SUMMARY

The evolution of welfare feeding in the United Kingdom is investigated within the framework of the development of the Welfare State. Welfare feeding, including the nutritional role of meals, is then evaluated looking at two examples of welfare provision, feeding in schools as an example of provision for the young and meals-on-wheels as an example of provision for the elderly. The nutritional role of both school meals and meals-on-wheels are considered in the light of nutritional requirements, contemporary dietary views and the feeding behaviour of the young and elderly. Whilst research suggests that school meals make a more significant contribution to the diet than alternative sources of lunch there is evidence that the nutritional value of both school meals and meals-on-wheels are variable and that in some cases they have not provided expected levels of nutrients. There are thus clear requirements for some form of nutritional standards for both school meals and meals-on-wheels. The uptake of school meals is a function of pupils perceptions of lunchtime feeding. An attitude based approach using a Likert Scale was developed to identify what children perceive as important in the school feeding environment. A core group of problem areas were identified as relevant for all groups of pupils and more specific factors were identified for each sub-group. It was established that the attitude measurement tool was appropriate in the prediction of feeding behaviour. The transportation of meals was investigated in terms of the requirements of the meals-on-wheels service. Alternative delivery systems were evaluated and those most appropriate to the meals-on-wheels service were identified. Insulated systems are appropriate for deliveries of up to 90 minutes whilst the best of the heated delivery systems are appropriate for up to 3.5 hours.
I would like to express my thanks to Dr James Thomson and Mr Michael Kipps who acted as my supervisors for the period of this research and without whose guidance and patience this work would have been impossible. I would also like to thank Dr Fred Lawson for his help during the early stages of the study. Finally I would like to acknowledge the help of the King Edward VII Hospital Fund for London Library and the Women's Royal Voluntary Service Library.
## CONTENTS

### CHAPTER 1. - INTRODUCTION.

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1. Background to the research.</td>
<td>1</td>
</tr>
<tr>
<td>1.2. Rationale.</td>
<td>4</td>
</tr>
<tr>
<td>1.3. Aims.</td>
<td>6</td>
</tr>
<tr>
<td>1.4. The scope of the research and definition of terms.</td>
<td>7</td>
</tr>
<tr>
<td>1.5. The approach.</td>
<td>11</td>
</tr>
</tbody>
</table>

### CHAPTER 2. - WELFARE FEEDING IN THE UNITED KINGDOM.

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1. The evolution of welfare services in the United Kingdom.</td>
<td>15</td>
</tr>
<tr>
<td>2.1.1. The Elizabethan Poor Law.</td>
<td>15</td>
</tr>
<tr>
<td>2.1.2. The Victorian Poor Law.</td>
<td>18</td>
</tr>
<tr>
<td>(i) &quot;Laissez-faire&quot; and the free market system.</td>
<td>18</td>
</tr>
<tr>
<td>(ii) The New Poor Law.</td>
<td>22</td>
</tr>
<tr>
<td>(iii) Education.</td>
<td>24</td>
</tr>
<tr>
<td>(iv) Hospital and medical services.</td>
<td>27</td>
</tr>
<tr>
<td>2.1.3. Government policy and social conditions up to 1905.</td>
<td>29</td>
</tr>
<tr>
<td>2.1.4. Liberal social policy up to 1914.</td>
<td>35</td>
</tr>
<tr>
<td>(i) Children.</td>
<td>35</td>
</tr>
<tr>
<td>(ii) The elderly.</td>
<td>35</td>
</tr>
<tr>
<td>(iii) The National Insurance Scheme.</td>
<td>36</td>
</tr>
<tr>
<td>2.1.5. Welfare services from 1918 to 1939.</td>
<td>39</td>
</tr>
<tr>
<td>(i) Health and housing.</td>
<td>39</td>
</tr>
<tr>
<td>(ii) Education.</td>
<td>40</td>
</tr>
<tr>
<td>(iii) Unemployment.</td>
<td>41</td>
</tr>
<tr>
<td>2.1.6. Welfare services from the Second World War.</td>
<td>44</td>
</tr>
<tr>
<td>(i) The effects of the Second World War.</td>
<td>44</td>
</tr>
<tr>
<td>(ii) Social policy during the Second World War.</td>
<td>45</td>
</tr>
<tr>
<td>(iii) The Welfare State.</td>
<td>47</td>
</tr>
<tr>
<td>2.1.7. The origins of feeding within the Welfare State.</td>
<td>52</td>
</tr>
</tbody>
</table>
2.2. Feeding in schools.

2.2.1. Early public school feeding programs. 56
2.2.2. Catering in the early elementary schools. 58
2.2.3. The Education (Provision of Meals) Act 1906. 62
2.2.4. School feeding from the Education Act 1906 to 1939. 64
2.2.5. The Second World War and the 1944 Education Act. 68
2.2.6. The school meals service from 1945 to 1970. 72
2.2.7. Financial pressures on the school meals service during the 1970's. 74
2.2.8. The 1980 Education Act. 82

2.3. Feeding in hospitals.

2.3.1. Evidence of catering in the earliest hospitals. 88
2.3.2. Feeding in medieval English hospitals. 89
2.3.3. Catering in the hospitals of the eighteenth and nineteenth centuries. 93
2.3.4. Twentieth century hospital feeding before the National Health Service. 101
2.3.5. Hospital feeding within the National Health Service. 102
2.3.6. Advances in hospital catering in the 1970's and 1980's. 108
   (i) The temperature of served meals. 110
   (ii) Centralized versus decentralized catering systems. 111
   (iii) The transportation of hospital meals. 112
   (iv) Special diets. 114
2.3.7. Hospital catering in the 1980's. 115
   (i) Financial pressures on the hospital catering service. 116
   (ii) The "contracting-out" of hospital catering. 116
   (iii) The nature and dimensions of the hospital catering service in the 1980's. 117
2.4. The evolution of the meals-on-wheels service.

2.4.1. The origins of delivered meals services.

2.4.2. Meals-on-wheels as part of an alternative to institutional care.

2.4.3. The development of the meals-on-wheels service in the 1950's and 1960's.

2.4.4. The modern meals-on-wheels service to 1980.

2.4.5. Modern technological approaches to delivered meals services.

2.4.6. The meals-on-wheels service since 1980.

CHAPTER 3 - WELFARE FEEDING FOR THE YOUNG - SCHOOL MEALS.

3.1. Schools and the school population.

3.1.1. Projected population changes.

3.1.2. The number of schools and schoolchildren.

3.2. The school meals service in the 1980's.

3.3. School meals and the nutrition of adolescents.

3.3.1. The nutritional requirements of school age children.

3.3.2. Contemporary dietary views as guidelines for school feeding.

3.3.3. Characteristics of the diets and feeding behaviour of adolescents.

3.3.4. The nutritional role of school meals.

3.4. The uptake of school meals and the attitudes of schoolchildren to school feeding.

3.4.1. The problem of uptake.

3.4.2. The investigation of feeding preferences.

3.4.3. Attitudes and the prediction/explanation of behaviour.

3.4.4. Moderators of the attitude-behaviour relationship.

3.4.5. The Inner London Education Authority.
3.4.6. Methodology.

(i) Preliminary school visits.  
(ii) Attitude measurement.  
(iii) The Likert method of attitude measurement.  
(iv) Group discussions.  
(v) Survey questionnaire - initial drafts.  
(vi) Pilot study.  
(vii) The final questionnaire.  
(viii) The sample.  
(ix) The administration of the survey.  
(x) Data processing and analysis.

3.4.7. Results.

(i) The sample.  
(ii) Food restrictions.  
(iii) Lunchtime activities.  
(iv) Sources of lunchtime food.  
(v) Parental influence.  
(vi) Preferred type of school meals service.  
(vii) Attitudes to school meals.

CHAPTER 4 - WELFARE FEEDING FOR THE ELDERLY - MEALS-ON-WHEELS.

4.1. The elderly population.

4.1.1. The size of the elderly population.  
4.1.2. The elderly population and the provision of social services.

4.2. The meals-on-wheels service in the 1980's.

4.3. Meals-on-wheels and the nutrition of the elderly.

4.3.1. The nutritional requirements of the elderly.  
4.3.2. Contemporary dietary views as guidelines for the feeding of the elderly.  
4.3.3. Characteristics of the diets and feeding behaviour of the elderly.  
4.3.4. The nutritional role of meals-on-wheels.
4.3.5. The acceptability of meals-on-wheels.

4.4. The delivery of meals-on-wheels.
4.4.1. The problems associated with the delivery of meals-on-wheels.
   (i) Delivery temperature.
   (ii) Food quality.
   (iii) Nutrient content.
   (iv) Hygiene.
   (v) Transportation and delivery equipment.

4.4.2. Research into delivery systems for meals-on-wheels.

4.4.3. Approach to the investigation of the delivery of meals-on-wheels.

4.4.4. Transportation equipment.

4.5. Thermal performance.
4.5.1. Objectives.
4.5.2. General methodology.
4.5.3. Thermal conductivity.
4.5.4. Temperature gradients.
4.5.5. Insulation performance of complete systems.
4.5.6. Performance of heated systems.
4.5.7. Heat distribution.
4.5.8. Simulated meals-on-wheels delivery.
4.5.9. Summary and conclusions.

4.6. Hygiene.
4.6.1. Objectives.
4.6.3. Hygiene evaluation of delivery systems.
4.6.4. Micro-biological field study of the hygiene of delivery systems.
4.6.5. Micro-biological field study of delivered meals.
4.6.6. Summary and conclusions.
4.7. Ergonomics.
4.7.1. Objectives.
4.7.2. Weight.
4.7.3. Size.
4.7.4. External surface temperatures.
4.7.5. General design features.
4.7.6. Summary and conclusions.

4.8.1. Objectives.
4.8.2. Fire risks.
   (i) Materials.
   (ii) Electrics.
   (iii) Heat source.
4.8.3. Flue gases.
   (i) Flue gases and health.
   (ii) Carbon monoxide levels produced by Hotlock delivery system.
   (iii) Carbon monoxide levels during delivery.
4.8.4. Summary and conclusions.

4.9. Durability and costs.
4.9.1. Objectives.
4.9.2. Durability.
   (i) Carrypack.
   (ii) Insulated Container.
   (iii) Nutri-System.
   (iv) Temp-rite.
   (v) Corsair.
   (vi) Excelarc.
   (vii) Hotlock.
   (viii) Huskybox.
4.9.3. Cost-effectiveness.
4.9.4. Summary and conclusions.
4.10. Recommendations and conclusions.
   4.10.1. Objectives.
       (i) Hygiene.
       (ii) Temperatures.
   4.10.3. Loading, unloading and delivery to the recipient.
   4.10.4. Delivery systems.
   4.10.5. Summary.

CHAPTER 5 - CONCLUSIONS.

5.1. Feeding within the Welfare State.
   5.1.1. The nutritional role of school meals.
   5.1.2. The nutritional role of meals-on-wheels.
   5.1.3. The future.

5.2. The uptake of school meals and childrens attitudes to school feeding.
   5.2.1. Methodology.
   5.2.2. Factors affecting the uptake of school meals.
   5.2.3. The attitudes of schoolchildren to school feeding.
   5.2.4. Further investigation and research.
       (i) The uptake of school meals.
       (ii) Likert attitude scales and the prediction/explanation of consumer behaviour.

5.3. The delivery of meals-on-wheels.
   5.3.1. Methodology.
   5.3.2. The transportation and delivery of meals-on-wheels - existing systems.
   5.3.3. Alternative meal delivery systems.
   5.3.4. Further investigation and research.

REFERENCES.
LIST OF TABLES

CHAPTER 2.

2.1. Scale for weekly income of the poor as determined by Speenhamland system, May 6th 1795. 54
2.2. One week's meals at Christ's Hospital, 1678. 57
2.3. An example of one week's lunch menu at Chittlehampton School in the late nineteenth century. 60
2.4. An example of a good lunchtime diet as suggested by the Board of Education, 1939. 67
2.5. School meals served to pupils at maintained schools in England (1969-1985) 75 & 76
2.7. School meal prices charged by local education authorities on 9th December 1981. 85 & 84
2.8. The weekly diet at St. Bartholomew's Hospital, 1687. 92
2.9. The weekly diet at the Radcliffe Infirmary, Oxford, 1820. 94
2.10. Alternative diets at St. Thomas' Hospital, 1761. 96
2.11. Weekly menu at St. Frederick's Hospital, Copenhagen, on 1st July 1774. 98
2.12. Weekly meal plan at Massachusetts General Hospital, 1822. 100
2.13. Examples of the daily diet at St. Thomas' Hospital in 1968. 105
2.14. Meal transportation systems and user hospitals in the south-east of England (1983) 113
2.15. The numbers of meals-on-wheels served in the 1980's. 137

CHAPTER 3.

3.2. Numbers of school pupils in the U.K. by type of school. 143
3.3. Numbers of school pupils in the U.K. by age. 143
3.4. The number of maintained schools in England (1971-85). 145
3.5. Approved school closures in 1982-84. 145
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8.</td>
<td>Recommended daily amounts of food energy and nutrients for children aged 12-17.</td>
</tr>
<tr>
<td>3.10.</td>
<td>Number of pupils in ILEA primary and secondary schools by ethnic group.</td>
</tr>
<tr>
<td>3.11.</td>
<td>ILEA divisions and main language groups.</td>
</tr>
<tr>
<td>3.13.</td>
<td>Changes in meal uptake with the introduction of cash cafeteria service.</td>
</tr>
<tr>
<td>3.14.</td>
<td>Attitude statements included in Likert scale.</td>
</tr>
<tr>
<td>3.15.</td>
<td>Analysis of survey sample by age and sex.</td>
</tr>
<tr>
<td>3.16.</td>
<td>Foods respondents cannot eat or are not allowed to eat by sex.</td>
</tr>
<tr>
<td>3.17.</td>
<td>Foods respondents cannot eat or are not allowed to eat by age.</td>
</tr>
<tr>
<td>3.18.</td>
<td>Foods listed under &quot;any other foods you cannot eat&quot; in question 4, and their frequency.</td>
</tr>
<tr>
<td>3.20.</td>
<td>Why respondents cannot eat food items by age.</td>
</tr>
<tr>
<td>3.22.</td>
<td>&quot;What did you do during lunchtime yesterday?&quot;, by age.</td>
</tr>
<tr>
<td>3.23.</td>
<td>&quot;What do you think is the most important thing to do at lunchtime?&quot;, by sex.</td>
</tr>
<tr>
<td>3.24.</td>
<td>&quot;What do you think is the most important thing to do at lunchtime?&quot;, by age.</td>
</tr>
<tr>
<td>3.25.</td>
<td>&quot;Where did you get your lunch from yesterday?&quot;, by sex.</td>
</tr>
<tr>
<td>3.27.</td>
<td>Respondents having lunch in or out of school.</td>
</tr>
<tr>
<td>3.28.</td>
<td>&quot;Why did you get it there?&quot;, by sex.</td>
</tr>
<tr>
<td>3.29.</td>
<td>&quot;Why did you get it there?&quot;, by age.</td>
</tr>
</tbody>
</table>
3.30. Source of lunch cross-tabulated by reason for obtaining it there.  
3.32. Parental influence by age.  
3.33. "Where do you think your parents prefer you to get your lunchtime food from?", by sex.  
3.34. "Where do you think your parents prefer you to get your lunchtime food from?", by age.  
3.35. Parental preference cross-tabulated by usual lunch place.  
3.36. Parental influence cross-tabulated by parental preference.  
3.37. Parental influence cross-tabulated by usual lunch place.  
3.38. Preferred type of school canteen.  
3.40. Preferred type of school canteen by type of canteen at respondents school.  
3.41. Mean attitude score for each school sampled.  
3.42. Mean attitude score and statements which were on average agreed/disagreed with by the whole sample.  
3.43. Mean attitude score and statements which were on average agreed/disagreed with by boys.  
3.44. Mean attitude score and statements which were on average agreed/disagreed with by girls.  
3.45. Mean attitude score and statements which were on average agreed/disagreed with by respondents aged 11-12.  
3.46. Mean attitude score and statements which were on average agreed/disagreed with by respondents aged 13-14.  
3.47. Mean attitude score and statements which were on average agreed/disagreed with by respondents aged 15-16.  
3.48. Mean attitude score and statements which were on average agreed/disagreed with by respondents at schools with traditional meal service.
3.49. Mean attitude score and statements which were on average agreed/disagreed with by respondents at schools with cash cafeteria service.

3.50. Mean attitude scores and statements which were on average agreed/disagreed with by respondents who cannot eat some foods.

3.51. Mean attitude scores correlated with school characteristics.

CHAPTER 4.

4.2. Use of some health and personal social services by the elderly, 1984.
4.3. Elderly people in private households by age and sex, 1985 (Great Britain).
4.4. The number of meals-on-wheels served from 1980 to 1985.
4.5. Recommended daily amounts of food energy and nutrients for people aged 65 and over.
4.6. Delivery systems used by the meals-on-wheels services in the London boroughs.
4.7. The range of alternative meals-on-wheels delivery systems, 1980.
4.8. Basic description of delivery systems and the models tested.
4.9. Insulation qualities of delivery systems.
4.10. The performance of heated systems.
4.11. Heat distribution.
4.15. Hygiene aspects and recommended cleansing.
4.17. Microbial counts per gram of food delivered. 375
4.18. The weights of delivery systems. 380
4.19. Equipment size and dimensions. 383
4.20. Equipment loading into a range of transportation vehicles. 383
4.21. External surface temperatures. 385
4.22. Effects of different concentrations of carbon monoxide on resting individuals. 392
4.23. Carbon monoxide concentrations produced in a range of delivery vehicles. 403
4.24. Delivery system costs as at 1st July 1981. 411
## LIST OF FIGURES

### CHAPTER 2.

2.1. Regional Health Authority areas of England.  

### CHAPTER 3.

3.1. Number of children in the U.K. aged 5-14 years from 1941 to 1985 and projected figures from 1986 to 2001.  
3.2. Inner London Education Authority divisional areas.  
3.3. Approach adopted for identifying children's attitudes to school meals.  
3.4. Breakdown of schools from sample who did or did not take part in survey.  
3.5. Histogram of Likert attitude scores for the whole sample.  

### CHAPTER 4.

4.2. Approach to the investigation of meals-on-wheels delivery systems.  
4.3. Characteristics of meals-on-wheels operations and their implications for delivery systems.  
4.5. Sampling points for temperature gradients.  
4.6. Temperature gradient through Carrypack wall.  
4.7. Temperature gradient through Insulated Container wall.  
4.8. Temperature gradient through Nutri-System wall.  
4.9. Temperature gradient through Hotlock wall.  
4.10. Temperature gradient through Corsair wall.  
4.11. Temperature gradient through Huskybox wall.  
4.12. Temperature gradient through Excelarc wall.  
4.13. Temperature gradient of good insulator.
4.15. Thermocouple positions over wall for heat-loss curve. 336
4.16. Heat loss curves over container walls. 337
4.17. Aluminium wall with insulating barrier. 338
4.18. Thermocouple positions in meals within containers. 340
4.19. Thermocouple positions on inside of container. 343
4.20. Average internal temperature during recommended pre-heating periods. 345
4.21. Heat loss due to hinged lid in Huskybox. 355
4.22. Positions for microbiological sampling. 371
4.23. The flow of air into, and flue gases out of the Hotlock. 395
4.24. Flue gas sampling point. 396
4.25. Carbon dioxide in Hotlock flue gas over time. 397
4.26. Carbon monoxide in Hotlock flue gas over time. 398
4.27. CO emission and concentrations around Hotlock exhaust portholes. 400
4.28. CO emission and concentrations around charcoal ignition equipment. 401
4.29. Heat loss curve for mashed potato (mix) during processing. 416
4.30. Temperatures of packed meals portioned from one batch. 417
LIST OF PLATES

Plate 1 Excelarc HB40 317
Plate 2 Corsair CH203 317
Plate 3 Huskybox B13 318
Plate 4 Hotlock 18 meal 318
Plate 5 Carrypack PB20 319
Plate 6 Insulated Container - Queen 319
Plate 7 Nutri-System 320
Plate 8 Temp-rite Citizen 320

LIST OF APPENDICES

Appendix 1. School visits - Data Checklist
Appendix 2. Comments on school lunchbreaks made by pupils at Bacons School and Prendergast School during group discussions.
Appendix 3. Tests to determine the effect of different salt concentrations (1% & 10%) upon the evaporation of water from gruel.
Appendix 4. Sample of schools for ILEA survey
Appendix 6. Pupil questionnaire - 2nd draft.
Appendix 7. Final survey questionnaire.
CHAPTER ONE - INTRODUCTION

1.1. Background.

During the late 1970's and the early 1980's traditional catering services within the Welfare State came under a great deal of financial pressure. The school meals service was required to drastically reduce net expenditure (total expenditure less income from pupils), whilst hospital catering services were put out to tender to identify the cheapest alternatives in terms of methods of operation.

As a result of the White Paper "New Policies in Public Spending" (1970), the school meals service was asked to find ways to halve net expenditure on school feeding by 1980. During discussions with the Government in 1979, the Association of County Councils pointed out that efforts to reduce expenditure on school meals were hampered by the requirements of their statutory duties as determined by the Education Act 1944 and the Provision of Milk and Meals Regulations 1945, and as modified by the Provision of Milk and Meals Regulations 1969 and the Education (Milk) Act 1971. This legislation required education authorities to provide meals at all maintained schools for all those pupils who desired them. Furthermore these meals had to be suitable as the main meal of the day, charges for them should not exceed the food cost, and suitably qualified School Meals Organisers had to be appointed. It was these requirements that the Association of County Councils claimed were limiting their ability to reduce costs. As a consequence the Education Act 1980 removed many of these requirements.

Section 22 of the Education Act 1980 permitted the local education authorities to decide upon the nature and the extent of the school meals service and to determine the prices to be paid for them. The only statutory requirements were that lunchtime meals should be provided for pupils whose parents receive supplementary benefit or family income supplement, and that facilities for those pupils bringing their own lunch to eat at school should be provided. This
legislation permitted quite radical changes in the meals service, and the requirement to reduce net expenditure by half virtually ensured that such radical changes would have to be made. The options available to the local education authorities were clear, they could maintain the meals service but charge appropriate prices to cover the costs, they could put the meals service out to tender and allow other organisations to cover costs, or they could reduce the meals service to the statutory minimum as described above. In practice all three of these options were used by different authorities (see section 2.2.8).

Catering services in hospitals were also under financial pressure during this period. Net expenditure on catering as a percentage of net hospital revenue expenditure was reduced from 7.1% in 1976/77 to 5.6% in 1980/81 (Capel 1983). This pressure was maintained by the report "The Cost of Catering in the National Health Service" (Royner, unpublished, quoted by Wollfe 1985). This report identified the enormous levels of waste in the hospital meals service. It found that nearly one third of all food served was wasted and pointed out that a reduction in waste of 7% would save £17.3 million per year (Wollfe 1985). As a consequence of these findings the report recommended the privatisation of hospital catering.

The National Health Service was thus required to obtain private tenders for catering services, along with laundry and cleaning services. In September 1983 the local health authorities were then instructed to compare the alternative operations as identified by the tenders and to submit timed schemes in response by February 1984. This process of privatisation was still continuing at the time of this study.

Although some of the welfare catering sectors had not been directly affected, the Government's attitude towards welfare catering was clearly indicated by these policies. As Stuart Sexton, adviser to the Secretary of State for Education and Science, stated with regard to school meals, "We seek to spend as much as possible of the available money on education within the classroom, rather than on
services which parents themselves could and should properly pay for” (S. Sexton, personal communication dated 5th January 1982). This statement would seem indicative of the general Government attitude towards catering as part of the Welfare State and it would appear that further significant changes in the operation of welfare feeding services, particularly privatisation, are likely.
1.2. Rationale.

The late 1970's and early 1980's were thus years of considerable change, uncertainty and financial pressure for the welfare catering industry. Furthermore, because of the Government's desire to see costs reduced, the industry was under very close scrutiny in terms of its operational methods, efficiency, and the cost/benefits of the services each sector provided. At least partly because of this pressure from the Government, the various sectors of the welfare catering industry were taking a critical look at the way their services were organised and operated.

They were particularly aware of several specific operational and organisational problems they faced. Problems for which they could be open to criticism in the future. Examples of the types of problem they faced included aspects such as the nutritional quality of meals and the acceptability of meals to recipients. More specifically, the hospital meals service was concerned with the problems associated with the transportation of hot meals to distant wards. Meals-on-wheels services had similar problems with the transportation of meals to recipients' homes, and the school meals service was concerned with problems of the levels of school meal uptake and the contribution of school meals to the pupils' diet.

Concern about these aspects of the meals-on-wheels and school meals services led the Department of Health and Social Security (DHSS) and the Inner London Education Authority (ILEA) to fund research to investigate these problems at the University of Surrey. Specifically the DHSS was interested in research into the problems of the transportation of meals within the meals-on-wheels sector. The ILEA was interested in research into the uptake of school meals.

It was decided that this research should form the basis of a wider investigation of feeding within the Welfare State. Although there has been a lot of published work on the development of the Welfare State and the development of individual services such as the National Health Service, and there have been a number of studies
into specific aspects of welfare feeding, mainly nutritional, there has been no published study into the development of and the current state of feeding within the Welfare State as such. With the major changes that were taking place in the early 1980's, it was appropriate that such a study should be carried out.

It was therefore determined that this research would look at the development of welfare feeding within the framework of the Welfare State, and would then look at the current state of welfare feeding as represented by two examples of the provision for two different groups of the population. In order to cover two very different welfare feeding services, the study investigated the provision of meals at the two ends of the life-cycle. At one end, the provision of welfare feeding for the young would be investigated in the form of school meals. At the other end of the age range, the provision of welfare feeding for the elderly would be investigated in the form of meals-on-wheels (despite the fact that the service is not solely provided for the elderly, a point discussed further in section 1.4.). It is within this framework of investigation that the problems as identified by the DHSS and the ILEA would be researched.
1.3. **Aims.**

Having discussed the background and the rationale behind the research, the specific aims may be identified. These are:

- To investigate and document the development of welfare feeding within the framework of the Welfare State.
- To investigate the current state and nutritional role of welfare feeding as reflected by publications and research into the school meals service and the meals-on-wheels service.
- To identify the factors that determine the uptake of school meals with particular reference to secondary schools within the Inner London Education Authority.
- To analyse the existing alternatives and recommend the most appropriate delivery systems for the transportation of meals in the meals-on-wheels service.
1.4. The scope of the research and definition of terms.

It is important for the purposes of clarity to specify the scope of the investigation and to define the terms that are used frequently in the text. The definitions used are for the purposes of this research and are not intended as universal standards. Indeed other researchers may well use different definitions in other work.

The Welfare State is a rather general term for the group of social services operated by the Government which ensure the welfare of all the citizens of the United Kingdom. It includes a very wide range of social services most of which fall within the broad areas of health, housing, employment and education.

This study is concerned with feeding within the Welfare State, the bulk of which relates to feeding in schools of all types, feeding in hospitals, and feeding at home as part of a program of domiciliary care. For the purposes of this study therefore welfare feeding will be considered in terms of the major sectors of school catering, hospital catering and meals-on-wheels.

The region to be covered in this investigation will be the United Kingdom. The United Kingdom is taken as being England, Wales, Scotland and Northern Ireland. In some cases where no alternatives are available, particularly with the population statistics, it has been necessary to use figures relating to Great Britain, or figures for England and Wales.

Chapter 3 looks at feeding in schools as an example of welfare feeding for the young. It includes all types of school, but mainly applies to junior, middle (where applicable) and secondary schools. It does not consider catering at institutions of further education, despite the fact that in some areas they include sixth form colleges. Institutions of higher education are not included either. The research identifying the factors that determine the uptake of school meals deals solely with secondary school feeding. This is because the problem of low uptake is mainly associated with the
older pupils and this is reflected in the fact that secondary schools were those with which the ILEA was particularly concerned.

The meals-on-wheels service is investigated as an example of feeding for the elderly. The elderly are for the purposes of this study defined as those aged over 65 years. There are however some population statistics in section 4.1., where it has been necessary to use figures relating to those over retirement age. These statistics therefore include females over the age of 60. Although the service is not purely one for the elderly but is intended for those people who are unable to provide meals for themselves for reasons of ill-health or incapacity, it is in practice mainly used by those over the age of 65.

Meals-on-wheels services are included as part of the Welfare State in this study despite the fact that in many areas they are not operated by government bodies but by charitable organisations such as the Women's Royal Voluntary Service and Age Concern. These organisations do however work in close co-operation with the local authorities in providing a service for the welfare of the population. As such this study includes the meals-on-wheels service as a social service and as a form of welfare feeding.

A number of other terms used in the research will now be defined;

1. The Inner London Education Authority.

The Inner London Education Authority (ILEA) is the local education authority that controls educational provision within the twelve London boroughs. These are divided into ten divisions as shown in figure 3.2. The ILEA is described in more detail in chapter three.

2. Meal uptake.

With regard to the numbers of meals provided in the school meals service it is usual to refer to the uptake of meals. The uptake is the number of meals sold over a particular period of time expressed as a percentage of the total school roll over the same period of
time. This figure therefore indicates the number of meals sold as a proportion of the total possible number of meals that could be sold.

3. Cash cafeteria service.

The ILEA provides a useful definition of cash cafeteria service; "a service where items on the tariff are separately priced, the charge being related to the standard meal charge, and where pupils have the freedom to buy as much or as little as they wish." (ILEA 1982).

4. Traditional meal service.

For the purposes of this study, traditional meal service will be considered as those situations where complete meals are offered and there is little or no choice. This is typical of the style of school meals prior to the 1980 Education Act.

5. Equated number of meals.

In operations such as cash cafeterias where children make up their own meals it is difficult to quantify the actual number of meals sold. It is normal in these situations to calculate the equated number of meals by dividing the total amount of money taken by the price of a standard meal. It should be noted however that this figure could be misleading. In situations where the average spend is more than the price of a standard meal, the actual uptake will be lower than the equated figure. Conversely, where the average amount spent is less than the price of the standard meal, the actual uptake will be higher than the equated figure. Because of this anomaly it would probably be more meaningful to count the number of pupils who use the cafeteria regardless of how much they spend.

6. Attitudes.

The research in chapter three is concerned with the relationship between meal uptake and attitudes. For the purposes of this research, attitudes may be defined as the positive and negative feelings towards particular objects or stimuli which mould the individuals reaction towards those objects or stimuli. It should
also be noted that attitudes are also a function of the individuals beliefs (the probability that the object has particular characteristics and features and whether it indeed exists) and values (the individuals concept of what is desirable). Other terms relating to attitudes and attitude measurement, such as Likert scales, the Semantic Differential and so on, are defined in chapter three.

7. Warm holding time.

In chapter four the meals-on-wheels delivery systems are investigated in terms of their thermal performance which is measured in terms of the warm holding time. The warm holding time may be defined as the time in minutes between the loading of meals into the delivery system and the point in time at which they fall to below 62.8°C. It is effectively a measure of the length of time over which meals may be delivered at an acceptable temperature.
1.5. The approach.

In order to achieve the aims as described in section 1.3, the following approach was adopted. The thesis may be broken down into three main areas corresponding to chapters two, three and four. Chapter two documents the development of welfare feeding within the framework of the development of the Welfare State. Chapters three and four then look in some detail at the school meals and the meals-on-wheels services as two examples of feeding within the Welfare State - one being an example of feeding for the young and the other of feeding for the elderly. A major part of each of these two chapters is the research into the uptake of school meals (chapter two) and the delivery of meals-on-wheels (chapter three).

Since the development of welfare feeding is directly related to the development of welfare services, the starting point of chapter two is a review of the historical background to the modern Welfare State. This section documents welfare services from the Elizabethan Poor Law of the sixteenth century, through to the modern Welfare State created after the Second World War. This provides a framework for the investigation of feeding within the Welfare State.

The rest of chapter two documents the historical background of the school meals service, the hospital meals service and the meals-on-wheels service. Section 2.2, looks at school feeding from the early public schools of the sixteenth century, to the development of a state education system and the creation of a national school meals service in 1944. It then follows the development of school feeding through to the 1980 Education Act and its consequences, particularly as a result of the removal of the requirement for local authorities to provide meals for all children.

Section 2.3, investigates the development of feeding within hospitals. Although there is evidence of feeding in hospitals in India and Egypt as long ago as the sixth century B.C., and the Romans had built hospitals in the United Kingdom during the first century A.D., the earliest evidence of hospital feeding in the
United Kingdom was associated with the medieval hospitals of around 1000 A.D.

From these medieval beginnings hospital feeding is investigated through to the development of the National Health Service in 1946 and to the modern hospital catering service of the 1980's. Because hospital catering is not one of the services looked at in greater detail in later sections, some of the more recent advances in hospital catering are also discussed.

The final section of chapter two looks at the development of the meals-on-wheels service. This service has much more recent origins than both school and hospital feeding, since it was started in response to the feeding problems of the Second World War. The background is then traced through the development of meals-on-wheels as part of a wider system of domiciliary care to the modern meals-on-wheels service of the 1980's.

Chapter three investigates the school meals service. The starting point is an analysis of the school age population and the numbers of schoolchildren and schools. This looks at past trends, existing numbers and projected trends which form the basis of predictions of the future possible market for school meals. The next section provides a description of the school meals service in the 1980's.

The primary function of any welfare feeding program is a nutritional one. This is despite the fact that in many cases there will be secondary benefits such as monitoring the welfare of recipients, contributing to nutrition education and any social benefits derived from feeding with others. Because of this it is important to consider the nutritional role of school meals, and particularly their role within the overall diets of children.

Section 3.3 reviews the literature concerning school meals and the diets of schoolchildren. The nutritional requirements of school age children are identified and the relevance of contemporary dietary views to these requirements are discussed. The implications for the diet and for any school meals feeding program, of the feeding
characteristics of adolescents are also identified. Finally in the light of the above research the nutritional role of school meals is discussed.

Having identified the nutritional value of school meals, section 3.4. discusses the importance of the levels of uptake on both the meals service and the diets of schoolchildren. There is a clear need to maximise uptake through the provision of an appropriate meals service that will attract pupils. Published research on methods for the investigation of food preferences and for the measurement of attitudes are reviewed in terms of their application to the prediction and explanation of feeding behaviour. Attitude scales are identified as appropriate for the purposes of this research. The detailed methodology was then formulated as described in section 3.4.6., and the results of the research presented and discussed in section 3.4.7.

Chapter four investigates meals-on-wheels services as an example of feeding for the elderly. Using a similar approach to chapter three, population statistics are analysed in terms of the effects of projected future changes on the numbers of those aged over 65. The nature of the service in the 1980's is then described, and meals-on-wheels and the nutrition of the elderly are discussed on the basis of published research findings. Research on the acceptability of meals-on-wheels is also discussed in this section.

Section 4.4. introduces the research into the delivery of meals-on-wheels through the identification of current problems with the delivery of meals-on-wheels. Having identified the main problem areas, existing delivery systems are investigated in terms of these problems.

Previous investigations into meal delivery systems are discussed, and then the methodology for the investigation is formulated. A number of specific areas corresponding to the problems already identified are selected for investigation. Subsequent sections investigate these areas, each identifying the objectives of the research, the methodology, the results, and finally a summary and
the conclusions of the section. The final section of the chapter presents the conclusions and recommendations that result from the investigation.

The final chapter draws the results and findings of the whole thesis together looking at the three areas of investigation, feeding within the Welfare State in general terms including the nutritional aspects, the delivery of meals-on-wheels and finally the uptake of school meals. Whilst providing a summary of the results of the research, this section also makes conclusions regarding the methodology used for each section, the ways in which it was particularly successful and the ways in which it could have been improved. This chapter also includes sections on the scope for further research and investigation making suggestions of specific areas for research that would make important contributions to the knowledge in those areas.
CHAPTER TWO - WELFARE CATERING IN THE UNITED KINGDOM.

2.1. The evolution of welfare services in the United Kingdom.

The welfare services in the United Kingdom have developed essentially from the Elizabethan Poor Law system of the 16th century. Indeed The Poor Law, with various amendments, dominated social policy for three hundred and fifty years until the National Assistance Act of 1948 declared it abolished and along with the 1944 Education Act, the 1946 National Insurance Act and the 1946 National Health Service Act provided the basis of the welfare services into the 1980's.

The 1980's have however seen a change in government attitudes towards welfare services. It is argued by some that government social expenditure has grown to a level and in a fashion which is both economically and socially undesirable. It is believed that such spending excessively distorts the function of the economic market and provides disincentives to effort. The Welfare State, therefore, faces very close economic analysis and indeed the first determined attempt since the Second World War to cut it back from present levels.

2.1.1. The Elizabethan Poor Law.

The Elizabethans were the first to realise that unemployment and poverty were not just the results of idleness and moral inadequacy. They saw that the poor needed help and accepted some responsibility for the less fortunate in society through an early system of poor relief.

Until this time the Tudors had attempted to deter vagrancy through physical punishment, including beatings, and the use of the stocks. These policies had little effect and so during the 1530's more constructive methods were adopted including legislation that
authorised parishes to collect money to support the impotent poor. This was the first sign of the state accepting some responsibility for those who were unable to work.

During the second half of the sixteenth century a number of factors led to great increases in economic and social stress. These included depopulation due to the enclosure of arable land, massive inflation, epidemic diseases, fluctuations in the cloth trade and poor harvests in 1594-7. The consequent poverty, unemployment and illness led to a large increase in the numbers of beggers, and in particular, wanderers seeking work or charity. This mobility of labour was greatly feared during the sixteenth century since wanderers were likely to be thieves and rogues and such people in any large numbers could cause political disturbance.

The Elizabethan remedy to this problem was to find the unemployed work. The Poor Relief Act of 1576 and more successfully the legislation of 1598 were passed "for setting the poor on work and for avoiding idleness". These Acts were based on the experiences of the City of London where the Palace of Bridewell had been converted into a poor-house for both the able-bodied and the impotent poor. Under the new legislation there were to be three classes of poor for whom there would be three forms of treatment. For the impotent who could not earn there was to be the poor-house, for the able-bodied the workhouse and for idlers "houses of correction".

In practice, due to limited finances, all three groups tended to be treated as one, and were placed in workhouses which were to become known as "Bastilles". These were prison-like workhouses where the punitive spirit prevailed.

Attempts to provide work also failed since workhouse labour competed with ordinary labour and was in the long run more expensive. It was easier therefore to require no work or just provide jobs of little value such as stone breaking or oakum picking. Pauper children were to be apprenticed in local industry, but in practice proved to be little more than cheap labour on the land or in local houses.
This early form of poor-law was to be administered by the Justices of the Peace through the "overseers of the poor". These overseers were to levy a tax on the parishioners to pay for all the work associated with the upkeep of the poor.

The role of private charity was significant during the second half of the seventeenth century through the funding of almshouses, schools, hospitals, apprenticeships and loans - some of which are still in evidence today. Indeed it was charity that made the most significant contribution to the efforts to relieve poverty in this first half of the century.

Since the Elizabethan Poor Law was based upon the parish, each had to look after its own poor. This led to many disputes and litigation over which parish was responsible for those paupers whose place of residence was doubtful. The general rule was that they should be returned to their rightful parish as determined by birth. This was often difficult however since it was in the interests of the overseers to prevent paupers becoming chargeable to their parish in order to keep the poor rates to a minimum.

As a consequence there were many disputes and families were shuttled from parish to parish. Expectant mothers were invariably hurried away since any children born in the parish became its responsibility. As stated at the time a "mournful and onerous general post' of indigent folk, men, women and children in all states of health and disease, perpetually criss-crossing the kingdom under expensive escort" (S. & B. Webb 1927). In an attempt to clarify the situation the 1662 Act of Settlement and Removal empowered parishes to remove paupers to their native parish as determined by birth, marriage or apprenticeship. This legislation was to be "the pivot around which the administration of poor relief was to swing for nearly two centuries" (Marshall, 1926).

As noted earlier, the three kinds of pauper identified by the Poor Law were usually gathered into one workhouse or house of correction. Only the largest parishes however could afford to build such institutions so Gilberts Act of 1782 made it legal for amalgamations
of parishes to be formed to promote the spread of workhouses. This Act also encouraged outdoor relief such as pensions, doles and payments in kind.

By the end of the eighteenth century the Poor Law had come under extreme strain due to population growth, increased social mobility, industrialisation and economic fluctuations. It had been geared to the pre-industrial economy but industrialisation had created a host of new problems. There were both the unemployed and also the low paid who now needed help.

The Government failed to act so the parishes adopted a number of new solutions to the exceptional problems they faced. At Speenhamland it was decided that the parish would supplement deficient wages on a scale based on the price of bread. This was to be known as the Speenhamland System and was widely adopted in the south of England in the 1790's. Other systems included supplements of food, payment in money or in kind, and in particular child and family allowances. All of these were devices used to help those in low paid work who in times of crisis and scarcity were in as much need as the unemployed.

2.1.2 The Victorian Poor Law.

(i) "Laissez-faire" and the free market system.

Social policy in the late eighteenth and first half of the nineteenth century was greatly influenced by the emergence of a new social philosophy. It was inevitable that such a massive change as the Industrial Revolution would be accompanied by new ideas and attitudes towards economic and social matters. Indeed theories that explained the role of capital and free competition in the new society crystallised into the concept of "laissez-faire".

The early "laissez-faire" philosophy emerged after the Civil War. There developed with the triumph of the puritan spirit a hardening of attitudes towards the care of the poor and an increasing impatience with them as obstacles to economic improvement. This attitude slowly gained support until 1776 when the paternal approach
of Tudor legislation was completely undermined by the publication of "An Enquiry into the Nature and Causes of the Wealth of Nations" (Adam Smith, 1776). Smith popularised the views of the free market system where, as he said, "consumption is the sole end and purpose of all production", and that the consumer is best served by market forces operating freely under competition.

Thus, it was held that the economy should be free from regulations such as restrictionist tariffs. These were restraints upon trade and therefore restricted full economic development. Furthermore, it was felt that economic growth would be best achieved by allowing all to pursue their own self-interest since it was the firm belief that general welfare would be served by the collective pursuit of individual welfare. Thus by pursuing his own self-interest an individual is "led by the invisible hand to promote an end which was no part of his intention" (A. Smith 1776). This was to be the common social ethic underlying the early industrial society.

"Laissez-faire" was to have a profound influence on the social policy of the early nineteenth century. People were inspired by the individualism reflected in Adam Smith's views and were preaching the doctrine of self-help. The aim of all was to be independent, and of course this aim was in direct conflict with the ethos of the Poor Law which tended to make people dependent upon society. The Poor Law nullified the normal stimulants to self-help. As Sydney Smith (1820) stated, "What encouragement have the poor to be industrious and frugal when they know for certain that should they increase their store it will be devoured by the drones, or ......, that if by their indolence and extravagance, by their drunkenness and vices, they should be reduced to want, they will be abundantly supplied ?".

The Poor Law was also suffering attacks from other angles. As has been mentioned, it was based on the non-industrial society and as such was unable to cope with the problems presented by the industrialised economy of post Industrial Revolution Britain. It was recognised that there was urgent need for reform of the Poor Law,
and indeed some schools of thought saw abolition as the answer. At the forefront of the abolition movement was the Reverend Malthus who in his "Essay on the Principle of Population" (1798) put forward, the proposition that population growth would outstrip the growth in the output of food unless certain constraints were imposed. The Poor Law, with its device of child allowances was therefore worsening an already pessimistic future. It seemed to promote population increases through providing bonuses for large families. David Ricardo (19715) came to similar conclusions although from a different argument based on the "iron law of wages".

Thus, by the early 1800's there was much support for changes in the Poor Law. Many alternative suggestions such as increases/decreases in public spending, repeal of the Corn Laws, more/less workhouses or more/fewer enclosures were put forward, but none received sufficient support to be implemented. Abolition without a viable replacement would merely increase distress so changes were delayed. In fact it took the Swing Riots of 1830 and the general threat of social disorder to stimulate the Government to reform social policy.

In February 1832 a Royal Commission was appointed for a full-scale inquiry into the operation of the Poor Law, reporting its findings in the "Report of the Commissioners for Inquiry into the Administration and Practical Operation of the Poor Laws, 1834" (1835). This report was the work of Senior and Chadwick - both "laissez-faire" economists - and it identified the key problem as the allowance system whereby low wages were supplemented by the local rates. This, they believed, depressed wages and instead of indicating the lower level of pay in fact set a ceiling above which wages would not rise. This demoralised the workers and also provided an open invitation to idleness since the allowance system cushioned the workers from disaster and hunger which were seen as the spurs to individual industry. Furthermore, there was a lack of motivation since the public provision at subsistence level was often greater than the private provision men could make through their own endeavour.

The Poor Law Report in fact confirmed all the preconceived views of
Senior and Chadwick, both advocates of "laissez-faire". There has been much debate since whether the report was a true reflection of the Poor Law or whether the investigators were selective in their use of evidence (see Blaug 1963, Blaug 1964, Fraser 1973 for instance). Regardless of this discussion however, the report formed the basis of social policy from 1834 onwards. It suggested three main points for a new poor law system:

- the principle of less eligibility
- the workhouse test
- administrative centralisation.

The principle of less eligibility was based on the belief that men would always seek comfort and avoid pain. Thus, instead of relief (in the form of allowances) being of a standard above that of a labourer they should in fact be below that of a labourer. The poor would then seek to be employed since the benefits in employment would be greater than those in unemployment. This had not been the case with the old Poor Law where benefits had sought to raise people above the identified minimum wage levels. This new approach would also discourage people from leaving the classes of the employed to join the class of the pauper. Less eligibility was very much in keeping with the opinions and mood of the era and was therefore readily accepted when suggested in the report of 1834.

The workhouse test was an extension of the less eligibility principle. It was accepted that the aged, infirm and orphans needed residential care, but it was the able-bodied poor that were the concern of the report. It was suggested that all outdoor relief should be abolished and that only institutional relief in the workhouse should be offered - the "test" being that the workhouse would provide a standard of living below that of the poorest independent labourer (the less eligibility principle) and would therefore only be resorted to by the truly destitute. The workhouse was to be a deterrent. As McCulloch (1828) observed, "The real use of a workhouse is to be an asylum for the able-bodied poor ..... But it should be such an asylum as will not be resorted to except by those who have other resource ..... The able-bodied tenant of a
workhouse should be made to feel that his situation is decidedly less comfortable than that of the industrious labourer who supports himself."

Thus, the prop of the allowance system was to be removed, since it was felt that it created social cripples, and fear of the workhouse was to be the spur to make paupers raise themselves out of destitution. The social philosophy of the day was that people were masters of their own fate and that those who had been encouraged to be idle by the security of the allowance system could be stimulated to industry by fear of the workhouse.

The removal of outdoor relief also reduced the financial burden on the ratepayers. This was important since the expenditure on poor relief had exceeded £7 million by 1831, or the equivalent of just over 10 shillings per head (Fraser 1973).

(ii) The New Poor Law.

The eventual reform of the old Poor Law was carried out by the Poor Law Amendment Act 1834. The Poor Law Commission was also set up at this time in order to administer the new legislation.

Almost immediately the aim of reducing the poor rates was achieved. Between the years 1834 and 1844 the national poor rates had fallen to around £4.5 million per annum. There were also some problems associated with the new legislation. Although the workhouse conditions were a deterrent to the able-bodied poor, they were also imposed on the sick, aged and children - the groups for whom the 1834 report had proposed special arrangements. These people who were poor through no fault of their own were therefore subject to living conditions below those of the working labourer, conditions that were intended to some extent to be a punishment for the idle. This was nevertheless unavoidable in the prevailing conditions of economic restraint where all classes of the poor had to be accommodated in a single workhouse.

Another problem was that although the New Poor Law was generally
accepted in the south, in the industrial north there was much protest. This arose from the fact that it had been geared to deal with the work-shy in the relatively stable work environment of rural areas. The problems of industrial poverty were however different since unemployment was often a function of industrial slumps. Fluctuations in the new industrial economy therefore left many people unemployed who were none the less genuinely seeking and willing to take up full-time employment. The workhouse test was therefore inappropriate for many of the unemployed poor. Indeed temporary unemployment was a near inevitable part of life in industrial areas and men in insecure or fluctuating trades were in continual fear of the workhouse. The deterrent was thus working, but it was also having the effect of generating resentment and much anger. In fact the anger built up until it erupted in violence in 1837 and 1838 in the form of riots in Bradford, Huddersfield, Rochdale and Oldham.

This substantial feeling against the New Poor Law was to subside however for two reasons. Firstly, people were encouraged to remedy all their grievances through gaining political power. They were thus diverted to follow the causes of the Chartist movement seeking to establish annual parliaments, the vote for all men, the removal of property qualifications for Members of Parliament, the payment of Members of Parliament and the secret ballot. The second, and probably most important reason for the fall in opposition was the realisation that the local poor law unions had far more autocracy than the legislation had indicated. There was very little the Poor Law Commission could do when faced with a local union that refused to co-operate. The consequence of this was that many refused point blank to implement the workhouse test and maintained the outdoor relief of the pre-1834 period. Indeed, by 1854, 84% of paupers were receiving outdoor relief in return for some form of work (Fraser 1973).

In practice the Poor Law Commissioners role was mainly supervisory, prodding local poor law unions in the right direction and checking excessive local expenditure. Indeed, although the workhouse was to be the basis of the 1834 legislation the commission could not compel
the local poor law unions to build workhouses since the ratepayers were looking for immediate relief from the financial burden of the Poor Law. To build workhouses would immediately incur increases in expenditure.

The weaknesses in the New Poor Law led many to observe that it did not fully implement the findings of the Poor Law Report. As Finer (1952) stated, the Act was a "clumsy caricature of the Report". Nevertheless, the New Poor Law was effective in discouraging the able-bodied from resorting to relief. The workhouse was greatly feared by the working classes and consequently it was only the absolutely desperate and truly destitute who would seek its help. As Lloyd George noted, the conditions were "so harsh and humiliating that working-class pride revolts against accepting so degrading and doubtful a boon" (Braithwaite 1957).

(iii) Education.

In the immediate post-industrial period the opportunities for children to obtain an education were few. Those who were sufficiently wealthy could of course pay for their children's education, sending them to public school and then to university, but for the mass of the population there was little chance of a formal school education. Indeed the only forms of state schooling were limited to cadets in the army, criminals in prison or paupers in the workhouse. The church contributed to some degree through the provision of Sunday schools but these were mainly concerned with the teaching of religion and morality based on the principles of Christianity.

The prevailing attitude of this period was very much that the poor should remain in ignorance in order to avoid any dissatisfaction with what was seen as their allotted position in life. To educate the poor would enable them to read undesirable literature, give them ideas above their station and lead to dissatisfaction with their menial jobs. Bell identified the dangers of "elevating by indiscriminate education the minds of those doomed to the drudgery
of daily labour above their condition and thereby rendering them discontent and unhappy with their lot" (Silver 1965).

The policy of maintaining ignorance was to backfire since the working classes were now susceptible to the ideas of various agitators. Support therefore developed for an educational movement that would ensure that the people held the "right" attitudes and values and in particular possessed the essential virtue, as the middle classes saw it, of "knowing ones place". Thus it was ensured that the hierarchical structure of British society would be maintained through the educational system.

At the beginning of the nineteenth century two pioneering voluntary societies in the primary education field were founded. These were the nonconformist Foreign School Society, founded in 1808, and the National Society of the Anglican Church, founded in 1811. Although there was much religious hostility between these societies, which in fact bedevilled educational advance for over sixty years, they both evolved similar teaching methods. However due to the lack of resources, both of money and teachers, the schools used either slates or sandtrays for writing, and they adopted the monitorial system where the older and more able students taught the younger children.

Despite the work of these two societies the Parliamentary Committee of Enquiry of 1818 found that only 7% of the population were attending day schools. Nevertheless, it was not until 1833, when the Chancellor provided £20,000, that the Government took a more prominent role in the educational system.

Having committed money to education it was inevitable that the States involvement would increase from this point on since the Government would want to supervise the spending of monies that it granted. The Government was therefore at this stage helping to support what was still a voluntary school system.

Development of the education system was hindered over the next twenty years by the continual feuding of the two voluntary
societies. This continued rivalry in fact helped to spread the view that the State should take a greater role in education and that neither the church nor the dissenting groups should have control. The extension of state intervention was also promoted by the activities of Sir James Kay-Shuttleworths (Secretary to the Committee of the Council for schools) inspectors who acted as disciples for the educational cause.

The Government took a more prominent role in the educational system through the pupil-teacher training scheme of 1846, the inspection of supported schools, the creation of the Education Department in 1856, and the provision of increased grants to a level reaching £500,000 in 1857. By 1861, estimated school attendance had risen to just under 13% of the population (Fraser 1973). Indeed the increased expenditure became a matter of some concern and in 1862 new regulations were introduced in the form of the Revised Code. This was a system where schools were paid according to attendance, four shillings per pupil, and for examination success in reading, writing and arithmetic, eight shillings per pupil. The aim was to introduce market forces and some degree of free trade into the educational system whilst also reducing expenditure.

The 1870 Education Act created a landmark in the educational system by establishing the right of every child to some form of education and by providing schools that would fill the gaps left by the voluntary school network. As Simon (1960) stated, education "was no longer a charity but a right". The spur for this sweeping legislation was the Reform Act 1867, and the associated need to educate the new electorate. This gave rise to Lowes famous comment, "I believe it will be absolutely necessary to compel our future masters to learn their letters" (quoted by Bruce 1966) - or as it is more widely quoted, "We must educate our masters". Although the 1870 Act did not provide free or compulsory education, it did extend the provision of education to all children. Where there were no voluntary schools, School Boards were established, and non-denominational schools were formed, the intention being that the board and voluntary schools would compliment each other.
The natural progression in the development of the educational system was to make school attendance compulsory. This was made law by the 1880 Education Act for those children aged 5-10 years, with the leaving age raised to 11 years in 1893, to 12 years in 1899, and to 14 years in 1918.

Compulsion to attend school also raised the problem of fees which had averaged about 3d. per week per child in 1880. Many school boards, however, waived fee payment for needy families and by 1891 the Fee Grant Act had virtually established free elementary education.

The Education Act 1902 brought education under the control of the county and municipal boroughs by abolishing the separately elected school boards. It also encouraged the provision of secondary education through either establishing rate financed secondary schools or by providing rate support to voluntary grammar schools. This prompted a significant growth in the provision of secondary education. A consequence was however, that social divisions were reinforced since the voluntary grammar schools had a higher social status, charged higher fees and were selective both socially and intellectually (Musgrave 1969).

(iv) Hospital and medical services

As with the educational system of the early nineteenth century, those people who had sufficient money to pay medical bills could use the system of private health care. For the poor however there were only the charitable or voluntary hospitals that were financed by either the benevolent or by doctors for the purposes of research.

The State became involved in medical treatment through the need of the Poor Law to treat paupers. Initially the Poor Law used the services of the voluntary hospitals, but with the growth in population these hospitals could not cope, and by 1847 the Poor Law was forced into providing medical services for the masses.
The medical treatment of paupers was a contentious since the 1834 Poor Law had been based on the principle of less eligibility, the premise that whatever the paupers received should be inferior to that which the worker could provide for himself. The danger of treating paupers therefore, was that the able-bodied may resort to the Poor Law in order to gain medical services. As the Poor Law Commissioners (1841) stated, "This superiority of the condition of the pauper over that of the independent labourer as regards medical aid will ..... encourage a resort to poor rates for medical relief".

The general use of the Poor Law, and in particular the Poor Law Medical Officer by the poor at large was further stimulated by the vaccination procedure. With Jenner's discovery, in 1798, of vaccinations for smallpox, the Government attempted to halt the spread of the disease in 1840 by the provision of free vaccination on demand. The only mechanism through which this could be achieved was through the system of Poor Law Medical Officers. A medical service for all was thus provided by the Poor Law.

The extension of the Poor Law Medical Officers duties across all groups of society was also encouraged in two other ways. They could treat outdoor paupers already, but as the numbers grew it became accepted that they should also treat accident victims and childbirth, and then eventually, give treatment for all cases where there was an inability to pay doctors fees. The workhouse sick wards were becoming increasingly used for the general public. Indeed the workhouses took on the characteristics of public hospitals as they came to cater more for the sick than the able-bodied. By 1866 many Poor Law unions had employed two doctors for the increased workload and the term "state hospital" was widely used to describe workhouse infirmaries. The extent to which the workhouses had come to represent a public hospital system may be seen from the fact that in 1861 of 65,000 hospital beds in England and Wales, 50,000 (81%) were in workhouse sick wards (Pinker 1966).

By the 1870's and 1880's many local boards followed the example set in London of building specialist hospitals and in some cases providing an ambulance service. This was widely regarded as the
start of a State medical service since it was clear that the new facilities were used by many others than just paupers, and also the hospitals were becoming separate from the workhouses. Attitudes were also changing, many felt that as a matter for preventative medicine it was good to let all people use the hospitals. This was actually recommended by the Royal Commission in 1881.

Thus, contrary to the ethos of the 1834 Poor Law, the workhouse infirmaries and medical officers had developed into an early form of State medical service.

2.1.3. Government policy and social conditions up to 1905.

It was widely believed in the England of the late nineteenth century that levels of poverty were limited and could for the main part be dealt with by private charity. This was surprising since there had been much literature on the subject, especially in the first half of the nineteenth century, when a number of novelists such as Dickens, Disraeli, Kingsley and Gaskell had described the poverty stricken conditions of the new industrial society. Furthermore, factual reporting of the situation had also been provided by Mayhew (1856) in "London Labour and the London Poor". In this work Mayhew described the poor as, "a large body of persons of whom the public had less knowledge than of the most distant tribes on earth".

This casual attitude was dramatically changed in the last 20 years of the nineteenth century. Initially, the depression of 1875 to 1895 increased unemployment and therefore accentuated the problems of low pay and poverty. In addition, there were a number of publications and studies which graphically highlighted the extent of poverty in English society. As the Illustrated London News said, "Recent revelations as to the misery of the abject poor have profoundly touched the heart of the nation" (Wohl 1970). One of the most powerful documents concerning poverty was the pamphlet "Bitter Cry of Outcast London" by Mearns (1883) which described the poverty in London slums - "pestilential human rookeries ... where tens of thousands are crowded together amidst horrors which call to mind
what we have heard of the middle passage of the slave-ship" (Mearns 1883).

There was not, as yet, any statistical evidence or quantification of the problem. With this in mind Booth (1902) carried out surveys of poverty in London and found that 30% of the inhabitants of London were living "in poverty or want". These surprising findings were confirmed by further survey work carried out by Rowntree (1902) in York. Rowntree discovered that 28% of his survey population were in poverty, a very similar figure to that which Booth had found. As Rowntree (1902) concluded, "we are faced with the startling possibility that from 25 per cent to 30 per cent of the town population of the United Kingdom are living in poverty".

It had thus become clear to the English public that poverty was not being reduced by the industrial progress of the period and that the legislation of 1834 had not reduced the numbers of the poor - it was primarily concerned with the problem of pauperism and not poverty. The poor had not raised themselves but had remained poor and largely ignored by the State.

During this period the first resort for those in poverty was the family or friends. In the absence of help from these sources application to charity was the next step. In fact, the scale of private charity expanded dramatically in the mid-nineteenth century and actually provided some protection from the rigours of the Poor Law. Victorian philanthropy seemed to stretch to so many worthy causes such as fallen women, drunkards, stray animals and children that by 1861 there were no fewer than 640 charities in London alone (Fraser 1973). Indeed the income of these charities actually exceeded the spending of the Poor Law in the capital at this time.

Many of today's famous charities date from this period including the Young Mens Christian Association, Dr. Barnardos, the Royal Society for the Prevention of Cruelty to Animals, the Salvation Army and the Royal National Lifeboat Institute. There were also many benevolent
societies associated with the Anglicans, Catholics, and Nonconformists and also racial groups, most notably the Jewish Board of Guardians who were responsible for setting up schools such as the Jewish Free School in London. A new development in the nineteenth century was the visiting societies which attempted to bridge the gap between the rich and poor by personal contact. Positive efforts were actually made to visit needy people in their own homes. The most famous of these was the Metropolitan Visiting and Relief Association.

Despite the existence of all the charitable bodies, it was abundantly clear that there was still much poverty and that the Poor Law of 1834 was not appropriate, or able, to deal with the situation. Furthermore, people were beginning to realise that not everyone was able to practice self-help and that in an industrial society unemployment and poverty often arose from factors such as industrial slumps over which the individual had very little control. As Levine (1967) observed in "The Emergence of Victorian Consciousness", "Although Victorian didactic literature constantly insists on the necessity of self-help, one of the dominant themes of a major tradition within Victorian fiction is the powerlessness of the individual".

The increased awareness of the causes and nature of poverty ensured that the relief of poverty would become an important political issue. This was particularly true with the changes in the political system at the end of the nineteenth century where political influence moved away from property ownership to population. It was now more important to have popular support than purely wealthy backing. Politicians realised that they had to placate the mass of voters in order to gain political power.

There were also increasing signs of the working classes organising themselves into political groupings. Socialism grew in the 1880's with the formation of such groups as the Social Democratic Federation, the Socialist League and the Fabian Society. Trade unionism was also spreading after the inception of the Trades Union
Congress in 1868. Eventually a working class political party was formed called the Independent Labour Party, finally becoming the Labour Party in 1900, with the support of the trade unions, the Fabians and the Social Democratic Federation.

The formation of bodies representing the interests of the working classes posed a serious threat to the Liberals and Conservatives and stimulated the development of their social policies. There was now the real fear that an alternative socialist society could arise should the working classes not be placated in some way. The "laissez-faire" attitude was no longer acceptable and whilst there was a minimum of state activity in the period to 1870, the subsequent years saw a mass of legislation that dealt with social problems.

The depression of 1875 to 1895 led to increased problems of unemployment and in response Joseph Chamberlain, as President of the Local Government Board, issued a circular to authorities urging them to relieve unemployment through a schedule of increased public works. This was a significant admission that not all unemployment was the result of personal failing and that the Government could take a positive role in the alleviation of the problem. Nevertheless, the circular was ineffective. There was no special finance for public works, most work was unsuitable for winter when unemployment was at its highest, and any work carried out with an untrained labour force was both expensive and inefficient.

Towards the end of the nineteenth century the State also took a more prominent role in housing, factory reform and public health. In 1871 legislation ensured that the whole country was covered by sanitary authorities with medical officers of health to control such problems as polluted water supplies and poor drainage. This legislation was further developed by the Public Health Acts of 1875 and 1890 which enforced minimum standards of sanitation and drainage.

As well as the educational legislation already discussed, there was further State involvement in the care of children during the 1800's.
The Factory Acts controlled child employment and in addition there was the Prevention of Cruelty and Protection of Children Act of 1889, and The Custody of Children Act 1891. The emphasis of this legislation was upon the removal of children from corrupting environments rather than the improvement of those environments (J. Heywood 1959).

State involvement in housing, except through the Public Health Acts, was limited due to the enormous cost of any action and also the belief that property should rest in private hands. There were nevertheless extremely bad housing conditions for the poor as was illustrated by Mearns (1883) in "The Bitter Cry of Outcast London". The Government's response was to ease the local authority borrowing for house building through the Housing Acts of 1885 and 1890. Most of this money was spent by the London County Council and to a lesser extent by the councils of Sheffield, Manchester, Liverpool and Bradford. In comparison with the size of the problem however, this legislation had achieved very little by 1900 (E. Bouldie 1974).

Throughout the nineteenth century there had been legislation passed regarding hours of work and working conditions in factories and workshops. The early Factory Acts of 1819 and 1833 were primarily concerned with the employment of children and particularly the hours they worked. Later legislation was to deal with the working hours of all employees and also the conditions of work in all industrial premises. The main difficulty however was the enforcement of the legislation. The Factory Act of 1901 established enforceable standards of space, cleanliness and sanitation and also ordered the fencing of dangerous machinery. Despite this, the enforcement of the legislation was still a major problem.

A very important piece of legislation regarding the welfare of workers was the Workers Compensation Act 1897. This Act made employers liable for accidents at work and obligated them to insure against the risk. No longer did employees or their families have to suffer the fear of poverty and destitution through injury or death. This was particularly important since the incidence of accidents in industries such as mining, the railways and the docks were very
high. During the period 1902 to 1906, 50 seamen, 12 miners and 8 railwaymen were killed per year at work (Thane 1982).

Thus, by 1900 the Government had taken some action concerning the recognised social problems of the period. In comparison with the magnitude of these problems, however, the action was quite limited. Whilst there were Royal Commissions on Labour (1893-4), Housing of the Working Classes (1884-59), Aged Poor (1895), on the Sanitary Laws (1871), on the Factory Acts (1876), and Select Committees on Distress from Want of Employment (1895), Old Age Pensions (1896 & 1899), and Poor Relief (1888), to name a few - there was very little action arising out of them.

The major limiting factor for any form of action was the finance available. Any action by the Government involving substantial expenditure would inevitably lead to increased revenues being required from taxes. Increasing the level of taxation was not acceptable so the alternative strategy was to place the burden of social provision on local government.

The rates were already financing the Poor Law, most of the public health and housing, and about one third of educational expenditure. Local government was therefore reluctant to take on yet further responsibilities. This was however an opportunity for increased autonomy and some authorities made good use of this to pursue an active policy of municipalisation. Furthermore, the profitable running of such services as gas, water, electricity and public transport could yield income to offset against the rates, or build services like libraries and public baths (Briggs 1968, Dyos & Wolff 1973). There was thus a growth in the municipal ownership of services such as gas and electricity, the provision of facilities such as libraries, public baths, museums, street lighting and refuse disposal. This was the peak of municipal autonomy and from 1900 central government authority was to advance.
2.1.4. Liberal social policy up to 1914.

The general election of January 1906 gave the Liberals a landslide victory with a majority of 356. More significant in the long-term however was the election of Labour members to the House of Commons. This indicated the distress of the masses, which if not placated, could in the long-term destroy the Liberal Government. The working classes clearly felt they needed special representation of their interests within the political system. The Labour Party offered this representation. As The Times (1906) noted, "The emergence of a strong Labour element in the House of Commons has been generally recognised as the most significant outcome of the present election. It lifts the occasion out of the ordinary groove of domestic politics and will have a far wider influence than any mere turnover of party voters".

(i) Children.

It was the Labour Party that introduced the Bill that finally became the Education (Provision of Meals) Act 1906. This Act gave local authorities the power to feed needy schoolchildren. The presence of the Labour members on the backbenches was to stimulate the Liberals into much social legislation during this term of office.

As well as the provision of meals, the Liberals implemented a system of school medical inspection in 1907 and also the Childrens Act 1908. This legislation was introduced in order to ensure that childrens health was monitored and that they received proper medical attention - the 1908 Act actually made it a legal offence for parents to neglect a child's health. Childrens rights had thus been established and the State had taken positive steps to increase its responsibility for the welfare of children.

(ii) The elderly.

The legislation concerning the elderly was even more significant than that already discussed for the young. In 1908 the Old Age Pensions Bill at last introduced old age pensions for those over 70.
years of age. This enormous breakthrough in social policy was in fact widely expected since a popular campaign for pensions had been waged since the 1880’s when Booth (1902) had identified how much poverty was due to old age. The main obstacles to their introduction were two-fold. Firstly, the Friendly Societies would not tolerate competition for the contributions of their members, and secondly, the Boer War had incurred massive expenditure leaving no funds to finance pensions.

There was also a lengthy discussion on whether the pensions should be non-contributory as Charles Booth suggested, or contributory as was advocated by Joseph Chamberlain. In the end a non-contributory scheme was introduced, on the recommendation of 1899 Commons Select Committee. This pension provided 5 shillings per week for those over the age of 70 years.

Old age pensions were quite separate from the Poor Law and all the stigma associated with it. Because of this far more people applied for pensions than had been initially anticipated, and furthermore because of the enormous costs of a non-contributory scheme the Liberal Government, and in particular Lloyd George as the Chancellor, needed to raise extra revenues. This led to the "Peoples Budget" of 1910. The budget was so named because of its policy of the redistribution of wealth through taxation of the wealthy for the benefit of the poor. There was a sliding scale of taxation, capital gains tax on the unearned increment of land values (as revealed at sale), capital levy on unused land and tax payable when land reverted to the landlord on the expiration of a lease. As Lloyd George said at the end of his budget speech, "This is a War Budget. It is for raising money to wage implacable warfare against poverty and squalidness".

(iii) The National Insurance Scheme.

Lloyd George was concerned with extending benefits to other deserving causes such as the sick, unemployed, widows and orphans. Finance was again a problem since the cost of pensions was greater than had been expected, £8 million as opposed to the expected £6 million (Bruce 1966), and further benefits could not be financed out
of taxes alone. This led to consideration of the insurance system where the workers and employers provided the necessary revenue. Furthermore, the insurance system enabled people to maintain self respect since they were to receive benefits for which they had actually paid - there was no suggestion of charity. On the other hand there was to be no place for the concept of the undeserving poor - if a person had paid their contributions they were entitled to benefits regardless of how their illness, injury or unemployment arose.

The British insurance scheme was based largely upon that introduced into Germany by Bismark and came into being with the National Insurance Act 1911. The first part of the Act dealt with health insurance and the second part was concerned with an unemployment insurance scheme. In order to get the first part accepted, Lloyd George had to balance the interests of three major groups - the friendly societies, the medical profession and the industrial insurance companies. As a consequence, the final Act was subject to a number of compromises such as the omission of benefits for widows and orphans. The mechanics of the scheme were that the individual would pay 4 pence, the employer 3 pence, and the State 2 pence to give a total contribution of 9 pence. This led to Lloyd George's famous "9 pence for 4 pence" comment. The money would be paid to approved societies who would administer the scheme and who would pay the insured worker 10 shillings per week sick pay, and for medical treatment from a doctor selected from the local Insurance Commission panel.

A number of shortcomings remained nevertheless. The health services were fragmented (public health, Poor Law, voluntary insurance) and there was a lack of general hospital provision. Furthermore, the scheme did not cover the workers dependents since the aim was to keep families from poverty and therefore it was only the wage earner who was insured. As the Government actuaries said "women living with their husbands need not be included ..... So long as the husband is in good health and able to work adequate provision will be made for the needs of the family" (Gilbert 1966). The health
insurance scheme was a major step forward in the extension of State aid and in the movement towards a comprehensive welfare service whilst getting away from the Poor Law of the past. The second part of the National Insurance Act 1911 was concerned with an unemployment insurance scheme. Labour exchanges were already run by the State and were nationally financed through the Labour Exchanges Act 1909. They were to act as the interface between the labour force and the employers and in so doing promote "the organised fluidity of labour" (Beveridge 1909).

The provision of insurance against unemployment, unlike health insurance which had been pioneered in Germany, was largely a new and untrodden field. There were therefore many points that needed to be clarified. For instance, should benefits be related to contributions, should contributions be related to earnings, and should benefits be withheld from those who were to blame for their own unemployment?

The scheme introduced in the 1911 Act was made compulsory in a number of clearly defined industries. The employees paid 2.5 pence, the employers 2.5 pence, and the state paid approximately 1.7 pence. The benefits were 7 shillings per week for up to 15 weeks, and benefits were paid at a ratio of one week's benefit for every five contributions.

The National Insurance Act 1911 along with legislation on labour exchanges, old age pensions, school meals and medical inspection had by 1914 provided the foundations of the Welfare State. For each of these Acts it had been policy to separate the new provisions from the socially unacceptable scope of the Poor Law. In this way the Poor Law would eventually be superseded and the old ethos of less eligibility finally removed from social policy.
2.1.5. Welfare services from 1918 to 1939.

The need to mobilise the full resources of the country during the First World War led the Government to adopt powers undreamed of before the war. Through the Defence of the Realm Act 1914 the Government was granted extensive powers and national defence became the greatest single stimulus to the enlargement of the function of the State. The result was that much industry such as the railways, shipping and munitions were put under a sort of quasi-nationalisation. The war was also to have the effect of sweeping away the old world and providing the opportunity to build a new one. As Lloyd George said, "The present war ..... presents an opportunity for reconstruction of industrial and economic conditions of this country such as has never been presented in the life of, probably, the world" (Gilbert 1970).

(i) Health and housing.

After the war health reformers were quick to point out that the health of the nation was of fundamental importance. This was highlighted by the fact that due to their poor physical condition only one in three conscripts was fit to join the forces during the war. The result was the formation of the Ministry of Health in 1919. Although the health insurance scheme was introduced amid a great deal of opposition it subsequently followed a fairly smooth and undisturbed course. By 1937 treatment as a panel patient, through the approved societies, was normal for the 18 million workers insured under the 1911 scheme.

There were however some criticisms of the scheme. Since there were many approved societies the workers in one area or one factory may have been members of many different societies. This led to an extraordinary duplication of administration. Another problem was that the societies could provide discretionary extra services above the statutory required benefits, these could include dental or ophthalmic services for instance. Benefits therefore varied from society to society and there was a clear need to rationalise benefits. Nevertheless, the system of approved societies was to
survive until after the Second World War due to the limited finances of the Government.

The final, and perhaps most significant problem was the lack of hospital provision, despite the creation of the Ministry of Health and legislation empowering the Local Authorities to take over Poor Law infirmaries as municipal hospitals. Between 1921 and 1938 there was an increase of only 4,000 public hospital beds (Fraser 1973). A major responsibility of the new Ministry of Health was the housing shortage. Lloyd George had already committed himself to the provision of housing in his famous statement concerning "homes fit for heroes", this was now a major concern since there had been no house building during the First World War. The Housing and Town Planning Act 1919 invested the local authorities with the duty of supplying housing where there were deficiencies in their areas. It also provided Treasury subsidies to the local councils for this purpose. This was a clear commitment by the State to housing and had the effect of encouraging the building of 213,000 homes in the years 1919-21 and 110,000 in 1922 - the largest number of houses built in any inter-war year. Indeed between the wars, a total of 4 million homes were built.

The housing problem in terms of numbers had been largely solved, but it soon became clear that the problem had now changed to one of quality. Living standards had risen and much of the older housing had become sub-standard. There was a need for slum clearance and rebuilding so the 1930 Housing Act provided subsidies for slum clearance and the 1935 Housing Act actually made overcrowding a penal offence.

(ii) Education.

Education was also an area of concern during the post-war period since many children had missed their schooling in order to work in the factories. There was now a resolve to improve the educational system as was illustrated by the Board of Educations (1918) comment that war "has certainly a clearer and wider recognition of the value of education, and while showing the defects and shortcomings of our
system, has produced the resolution to improve it" (Marwick 1965). This led to the Education Act 1918 which created a major extension of State education. The Act established the principle that children should not be prevented from receiving an education from which they would benefit through an inability to pay fees. In addition, the school leaving age was raised to 14, part-time education up to the age of 18 was introduced, and all elementary education was free. These educational advances were however overtaken by financial limitations and some cuts, such as the part-time education up to 18, were made with what became known as the "Geddes Axe".

Education was little changed between the 1918 Education Act and the Butler Act 1944. There were however two significant reports on which the Butler Act was to be based. The Hadow Report of 1926 established the notion of elementary and senior (secondary) schools, with transfer at 11, and two different types of secondary school, grammar schools and modern schools. The Spens Report of 1938 added the third secondary school, the technical school, and completed the idea of different schools for different abilities.

(iii) Unemployment.

Unemployment was a major problem throughout the inter-war years. Indeed from the summer of 1920 to the summer of 1940 unemployment was never below one million and at times reached over three million. During the war the insurance scheme had still only covered a few specific industries and as such did not raise as much finance as could have been raised under the full employment of wartime Britain. Nevertheless, there was still a surplus of £21 million at the end of the war.

The insurance scheme was finally extended in the National Insurance Act 1920 to include nearly all workers earning up to £250 per year. Unfortunately, just at the time insurance was extended, unemployment rose sharply and the surplus of the immediate post-war period was rapidly turned into a massive deficit. Furthermore, there were many unemployed workers who did not qualify or who had exhausted their benefits. In order to help these people there evolved extended or
uncovenanted benefits. The insurance scheme was therefore undermined by a system of doles funded mainly by a tax on employment.

Unemployment remained an immense problem since the unemployed could not be ignored or passed on to charity, yet continuing to help them was seriously threatening to bankrupt the nation. There were insufficient funds in the insurance scheme especially since it had been extended, and dole payments were having to come directly from the Treasury.

In the meantime the Blanesburgh Committee of 1925 recommended that there should be a standard insurance benefit earned by a minimum of contributions but unlimited in duration. For those who did not qualify through the minimum contribution there was to be a special transitional benefit. These measures were implemented in 1927. Benefits were now easier to obtain since the onus was on officials to prove that applicants were not seeking work — there was now little check on excessive demands.

With unemployment rising to over two million the net effect of all these provisions was to produce a budgetary deficit. The transitional benefit alone cost £19 million in the first year (Fraser 1973). By 1930, the Labour Government was facing the worst world-wide depression ever experienced and it was vital that the problem of massive unemployment and the growing national debt be tackled. The Liberals suggested a Keynesian solution of public works financed by loans that would they believed reflate the economy. Others, such as the Bank of England and Treasury followed the more orthodox theories of a balanced budget and the avoidance of public borrowing. By 1931 a crisis had developed and Bank officials told Ramsey Macdonald on August 11th, "we were on the edge of a precipice and, unless the situation changed radically we should be over it directly" (Feiling 1946).

The Government had to balance a deficit of £170 million and
financial opinion was that a 10% cut in the dole payments was the only policy to restore international confidence and reduce the deficit. Thus, it was through a political crisis that the insurance benefits in 1931 were cut by 10% and the transitional benefit was to be subject to a stringent means test. The unemployed were to take the full brunt of the depression.

Since 1918 the unemployment scheme had been built and adjusted on an ad hoc basis in response to a number of crises. The 1934 Unemployment Act was an attempt to clarify and consolidate the Welfare State. Part one extended the coverage of compulsory insurance and restored to former levels the 1931 cuts. The scheme was now to be run by an independent committee which was responsible for the unemployed for the first 26 weeks of benefits.

Part two of the Act was concerned with those who were not entitled to insurance benefits, such as those on transitional payments, and set up the Unemployment Assistance Board (UAB) to deal with these people. The UAB had the power to produce its own regulations, scales and means tests which immediately created problems because its scales were set below those operated by the Poor Law. In order to resolve this anomaly the able-bodied maintained by the Poor Law were absorbed into the UAB scheme in April 1937. This had a profound effect on the Poor Law since with the loss of the able-bodied unemployed it virtually disappeared, as did the concept of less eligibility. Indeed some UAB scales were higher than local wages.

The 1911 Insurance Act had excluded widows and orphans from the insurance scheme in order to concentrate benefits on the family wage earners. The 1925 Widows, Orphans and Old Age Contributory Pensions Acts corrected this by providing benefits for the wives and children of insured workers on their death. In addition this Act provided a pension without means test from the age of 65 to 70, at which age the insured could transfer to the existing non-contributory pensions, again without a means test. The pension scheme remained in this form until the Second World War.
2.1.6. Welfare services from the Second World War.

(i) The effects of the Second World War.

Until the 1940s social policy had been selective in its treatment of different groups of the population. For example, insured workers had access to medical services but their families had not, some workers were insured against illness, unemployment and old age whilst others were in industries that were not in the insurance schemes, and some pensioners were subject to a means test whilst others were not.

The effect of the war was to create a common experience and common treatment - bombs were not selective and old people, rich and poor, needed shelter and protection. As Titmus observed, "the circumstances of the war created an unprecedented sense of social solidarity among the British people, which made them willing to accept a great increase of egalitarian policies and collective State intervention" (Harris 1981). The war also meant that there had to be a full utilisation of all resources, particularly manpower, and therefore full employment following Keynesian economics was essential.

Attitudes had changed and people were no longer willing to return to the pre-war situation of selective treatment and massive unemployment. The general feeling was that what could be achieved during wartime could be achieved in peacetime.

Another feature of the war that changed attitudes was the evacuation of the cities. Evacuation served to show society the deprivation and poverty of the urban working class through the movement of undernourished and poorly clothed children to the rural areas of the country.
(ii) Social policy during the Second World War.

There were a number of important social developments during the war years. In July 1940 the number of school meals taken was doubled and school milk consumption rose by 50% through increases in grants from the Treasury. By September 1941 it was recognised that all children needed a good nutritious diet, so the Government authorised increased expenditure on both school meals and milk. By 1945 approximately one third of all children ate in school, 14% of which had free meals, and three quarters took school milk, 10% of which was free (Fraser 1973). Milk was also provided at half price to all children under five and all expectant or nursing mothers. There had thus evolved a general food policy to ensure the health of priority groups.

The Unemployment Assistance Board had been renamed the Assistance Board and was given wider social responsibility to deal with all those in distress due to the war. It was empowered in 1940 by the Old Age and Widows Pension Act to supplement pensions, the value of which had been eroded by inflation. The Assistance Board had now become an all purpose relief agency.

The hospital service had to be extensively reorganised to meet wartime needs. Both types of hospital, the voluntary and the public, had to deal with two categories of patient - the services personnel who received free treatment and the civilians who had to pay. Gradually however, the numbers receiving free treatment increased as other groups such as munitions workers, evacuees, and firemen were included. By 1944 there were 26 groups eligible for free hospital treatment.

The achievements of the emergency hospital service indicated that a national hospital system was possible and desirable on many accounts. The notion of a national hospital service was not new and had already been discussed in the Beveridge Report of 1942. William Beveridge had been appointed chairman of a committee to inquire into the field of social insurance and had devised the concept of attacking the "five giants" of want, disease, ignorance, squalor and
idleness. He envisaged a well organised and planned social insurance scheme where in return for a simple weekly contribution, a cradle to grave provision of sickness, medical, unemployment, widows, orphans, old age, maternity, industrial injury and funeral benefits would be provided. The contributions would be set at a flat-rate and the benefits would be at a flat-rate subsistence level. The report was thus advocating the generalisation of what had previously been a selective system into a more comprehensive system provided for by a single contribution covering all risks.

An important aspect of the Beveridge proposals was that the social insurance scheme was to be contributory and not a free system of allowances paid for by the State. This was important since as a natural reaction to the Poor Law people preferred contributory benefits that were earned as a right.

The Beveridge Report seemed to a gateway to the promised land of a new society free from the fears of poverty and the Poor Law, and since it was so widely publicised the nation was eagerly anticipating its implementation. The Conservative Government, however, and Churchill in particular, were somewhat lukewarm towards the Beveridge proposals. This was mainly because they believed the nation should concentrate on fighting the war which was still far from being won. Because of this it became the view of the public that the Labour Party was the party of the Beveridge Report. As James Griffiths the Labour minister in charge of insurance commented, "This makes the return of the Labour Party to power at the next election an absolute certainty" (J.Beverage 1954).

Despite Churchills apparent reluctance to consider a program of social reform, there was a White Paper, "A National Health Service", published in 1944 which talked of "a comprehensive service covering every branch of medical and allied activity" with free treatment paid for out of taxes. There were two further White Papers in 1944, "Employment Policy", which recommended the use of public spending to maintain employment, and "Social Insurance", which accepted much of Beveridges thinking with regard to covering all people for all risks. The Government had thus laid plans for tackling three of
Beveridges "giants" - disease, unemployment and poverty.

In 1943, Butler produced the White Paper, "Educational Reconstruction" which was to form the basis of the 1944 Education Act. This Act aimed to provide a comprehensive national educational system under the control of the new Minister of Education. Fees were abolished in local authority secondary schools, the leaving age was to be raised to 15 in 1945, and church schools were brought under firm State control. There were now three stages of educational development - primary, secondary, and further - all of which had to be provided by the education authorities.

(iii) The Welfare State.

With the end of the war in 1945 an election was held in order to determine the nature of peacetime parliament. Surprisingly, considering the successful leadership of Churchill during the war, the Labour Party achieved a landslide victory with a majority of over 150 seats. The reasons for this result are widely believed to have been rooted in a public reaction to the depression years before the war. As one journalist noted, "the dole queue was more evocative than El Alamein" (Howard 1963). Furthermore, despite the fact that the two parties largely agreed on their policies as expressed by the Beveridge Report and the series of White Papers in 1944, it was still widely believed that the Labour Party was the more likely to create a new society - it was still the party of social reform.

With this popular mandate, an enormous amount was achieved in the first year of 1945-46. There was an extensive programme of nationalisation with the Bank of England, airways, coal, gas, electricity, railways, canals and ports, and the iron and steel industry all taken into public control. This policy of nationalisation meant that the Government had control over a substantial part of the economy which enabled it to control the economy as a whole.
Beveridge had identified that the goal of full-employment could be achieved and indeed in the two decades after the war unemployment rarely rose above 2%. This brought its own problem of inflation since running the economy at full output inevitably led to increases in wages and costs. Wage control through some form of incomes policy was to become a major concern of post-war governments.

Housing.

Despite promises of massive house building programmes there were still inadequacies in housing. The construction industry was badly hit by shortages of materials despite the Governments attempts to control inessential building. The 1949 Housing Act helped alleviate the problem by enabling local authorities to acquire houses for improvement with a 75% grant subsidy. Private owners were also given 50% subsidies for improvements to their own homes.

As the housing gap was filled, however, the increased living standards of the 1950's served to accentuate the problems of slums and substandard housing. Slum clearance thus became a matter of some concern.

Education.

Although Butler and the 1944 Education Act had set the scene for modifying the educational system, it was the Labour Government that was left to implement the policies. Many of the recommendations, however, were pruned due to cuts in expenditure necessitated by the Korean War. Few nursery schools or county colleges were built, general school building and technical education suffered cuts, and compulsory part-time education between 16 and 18 was shelved indefinitely. The school leaving age was not raised to 15 until 1947 and the hopes of raising it to 16 were not realised for another 30 years.
The social security system suffered few cutbacks in expenditure probably because of the all-party support that the Beveridge proposals had received. In 1944 there was a major reorganisation of the administration of the social services with the Ministry of National Insurance taking over health insurance, unemployment insurance and workmen's compensation.

One of the first measures the Ministry dealt with was the Family Allowances Act 1945. This Act established a universal five shillings child allowance for second and subsequent children and as one official report stated, "The State now accepted the responsibility of making a financial contribution to the costs of bringing up every family of two or more children" (Ministry of National Insurance 1950).

The National Insurance (Industrial Injuries) Act 1946, made accidents at work the responsibility of the whole of society through the pooling of risks in an insurance scheme. This was a particularly important piece of legislation since the accident rate was very high and particularly so in some industries such as mining and construction. There was, however, a certain anomaly in this Act since its rates of benefit were higher than the normal insurance payments, clearly contrary to the Beveridge recommendation that all interruptions of earnings should be treated in the same way.

A new social insurance scheme was established by the National Insurance Act 1946. This legislation was based on the Beveridge proposal that the whole population should be covered for all risks from the cradle to the grave - a comprehensive system for a single weekly contribution. Benefits were provided for sickness, unemployment, retirement, maternity, widows and orphans, and for death. Both benefits and contributions were at a flat rate, and as such contributions had to be fixed at a level that the lowest paid could afford. The benefits were therefore limited by the restricted contributions. Where insurance benefits did not meet
peoples requirements or where people had not qualified, supplementary allowances were available from the National Assistance Board, on a means test basis, under the auspices of the 1948 National Assistance Act. This Act was a landmark in British social policy because it finally laid the Poor Law to rest. The National Assistance Board was now to relieve anyone who could not earn enough to meet their own needs, effectively catching anyone who fell outside the scope of the insurance scheme.

Thus, through the four Acts described a social security system evolved that protected anyone from poverty. In order to inform and explain the new benefits an enormous publicity campaign was carried out involving the distribution of booklets to 14 million homes, and publicity in the cinema, radio and the press.

o The Health Service.

The 1944 White Paper "A National Health Service", had already identified the desirability of a free and comprehensive health service, but the initial problem was how to organise such a service out of the fragmented system of approved societies. As Beveridge (1942) had observed, there was a "dissipation of health insurance administration between a thousand approved societies of all sorts and sizes". Basing the administration on the local authorities, despite the long history of public health and welfare in that area, was strongly opposed by the medical profession and was therefore discounted in favour of national control through a new set of health authorities. This new system was to be financed mainly through taxation and partly by insurance.

The National Health Service Act passed through Parliament and was law in 1946. Local authority and voluntary hospitals were nationalised and put under the control of 20 regional hospital boards. On the other hand executive councils administered dental, opthalmic and pharmaceutical services, and the general practitioners. The general practitioner had thus become separate
from the hospitals. Under the local authorities, health and welfare services included vaccination and immunisation, maternity and child care, domestic help, health visiting, home nursing and ambulances. The Health Service had thus fallen under three different administrations - the hospital boards (hospitals), the executive councils (medical services and general practitioners), and the local authorities (health and welfare). The fact that the health service was divided in this way meant that treatment was often provided from all three channels. For example, a pregnant mother would receive help from the midwife (local authority), the doctor (executive council) and the hospital (hospital board). It was envisaged that eventually integration of all three would take place in the health centres that were planned at the time. Finances were limited however and few health centres were actually created. This severely restricted the integration of the National Health Service.

Despite the National Health Service Act being passed in 1946, it had been passed without the co-operation of the doctors being obtained. Indeed a poll of general practitioners had registered a 64% vote against participation in the new service (Fraser 1973). This was mainly due to fears that working within the National Health Service would lead to the sale of private practices, the direction of labour and salaried payment. It was clear that only the doctors could make the service work so Bevan, the Minister of Health, sought to win their approval through offering consultants lucrative concessions (high salaries for part-time hospital work and the use of hospital beds for private practice), and by providing payment solely by capitation with assurances that a salaried service would not be introduced. Opposition faded in the face of these offers and doctors agreed to join the National Health Service.

The appointed day for the whole of the Welfare State to come into operation was 5th July 1948. This included National Insurance, Industrial Injuries, National Assistance and the National Health
Service Acts. New family allowances and higher pensions had been paid since 1946.

In the first year the insurance scheme costs were well below expectations with a surplus of £95 million. This was due to the low unemployment rate of only 1.2% of the insured labour force. The Health Service, however, was very expensive with £400 million spent in the first year alone. This was not just due to hospital treatment but was also the result of the massive costs of the dental and optical services. This expenditure however merely reflected the years of neglect that had accumulated and now needed treatment.

In 1951 the Conservative Party regained power. They maintained the Welfare State which was hardly surprising since it was partly their creation through the White Papers produced during Churchill's Government in the early 1940's. The only change the Conservatives made was the introduction of prescription charges to offset some of the expense of the service.

The 1940's had thus seen the development of social services from the last strands of the Poor Law into the modern Welfare State which has remained largely unchanged into the 1980's.

2.1.7. The origins of feeding within the Welfare State.

An essential role of any welfare system is to ensure that the poor are maintained by an adequate diet. This may be achieved either through the provision of finance to pay for food or by the provision of the food itself. Without the fulfillment of basic physiological needs, including adequate feeding to sustain life other welfare services become superfluous. Food is therefore inextricably related to welfare and charity and has played a role in these services from the earliest times. Indeed the earliest forms of charity were usually donations of food, or the money to buy food, to the poor and needy.
The importance of food to the early welfare services is perhaps best illustrated by the use of the Speenhamland System of poor relief in the south of England during the 1790’s. This was an early system of poor relief devised in the village of Speenhamland, Berkshire.

Under this system allowances and supplements for deficient wages were calculated on a scale based on the price of bread. Since bread formed the staple of the diet at this time it was thus used as an early form of cost of living index. As the price of bread rose or fell the income of the "industrious poor" could be calculated and appropriate allowances or supplements allocated as necessary, see table 2.1. (Martin 1971).

Methods of poor relief at this time varied and some areas preferred to build workhouses in which to house the destitute. Clearly these people had to be fed and so one of the first forms of welfare catering was developed in the workhouses. In keeping with the principle of less eligibility, where those receiving welfare provision should not fare better than those in work, the conditions and feeding in the workhouses were deliberately kept at minimum levels.

The typical diet consisted of bread and gruel for breakfast, soup and vegetables for lunch, and bread and broth for supper. The "soup" would typically be made of beef or mutton and water in the proportions of one pound of meat to one gallon of water, producing a rather thin, insubstantial dish. On Sundays there would probably be a small portion of meat instead of the soup at lunchtime. Children and the elderly would have special variations to their diet such as the addition of milk for the young and tea for the elderly (Martin 1971). Since the workhouse infirmaries were to become the basis of the public hospitals, feeding within the workhouses was to become the forerunner and the earliest form of hospital catering.

A third method of poor relief at this time was outdoor relief with a system involving payment in kind, the provision of food itself. This enabled the parishes to minimise the number of people they had to maintain in the workhouses whilst providing some support for the needy. Meals-on-wheels are perhaps the modern day equivalent of
Table 2.1. Scale for weekly income of the poor as determined by Speenhamland System  
May 6th, 1795  (Martin, 1971)

"This shows at one view what should be the Weekly Income of the Industrious Poor, as settled by the Magistrates for the County of Berks., at a Meeting held at Speenhamland, May the 6th, 1795"  

| When the gallon loaf is | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s  | d  | s |
outdoor relief. Although meals-on-wheels are not specifically provided for the poor but for those who are incapable of producing their own meals because of old age or disability, in many cases these people are also poor often largely as a consequence of their disability. As with all forms of outdoor relief, meals-on-wheels enable people to live in their own homes and minimise the numbers in institutional care such as, hospitals and old peoples homes - a point discussed in detail in section 2.4.2. In this way the costs to the state of maintaining these people are thus reduced and the independence of recipients is maintained.

Before either the workhouse or the Poor Law there was already in existence a system of meals provision in schools and colleges. Indeed feeding in schools is linked with the foundation of the earliest schools as far back as the Middle Ages. Kings School, Canterbury, founded in1598 is an example. Although school feeding was not strictly welfare catering at this time, because virtually all schools were operated on a fee-paying basis, the role of the school meal, as part of the of the school community life as well as its nutritional role, was established. This was to continue through the Education Acts from 1906 until the 1980 Education Act.

Food and meal provision is therefore an integral aspect of the welfare services and has developed within the framework of the developing Welfare State. The historical basis of feeding within three welfare services will now be considered.
2.2. Early public school feeding programs.

Accounts of the conditions at early public schools indicate that the meal provision was usually spartan, partly due to limited finances but also because nutrition was not the sole purpose of meal times. The sociological aspects of communal feeding were perceived as being just as important as nutritional ones. This is illustrated by the refounding statutes of Kings School 1541, which provided for a school hall where meals would be taken, "that those who came together and praise God together in choir may also sit together and praise God together at table" (Evans 1974).

Many of the early schools were founded by wealthy benefactors and depended upon these people for the money to finance their meal provision. At Winchester for example, Sir Richard Rede referred in 1559 to the "right slender and small" meals of his school days, and in his will left 40 shillings and an annuity of 3 pounds for their improvement. Other benefactions followed, Mr Harris in 1700 donated two hundred pounds to vary the diet by providing "veal in season", Mr Scott gave an annual income of one hundred pounds for "the better support and maintenance of the scholars" (Cook A.K., "About Winchester College", quoted by Evans 1974). Thus, improvements in the meals and diet at Winchester were usually due to external influence through benefactions, not necessarily the enlightenment of the school.

An indication of the typical diet at the time is provided by the meals for one week at Christ's Hospital in 1678, table 2.2. (Evans 1974). The food is particularly plain and the meals highly repetitive — essentially boiled beef, porridge/gruel, and cheese. Nutritional evaluation is difficult however since there is no indication of the quantities served, whether vegetables were provided or whether a breakfast was included.
Table 2.2. One weeks meals at Christs Hospital, 1678.

<table>
<thead>
<tr>
<th>Day</th>
<th>Noon</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>boiled beef, porridge, bread.</td>
<td>roast mutton.</td>
</tr>
<tr>
<td>Monday</td>
<td>water gruel with currants.</td>
<td>cheese.</td>
</tr>
<tr>
<td>Tuesday</td>
<td>boiled beef.</td>
<td>cheese.</td>
</tr>
<tr>
<td>Wednesday</td>
<td>milk porridge, bread and butter.</td>
<td>pudding, pies without bread.</td>
</tr>
<tr>
<td>Thursday</td>
<td>boiled beef.</td>
<td>cheese.</td>
</tr>
<tr>
<td>Friday</td>
<td>milk porridge, bread and butter.</td>
<td>cheese.</td>
</tr>
<tr>
<td>Saturday</td>
<td>milk porridge, bread and butter.</td>
<td>cheese.</td>
</tr>
</tbody>
</table>

Source: Evans 1974

Very simple, plain food was the norm at other schools. At Eton, according to Rodgers (1938) in "Old Public Schools of England", the meal portions were very small as well as being plain. There was no breakfast and for dinner there was only mutton and mashed potatoes, of which there was insufficient, especially for the younger boys who were served last. In the summer months bread and beer was provided, and on founders day and Election Saturday half a chicken and some green vegetables were served. Apart from these occasions the diet never varied.

The boys at Downside seemed to eat better than most according to Langley (Evans 1974), "each scholar has the first Choice of the Portions at Meat, according to his Superiority in Learning. Our diet is Bread and Butter every Morning, at Noon half a pound of boiled meat with a Porringer of Broth; and at Night, the same allowance of Roast with Salad, except on Days of Fast, but at Meals we have as much Bread and Beer as we desire".

In addition to the formal school feeding provision it was normal at public schools for people to have their own sources of food, tuck,
that they either bought locally or had sent from home. An anonymous document from Westminster School, dated 27th May 1690, described the tuck vendors at the school gate, saying, "that women are suffered every day to sit at the Schoole doore, or in the Cloysters, with Oranges, Sweetmeats, Tarts, Cakes and fruite, which not onley tempts the boys to be liquorish, but occasions the Seniors and commanding boys to require of their inferiors whatever their greedy Stomacks crave" (Carleton J., "Westminster School" quoted by Evans 1974).

2.2.2. Catering in the early elementary schools.

The elementary schools of the nineteenth century were founded and run by the voluntary bodies of the Anglican Church and the Nonconformists, the National Society and the British and Foreign Society respectively. After the 1870 Education Act these elementary schools were supplemented in areas of need with non-denominational board schools financed out of the rates.

It was during the last 20 years of the nineteenth century that there was growing concern about poverty and the state of the nations health. In particular there was an increasing volume of evidence showing that many children were under-fed and living in abject poverty. William Booth, the founder of the Salvation Army, described the childhood of the pauper in his book "In Darkest England and the Way Out" (1890) as, "The bastard of the harlot, born in a brothel, suckled on gin, and familiar from the earliest infancy with all the bestialities of debauch, violated before she is twelve, and driven into the streets by her mother a year or two later, what chance is there for such a girl in this world - I say nothing about the next ?"

Survey work carried out by Charles Booth and Seebohm Rowntree attempted to quantify the levels of poverty in urban Britain. Booth investigated Tower Hamlets in 1886 and East London and Hackney in 1887. This led to the 17 volume "The Life and Labour of People in London", published in parts from 1889 to 1903. He concluded that about 30% of Londons population were living in poverty. Seebohm Rowntree (1902) carried out similar work in York, published in
"Poverty: A Study of Town Life", and reached similar conclusions - that 28% of the population of York were too poor to buy "the minimum necessaries for maintenance of merely physical efficiency".

These findings supported the growing belief in the need for physical fitness. This had arisen due to a number of factors - the publication of Darwin's "Origin of the Species" (1897) with its doctrine that only the fittest survive, the fear of war in 1859 leading to the volunteer movement and the cadet corps in schools, and the formation of the Church of England Temperance Society in 1862 (Carter 1933).

Schools therefore vigorously pursued the maxim of a healthy mind through a healthy body by the provision of sports, physical exercise and fresh air. This belief in physical fitness was particularly held by Almond of the Loretto School, Edinburgh, who worked on the maxim that, "the laws of physical well-being are the laws of God" and supported this through a policy of open windows, shorts, shirt-sleeves, cold baths and long runs in the rain (Mackenzie 1905). The concern with physical well-being developed to the stage where in 1906 physical exercise was included as part of the school syllabus issued by the Board of Education in 1909 (Barnard 1968). As Sir Robert Morant observed, "that for the good of the children and the people, what subjects are taught and how they are taught do not matter anything like so much as attention to the physical condition of the scholars and the teachers" (Allen 1934).

An essential aspect of the concern for physical health was sound nutrition through the provision of an adequate diet. Indeed when the Code of Grants (the system by which grants to schools were allocated according to levels of performance) were revised in 1884, many criticized them as being too harsh, but the Lancet, commenting on a report to the Education Department by Dr Crichton-Browne, had stated that "the educational system is not overworking children but demonstrating that they are underfed" (Armytage 1965). The report to the Education Department had recorded instances of schools in which up to a third of the children were half starved, and most lived mainly on tea and bread (Crichton-Brown 1885).
Voluntary provision of meals in some schools had dated back to the 1860's and it was to these schools that the authorities looked for guidance on school feeding. The village school at Rousden, Devon, had received wide acclaim for its Penny Dinners provided from a kitchen built along with the school in 1876. The Inspectors of Schools having observed the meals programme stated that they were "a very great success. What strikes one on coming into the school is the healthy and vigorous look of the children and that this vigour that is not merely bodily comes out in the course of Examination. There is a marked contrast between their appearance and their work on the day of Inspection and those of the children in many neighbouring schools" (Sellman 1968). Other schools in Devon also provided meals but of a more basic nature such as soup and sandwiches. An example is provided by the Chittlehampton School menu as shown in table 2.3.

Table 2.3. An example of one week's lunch menu at Chittlehampton School in the late nineteenth century.

<table>
<thead>
<tr>
<th>Day</th>
<th>Meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>pea soup and bread.</td>
</tr>
<tr>
<td>Tuesday</td>
<td>bread, corned beef sandwiches and tea.</td>
</tr>
<tr>
<td>Wednesday</td>
<td>pea soup and bread.</td>
</tr>
<tr>
<td>Thursday</td>
<td>bread, corned beef sandwiches and tea.</td>
</tr>
<tr>
<td>Friday</td>
<td>bread, butter, jam and cocoa.</td>
</tr>
</tbody>
</table>

Source: Evans 1974

Despite all this favourable evidence for the provision of school meals, not all opinion was favourable. It was argued by some, that if children starved it was because they were neglected by their parents, and that if meals were provided it would encourage employers to keep wages low and for parents "to waste their money on drink" (Bruce 1966). Fitch, a senior school inspector, was strongly of the view that child health was the concern of the parent and not the Government. He was also concerned that providing school meals would relieve parents of their responsibilities and "might do far
more mischief than is evident at first sight". He commented, "Already I have had occasion to see how much harm is done by the benevolent efforts of persons who provide free dinners for children in the elementary schools; how many idle and improvident parents have been tempted to neglect their children ...... in the hope that sympathy might be awakened and the children fed at other peoples expense" (Fitch 1884).

Nevertheless, the Vice-President of the Committee of the Council on Education, A.J. Mundella, had noted the success of the Rousden meals program and seeing it as an answer to the criticism of the revised Code of Grants, with which he had been involved, urged all local authorities to provide a similar service. The Central Council for Promoting Self-Supporting Penny Dinners was formed, with Mundella as President, and in 1885 it circulated details of the Rousden methods. School maintenance funds were not to be used for meal provision but as at Rousden, Penny Dinners were to be subsidised by private individuals, benevolent donations and voluntary unpaid labour.

In Birmingham a Schools Cheap Dinner Society supplied lunches for schoolchildren in the poor districts of the city from 1884. Contributions for the meals came from charities and from board schoolteachers, whilst an anonymous donor provided the children at one board school in the poorest part of Birmingham with free breakfasts (Rossiter 1881). The London School Board stated in 1889 that 12.8% of children attending London schools were permanently undernourished (Thane 1982) and through committees set up in 1894 and 1898 formed the School Dinner Association. As late as 1899, "an article in 'Justice' claimed that nearly 500,000 children attend school hungry" (Simon 1965). By 1905 there were more than three hundred charitable bodies in the UK providing school meals and most of the large cities such as Manchester, Glasgow, Birmingham and Bradford were covered.

2.2.3. The Education (Provision of Meals) Act 1906.

In the early years of the nineteenth century there was continuing evidence of the poor physical condition of the British population. Public concern was raised by the Royal Commission on Physical
Training in Scotland which provided evidence of the poor condition of schoolchildren and suggested that education authorities should provide school meals with the help of voluntary agencies (Fraser 1973).

Even more worrying was the authoritative Report of the Interdepartmental Committee on Physical Deterioration of 1904. This report had been commissioned as a response to the poor quality of recruits for the Boer War - a large number of potential recruits had been rejected, one in four, due to poor health or physical disability. The findings of the report were "horrifying" (Dent 1970) and there was a genuine feeling of "national deterioration" (Fraser 1973). The situation had to be remedied since it was felt that an imperial nation like Britain, with a large empire to maintain, needed a physically strong and well nourished army.

The 1904 committee made a number of recommendations which eventually led to many future developments. These included the appointment of Medical Officers of Health, regulation of overcrowding and air pollution, attention to infant welfare, training of schoolgirls in cookery and hygiene, medical inspection of schoolchildren, improvement of standards of food and drink, and most particularly the provision of meals for underfed children (Bruce 1966). The report specifically advised that "definite provision should be made by the various local authorities for dealing with the question of underfed children" (Interdepartmental Committee on Physical Deterioration 1904).

The Conservative Party was in power at this time but despite the evidence the Balfour ministry would not allow any measures that would involve increased taxation. Much social policy, including school meals, was therefore shelved. In 1906 a major political change took place. The Conservative Government under Balfour had resigned in December 1905 and in the ensuing general election, in January 1906, the Liberals under Campbell-Bannerman achieved a landslide victory. Just as significant, however, was the election of the first Labour members sponsored by the Labour Representation Committee, later to be known as the Labour Party. Although the Labour strength was numerically insignificant it was the first real
representation of the working classes. It also symbolised the
distress of the masses which if not placated could destroy the
Liberal Government.

The Liberals had not come into office committed to social reform but
a number of backbenchers were sympathetic to social policies, and
the Labour members were particularly concerned with unemployment,
old age pensions and school meals (Russell 1973). Margaret McMillan
and Dr James Kerr formed the most influential of a number of groups
that were seeking the provision of meals for the undernourished in
elementary schools (Dent 1970), and with the support of Sir Robert
Morant in the Board of Education they had considerable official
backing behind the scenes. The Fabian Society were also pressing
for free meals in elementary schools along with the provision of
physical training and sports (Lawson & Silver 1973).

A Bill for the feeding of schoolchildren by local authorities was
introduced by William Wilson, a Labour backbencher and Chairman of
the Amalgamated Society of Carpenters and Joiners, and came into
force as the Education (Provision of Meals) Act in December 1906.
The Act was only a permissive measure however, since it imposed no
statutory requirement on the local education authorities to provide
meals. It was nevertheless significant since it was the earliest
example of relief from public funds to a specific part of the
population by an agency other than the Poor Law (Le Gros Clark
1948).

The Act permitted local authorities to assist voluntary
organisations to provide, or to provide themselves, meals for
children "unable by reason of lack of food to take full advantage of
the education provided for them" - section 3, Education Act 1906
(Dent 1970). These meals were to be financed by voluntary
contributions, as before, but also by modest charges to parents who
could pay, and by spending up to the product of a half penny rate.
An important aspect of the legislation was that to resort to free
school meals did not pauperise - resorting to the Poor Law deprived
parents of rights of citizenship as paupers. Thus the provision of
free meals was dissociated from the Poor Law. Indeed it became
impossible to make those ineligible for free meals to pay, and in

63
effect the 1906 Act began a system of publicly financed free school meals.

Because the Act did not make it a statutory duty of local authorities to provide school meals the service developed very slowly and never really got off the ground until the Second World War. Except in times of massive unemployment the proportion of elementary schoolchildren to benefit from school meals never rose above 3% of the total (K. Evans 1978) and despite attempts to avoid such associations it was inevitable that the service would be regarded as part of the Poor Law. This was because most children taking meals were undernourished, the meals were similar to the charity soup kitchen meals, and the children were identified by being marched away from the school to another building to eat their meals (Dent 1970).

The 1906 Act was nevertheless significant in social policy since it was the first provision of publicly financed benefits to the poor outside the Poor Law. It also extended schooling beyond pure education into more general child welfare, and it was a step towards recognising that with public support, children could be well cared for at home and that parents were not necessarily to blame for their children's undernourishment.

2.2.4. School feeding from The Education Act 1906 to 1939.

By 1911/12, 131 of the 322 Education Authorities in England had introduced meals services. Of these only 95 financed them out of the rates, the rest being financed from voluntary and charitable organisations (Thane 1982). In London there were 29,000 schoolchildren receiving meals in 1906, by 1911 there were 41,000 (J. Evans 1974), and by 1912 there were about 100,000 with 258,000 in the rest of England and Wales (Thane 1982). After 1910 more needy children were being fed in London by the Education Committee than by the Poor Law (Bruce 1966). There was a clear need for feeding on such a scale to have further funding and greater State control since voluntary societies were
leaving the meals provision more and more to the local authorities. In 1914 the Board of Education had a new Education (Provision of Meals) Act passed which provided for half the cost of meal provision to be paid by the Treasury and authorised school feeding during the holidays. The assessment of need, for eligibility for free meals was to be made by the school medical officers purely on the basis of health rather than on parental income (Gilbert 1966). It had been realised that the problem was not so much lack of food as lack of suitable food (Bruce 1966).

School meals at this time varied widely in their nature, from a simple full midday meal to a spoonful of codliver oil to a third of a pint of milk. Whilst in later years full midday meals were normal in all areas, the earlier school feeding was intended to correct undernourishment and the nature and size of the meal varied with the nutritional necessity (Vaizey 1958). In addition, with variations in types of provision the expenditure would also vary from authority to authority.

During the First World War the number of school meals declined and indeed the Ministry of Food actually discouraged the provision of meals. The war brought for the first time in modern history near full-employment with only 0.4 to 0.8 million unemployed for much of the war (Mitchell & Deane 1962). It did however take time for the economy to adjust to wartime requirements and although school meal uptake and provision had declined, there was a significant rise in the numbers of malnourished children in the large towns (Marwick 1965).

After the war there were lean years of economic depression and very high unemployment prevailed for the two decades after 1920. Indeed the number officially recorded as unemployed did not fall below a million for 20 years, and fluctuated between 8.7% of insured workers in May 1927 to 22.4% in September 1931. The unemployment levels were particularly high in some areas such as Glasgow where 59% were unemployed and Hartlepool where 60% were unemployed (Mowlat 1955).

Initially education authorities increased the meal provision,
especially in mining areas during the coal dispute, to the extent that in 1921-22 600,000 children were taking meals. In 1923 however there were drastic cuts in public expenditure, the rate of meals grant was reduced by half and consequently fewer than 150,000 children took meals (Education 8th October 1982).

There was still concern about nutrition and free milk was available to needy children from 1921. In 1931 the Ministry of Agriculture launched a campaign through the Milk Marketing Board, "Milk in Schools", to encourage more children to drink milk. This scheme allowed schoolchildren to buy one third of a pint of milk for half a penny, and those who suffered malnutrition were allowed two thirds of a pint. This was an important policy since medical inspections in the early thirties had shown that nearly one quarter of the children in elementary schools were suffering from malnutrition to some degree before the introduction of subsidised milk. In addition the Ministry of Health had set up an advisory Committee on Nutrition in 1931 which had produced an influential report on the nutritive value of milk (Bruce 1966).

In December 1935 the Board of Education requested that "all children unable by reason of lack of food to take full advantage of the education provided for them should receive such supplementary nourishment as may be appropriate in each case, the meals being provided free where the parent is unable to pay" (Board of Education 1939). The Medical Branch of the Board of Education reported that many school meals were nutritionally unsatisfactory with energy values of 200-600 calories and 1-10 grams of fat and animal protein. An example of a "good" lunchtime diet was provided as shown in table 2.4.

A survey in 1936 by Sir John Boyd Orr for the Ministry of Agriculture found that 10% of the population and 20% of children, were very badly fed, and that up to 50% were "ill-fed". A later survey by Clark showed the situation to be less severe in the small towns but severe in London and particularly so for children (Mowlat 1955). The problem of undernourishment had clearly not been
Table 2. An example of a good lunchtime diet as suggested by the Board of Education, 1939.

Monday, Wednesday — soup, bread and rice pudding.
and Friday.

Tuesday and Thursday — hash, bread and rice pudding.

Source: Proceedings of the Nutrition Society 1945

resolved. The Childrens Minimum Council to the President of the Board of Education described the school meals service in the 1930's;

"The number of children getting free (solid) meals at any one time must have averaged less than 2% of the school population. This may be compared with Sir John Orrs estimate of 25% of the nations childrens diets are deficient .... Free meals are particularly inadequate in county districts where wages are low .... Among the authorities which do provide dinners the differences in the proportion of children fed do not appear to bear any relation to the probable economic need, as measured, for instance, by the incidence of unemployment" (quoted by Evans 1974),

Thus there were far more undernourished children than were taking meals, and perhaps most significantly the numbers taking meals in each authority did not correlate with levels of unemployment.

The policy of the Board of Education that for children to be given meals they should be in poverty and show symptoms of malnutrition, created many problems. As the British Medical Association (BMA) said to the Board of Education in November 1933, "The detection of early signs of subnormal malnutrition in clinical examination is extraordinarily difficult". With detection being difficult under clinical examination there could surely be little chance of teachers detecting malnutrition by observation. The B.M.A. further noted that "the presence of physical signs", the stage at which the
teacher could reasonably observe nutritional problems, "may indicate a well-established condition of malnutrition which may well have been prevented". There was a clear need for this policy to be modified into a more practical, workable form.

In the years before the Second World War it was normal for the Organiser of Domestic Subjects to supervise the school canteens whilst the Headteacher had the ultimate responsibility for the meals program. In 1937 the Association of Teachers of Domestic Subjects published a booklet, "School Dinners", which provided advice on the running of school meals systems including specimen plans, schedules of equipment and recipes.

In rural areas many children brought packed lunches to school. A description of these is provided in "Dinner at School";

"Their little grub-bags were hung on the coat pegs on entering school. There were two packets, the first was 'elevenses' or playtime lunch consisting of an apple or carrot and a slice of bread. At twelve o'clock the second packet was opened .... here was a 'huffer' (a small Essex loaf) split open and containing a dab of butter and a lump of cheese, perhaps with lettuce, beetroot or onion; second course - a lump of cake. All could be eaten from the bag and no cutlery was required. Often in the cold weather teacher would make a cup of cocoa (one halfpenny). Bread was toasted if required by holding it against the blackleaded cake-stove. The epicure would sometimes bring potatoes to roast - they were slid under the fire at playtime and by noon were done, the potato monitor turning them at intervals" (Essex County Council 1943).

2.2.5. The Second World War and the 1944 Education Act.

During the Second World War school meals became closely associated with the war effort. The whole population was affected by the need for food rationing and it became national policy to ensure the health of the school population through the provision of meals for all children attending schools - either free in the case of
hardship, or for payment. The Government was thus determined to extend school meal provision for the traditional reasons of humanitarian concern for poor children and to ensure sufficient nourishment for educational purposes. Other reasons for this policy were:

- because domestic rations took no account of the special needs of children. School meals thus enabled ration allowances to be supplemented,
- to help with the feeding of children evacuated from the cities, and to relieve some of the burden on the host family,
- to allow mothers to work and help with the war effort.

In July 1940 the Treasury grants were increased and consequently the number of meals taken doubled whilst milk increased by 50%. The wartime situation, with rationing affecting the rich and poor, accentuated the value of school meals. As a Cabinet memorandum noted, "There is a danger of deficiencies occurring in the quality of childrens diets ..... there is no question of capacity to pay; we may find the children of well-to-do parents and the children of the poor suffering alike from an inability to get the food they need" - The Economist, 1st May, 1943 (quoted by Titmus 1950).

In 1943 prefabricated huts equipped as kitchens or as dining rooms were provided free to local authorities by the Ministry of Works. The Government set a target of providing meals to 75% of children attending grant aided schools. The service expanded rapidly from 1942 when 19% (843,000) of children in primary and secondary schools took school dinners, to 1945 when 39.6% (1,832,000) of pupils took a school dinner. Only 14% of those taking meals received them free, the service starting as a charity had now become a meal service for all.

Guidance on school meal provision was provided by the "School Canteen Handbook" produced by the National Union of Teachers and the Gloucestershire Training College of Domestic Science (1940). It provided specimen diagrams and workflows for production, but also more general guidance to ensure that the full educational value of the meal was realised. It suggested that children should be made to
brush their hair and wash their hands before meals, they should have adequate time for eating, there should be a quiet period after the meal, they should be encouraged to eat vegetables, and to leave clean plates. The value of the school meal was clearly seen to extend beyond dietary considerations.

The Handbook also suggested energy values of 730 calories for those aged 5-11 and 920 for those aged 11-15. These were superseded in 1941 when the Board of Education set agreed dietary standards of 1,000 calories, 20-25 grams of animal protein and 30 grams of fat.

Although there was an enormous expansion of meal provision in the early 1940's, it was not the same throughout the country. Whilst uptake was very high in some areas others provided no meals at all. This was changed with the 1944 Education Act.

The 1944 Education Act, based on Butlers White paper "Educational Reconstruction", was a landmark in the British educational system. Curtis (1968) regarded the Act as "the greatest single advance made in the development of English Education", and Bruce (1966) observed that it "established for the first time a comprehensive and progressive system of education for all". The Act also contained the most significant changes to school meal provision since 1906. Under section 7 of the Act it was now the duty "of the local education authority for every area so far as their powers extend to contribute to the spiritual, mental, and physical development of the community" (Burgess 1964). Thus local authorities now had a general responsibility for healthy living at schools including satisfactory eating and dietary arrangements.

The specific meals policy was detailed by Section 49 of the Education Act 1944 and was implemented by the Provision of Milk and Meals Regulations 1945. This legislation required all the education authorities to provide meals at all maintained schools for all pupils who desired them. Whilst previously teachers had undertaken lunchtime supervision of pupils voluntarily, the new legislation gave local authorities the power to require teachers to supervise pupils. Teachers were particularly unenthusiastic about this as the administration and supervision of school meals had become "an
obligatory and burdensome part of the teachers work" (Baron 1968).

The other main requirements were:

- the local education authorities were required to employ a School Meals Organiser with adequate experience of planning, preparation and service of meals and dietetics,
- the provision of midday meals suitable as the main meal of the day on all school days,
- charges for meals, not exceeding the cost of the food, set by the local education authority and approved by the Minister of Education,
- entitlement to free meals according to financial hardship determined by the local education authority,
- local education authorities required to provide one third of a pint of milk per pupil per day in maintained schools. This was to be free of charge.

The role of the school meal in the education and social training of pupils was still perceived as an important one. The official opinion was expressed in a Ministry of Education Circular, "School Meals and Midday Supervision" (1946);

"The school dinner is one of the most important and frequent occasions on which large numbers of pupils are assembled together to act as a community. By its very nature this daily act is necessarily part of the corporate life of the school, as it has always been regarded in secondary schools ..... it affords an outstanding opportunity for social training, without which education is incomplete, for teaching good manners and for the establishment of sound dietetic habits".

The 1944 Education Act and the regulations of 1945 had thus provided the basis of a national school meals service that was to prevail in the same basic form until 1980.
2.2.6. The school meals service from 1945 to 1970.

From 1945 until 1970 a number of adjustments were made to the school meals service. In 1947 the grant from the Treasury was amended to provide both a premises grant and a 100% meal grant (Curtis 1968). In addition The Milk and Meals (Amending) Regulations 1949 removed the power of setting the price for meals from the local authorities to enable a uniform national charge to be set by the Government.

Food rationing, a legacy of the Second World War, continued until 1954. After this date the meals service had far more flexibility in terms of the foods it could use and in 1955 the Department of Education and Science circulated new recommended food quantities and reaffirmed the nutritional requirements for school meals - an energy value of 650-1,000 calories according to age and sex, 20 grams of animal protein and 25-30 grams of fat (Department of Education and Science 1955).

These nutritional requirements were effective until January 1966 when a revised schedule was issued. This was the result of the findings of a working party, set up in 1965, to investigate the nutritional standards set by the 1955 circular. The working party concluded that no major changes were necessary but did adjust the nutritional standards to a total protein content of 29 grams of which approximately 18.5 grams should be animal protein, an energy value of 880 calories and a fat content of 32 grams (Department of Education and Science 1966).

It is interesting to note, in the light of recent associations of animal fats with coronary heart disease (see section 3.3.2), that the recommended fat content was increased and that there was such concern with the proportion of animal protein in the diet. Indeed nutritionists have in recent years been recommending a reduction in fat consumption and the replacement of saturated fats by poly-unsaturated fats, implying a move from animal protein to an increased proportion of vegetable protein (Truswell 1977, Department of Health and Social Security 1978a, Whitehead 1979, Mann 1979, Passmore, Hollingsworth & Robertson 1979, Lewis 1980, National Advisory Committee on Nutrition Education 1983, Kipps & Thomson 1983, Kipps & Thomson 1983).
During the period from 1945 until 1970 the school meals service had developed both in terms of the number of meals served and the standard of the service. In 1958 over three million pupils in maintained schools took meals per day (Barnard 1968), in 1967 four million (69.5% of those present) took meals and by 1968 six million (82.2%) took meals (Baron 1968).

After 1967 certain attitudes to the educational aspects of the school meal changed. Whereas teachers appreciated the educational and social value of the lunchtime meal, and had previously supervised lunchtimes voluntarily, the compulsion of the 1944 Act meant that meal supervision had become viewed as a "burdensome" task (Baron 1968). This was despite the appointment of lunchtime "assistants" as recommended by the Ministry of Education Circular No. 97 (1946). After much protest by the teachers unions the requirement to do supervisory duty was removed in 1968, although headteachers were still to have responsibility for the children during the lunch period. This led to a large scale withdrawal of teachers from lunchtime supervision and a consequent reduction in the control exercised over the children's feeding.

The style of school meals changed after 1967. With less control over the feeding behaviour of pupils it became necessary to provide more of the food they liked and would eat through choice. This began the movement away from the traditional meal of meat and two vegetables towards the practice of offering a choice of meals, particularly to the older children.

In 1969 the Provision of Milk and Meals Regulations superseded all previous regulations including those of 1945. The new regulations were much condensed and shortened and were also far less specific in their requirements. The school meals organiser, for example, now needed only be a "fit person". Free milk was no longer provided in secondary schools after 1968, and with the Education (Milk) Act 1971 it was withdrawn from most junior schools, being restricted to special schools and those pupils for whom milk provision was recommended by the School Medical Officer. It was permitted however
for schools to sell milk to pupils of all ages.

2.2.7. Financial pressures on the school meals service during the 1970's.

By 1970 the national uptake of school meals was no longer rising and indeed the number of meals served per day fell by 14,000 from 1969 to 1970 and by 463,000 from 1970 to 1971. This represented a drop in the percentage of pupils taking meals - from 70.5% in 1969 to 60.3% in 1971 (Department of Education and Science 1971). Although 1968/9 probably represented a peak in the levels of meal uptake, the drop in subsequent years was mainly due to price rises in 1968 and 1971. This is clearly illustrated by the fact that in September 1970 uptake was 68.3%, in April 1971 the charge for meals was raised through the Provision of Milk and Meals (Amendment No.2) Regulations and uptake in May 1971 had fallen to 54.3%. Nevertheless, by October 1971 the level of uptake had revived to 60.3% and by October 1974 it was 70.2%, almost at its 1969 level (see table 2.5.).

It is interesting to note that a further price rise in April 1975, from 12 pence to 15 pence, had a negligible affect on uptake, which remained at around 70% for the next two years. Clearly uptake had become less price sensitive and parents had probably come to appreciate the value of school meals, both nutritionally and economically (Department of Education and Science 1969-76). In 1976 the price was again raised from 15 pence to 25 pence and uptake fell to under 62%. The most dramatic fall in uptake, however, was to come from 1979 to 1980 when there were two price increases, 25 pence to 30 pence in autumn of 1979 and to 35 pence in February 1980. The uptake figure dropped from 64% to 48% during this period (Department of Education and Science 1976-1980).

Although school meal uptake was substantial during the 1970's, there were still a number of children who preferred to bring a packed lunch for their midday meal. With regard to these pupils, the Secretary of State for Education expressed the hope that authorities would make facilities available for these children and make no charge for their use (Department of Education and Science 1971).
Table 2.5. School meals served to pupils at maintained schools in England (1969-1985).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. meals served ('000)</td>
<td>4,886</td>
<td>4,874</td>
<td>4,411</td>
<td>4,802</td>
<td>5,115</td>
<td>5,440</td>
<td>5,552</td>
<td>5,503</td>
</tr>
<tr>
<td>% of pupils taking meals</td>
<td>70.5</td>
<td>68.3</td>
<td>60.3</td>
<td>64.4</td>
<td>66.4</td>
<td>70.2</td>
<td>70.3</td>
<td>69.4</td>
</tr>
<tr>
<td>No. paid meals ('000)</td>
<td>4,340</td>
<td>4,294</td>
<td>3,665</td>
<td>4,013</td>
<td>4,378</td>
<td>4,746</td>
<td>4,824</td>
<td>4,724</td>
</tr>
<tr>
<td>No. free meals ('000)</td>
<td>547</td>
<td>580</td>
<td>746</td>
<td>789</td>
<td>737</td>
<td>694</td>
<td>728</td>
<td>779</td>
</tr>
<tr>
<td>% meals served free</td>
<td>11.2</td>
<td>11.9</td>
<td>16.9</td>
<td>16.4</td>
<td>14.4</td>
<td>12.8</td>
<td>13.1</td>
<td>14.2</td>
</tr>
</tbody>
</table>

Table 25. (cont.) School meals served to pupils at maintained schools in England (1969-1985).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. meals served ('000)</td>
<td>4,856</td>
<td>5,096</td>
<td>4,855</td>
<td>3,535</td>
<td>3,515</td>
<td>3,428</td>
<td>3,482</td>
<td>3,392</td>
</tr>
<tr>
<td>% of pupils taking meals</td>
<td>61.7</td>
<td>65.9</td>
<td>64.1</td>
<td>48.2</td>
<td>49.0</td>
<td>49.4</td>
<td>51.4</td>
<td>51.3</td>
</tr>
<tr>
<td>No. paid meals ('000)</td>
<td>3,929</td>
<td>4,022</td>
<td>3,956</td>
<td>2,811</td>
<td>2,659</td>
<td>2,464</td>
<td>2,407</td>
<td>2,244</td>
</tr>
<tr>
<td>No. free meals ('000)</td>
<td>927</td>
<td>1,074</td>
<td>899</td>
<td>724</td>
<td>856</td>
<td>964</td>
<td>1,075</td>
<td>1,148</td>
</tr>
<tr>
<td>% meals served free</td>
<td>11.8</td>
<td>13.9</td>
<td>11.9</td>
<td>9.8</td>
<td>11.9</td>
<td>13.9</td>
<td>15.9</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Note: Figures for 1985 are not available because no census was taken due to teachers' industrial action.

The provision of these facilities was made a statutory requirement by the 1980 Education Act.

In 1973 the Secretary of State for Education and Science appointed a Committee on Catering Arrangements in Schools, "To review the aims and organisation of the meals and refreshment service in schools" (quoted by J. Evans 1974), and also set up a Working Party to review the nutritional aspects of school meals. The reports were both published in November 1975.

The main recommendations of the Committee on Catering Arrangements in Schools (1975) were:

- That the provision of a suitable meal of the traditional type on school days should continue, but there should be an increasing choice of meal as the pupils get older. This would allow pupils to make a selection according to their personal tastes and needs. The variations in service envisaged were:
  (i) 5-7 year olds - a set meal of suitable nutritional standard.
  (ii) 9-14 year olds - a choice of menu, with increasing choice at the upper age levels.
  (iii) 15+ year olds - a set meal for those requiring it together with an a la carte or free choice system with individually priced items.

- Local education authorities should be given more discretion over the charge made for milk supplied to pupils not entitled to receive it free of charge. This could meet the needs of those pupils who arrive at school hungry.

- Discussions should take place regarding the development of an information and advice centre on school catering.

The Working Party on the Nutritional Aspects of School Meals (1975) made the following recommendations:

- There was no need to revise the nutritional standards set by the Department of Education and Science Circular 3/66 (1966), but there was no longer any need to set separate requirements for animal protein and fat. The average meal should provide a
minimum of one third of a child's daily energy requirements and
between one half and one third of the protein requirements.

- The general meal pattern should remain the same. Fresh meat
  should be served on average three days a week and other animal
  protein on the remaining days.

- Attention should be paid to the content of essential minerals and
  vitamins although no standards were specified. It was
  recommended that school meals should be monitored for these
  essential vitamins and minerals.

- Support was given to the suggestion that legislation regarding
  the selling of milk should be relaxed. The provision in the
  Education (Milk) Act 1971 requiring milk to be sold at an
  economic charge was repealed by the Education Bill in December
  1975.

Consultations between the local authority associations and other
interested bodies took place in 1976 but the recommendations of both
reports had to be considered in the light of the announcement of
planned economies in the service of £30 million. The Chancellor of
the Exchequer had announced on the 15th December 1976 plans to
reduce public expenditure in the financial years 1977/78 and
1978/79, and the Secretary of State outlined the intention to
discuss methods of reducing spending on school meals in December
1976 (Department of the Environment 1976). These cuts were in
addition to the Government's intention to halve by 1980 the 1975/76
subsidy to school meals. As part of this policy to reduce spending
the price of the meal was raised from 15 pence to 25 pence.

Financial pressure on the meals service had begun in 1970 with the
Government policy as expressed in the White Paper, "New Policies in
Public Spending" (1970). This document required that charges for
meals should cover the costs of producing them. This led to the
price increase of 1971. As a result of the discussions arising out
of the Department of Environment Circular of December 1976, the
Department of Education and Science issued a circular, "The School
Meals Service" (1978), which summarised the kind of economies that
had been found to be practical. Policies that had already been
successfully adopted by some local education authorities included
the use of cheaper food materials such as vegetable protein and powdered milk, reduction in staff costs through the use of more convenience foods and revising staff scales, simplified menus and menu items, and in some cases the introduction of cook-freeze catering.

In keeping with the Government's aim to halve the 1975/76 subsidy by 1980, it announced in November 1979 in the Public Expenditure White Paper, that it would be expecting a very considerable reduction in net expenditure on school meal provision. In order to assist the local education authorities with these reductions, the price of the school meal was raised in autumn 1979 to 30 pence and then again on the 4th February 1980 to 35 pence.

Expenditure on school meals in England along with total educational expenditure is shown in table 2.6. This table shows the current and capital expenditure on meals, along with the total expenditure on meals expressed as a percentage of the total expenditure on education (current and capital). It is interesting to note that no capital expenditure was incurred after 1974/75 which closely corresponds to the time at which the Government was beginning to impose financial constraints on the service. Expenditure on school meals as a percentage of total expenditure on education remained fairly constant at around 5% throughout the 1970's. There was a small decrease from 1976 (5.8%) to 1980 (5.0%) reflecting in part the economies imposed during this period – most of the savings were achieved through increases in prices in 1977, 1979 and 1980. The subsidy for the service being the difference between the expenditure and the revenue received from pupils.

Throughout the 1970's remission from payment for school meals for the poor had been maintained. The scale of parental net income below which there was entitlement to free school meals was revised annually to take into account increases in supplementary benefit rates, and in 1978 publicity measures were taken to ensure that those entitled were aware of the benefits. In the same year a circular (Department of Education and Science 1978) asked local authorities to ensure that their arrangements for the collection of
Table 2.6. Public expenditure on school meals in England (1969-1985) £m.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current expenditure on school meals</td>
<td>86.8</td>
<td>94.6</td>
<td>99.9</td>
<td>123.2</td>
<td>169.9</td>
<td>247.4</td>
<td>318.6</td>
<td>381.6</td>
</tr>
<tr>
<td>Capital expenditure on school meals</td>
<td>10.6</td>
<td>10.6</td>
<td>10.7</td>
<td>13.5</td>
<td>11.7</td>
<td>10.6</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Total expenditure on school meals</td>
<td>97.4</td>
<td>105.2</td>
<td>110.6</td>
<td>136.7</td>
<td>181.6</td>
<td>258.0</td>
<td>318.6</td>
<td>381.6</td>
</tr>
<tr>
<td>Total expenditure on education</td>
<td>1942.5</td>
<td>2244.8</td>
<td>2605.8</td>
<td>3086.9</td>
<td>3426.5</td>
<td>4570.0</td>
<td>5797.7</td>
<td>6525.5</td>
</tr>
<tr>
<td>Expenditure on school meals as a % of expenditure on education</td>
<td>5.0</td>
<td>4.7</td>
<td>4.2</td>
<td>4.4</td>
<td>5.3</td>
<td>5.6</td>
<td>5.5</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Table 2.6. (cont.) Public expenditure on school meals in England (1969-1985) £m.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current expenditure on school meals</td>
<td>364.6</td>
<td>388.4</td>
<td>421.7</td>
<td>397.4</td>
<td>395.6</td>
<td>411.0</td>
<td>426.0</td>
<td>425.0</td>
</tr>
<tr>
<td>Capital expenditure on school meals</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Total expenditure on school meals</td>
<td>346.6</td>
<td>388.4</td>
<td>421.7</td>
<td>397.4</td>
<td>395.6</td>
<td>411.0</td>
<td>426.0</td>
<td>425.0</td>
</tr>
<tr>
<td>Total expenditure on education</td>
<td>6853.6</td>
<td>7537.1</td>
<td>8604.8</td>
<td>10507.0</td>
<td>11389.4</td>
<td>12196.4</td>
<td>12920.0</td>
<td>13411.0</td>
</tr>
<tr>
<td>Expenditure on school meals as a % of expenditure on education</td>
<td>5.3</td>
<td>5.2</td>
<td>5.0</td>
<td>3.8</td>
<td>3.5</td>
<td>3.4</td>
<td>3.3</td>
<td>3.2</td>
</tr>
</tbody>
</table>

dinner money were consistent with the need to avoid the identification of pupils taking free meals.

2.2.8. The 1980 Education Act.

The 1970's had seen the development of stringent financial restrictions on the school meals service. During discussions with the Government in July 1979, the Association of County Councils pointed out that the local authorities efforts to stem the growth in public expenditure were hampered by a number of statutory duties that limited their discretion over the provision of certain services. It was suggested that the relaxing of many of these duties would enable greater economies to be made.

Section 22 of the Education Act 1980 governing the provision of school meals and milk came into effect on 14th April 1980. This Act stipulated that local education authorities could now decide upon the nature and extent of the school meals service they would provide for pupils, and could set the charges to be made for them. There was no longer a requirement to provide meals of a defined nutritional standard. The only statutory requirements remaining were that local education authorities were required to:

(i) provide a lunchtime meal for pupils whose parents receive supplementary benefit or family income supplement.
(ii) provide facilities for those pupils bringing their own lunchtime food to eat in school.

The local authorities were also released from the duty to provide free school milk. Each authority being permitted to decide on what conditions milk be provided for pupils in their area. The aim of this legislation was to enable local authorities, through the freedom to decide on the form of the meals service and the prices to be charged for them, to reduce their net expenditure (subsidy) by the required 50% of the 1975/76 level.

The individual local authorities have been exercising their greater
autonomy in various ways. At one extreme the authorities have been cutting the meals service down to the statutory minimum of providing food only for those children eligible for free meals. Dorset, Hereford and Worcestershire, and Lincolnshire followed this policy and discontinued school meals in their primary schools.

A number of authorities contracted-out the provision of school meals to commercial catering organisations such as Gardner Merchant and Sutcliff Catering. Both Merton and Croydon Education Authorities have contracted-out their school meals to commercial catering companies. Not all education authorities, however, were successful in their attempts to privatise the meal service, Birmingham for example were told by Gardner Merchant that there was little they could do to improve the service within the existing financial constraints and the need for their company to reap some form of benefit (Latham 1982).

Many authorities have reacted in a more positive way by cutting costs, providing the types of food children will buy and by charging prices that will cover costs. In this way, these authorities have been able to maintain their control over the school catering service. The affect of such policies has been to raise the price of meals in most areas from the pre 1980 figure of 35 pence to up to 60 pence in some cases (see table 2.7.).

The move towards providing foods that children will buy has led to a major change in the style of the service that many authorities now provide. This has been a move from the traditional set meal towards the wider choice of the cash cafeteria. Whilst the traditional service offers a limited number of complete meals for a fixed price, the cash cafeteria offers a range of individually priced items from which pupils may compose their own meal in an à la carte manner.

There has, however been much concern about allowing children to choose what they have for their lunch and the affect such choices will have on their diets. This aspect of the new style of school meals has been investigated by Kipps and Thomson (1984) who found that whilst the energy intake from school meals was "adequate", they
Table 2.7. *School meal prices charged by Local Education Authorities on the 9th December 1981* (pence)

<table>
<thead>
<tr>
<th>Authority</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avon</td>
<td>50</td>
</tr>
<tr>
<td>Barnet</td>
<td>45</td>
</tr>
<tr>
<td>Bedfordshire</td>
<td>60</td>
</tr>
<tr>
<td>Beverley</td>
<td>55</td>
</tr>
<tr>
<td>Bolton</td>
<td>42</td>
</tr>
<tr>
<td>Brent</td>
<td>45</td>
</tr>
<tr>
<td>Buckinghamshire</td>
<td>60</td>
</tr>
<tr>
<td>Calderdale</td>
<td>40</td>
</tr>
<tr>
<td>Cheshire</td>
<td>50</td>
</tr>
<tr>
<td>Cornwall</td>
<td>50</td>
</tr>
<tr>
<td>Croydon</td>
<td>50</td>
</tr>
<tr>
<td>Derbyshire</td>
<td>45</td>
</tr>
<tr>
<td>Doncaster</td>
<td>40</td>
</tr>
<tr>
<td>Durham</td>
<td>36</td>
</tr>
<tr>
<td>East Sussex</td>
<td>48</td>
</tr>
<tr>
<td>Essex</td>
<td>50</td>
</tr>
<tr>
<td>Gloucestershire</td>
<td>50</td>
</tr>
<tr>
<td>Haringey</td>
<td>45</td>
</tr>
<tr>
<td>Havering</td>
<td>50</td>
</tr>
<tr>
<td>Hertfordshire</td>
<td>60</td>
</tr>
<tr>
<td>Hounslow</td>
<td>40</td>
</tr>
<tr>
<td>ILEA</td>
<td>35</td>
</tr>
<tr>
<td>Kent</td>
<td>50</td>
</tr>
<tr>
<td>Kirklees</td>
<td>35</td>
</tr>
</tbody>
</table>

(Source - Education 8.1.82)
Table 2.7. (cont.) School meal prices charged by Local Education Authorities on the 9th December 1981. (pence)

<table>
<thead>
<tr>
<th>County</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lancashire</td>
<td>40</td>
</tr>
<tr>
<td>Leicestershire</td>
<td>47</td>
</tr>
<tr>
<td>Manchester</td>
<td>40</td>
</tr>
<tr>
<td>Newcastle</td>
<td>40</td>
</tr>
<tr>
<td>Norfolk</td>
<td>53</td>
</tr>
<tr>
<td>North Tyneside</td>
<td>35</td>
</tr>
<tr>
<td>North Yorkshire</td>
<td>50</td>
</tr>
<tr>
<td>Oldham</td>
<td>40</td>
</tr>
<tr>
<td>Redbridge</td>
<td>45</td>
</tr>
<tr>
<td>Rochdale</td>
<td>40</td>
</tr>
<tr>
<td>St. Helens</td>
<td>40</td>
</tr>
<tr>
<td>Shropshire</td>
<td>45</td>
</tr>
<tr>
<td>Sefton</td>
<td>50</td>
</tr>
<tr>
<td>Solihull</td>
<td>50</td>
</tr>
<tr>
<td>South Tyneside</td>
<td>40</td>
</tr>
<tr>
<td>Stockport</td>
<td>50</td>
</tr>
<tr>
<td>Sunderland</td>
<td>35</td>
</tr>
<tr>
<td>Sutton</td>
<td>45</td>
</tr>
<tr>
<td>Trafford</td>
<td>45</td>
</tr>
<tr>
<td>Walsall</td>
<td>35</td>
</tr>
<tr>
<td>Warwickshire</td>
<td>52</td>
</tr>
<tr>
<td>Wigan</td>
<td>40</td>
</tr>
<tr>
<td>Wirral</td>
<td>55</td>
</tr>
</tbody>
</table>

(Source - Education 8.1.82)
provided "too great a proportion of energy from fat and sugar and too small a proportion from complex carbohydrate", that the intake of dietary fibre was too low, and stated that "there is a need for nutritional guidelines for school meals". The nutritional aspects of school meals are discussed in some detail in section 3.3.

The Inner London Education Authority (ILEA) is one notable example where cash cafeterias have been adopted. Indeed, the ILEA first introduced this type of meals service in the early 1970's and by 1982, 120 of the 165 secondary schools in London had been converted to cash cafeteria service.

The ILEA provides a useful definition of the cash cafeteria:

"a service where items on the tariff are separately priced, the charge being related to the standard meal charge, and where pupils have the freedom to buy as much or as little as they wish. In each cash cafeteria it is possible for children to buy items equivalent to a full school meal (a meat dish, two vegetables and a sweet) for 35 pence and a normal school meal is also on sale at 35 pence .... On most of the sites a complementary refreshment sales service (beverages, food, confectionary, ice cream, yoghurt) has also been provided" (Inner London Education Authority 1982).

Some local education authorities have in addition to providing cash cafeterias embarked on a policy of advertising and promoting their school meals. The East Sussex Education Authority produced a promotional campaign in association with the Milk Marketing Board to promote both the meals and the children's nutritional awareness (Fast Food 1982a &b). Increasing nutritional awareness is an important aspect since nutrition education had already been identified by the British Dietetic Association (1980) as an important factor in improving children's eating behaviour. The school meals service in Devon adopted a marketing campaign in response to a dramatic 50% drop in uptake in 1980. A programme of information to parents and pupils along with sample meals produced significant rises in uptake of up to 200% (Parnham 1982).
Despite these attempts by some authorities to maintain their levels of uptake, the national school meal uptake dropped dramatically after the 1980 Education Act. From an uptake of 64.1% in October 1979 the level dropped to 48.2% in October 1980 and remained at around 50% for the next four years (Department of Education and Science 1979-84).
2.3. Feeding in hospitals.

Medieval English hospitals were actually wayside shelters providing hospitality for pilgrims and travellers. Indeed the name hospital is derived from the Latin adjective "hospitalis" concerning the care of "hospes" or guests (Oxford English Dictionary 1978). Few hospitals of this period were concerned with the care of the sick and it was not until the eighteenth century that their primary concern became health care.

As with all residential institutions feeding has always been an important consideration, initially as part of the hospitality for travellers and more recently as part of the care for the sick. The role of adequate feeding in hospitals was recognised from the earliest times as illustrated by the observations made in "An Account of the Establishment of the County Hospital at Winchester", 1737. In discussing the value of hospitals for the care of the sick, the document states "It is the most safe and eligible manner of doing it (caring for the sick); because the care and neatness, as well as the simplicity and regularity of Diet, with which the poor are kept in Hospital, do all contribute much sooner to their recovery" (quoted by Woodward 1978).

2.3.1. Evidence of catering in the earliest hospitals.

Probably the earliest reference to food served in hospitals was in the sixth century B.C. when there were very crude hospitals in India and Egypt. At around the same time there was also food provided in the temples to which the sick retired in the cities of Greece and Rome (MacEachern 1957). It was the Romans who built the first of what we would recognise today as hospitals. These were called "valetudinarium", or military hospitals which were normal barracks adapted for sick or wounded soldiers. Evidence of these "valetudinarium" dating from the first century A.D. has been excavated at Vindonissa (today Windisch) in Switzerland and in
Perth, Scotland. A later hospital at Carnuntum dating from the second century A.D. shows clear evidence of catering provision with the remains of a kitchen and a cooking hearth (Thompson & Goldin 1975).

Other early hospitals were also evident in medieval Constantinople including the Hospital of the Pantocrator which, according to surviving texts, included a kitchen, a butchery and provided evidence of menus for daily diets (Pournacopoulos 1960).

2.3.2. Feeding in medieval English hospitals.

Although the Romans had built military hospitals, some of the earliest hospitals in England for which evidence has been established were built by the Saxons. One was founded in St. Albans in 794 A.D., one in Flixton, Yorkshire, and another St. Peters in York in 937 A.D.

The hospitals of this period played an important part in the social history of the time. They were usually built along with monasteries and as such were more ecclesiastical than medical institutions. They were mainly concerned with providing care rather than seeking cures. Hospitals endeavoured, as the body decayed through illness, injury or old age, to strengthen the soul and prepare it for the future life through the practice of faith and love rather than skill and science. As religious establishments there were strict rules of conduct, much the same as monasteries, and as such patients were expected to attend all the many religious services.

As already mentioned, hospitals were also concerned with providing hospitality to poor travellers and pilgrims. As such they were usually built at places of pilgrimage or along main routes. Indeed St. Peters in York was founded by King Athelstan in order to extend the provision of hospitality for travellers to York. Some hospitals were specifically intended for lepers, known as "leperhouses", whilst others were set aside for the aged and infirm, known as "bedesmen" (Harris 1967).
Apart from the monasteries and friaries there existed a surprisingly large number of hospitals in medieval England, especially when considering that the population never exceeded four million. From the Norman conquest until the mid sixteenth century there were upwards of 750 such charitable institutions (Clay 1966). Two of England's most famous hospitals, St. Bartholomew's and St. Thomas', were in fact founded as early as the twelfth century.

All hospitals provided for the physical necessities of life although the food provision varied from the poor ill-fed lazar in the poor house, dependent upon the chance alms of passers-by, to the more generous provision of the well-endowed charitable institution. The typical diet consisted of gruel or milk potage for breakfast, meat (boiled beef or lamb) or cheese and butter at midday, and supper of meat broth and vegetables or milk potage. In addition bread and beer were also provided.

At Sherburn Hospital each person received a loaf and a gallon of beer per day, meat three times a week and on other days eggs, herrings or cheese with butter and vegetables. The diet at St. Bartholomew's was similar - twelve ounces of bread, eight ounces of beef or mutton or butter and cheese, three pints of beer (brewed in the hospital) and one pint of meat broth or porridge, with ale daily (Medvei & Thornton 1974).

At St. Thomas' the patients' physical comforts were particularly well cared for during the first half of the sixteenth century. They slept on feather beds and high standards of food quality were insisted upon. A contract for the supply of meat, dated September 2nd 1566, required the butcher to supply "clean beef without point and without any bones and of loins and legs of mutton of the best for 13 pence the stone", and further, "if there happen any bones to be in the beef, then upon the delivery of the bones to the butcher, the butcher doth agree to deliver for the same bones clean flesh" (quoted by McInnes 1963). The patients were divided into groups of four and each group was allowed four "penny loaves" and a gallon and a half of beer daily. On four days of the week they shared three
pounds of beef or mutton and other days half a pound of butter or one pound of cheese. Apart from the main meal at midday, there was also breakfast of gruel or milk porridge and supper of broth. Vegetables and fruit were rarely eaten.

It is interesting to note that at St. Thomas' certain foods and drinks were actually forbidden. In 1569 an order prohibited the consumption of foods regarded as injurious to health as follows, "meats following, being forbidden both by the physician and surgeons, that is to say, no shellfish, as oysters, mussels, cockles, crabs, nor eggs, nor no kind of inwards of beasts, as sheep gethers, nor tripes, nor garlic, nor onions, nor apples, nor custards, nor no kind of puddings made of blood nor no kind of fresh fish, as eels, pilchards, nor fresh herrings, nor sprats nor no kind of fowl of the rivers" (quoted by McInnes 1963).

There was a marked difference between the daily hospital diet and festival fare. At Sherburn Hospital and St. Nicolas' Hospital in Pontefract, there was a goose feast at Michaelmas (29th September) whilst at St. Bartholomews and St. Albans each person received a hog with the "inwards and all its parts" (Clay 1966).

Although these medieval hospital diets seem very low in ascorbic acid, it was not part of the ordinary Englishman's diet at this time to eat vegetables. Indeed, in order to alleviate the ascorbic acid deficiency some hospitals supplemented the diet with a rich vitamin drink, known as "scurvy drink" (Medvei & Thornton 1974).

In 1683 the Royal Commission laid down a diet scale for hospitals. This included ten ounces of bread daily, meat four times per week, two ounces of butter per day from May to October, cheese, and one quart of beer per day. The only exception was St. Thomas' Hospital where three pints of beer per day and milk pudding twice a week was provided (Poynter 1964). In 1687 St. Bartholomews Hospital approved and appointed a weekly diet as shown in table 2.8.

In some of the later almshouses the inmates received wages and provided their own food to be cooked by the attendant or cook. At
Higham Fevers it was ruled that, "every poor man shall buy his meat upon the Saturday ..... and deliver it to the woman; ..... she shall upon the Sunday set upon the pot and make them good pottage, and shall give every man his own piece of meat and a mess of pottage in his dish, and the rest of the pottage shall be saved until Monday" (Clay 1966).

Table 2.8. The weekly diet at St. Bartholomews Hospital, 1687.

Sunday; 10 oz. wheat bread, 6 oz. boiled beef, 1.5 pints beef broth, 1 pint Cawdell Ale, 3 pints beer.

Monday; 10 oz. wheat bread, 1 pint milk pottage, 6 oz. beef, 1.5 pints beef broth, 3 pints beer.

Tuesday; 10 oz. wheat bread, 0.5 lb. boiled mutton, 3 pints mutton broth, 3 pints beer.

Wednesday; 10 oz. wheat bread, 4 oz. cheese, 2 oz. butter, 1 pint milk pottage, 3 pints beer.

Thursday; as Sunday plus 1 pint of rice milk.

Friday; 10 oz. wheat bread, 1 pint water gruel, 2 oz. cheese, 1 oz. butter, 3 pints beer.

Saturday; as Wednesday.

Source; Dainton 1961

In addition to providing for the resident patients of the hospital, many hospitals provided food as a form of outdoor relief for the local poor. St. Marks Hospital in Bristol and St. Leonards Hospital in York, were two such hospitals providing loaves and fish to the local people.
With the Reformation and the dissolution of the monasteries in the sixteenth century, all hospitals associated with monastic institutions were closed and all outdoor relief was stopped. It was only after some persuasion that Henry VIII allowed some to be refounded, but under lay control.

2.3.3. Catering in the hospitals of the eighteenth and nineteenth centuries.

The eighteenth century was an important period in the history of hospitals. The voluntary hospital movement began through the charity of a prosperous and wealthy nation - five more hospitals were founded in London alone; Guys, Westminster, St. Georges, London and Middlesex. Medical science was making great progress particularly with Jenner's discovery of vaccination for the control of smallpox. In addition surgery was becoming a science and midwifery had become revolutionised (Harris 1967).

The standard of hospital feeding however had hardly changed. Indeed the diet at the London Hospital, one of the new hospitals founded in 1740, was quite poor. It consisted of water gruel for breakfast, boiled meat for dinner and broth for supper. Complaints, although common, were not tolerated and patients either took the food or went without. Even if the diet was unsuitable for the patients particular illness no alternative was provided, as the hospital minutes stated, "it was agreed that no other diet be expected or allowed on any account whatever" (Dainton 1961). Food was also used as a disciplinary measure in the form of dietary restrictions. For example, patients who refused to attend any of the many daily religious services would forfeit their dinner and perhaps their supper (McInnes 1963).

In some hospitals the medieval hospital diet survived until the nineteenth century. At the Radcliffe Infirmary, Oxford, the diet as shown in table 2.9. was still in use in 1820.
The weekly diet at the Radcliffe Infirmary, Oxford, 1820.

Sunday & Thursday;
Breakfast  - 1 pint water gruel or milk potage.
Dinner    - 8 oz. boiled veal or mutton.
Supper    - Sunday, 2 oz. cheese or butter
Thursday, 1 pint water gruel, broth or milk potage.

Monday and Friday;
Breakfast - 1 pint milk potage, water gruel or broth.
Dinner    - 1 pint rice milk.
Supper    - 2 oz. cheese or butter.

Tuesday and Saturday;
Breakfast - 1 pint water gruel or milk potage.
Dinner    - 8 oz. boiled mutton or beef.
Supper    - 1 pint water gruel, milk potage or broth.

Wednesday;
Breakfast - 1 pint milk potage or water gruel.
Dinner    - 12 oz. bread pudding.
Supper    - 2 oz. cheese or butter.

Beer; 2 pints per day on Sunday, Monday, Wednesday, Friday. 1.5 pints per day on Tuesday, Thursday, Saturday.
Bread; As much as each patient desired.

Source: Dainton 1961

In fact the food in hospitals was so poor that friends and relatives of patients would supplement the diet with gifts of food. In some hospitals there were food sellers who were allowed to go around the wards selling victuals - at Guys Hospital a man sold watercress and periwinkles every afternoon (Dainton 1961).

Beer had long been the accepted beverage in hospitals and three pints a day per patient was quite normal. As Andrew Boarde observed, ale was the natural drink of the Englishman and even
"small beer" - a table beer drunk with meals with an alcohol content of around 2-3% - provided 500-600 calories and a good supply of vitamin B (Poynter 1964). The consumption of poor quality beer was however blamed for the common occurrence of bladder stones (Langdon-Davies 1952).

Some hospitals were beginning to see the value of providing a range of alternative diets, either to suit different physical conditions, or merely to minimise waste - patients who were not able to eat a full diet were given middle or half diets consisting of half the normal quantity of food (Isch 1964). As more was learned about the treatment of diseases the need for a variety of diets became apparent. Fevers were very common and sufferers could rarely take solid foods. Water gruel, pap (flour or bread cooked in water), or panada (flour or bread cooked in broth with milk or butter) were therefore substituted saving both money and preparation time (Drake 1931).

St. Thomas' Hospital was one of the first to provide alternative diets, in 1761. The full diet, milk diet, dry diet and fever diet were approved as shown in table 2.10. In 1837 St. Bartholomews followed a similar course of action with the provision of three alternatives to the standard diet. A "broth diet" which substituted broth for meat, a "milk diet" replacing milk pudding for broth, and a "thin diet" which consisted of half the quantities of the milk diet plus extra tea and sugar (Harris 1967).

The mid-nineteenth century saw a movement away from the predominance of beer as the main beverage. Milk and water had always been potentially dangerous due to the high incidence of bacterial contamination, but with the increasing popularity of tea in the late eighteenth and early nineteenth centuries an alternative beverage had become available. Tea was provided at the Royal Infirmary in Manchester from 1870 and was provided for female patients in St. Bartholomews from 1853 (Brockbank 1952).
Table 2.10. Alternative diets at St. Thomas' Hospital in 1761.

Full Diet
Breakfast - milk porridge four days, water gruel three days per week.
Dinner - Half a pound of meat five days, 4 oz. butter or 6 oz. cheese two days.
Supper - 1 pint broth.
Bread - 14 oz. per day.
Beer - 1 quart in winter, 3 pints in summer.

Middle Diet
Breakfast - as for full diet.
Dinner - 6 oz. mutton or veal on five days and 4 oz. butter or 6 oz. cheese two days.
Supper - milk porridge four days, water gruel three days.
Bread - 12 oz. per day.
Beer - 1 quart

Milk diet
Breakfast - as for full diet.
Dinner - 1 pint rice milk on four days a week, 8 oz. pudding on three days.
Supper - as for middle diet.
Milk & - 1 quart (one third milk) in winter, 3 pints in summer.
water
Bread - 12 oz. daily.

Dry Diet
Breakfast - 2 oz. cheese or butter.
Dinner - as for full diet.
Supper - as for breakfast.
Bread - 14 oz., or 5 sea biscuits daily.
Beer - 1 quart daily.

Fever Diet
Barley water, water gruel, panada, thin broth, milk porridge, rice gruel, and sage tea.

Source; Dainton 1961
The 1850's also saw the beginning of Florence Nightingale's influence on the English hospital system. She was particularly concerned with patient diets and fully appreciated the value of sound nutrition to physical recovery. She advised that "consulting the hours when the patient can take food, the observation of the times, often varying, when he is most faint, the altering seasons of taking food, in order to prevent such times...... all this, which requires observation, ingenuity, and perseverance...... might save more lives than we wot of......" (Nightingale 1861). The proper feeding of patients was a most important aspect of the nurses duties and Nightingale (1861) stated that the good nurse should "watch for the opinions...... which the patients stomach gives...... to take care to observe the effect of his food and report it to the doctor".

Florence Nightingale was also concerned with the practical aspects of meal provision. Early in her career she rationalised food purchasing at the Institute for Sick Gentlemen by negotiating contracts and purchasing at wholesale prices. Later, during the Crimean War, she was joined by Alexis Soyer who was to revolutionise hospital kitchens. As she observed, Soyer was the only chef at the time who understood "the purpose of cooking large quantities of food in the most nutritive and economical manner for great quantities of people" (Woodham-Smith 1950).

Eighteenth and nineteenth century hospital feeding in other European countries provides a stark contrast with that offered in Britain. At Fredericks Hospital in Copenhagen, founded in 1758, there were two meals per day based on a one week cyclical menu. Although this was very repetitive the food was quite sophisticated and remarkably rich in green vegetables compared with the typical English hospital diet. The menu for the week beginning 1st July 1774 was as shown in table 2.11.

As early as the fourteenth and fifteenth centuries the cuisine at the Hospital Notre-Dame des Fontenilles, Tonnerre, France was highly advanced and of particularly fine quality. According to abstracts
Table 2.11. Weekly menu at St. Fredericks Hospital, Copenhagen, as at 1st July 1774.

Sunday; Dinner - Soup with forced meat balls; veal cutlets; lamb or beef steaks; pastry or pudding.
Supper - Hasty pudding with butter; bread and butter with eggs; beer.

Monday; Dinner - Bouillon soup with pearl barley; veal or lamb fricasee.
Supper - Water gruel with raisins and toasted bread.

Tuesday; Dinner - Broth with toasted wheat bread and meat (roasted or boiled).
Supper - Hasty pudding with butter.

Wednesday; Dinner - Bouillon soup with rice, veal, lamb or beef with spinach, sauerkraut, cauliflower or carrots.
Supper - Soup, bread, beer.

Thursday; Dinner - Soup with bread dumplings or green cole; broiled meat.
Supper - Wine soup, with rice or Scotch barley.

Friday; Dinner - Soup with greens, eggs and toasted bread, beef and horseradish.
Supper - as on Monday.

Saturday; Dinner - Rice milk; fish or steaks.
Supper - Cherry-soup with toasted bread.

- Bread and beer or ale every day.
- Each patient has for breakfast two biscuits and a pint of milk; and weekly one ounce of congou tea, and half a pound of white sugar.
- The soup shall be well supplied with vegetables according to the season.

Source: Thompson & Goldin 1975
from hospital records by Dr Jean Fromageot the diet consisted of, "Lamb, beef, veal for soups; pork; fish from the pools and the river. Garlic, onions and beans often mentioned, with 'kinds of mustard'. Many good cheeses, honey, grapes, fruits and even figs. Wine. Certain specialities seemingly reserved for exceptional circumstances; simnels (a bun or bread of fine wheat flour); cheeses to make .... flans, custard tarts; Parisian spices; river birds, hens for the sick, venison pate, beef snouts ....." (Quoted by Thompson and Goldin 1975).

In the United States of America one of earliest hospitals was the Philadelphia General Hospital, founded in 1731, and originally administered by Quakers. The feeding provision at this hospital was observed by Brissot be Warville who commented, "The kitchens are well kept ..... The eating-rooms, ......, are equally clean and well aired; neatness and good air reign in every part. A large garden at the end of the court, furnishes vegetables for the kitchen ...... In the yard they rear a great number of hogs, for in America the hog, as well as the ox, does the honours of the table through the whole year" (Hunter 1955).

As early as 1799 the Board of Governors of the New York General Hospital were particularly concerned with patients diets and appointed a committee to investigate patient feeding. The committee recommended breakfast of rye, coffee with molasses, or cocoa, and bread, dinner of oxhead and meat soup or "Indian" dumplings with bread and vegetables, and an evening meal of "mush" and molasses alternated with coffee or cocoa and bread. The daily milk allowance was one gallon per person! By 1806 the meals were altered to include less milk and more rice and cereals. (Gilliam 1936).

Whilst the early nineteenth century hospital feeding in New York was very different from English hospital fare, some American hospitals provided more traditional meals. The meal plan for the Massachusetts General Hospital in 1822 was as shown in table 2.12. Although not as sophisticated as some of the European hospital diets it was clearly an improvement on the extremely plain diets of the English hospitals.
Hospitals in the United States of America were particularly concerned with the nutritional standard of the meals they provided and many were to appoint dietitians during the nineteenth century. The Rochester General Hospital established a diet kitchen in 1882 (Smith 1947), Pennsylvania Hospital employed its first dietitian in 1895 (Packard 1938), and the Massachusetts General Hospital appointed a dietitian in 1907 with a second appointed in 1917 (Faxon 1960).

Table 2.12. Weekly meal plan at Massachusetts General Hospital.

Breakfast and supper - Bread and butter with tea or coffee or chocolate every day.
Dinner - Monday and Thursday; soup, potatoes and bread.
   Wednesday and Saturday; fish or boiled meat, rice pudding, potatoes, turnips and bread.
   Tuesday and Friday; meat or poultry when cheap, potatoes and onions.
   Sunday; roast beef or veal or pork or mutton.

Source: Faxon 1960

Although Florence Nightingale had been advocating the role of dietetics as early as the 1860's (Cook 1942), it was not until after the First World War that English hospitals began to employ dietitians (Platt, Eddy & Pellett 1963). At this time the catering in the majority of hospitals was the responsibility of the housekeeping sister under the authority of the matron (Harris 1967).
2.3.4. Twentieth century hospital feeding before the National Health Service.

Despite progress in all other hospital departments during the period 1900-1930, catering continued to lag behind. At St. Thomas', although a diet kitchen was established in 1927, the ordinary hospital meals "left a good deal to be desired" (McInnes 1963). Indeed the diet sheets remained unchanged from 1907 to 1930 and the only changes in diet over the previous 350 years had been the substitution of tea and cocoa for beer and ale.

The catering in most English hospitals at this time was run by the housekeeping sister who would have had little if any catering training. Some teaching hospitals however employed housekeepers and cooks trained in domestic science, whilst the London County Council had its own trained housekeepers (Harris 1967). Both were steps towards an improvement in standards and a more professional meals service. One significant development during this period was the founding of the King Edward VII Hospital Fund for London in 1897. This organisation was set up in order to investigate the running of hospitals, to assess their problems, needs and difficulties, and through the provision of direct grants help with the development of new research into all aspects of hospital work. In this way the fund was to make a significant contribution to the development of hospital catering.

The hospital diets of the early twentieth century usually consisted of one main meal per day with bread, margarine and cheese for supper. Visitors were expected to bring additional provisions such as eggs, butter and fruit. With the outbreak of war and food rationing in 1939, however, this source of additional food was curtailed and patients had to rely totally upon the hospital diet. The King Edwards Hospital Fund observed that hospital meals seemed hardly adequate in terms of nutrition and consequently the Briscoe Committee was formed to investigate hospital feeding. In the meantime the Ministry of Health published "Wartime Feeding in Hospitals" (1942), which recommended cooked breakfasts, two course
midday meals, salad, cake or fish paste for tea, and a hot supper such as soup.

The Briscoe Committee published its findings in 1943 in "Memorandum on Hospital diets" (King Edwards Hospital Fund for London 1943). It had investigated three London hospitals and had identified an extreme nutritional inadequacy in the diets offered to patients and staff. The committee suggested that specialist catering departments should be set up within hospitals. It observed that, "Catering may be regarded as a single important function or department of the hospital, requiring an experienced catering officer in charge, with suitable staff" (King Edwards Hospital Fund for London 1943). The report also emphasised the importance of food in patient recovery - "the food service should be regarded as one of the essential remedial services offered by hospitals". These Briscoe recommendations were to form the basis of meals provision under the new National Health Service.

2.3.5. Hospital feeding within the National Health Service.

The National Health Service Act 1946 came into effect on the 5th July 1948. Most hospitals were nationalised and grouped into regions (figure 2.1.), administered by Regional Boards, and subdivided into groups administered by management committees. The teaching hospitals were excepted, being controlled by their own boards of governors and reporting direct to the Minister of Health.

With the coming of the National Health Service a number of very significant developments took place in hospital catering. These changes were to bring the meals service from a function run by nurses under the matrons control to the highly specialised department managed by the full-time professionals of today.

As recommended by the Briscoe Committee hospital catering became a distinct hospital department, and following the recommendations of the Ministry of Health (1945) it came under the control of appropriately trained full-time managers - the newly appointed
Figure 2.1. Regional Health Authority areas of England.
The appointment of catering officers led to improved menus, a choice of meals for both staff and patients, and the use of recognised recipes and methods of food preparation (Kitchen 1973). During the Second World War four dietitians had been appointed by the Ministry of Health to give advice on the nutritional aspects of food. Under the National Health Service dietitians provided special diets from the diet kitchen as well as providing advice on nutritional and dietetic matters to hospital committees.

The professional training of caterers was a matter of some concern and in 1944 City and Guilds introduced the new 151/152 courses specifically intended for those going into the catering trade (the first catering course for simple cookery had been introduced in 1899). The King Edwards Hospital Fund meanwhile perceived a need for specialist hospital catering training. The Fund had already set up advisory services and colleges to train administrators, matrons and ward sisters, and in 1950 it opened the School of Hospital Catering at St. Pancras Hospital, initially to provide refresher courses to existing catering staff, but later to train new hospital catering staff. In the same year the Catering and Diet Committee was formed to administer the Catering Advisory Service (Harris 1967). A training scheme within the health service was also provided by the Ministry of Health in 1954, this was the apprentice cooks training scheme — a scheme intended as part of a long-term policy to provide a body of trained and experienced cooks for the future (Kitchin 1973).

The 1940's was thus a period of progress in the field of hospital catering and improvements in feeding were evident. McInnes (1963) provides examples of the diet for two days at St. Thomas' Hospital in 1962 as shown in table 2.13. It is interesting that McInnes does not provide the menus for two consecutive days and it is possible that these are the better examples of the daily diet.

In order to further the improvement in standards and conditions in hospital catering, two handbooks were published in 1962 by the
Table 2.13. Examples of the daily diet at St. Thomas' Hospital in 1962.

- Wednesday March 7th 1962.
  Breakfast - Kippers, porridge, cereal, rolls, marmalade.
  Lunch - Roast beef, Yorkshire pudding, leeks and white sauce, roast potatoes.
  Tea - Jam and lemon curd tarts.
  Supper - Potage St. Germain, poached eggs Florentine, creamed potatoes.

- Friday March 9th 1962.
  Breakfast - Scrambled eggs, porridge, cereal, rolls, marmalade.
  Lunch - Roast pork, apple sauce, stuffing, French beans, roast potatoes. Milk pudding, fruit and custard, pineapple gateau.
  Tea - Jam and eclairs
  Supper - Cream of mushroom soup,

Source: McInnes 1963

English and the Scottish health authorities. "Hospital Catering" (Ministry of Health 1962) provided guidance on diets, nutrition, food costs, food preparation and cooking, cleaning, maintenance, staffing, food service, and hygiene. With regard to nutrition it highlighted the need for special diets and adequate levels of minerals, vitamins (especially ascorbic acid), and protein, whilst at the same time controlling energy intake (especially from starches, sugars and fats). The handbook stated that, "Responsibility for ensuring that the nutritional requirements of the individual patients are met is borne equally by the Catering Officer and the nursing staff. The Catering Officer must plan his menus so that a selection of dishes is available at each meal from which a range of balanced diets can be provided, while the nursing staff, who order and serve the food, must do their best to ensure that each patient obtains the quantity and type of dish which satisfies his nutritional needs as well as his taste and appetite"
The Scottish publication, also called "Hospital Catering" (Scottish Health Services Council 1962), complimented the English booklet despite covering similar topics - nutrition, food service, staff catering, purchasing, hygiene and organisation. It concurred with the nutritional advice although it was more specific in providing actual energy requirements for different types of patients, and in suggesting particular foods as sources of nutrients such as vitamin C and protein.

At about the same time (1959) Professor B.M. Platt had been investigating the feeding arrangements in the hospitals of West Cornwall. The findings of his report:

- excessive food waste
- low nutritional value
- poor cooking practices leading to loss of nutrients
- excess consumption of "food extras" high in purified carbohydrates, particularly sugar, such as biscuits, sweets, tea, coffee, and other snacks.

(Platt, Eddy & Pellett 1963)

prompted The Nuffield Provincial Hospital Trust to sponsor a more extensive national survey. The results of the study were publicised in "Food in Hospitals" (Platt, Eddy & Pellett 1963).

The main findings of the national survey were that:

- there was excessive waste of food sent to wards (40-45%), most of which was left in serving dishes as opposed to plate waste.
- there were "notable defects in the cleanliness and hygiene of food handling".
- there was overcooking of vegetables and long delays in food service leading to nutrient loss and food damage.
that food presentation and service was poor, particularly in the large hospitals.

In response to these findings the report recommended that:

- the nutritional needs of all patients be a matter for medical concern.
- nurses required assistance in food service and there should be appointed ward caterers.
- one person should be responsible for all aspects of hospital catering.
- dietitians should be less exclusively concerned with special diets and more generally concerned with the requirements of all patients.
- the status of catering officers should be raised and they should be trained in dietetics and involve themselves in food service and distribution.

The 1960's had thus seen the publication of some much needed guidance for hospital caterers. There had been an analysis of the problems in hospital catering - Platt, Eddy and Pellett (1963) - and also advice provided on specific areas of concern - Ministry of Health (1962) and Scottish Health Services Council (1962). A further more general publication, "A Textbook of Hospital Catering" (Harris 1967) provided advice on the actual running of catering operations within hospitals.

In 1967 a pay-as-you-eat scheme for all grades of hospital staff was introduced. Staff could now purchase meals by item rather than having to buy complete meals. This change pushed the hospital catering service towards the style of other catering operations by enabling the Catering Officer to increase the range of meals and meal items along the lines of an à la carte system.
2.3.6. Advances in hospital catering in the 1970's and 1980's.

The early 1970's saw a major restructuring of the National Health Service. The local authority health services had become increasingly viewed as "a ragbag of functions" (Brown 1979a) that needed to be integrated into the hospital and general practitioner services. The Health Service Reorganisation Act 1973, therefore aimed to reduce the inefficiency associated with the tripartite structure of the Executive Councils, the Hospital Boards and the local authorities through the provision of a unified administration (see Brown 1979a and Levitt & Wall 1985). This new administration was to place the responsibility for management at three levels - the Secretary of State, Regional Health Authorities, and Area Health Authorities (The Family Welfare Association 1984). As Brown (1979a) observed, "basically, the local authority services were rationalised and brought under the same management as hospital services, while the administration of family practitioner services was aligned with the new authorities".

The catering service administration was also reorganised with a shift in emphasis towards a more unit based management structure. The organisation was now based on the Unit Catering Manager who reported to the District Catering Manager who was in turn responsible to the Area Catering Manager.

Although significant improvements in hospital care had been made since the formation of the National Health Service, the catering provision had largely remained below the expected catering standards of the time. Despite administrative changes, there had been few improvements in the catering service (Department of Health and Social Security 1972a). Platt, Eddy and Pellett (1963) had already identified the poor quality of hospital food in the 1960's. They stated that "The best food and the best service with the greatest attention to the patients needs were given in the best small hospitals, mostly those with fewer than 50-60 beds. The larger the hospital the lower was the efficiency of administration and the quality of food as served. A number of hospitals for the chronic sick were generally unsatisfactory and the food was poor."
Furthermore, food service was described as "indifferent", and in 29 per cent of the larger hospitals it was actually "bad" and "the presentation of food generally left room for improvement" (Platt, Eddy & Pellett 1963).

Two further studies in the 1970's indicated that few improvements had been made. Mayhew, Appleby, Ennals and Clark (1972) commented on the poor quality of food in psychiatric wards - at least partly due to severely restricted finances; "To all of us the food which was served to the patients was disappointing. To some of us it was less than edible. The diet was starchy with much bread and cocoa. In only one hospital did we receive fresh fruit. Vegetables cooked in a central kitchen reached the wards half cold. The poor quality of meat suffused in fat was rejected by all but the most hungry patients". Waste was also identified as a problem - "The waste which some of us witnessed was enormous" (Mayhew, Appleby, Ennals & Clarke 1972).

The Egon Ronay Organisation (1972) identified poor purchasing, poor cooking and lack of imagination as the main causes of the low quality meals they inspected. The report stated, "It should be emphasised that we have applied the simplest basic criteria both to raw materials and cooking, and have tried to be as lenient about quality and as understanding of the catering staffs difficulties as possible. Which brings the dismal, in many cases scandalously, low standard of the cooking and often of the raw materials, all the more sharply into focus through a small number of satisfactory experiences". Further, the Egon Ronay Organisation observed that "Instead of lifting up the sick, for many of whom meals are the only relief from monotonous hospital routine, most of the food we found was depressing enough to reduce the appetite by its very appearance" (Egon Ronay Organisation 1972).

Criticism of hospital food continued during the 1970's (see for example Consumer Association 1974). Armitage (1976) carried out a survey of the reaction of patients to food served in geriatric hospitals in Kent. This report did not merely judge the quality of food but also attempted to identify the important aspects of patient
satisfaction. The major findings were that;

- The facility to choose between different meals bore little relationship to patient satisfaction. In fact the hospital with the highest level of meal satisfaction offered no choice of meal.
- Patients on special diets were more likely to regard the portions as small and the meals monotonous.
- Meal serving times in two of the investigated hospitals were "contrary to recommended practice".
- The temperature of the food was "often very low indeed", especially where meals were left until there was a member of staff to feed the patient.

The report concluded, "Overall ..... there appears to have been little improvement achieved in hospitals studied following the recommendations made by the Good Food Guide and published by the Consumer Association in February 1974". Whilst improvements in the standards of the catering service were clearly necessary, hospital catering was also facing a number of fairly new problems during this period.

(i) The temperature of served meals.

Armitage (1976) had observed that the service temperature of meals was "often very low". This is a matter of concern for three main reasons:

- Hygiene - food must be kept at temperatures that minimise the risk of food poisoning. For this purpose cooked food should be kept at a temperature above 62.8°C (145°F) - Food Hygiene Regulations 1970) - appendix 5.
- Acceptability - people expect and prefer to eat their meals within certain temperature ranges (Foley & Gillam 1928; Wertman 1933; Thomas 1954; Brooks West & Wood 1955; Blaker, Newcomer & Ramsey 1961; Thompson & Johnson 1963a & 1963b).
- Psychology - it has become increasingly recognised that food provides social psychological support as well as the satisfaction of hunger and nutritional requirements. Of particular relevance
to hospital feeding is the role of food in providing security, as McKenzie (1979) states, "Food acts as an aid to security. Thus when everything seems to be going wrong we comfort ourselves that things are 'alright really' by turning to established favourite dishes". With regard to the temperature of foods Dichter (1954) points out that "The cold cup of coffee ..... has deep emotional meaning. To the insecure patient it is a sign. Good hot coffee is symbolic of the home away from home, of being welcome. Bad coffee is the perfect symbol that he is a stranger, that he is receiving what amounts to the orphans negligent care". Although this is an American perspective it probably holds true for most foods.

The temperature of meals was to be a continuing problem during the twentieth century largely due to the movement towards larger hospitals and centralized food production systems. Previously the service of hot food had been less of a problem since many hospitals were quite small and the larger hospitals had used decentralized systems - some simple cooking and all reheating took place in ward kitchens.

(ii) Centralized versus decentralized catering systems.

As early as 1914, Greener observed that, "By sending the food to the ward in which it is to be served, and having it again well heated if necessary before serving, much better service can be effected. A central serving room in which all trays are served is certainly a great convenience, but it is nearly impossible to send trays to distant parts of the house and keep the food hot in transit." (Greener 1914). Kahrs (1948), although much later, also believed there were food quality advantages in decentralized rather than centralised catering systems - "The food will reach the patient in much better condition than if it were brought varying distances from a central serving area".

Despite these views, the authorities could not ignore the economic and administrative advantages of centralised catering. Thompson,
Hartman and Pelletier (1960) made a direct comparison of centralized and decentralized systems operating under similar conditions at Stamford Hospital, Connecticut. They concluded that although there were no significant differences between customer satisfaction (except that those on modified diets preferred centralised or tray service), or service temperatures, they calculated that labour cost reductions of 20% could be expected from a change to centralized from decentralized catering systems (see also Thompson & Goldin 1975). There was therefore a widespread move towards centralised hospital catering in both the United Kingdom and the United States of America (Hargrave 1955).

(iii) The transportation of hospital meals.

Centralized catering brought with it the problems associated with the transportation of meals and particularly the maintenance of food temperatures. Early delivery systems were based on electrically heated trolleys of which the Grundy Modulus, Stellex and Moffat systems are the modern counterparts. More recently many delivery systems have been based upon the insulation of individual complete tray meals such as the Temp-rite, Electrolux Helitherm, and Stellex Templock systems, whilst some have included heat storing pellets such as the Grundy Finessa, Caldomet and Ganymede systems. Examples of hospitals that used these systems are shown in table 2.14.

Concern over the service temperature of hospital meals nevertheless remained and a number of investigations into the problems of meal distribution (Herman & Bloch 1970; Mallman 1970; Barrett-Gray 1979), particular meal delivery systems (Doyon 1977; Blakemore, Mozley & Osmer 1979), and comparisons between systems (Harvey 1977; Jonsson, Ohlsson & Lindholm 1977; De Fielletaz Goethart, De Boer, Coelen & Lassche 1979) have taken place since the 1960's.

Work has also been carried out investigating more radical changes in hospital catering. In the late 1960's cook-freeze catering systems were investigated and tried at the Leeds Hospital for Women.

(i) Bulk food service - Heated food trolley;
   - St. Lukes Hospital, Guildford.
   - Orpington General Hospital
   - Bromley Hospital
   - Hastings Hospital
   - Croydon General Hospital

(ii) Plated service - Heated food trolley;
   - Beckenham General Hospital
   - Beckenham Maternity Hospital
   - Keyne Hill Hospital
   - Redhill General Hospital

(iii) Tray service
   (a) Insulated - Temprite
      - Hithergreen Hospital, Kent
      - Cranleigh Hospital, Surrey
   (b) Insulated - Stellex Templock
      - St. Mary's Hospital, Portsmouth
      - Joyce Green Hospital, Dartford
   (c) Heat store - Ganymede
      - Epsom District Hospital
   (d) Heat store - Grundy Finessa
      - William Harvey Hospital, Ashford
      - Royal Sussex County Hospital, Brighton
      - Royal Surrey County Hospital, Guildford
in 1967 and at the Darenth Park Hospital, Kent, in 1968 (sponsored by the King Edwards Hospital Fund for London). A cook-freeze system was finally adopted at Darenth Park Hospital, and a number of other hospitals followed suit, including the hospitals in the Newcastle area in 1974 (Passmore 1977, Brown 1979b).

By 1976 attention had focussed on the application of cook-chill systems to institutional catering (Paulus, Pierkarski & Leistner 1979). A number of hospital trials took place and cook-chill was adopted to serve five hospitals in the north-west Surrey area (Self 1985). By August 1984 cook-chill was being considered by 35 of the 171 health authorities in England (M.R.Dyson 1984).

A number of alternative catering systems suitable for hospitals, including cook-serve and convenience catering, are examined by Glew in "The Challenge of Catering; Latest developments in technology" (1985).

(iv) Special Diets.

Since the widespread introduction of diet kitchens and the employment of dietitians, many special diets have been developed to cope with the increased knowledge of illnesses and their appropriate dietary requirements. An example of the advanced nature of special diets is the provision of sterile foods for patients in isolator tents. Bone marrow transplant patients suffering from either severe combined immune deficiency disease or aplastic anaemia have to be treated in sterile environments. Such an environment is provided by isolator tents and any food introduced into the tent must be either very high quality canned foods (i.e. aseptic) or irradiated foods (Quirk 1978).

Non-indigenous ethnic diets have also become a matter of increasing concern. Ethnic minority groups with special dietary requirements have increased in number and have to be catered for within the hospital system. The importance attached to these requirements is
well illustrated by the following extract from a Glasgow newspaper in 1970, "Four nurses in a Jewish old peoples home were fired Sunday after an empty can of pork luncheon meat was found in the kitchen dustbin. All crockery and cutlery were destroyed" (Regina Leader Post 1970).

The West Birmingham District has been particularly concerned with the provision of ethnic diets. Jewish food is purchased direct from a Jewish centre and is then reheated in the hospitals (Spilsbury 1981). Some hospitals such as the Dudley Road Hospital in Birmingham, which has at least one third Asian or West Indian patients at any one time, have employed Asian cooks and dietitians (Sutton 1982). Problems remain however since there are many subgroups within the broad ethnic groupings, and it is often difficult to assure patients that their specific dietary requirements have been adhered to - in terms of ingredients and cooking methods. The Dudley Road Hospital, for example, uses no meat at all for its Asian diets because the patients will not accept that the meat used is genuine Halal meat (Sutton 1982).

Other technological advances in the 1980's have included the use of computers for both general catering applications (stock controls, ordering, menu planning, recipes) and specific hospital catering applications such as meal ordering via satellite terminals from wards to kitchen and for dietary analysis (M.R.Dyson 1984; Self 1985).

2.3.7. Hospital catering in the 1980's

In April 1982 the National Health Service was again reorganised with the Area Health Authorities being replaced by District Health Authorities. The aim was to reduce the number of administrative levels within areas and put a greater emphasis on decision making at unit level. The structure of the catering service - Regional Catering Adviser, District Catering Manager and Unit Catering Manager was also changed with the removal of the District Catering Manager tier. The Unit Catering Manager was now responsible to
(i) Financial pressure on the hospital catering service.

Despite the advances in hospital catering outlined earlier, the catering service was under financial pressure throughout the 1970's and 1980's. Net expenditure on catering, as a percentage of net hospital revenue expenditure, fell from 7.1% in 1976/77 to 5.6% in 1980/81 (Capel 1983). Further pressure for financial savings led to the Health Secretary commissioning the, as yet unpublished, report "The Cost of Catering in the National Health Service" (Rayner unpublished, quoted by Wollfe 1985).

Royner highlighted the amount of food waste in hospitals, finding that nearly one third of food served was wasted and that a reduction in waste of 7% would save £17.3 million per year. The report also recommended the privatisation of hospital catering (Wollfe 1985).

(ii) The "contracting-out" of hospital catering.

The Government responded to the Rayner report by requiring the National Health Service to obtain private tenders for catering, laundry and cleaning services so that by 1986 the cheapest operators would have been identified. In September 1983 health authorities were instructed by the Department of Health and Social Security to compare the cost of these support services and to submit timed schemes detailing their response by February 1984.

The concept of privatisation within the National Health Service is not new since there has been considerable contracting-out in the building and maintenance departments for some time. Indeed in 1965 there were 35 hospital catering departments operated by contract caterers although by 1984 this number had fallen to only two (R.Dyson 1984).

The current privatisation situation is yet to be resolved, although it is clearly going to have a radical influence upon the future of hospital catering services.
Although the Rayner report was not published, and neither the National Health Service or the Department of Health and Social Security keep statistics on hospital catering, another investigation by Steele and Delaney (1983) provides the most recent insight into the nature and size of hospital catering in the 1980's.

Meals are provided free of charge to in-patients and day patients, and on a pay-as-you-eat basis for hospital staff. Net catering expenditure is around 5-6% of total net hospital revenue expenditure and was £327.9 million in 1981/82. In the same year, the cost of catering for patients was £256.8 million (approximately 50% food cost and 50% overheads - mainly labour), an average catering cost of £2.40 per patient per day. The cost of catering for staff was about £114 million of which approximately one third was recovered through charges - a net subsidy of around £90 per employee per year.

On average each District Health Authority provides 4,000 patient meals per day at twelve different sites. The average authority employs about 150 full-time catering staff equivalents, 30,000 full-time equivalents nationally (Steele & Delaney 1983).

It is clear from the preceding sections that hospital catering is in the process of great change. It is too early to identify all the consequences of these changes or the likely state of the hospital catering service when the changes have worked their way through, but the King Edward Hospital Fund for London has commissioned a report to review hospital catering, the first since 1961, that should indicate the way in which the service is developing. The report, by a group chaired by Lady McCarthy aims to:

- identify the needs of modern hospital catering services,
- identify whether the needs are met,
- make recommendations to facilitate the achievement of the needs,
to look at the patients needs - nutritional and aesthetic, staff needs, finance and management.

(Source: Industrial Caterer 1984)

Although it was anticipated that the report would be available in 1985, at the time of writing it was as yet still unpublished. Nevertheless, once available it should provide an up to date statement upon the contemporary hospital catering service.
2.4. The evolution of the meals-on-wheels service.

2.4.1. The origins of delivered meals services.

Although the Women's Voluntary Service (WVS) was the major body concerned with the development of delivered meals services in Britain, it is unclear which voluntary organisation first started such a service. Stanton (1971) states that a delivered meals service was started in the 1930's, by the Invalid Kitchens of London, and "during the war gained impetus throughout the country by the work of the Women's Voluntary Service".

Roberts (1970), however, states that meals-on-wheels services originated in the luncheon clubs set up by the Old Peoples Welfare Committees (OPWC's) in the 1940's. In particular the work of the Woolwich OPWC which in 1943 provided a meal delivery service to the housebound elderly of the Woolwich Borough. Walker (1974) on the other hand states that "the service was inaugurated by the Women's Voluntary Service". The WVS were already involved with the British Restaurants when in 1943 a severe outbreak of influenza meant that some people were too ill or too old to go to the restaurants and some meals were carried by hand to the needy. In particular five meals were carried to the housebound in Welwyn Garden City (WVS for Civil Defence 1963).

Despite doubts over the origins of the meals-on-wheels service, it is accepted that the WVS became the primary organisation concerned with the provision of a delivered meals service. Indeed the WVS had long been concerned with establishing and pioneering community help. As Susan Walker, a Vice-Chairman of the WVS states, the primary role of the WVS was "to keep a lookout for human need in the context of a nation embattled, rationed and in the midst of every kind of shortage and privation, and to devise or improvise, and at least to try to do something practical to meet whatever they saw" (Walker 1974). It was thus natural that during the Second World War the WVS should become involved in the provision of ration-free food for
these people whose lives had been disrupted by the war. Through bulk or "collective" cooking it was possible to maximise the limited food supplies available. Initially the food was intended to help evacuated children, but later provision was extended with mobile canteens to feed civil defence staff and local residents who were disrupted by the mass bombing raids on London in 1940 (Means and Smith 1985). The meals service was further extended into other areas of the country by the spread of communal feeding centres. As Graves (1948) observed, "the need for canteens seemed endless".

After 1942 the Communal Feeding Centres became the responsibility of the Ministry of Food under Lord Woolton. The Ministry reluctantly accepted responsibility on the condition that the 17,000 WVS volunteers continued to staff the centres (Walker 1974). The Communal Feeding Centres were then renamed the British Restaurants and were specifically geared towards providing meals, supplementary to rations, to communities within their immediate vicinity.

Whilst the urban population had this additional food provisioning, the rural workers were not receiving such benefits. With a view to balancing the situation the WVS started the Agricultural Pie Scheme whereby meat pies were baked locally and then delivered by private cars to those working on the land. Initially starting on a very small scale in just three areas, the scheme "attained a tremendous size" where "literally millions of pies were produced" (Walker 1974).

The concept of delivered meals subsequently developed in urban areas to provide for those who were too frail or too sick to use the British Restaurants. The elderly were a group for particular concern, and in a 1943 survey the National Old Peoples Welfare Committee (1944) established that:

- elderly people were unable to queue for long periods to obtain non-rationed food,
- many elderly people could not get to the British Restaurants,
many elderly people could not afford the cost of food in the British Restaurants,
elderly people had special requirements, such as the need for more milk and tea, than rationing allowed.

There was thus a clear requirement for some special meal provision for the elderly - delivered meals appeared to satisfy many of these needs. As the WVS observed, "The recognised need was for a main meal which the recipient could not provide for himself. It had to be at a price an old age pensioner could afford and it had to be delivered regularly" (WVS for Civil Defence 1963).

The National Old Peoples Welfare Committee (NOPWC) was formed in 1940 by twenty local Old Peoples Welfare Committees (OPWC's), its aim being "to study the needs of old people and to encourage and promote measures for their well being" (National Old Peoples Welfare Council 1963). Although the OPWC's ran some meals-on-wheels schemes, most concentrated on developing luncheon clubs, many of which were funded by the Lord Mayors Air Raid Distress Fund (1954). It was the WVS that initiated and developed most meals-on-wheels services.

The actual transportation of the meals was originally on foot, the first "wheels" being those of bicycles and perambulators. Maintaining meals at an acceptable temperature was a problem and a number of improvised methods were adopted, these included using wooden hay boxes, old blankets, Canadian Red Cross dinner pails and virtually anything else that would retain heat. By 1947 approximately 6,000 meals were being delivered per week (Walker 1974). The majority of the schemes however were in London and by 1947 there were only 23 schemes outside the capital (Means and Smith 1985).

Throughout the 1940's there had been little enthusiasm for the meals-on-wheels service from the Ministry of Health, and responsibility for the Communal Feeding Centres (British Restaurants) had only been begrudgingly undertaken on the condition
that the WVS volunteers continued to man the centres. There was however much national concern and press publicity in 1947 and 1948 over the feeding problems of the elderly (see Means and Smith 1985, page 102 for examples). These were essentially the same problems as identified by the NOPWC in 1944. In response the Ministry of Health and the Ministry of Food held a conference on 26th February 1948 with the result that the voluntary bodies were requested to extend their provision of meals-on-wheels (DHSS 1948). In response the NOPWC (1948) sent a circular to all its regional offices asking them to expand and promote mobile meals services, whilst the WVS sent a circular requesting regional offices to investigate meals-on-wheels and to be prepared to "undertake further work where it is still needed" (WVS 1948).

As a more positive response to the widespread concern over the feeding of the elderly section 31 of the National Assistance Act 1948 stipulated that "A local authority may make contributions to the funds of any voluntary organisation whose activities consist in or include the provision recreation or meals for old people" (National Assistance Act 1948). As Means and Smith (1985) observed, "The sick and frail were no longer perceived as a troublesome burden in a war torn country, but a group that needed to be seen to be treated with sympathy".

Food rationing was still in force at this time and indeed continued into the 1950's. It was important therefore to identify who was eligible to receive meals-on-wheels. The WVS followed the instructions of the Ministry of Food Licensing who specified "aged persons, permanent invalids and persons striken with sudden illness, certified as eligible ..... by a Public Assistance Official, Medical Officer of Health, a doctor, or an almoner" (WVS 1948).
2.4.2. Meals-on-wheels as part of an alternative to institutional care.

As already mentioned, the Ministry of Health had little interest in meals-on-wheels services in the 1940's. The general attitude was that the provision of domiciliary services was a poor second best to residential care for the elderly. As the Nuffield Foundation Report (Rowntree 1947) stated, "many old people will prefer no doubt to enter them (old peoples homes) rather than continue living in unsatisfactory conditions in private houses", and with regard to domiciliary services, "This will lessen the need for extensive plans of home help, home nursing, visiting and home meals service for old people who would be better off in a Home or Institution". The concept of maintaining independence through assisting the elderly to live at home was very much a minority view in the 1940's.

The change in attitude towards a consensus view that elderly people should be enabled to stay at home came in the 1950's. This was as much to reduce financial pressure on the State as to cater for the quality of life of the elderly. Sheldon (1955) observed that keeping the elderly in institutions was increasing the already considerable financial burden on the rest of the population, and that "their craving to maintain independence up to and even beyond the best possible moment" should be encouraged.

The emotional and psychological benefits of such a policy were also appreciated. Townsends (1963) view of the home, "the old armchair by the hearth, the creaky bedstead, the polished lino with its faded pattern, the sideboard with its picture gallery, and the lavatory with its broken latch reached through the rain. It embodied a thousand memories and held promise of a thousand contentments", clearly contrasts with the earlier view held by the Nuffield Foundation.

Concern had also been expressed that by resorting too readily to institutional care the Welfare State had undermined the willingness
of the family to care for its elderly dependent members. As Rudd (1958) states, "The feeling that the State ought to solve every inconvenient domestic situation is merely another factor in producing a snowball expansion on demand in the National Health Service". He also observes that within families that "have a sound feeling of moral responsibility, serious problems do not arise" in the family care of elderly relatives. Indeed, despite the fears that families may have become neglectful of their elderly members, research indicated that "the alleged negligent 'spirit of the age' is in reality a factor of minor importance" (Chalk and Benjamin 1953), and that "in all, the impression of family ties was one of unity and strength, not of irresponsibility and weakness" (National Council of Social Service 1954). A number of investigations had provided evidence that families were looking after their elderly and that there was a need for support through the establishment of a national system of domiciliary services - Sheldon (1948), Exton-Smith (1952), Townsend (1963), Lowther and Williamson (1966), Isaacs and Thompson (1960), and Maroney (1976), for example.

Thus in order to enable the elderly to remain in their own homes for as long as possible, it was necessary to provide domiciliary services as support. These services were also required, to some extent, by the elderly living with families such that the burden of care could at least be partly shared by the community. As Walker (1981) observed, with the increasing burdens of modern life families are not so much unwilling to care for their elderly members but are unable to care without the support of the Welfare State. It was thus necessary to strike a balance between the State over providing and thereby removing the family sense of responsibility, and under providing and creating too great a burden on the family - "we must do everything possible to assist the family in the care of its aged dependants without at the same time relieving it of the necessity for still taking an interest in the matter" (Sheldon 1950).
2.4.3. The development of the meals-on-wheels service in the 1950’s and 1960’s.

Voluntary organisations concerned with the provision of meals-on-wheels faced a number of particular problems in the 1950’s and the early 1960’s. Bodies such as the WVS and the OPWC’s depended almost entirely upon the labour of volunteers. The number of volunteers however fell significantly after the war and as a consequence staff recruitment became a major difficulty (Slack 1960). In addition, volunteers were more readily recruited in the wealthier areas of the country which consequently received a more extensive meals-on-wheels provision. This was despite the fact that their need was usually no greater than that of other areas (Harris 1961a).

Limited finances also created problems. Despite the National Assistance Act, 1948, the cost of transport and kitchens was an enormous problem for the voluntary bodies. Whilst some local authorities met such expenses, most claimed that the Act only allowed them to meet food and delivery costs. As an example of the levels of grants for meals-on-wheels during this period see the "Annual Report" of the Old Peoples Welfare Department, 1951 (held by WVS Archives).

A third problem faced by the voluntary organisations, partly as a result of lack of finances, was the need for professional administration. The provision of a national scheme of domiciliary care required an efficient administration but expenditure on professional administrative staff was difficult for voluntary bodies to justify in fund raising appeals (Roberts 1970). The weakness in organisation and administration was identified by Slack (1960), and Means and Smith (1985) point out that, "The WVS certainly found difficulties in the cost and complexity of administering meals-on-wheels schemes".

A further barrier to the development of a nationally coordinated meals-on-wheels service was the level of friction between the organisations involved, especially between the local authorities,
the WVS and the NOPWC. As Cross (1951) observed, "At the present moment there is a great deal of ill-feeling which is very damaging to the WVS", and that, "tempers have become frayed and everyone is pulling against everyone else". The situation in Manchester and Pinner was apparently particularly "anti-WVS" (Cross 1951).

The voluntary organisations, and consequently the meals-on-wheels service, thus faced problems of a shortage of volunteers, lack of finances, inadequate organisation and administration and also inter-organisational friction (see Means and Smith 1985). This was reflected in the service as investigated by Cross (1951), the WVS itself in 1956, and Harris in 1961(1961a and 1961b).

The WVS survey found that of the 27 schemes they investigated many served "poor quality food", much of which was "tepid". Furthermore, many schemes had inadequate equipment (WVS 1956). Cross (1951) also pointed out that "few if any organisers appear to be cost conscious" - a crucial point in the light of the financial shortages already discussed. It is interesting to note, however, the comments made by Cross (1951) concerning the delivery temperature of meals. Cross identified "very few complaints about the temperature of meals", and since it was believed most food would be reheated, Cross states that "the actual temperature at which the meal is delivered is not really of such importance that money should be spent on expensive equipment" (Cross 1951).

The national survey sponsored by the National Corporation for the Care of Old People, conducted by Harris (1961a & 1961b), provided a fairly detailed description of the meals-on-wheels service as it was in the early 1960's. It highlighted some particular weaknesses:

- the fact that only 40% of recipients received more than two meals per week,
- that 36% of schemes closed for a week or more per year (24% closed for five weeks or more, usually the school holidays), and,
- that contrary to Cross' belief, only 34% of recipients reheated their meals - indicating a clear need for the delivery of hot meals for immediate consumption.
The conclusion was critical of voluntary organisations and suggested that the organisation and responsibility for the meals-on-wheels service should be taken over by the local authorities, whilst the voluntary bodies "devote their resources to delivering and serving the meals" (Harris 1961a). Gibbs, Chairman of the National Corporation for the Care of Old People, summed up in the forward, "This report makes clear, many different voluntary committees have shown the way, but ...... there is still not enough done. The scale on which this service should be provided ...... is beyond the scope of the voluntary finances and their resources of manpower; and it is clear that the time has come when local authorities, ......, should become responsible for this important service " (in Harris 1961b).

Although the WVS had for some time actively supported the view that the local authorities should take a greater role in the meals-on-wheels service - "the service should be extended to meet to the full the needs of old and sick people. To achieve this, the resources of the local authorities would be of infinite value " (WVS 1953) - they were appalled at the suggestions of inefficiency and that they should lose responsibility for the service. Lady Reading, Chairman of the WVS, wrote to The Times (20th January 1961), and spoke in the House of Lords in defence of the WVS. In the House of Lords she stated that the Harris report "was made from information gathered two and a half years earlier, and that the facts proved that it was a completely and utterly incorrect forecast" (Hansard 1961). Lady Reading pointed out that there were 28,662 meals delivered in the first week of June 1958, and by the first week in June 1960 the figure had risen to 48,096 meals. An impressive increase in the provision of meals-on-wheels she said. Lady Reading, in the same speech, put forward a motion "to get for the organisations operating this service the tools with which to do the job", referring to legislation that would permit local authorities to be more supportive. She added, "We are convinced that, with sufficient equipment, the number of meals could be quickly stepped-up and a much greater number of persons served" (Hansard 1961).
The Government was anxious that the meals-on-wheels service should be extended quickly, but was also concerned not to lose the valuable goodwill of the voluntary bodies. The answer was to increase the power of the local authorities to compliment the work of the voluntary organisations. As Johnson-Smith said in the House of Commons, "I hope that by making it the responsibility of the local authorities in areas where the voluntary agencies are not well organised, or even non-existent, to undertake and expand the service, and, where the voluntary agencies are already well organised, to assist them to do better...". As he further stated, "there is no conflict as between those who wish to preserve the voluntary spirit...and those who feel that the local authorities, the public services, also have a part to play......there is scope for ever more fruitful co-operation" (Hansard 1962).

The National Assistance Act, 1948 (Amendment) Act 1962, extended the power of the local authorities to contribute to the meals-on-wheels service by permitting them to;

- provide "meals and recreation for old people in their homes or elsewhere", use any voluntary agency whose activities concern meals and recreation to assist with the provision,
- assist voluntary organisations by use of local authority premises, furniture, vehicles or equipment (either as a gift or a loan), and the services of local authority staff associated with those facilities.

The Act made no ruling on which organisation should organise and control the meals service, but with time the local authorities usually assumed overall control with the voluntary bodies becoming mainly concerned with the delivery of meals.

The aim of the 1962 Act had been to increase the provision of delivered meals, and by 1968 the growth had been substantial with over 12.5 million meals served - approximately 240,000 meals per week, compared with 29,000 meals per week in 1958, the year of the Harris survey (DHSS 1968). The frequency of meals delivered to individuals, however, remained low. Over half the recipients had
two meals per week but a significant number had only one meal per week (DHSS 1968).

Some felt that the 1962 Act had not done enough to promote the expansion of the meals-on-wheels service. The International Tribune of Great Britain suggested that Section 29 of the 1948 National Assistance Act should have been changed to make the provision of meals mandatory, not permissive, funded by central Government grants (International Medical Tribune of Great Britain 1966). Despite these views, the 1950's and 1960's had seen the meals-on-wheels service develop into a national network of schemes through the work of the voluntary bodies and the finances of the local authorities, forming an important aspect of a wider national program of domiciliary care.

2.4.4. The modern meals-on-wheels service to 1980.

Whilst the meals-on-wheels service had become a nationwide provision in the 1960's, concern remained over the efficiency of the service. In March 1970 the Department of Health and Social Security issued a circular which suggested "ways of improving services and invites local authorities to review their arrangements with these in mind" (DHSS 1970). Although the service had increased the number of meals served to 13 million in 1969, the circular observed that, "This throws into ever sharper relief the need to ensure that meals-on-wheels services fully serve their purpose and are economically and efficiently organised; and examination of a number of these services locally has suggested that these objectives are by no means always attained" (DHSS 1970).

The circular, "Organisation of Meals on Wheels", (DHSS 1970) attempted to clarify a number of points. Whilst pointing out that in many cases alternatives to meals-on-wheels (luncheon clubs, home helps, "good neighbours") may be more appropriate, it identified people who would most likely require the service.
These were:

- those living alone who are sick or mentally confused or so physically infirm that they have difficulty in preparing or cooking a main meal,
- those in temporary difficulty,
- those who have inadequate cooking facilities or have not the will to make use of their facilities and cannot obtain meals from other sources.

The circular also covered organisational and administrative points such as sources of supply, charges, cost control and the basic requirements for setting up and running a meal delivery scheme. Of particular significance, however, was the fact that the circular discussed diet and nutrition. Until this time the delivery of a "main meal" had been the only real nutritional objective (WVS for Civil Defence 1963). With the involvement of the local authorities and therefore public money there was concern that "Special attention needs to be given to diet and nutrition" (DHSS, 1970). Specific nutritional points raised were:

- that meals-on-wheels could only make "a significant contribution to nutrition" if at least five hot meals a week were served,
- that protein intake is important and may be supplemented by the addition of dried milk,
- that "over-supply" of fats and carbohydrates should be avoided,
- that ascorbic acid may be boosted by the provision of an orange once a week.

The circular also stated that where at all avoidable meals should not be left for reheating and later consumption, and that excessive delay in delivery can "considerably reduce" the vitamin content. Concern for the nutritional aspects of meals-on-wheels was roused and a number of studies took place to identify the nutritional value of delivered meals and their role, existing and potential, within the diet - Stanton (1971); Davies, Hastrop & Bender (1973 a & b); Davies, Hastrop & Bender (1974 a & b); London Borough of Harrow (1976); Booth (1977); Kemm (1979); Turner, Ryley & Kerwin (1979).
The nutritional aspects of the meals-on-wheels service are discussed further in section 4.3.

Although the circular "Organisation of Meals-on-Wheels" had raised points to improve the administration and organisation of the service, the Department of Health and Social Security were still concerned with maximising efficiency. As Cooper (1973) observed, "despite the service being run with enthusiasm and dedication it lacked a certain amount of over all management expertise". The Department of Health and Social Security thus commissioned a study by P.A. Management Consultants Ltd. (1973) to investigate the meals-on-wheels service. The study concentrated on "certain organisational aspects of the preparation and delivery of meals-on-wheels" and aimed "to provide guidance on the most effective deployment and organisation of existing manpower and equipment" (DHSS 1973). Some of the more important findings of the final report were that:

- in some kitchens output could be increased by around 40% with minimal additional capital expenditure - not exceeding £1,000,
- significant financial savings could be made "if the most economic delivery methods were adopted". For ten of the larger centres the savings could amount to £75,000 per annum,
- efficiency could be increased with improved purchasing policies and better portion and cost control,
- that only 22% of schemes achieved the recommended maximum cooking to delivery period of 2.5 hours - 46% exceeding 3 hours (DHSS 1970),

(P.A. Management Consultants Ltd. 1973)

The scope for improvement was clear and copies of the report along with a circular discussing its contents were sent to the local authorities (DHSS 1973).

The number of delivered meals served continued to rise during the 1970's, but despite the recommendation of the circular "Organisation of Meals-on-Wheels" (DHSS 1970), the aim of providing five meals per
week per person was still far from being achieved. In 1972 there were 18 million meals served but over 50% of the service was operating on a two meal per week basis (Cooper 1973). By 1974 the average rate of delivery was 2.79 meals per head per week but the rate varied from area to area - the London boroughs were achieving an average of 4.55 meals per head per week (Manning 1974).

The subject was raised in the House of Commons when Mr Greville Jenner, whilst emphasising the value of the service, observed that "it is limited in its means, in the number of people it reaches, in the days of the week and the weeks of the year it operates", and also noted, "the enormous discrepancy of the service in the areas" (Hansard 1974). Mr Jenner asked the Government for assurance that the service would not be reduced in the planned reorganisation of the health service for 1974, but would indeed be extended to include more frequent delivery and wider provision. The Under-Secretary of State for Health and Social Security, Mr Alison, stated that the Government had a "deep concern to develop organised meals services for elderly and handicapped people within the context of expanding the key domiciliary care services", and that in the "long-term" - no timescale was indicated - it envisaged the provision per thousand of the population over the age of 65 to be more than doubled to 200 meals per week (Hansard 1974). This was clearly an optimistic view since in 1978 the Secretary of State for Social Services stated that in 1977 there were still only 71 meals served per week per thousand of the population over the age of 65 (Hansard 1978).

A new initiative concerning attitudes towards the elderly was started in 1978 with the publication, "A Happier Old Age" (DHSS 1978). This was a discussion document with the aim of taking a "fresh look at our attitudes towards the older generation, their role in society and the kind of help they need from society" (DHSS 1978). Whilst raising a number of points for consideration, "A Happier Old Age" also outlined the Governments two main aims of:

- ensuring that retirement does not mean poverty, and,
- keeping old people "active and independent in their own homes"

(Source; DHSS 1978)
The result of this document and subsequent discussions was the publication of the Government White Paper, "Growing Older" (Department of Health and Social Security 1981a) which, "outlines a general approach as a possible basis for action in the future" (Department of Health and Social Security 1981b). The main theme of the White Paper was that the public services could only support the elderly through enabling the community itself to support its older members. As it observed, "The primary sources of support and care for elderly people are informal and voluntary", and the Government clearly believed it should largely remain so - "Care in the community must increasingly mean care by the community....The Government sees the primary role of the public services as an enabling one, helping people to care for themselves....by providing a framework of support" (Department of Health and Social Security 1981a).

The published reaction to "Growing Older" was one of disappointment and some anger. The Economist (1981) called it "bland and non-committal", The Lancet (1981) said "disappointing, it adds little new, and promises less". On a stronger note, Geriatric Medicine (1981) said, "a sad document....In many places the text verges on the patronising", and New Age commented "The White Paper is a moral abdication (New Age 1981). Thus, what had started as optimistic and hopeful new initiative had resulted in a disappointing reiteration of all that had gone before.

2.4.5. Modern technological approaches to delivered meals services.

The work of P.A. Management Consultants Ltd. (1973) had discussed many of the technical problems that the meals-on-wheels service faced. In particular, the report identified the inability of the traditional system to deliver meals within the recommended maximum cooking to delivery period of two and a half hours (DHSS 1970) - this problem of the time-lapses between cooking and delivery was confirmed by Turner and Glew (1982). These inadequacies with the traditional delivery system prompted a number of studies into the
existing meals-on-wheels service and on potential innovative methods to improve the quality of delivered food.

In the 1970’s the Department of Health and Social Security commissioned the University of Leeds to carry out a research project into new methods of provision for delivered meals in the Leeds area (Armstrong, O'Sullivan & Turner 1980). Subscribing to the view that the elderly should be encouraged to remain active, the researchers explored three approaches that involved some participation by the recipient. All three approaches involved the delivery of partially prepared meals (frozen, pouch sterilized, raw ingredient packs), which would be temporarily stored and then later regenerated in the home (Armstrong et al. 1980). Clearly since these systems all require storage equipment, ovens and at least some cooking capability on the part of the recipient, they are not suitable for all. They do however offer minimized nutrient loss (Glew 1984), in some cases offer financial savings - although the delivery of frozen meals was about 20% more expensive (Lee & Martin 1979), and good customer acceptability (Johnson, DiGregorio & Harrison 1980).

The University of Leeds researchers also carried out trials on a delivery system involving frozen meals regenerated by microwave oven in a specially adapted delivery van (Armstrong 1979). Whilst the delivered meals were perceived to be hotter (Johnson et al. 1980), and would probably retain a better nutritional value, the costs were calculated to be 35-40% higher (Lee & Martin 1979). The Lothian district in Scotland had already adopted a scheme involving the regeneration of frozen meals and found advantages in acceptability, nutrition, service temperature and the fact that the service could continue during the school holidays (Ageing International 1978).

With cook-freeze systems largely superseded by cook-chill systems (which are cheaper in both capital and running costs and may utilise a wider range of foods without loss of quality), chilled meals have become a further option for meals-on-wheels operations. Indeed a system for the delivery of chilled meals for regeneration in the
home has been adopted in Victoria, Australia, since 1980. The advantages of this approach have been identified as;

- more flexible delivery times maximising the utilisation of delivery staff and equipment,
- more flexible eating times for the recipient,
- improved hygiene, and,
- improved acceptability – delivery and food quality.

(Hyndman & Goodwin 1981).

All the above involve radical changes in the meals-on-wheels operation and also require major capital expenditure. For this reason most local authorities have maintained the traditional meals-on-wheels systems where hot meals are delivered to the recipient.

2.4.6. The meals-on-wheels service since 1980.

The nutritional aspects of delivered meals and their contribution to the diet has continued to be a matter of some concern (Davies, Holdsworth & Purves 1982; Johnson, DiGregorio & Harrison 1982 – reprint of 1980; Ruane, Cohen & Heiser 1983). A matter of fairly recent concern however has been the lack of provision for special diets. In particular it has been noted that non-indigenous ethnic groups have become a significant part of the elderly population. Over 50% of local authorities have over 5% minority ethnic populations (Townsend 1985). As a result of this situation many authorities, especially in the Birmingham area, have been asked by leaders of minority communities to provide special meals-on-wheels (Scan 1984).

Where such meals have been provided however problems have arisen due to lack of uptake. Haringey Social Services decided to provide meals to the elderly of the Asian, Cypriot and West Indian
communities but despite an extensive publicity campaign there was almost no interest in the service (Townsend 1985). Something beyond the mere provision of special foodstuffs clearly needs to be done in terms of the acceptability of meals-on-wheels to ethnic minority groups. Haringey have now based the service on ethnic community centres in order to try and overcome this problem (Townsend 1985).

Special diets for medical reasons, such as diabetes, are also an area where there is need for some provision. Some authorities provide variations on their standard meals whilst in others diet meals are prepared by home helps. Wandsworth Social Services Department have tried an interesting approach, utilising a special diet delivery round. This approach has shown "encouraging results in terms of satisfaction and improved health" (Connelly & Goldberg 1979).

Potentially, the most significant development for the meals-on-wheels service in the 1980's has been the Governments policy of the privatisation of public services. Whilst the privatisation of the school and hospital meals services have received more publicity, the meals-on-wheels service has also been subject to the same policy. As yet few schemes have in fact been taken over by private operators and those that have, such as at Merton, Surrey, have not been particularly successful. In the case of the Merton service which was taken over by Sutcliffe Catering adopting a cook-chill system, the meals were "tasteless, uninspiring and poor value for 73p" (Community Care 1984a), and within the first ten weeks there were 158 complaints about the food (Community Care 1984b). Furthermore, the savings expected by the council were far in excess of those actually achieved (Community Care 1984b).

As discussed earlier the Government in 1974 had envisaged the provision of meals per thousand of the population over the age of 65 to eventually reach 200 per week (Hansard 1974). The levels of provision of meals-on-wheels in the 1980's are shown in Table 2.15.
Table 2.15. The numbers of meals on wheels served in the 1980's.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of meals served (millions)</td>
<td>27.0</td>
<td>27.0</td>
<td>27.1</td>
<td>27.9</td>
<td>28.9</td>
<td>29.9</td>
</tr>
<tr>
<td>Meals served per 1000 over 65</td>
<td>3874</td>
<td>3823</td>
<td>3610</td>
<td>3914</td>
<td>4085</td>
<td>4248</td>
</tr>
<tr>
<td>Meals per week per 1000 over 65</td>
<td>75</td>
<td>74</td>
<td>69</td>
<td>75</td>
<td>79</td>
<td>81</td>
</tr>
</tbody>
</table>

Source: DHSS Personal Social Services 1981-1986

Whilst the provision per thousand of the population over the age of 65 has risen from 71 in 1977 to 75 in 1980 and to 81 in 1985 (DHSS Personal Social Services 1981 & 1986), the progress has been very slow and is nowhere near achieving the optimistic levels predicted by the 1974 Government.

Although the increase in the number of meals related to the population over 65 has been erratic and rather slow, the actual number of meals-on-wheels served has increased steadily through the 1980's from 27 million in 1980 to nearly 30 million in 1985. The current nutritional contribution of meals-on-wheels is difficult to judge since the DHSS no longer generates statistics on the number of meals served per person per week. The DHSS had stated in 1970 that meals-on-wheels could only make a "significant contribution" to the diet where at least five meals a week were served (DHSS 1970). It would be particularly interesting to see what proportion of meals-on-wheels recipients in the 1980's actually receive five meals per week and the average number of meals received per person per week.

Thus, although slow, some progress in the development of meals-on-wheels has been made. This growth should be accelerated
and the service further increased to provide a far more comprehensive and consistent service into the latter half of the 1980's. Chapter 4 of this study looks at the current problems associated with delivered meals in more detail.
CHAPTER THREE - WELFARE FEEDING FOR THE YOUNG - SCHOOL MEALS.

3.1. Schools and the school population.

3.1.1. Projected population changes.

For the purposes of the future planning of services such as school meals it is essential that the size and dimensions (age and sex for example) of the future population and market are predicted. Reasonable population projections may be made on the basis of four sets of data; recent figures on the size of the population by age and sex, estimated future levels of emigration and immigration, estimated future numbers of deaths, and estimated future numbers of births.

The population of the United Kingdom has grown steadily up to 1971 and since then the overall population has remained fairly stable. From 1985 until the end of the century growth of over 4% is projected. From 2001 to 2015 increases in the population will be less and only slow growth is forecast (Central Statistical Office 1987).

The age structure of the population within these totals has changed significantly. There is now a lower proportion of children aged under 15 than in 1971, and a higher proportion of those aged 65 or over (Central Statistical Office 1987). The significance of the increased proportion of elderly people will be discussed in Chapter 4.

Recent changes in the number of children in England and Wales are shown in table 3.1. Over all the number of 0-15 year olds has fallen by 6% during the period 1981 to 1985, but more significantly the number of school age children has fallen by 10.1% over the same
Table 3.1. Changes in the number of children in England and Wales—mid 1981 to mid 1985, ('000)

<table>
<thead>
<tr>
<th>Mid-Year</th>
<th>Pre-school age</th>
<th>School age</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 4</td>
<td>%</td>
<td>5 - 15</td>
</tr>
<tr>
<td>1981</td>
<td>3,005</td>
<td>7,904</td>
<td>10,910</td>
</tr>
<tr>
<td>1982</td>
<td>3,065</td>
<td>+1.9</td>
<td>7,632</td>
</tr>
<tr>
<td>1983</td>
<td>3,120</td>
<td>+1.8</td>
<td>7,385</td>
</tr>
<tr>
<td>1984</td>
<td>3,133</td>
<td>+0.4</td>
<td>7,224</td>
</tr>
<tr>
<td>1985</td>
<td>3,151</td>
<td>+0.6</td>
<td>7,103</td>
</tr>
<tr>
<td>1981-5</td>
<td>+4.8</td>
<td>-10.1</td>
<td>-6.0</td>
</tr>
</tbody>
</table>

Source: Office of Population and Census Surveys 1986

Period. The rate of decrease in the school age population is however falling—it fell by 3.4% in 1981-82, and by 2.2% in 1984-85. The number of pre-school age children on the other hand has increased by 4.8% (145 thousand), an indication of future increases in the number of school age children. Indeed these future increases are already becoming evident since in the year ending mid 1985 the number of 5-9 year olds actually increased by 1.5%. This was the result of the relatively large numbers of children born in the late 1970's replacing the smaller numbers born in the mid 1970's. The 10-15 group however, decreased by 4% (Office of Population Censuses and Surveys 1986).

Although the population statistics published in "Social Trends" (Central Statistical Office 1986) do not provide an exact school age breakdown, that is from age 5 to 15, the 5-14 sub-group provides a good indication of the trends in the size of the school population. Only around 30% of pupils remain at school beyond the statutory minimum leaving age of 16 (Department of Education and Science 1983).
Figure 3.1. shows the number of children in the United Kingdom aged 5-14 years from 1941 to 1985, and the projected numbers from 1986 to 2001. This section of the population increased steadily until 1976, to 9.2 million, but since 1976 there has been a gradual fall until in 1984 there were 7.4 million. This fall in numbers is expected to continue until the early 1990's, when the 5-14 year olds are projected to number some 7 million. However, by 2001 the number of 5 to 14 year olds is expected to increase again to 9.2 million, due to a projected rise in the number of births until the mid 1990's. By 2001 there will be approximately 180 thousand more children aged 7 than there were in 1984 (Central Statistical Office 1986).

Note: Projected figures from the 1987 edition of “Social Trends” are not used because the age groups 0-4 and 5-14 have been treated as one classification.

3.1.2. The numbers of schools and school children.

Clearly, the changes in the numbers of school age children, and consequently the number of school pupils, will have implications for the provision of schools and school services. The numbers of school pupils in the United Kingdom from 1961 to 1984 and projections for 1986 to 1996 are shown in Table 3.2 and Table 3.3.

The delayed effect on the school rolls of the increasing birth rate up to 1964 and the decline in the 1970's is reflected by increased pupil numbers up to the mid 1970's and then a fall in the numbers from 1976 to 1984. The raising of the minimum leaving age in the mid 1970's and then again in the early 1980's also had a contributory effect in increasing the school rolls during the early 1970's.

From 1976 to 1984 the total number of pupils in the public sector primary and secondary schools (i.e. those over 5 years of age) fell from 17.3 to 14.1 million. From 1984 to 1988 there was a further fall to 12.6 million. From 1988 to 1996 the number is expected to rise again, but by 2001 the number of pupils will be 13.1 million.

From 1961 to 1984 the delayed effect of the changes in the birth rate is reflected by pupil numbers rising up to 1964 and then falling steadily until 1984. The raising of the minimum leaving age in the mid 1970's and again in the early 1980's also had a contributory effect of increasing the school rolls during these years. From 1976 to 1984 pupil numbers fell, due to a combination of a declining birth rate and the raising of the minimum leaving age. From 1984 to 1986 the pupil numbers continued to fall, with a small rise in 1987 and then a further fall to 1988, after which the pupil numbers are expected to rise again until 2001.
Figure 3.1. Actual and projected numbers of children aged 5 - 14 in the UK 1941 - 2001

Source: Central Statistical Office 1986
### Table 3.2. Numbers of school pupils in the U.K. by type of school (000's)

<table>
<thead>
<tr>
<th>Year</th>
<th>Public Sector</th>
<th>Nursery</th>
<th>Primary</th>
<th>Secondary</th>
<th>Assisted &amp; Independent</th>
<th>Special Schools</th>
<th>All Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31</td>
<td>50</td>
<td>75</td>
<td>89</td>
<td>93</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>4906</td>
<td>5902</td>
<td>5998</td>
<td>5171</td>
<td>4758</td>
<td>4655</td>
<td>4598</td>
</tr>
<tr>
<td></td>
<td>3165</td>
<td>3555</td>
<td>4448</td>
<td>4606</td>
<td>4494</td>
<td>4385</td>
<td>4111</td>
</tr>
<tr>
<td></td>
<td>680</td>
<td>621</td>
<td>629</td>
<td>619</td>
<td>606</td>
<td>603</td>
<td>570</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>102</td>
<td>149</td>
<td>147</td>
<td>141</td>
<td>138</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>8859</td>
<td>10230</td>
<td>11300</td>
<td>10632</td>
<td>10094</td>
<td>9877</td>
<td>9509</td>
</tr>
</tbody>
</table>

* = Projected figures

(Source: Central Statistical Office 1986.)

### Table 3.3. Numbers of school pupils in the U.K. by age. (000's)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 4</td>
<td></td>
<td>255</td>
<td>384</td>
<td>576</td>
<td>792</td>
<td>823</td>
<td>858</td>
<td>865</td>
<td>889</td>
<td>969</td>
</tr>
<tr>
<td>5 - 10</td>
<td></td>
<td>4550</td>
<td>5544</td>
<td>5453</td>
<td>4752</td>
<td>4302</td>
<td>4138</td>
<td>4093</td>
<td>4292</td>
<td>4544</td>
</tr>
<tr>
<td>11 - 15</td>
<td></td>
<td>3766</td>
<td>3820</td>
<td>4609</td>
<td>4620</td>
<td>4442</td>
<td>4351</td>
<td>4051</td>
<td>3354</td>
<td>3562</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>172</td>
<td>273</td>
<td>432</td>
<td>280</td>
<td>312</td>
<td>310</td>
<td>296</td>
<td>250</td>
<td>252</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>87</td>
<td>157</td>
<td>175</td>
<td>168</td>
<td>188</td>
<td>190</td>
<td>177</td>
<td>158</td>
<td>140</td>
</tr>
<tr>
<td>18+</td>
<td></td>
<td>29</td>
<td>53</td>
<td>56</td>
<td>21</td>
<td>27</td>
<td>31</td>
<td>28</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>(i)</td>
<td>8859</td>
<td>10230</td>
<td>11300</td>
<td>10632</td>
<td>10094</td>
<td>9877</td>
<td>9509</td>
<td>8968</td>
<td>9489</td>
</tr>
</tbody>
</table>

(i) In 1980 the date of measurement by age changed from 31st December to 31st August in England and Wales.

* = Projected figures

(Source: Central Statistical Office 1986.)
by 15%. The secondary school rolls fell by only 1% but the fall in the primary rolls was a dramatic 25%. Clearly this fall in numbers will work its way through to the secondary schools and this is reflected in the projections for 1991 and 1996 where a fall of 18% is expected. The primary schools on the other hand are expected to increase by 9% during the same period (Central Statistical Office 1986).

As already mentioned the declining school population will lead to a contraction of the education service and in particular a reduction in the number of schools. Table 3.4. shows the number of maintained schools in England from 1971 to 1985. As with the school population, the number of schools reached a peak in the mid 1970's with a total of 26,077 in 1976 but has since declined to 24,116 in 1985 (Department of Education and Science "Annual Reports" 1971-85). This has led to a programme of school closures as shown in table 3.5. The rate of decline varied between local education authorities with the inner city areas being particularly affected. This is shown by the number of school closure approvals in the urban areas in table 3.5. (Department of Education and Science 1984).

The contraction of school provision is expected to continue alongside the fall in the school roll until 1991. Indeed the Government is particularly concerned that money should not be wasted maintaining surplus school places and half empty school buildings. In line with this policy the Secretary of State for Education and Science has told local education authorities to find ways of removing two million surplus school places, including the closing down of small schools, by 1991. He has estimated that maintaining each surplus primary school place costs £100 per year and for each secondary school place £170 per year. The annual savings are thus an estimated £70 million (The Times, 6th August 1986). The Audit Commission has estimated that 1,000 secondary schools may have to close as a result (quoted by The Times 1986). It is against this background of a declining school population and school closures, albeit projected to stabilise by 1991, that the school meals service has to operate.
### Table 3.4. The number of maintained schools in England (1971-1985).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>20965</td>
<td>20754</td>
<td>20749</td>
<td>21372</td>
<td>21242</td>
<td>21018</td>
<td>20650</td>
<td>20384</td>
<td>20020</td>
<td>19734</td>
</tr>
<tr>
<td>Middle</td>
<td>264</td>
<td>908</td>
<td>1153</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Secondary</td>
<td>4838</td>
<td>4415</td>
<td>4220</td>
<td>4711</td>
<td>4680</td>
<td>4654</td>
<td>4622</td>
<td>4553</td>
<td>4444</td>
<td>4382</td>
</tr>
<tr>
<td>Total</td>
<td>26067</td>
<td>26077</td>
<td>26122</td>
<td>26083</td>
<td>25922</td>
<td>25672</td>
<td>25272</td>
<td>24937</td>
<td>24464</td>
<td>24116</td>
</tr>
</tbody>
</table>


### Table 3.5. Approved school closures in 1982-1984.

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>75</td>
<td>127</td>
<td>100</td>
</tr>
<tr>
<td>Secondary</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>131</td>
<td>103</td>
</tr>
</tbody>
</table>

3.2. The school meals service in the 1980's.

As already discussed in section 2.1, the 1980 Education Act had a profound effect on the modern school meals service. Since April 1980 control over the form and content of school meals passed from central government to local education authorities, each being able to adopt its own criteria regarding the provision of meals - they still have to provide free meals for those who are eligible and facilities for those children bringing their own food to school.

Since control over the provision and nature of the school meals service passed from central government to the local education authorities, each has been able to adopt its own policy regarding the provision of meals. This even extends to the level of cutting the meals provision to the statutory minimum of only providing free meals. Clearly therefore the organisation of each school meals operation will depend upon the policies of the particular local education authority.

The education authorities are responsible for the finances of the school meals service, and as such have to cover the cost of the free meals as well as any subsidy that arises from a shortfall of income and expenditure on paid meals. A major reason for the relaxing of the legislation on school meals was to enable the education authorities to reduce these costs.

Table 3.6. shows the numbers of meals served from 1979 to 1985 and table 3.7. shows public expenditure on school meals over the same period. The effect of the 1980 Education Act is clearly shown in table 3.6. Uptake fell from 64% in 1979 to 48% in 1980, a fall in the number of meals served on the day of the census of 1.3 million. It is somewhat surprising to note that despite the requirement to maintain the free meals provision, the number of free meals served also fell, by nearly 200,000 from 1979 to 1980. Whilst the number of paid meals has continued to decline during the 1980's (by 43% from 1979-1984), the uptake of free meals has gradually increased to
Table 3.6. School meals served to pupils at maintained schools in England 1979-1985.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total no. meals served (000)</th>
<th>% of pupils taking meals</th>
<th>No. paid meals (000)</th>
<th>No. free meals (000)</th>
<th>% meals served free</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>4,855</td>
<td>64.1</td>
<td>3,956</td>
<td>899</td>
<td>11.9</td>
</tr>
<tr>
<td>1980</td>
<td>3,535</td>
<td>48.2</td>
<td>2,811</td>
<td>724</td>
<td>9.9</td>
</tr>
<tr>
<td>1981</td>
<td>3,515</td>
<td>49.0</td>
<td>2,659</td>
<td>856</td>
<td>11.9</td>
</tr>
<tr>
<td>1982</td>
<td>3,428</td>
<td>49.4</td>
<td>2,464</td>
<td>964</td>
<td>11.9</td>
</tr>
<tr>
<td>1983</td>
<td>3,482</td>
<td>51.4</td>
<td>2,407</td>
<td>1,075</td>
<td>13.9</td>
</tr>
<tr>
<td>1984</td>
<td>3,392</td>
<td>51.3</td>
<td>2,244</td>
<td>1,148</td>
<td>15.9</td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.4</td>
</tr>
</tbody>
</table>

** - No census was taken in 1985 due to teachers industrial action.


Table 3.7. Expenditure on school meals in England 1979-1985 (£m).

<table>
<thead>
<tr>
<th>Year</th>
<th>Current expenditure on school meals</th>
<th>Average expenditure per meal (p)</th>
<th>Total expenditure on education</th>
<th>Expenditure on school meals as a % of expenditure on education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979/80</td>
<td>421.7</td>
<td>43.4</td>
<td>8,604</td>
<td>5.0</td>
</tr>
<tr>
<td>1980/81</td>
<td>397.4</td>
<td>56.2</td>
<td>10,507</td>
<td>3.8</td>
</tr>
<tr>
<td>1981/82</td>
<td>395.6</td>
<td>56.3</td>
<td>11,389</td>
<td>3.5</td>
</tr>
<tr>
<td>1982/83</td>
<td>411.0</td>
<td>60.0</td>
<td>12,196</td>
<td>3.4</td>
</tr>
<tr>
<td>1983/84</td>
<td>426.0</td>
<td>61.2</td>
<td>12,920</td>
<td>3.3</td>
</tr>
<tr>
<td>1984/85</td>
<td>425.0</td>
<td>62.7</td>
<td>13,411</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Source: Department of Education and Science 1979-1985
over a million per day, 17% of the total meals served (Department of Education and Science 1979-1984).

Public expenditure on school meals has remained at around £420 million per year despite the fact that the number of meals has dropped by 30% from 1979 to 1984 (table 3.7). The average expenditure per meal has thus risen from 43.4 pence in 1979 to 62.7 pence in 1984. This is however a smaller increase than would arise from an average inflation rate of 10% per annum, which would have led to an expenditure of 69.7 pence by 1984, and so indicates that expenditure has probably fallen in real terms. Expenditure on meals as a percentage of total expenditure on education showed a large decrease from 1979 to 1980, 5.0% to 3.8%, and has fallen every year since to a level of 3.2% (Department of Education and Science 1979-85). These figures and the raising of the prices for meals in 1980 clearly illustrate the attempts of the local education authorities to achieve the Governments aim of reducing net expenditure on school meal provision.

Thus, taking 1984 figures as the most recent, no school meals census was taken in 1985 due to industrial action, the school meals service provides around 3.4 million meals per school day representing an uptake of 51.3%. Meals are provided at a national average net cost of 63 pence per meal, and 17.4% are provided free of charge (Department of Education and Science 1984).
3.3. **School meals and the nutrition of adolescents.**

3.3.1. The nutritional requirements of school age children (12-17 years old).

The recommended daily amounts of food energy and nutrients for children aged 12-14 and 15-17 are shown in Table 3.8. (DHSS 1981). The DHSS report recognises the fact that requirements differ from one individual to another and that intake may be well below that recommended and yet an individual may show no recognisable signs of deficiency (Nutrition Reviews 1980). Furthermore, it notes that the requirements of an individual may also change over time due to changes in nature of the diet or changes in health. The recommended amounts of energy and nutrients therefore do not represent minimum individual intakes but rather "the average amount of the nutrient which should be provided per head in a group of people if the needs of practically all members of the group are to be met" (DHSS 1981).

Thus, whilst the recommendations have limited use in the analysis of individual diets they are of value in the investigation of the diets of groups of people. As the report itself states, "it would still be true to say that, on present knowledge, the greater the proportion of people with intakes below those recommended, the greater the possibility that some individuals may be undernourished with respect to the nutrient or nutrients in question" (DHSS 1981).

Recommended daily allowances as suggested by the DHSS have faced some criticism in terms of the amount of data and research upon which they are based. Dwyer (1981) points out that the recommendations for adolescent nutrient needs are based on "scanty" data and are therefore little more than "educated guesses". He states that there is only "substantial information" on water and energy requirements, whilst for sugars, dietary fibre, protein, calcium, magnesium, iron, zinc, iodine, vitamin D, thiamin, riboflavin, and ascorbic acid there is only "fragmentary data". He states that of the 50 or so nutrients known to be required, over 30 have unknown minimum dietary levels (Dwyer 1981).
### Table 3.8. Recommended daily amounts of food energy and nutrients for children aged 12-17.

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12-14</td>
<td>15-17</td>
<td>12-14</td>
<td>15-17</td>
</tr>
<tr>
<td>Energy (MJ)</td>
<td>11.0</td>
<td>12.0</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>66</td>
<td>72</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>1.1</td>
<td>1.2</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>1.4</td>
<td>1.7</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Nicotinic acid (mg) (i)</td>
<td>16</td>
<td>19</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Ascorbic acid (mg)</td>
<td>25</td>
<td>30</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Vitamin A (µg) (ii)</td>
<td>725</td>
<td>750</td>
<td>725</td>
<td>750</td>
</tr>
<tr>
<td>Vitamin D (µg) (iii)</td>
<td>(iii)</td>
<td>(iii)</td>
<td>(iii)</td>
<td>(iii)</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>700</td>
<td>600</td>
<td>700</td>
<td>600</td>
</tr>
<tr>
<td>Iron (mg) (iv)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**

(i) Figures are for nicotinic acid equivalents. One nicotinic acid equivalent = 1 mg available nicotinic acid or 60 mg tryptophan.

(ii) Figures are for retinol equivalents. One retinol equivalent = 1 µg retinol or 6 µg β-carotene or 12 µg other biologically active carotenoids.

(iii) Where children are sufficiently exposed to sunlight no dietary sources are necessary, but during winter they should receive 10 µg by supplement daily.

(iv) This may be insufficient for girls with large menstrual losses.

Source: DHSS 1981.
Determining the nutritional requirements of adolescents is further complicated by the onset of puberty and the growth spurt during teenage years. Not only do girls have their growth spurt earlier than boys but there is also a wide range of ages during which it may take place. For boys it usually occurs between the ages of 12.5 and 15.5 years with the peak at 14 to 15 years. Girls on the other hand normally have their growth spurt between the ages of 10.5 and 13.5 years with the peak at 12 to 13 years (Tanner 1981).

The nutritional requirements of girls, especially the requirement for iron, will also be influenced by the menarche which usually takes place between 10.5 and 15.5 years, the average in the UK being 13 years (Tanner 1981). These variations in the timing of both the growth spurt and the menarche make it clear that nutritional requirements in adolescence are more closely related to physiological age than to chronological age.

Despite the above criticisms of the DHSS recommended daily allowances, the figures do have value as guidelines, especially in the nutritional analysis of groups of the population. As stated earlier, the more people with intakes below the recommended level, the more likely it is that some people will be undernourished (analysis of undernutrition on an individual basis may only be carried out with an analysis of clinical, anthropometric, haematological, and biochemical factors). As regards the problems of the growth spurt and the onset of menstruation, the report states that the recommendations provide a large enough margin of safety to take into account "the needs for growth in children; differences in the requirements according to sex and age; differences in the degree of physical activity, and the additional requirements of pregnancy and lactation" (DHSS 1981). Furthermore, whilst some individuals may have their growth spurt earlier and others later than average, analysis in representative groups should average these variations out. Thus although few valid comments may be made on the diets of individuals, the recommended daily allowances are of use in the investigation of the diets of groups of the population such as schoolchildren.
3.3.2. Contemporary dietary views as guidelines for school feeding.

The last decade has seen the publication of a number of reports concerning the diet and health of the affluent western nations (DHSS 1974, The Royal College of Physicians and British Cardiac Society 1976, Truswell 1977, DHSS 1978a, Passmore et al 1979, Hollingsworth 1979, Whitehead 1979, Mann 1979, Lewis 1980, National Advisory Committee on Nutrition Education 1983, DHSS 1984 for example). These publications have identified a number of dietary characteristics which may be associated with common western diseases, coronary heart disease and dental caries for example, and suggest modifications to the diet which may help reduce the prevalence of such diseases.

Clearly any significant changes in the nations feeding habits will be best achieved through influencing formative feeding behaviour in the young. Dietary recommendations therefore provide important guidelines for school feeding programmes supplementing the nutritional guidance provided by the recommended daily allowances already discussed (DHSS 1981). Most of the recent dietary recommendations made by nutritionists and government bodies are covered by the discussion paper "Proposals for nutritional guidelines for health education in Britain" by the National Advisory Committee on Nutrition Education (NACNE) (1983). Indeed the paper is based upon, "expert committees, predominantly UK based, which have produced reports in this area in the last few years", and, "Additional information was obtained from international working parties" (National Advisory Committee on Nutrition Education 1983). It is thus appropriate to use the recommendations of the NACNE as a reflection of contemporary dietary views.

The paper's main recommendations to modify the British diet are as follows;

- **ENERGY**
  - the paper notes that 15% of 16-19 year olds are over weight and that risks to health are not only confined to the
substantially obese but are also associated with mild degrees of excess weight.
- energy intake should thus be sufficient to maintain an appropriate weight to height ratio. Suitable weight ranges for height and sex are provided by the report "Obesity" (Royal College of Physicians 1983) and are quoted by the NACNE paper.
- the proportion of energy contributed by fat should be reduced from the present 38% to 30% of total energy intake.

CARBOHYDRATES
- limiting the intake of all carbohydrates as a means of weight control is no longer recommended and is now contrary to present nutritional policy. As the paper states, "weight control is best achieved with a low fat diet".
- not all carbohydrates are recommended however. An increased intake of complex carbohydrates rich in fibre is suggested. Passmore et al. (1979) advise a 15% increase in the consumption of potatoes, vegetables, fruits and grain products.
- the consumption of simple sugars such as sucrose, which are high in energy but which contain few other nutrients, should be reduced. The paper suggests that the current total sucrose intake of 38Kg per head per year should be reduced to 20Kg. This figure allows 10Kg intake in the form of confectionary, soft drinks and snacks - although these should be restricted as much as possible - and 10Kg intake contained in foods.

DIETARY FIBRE
- it is suggested that dietary fibre intakes should be increased from an average 20gm per day to an average of about 30gm per day for adults.
- the suggested sources of this increased fibre intake are vegetables, fruits and particularly cereals.
- special fibre preparations and foods to which bran or other fibres have been added are not recommended.

DIETARY FAT
- as Passmore et al. (1979) observe, "there is considerable, though not conclusive, evidence that a high fat intake
contributes to coronary heart disease.

- it is recommended that saturated fatty acids should contribute only 10% of the total energy intake.
- to achieve these recommendations the paper suggests reducing fat intake from dairy and meat products.

**SALT**
- the present average salt intake of 12gm per day "is far in excess of that required" and could be reduced to 3gm.
- in the short-term the paper suggests an average reduction in salt intake of 1gm per person per day and an average reduction of 3gm would be desirable in the longer term.
- these intakes may be achieved by reducing the salt added in cooking and at the table.
- since substantial amounts of salt are present in manufactured foods further reductions in salt intake may only be possible with the help of the food manufacturers, either through labelling or reducing salt contents.

**ALCOHOL**
- although current legislation forbids the sale of alcoholic beverages to those under the age of 18 years, there is no doubt that adolescents do have access to alcoholic drinks and may start consuming alcohol before that age (Truswell & Darton-Hill 1981).
- clearly any alcohol consumption by those under the age of 18 is undesirable and should be discouraged.
- for adults NACNE suggests that "the regular intake of alcohol should not exceed the equivalent of 4 pints of beer a day", whilst acknowledging the recommendation of Passmore et al. (1979) that the average intake should not exceed 4% of energy intake.
3.3.3. Characteristics of the diets and feeding behaviour of adolescents.

As a distinct sub-group of the population, adolescents have a number of identifiable feeding and diet characteristics. These characteristics have important nutritional implications and should be considered in the development of any school feeding programme.

0 MISSING MEALS

Truswell and Darton-Hill (1981) state that breakfast provides around 20% of total energy intake and that children who eat breakfast are more likely to meet recommended daily allowances for all nutrients. The National Dairy Council (1981) in a study of 1,748 schoolchildren in England and Wales found that 13% had nothing to eat for breakfast and a further 5% had no more than a snack. Of particular concern are the 14-18 year olds of whom 20% had no breakfast on the date of the survey. Bender, Harris and Getreuer (1977) obtained similar results in their survey where 21% of senior schoolchildren had no breakfast.

This significant number of children who go to school without having eaten is a matter of some nutritional concern. It is interesting however to note that Huenemann, Shapiro, Hampton and Mitchell (1968), in a survey of 122 US teenagers, found that those who missed breakfast "were indeed the 'obese' boys and girls".
There is also evidence that adolescents miss midday meals. Huenemann et al (1968) noted that "Lunch was, in fact, omitted more often than breakfast during the summer vacations and about equally during the school year". The National Dairy Council (1981) found that 5% of their survey of British children had no lunch and a further 16% had only a single item snack.

**SNACKING**

"Adolescents are seen as eating more of their food as snacks than adults do" - Truswell and Darton-Hill (1981). Huenemann et al. (1968) found that on average teenagers tended to eat more often than three times a day and identified "the high frequency of snacking as a part of the eating pattern of these subjects" - this investigation covered teenagers with an average age of 16 to 17.5 years of age (longitudinal study). Indeed, the average number of snacks per week was 10.6 per person with the girls averaging 11.5 snacks per person per week.

Nevertheless, it is interesting to note Thomas and Call's (1973) observation that "although large quantities of the empty calorie foods which many persons associate with between meal eating are consumed annually it seems on the basis of existing data that the place which such foods occupy in the teenage diet has been exaggerated since foods eaten between meals provided a relatively good balance of nutrients".

A survey by the National Dairy Council (1981) looked at the incidence of children taking mid-morning snacks. Thirty-five percent of the sample took a mid-morning snack, and the incidence of snacking was less with the older children - 29% of the 14-18 year olds. The survey also notes that "Almost all children in the 14-18 year age group who missed breakfast did not eat anything mid-morning". There must therefore be a significant number of children who eat nothing from the previous evening until lunchtime. Only a detailed analysis of diets using weighed food intakes and anthropometric...
measurements will reveal whether these individuals are meeting their nutritional requirements or are indeed undernourished.

**FAST FOOD/TAKE-AWAY MEALS**

Bender et al. (1977) found that 18% of senior schoolchildren bought their lunchtime meals outside school. The purchase of fast food/take-away meals is probably a reflection of the young adults desire to develop and show a degree of independence. As Greenwood and Richardson (1979) state, "Young people want to seek and develop their own identity and one form of this independence is reflected in the number of meals the adolescent, particularly the older teenager, eats away from home and outside the school environment."

Whilst the occasional fast food/take-away meal would not create dietary problems, should such meals become a regular and significant part of the diet there could be nutritional consequences. In an analysis of fast food meals, Greecher and Shannon (1977) found that there was only an average 658Kcal energy, only 23% of the DHSS recommended daily amount for 15-17 year old boys. They also noted that there was a high fat content, most of which was saturated fat.

**UNCONVENTIONAL MEALS**

The unconventional meal behaviour of adolescents has already been illustrated by their omission of meals and the frequent snacks eaten during the day. As Huenemann et al. (1968) observe, "The finding that roughly one-third of the subjects ....... had highly irregular eating practices during four separate weeks suggests a way of living and eating quite different from the traditional three-meal-a-day pattern." In terms of the nutritional implications of this feeding behaviour, Huenemann et al. (1968) state, "While there were individual exceptions, those adolescents who ate regular structured meals, usually augmented by snacks, tended to have better nutrient intakes than irregular eaters."
ADOLESCENT DIETERS

Research has shown that significant numbers of adolescent girls attempt to reduce their weight through dieting. These numbers often exceed those who are actually overweight. Huenemann, Hampton, Shapiro and Bekucke (1968) found that 46% of girls in their sample wanted to lose weight and yet only 11% and 12% respectively were mildly or markedly obese. Dwyer, Feldman and Mayer (1976) obtained similar results. They found that although 15% of senior girls were obese, 61% had dieted to lose weight. Whilst the desire to control body weight through food intake is not in itself harmful, continual dieting may lead to illness and the possibility of developing anorexia nervosa. Crisp, Palmer, and Kalucy (1976) found one severe case of the disease in every 200 girls and one in every 100 in girls between the ages of 16 and 18 years.

OBESITY

As well as anorexia nervosa, the British Dietetic Association (1980) identifies obesity as a nutritional problem in the school age population. Huenemann et al. (1968) found 12% of the girls in their sample with "marked obesity" whilst Dwyer et al. (1976) found 15% of senior girls to be obese. Adolescent obesity is also discussed by Hager (1981) who states that between 3% and 13% of of children and teenagers suffer from obesity.

LOW NUTRIENT INTAKES

Low intakes of a number of particular nutrients give cause for some concern.

1. Iron

Greenwood and Richardson (1979) state that "Iron deficiency anaemia is undoubtedly one of the most serious public health
problems related to nutrition during adolescence". Studies have indicated that iron deficiency in British children exists (see Nelson and Naismith 1979, Harris, Armstrong, Ali and Loynes 1983, Barber, Bull and Buss 1980, British Medical Journal 1986).

The requirement for iron increases during puberty, being closely related to the growth spurt, and for girls, to the onset of menstruation. Sjolin (1981) suggests that the need for absorbed iron during the growth spurt increases from 0.9mg to 2.1mg for boys, and to 1.4mg for girls, and that after puberty the requirements are 1.4mg for boys and 3.3mg for girls. These levels are far in excess of the DHSS (1981) recommendations, especially when the estimated absorption rate for this country may be as low as 6-7% (Bull and Buss 1980) - the DHSS (1981) assumes an absorption rate of 10%. The recommended daily allowance in the USA is 18mg (Committee on Dietary Allowances 1980), but this intake may be difficult to achieve without supplementation. The low incidence of iron deficiency in Sweden is attributed to the enrichment of grain with iron (Sjolin 1981).

The consequences of iron deficiency are not purely physical but are also behavioural. Studies by Oski and Honig (1978), Oski, Honig, Helu and Horwitz (1983), Walter, Kovalsky and Steel (1983), Pollitt, Soemantri, Yunis and Scrimshaw (1985), have shown that a deficiency of iron is "associated with abnormalities of behaviour and mental performance which improve with treatment with iron" (Addy 1986). These behavioural and mental "abnormalities" would be of particular significance in the school environment.

2. Vitamin D

Vitamin D deficiency and related bone defects have been identified in Asian children in the London Borough of Tower Hamlets (Harris et al. 1983) and in Bradford (Ford and McIntosh 1976). Nelson and Naismith (1979) found that their sample of
"at risk" poor inner-city children in London had an average intake of only 40% of the recommended daily amount. As the DHSS (1981) states, no dietary sources of vitamin D are necessary where there is sufficient exposure to sunlight, but where this is insufficient supplementation of 10ug per day should be provided. From the evidence quoted there are clearly cases in this country where children's diets could be profitably supplemented.

3. Calcium

Calcium is an important mineral in the child's diet since it is essential for the growth of bone and tissue. Corry-Mann (1926) demonstrated that a daily supplement of one pint of milk could increase the growth in height of boys aged 6-11 by 43%. The British Dietetic Association (1980) has identified calcium undernutrition as one of the potential nutritional problems in the school age population and quotes Everson (1960) as evidence. Baker, Elwood, Hughes, Jones, Moore and Sweetnam (1980) found that the provision of free school milk led to no significant height gain differences in their sample of schoolchildren. This perhaps indicates that there is sufficient milk provision at home. Nevertheless, NACNE (1983) advise that there is "a continuing need to advocate the consumption of milk to ensure adequate calcium intakes to meet the estimated calcium requirements of children".

All the above characteristics of adolescent feeding behaviour are important in terms of their effect on the diet and their possible nutritional consequences. There may also be significant educational consequences of poor diets, especially in cases of iron deficiency. As such any adolescent feeding program such as the school meals service, provides an ideal opportunity to approach these dietary problems by making up for deficiencies in other feeding environments.
3.3.4. The nutritional role of school meals.

Until 1941, when the Board of Education suggested that school meals should provide 1000 kilocalories (4.2 MJ) energy, 20-25 grams of animal protein and 30 grams of fat, there had been no nutritional guidelines for school feeding. These suggestions were largely confirmed by the Department of Education and Science in 1955 who recommended an energy value of 650 to 1000 kilocalories (2.7-4.2 MJ) according to age and sex, 20 grams of protein and 25-30 grams of fat. In 1966 the Department of Education and Science, after investigating nutritional standards, adjusted these recommendations to an energy value of 880 kilocalories (3.6 MJ), 29 grams of protein of which 18.5 grams should be animal protein and 32 grams of fat.

In 1975 two important reports were published. The Committee on Catering Arrangements in Schools published "Catering in Schools" whose main recommendation was that in addition to the traditional set meal there should be an increasing choice for older pupils. With a choice of meal available it became difficult to set very specific nutritional standards, and recognising this the Working Party on the Nutritional Aspects of School Meals (1975) advised that the average meal should provide a minimum of one third of a child's daily energy requirements and between a half and a third of the protein requirements.

The 1980 Education Act made significant changes to the responsibilities of the local education authorities. They were now able to decide on the nature and extent of the school meals service they would provide and there was no longer any requirement to provide meals of a defined nutritional standard. There was much concern over the nutritional consequences of the 1980 Education Act. Whilst many local authorities changed their school meals provision to cash cafeteria operations, many others cut their school meals provision to the statutory minimum of only providing meals for children whose parents are receiving supplementary benefit or family income supplement. This concern was expressed by the British Dietetic Association in its Policy Statement of 1980. It stated that primary school years provide the "opportunity to develop good
dietary habits during a time of relatively closely controlled school feeding", and that the secondary school years are a "period of rapid growth and development, when greatly increased demands are made on the bodies resources which will only be met if sound eating habits are continued from earlier years" (British Dietetic Association 1980). The Association also noted that the consequences of the removal of nutritional guidelines are contrary to current views as expressed by Government publications such as "Eating for Health" (DHSS 1978c).

There have been a number of studies investigating the nutritional value of school meals and the contribution of school meals to the overall diets of schoolchildren. Almost all of these studies however have investigated the pre-1980 traditional meals systems. One exception is the report, "The School Meals Service in the Inner London Education Authority" (Kipps and Thomson 1984), which looks at both traditional and cash cafeteria meal operations.

A major study of the nutrition of primary and secondary schoolchildren was carried out from 1968 to 1970 in Kent (Cook, Altman, Moore, Topp and Holland 1973). Using weighed diet records the average daily nutrient intake was compared with the DHSS recommendations of 1969. The intake of most nutrients compared favourably with the DHSS (1969) recommended levels. Intake of calcium, vitamin A and ascorbic acid was much higher than recommended. The energy values however were below the 1969 recommended levels but when compared with the later DHSS (1981) recommendations are adequate.

Using the information from the 1968-70 survey, Cook et al. (1975) were able to assess the contribution of school meals to the over all nutrition of their sample of schoolchildren in Kent. The main findings of this report were that:

- School meals met the standards set by the Department of Education and Science in 1966, although the sucrose content was about one third higher than that calculated from suggested amounts of sugar-containing foods,
school meals provided higher nutrient intakes than alternative types of lunch,

there were no significant differences in height, weight adjusted for height, skinfold thickness, or clinically assessed nutritional status between those taking school lunches and those taking alternative types of lunch,

school meals provided a higher proportion of the daily energy and nutrient intake for children from larger families, families without a father, and families from lower social classes,

The results of two further studies, published in 1972, indicated that contrary to the findings of Cook et al., school meals did not provide the nutrients as recommended by the Department of Education and Science (1966). Bender, Magee and Nash (1972), in a survey of 48 schools in the south-east of England, found that the average energy content of meals was only 54% of that recommended, and that the protein content was only 55% of recommended levels. In addition the average sucrose content of the meals was 22 grams — a level considered to be too high by Bender et al. (1972).

Richardson and Lawson (1972) looked at the midday meals of senior schoolchildren in one comprehensive school in London. The average energy and protein content of these meals was 80% of the Department of Education and Science (1966) recommendations. Furthermore, uptake was low with only 41% of pupils taking a school meal — the uptake in the Kent schools survey was 80% (Cook et al. 1975). Alternatives to school meals were analysed and they were found to be low in protein, iron and calcium and high in sugar — only 4% of children who had an alternative to the school meal had a meal that compared favourably with it. As Richardson and Lawson observe, although school meals could be improved, they still offer the best nutritional value.
The failure of school meals to achieve the appropriate nutritional standards was confirmed by three further studies. Bender, Harris and Getreuer (1977) found that the average protein and energy content of school meals in the London Borough of Brent was "below the standard set by the Department of Health and Social Security for all age groups".

McAllister, Hughes and Jones (1981) established that junior school meals in South Glamorgan provided an average 546 kcal (2.3 MJ), only 24% of the RDA, and 19 grams of protein, 36% of the RDA (DHSS 1981). Nelson and Paul (1983), in a dietary study of 191 primary and secondary schoolchildren, examined the nutritive contribution of different midday meals, including school lunches, to the diets of schoolchildren in Cambridge. Cook et al. (1975), in a similar study, had investigated the same aspects of adolescent diets in Kent and had concluded that school meals met the required nutritional standards. The Nelson and Paul (1983) study on the other hand found that school lunches provided:

- less than one quarter of the recommended daily amount for energy, iron, and riboflavin, and,
- less than one third of the recommended daily amount for protein, calcium, thiamin and ascorbic acid.

These levels are clearly below the recommendations of the Department of Education and Science (1975) - that the meals should provide one third of the recommended daily allowance of energy and between one third and one half of the recommended daily allowance for protein. It was also found that energy and nutrient intakes were lower on days when a school meal was taken as opposed to days when an alternative, such as sandwiches or lunch at home, was eaten. This is also contrary to the findings of Cook et al. (1975).

In common with Cook et al. (1975), the Cambridge study established that children from lower income families obtained a larger proportion of their daily nutrient intake from school meals than did
those children from higher income families. The importance of the school meal to the diets of poor children is confirmed by Nelson and Naismith (1979) in their study of the diets of poor inner-city children in London. The school meal clearly plays an important nutritional role for the children of lower income families.

As already mentioned, Kipps and Thomson (1984) investigated the nutritional role of school meals in both traditional meal operations, typical of the pre-1980 school meal service, and cash cafeteria operations which developed as a result of the 1980 Education Act. The aims of this research were to compare the nutritional value of meals in the two types of operation, to ascertain how "wisely" the children are choosing from the range of foods available to them, to compare the nutritional value of school meals with alternative lunches, and to provide a qualitative assessment of food consumed during the rest of the day.

In the absence of any nutritional requirements for school meals, Kipps and Thomson suggest a number of guidelines based on the recommendations of the NACNE Report (1983). They suggest the following:

- that although the energy provided by the school meal cannot be specified, due to the variation in energy needs, it is appropriate to identify sources of energy. It is suggested that:
  - 34% of energy be obtained from fat,
  - 55% of energy be obtained from carbohydrates,
  - 11% of energy be obtained from protein,
- that only one third of total fat should be saturated fat,
- that the intake of complex carbohydrates, including dietary fibre, should be increased, whilst sugar intake should be reduced to no more than 18 grams.
- that the intake of salt should be reduced by one gram per day, coming from a reduction in salt added in cooking and at the table, and that an upper limit of 1.5 grams should come from salt in foods.
The findings of the Kipps and Thomson (1984) survey were as follows:

- The mean energy intakes from school meals were "adequate". Mean energy intakes for cash cafeteria operations were higher than for traditional operations - this was interpreted as an indication that the greater freedom of choice was encouraging children to eat more.

- The mean values for most schools - all except the traditional meals at the girls school - indicated too great a proportion of energy from fat.

- The mean sugar values for all meals, especially those in the boys school, were too high. The mean sugar values for cash cafeteria meals were higher than for traditional meals. Mean dietary fibre intakes were low.

- Mean values indicated adequate levels of most other nutrients. The range of intakes for most of these nutrients reflected the differences in over all food intakes - low total food intakes were often reflected in low nutrient intakes.

- School meals compared "very favourably" with alternative lunches. In almost all cases school meals had higher mean values for energy and nutrients.

In view of these findings Kipps and Thomson recommend that nutritional standards should be set by either the Government, or in the absence of national school meal provision, by the local authorities. They suggest that such standards should be based on the recommendations of the NACNE Report (1983) following the guidelines already mentioned.

Having discussed the findings of surveys into the nutritional role of school meals a number of points may be made. Despite the fact that a number of studies have established that school meals have not been meeting the appropriate nutritional standards, they do nevertheless play an important role in the diets of schoolchildren. This is especially the case for those children of families in the lower income groups.
The above studies have also established that school meals usually make a more significant contribution to the diets of schoolchildren than do lunches from alternative sources. There is thus a clear nutritional case for the continuance of a school meals service.

The fact that many school meals have not been meeting minimum nutritional standards and also that they have not been providing the correct balance of nutrients - high sucrose and fat contents whilst low dietary fibre and complex carbohydrate contents - indicates the need for nutritional standards. Kipps and Thomson (1983) suggest that the most appropriate approach would be to provide "nutritional guidelines". These guidelines would place less emphasis on minimum energy levels and concentrate more on the types of foods to be provided in order to enable children to select a nutritionally balanced meal. The proportion of energy to be obtained from fat, carbohydrate and protein should also be specified.
3.4. The uptake of school meals and the attitudes of schoolchildren to school feeding.

3.4.1. The problem of uptake.

Both the number and the proportion of children taking school meals fell significantly up to and including the time of the 1980 Education Act (table 3.9.). From an uptake of 64% in 1979 the proportion of those taking school meals fell to 49% in 1981.


<table>
<thead>
<tr>
<th></th>
<th>1979 No.</th>
<th>%</th>
<th>1980 No.</th>
<th>%</th>
<th>1981 No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils in attendance</td>
<td>7,276,798</td>
<td>7,331,860</td>
<td>7,170,237</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupils taking school meal</td>
<td>4,854,938</td>
<td>64.1</td>
<td>3,534,858</td>
<td>48.2</td>
<td>3,515,316</td>
<td>49.0</td>
</tr>
<tr>
<td>Paid meals</td>
<td>3,956,170</td>
<td>52.2</td>
<td>2,810,601</td>
<td>38.3</td>
<td>2,695,034</td>
<td>37.1</td>
</tr>
<tr>
<td>Free meals</td>
<td>898,768</td>
<td>11.9</td>
<td>724,257</td>
<td>9.9</td>
<td>856,282</td>
<td>11.9</td>
</tr>
<tr>
<td>Packed lunches</td>
<td>951,765</td>
<td>12.2</td>
<td>1,982,122</td>
<td>27.0</td>
<td>1,878,602</td>
<td>26.2</td>
</tr>
</tbody>
</table>

% - percentage of pupils in attendance.


The case for maximising the uptake of school meals is clear. Previous sections (section 3.3.) have discussed the significant role of the school meal in the diets of schoolchildren and the fact that the school lunch usually provides a more nutritious meal than the available alternatives. The benefits of school feeding however cannot be realised unless meals are eaten. Uptake is thus a fair indicator of the degree to which school meals services are being utilised and the extent to which they are contributing to diets of the nations schoolchildren.
Although many school meal services are subsidised, and others are run on a non-profit making basis, there is still an economic need to maximise the numbers of meals taken. Economies of scale lead to lower costs per meal. In addition there must be a cut-off point below which the provision of meals is no longer feasible. Furthermore, the greater the uptake the more likely it is that the service will be able to cater for the needs of minority groups, such as ethnic minorities, as well as the "average" schoolchild.

It is clearly necessary to establish the reasons for high and low uptake of school meals, the reasons for children choosing to eat alternative lunches, and the factors that are most important in these decisions. Having determined these points the school meals service may gear itself more accurately to balancing the desires of their market with the need to maintain sound nutritional practices.

3.4.2. The investigation of feeding preferences.

Considerable research has been undertaken investigating food preferences as a measure of food acceptance and food attitudes. This work has been largely based upon hedonic rating scales, rating preferences upon some form of like-dislike continuum.

The determination of food preferences has been of particular relevance in institutional feeding. In such operations the acceptability of foods goes beyond commercial considerations and relates to the wider concerns of diet, nutrition and the need to minimise waste. Identifying foods that are liked/disliked is thus important as an aid to the planning of meals and feeding programs. Extensive data using like/dislike preference scales has been provided by the United States Army, which since the late 1950's and early 1960's has attempted to develop techniques for the measurement of food acceptance and preference (U.S. Army Natick Laboratories 1971). Different hedonic scales have been utilised, Kennedy used five point scales for investigations into the preferences of California boys (Kennedy 1952), and California college women
Kennedy 1958), whilst Abbot, Townsend and French (1952) used a two point scale to investigate the food preferences of Florida men. Peryam and Pilgrim (1957), however, suggest the nine-point scale, ranging from "like extremely" to "dislike extremely", as the most objective and reliable measure of food likes and dislikes.

The use of hedonic scales for the evaluation of children's preferences is fairly well documented (Breckenridge 1959, Foley, Hertzler & Anderson 1979). Zunich and Fults (1969) used a two point scale - like/dislike - to evaluate the food preferences of schoolchildren, whilst Feitelson and Fiedler (1982) adopted a two point scale with a "never tasted" option to investigate the preferences of Jewish children with a view to marrying them to Kosher dietary laws. A particular problem with such groups, especially the younger children, is their ability to understand the rating terms. Head, Giesbrecht and Johnson (1977) used a five point scale with the ratings "great", "good", "o.k.", "bad" and "terrible". Another approach was that of Burt and Hertzler (1978) where a four point rating scale was represented by the facial expressions:

![Facial Expressions]

Lachance, Moskowitz and Winawer (1972) drew on both these approaches using facial expressions and readily understood terms as follows:

![Facial Expressions]

As an alternative approach to hedonic rating scales, a number of other studies have looked at the willingness of respondents to eat specific foods. Responses to "willingness to eat" questions are then used as a reflection of attitudes to the foods in question (Hall and Hall 1939, Lamb, Adams and Godfrey 1954, Schuck 1961). The advantage of this approach is that it reduces the problems of
relating like/dislike preferences to actual behaviour. For example, "willingness to eat" would relate more directly to behaviour in situations where no foods are particularly liked but items are nevertheless selected. In the final analysis most researchers have been concerned with actual behaviour in terms of foods selected or eaten, "willingness to eat" evaluations will clearly be more closely related to this than like/dislike ratings.

Both the above approaches suffer from the problems associated with the verbalisation of preferences. Whilst some respondents may have problems in understanding the terms used, there may also be those who are unwilling or unable to disclose their actual preferences. In order to avoid these problems, and to base the data on reality, some studies have observed actual feeding behaviour, identifying preferences in terms of food selections, consumption and plate waste. Carlisle, Bass and Owsley (1980) used such an approach to investigate the food preferences of Alabama teenagers. Head, Giesbrecht and Johnson (1977) used weighed plate waste, as well as the hedonic scales already mentioned, to gauge food acceptability. Clearly, however, any results obtained from such approaches are limited by the range of foods offered in the particular situation in question.

The effectiveness of both hedonic and acceptability scales depends upon the willingness and the ability of the respondent to give genuine views. In some cases these may not be forthcoming since individuals may not be aware of their own motives, they may wish to conform to social norms or they may wish to project a favourable image. For these situations one needs to probe more deeply and this has led to the development of indirect projective techniques. Lewin (1942) developed a technique using hypothetical situational questions to which children could relate and respond accordingly. This tool was adopted by Litman, Cooney and Steif (1968) in a study of the food attitudes of Minnesota schoolchildren. Other similar indirect projective techniques that could be adopted include sentence completion, picture interpretations, play techniques (especially useful for children) and experiments (see Oppenheim 1968).
All the approaches discussed so far have concentrated on feeding behaviour in terms of food preferences. There are however many other associated factors that are of importance in determining feeding behaviour (Oppenheim 1968). This study is concerned with the behaviour of schoolchildren at lunch and clearly there are other considerations other than just the food that will help determine the child's decisions with regard to lunchtime feeding. For this reason, the above approaches were not adopted for this study.

The need was for a more broad based approach which would identify the whole range factors of importance in the feeding experience. Factors beyond just food preferences. Other matters of concern could include such things as food costs, the feeding environment, the convenience of feeding, and the social aspects of feeding. A technique was thus required that would encourage respondents to verbalise such factors. A further requirement of this study was that attitudes to school meals should be measurable so that comparisons may be made between different groups of individuals - boys/girls, schools, age groups, for example. A number of attitude measuring techniques have been developed that fulfill both these requirements. They have only rarely however been used to determine attitudes to food and feeding behaviour.

Law, Lewis, Grant and Bacheman (1972) investigated the attitudes of high school students to school lunches using a questionnaire composed of questions that could be answered by choosing one of several statements. Their results identified aspects of importance to the students - having to stay in school during lunchtime, queuing, portion sizes, meal quality - but did not assign values to their overall attitudes to school feeding.

Carlisle, Bass and Owsley (1980) looked at the connotative meanings of foods for high school children in Alabama, using an instrument following the semantic differential scales of Osgood, Succi and Tannenbaum (1957). This approach measures the multidimensional connotative meanings of food looking at a number of dimensions in
polar terms that cover a range of meanings associated with foods. Ratings may thus be made over a number of dimensions of meaning and comparisons may be made between different attitudes. Carlisle et al. (1980) concluded that, "the connatative meanings of foods are associated with preferences", and in particular that "age-related meanings" indicated higher preferences, that is that there were higher preferences for foods that were considered to be appropriate for teenagers. Indirect or connative aspects of feeding are therefore clearly of importance in determining feeding behaviour.

Carruth and Anderson (1977) looked at the development of an attitude measuring instrument for food and nutritional attitudes. They used a pool of 40 attitude statements, selected by a panel of judges, which were arranged in a Likert scale type format i.e. five alternative responses in the "strongly agree" - "strongly disagree" continuum (the Likert scaling technique is discussed in detail in section 3.4.6.). They concluded that, "Without more rigorous methodology, attitude measurement in nutrition education will remain at the descriptive, qualitative level of research". The specific aspects they identify as part of this "rigorous methodology" are the internal consistency, or unidimensionality of the pool of attitude statements (the extent to which statements all measure the same attitude), the content validity of the statements used (how appropriate statements are to the population and attitude being investigated), and reliability over time.

The aspects identified by Carruth and Anderson (1977) may indeed be built into the technique in the following ways. Unidimensionality may be ensured using factor analysis and by discarding inappropriate statements. Surprisingly, Carruth and Anderson used factor analysis after selecting statements for their scale rather than as a basis for selection. Their results established that the attitude instrument was not in fact internally consistent, a fact they should have identified before the survey rather than after it!

The content validity of statements may be ensured by obtaining statements and views from the specific population to be investigated, rather than from a range of ad hoc sources, some of
which may be inappropriate. Reliability over time is important, especially with regard to the time between the attitude measurement and the measurement of behaviour. Using the Likert and Thurstone attitude scaling techniques, Carruth and Anderson found that reliability over time was achieved. Either of these would therefore appear a possibility for this study.

Having reviewed previous studies, the use of attitude scaling techniques (e.g. Likert or Thurstone scales) for the purpose of identifying important aspects of the feeding experience, including connotative aspects, and for the rating of attitudes to school feeding for comparative purposes, would seem appropriate.

3.4.3. Attitudes and the prediction/explanation of behaviour.

In early considerations of the role of attitudes it was widely assumed that attitudes had a direct bearing upon behaviour and as such could be used as predictors of behaviour (Allport 1954, Campbell 1950, Doob 1947). However, Richard LaPiere (1934), in his study of the attitudes of hoteliers towards racial minorities, found substantial differences between the amount of prejudice expressed in his questionnaire measure of attitudes and the overt public behaviours he observed. These results cast serious doubts in the minds of social psychologists on the extent of the attitude-behaviour relationship.

It should be noted however that LaPiere did not completely reject the attitude-behaviour concept, but rather questioned his own approach in terms of the usefulness of attitude measurement procedures that ask individuals to describe their attitudes. Nevertheless, in the 35 years since LaPiere many further studies investigated the relationship between verbalised expressions of attitudes and observed behaviours. Wicker (1969) provides a comprehensive review of these studies concluding that, "It is considerably more likely that attitudes will be unrelated or only slightly related to overt behaviours than that attitudes will be closely related to actions". The evidence he cites, however, does
not really back his assertion since at least half the studies quoted show attitude-behaviour correlations of over +0.4 indicating at least some degree of positive relationship.

Despite Wickers pessimistic conclusions, social scientists have continued to investigate the attitude-behaviour relationship with a view to establishing more predictive measures of behaviour. It has been suspected that low correlations between attitudes and behaviour are not due to weak relationships, but that they have been the result of inappropriate measurements of the variables. Indeed the early pessimism about the predictive validity of attitudes has recently given way to the suggestion that strong attitude-behaviour relations may in fact be obtained under certain conditions.

It is believed that in the absence of many of the extraneous influences, the individuals attitudes would indeed be expressed in behaviour. Psychological vacuums are impossible to create however, so techniques have to be developed that will minimise or allow for such variables. Clearly the behaviour of any individual will be subject to a number of influences that cannot be predicted or allowed for. The prediction of individual behaviour is thus fraught with problems.

The prediction of the behaviour of groups of respondents however, especially large groups, using appropriate attitude measures, may be made with some degree of reliability. This is because the effects of unusual and irregular influences will to a large extent be smoothed out by the size of the sample i.e. most of the sample will behave in a regular manner. Clearly, to be effective any technique must identify major determinants of behaviour for the group as a whole. This point is borne out by Udell (1965) in a study investigating a large sample of 1,400 respondents. Udell used the Thurstone technique (discussed in later sections) to predict consumer behaviour, specifically behaviour and attitudes to trading stamps. He concluded that the "Thurstone attitude indexes were predictive of the stamp-saving behaviour of the respondents".
3.4.4. Moderators of the attitude-behaviour relationship.

A number of aspects of attitudinal and behavioural measurement have been identified as important moderators of the predictive relationship. These moderating aspects and their implications will now be discussed.

Methodological refinements include concern over the levels of specificity at which variables are measured. Not only must it be ensured that the attitude measure is directly concerned with the object of the behaviour, but research has shown that attitude-behaviour correlations are highest when the same level of specificity or generality is used for each (Liska 1974, Ajzen and Fishbein 1973, Fishbein and Ajzen 1975). Thus, for the prediction of specific behaviours, attitudes to these specific behaviours must be measured as opposed to more general attitudes towards the object of the behaviour. Therefore, in the investigation of the uptake of school meals, attitudes towards actually taking meals, rather than just the meals themselves, should be measured.

It is an objective of this study however to identify important aspects of school feeding as perceived by the pupils. There is therefore a need to investigate general attitudes to school feeding as well as specific attitudes to taking meals. In the final analysis the combination of obtaining statements from a sub-sample of schoolchildren and the use of factor analysis should ensure the appropriateness of attitude statements included in the survey.

Cook and Sellitz (1973) suggest that in order to limit the effects of inaccuracies in any one attitude measurement technique, several different techniques should be used together. There are time and logistical problems associated with such a multiple technique approach, and indeed for these reasons it has rarely been used in practice. Additionally Cook and Sellitz suggest that more than one measure of behaviour should be used because single measures of behaviour are more likely to be unrepresentative of general behaviour. This would be difficult in this study because the ILEA were only able to provide one set of data on school meal uptake for
the relevant period. As already mentioned, the use of a large sample should ensure that unusual or irregular responses will be less significant.

Davidson and Jaccard (1979) looked at the attitude-behaviour relationship in a longitudinal study to examine the effects of time on the consistency of the relationship. They found that "the larger the time interval between the measurement of attitude and behaviour, the higher the probability of exposure to new information and, in turn, attitude change". This would thus lead to the greater likelihood of weak attitude-behaviour correlations. It is clear therefore that measures of attitudes and behaviour should take place at fairly similar points in time.

In addition to methodological refinements in attitude-behaviour testing, personal and situational variables have also been identified as influencing the extent to which individuals respond to their measured attitudes. The relevance of the identified behaviour to the respondent is an important factor. Several researchers have investigated the extent to which the prediction of behaviour through attitudes is determined by previous experience of that behaviour (Fazio and Zanna 1978, Zanna, Olson and Fazio 1980, Borgida and Campbell 1982). Zanna, Olson and Fazio (1980) concluded that "an attitude representing a summary of relevant past behaviours is more predictive of later behaviours than is an attitude formed outside the behavioural arena". It is therefore important that respondents have behavioural experience of the attitude object before any predictions of behaviour may be made through attitude testing. For the purposes of this survey most schoolchildren will have had at least some experience of school meals, the attitude object in this case.

Encouragement cues such as observing others carry out appropriate behaviours, also appear to be significant in the attitude-behaviour relationship. School feeding is a relatively high profile school activity and as such will be fairly frequently observed by most pupils.

A final moderator of attitude-behaviour consistency is the extent to
which attitude responses and the corresponding behavioural responses may be made with the same level of difficulty/ease. Whilst it may be easy to give an attitude response, the corresponding behavioural responses may be more difficult to achieve for a number of reasons. These may include such factors as social or peer group pressure which may therefore modify or completely change behaviour (Campbell 1963). The implications of this are that either the expression of attitudes should be at the same level of difficulty as the behaviour, or that the attitude measurement should allow for difficulty or obstructions to the appropriate behaviour.

In this study respondents were allowed to complete their survey forms within their own social groupings. In this way it was hoped that the influence of peer groups would be transferred to the attitude measurement.

To summarise, the following factors have been identified as moderators of the attitude-behaviour relationship. Methodological factors include:

- the levels of specificity or generality at which attitudinal and behavioural variables are measured,
- the number of attitude and behaviour measures used,
- the size of the sample investigated,
- length of time between the measures of attitude and behaviour.

Personal and situational variables of significance include:

- previous experience of appropriate behaviours,
- encouragement cues,
- levels of interest in the outcome of behaviours,
- the relative difficulty or ease with which attitude and behaviour responses may be made.
3.4.5. The Inner London Education Authority.

The Inner London Education Authority (ILEA) was used for the investigation into schoolchildren's attitudes to school feeding for the following reasons;

- the authority is committed to the maintenance of a school meals service,
- the authority had a particular interest in the problem of uptake,
- the authority was willing allow researchers access to schools and school children,
- the ILEA provides an extremely diverse school population. This enables the analysis of many sub-groups of the school population.

The ILEA was also particularly interesting because of its policy of change towards a cash cafeteria system. The ILEA had first introduced this type of service in the early 1970's, and at the time of this research was still in the process of the change-over. This enabled a comparative investigation to be carried out comparing the attitudes to traditional types of meal operation and the attitudes to the cash cafeteria operation.

The ILEA is the largest local education authority in Europe. It covers the twelve boroughs of Inner London (figure 3.2.) and caters in its school meals service for about 800 primary and 180 secondary schools, employing approximately 7,500 staff. The school meal budget in 1983 was approximately £40 million. The ILEA is committed to maintain a subsidised meal service of a high quality in terms of both acceptability and nutrition.

The ILEA school meals service has to provide meals to an extremely varied school population. Apart from English about 131 different languages are spoken in ILEA schools. The following twelve languages, excluding English, are spoken by more than a thousand individuals: Bengali, Turkish, Greek, Spanish, Gujarati, Punjabi, Italian, Urdu, Chinese, French, Arabic, Portuguese. Tables 3.10. and 3.11. show the ethnic origin of primary and secondary school pupils in the ILEA.
Figure 3.2. Inner London Education Authority Divisional Areas
Table 3.10. Number of pupils in ILEA primary and secondary schools by ethnic group.

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Primary</th>
<th></th>
<th>Secondary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nos.</td>
<td>% total</td>
<td>Nos.</td>
<td>% total</td>
</tr>
<tr>
<td>British</td>
<td>95,070</td>
<td>59.0</td>
<td>93,102</td>
<td>62.3</td>
</tr>
<tr>
<td>West Indian</td>
<td>20,625</td>
<td>12.8</td>
<td>23,761</td>
<td>15.9</td>
</tr>
<tr>
<td>Asian</td>
<td>13,696</td>
<td>8.5</td>
<td>8,817</td>
<td>5.9</td>
</tr>
<tr>
<td>Mixed</td>
<td>10,152</td>
<td>6.3</td>
<td>7,173</td>
<td>4.8</td>
</tr>
<tr>
<td>Other</td>
<td>8,540</td>
<td>5.3</td>
<td>6,725</td>
<td>4.5</td>
</tr>
<tr>
<td>African</td>
<td>4,673</td>
<td>2.9</td>
<td>3,437</td>
<td>2.3</td>
</tr>
<tr>
<td>Turkish</td>
<td>2,739</td>
<td>1.7</td>
<td>2,242</td>
<td>1.5</td>
</tr>
<tr>
<td>Greek</td>
<td>2,095</td>
<td>1.3</td>
<td>2,092</td>
<td>1.4</td>
</tr>
<tr>
<td>Chinese</td>
<td>1,934</td>
<td>1.2</td>
<td>1,345</td>
<td>0.9</td>
</tr>
<tr>
<td>Arab</td>
<td>1,450</td>
<td>0.9</td>
<td>747</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>161,135</td>
<td>99.9</td>
<td>149,442</td>
<td>100.0</td>
</tr>
</tbody>
</table>

ILEA definitions of ethnic groups:
- **Asian** - Indian sub-continent, e.g. India, Bangladesh, Pakistan.
- **Chinese** - Also other Far East, e.g. Japan, Vietnam.
- **British** - English, Welsh, Northern Irish, Scottish.
- **Arab** - Includes North African Arab, e.g. Morocco, Egypt.
- **Mixed** - mixed ethnic origins.
- **Other** - Pupils of other ethnic origins.

<table>
<thead>
<tr>
<th>Division</th>
<th>Main language groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kensington &amp; Hammersmith</td>
<td>Spanish, Italian, Portuguese, Arabic, others.</td>
</tr>
<tr>
<td>2. Camden &amp; Westminster</td>
<td>Bengali, Greek, Spanish, Italian, Chinese, Arabic, Portugese, others.</td>
</tr>
<tr>
<td>3. Islington</td>
<td>Turkish, Greek, Italian.</td>
</tr>
<tr>
<td>4. Hackney</td>
<td>Turkish, Greek, Gujarati, Punjabi, Urdu, French, others.</td>
</tr>
<tr>
<td>5. Tower Hamlets</td>
<td>Bengali, Turkish, Punjabi.</td>
</tr>
<tr>
<td>7. Lewisham</td>
<td>Turkish, Italian.</td>
</tr>
<tr>
<td>8. Southwark</td>
<td>Turkish, Greek, others.</td>
</tr>
<tr>
<td>9. Lambeth</td>
<td>A mixture of the twelve plus others.</td>
</tr>
<tr>
<td>10. Wandsworth</td>
<td>Gujarati, Italian, Urdu, others.</td>
</tr>
</tbody>
</table>

Notes:  
- Languages other than the main twelve are listed as "others".
- Language groups of the greatest concentration are underlined.

Source: Inner London Education Authority, 1981.
As already mentioned uptake was a matter of particular concern to the ILEA. In the years up to 1980 the uptake in ILEA schools had steadily fallen as shown in Table 3.12.

Table 3.12. The uptake of school meals within the ILEA 1970-1980.

<table>
<thead>
<tr>
<th>Year</th>
<th>Paid Meals(%)</th>
<th>Free Meals(%)</th>
<th>Total Uptake(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>52</td>
<td>15</td>
<td>67</td>
</tr>
<tr>
<td>1971</td>
<td>42</td>
<td>18</td>
<td>60</td>
</tr>
<tr>
<td>1972</td>
<td>45</td>
<td>19</td>
<td>64</td>
</tr>
<tr>
<td>1973</td>
<td>46</td>
<td>19</td>
<td>65</td>
</tr>
<tr>
<td>1974</td>
<td>50</td>
<td>19</td>
<td>69</td>
</tr>
<tr>
<td>1975</td>
<td>50</td>
<td>19</td>
<td>69</td>
</tr>
<tr>
<td>1976</td>
<td>48</td>
<td>19</td>
<td>67</td>
</tr>
<tr>
<td>1977</td>
<td>40</td>
<td>22</td>
<td>62</td>
</tr>
<tr>
<td>1978</td>
<td>40</td>
<td>24</td>
<td>65</td>
</tr>
<tr>
<td>1979</td>
<td>40</td>
<td>23</td>
<td>63</td>
</tr>
<tr>
<td>1980</td>
<td>37</td>
<td>22</td>
<td>59</td>
</tr>
</tbody>
</table>


Within the ILEA, the introduction of the cash cafeteria meal service appears to have caused a very significant increase in uptake. Table 3.13. shows the average number of pupils taking school meals for twelve week periods before and after the introduction of the cash cafeteria service. The mean increase in uptake at these twelve schools was 45%. This is quite a dramatic change which must however be viewed with caution since the uptake figures for the period after the introduction of the cash cafeteria are "equated meals" - obtained by dividing the total money spent in the cafeteria
Table 3.13. Changes in meal uptake with the introduction of cash cafeteria service.

<table>
<thead>
<tr>
<th>School</th>
<th>Average weekly meals (1)</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before (2)</td>
<td>After (2)</td>
</tr>
<tr>
<td>Lewisham</td>
<td>1,490</td>
<td>1,970</td>
</tr>
<tr>
<td>Crown Woods</td>
<td>2,610</td>
<td>4,030</td>
</tr>
<tr>
<td>Central Foundation</td>
<td>830</td>
<td>1,100</td>
</tr>
<tr>
<td>Norwood</td>
<td>900</td>
<td>1,020</td>
</tr>
<tr>
<td>Dalston Mount</td>
<td>1,010</td>
<td>1,590</td>
</tr>
<tr>
<td>Blackheath Bluecoat</td>
<td>1,410</td>
<td>1,820</td>
</tr>
<tr>
<td>Fulham Gilliat</td>
<td>460</td>
<td>660</td>
</tr>
<tr>
<td>Hampstead</td>
<td>1,600</td>
<td>2,400</td>
</tr>
<tr>
<td>St. Philip Howard</td>
<td>1,150</td>
<td>1,760</td>
</tr>
<tr>
<td>Deptford Green</td>
<td>1,230</td>
<td>1,870</td>
</tr>
<tr>
<td>Islington Green</td>
<td>940</td>
<td>1,410</td>
</tr>
<tr>
<td>Henry Thornton</td>
<td>1,430</td>
<td>2,270</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>15,060</strong></td>
<td><strong>21,800</strong></td>
</tr>
</tbody>
</table>

Notes:

1. Equated number of meals = Total money Taken (p) / 35p
2. Calculations based on average demand over 12 weeks before and after conversion


by 35p (the price of the standard school meal in the ILEA). Thus, depending on the average spend, these figures could be either an under or over-estimate of the true pupil uptake figure. The ILEA
have investigated the average spend in three of their schools and the results were as follows:

- Those spending less than 15p: 5%
- Those spending 16-25p: 7%
- Those spending 26-35p: 42%
- Those spending 36-50p: 38%
- Those spending over 50p: 8%  

(ILEA 1982)

These figures indicate that the children do spend around 35p per meal and so the equated uptake figures are likely to be fairly close to the actual pupil uptake.

The results in table 3.13 would therefore appear to show that at least part of the solution to the problem of the low uptake of school meals lies with the introduction of the cash cafeteria style of operation. Investigation of the attitudes of children to school feeding should provide some reasons for this trend.

In order to maximise uptake it is necessary to establish what children perceive as important in the lunchtime feeding programme in more specific terms. Furthermore, it is also important to determine whether the various sub-groups of the school population have particular needs, or perceive particular problems. In this way the school meals service may tailor its food program more precisely to the requirements of their customers and therefore increase the uptake of school meals. The following sections will detail the approach and the results of the research investigating schoolchildren's perceptions of the school feeding experience.

3.4.6. Methodology.

The following approach was adopted for the purpose of identifying the attitudes of children within the ILEA to school meals. These attitudes will indicate the reasons for high and low uptakes under different conditions. The general approach is illustrated in figure 3.3. Each stage of this approach is described fully in the following sections.
In order to gain an understanding of the typical school environment, the pupils involved, and in particular the catering/dining environment, eight schools were visited in the preliminary stages of the research. These schools were selected by the Education Catering Branch of the ILEA as representative of the schools in inner London. All visits took place during the lunchbreak so that the school meals service could be observed and indeed in many cases so that the school meal could be sampled. The meals service, and any particular problems relevant to the research were discussed with both the District Catering Organiser and the cook-in-charge/supervisor at each school. Where possible, headteachers were also consulted about their views on matters concerning the provision of school meals. The views of headteachers and supervisors in the ILEA were fully researched in a study conducted in parallel with this research, the results being published by Kipps and Thomson (1984). Whilst observing the meals service, pupils were also consulted about lunchtime feeding and school meals specifically. Discussions with these pupils were intended to provide initial impressions of their views and attitudes and as such were very informal and unstructured.

At each school a data checklist (appendix 1) was completed. This covered a number of aspects of the meal service and school statistics, and attempted to identify characteristics of the meal service with a view to identifying problems and any common themes associated with low school meal uptake.

These visits, the information gained from the data checklists, and particularly the informal discussions with the pupils, clearly established that the only valid approach to identifying the reasons for the pupils lunchtime feeding behaviour was through the investigation of their perceptions and attitudes. It became apparent that imposing the perceptions and values of the researcher onto the situation would not produce valid results. For example, should it
Figure 3.3. The approach adopted for identifying children's attitudes to school meals.

- Preliminary visits to schools to observe meals operation.
- Group discussions with pupils to identify important variables.
- Initial drafts of survey questionnaire.
- Pilot study to evaluate questionnaire and techniques adopted.
- Final questionnaire to quantify variables and measure attitudes.
- Survey of representative sample of ILEA schools.
- Data processing.
- Analysis of results, formulation of conclusions.

Be established through fieldwork that meals are often served cold, it would not be valid to cite this as an uptake problem unless it is also established that it is perceived as a problem by the pupils themselves. A far better approach is to establish what pupils
perceive as important at lunchtime, and what they perceive to be the problems with school meals. One may then identify and quantify, through survey work, the reasons for lack of participation or dissatisfaction.

(ii) Attitude measurement.

As has already been stated, this study is concerned with the attitudes of schoolchildren to lunchtime feeding. Attitudes may be defined, for this purpose, as the positive or negative feelings that give rise to a tendency to act or react in a certain manner to particular objects or stimuli - school feeding in this instance.

There has been much research into methods of attitude scaling and measurement and there are consequently a number of techniques that have been developed for this purpose. It is therefore necessary to select the appropriate technique to meet the requirements of the research in hand. The criteria that need to be satisfied in this situation are that the technique should:

- identify aspects of the school meals service that are perceived as important by pupils.
- enable the quantification of the factors already identified as important to pupils. This will indicate the importance of each factor to the whole sample.
- measure attitudes to school feeding so that comparisons may be made between sub-groups in terms of whether they are more or less positive/negative in their attitudes to school meals.

In addition, the nature of the population to be sampled imposes a number of considerations on the choice of attitude measurement technique. The following characteristics are important in this sample:

- pupils from 10-17 years of age and across the whole range of abilities will be sampled. Any technique must therefore be readily understood by all potential respondents.
the interviews or questionnaires will be conducted at school therefore any technique must cause the minimum of disruption to the school routine. Ideally, it should be possible to carry out the work within one lesson period of around 45 minutes — effectively 30 minutes allowing for introduction and explanation — and with whole classes averaging 25 pupils.

Due to the limitations of researcher time, and the necessity for a large sample to quantify the important factors in the feeding experience, any selected technique must be suitable for batch completion and processing. It should not require individual interviews. Questionnaires should lend themselves to precoded responses and computer analysis.

The above requirements rule out a number of the available techniques.

1. Projective Techniques;

These are indirect probing techniques used when it is necessary to penetrate below the levels of conscious awareness or behind an individual’s social façade. They include such methods as sentence completion, cartoons (where speech ‘balloons’ are filled-in by the respondents), picture interpretation (where fairly ambiguous pictures are interpreted by the respondents), and play techniques (particularly useful for investigating children). For a more extensive description of these see Campbell (1950) — reprinted in Warren and Jahoda (1973) — and Oppenheim (1968).

These techniques are not suitable for this research however since they do not lend themselves to precoded responses and they usually require individual interviews for each respondent.

2. Repertory Grid;

A technique developed by Kelly (1955) and advanced by Bannister (1962), which attempts to identify the meaningful attributes of
stimuli for a particular individual. This is achieved by asking how, out of three objects, two are alike and in the same way different from the third. In this way respondents verbalise their attitudes.

This technique does not suit the requirements of this study because the rather abstract concepts would be difficult for young children to understand, and furthermore, it would be impossible to precode the responses for computer analysis.

3. The Semantic Differential;

The Semantic Differential technique is concerned with the measurement of the different kinds of meaning, or the different semantic dimensions, which we adopt in the conceptualization of any object or stimulus (see Osgood, Suci and Tannenbaum 1957 and Osgood, May and Miron 1975). Three main dimensions of judgement have been identified, evaluative (good/bad), active (active/passive), and potency (strong/weak). The Semantic Differential thus utilises a number of unidimensional scales each assigned a range of values with seven points at one end of the scale and one point at the other. These scales would cover the three areas of judgement and in this way assess the attitudes of respondents to the particular stimuli across a number of dimensions.

This technique would probably prove too abstract and confusing for many of the children involved and was thus not selected, despite its suitability for precoding and computer analysis.

4. Scalogram Analysis;

Developed by Guttman (1944) and frequently referred to as the Guttman Scale, this technique uses attitude statements to form an ordinal scale. This means that a respondent's particular score on the scale indicates exactly what items he has endorsed. This method is only suitable, however, for investigating fairly
narrow concepts or stimuli for which a suitable quantitative variable may be assigned. The concept of lunchtime feeding encompasses a whole range of factors that would be impossible to rank in any meaningful ordinal scale. Furthermore, the Guttman Scale requires the items to be dichotomous, that is, respondents may only agree or disagree. There is thus no option to express indifference or strong agreement/disagreement to statements. For these reasons this technique was not deemed suitable for this study.

Two techniques that do satisfy the criteria already discussed are the Thurstone method and the Likert method. Both use attitude statements with which respondents either agree or disagree. The Thurstone method concentrates on creating a scale with attitude statements spread out at equal intervals along the positive attitude-negative attitude continuum. Respondents' attitudes are then measured according to the statements with which they have agreed, that is the degree to which they are positive or negative attitude statements (Thurstone 1928, Oppenheim 1968).

Although the Thurstone method produces reliable scales, it is also very time consuming to develop (Edwards & Kenney 1946). The Likert method however is less laborious and requires much less time to develop. Direct comparisons between the two approaches by Barclay and Weaver (1962) have indicated that the Thurstone scale takes around 43% more researcher time to construct than does the Likert scale. Furthermore, research by Edwards and Kenney (1946) has revealed that Likert scales correlate well with Thurstone scales (correlation coefficient of +0.92), and as Oppenheim (1968) states, their reliability is often higher - a reliability coefficient of 0.85 is often achieved (Edwards and Kenney found in their research a reliability coefficient of 0.94 for the Likert scale). For these reasons the Likert scale was selected as the technique to be used in this study.
(iii) The Likert method of attitude measurement;

Having briefly described the alternative methods of attitude measurement, and the reasons for their rejection, the Likert (1932) method will now be discussed. The method may be developed in a number of stages as follows.

1. Initially a pool of attitude statements concerning the stimulus in question must be generated. These statements should be clear, concise and phrased such that the sample can understand and relate to them. Double negatives in particular should be avoided. Ideally the source of the statements should be a sample of the population to be tested in order to ensure their validity. It is generally better to generate a good many more statements than are likely to be finally used since a number will be ruled out at later stages as unsuitable for use.

2. A sample of respondents, as similar as possible to the population to be sampled for the main survey, should be used to test the pool of statements. All statements should be assigned five possible responses - strongly agree, agree, indifferent, disagree, strongly disagree. From these the respondents have to select one as representative of their view on that statement. Each of the responses is assigned a score of between one and five, depending upon whether a high score represents a favourable or unfavourable attitude to the object in question. Thus for a statement that is favourable, strongly agree will be assigned a score of five, whilst for an unfavourable statement, strongly agree will be assigned a score of one. This is assuming that a high score represents a favourable attitude.

3. Using the results of the trial sample, each statement should be graded in terms of how well it measures the attitude in question. Only the statements that best measure the attitude should then be retained for the main survey. Ideally the scores for each statement should be correlated with a reliable and accurate independent gauge of the attitude in order to
identify those statements that measure the attitude. Unfortunately, such independent gauges are rarely available and the best alternative is to use the internal-consistency method of item-analysis. This involves correlating the scores for each statement with the scores for the rest of the pool of statements. Negative correlation coefficients indicate that the numerical values are not properly assigned (the one and five ends of the scale should be reversed), and zero or low coefficients indicate that the statement does not measure the same attitude as the body of statements, Likert (1932) refers to these as "undifferentiating" statements. By retaining those statements with the highest positive correlation coefficients, and rejecting those with low coefficients, the pool of statements may be refined into a more consistent and reliable measure of the attitude (Likert 1932).

The major assumption inherent in this method is that the statements, as a whole, measure the attitude with which we are concerned. For this to be the case the statements with tenuous or abstract links to the attitude should be minimised. The use of such statements will inevitably dilute the relationship between the attitude and the pool of statements, and may in extreme cases lead the pool to measure factors unrelated to the attitude in question. Clearly factor analysis based upon such a pool will accentuate the deviation from desired attitudes.

4. Having discarded the low correlating items, a revised pool of statements that more accurately measure the attitude should remain. Likert (1932) further suggests that to avoid stereotyped responses, the statements should be worded such that half express positive attitudes to the stimulus and half negative attitudes. The statements should then be arranged in random order within the questionnaire.

Although the main concern of the Likert scale is to ensure that all items in the survey measure a particular attitude, a major advantage is that items that are not obviously related to the attitude can be identified. As has been stated, aspects of the school meals service that are perceived by the pupils as important are of concern, this
technique facilitates the identification of such factors through the initial interviews used to generate attitude statements. Furthermore, items included in the Likert scale may be individually analysed in order to determine their relative importance to the sample (Moser & Kalton 1979). This satisfies the requirement that factors associated with lunchtime feeding should be quantified in terms of the number of respondents who perceive them as important.

(iv) Group Discussions.

Group discussions were carried out at two schools within the ILEA, one operating a traditional meal service and one operating a cash cafeteria service. This ensured that views arising from the recipients of both types of operation were obtained. Three groups of around ten pupils were interviewed at each school - one of first year pupils, one of third year pupils, and one of fifth year pupils.

The aims of these discussions were to:

1. enable the researcher to gain an understanding and feel for the population to be sampled,
2. identify the aspects of lunchtime feeding at school that are perceived as important by pupils,
3. generate the attitude statements for use in the attitude survey,
4. act as a basis for the phrasing of questions in a form which will be readily understood by London schoolchildren.

As a qualitative technique, the aim of group discussions is not to quantify variables but to identify factors of relevance to the sampled population. As with depth interviews, group discussions aim to probe underlying attitudes, but in addition they also enable the participation of groups of respondents, thus providing a wider range of views (Social and Community Planning Research 1972). In this way it is hoped that most aspects of importance to schoolchildren in London will be identified.

All discussions took place in class-rooms away from the distraction.
of other pupils. They lasted for approximately thirty-five minutes. Each was preceded by a brief introduction explaining that the views of schoolchildren on lunchtime activities were being sought by the University of Surrey on behalf of the ILEA. There was no direct mention of school meals during this introduction so that the topic might arise spontaneously during the course of the discussion. This also ensured that other important aspects of the lunch period were discussed and that the emotive subject of school meals did not totally dominate the conversation. Apart from the introduction there was no formal structure imposed on the discussion. The group were allowed to raise the topics that were felt to be important and only occasional prompts were given in order to remain on the broad topic of lunchtime activities. In all six group discussions the subject of school meals arose without prompting. To ensure that accurate records of the discussions were kept they were all tape-recorded with the prior consent of the group. The use of taped records also enabled the use of direct quotations for the attitude statements, and avoided the problem of the researcher being occupied with recording comments by hand.

For the group discussions to be successful in identifying variables and attitudes to lunchtime activities, it was essential that the members of the group were at ease and felt free to express themselves fully. With this in mind, it was particularly stressed that the researcher was not a teacher, that comments would not be relayed to the school or attributed to any particular pupils, names were not solicited, and that the tape of the discussion would be immediately taken to the University of Surrey for analysis.

At the end of each discussion, all members were invited to write down any additional thoughts or strong feelings they might have. The comments that were made are shown in appendix 2. This ensured that those less forthcoming pupils had the opportunity to express themselves.

All six group discussions were successful in generating a range of comments. Indeed, once the participants had been assured of confidentiality, comments came freely and it became clear that the pupils were pleased of the opportunity to express their feelings.
Using the information gained from the initial school visits and the group discussions, the initial drafts of the questionnaire could be formulated. Before devising the questionnaire, however, the aims and the types of information expected to be generated were identified as follows:

1. to quantify the factors perceived as important by the pupils,
2. to measure the attitudes of respondents to the school meals service,
3. to evaluate the problem of foods that some groups of respondents will not or cannot eat,
4. to determine the importance of lunch and identify the activities with which it has to compete for the time and attention of pupils at lunchtime,
5. to determine where respondents get their lunches from and the reasons why,
6. to determine the extent of parental influence on lunchtime feeding on school days,
7. to analyse the above findings by age, sex, and type of school meal service.

The draft questionnaire is shown in appendix 6. The question identification numbers were not included when the pilot study was carried out in order to avoid any suggestion of priority. They are included here in order to allow questions to be identified in the discussion.

Most of the questions were precoded on the basis of information gained in the preliminary visits and group discussions. Many questions however include an open response in order to allow for further relevant responses to be included in subsequent versions of the questionnaire.

The role of each question in the achievement of the above aims will now be discussed.
1. Personal data.

Questions 1, 2, and 3 in the questionnaire are concerned with defining the personal data of each respondent. Age and sex were both anticipated as important variables which may have implications for attitudes to school feeding. The name and code of the school were also important since analysis by type of school and the nature of the catering service would be carried out.

The names of respondents were not sought as such data would be of little value - all analysis would be on the basis of aggregate figures or sub-groups of the sample. Furthermore, it was essential that for honest and genuine responses, confidentiality should be ensured through anonymity.

Questions relating to parental and ethnic backgrounds were not included because any analysis along such lines could be achieved by school - the ILEA provided aggregate school data for this purpose. Furthermore, the ILEA had informally expressed the view that the collection of such personal data would be inappropriate and inconsistent with its policies.

2. Foods that respondents could not eat.

Questions 4 and 5 dealt with identifying the particular foods that respondents could not eat. As has already been stated, ethnic background was not probed. To establish the effects of religion and beliefs on feeding, a direct question was asked (question 5). A direct question such as this avoided having to determine the extent to which religion and beliefs influence food habits. For example, to what extent do third and fourth generation immigrants of any non-indigenous group still adhere to their ethnic beliefs? (see Kipps and Thomson 1984 for a discussion of these points).

Question 4 is precoded with the foods that may cause problems for some individuals. There is an open response in order to allow for unforeseen and unusual responses.
3. Lunchtime activities.

Questions 6 and 7 (appendix 6) are concerned with pupils lunchtime activities. The aim of these questions is to establish the relative importance of feeding at lunchtime, and to identify other activities that pupils see as important during this time.

Question 6 asks, "What did you do during lunchtime yesterday?". It specifically refers to "yesterday" in order to ensure that responses are based on reality. This reduces the risk that respondents will give answers that they feel are expected or are desirable, and also avoids responses based upon misconceptions about what respondents think they usually do. The large sample ensures that the aggregate responses should be representative of an average day. Question 6 will thus indicate how many pupils have a lunch and also other popular activities. For instance the numbers of pupils who go outside the school during lunch, which will also indicate the numbers who have direct access to external food sources.

Question 7, "What do you think is the most important thing to do at lunchtime?", attempts to rate the importance of alternative activities to the pupils. Furthermore, it should indicate those activities that would assume priority should choices have to be made.

4. Source of lunch.

Questions 8 and 9 aim to identify the sources of lunchtime food and the reasons for those choices. Again question 8 refers to "yesterday", for the same reasons as discussed for question 6. Question 9 seeks to establish the reasons for the choice of lunch place. The responses are not precoded because of the wide range of possible answers, and to avoid prompting responses. The results of the pilot study will provide a range of representative responses which may act as the basis of precoding in the final version of the questionnaire.
5. Parental influence and lunchtime feeding at school.

The extent to which pupils are influenced by their parents in their choice of lunchtime feeding is investigated in questions 10 and 11. Question 10 asks whether respondents are influenced by their parents, and if they are, in what way. Experience in the preliminary discussions indicated two likely responses, influence through financial limitations, and influence through verbal instructions. An open response was also included in order to allow for unforeseen factors to be expressed.

Question 11 asks where respondents believe their parents prefer them to have their lunch. Clearly this may not correspond with actual parental preferences, but the aim is to identify parental influence as perceived by the pupils, which may not necessarily be actual parental preferences. The responses from this question may also be cross-tabulated with the data on where respondents actually eat. This would indicate whether perceived parental preferences coincide with actual behaviour.

6. Preferred type of school meals service.

The last question in this section of the questionnaire asks, "From your experience, which type school canteen do you prefer?". Although many respondents will have had no direct experience of the cash cafeteria system, most will have an awareness of it and will be able to express some view. It will be interesting to quantify and compare the views of those with experience of the cash cafeteria system and those without direct experience. This will indicate the extent to which those pupils at schools with traditional catering systems desire the cash cafeteria system.

7. Attitudes to school meals.

The statements in the second half of the questionnaire, pages 4-9, are those generated by the group discussions. These will form the basis of the Likert scale. This large number of statements, a total of 69, will be pruned as described in section 3.4.6. The results of
the pilot study will provide the basis upon which statements will either be retained or rejected.

The procedure for this section of the survey is explained in detail on page 4 of the questionnaire (appendix 6) along with an example response. These instructions were vital in order to ensure that all respondents, the young and less able included, had a clear understanding of what was required.

For each statement there are five pre-coded responses — "strongly agree", "agree", "don't care", "disagree", and "strongly agree". Each response is assigned a value from one to five, with high values indicating positive attitudes. In the preliminary stages it was found that the pupils related more readily to the response "don't care" than to the usual response of "indifference". For this reason "don't care" was used as an expression of indifference. It should also be noted that the statements are listed in a random order with approximately half expressing positive attitudes ("strongly agree" assigned a value of 5) and half expressing negative attitudes ("strongly agree" assigned a value of 1).

Two of the statements — "I like to be able to buy fresh fruit at lunchtime" (number 35), and "Lunchtime is for relaxing" (number 50) — were not assigned values because it was not clear whether they were either positive or negative towards school feeding. For data processing and analysis purposes they were assigned codes 6 - 10. The results of the pilot study will indicate whether these statements are relevant for the attitude scale.

8. Aspects of lunchtime feeding perceived as important by pupils.

The attitude statements, as well as forming the basis of the Likert attitude scale, will also be used to quantify the importance of different factors in lunchtime feeding. Thus although statements may not correlate sufficiently highly to be included in the attitude scale, they may still be of interest for the investigation of factors in the lunchtime meal experience.
(vi) The Pilot Study.

The aims of the pilot study were as follows;

- To provide data on the attitude statements. This data will form the basis of decisions on which statements will be retained for the Likert scale, and will also be used as an indication of the important aspects of the feeding experience.
- To test the suitability of the responses for the precoded questions, and to act as the basis for precoding those questions with open responses.
- To test the adequacy of the questionnaire in terms of:
  - wording - is it clear, concise and unambiguous?
  - layout - are questions logically sequenced?
  - instructions - are they clear and precise?
  - timing - how long does it take to complete.
- To evaluate the fieldwork procedure in terms of the approach to pupils and school staff and to evaluate the suitability of the classroom environment for the completion of questionnaires.
- To determine the limitations on sample size set by time and numbers.
- To provide a trial analysis on data similar to that generated by the final survey. This will be particularly useful for testing the appropriateness of various statistical analysis programmes.

The pilot study was carried out at four schools within the ILEA - Bacons School, Kingsland School, Hydeburn School and Southfields School. Two of these schools were co-educational, one was a boys school and one was a girls school. The different types of meal service were included with two of the schools operating cash cafeterias and two schools operating a traditional meals service. A total sample of 225 pupils completed questionnaires selected from the first, third and fifth years. These age groups were selected in order to cover the range of ages in London secondary schools - there are relatively few schools with sixth forms of any size in the ILEA.
The results of the pilot study are discussed in the later sections of this chapter under the headings of Final Questionnaire, Sample, Procedure in the Field, and Analysis.

(vii) The Final Questionnaire.

The revised and final version of the questionnaire is shown in appendix 7. This version is the result of modifications to earlier versions based upon the results and experience on the pilot study.

It is not realistic to expect that all potential faults in the questionnaire will have been identified, but comparison with the initial draft (appendix 6) shows that many alterations and improvements have been made to the final questionnaire. The main modifications, including the formulation of the Likert scale, will be described and explained in the following section. As with appendix 6, the question numbers in the final questionnaire were not included in the survey copies. They are included here in order to facilitate the discussion of questions.

1. Attitude Statements;

The data for each of the attitude statements (except numbers 35 and 50 for the reasons already discussed) was correlated with the data for the body of statements in order to identify those that were suitable for the Likert scale. Only those statements with the highest correlation coefficients were selected and these are shown in table 3.14. They are shown in the final questionnaire (appendix 7) as Att.1 to Att.29. Two of the statements were discarded (numbers 31 and 38 in appendix 6) despite having high correlation coefficients. This was because they were very similar to other statements which had higher values which were included instead.

The statements not included in the Likert scale were then considered for their value in identifying the aspects of the meal experience perceived as important by the pupils. This was
Table 3.14. Attitude statements included in the Likert Scale.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would rather save my money than have school meals</td>
<td>0.682</td>
</tr>
<tr>
<td>I spend most of my time picking out the hairs and nasty bits from the school lunch</td>
<td>0.668</td>
</tr>
<tr>
<td>School meat is all gristly</td>
<td>0.654</td>
</tr>
<tr>
<td>The dinner ladies are really nice</td>
<td>0.650</td>
</tr>
<tr>
<td>We get hairs and things in school meals</td>
<td>0.645</td>
</tr>
<tr>
<td>If you complain the dinner ladies get annoyed and shout at you</td>
<td>0.634</td>
</tr>
<tr>
<td>I'd rather not eat than have school meals</td>
<td>0.631</td>
</tr>
<tr>
<td>It's boring in the dining room</td>
<td>0.625</td>
</tr>
<tr>
<td>I think the dinner ladies care about our food and what we eat</td>
<td>0.621</td>
</tr>
<tr>
<td>I don't think the cooks know what they are doing</td>
<td>0.621</td>
</tr>
<tr>
<td>The dinner ladies moan too much</td>
<td>0.595</td>
</tr>
<tr>
<td>With school meals everything is clean and hygienic</td>
<td>0.594</td>
</tr>
<tr>
<td>There is nothing I like about school meals</td>
<td>0.586</td>
</tr>
<tr>
<td>The cutlery is always clean and hygienic</td>
<td>0.585</td>
</tr>
<tr>
<td>With school meals you get more fat than meat</td>
<td>0.564</td>
</tr>
<tr>
<td>School meals fill me up</td>
<td>0.562</td>
</tr>
<tr>
<td>It's like a prison camp at lunchtime with teachers watching all the time</td>
<td>0.560</td>
</tr>
<tr>
<td>School food is often too greasy</td>
<td>0.560</td>
</tr>
<tr>
<td>The dinner ladies tell us off if we complain</td>
<td>0.556</td>
</tr>
<tr>
<td>I'd rather have packed lunches from home because you can choose what you want</td>
<td>0.544</td>
</tr>
<tr>
<td>The food in school is hotter than the food you can buy outside</td>
<td>0.539</td>
</tr>
<tr>
<td>School meals usually look good to eat</td>
<td>0.537</td>
</tr>
<tr>
<td>People keep touching the food</td>
<td>0.532</td>
</tr>
<tr>
<td>If your're last in the queue all you get is leftovers</td>
<td>0.518</td>
</tr>
<tr>
<td>School meals are good value for money</td>
<td>0.516</td>
</tr>
<tr>
<td>Meals at school are usually hot</td>
<td>0.512</td>
</tr>
<tr>
<td>It is not worth going outside school to get lunch</td>
<td>0.496</td>
</tr>
<tr>
<td>School meals don't provide enough variety</td>
<td>0.486</td>
</tr>
<tr>
<td>We don't get enough time to eat our school lunch</td>
<td>0.459</td>
</tr>
</tbody>
</table>
not only concerned with school meals, but with the wider concept of lunchtime feeding. Statements were selected if, in the pilot study, they registered particularly strong positive or negative views. These statements are shown in the questionnaire (appendix 7) as Sen.1 to Gen.29.

The inclusion of all these statements makes the questionnaire very long. It was decided, however, that since they had all been justified as relevant to the survey and for the reasons discussed under "(5) Length of Questionnaire", that all the selected statements should be included.

2. Precoded responses.

A number of the questions had their precoded responses modified on the basis of the pilot study results. The modifications were as follows;

- Question 4 - the addition of two more responses; "I can eat all foods", to ensure that all respondents were able to tick an appropriate response. The pilot study had indicated that respondents expected to provide a response for all questions. The addition of this alternative also served to clarify the question.
  "I do not eat beef" was identified as a valid response and was therefore included.
- Question 5 - the addition of the response, "I can eat all these foods", for those who had responded "I can eat all foods" for question 4.
- Question 9 - the addition of the response, "I didn't have any lunch", and a clear distinction between going home for lunch and having a packed lunch from home.
- Question 10 - the pilot study identified the appropriate range of responses for this question, which are as shown in appendix 7.
3. Instructions and wording.

The phrasing of the instructions and some of the questions were modified for the final version of the questionnaire. The front page of the questionnaire (appendix 7) was printed on University of Surrey headed notepaper. The purpose of this was to reinforce the assurances that the responses were confidential and that comments would not be relayed to the school authorities. This was most important in order to ensure that genuine attitudes and feelings could be expressed. A brief rubric explaining the procedure was added to the front page. Respondents were also instructed to ask for any unclear or confusing parts of the questionnaire to be explained. The instructions for the statement section, page 5, appendix 7, were left as in the pilot study.

A source of some confusion in the pilot study was whether respondents were permitted to give more than one response to each question. In order to clarify this point questions were followed with instructions on how many responses were required.

Two questions were reworded. Many respondents gave their own name when asked for the "School Name". This was found to be because they were known by a different name at school than they were at home. This question was thus changed to "Name of School". Question 4 also created confusion with some respondents who thought they had to indicate those foods they could eat. This was clarified by phrasing all the responses in the negative, for example, "All meat" was changed to "I do not eat any meat".

4. Additional questions.

One question was added to the final questionnaire. Question 8 (appendix 7) asks, "Where do you usually get your lunch from on school days?". The reason for this addition was to cross-tabulate usual lunch place with the parental preferences identified in question 12. Clearly the results of this
cross-tabulation are dependent upon the pupils perceptions of their parents preferences, but they will give some indication the degree to which pupils follow what they perceive to be their parents preferences.

5. Length of questionnaire.

As has already been stated, the number of questions and the volume of attitude statements produces a rather long questionnaire of nine pages. For most surveys such a document would be unacceptable both in terms of respondents time and in terms of maintaining interest. The particular nature of this survey, however, permits a questionnaire of this length to be used. The specific factors that permit this are that:

- the respondents are a captive audience,
- the questionnaire will be completed during normal lesson periods, which will in practical terms allow 30 minutes. The pilot study indicated that a questionnaire of this length could be completed within 30 minutes,
- questionnaire completion will take place instead of normal lessons. It is interesting to note the unsolicited comments written on some of the pilot study questionnaires, such as, "Thank you, you saved us from maths".

Apart from the modifications described above, the questionnaire remained as in the initial drafts. The descriptions and the aims of the questions detailed in section (v) are therefore still valid for the final version of the questionnaire. A tool has thus been developed for the identification and quantification of the attitudes of schoolchildren to lunchtime feeding. This tool has been refined through the findings of a pilot study carried out on sub-sample of the target population.

(viii) The sample.

To provide as complete a picture as possible of the attitudes of London children to school feeding, it was necessary to select a
representative sample of schools within the ILEA. For this purpose the list of schools appearing in the secondary school Education Priority Area (EPA) data sheets were used as the sampling frame. This was provided by the ILEA as a comprehensive list of the secondary schools in inner London, and also served as a background data base for all the schools to be investigated.

Random sampling was selected as the most appropriate method of sampling for this survey. Stratification of the sampling frame was considered but it was found that although there were many variables that could be used as the basis for stratification none of them could be identified as the most important. It was thus decided that it was prudent not to stratify the sample and so avoid inadvertently introducing unnecessary bias. It is likely that with using a large, truly random sample, any characteristics of the population, should be represented within the sample itself.

The actual sampling method adopted was systematic sampling (Social and Community Planning Research 1972). This technique involves determining the number to be sampled, then using \[ K = \frac{N}{n}, \]
where \( N \) is the population and \( n \) is the number to be sampled. Every \( K \)th item throughout the sampling frame should then be selected. The first item to be selected is chosen by taking a random number between 1 and \( K \). This method is only valid, however, where there is no periodic arrangement within the sampling frame. The EPA list, being arranged in alphabetical order, exhibited no signs of periodicity and was thus suitable for systematic sampling.

The pilot study had indicated that in practical terms around fifty schools could be investigated given the resources and time available. In this case therefore, \( K = \frac{165}{50} = 3.3 \). If every third school after the first random number was selected, a sample of fifty-five schools would result. Although this exceeds the target sample size above, it allows for wastage arising from the failure of some schools to participate.

Having selected the schools, it was necessary to identify which pupils should be sampled. It was not practical to survey all pupils
in each school, so a representative sample was selected. In order to minimise the disruption to the school, and for practical reasons, whole classes were to be used. The preliminary work carried out in the pilot study indicated that with each class taking one period to complete their forms, no more than six classes could be covered in one day.

In order to cover the range of ages, six classes were selected from the first, third and fifth years, with two from each. This provided around 90-120 respondents per school. At a number of schools the fifth form could not be sampled due to examination commitments, on these occasions the fourth form was substituted. The sixth forms were not sampled since relatively few ILEA schools have sixth forms of any significant size.

The selection of particular classes beyond the choice of year was made by the school since selection was usually determined by school timetables and class availability. Most classes were of mixed ability, and those at co-educational schools invariably contained both boys and girls. The range of abilities, and both sexes were thus included within the class structure and no attempt was made to specify the make-up of classes. It should also be noted that not only were pupils who take school meals sampled, but also those having sandwiches, those eating outside school, those going home for lunch and those eating nothing for lunch.

(ix) Administration of the survey.

Experience in the preliminary visits to schools and the pilot study indicated that it was important to introduce and administer the survey appropriately. The following approach was adopted.

1. Supervision;

All questionnaire completion sessions were supervised by University of Surrey research staff. In some cases, particularly where a number of classes were being surveyed
simultaneously, teachers were also present. In general however school staff were neither required or encouraged to attend the sessions.

All respondents were asked to complete the questionnaire on their own. Despite this instruction there was invariably some discussion between groups. This was not prevented since it was clear that decisions regarding lunchtime feeding were often the result of group preferences and were not always purely personal decisions. The influence of peer groups was thus permitted. A degree of discussion between respondents was therefore likely to create more realistic prediction of behaviour than would enforced individual responses.

The supervision of classes of respondents presented no problems in terms of behaviour or questionnaire completion. Indeed most pupils were enthusiastic about the survey because it sought their views on a fairly emotive topic.

2. Introduction to the survey.

Before respondents were asked to complete the questionnaire, they were given a brief introduction to the survey and its purpose. The following points were made;

- That the questionnaire was from the University of Surrey, who were carrying out a survey on behalf of the ILEA, to find out what schoolchildren prefer to do at lunchtime in school.

- That it was important that they were honest and that they revealed their true feelings towards the points being discussed. They were also told that this was their opportunity to express their views to the ILEA, and that improvements and changes would be based upon the results of the survey.

- That their comments would be treated as confidential, that
the questionnaires would not be shown to their teachers, and that to ensure confidentiality they need not put their names on the forms. These assurances were essential in order to ensure that genuine views were expressed.

No specific references to school meals were made in the introduction. Thus was because it was important that the respondents did not think that the sole purpose of the survey was to evaluate the school meals service. Furthermore, for many of the questions it was essential that the emphasis was not put on feeding or school meals since these were possible responses that should arise unprompted by previous discussion.

3. Verbal instructions.

Despite the presence of written instructions on the survey questionnaire, experience had shown the need for additional verbal instructions to supplement and reinforce those already provided. The main reason for these additional instructions was that many respondents failed to read the instructions on the forms. Additional instructions of a more general nature were also given before the questionnaire was to be completed. Respondents were told that:

- They should read all instructions and questions carefully and that for some questions more than one response was allowed whilst for others only one response could be given.
- That those questions referring to "yesterday" meant the last day respondents were at school.
- That they had the whole lesson to complete the forms.
- That all responses should be indicated by ticking the appropriate boxes alongside the desired response.
- That where "lunch" was mentioned it referred to lunch from any source.
- That they should feel free to add any comments they felt were important to the bottom of the form.
4. Guidance during the completion of questionnaires.

All groups were told the response code for their school and were asked to enter it in the boxes on the first page. The first years were also taken through questions 2, 3 and 4 in order to ensure that they understood the procedure. Question 4, concerning the foods that respondents could not eat, was potentially confusing and was therefore particularly carefully explained to the first years.

When the respondents had reached the attitude section of the survey, further guidance was given. They were told that responses should be entered inside the response boxes and the numbers in the boxes were of no significance and should be ignored. Respondents were also told that this section was not concerned with establishing facts, but was intended to find out how schoolchildren felt about the topics discussed. For example, to the statement, "Meals at school are usually hot", they should indicate their impressions on whether the food is usually hot. In this way pupils should be able to respond to all statements and there should be no need for a "don't know" response.

General guidance and help was given to individuals throughout the sessions. Indeed it was stressed that the survey was not a test, and that any pupils finding parts confusing or difficult should ask for help. Despite the work in the pilot study, some words used in the questionnaire still created problems. Once identified such words were explained at each session. Those that frequently needed explaining were "influence", "gristly" and "cutlery".

Difficulties with non-indigenous ethnic groups only arose on one occasion. In this situation the school involved had a
teacher from the ethnic group in question who was able to translate and guide the pupils.

(X) Data processing and analysis.

With the size of sample and the number of variables involved in this survey, the data could only be adequately processed with the aid of computing facilities. The University of Surrey PRIME computing system was therefore used.

1. Data processing

All completed questionnaires were immediately taken to the University of Surrey and were numbered and checked. The questionnaires were checked to ensure that they were indeed complete and that all responses were clear and legible. This was essential since the data was to be entered by the University data processing department who would have neither the time or the background knowledge to interpret responses.

The survey was designed in close consultation with the data processing department so that the data generated was suitable for input and analysis. This imposed a number of requirements on the questionnaire:

- the responses for the questions had to be precoded. The assigned codes were entered into the response boxes to simplify processing.
- the questions had to be assigned columns for the entry of data. These were also entered on the questionnaire to ensure all information required by the data processing department was present on the forms.
- the questionnaire had to be put in a layout that would facilitate rapid processing. This meant that all data to be entered into the computer had to be placed on the right hand margin of the forms and that the text had to be arranged to the left.
Providing for these requirements ensured that data input was efficiently completed and problems were minimised.

2. Computer analysis.

A number of statistical packages are available for the analysis of data on the PRIME system. The data from the pilot study was analysed using the Minitab programme (Ryan, Joiner & Ryan 1976). This programme was selected for the following reasons;

- It is simple and straightforward to use.
- It may be used interactively, that is, individual comments and results may be generated as opposed to batch systems where the whole set of commands are entered together to produce batch results. This therefore allows the investigation of interesting trends and relationships as they arise. Furthermore, this feature allows more selective data processing by avoiding the need, or indeed the temptation, to generate vast quantities of data in the hope that interesting trends or relationships might arise.
- Previous research experience had been gained in the use of the programme.

Despite these advantages, a number of complications in the use of Minitab arose. It was found that the programme was not powerful or flexible enough for the analysis of large sets of data, and further that it was not suitable for use with the data files as generated by the data processing department. The alternative packages were therefore re-appraised for their suitability to this analysis. The Statistical Package for the Social Sciences (SPSS) was eventually selected as the most appropriate because;

- It is a very powerful programme ideally suited to the analysis of large sets of data.
- It provides a wide range advanced statistical analyses.
- It is suited to the data as prepared by the data processing
department.

o it provides well detailed and labelled tables in the output.

o although it is a batch system, once the instruction file has

been written, it may be used in an almost interactive manner

by carrying out a number of short analysis runs.

(Nie, Hull, Jenkins and Steinbrenner 1975, Hull and Nie 1981.)

3.4.7. Results.

(i) The sample.

From the sample of 55 schools (figure 3.4.), 36 took part in the

survey. Two had already been involved in the pilot studies and were

not therefore used for the main survey. Seven schools had been

re-organised since the collection of the ILEA data (ILEA 1982) and

could not therefore be used due to a lack of background information.

Ten schools were either unwilling or unable to participate in the

survey. An analysis of those schools that did and did not take part

in the survey is shown in figure 3.4. Appendix 4 also shows the

sample of schools along with school details such as the school

address and the name of the Headteacher.

Of the 36 schools taking part, 9 were girls schools, 14 were boys

schools and 13 were co-educational schools. In terms of ethnic

make-up, the schools in the final sample had a mean percentage of

indigenous pupils of 53.8% which is very similar to the mean for all

secondary schools in the ILEA of 53.7% (ILEA 1982). The total

number of respondents who completed the survey questionnaire was

3,999 - an average of 111 at each school. Five questionnaires were

not legible and were therefore not used. Sixty per cent were boys

and 40% were girls - three questionnaires did not indicate the sex

of the respondent. Although only first, third and fifth years were

sampled, all ages from 11 to 16 were represented, as shown in Table

3.15.
### Figure 3.4: Breakdown of schools from sample who did or did not take part in survey.

#### Schools that took part in survey:
- Acland Burghley
- Beaufoy
- Camden School for Girls
- Sir Walter St. Johns
- Ensham
- Haberdashers Askes Boys
- Highbury Grove
- Lady Margaret
- Mayfields
- Geoffrey Chaucer
- George Orwell
- St. Aloysius College
- St. Josephs Academy
- St. Pauls Way
- St. Thomas the Apostle
- Skinners Company
- John Griffith RC
- Sir John Cass & Redcoat

#### Schools used in pilot studies:
- Bacons

#### Schools re-organised since collection of ILEA data:
- Issaac Newton
- Silverthorne
- Thomas Calton
- Woodbury Down

#### Schools unwilling or unable to take part in survey:
- Clapham College
- Convent of the Holy Family
- Hampstead
- Sedgehill
- Priory Park
- Battersea County
- Blackheath Bluecoat
- Central Foundation Boys
- Elliot
- George Greens
- Hackney Free
- La Retraite High
- London Nautical
- John Roan
- Our Ladys Convent High
- Roger Manwood
- St. Bernards RC
- St. Marylebone
- St. Theresa's
- St. William of York
- Wandsworth
- Quentin Kynaston
- Archbishop Michael Ramsey
- Walsingham
- Peckham
- Hurlingham Chelsea
- Upton House
- Cardinal Pole RC
- Furzedown
- Kennington
- Stepney Green
- Notre Dame High
Table 3.15. Analysis of survey sample by age and sex.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Up to 11</td>
<td>265</td>
<td>11</td>
<td>158</td>
</tr>
<tr>
<td>12</td>
<td>680</td>
<td>28</td>
<td>453</td>
</tr>
<tr>
<td>13</td>
<td>340</td>
<td>14</td>
<td>172</td>
</tr>
<tr>
<td>14</td>
<td>544</td>
<td>23</td>
<td>390</td>
</tr>
<tr>
<td>15 and over</td>
<td>577</td>
<td>24</td>
<td>427</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,406</td>
<td>100</td>
<td>1,590</td>
</tr>
</tbody>
</table>

Notes:  
- Percentages are of the number in each group.  
- The totals for the 14 and 15 year age groups do not equal Boys + Girls due to missing values.  
- For the purposes of analysis these will be grouped as ages 11-12 years (39% of the sample), ages 13-14 years (36% of the sample) and 15-16 years (25% of the sample).

(ii) Food restrictions.

Question 4 of the questionnaire (appendix 7) is concerned with the foods that children cannot or are not allowed to eat. The results of this question are shown in tables 3.16. and 3.17. Those foods listed under "other foods" and their frequencies are shown in table 3.18.

These tables clearly indicate that there is a very wide range of food items that children will not eat or cannot eat. Of the total sample, 24.4% identified at least one food item that they could not eat. The most frequently identified food was pork, 8.6% of the sample would not eat pork, followed by eggs (6.8%), and milk (5.1%). This trend was also evident when the data was analysed by sex (table 3.16.), and age (table 3.17.).

Table 3.18. shows that the most frequently specified "other food"
### Table 3.16. Foods respondents cannot eat or are not allowed to eat, by sex.

<table>
<thead>
<tr>
<th>Foods cannot eat</th>
<th>Total</th>
<th>No.</th>
<th>%</th>
<th>Boys</th>
<th>No.</th>
<th>%</th>
<th>Girls</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can eat all foods</td>
<td>3,033</td>
<td>1,850</td>
<td>76.9</td>
<td>1,152</td>
<td>72.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat any meat</td>
<td>78</td>
<td>47</td>
<td>2.0</td>
<td>31</td>
<td>1.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat any meat except Halal meat</td>
<td>127</td>
<td>64</td>
<td>2.7</td>
<td>63</td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat pork</td>
<td>342</td>
<td>184</td>
<td>7.7</td>
<td>157</td>
<td>9.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat eggs</td>
<td>271</td>
<td>169</td>
<td>7.0</td>
<td>102</td>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not drink milk</td>
<td>203</td>
<td>99</td>
<td>4.1</td>
<td>103</td>
<td>6.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat any meat except Kosher meat</td>
<td>29</td>
<td>22</td>
<td>0.9</td>
<td>7</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat beef</td>
<td>73</td>
<td>41</td>
<td>1.7</td>
<td>32</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any others</td>
<td>225</td>
<td>124</td>
<td>5.2</td>
<td>101</td>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.  
       o The totals do not equal Boys + Girls due to missing values.

### Table 3.17. Foods respondents cannot eat or are not allowed to eat, by age.

<table>
<thead>
<tr>
<th>Foods cannot eat</th>
<th>Age</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11-12</td>
<td>13-14</td>
<td>15-16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can eat all foods</td>
<td>1,124</td>
<td>1,113</td>
<td>766</td>
<td>72.2</td>
<td>76.9</td>
<td>76.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat any meat</td>
<td>37</td>
<td>21</td>
<td>20</td>
<td>2.4</td>
<td>1.5</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat any meat except Halal meat</td>
<td>70</td>
<td>37</td>
<td>20</td>
<td>4.5</td>
<td>2.6</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat pork</td>
<td>146</td>
<td>118</td>
<td>78</td>
<td>9.4</td>
<td>8.2</td>
<td>7.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat eggs</td>
<td>132</td>
<td>85</td>
<td>54</td>
<td>8.5</td>
<td>5.9</td>
<td>5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not drink milk</td>
<td>74</td>
<td>78</td>
<td>51</td>
<td>4.8</td>
<td>5.4</td>
<td>5.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat any meat except Kosher meat</td>
<td>19</td>
<td>8</td>
<td>2</td>
<td>1.2</td>
<td>0.6</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat beef</td>
<td>39</td>
<td>18</td>
<td>16</td>
<td>2.5</td>
<td>1.2</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any others</td>
<td>80</td>
<td>86</td>
<td>59</td>
<td>5.1</td>
<td>5.9</td>
<td>5.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group
that children would not eat were vegetables - 64 (1.6%) respondents indicated that they were unable to eat particular vegetables or vegetables in general. It is also worth noting the wide range of foods included in this list in addition to the seven identified by the question.

Table 3.18. Foods listed under "any other foods you cannot eat" in question 4, and their frequency.

<table>
<thead>
<tr>
<th>Food</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>64</td>
</tr>
<tr>
<td>Liver</td>
<td>24</td>
</tr>
<tr>
<td>Fish</td>
<td>19</td>
</tr>
<tr>
<td>Cheese</td>
<td>16</td>
</tr>
<tr>
<td>Curry</td>
<td>9</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>6</td>
</tr>
<tr>
<td>Sugar</td>
<td>4</td>
</tr>
<tr>
<td>Butter</td>
<td>3</td>
</tr>
<tr>
<td>Chips</td>
<td>3</td>
</tr>
<tr>
<td>Apples</td>
<td>2</td>
</tr>
<tr>
<td>Bananas</td>
<td>2</td>
</tr>
<tr>
<td>Chicken</td>
<td>2</td>
</tr>
<tr>
<td>Sausages</td>
<td>2</td>
</tr>
<tr>
<td>Lamb</td>
<td>2</td>
</tr>
<tr>
<td>Honey</td>
<td>1</td>
</tr>
<tr>
<td>Flour</td>
<td>1</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>1</td>
</tr>
<tr>
<td>Kidney</td>
<td>1</td>
</tr>
<tr>
<td>Vinegar</td>
<td>1</td>
</tr>
<tr>
<td>Peppers</td>
<td>1</td>
</tr>
</tbody>
</table>

Pupils were told when completing the survey that this question was not concerned with foods they merely disliked, but foods that they could not eat due to medical or religious reasons. Despite this, one must accept that a number of responses were the result of dislikes. This
does not invalidate the results however, since we are concerned with food restrictions as they affect feeding at school, and clearly dislikes expressed in the survey are just as likely to be expressed in food choice.

Table 3.19. shows the reasons why respondents could not eat the foods they had identified earlier. Religion and beliefs restricted the eating habits of 292 respondents, 7.3% of the sample, whilst it is interesting to note that 46.2% of pupils at the schools surveyed were of a non-indigenous background. Indeed religion or beliefs accounted for only 29% of those whose feeding was restricted in some way.

Analysis of food restrictions by age (table 3.20.) and by sex (table 3.19.) reveals two trends. A larger proportion of girls (27.7%) than boys (23.7%) were unable to eat some foods and a larger proportion of the younger pupils, aged 11-12 (28.5%) than those aged 13-16 (23.2%), were unable to eat some foods. This latter trend is probably attributable to the lessening importance of religion/beliefs for the older children - 9.3% of the 11-12 year group and 5.6% of the 15-16 year group cited religion/beliefs as a food constraint. This would appear to indicate that the influence of religion/beliefs becomes less significant as children become older and more independent in their behaviour. It may however reflect a more general trend away from the influence of religion/beliefs.

To summarise;

- nearly a quarter (24%) of the sample said that there were foods that they could not eat,
- the most frequently identified foods that respondents could not eat were pork, eggs and milk in that order,
- religion/beliefs restricted the feeding of 7.3% of the sample and accounted for 29% of those who indicated that they could not particular foods,
- a wide range of foods were included in the list of restricted foods indicating the need for variety in foods offered in school meals programs.
Table 3.19. Why respondents cannot eat food items by sex.

<table>
<thead>
<tr>
<th>Why cannot eat food</th>
<th>Total</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Makes them sick or ill</td>
<td>718</td>
<td>18.0</td>
<td>414</td>
</tr>
<tr>
<td>Religion/beliefs</td>
<td>292</td>
<td>7.3</td>
<td>155</td>
</tr>
<tr>
<td>Total</td>
<td>1,010</td>
<td>25.3</td>
<td>569</td>
</tr>
</tbody>
</table>

Note: Percentages are of the number in each group

Table 3.20. Why respondents cannot eat food items by age.

<table>
<thead>
<tr>
<th>Why cannot eat food</th>
<th>11-12</th>
<th>13-14</th>
<th>15-16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Makes them sick or ill</td>
<td>298</td>
<td>19.2</td>
<td>245</td>
</tr>
<tr>
<td>Religion/beliefs</td>
<td>145</td>
<td>9.3</td>
<td>91</td>
</tr>
<tr>
<td>Total</td>
<td>443</td>
<td>28.5</td>
<td>336</td>
</tr>
</tbody>
</table>

Note: Percentages are of the number in each group
(iii) Lunchtime activities.

In order to establish the relative importance of lunch compared with other lunchtime activities, two questions were asked - questions 6 and 7, appendix 7. These were important since the school meal has to compete with both alternative food sources and alternative activities that schoolchildren may identify as important.

The precoded responses for these two questions were identified from the results of the group discussions carried out in the formative stages of the survey. They have therefore been established as appropriate to this survey population. Although the phrase "messed about" appears to be a vague expression, it is a phrase widely used by children to describe any unstructured and unsupervised activity. It was thus included as a possible response.

Tables 3.21. and 3.22. show the results of the question "What did you do during lunchtime yesterday?" analysed by age and sex. Respondents were allowed to give more than one response to this question and consequently the totals exceed the total number of respondents.

For all groups "Had lunch" was the most frequent response followed by "messed around". Analysis by sex shows that boys and girls were involved in much the same activities although a slightly larger proportion of girls (9.1%) than boys (5.6%) studied during the lunchbreak, whilst a larger proportion of boys (7.2%) than girls (3.8%) took part in club activities.

Analysis by age shows a particularly interesting trend in the proportion of the sample who went outside the school grounds during lunch. Whilst only 19.3% of 11-12 year olds went out of the school, 42.0% of the 15-16 year olds did so. This reflects the policy of many schools to allow only the older pupils out of school, and also shows the greater opportunity these pupils have to obtain lunch from other sources than the school meals service. Indeed of the whole
Table 3.21. "What did you do during lunchtime yesterday?", by sex.

<table>
<thead>
<tr>
<th>Activity</th>
<th>11-12</th>
<th>13-14</th>
<th>15-16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Studied/homework</td>
<td>279</td>
<td>7.0</td>
<td>134</td>
</tr>
<tr>
<td>&quot;Messed around&quot;</td>
<td>2,092</td>
<td>52.3</td>
<td>1,273</td>
</tr>
<tr>
<td>Lunchtime club activity</td>
<td>235</td>
<td>8.1</td>
<td>174</td>
</tr>
<tr>
<td>Had lunch</td>
<td>2,959</td>
<td>74.0</td>
<td>1,789</td>
</tr>
<tr>
<td>Went outside school</td>
<td>1,245</td>
<td>31.1</td>
<td>751</td>
</tr>
<tr>
<td>Reading</td>
<td>161</td>
<td>4.0</td>
<td>98</td>
</tr>
<tr>
<td>Something else</td>
<td>453</td>
<td>11.3</td>
<td>288</td>
</tr>
</tbody>
</table>

Note: 0 Percentages are of the number in each group.  
0 The totals do not equal Boys + Girls due to missing values.

Table 3.22. "What did you do during lunchtime yesterday?", by age.

<table>
<thead>
<tr>
<th>Activity</th>
<th>11-12</th>
<th>13-14</th>
<th>15-16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Studied/homework</td>
<td>131</td>
<td>8.4</td>
<td>82</td>
</tr>
<tr>
<td>&quot;Messed around&quot;</td>
<td>904</td>
<td>58.1</td>
<td>760</td>
</tr>
<tr>
<td>Lunchtime club activity</td>
<td>109</td>
<td>7.0</td>
<td>69</td>
</tr>
<tr>
<td>Had lunch</td>
<td>1,250</td>
<td>80.3</td>
<td>1,019</td>
</tr>
<tr>
<td>Went outside school</td>
<td>301</td>
<td>19.4</td>
<td>526</td>
</tr>
<tr>
<td>Reading</td>
<td>73</td>
<td>4.7</td>
<td>58</td>
</tr>
<tr>
<td>Something else</td>
<td>188</td>
<td>12.1</td>
<td>143</td>
</tr>
</tbody>
</table>

Note: 0 Percentages are of the number in each group.
sample nearly one third (31.1%) went out of school and therefore had direct access to local food sources such as sandwich bars, sweet shops and takeaway food outlets.

The results of the question "What do you think is the most important thing for you to do at lunchtime?", are shown in tables 3.23. and 3.24. In this case respondents were asked to give one response only and those indicating more than one were disregarded.

As would be expected, the most popular response, and therefore the most important activity for many of the respondents was having lunch (49.1%). Significantly however, around half the sample identified another activity as the most important thing for them to do at lunchtime. These individuals may therefore prefer to miss lunch should it preclude participation in their preferred activity. School meals must therefore avoid such decisions having to be made since many pupils will choose an alternative lunch or indeed miss lunch altogether. Time is probably the most important factor in this respect. Any time that pupils perceive as wasted, such as time spent waiting in queues, should be minimised. The attitudes of respondents to queues are more fully discussed in later sections.

Analysis by age (table 3.24.) reveals that the proportion of those who think eating is the most important lunchtime activity falls with increasing age. Relaxation however becomes of greater importance to the older pupils than to the younger pupils - 24.4% of 15-16 year olds identified relaxation as a priority whilst 11.9% of 11-12 year olds did so.

To conclude, the main points to arise concerning lunchtime activities were;

○ having lunch was identified as the most important activity for nearly half the sample (49.1%),

○ approximately half the sample identified some other activity than lunch as the most important. This indicates that many pupils would miss lunch if it were to restrict their participation in other activities. The attitudinal section of the survey clearly identifies queuing as a particular problem.
Table 3.23. "What do you think is the most important thing to do at lunchtime?", by sex.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study/finish homework</td>
<td>386</td>
<td>224</td>
<td>162</td>
</tr>
<tr>
<td>&quot;Mess around&quot;</td>
<td>285</td>
<td>203</td>
<td>81</td>
</tr>
<tr>
<td>Just relax</td>
<td>724</td>
<td>413</td>
<td>310</td>
</tr>
<tr>
<td>Get out of school</td>
<td>406</td>
<td>239</td>
<td>167</td>
</tr>
<tr>
<td>Lunchtime club activity</td>
<td>91</td>
<td>55</td>
<td>36</td>
</tr>
<tr>
<td>Have lunch</td>
<td>1,962</td>
<td>1,172</td>
<td>789</td>
</tr>
<tr>
<td>Something else</td>
<td>56</td>
<td>44</td>
<td>12</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.  
 o The totals do not equal Boys + Girls due to missing values.

Table 3.24. "What do you think is the most important thing to do at lunchtime?", by age.

<table>
<thead>
<tr>
<th>Activity</th>
<th>11-12</th>
<th>13-14</th>
<th>15-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study/finish homework</td>
<td>248</td>
<td>86</td>
<td>52</td>
</tr>
<tr>
<td>&quot;Mess around&quot;</td>
<td>99</td>
<td>124</td>
<td>62</td>
</tr>
<tr>
<td>Just relax</td>
<td>185</td>
<td>296</td>
<td>243</td>
</tr>
<tr>
<td>Get out of school</td>
<td>106</td>
<td>179</td>
<td>121</td>
</tr>
<tr>
<td>Lunchtime club activity</td>
<td>44</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>Have lunch</td>
<td>823</td>
<td>684</td>
<td>455</td>
</tr>
<tr>
<td>Something else</td>
<td>19</td>
<td>24</td>
<td>13</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group
nearly one third of all respondents, and 42% of the older children (15-16 age group), leave the school premises during lunchtime,

the second most frequently identified response for the most important lunchtime activity was relaxation, especially amongst the 15-16 year age group. The school meals service should therefore aim to create an environment conducive to this requirement.

(iv) Sources of lunchtime food.

Questions 8, 9 and 10 of the questionnaire (appendix 7) were concerned with sources of lunch on school days. It was decided that the results of question 9 should be used as the basis for establishing lunchtime food sources. This was because it was based on actual behaviour, that is "yesterday", rather than the pupils perception of "usual" lunchtime behaviour, which may be somewhat different. The results should therefore be more representative of actual behaviour on typical school days - especially with a large sample of nearly 4,000 respondents.

Tables 3.25. and 3.26. show the results of the question "Where did you get your lunch from yesterday?". The school canteen was clearly the most common source of lunch with 54.17% of the sample eating school meals. Analysis by sex (table 3.25.) shows that whilst a smaller proportion of girls than boys took a school meal (47.7% as opposed to 58.5% of boys), a far larger percentage brought a packed lunch from home (22.8% as opposed to 8.5% of the boys).

Analysis by age (table 3.26.) shows a clear trend towards older pupils eating outside school. All three of the external feeding alternatives - going home, shops and chipshop/takeaway - show an increased uptake with the older children, whilst the in-school alternatives of a school meal or a packed lunch show a decrease in uptake for the same pupils. This trend is more clearly shown when the numbers eating in school and out of school are aggregated as in table 3.27. The school lunch nevertheless remains the most popular alternative for all three age groups.
### Table 3.25. "Where did you get your lunch from yesterday?", by sex.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I didn't have any lunch</td>
<td>229 5.7%</td>
<td>134 5.6%</td>
<td>95 5.9%</td>
</tr>
<tr>
<td>I went home</td>
<td>254 6.4%</td>
<td>154 6.4%</td>
<td>100 6.3%</td>
</tr>
<tr>
<td>Packed lunch from home</td>
<td>566 14.0%</td>
<td>204 8.5%</td>
<td>362 22.8%</td>
</tr>
<tr>
<td>School canteen</td>
<td>2,162 54.1%</td>
<td>1,407 58.5%</td>
<td>753 47.4%</td>
</tr>
<tr>
<td>Shop (outside school)</td>
<td>263 6.6%</td>
<td>147 6.1%</td>
<td>116 7.3%</td>
</tr>
<tr>
<td>Chip-shop/takeaway</td>
<td>504 12.6%</td>
<td>343 14.3%</td>
<td>160 10.1%</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.
       o The totals do not equal Boys + Girls due to missing values.

### Table 3.26. "Where did you get your lunch from yesterday?", by age.

<table>
<thead>
<tr>
<th>Source of lunch</th>
<th>11-12 No.</th>
<th>13-14 No.</th>
<th>15-16 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I didn't have any lunch</td>
<td>62 4.0%</td>
<td>87 6.0%</td>
<td>80 8.0%</td>
</tr>
<tr>
<td>I went home</td>
<td>49 3.2%</td>
<td>102 7.1%</td>
<td>103 10.3%</td>
</tr>
<tr>
<td>Packed lunch from home</td>
<td>266 17.1%</td>
<td>192 13.3%</td>
<td>108 10.8%</td>
</tr>
<tr>
<td>School canteen</td>
<td>977 64.1%</td>
<td>688 47.6%</td>
<td>477 47.9%</td>
</tr>
<tr>
<td>Shop (outside school)</td>
<td>37 2.4%</td>
<td>144 10.0%</td>
<td>82 8.2%</td>
</tr>
<tr>
<td>Chip-shop/takeaway</td>
<td>133 8.6%</td>
<td>231 16.0%</td>
<td>140 14.1%</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.
Table 3.27. Respondents having lunch in or out of school.

<table>
<thead>
<tr>
<th>Source of lunch</th>
<th>Age</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11-12 No. %</td>
<td>13-14 No. %</td>
<td>15-16 No. %</td>
<td>Total No. %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In school</td>
<td>1,263 81.2</td>
<td>880 60.8</td>
<td>585 58.7</td>
<td>2,728 68.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of school</td>
<td>219 14.1</td>
<td>477 33.0</td>
<td>325 32.6</td>
<td>1,021 25.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: a Percentages are of the number in each group.

The results of the question asking why respondents chose their indicated source of lunch are shown in tables 3.28. and 3.29. The precoded responses for this question were generated by the pilot study already discussed. They are therefore typical of the criteria London schoolchildren use as the basis for their feeding choices.

The most popular basis for selection was, somewhat unsurprisingly, liking the food (25.5%), but for three quarters of the sample this was not the identified reason. The other two main reasons were not being allowed out of school (12.7%), and ease, or convenience (12.0%). The former of these clearly indicates that the potential numbers for eating out of school far exceeds the present 26% as identified in table 3.27.

Analysis by age (table 3.29.) and sex (table 3.28.) reveals the same three factors as primary determinants of meal choice for all groups. Analysis by age also indicates that parental influence is significant for the younger pupils but becomes less so for the senior pupils.

In order to establish specific reasons why respondents chose particular sources of lunch, the results of question 9 - "Where did you get your lunch from yesterday?", and question 10 - "Why did you get it there?", have been cross-tabulated. The results are shown.
Table 3.28. "Why did you get it there?", by sex.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Total</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>I like the food</td>
<td>1,018</td>
<td>25.5</td>
<td>676</td>
</tr>
<tr>
<td>I don't like the food in other places</td>
<td>213</td>
<td>5.3</td>
<td>122</td>
</tr>
<tr>
<td>It is easier</td>
<td>478</td>
<td>12.0</td>
<td>264</td>
</tr>
<tr>
<td>It is quicker</td>
<td>334</td>
<td>8.4</td>
<td>184</td>
</tr>
<tr>
<td>It is cheaper</td>
<td>336</td>
<td>9.4</td>
<td>227</td>
</tr>
<tr>
<td>It is free</td>
<td>269</td>
<td>6.7</td>
<td>172</td>
</tr>
<tr>
<td>My mum likes me to</td>
<td>249</td>
<td>6.2</td>
<td>156</td>
</tr>
<tr>
<td>There's better variety</td>
<td>324</td>
<td>8.1</td>
<td>171</td>
</tr>
<tr>
<td>Because of the weather</td>
<td>67</td>
<td>1.7</td>
<td>22</td>
</tr>
<tr>
<td>Because we aren't allowed out</td>
<td>506</td>
<td>12.7</td>
<td>293</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group

Table 3.29. "Why did you get it there?", by age.

<table>
<thead>
<tr>
<th>Reason</th>
<th>11-12</th>
<th>13-14</th>
<th>15-16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>I like the food</td>
<td>409</td>
<td>26.3</td>
<td>386</td>
</tr>
<tr>
<td>I don't like the food in other places</td>
<td>85</td>
<td>5.5</td>
<td>73</td>
</tr>
<tr>
<td>It is easier</td>
<td>138</td>
<td>8.9</td>
<td>197</td>
</tr>
<tr>
<td>It is quicker</td>
<td>118</td>
<td>7.6</td>
<td>130</td>
</tr>
<tr>
<td>It is cheaper</td>
<td>150</td>
<td>9.6</td>
<td>100</td>
</tr>
<tr>
<td>It is free</td>
<td>89</td>
<td>5.7</td>
<td>104</td>
</tr>
<tr>
<td>My mum likes me to</td>
<td>155</td>
<td>10.0</td>
<td>69</td>
</tr>
<tr>
<td>There's better variety</td>
<td>128</td>
<td>8.2</td>
<td>122</td>
</tr>
<tr>
<td>Because of the weather</td>
<td>19</td>
<td>1.2</td>
<td>30</td>
</tr>
<tr>
<td>Because we aren't allowed out</td>
<td>209</td>
<td>13.4</td>
<td>161</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group
in table 3.30. Most of the respondents who indicated that they had no lunch did not respond to this question and the results are therefore not included.

For all types of lunch except school meals, the main reason for selection was that the food was liked. This was particularly true of those who selected chipshop/takeaway meals where 54.7% indicated that the reason was that they liked the food. For school meals the main reason for participation was that respondents were not allowed out of school. This further confirms the finding that school policy accounts for a significant proportion of school meal uptake.

For those who went home to eat, had a packed lunch or went to a shop for food, variety was an important aspect in their choice. It is worth noting that few respondents who took school meals rated them highly for either speed or variety.

To conclude, the following points have been identified with regard to the sources of lunchtime food on school days:

- Over half the sample (54.1%) took school meals, although a smaller proportion of girls (47.4%) than boys (58.5%) did so,
- A larger proportion of girls (22.8%) than boys (8.5%) took a packed lunch,
- Older pupils are more likely to obtain lunch from sources outside school,
- Preference for the foods offered was the most common reason for the selection of food source followed by convenience. Parental influence is also a significant factor for the younger children,
- The most popular reason for taking school lunches was that pupils were not allowed out of school. This is a clear indication of the influence of school policy on school meal uptake.
<table>
<thead>
<tr>
<th>Source of lunch</th>
<th>Reason</th>
<th>Because we are not allowed out</th>
<th>I like the food</th>
<th>Don't like the food in other places</th>
<th>It is easier</th>
<th>It is quicker</th>
<th>It is cheaper</th>
<th>It is free</th>
<th>My mum likes me to</th>
<th>There is more variety</th>
<th>Because of the weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>I went home</td>
<td></td>
<td>4 (1.6)</td>
<td>64 (26.0)</td>
<td>32 (13.0)</td>
<td>38 (15.4)</td>
<td>11 (4.5)</td>
<td>10 (4.1)</td>
<td>27 (11.0)</td>
<td>25 (10.2)</td>
<td>34 (13.8)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Packed lunch from home</td>
<td></td>
<td>20 (3.6)</td>
<td>121 (21.8)</td>
<td>65 (11.7)</td>
<td>86 (15.5)</td>
<td>63 (11.4)</td>
<td>43 (7.8)</td>
<td>11 (2.0)</td>
<td>31 (5.6)</td>
<td>96 (17.3)</td>
<td>18 (3.2)</td>
</tr>
<tr>
<td>School canteen</td>
<td></td>
<td>465 (21.5)</td>
<td>441 (20.0)</td>
<td>31 (1.5)</td>
<td>299 (14.1)</td>
<td>147 (6.9)</td>
<td>216 (10.2)</td>
<td>211 (10.0)</td>
<td>185 (8.7)</td>
<td>166 (5.5)</td>
<td>18 (0.8)</td>
</tr>
<tr>
<td>Shop (outside school)</td>
<td></td>
<td>4 (1.6)</td>
<td>100 (38.8)</td>
<td>22 (8.5)</td>
<td>19 (7.4)</td>
<td>40 (15.5)</td>
<td>12 (4.7)</td>
<td>2 (0.8)</td>
<td>2 (0.4)</td>
<td>42 (16.3)</td>
<td>16 (6.2)</td>
</tr>
<tr>
<td>Chip-shop/takeaway</td>
<td></td>
<td>6 (1.2)</td>
<td>272 (54.7)</td>
<td>52 (10.5)</td>
<td>20 (4.0)</td>
<td>63 (12.7)</td>
<td>37 (7.4)</td>
<td>1 (0.2)</td>
<td>1 (0.2)</td>
<td>35 (7.0)</td>
<td>10 (2.0)</td>
</tr>
</tbody>
</table>
(v) Parental influence.

In the previous section, one of the reasons for the choice of particular types of lunch was, "My mum likes me to". This section investigates parental influence on the lunchtime food choice of their children. Two questions were asked, "Do your parents influence your choice of what or where you eat at lunchtime?", and, "Where do you think your parents prefer you to get your lunchtime food from?" — questions 11 and 12 in figure 3.5.

The results of question 11, regarding parental influence, are shown in tables 3.31. and 3.32. Most respondents, 76.5% of those who answered, said that their parents did not influence them. Analysis by sex (table 3.31.) reveals that a slightly larger proportion of girls (81.2%) than boys (73.4%) claim not to be influenced by their parents. Of those who indicated that they are influenced by their parents, financial constraints were more frequently identified than parental instructions. Analysis by age (table 3.32.) reveals that a larger proportion of the 15-16 year olds (84.8%) than both the 13-14 year olds (79.5%) and the 11-12 year olds (68.6%) claim that they are not influenced by their parents in their lunchtime feeding.

Tables 3.33. and 3.34. show the results of the question, "Where do you think your parents prefer you to get your lunchtime food from?". Since they reflect what the pupils think their parents prefer, there is the possibility that they do not accurately reflect their parents actual preferences. The question is valid however, because preferences can only influence behaviour in as much as they are perceived by the pupils. Most pupils indicate that their parents prefer them to eat in the school canteen (44.5%) but a large number also indicate that their parents do not mind where they eat (40.9%). It is clear that parental preferences, as perceived by pupils, do not normally include chipshops/takeaways or sweetshops since only 2.5% of respondents indicated these as preferences.

Analysis by sex (table 3.33.) shows that a larger proportion of boys believe that their parents like them to eat school meals. Analysis
Table 3.31. Parental influence.

<table>
<thead>
<tr>
<th>Influence</th>
<th>Total No.</th>
<th>Total %</th>
<th>Boys No.</th>
<th>Boys %</th>
<th>Girls No.</th>
<th>Girls %</th>
</tr>
</thead>
<tbody>
<tr>
<td>They don't influence me at all</td>
<td>3,060</td>
<td>76.5</td>
<td>1,767</td>
<td>73.4</td>
<td>1,291</td>
<td>81.2</td>
</tr>
<tr>
<td>They tell me where to eat</td>
<td>402</td>
<td>10.1</td>
<td>274</td>
<td>11.4</td>
<td>127</td>
<td>8.0</td>
</tr>
<tr>
<td>They influence me by the amount of money they give me</td>
<td>496</td>
<td>12.4</td>
<td>334</td>
<td>13.9</td>
<td>162</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.
      o The totals do not equal Boys + Girls due to missing values.

Table 3.32. Parental influence by age.

<table>
<thead>
<tr>
<th>Influence</th>
<th>11-12 No.</th>
<th>11-12 %</th>
<th>13-14 No.</th>
<th>13-14 %</th>
<th>15-16 No.</th>
<th>15-16 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>They don't influence me at all</td>
<td>1,068</td>
<td>68.6</td>
<td>1,151</td>
<td>79.5</td>
<td>841</td>
<td>84.4</td>
</tr>
<tr>
<td>They tell me where to eat</td>
<td>208</td>
<td>13.4</td>
<td>166</td>
<td>11.5</td>
<td>95</td>
<td>9.5</td>
</tr>
<tr>
<td>They influence me by the amount of money they give me</td>
<td>852</td>
<td>54.8</td>
<td>601</td>
<td>41.5</td>
<td>325</td>
<td>32.6</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.
Table 3.33. "Where do you think your parents prefer you to get your lunchtime food from?", by sex.

<table>
<thead>
<tr>
<th>Parental preference</th>
<th>Total</th>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Chipshop/takeaway</td>
<td>83</td>
<td>2.1</td>
<td>68</td>
<td>2.8</td>
<td>14</td>
<td>0.9</td>
</tr>
<tr>
<td>Home</td>
<td>469</td>
<td>11.7</td>
<td>252</td>
<td>10.5</td>
<td>217</td>
<td>13.7</td>
</tr>
<tr>
<td>School canteen</td>
<td>1,778</td>
<td>44.5</td>
<td>1,178</td>
<td>49.0</td>
<td>598</td>
<td>37.6</td>
</tr>
<tr>
<td>Shop</td>
<td>17</td>
<td>0.4</td>
<td>11</td>
<td>0.5</td>
<td>6</td>
<td>0.4</td>
</tr>
<tr>
<td>They don’t mind</td>
<td>1,637</td>
<td>40.9</td>
<td>806</td>
<td>36.8</td>
<td>751</td>
<td>47.2</td>
</tr>
</tbody>
</table>

Notes: o Percentages are of the number in each group.
    o Totals do not equal Boys + Girls due to missing values

Table 3.34. "Where do you think your parents prefer you to get your food from?", by age.

<table>
<thead>
<tr>
<th>Parental preference</th>
<th>Age</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11-12</td>
<td>13-14</td>
<td>15-16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Chip-shop/takeaway</td>
<td>32</td>
<td>2.1</td>
<td>32</td>
<td>2.2</td>
<td>19</td>
</tr>
<tr>
<td>Home</td>
<td>208</td>
<td>13.4</td>
<td>166</td>
<td>11.5</td>
<td>95</td>
</tr>
<tr>
<td>School canteen</td>
<td>852</td>
<td>54.8</td>
<td>601</td>
<td>41.5</td>
<td>325</td>
</tr>
<tr>
<td>Shop</td>
<td>8</td>
<td>0.5</td>
<td>4</td>
<td>0.3</td>
<td>5</td>
</tr>
<tr>
<td>They don’t mind</td>
<td>449</td>
<td>28.9</td>
<td>641</td>
<td>44.3</td>
<td>547</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group
by age (table 34) shows that fewer of the older pupils think that their parents prefer them to eat school meals, and more believe that their parents do not mind where they eat.

In order to identify whether respondents tend to eat where they think their parents prefer them to, parental preference was cross-tabulated with the pupils usual lunch place as identified by question 8 (appendix 7). The results are shown in table 3.35. This shows that most pupils do in fact tend to eat where they think their parents would like them to. Of those who indicated that their parents had a preference, 78% usually followed that preference in their feeding behaviour.

It would appear therefore, that despite the fact that only 10% of the sample said that they were influenced by expressed parental preferences (table 3.31.), a considerable number do eat where they believe their parents would like them to. This point is well illustrated by the fact that 81.5% of those who believe their parents would prefer them to have a school meal actually do so. Furthermore, 71.5% of those whose parents prefer them to have meals from home, usually have either a packed lunch or go home for lunch.

Table 3.36. shows parental influence cross-tabulated by parental preference. Of those who are told where to eat, 73.4% say that their parents prefer them to eat in the school canteen. This result, and the results of table 3.35., make it quite clear that parental influence tends to work in favour of the school meals service. The attitudes of parents are therefore a significant factor in the uptake of school meals.

Analysing the influence of finances on the choice of lunchplace, parental influence through money was cross-tabulated with respondents usual lunch place. The results are shown in table 3.37. For those who perceived money as a particular constraint on their lunchtime feeding, 60.9% said that their usual lunch was a school meal.
Table 3.35. Parental preference cross-tabulated by usual lunch place.

<table>
<thead>
<tr>
<th>Parental preference</th>
<th>Usual lunch place</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No lunch</td>
<td>Home</td>
<td>Packed lunch</td>
<td>School meal</td>
<td>Sweet shop</td>
<td>Chip-shop/takeaway</td>
</tr>
<tr>
<td>chip-shop/takeaway</td>
<td>5 6.0</td>
<td>4 4.8</td>
<td>6 7.2</td>
<td>15 18.1</td>
<td>6 7.2</td>
<td>47 56.6</td>
</tr>
<tr>
<td>Home</td>
<td>16 3.4</td>
<td>116 24.9</td>
<td>217 46.6</td>
<td>76 16.3</td>
<td>11 2.4</td>
<td>30 6.4</td>
</tr>
<tr>
<td>School canteen</td>
<td>64 3.6</td>
<td>20 1.1</td>
<td>64 3.6</td>
<td>1441 81.5</td>
<td>45 2.5</td>
<td>134 7.6</td>
</tr>
<tr>
<td>Shop</td>
<td>0 0.0</td>
<td>1 0.5</td>
<td>2 11.8</td>
<td>7 41.2</td>
<td>4 23.5</td>
<td>3 17.4</td>
</tr>
<tr>
<td>Don't mind</td>
<td>82 5.1</td>
<td>105 6.5</td>
<td>305 18.9</td>
<td>683 42.2</td>
<td>66 4.1</td>
<td>376 23.3</td>
</tr>
</tbody>
</table>

Note: % - percentages of parental preference
Table 3.36. Parental influence cross-tabulated by parental preference.

<table>
<thead>
<tr>
<th>Parental influence</th>
<th>Chip-shop takeaway</th>
<th>Home</th>
<th>School meal</th>
<th>Sweet shop</th>
<th>Don't mind</th>
</tr>
</thead>
<tbody>
<tr>
<td>They don't influence me at all</td>
<td>56 1.8</td>
<td>353  11.6</td>
<td>1190 39.0</td>
<td>11 0.4</td>
<td>1444 47.3</td>
</tr>
<tr>
<td>They tell me where to eat</td>
<td>10 2.5</td>
<td>66 16.4</td>
<td>295 73.4</td>
<td>2 0.5</td>
<td>29 7.2</td>
</tr>
<tr>
<td>They influence me by</td>
<td>15 3.0</td>
<td>44 8.9</td>
<td>271 54.9</td>
<td>4 0.8</td>
<td>160 32.4</td>
</tr>
</tbody>
</table>

Note: % - percentages of parental influence
Table 3.37. Parental influence cross-tabulated by usual lunch place.

<table>
<thead>
<tr>
<th>Parental influence</th>
<th>No lunch</th>
<th>Home</th>
<th>Packed lunch</th>
<th>School meal</th>
<th>Sweet shop</th>
<th>Chip-shop / takeaway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>They don't influence me at all</td>
<td>125 4.1</td>
<td>204 6.7</td>
<td>523 17.2</td>
<td>1628 53.6</td>
<td>106 3.5</td>
<td>454 14.9</td>
</tr>
<tr>
<td>They tell me where to eat</td>
<td>23 5.8</td>
<td>20 5.0</td>
<td>35 8.8</td>
<td>276 69.5</td>
<td>8 2.0</td>
<td>35 8.8</td>
</tr>
<tr>
<td>They influence me by</td>
<td>19 3.9</td>
<td>17 3.5</td>
<td>36 7.4</td>
<td>296 60.9</td>
<td>15 3.1</td>
<td>103 21.2</td>
</tr>
</tbody>
</table>

Note: % - percentages of parental influence
To summarise the main points in terms of parental influence on lunchtime feeding were identified as follows:

- three quarters of respondents said that they were not influenced by their parents,
- over three quarters of respondents usually obtain their lunch from the place their parents would prefer to,
- only 12.4% of the sample identified money as an influencing factor in their feeding behaviour - for many therefore money is not perceived as a limiting factor,
- parental preference, and whatever influence they have, tends to favour school meals as opposed to any other source of lunch.
- more of the older pupils claim not to be influenced by their parents in their choice of lunchtime feeding.

(vi) Preferred type of school meal service.

Question 13 (appendix 7) of the survey asks whether the respondents prefer the traditional school meal service, the cash cafeteria service, or whether they have no preference. The results are shown in tables 3.38. and 3.39.

Of those who expressed a preference, over half (56.3%) indicated that they preferred the cash cafeteria service whilst only 7.1% indicated a preference for the traditional service. These results are consistent for both boys and girls (table 3.38.). Analysis by age reveals that more of the older pupils tended to prefer the cash cafeteria than did the younger pupils - 47% of the 11-12 year olds and 62% of the 15-16 year olds preferred the cash cafeteria. The younger pupils tended to be more indifferent about the type of service.

In order to see whether preferences differ between those who have a cash cafeteria and those who still have the traditional meal service, preferred canteen was cross-tabulated with school canteen (table 3.40.). The results are similar for both groups of respondents with the cash cafeteria being the most popular for both.
Table 3.38. Preferred type of school canteen.

<table>
<thead>
<tr>
<th>Preferred canteen</th>
<th>Total No.</th>
<th>%</th>
<th>Boys No.</th>
<th>%</th>
<th>Girls No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>283</td>
<td>7.1</td>
<td>169</td>
<td>7.0</td>
<td>114</td>
<td>7.2</td>
</tr>
<tr>
<td>Cash cafeteria</td>
<td>2,253</td>
<td>56.3</td>
<td>1,344</td>
<td>55.9</td>
<td>906</td>
<td>57.0</td>
</tr>
<tr>
<td>Don't mind</td>
<td>1,417</td>
<td>35.4</td>
<td>868</td>
<td>36.1</td>
<td>549</td>
<td>34.5</td>
</tr>
</tbody>
</table>

Notes: o Percentages are of the number in each group.
       o Totals do not equal Boys + Girls due to missing values.

Table 3.39. Preferred type of school canteen by age.

<table>
<thead>
<tr>
<th>Preferred canteen</th>
<th>11-12 No.</th>
<th>%</th>
<th>13-14 No.</th>
<th>%</th>
<th>15-16 No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>126</td>
<td>8.1</td>
<td>79</td>
<td>5.5</td>
<td>73</td>
<td>7.3</td>
</tr>
<tr>
<td>Cash cafeteria</td>
<td>732</td>
<td>47.0</td>
<td>903</td>
<td>62.4</td>
<td>618</td>
<td>62.1</td>
</tr>
<tr>
<td>Don't mind</td>
<td>678</td>
<td>43.6</td>
<td>449</td>
<td>31.0</td>
<td>290</td>
<td>29.1</td>
</tr>
</tbody>
</table>

Note: o Percentages are of the number in each group.
A significant number of both groups still indicate no preference for either type of meal operation.

Table 3.40. Preferred type of school canteen by type of canteen at respondents school

<table>
<thead>
<tr>
<th>Preferred canteen</th>
<th>School canteen</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Traditional</td>
<td>129</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td>Cash cafeteria</td>
<td>684</td>
<td>50.9</td>
<td>1,496</td>
</tr>
<tr>
<td>Don't mind</td>
<td>503</td>
<td>37.8</td>
<td>870</td>
</tr>
</tbody>
</table>

Note: Percentages are of the total sample

In conclusion, the main findings with regard to the preferred type of school meal service have been that:

- the cash cafeteria is by far the more popular form of school meals service for those who expressed a preference. Whilst 54.3% preferred the cash cafeteria operation, only 7.1% preferred the traditional system,
- a significant proportion of the sample indicated that they had no preference (35.4%),
- a larger proportion of the older pupils than the younger ones expressed a preference for the cash cafeteria service - more of the younger ones expressed indifference,
- both those pupils who had, and those pupils who had not experienced the cash cafeteria system, expressed a preference for cash cafeteria service.
(vii) Attitudes to school meals.

The second half of the survey questionnaire (appendix 7) is concerned with the attitudes of respondents to school meals. The first 29 statements (Att.1-29) are those used for the Likert attitude scale, discussed in the section on methodology. The second 29 statements (Gen.1-29) are the more general comments on lunchtime feeding.

This section will look at attitudes in terms of mean attitude scores for various sub-groups of the sample, and also at the particular attitude statements with which these sub-groups either agree or disagree. For this purpose statements will be included if their mean attitude score is greater than 3.5 or less than 2.5 (with a scale of 1 to 5 the area 2.5 to 3.5 covers the zone of indifference), and if the score is statistically significant at the 95% level of confidence. Statements are then ranked in the tables according to the degree of agreement/disagreement.

This information will thus reveal the overall attitude of the sample, or sub-group, and also identify particular aspects that groups of respondents perceive as important to their lunchtime feeding experience.

1. The attitudes of the whole sample.

The mean attitude score for the sample as a whole was 80.8 points. With the mid-point of the scale at 87 points this score is not statistically significant (95% level of confidence), and furthermore it may be seen that it lies within the zone of indifference (72.5 points - 101.5 points). This indicates that the mean attitude of the sample is neither positive or negative towards school meals.

Investigation of the dispersion of the results (figure 3.5.) however reveals a very wide range of scores within the sample - the standard deviation was 20.4 points. Thus, whilst the mean score indicates indifference, it actually masks very highly positive and very highly
Figure 3.5. Histogram of Likert attitude scores for the whole sample
negative attitudes to school meals. Sub-groups of the sample will therefore be investigated in order to identify common factors associated with those who have either strongly positive or strongly negative attitudes. The mean attitude scores for each of the schools in the survey are shown in table 3.41. These scores reveal that despite the indifference score for the mean of the sample, there are a number of schools where more positive/negative attitudes exist.

Correlating the mean attitude scores for each school, with school meal uptake figures provided by the ILEA (ILEA School Meal Returns 1982 - Secondary Schools) reveals a positive correlation coefficient of 0.614. This indicates a clear positive relationship between attitudes, as measured by the Likert scale devised for this study, and lunchtime feeding behaviour. The attitude measurement tool is thus of value in our search to explain the feeding behaviour of schoolchildren.

Table 3.42. shows the statements that were important and statistically significant for the sample as a whole. A number of particular aspects of the lunch experience arise from this list. Statements 10 and 11 indicate the relative importance of feeding during the lunchbreak. These statements confirm the finding of section (iii) that for most respondents, having lunch is the most important activity at lunchtime.

A number of statements relate directly to the nature of lunchtime meals. Variety of foods is clearly of importance since the most highly ranked statement was, "It's best to have a wide choice of different meals at lunchtime". Cash cafeterias ("Cash cafeterias are good because you can choose what you like") and food sources out of school ("There's a better variety of food to choose from outside school") are associated with a better choice of foods than traditional meals service.

Several of statements in the survey referred to specific characteristics of traditional and cash cafeteria operations. Two statements regarding cash cafeteria operations were significant.
Table 3.41. Mean attitude scores for each school sampled.

<table>
<thead>
<tr>
<th>School</th>
<th>Rank</th>
<th>Mean Attitude Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acland Burghley</td>
<td>10</td>
<td>86.8</td>
<td>14.9</td>
</tr>
<tr>
<td>Battersea County</td>
<td>11</td>
<td>84.6</td>
<td>18.9</td>
</tr>
<tr>
<td>Beaufoy</td>
<td>24</td>
<td>75.7</td>
<td>18.8</td>
</tr>
<tr>
<td>Blackheath Bluecoat</td>
<td>20</td>
<td>80.2</td>
<td>19.9</td>
</tr>
<tr>
<td>Camden Girls</td>
<td>9</td>
<td>89.2</td>
<td>16.7</td>
</tr>
<tr>
<td>Sir Walter St. Johns</td>
<td>26</td>
<td>74.9</td>
<td>22.3</td>
</tr>
<tr>
<td>Central Foundation Boys</td>
<td>2</td>
<td>95.8</td>
<td>19.1</td>
</tr>
<tr>
<td>Elliot</td>
<td>33</td>
<td>69.3</td>
<td>19.9</td>
</tr>
<tr>
<td>Ensham</td>
<td>22</td>
<td>77.2</td>
<td>19.9</td>
</tr>
<tr>
<td>George Green</td>
<td>19</td>
<td>80.3</td>
<td>18.6</td>
</tr>
<tr>
<td>Haberdashers Askes (Boys)</td>
<td>17</td>
<td>81.8</td>
<td>19.7</td>
</tr>
<tr>
<td>Hackney Free and Parochial</td>
<td>25</td>
<td>75.4</td>
<td>15.7</td>
</tr>
<tr>
<td>Highbury Grove</td>
<td>31</td>
<td>71.3</td>
<td>19.2</td>
</tr>
<tr>
<td>La Retraite High</td>
<td>36</td>
<td>60.5</td>
<td>15.5</td>
</tr>
<tr>
<td>Lady Margaret</td>
<td>21</td>
<td>78.8</td>
<td>16.6</td>
</tr>
<tr>
<td>London Nautical</td>
<td>23</td>
<td>76.8</td>
<td>19.2</td>
</tr>
<tr>
<td>Mayfield</td>
<td>29</td>
<td>72.2</td>
<td>17.2</td>
</tr>
<tr>
<td>John Roan</td>
<td>16</td>
<td>82.9</td>
<td>20.3</td>
</tr>
<tr>
<td>Geoffrey Chaucer</td>
<td>14</td>
<td>83.8</td>
<td>14.6</td>
</tr>
<tr>
<td>Our Lady's Convent High</td>
<td>3</td>
<td>94.3</td>
<td>16.9</td>
</tr>
<tr>
<td>George Orwell</td>
<td>32</td>
<td>69.3</td>
<td>14.4</td>
</tr>
<tr>
<td>Roger Manwood</td>
<td>30</td>
<td>71.4</td>
<td>19.1</td>
</tr>
<tr>
<td>St. Aloysius College</td>
<td>6</td>
<td>90.5</td>
<td>16.7</td>
</tr>
<tr>
<td>St. Bernards RC.</td>
<td>18</td>
<td>80.7</td>
<td>20.8</td>
</tr>
<tr>
<td>St. Josephs Academy</td>
<td>4</td>
<td>91.2</td>
<td>18.8</td>
</tr>
<tr>
<td>St. Marlebone</td>
<td>28</td>
<td>73.8</td>
<td>17.4</td>
</tr>
<tr>
<td>St. Pauls Way</td>
<td>8</td>
<td>90.1</td>
<td>15.7</td>
</tr>
<tr>
<td>St. Theresa's</td>
<td>12</td>
<td>84.5</td>
<td>21.9</td>
</tr>
<tr>
<td>St. Thomas the Apostle</td>
<td>7</td>
<td>90.4</td>
<td>17.8</td>
</tr>
<tr>
<td>St. William of York</td>
<td>1</td>
<td>101.0</td>
<td>11.9</td>
</tr>
<tr>
<td>Skinners Company</td>
<td>34</td>
<td>67.7</td>
<td>14.7</td>
</tr>
<tr>
<td>Wandsworth</td>
<td>5</td>
<td>91.1</td>
<td>23.0</td>
</tr>
<tr>
<td>John Griffiths</td>
<td>27</td>
<td>74.0</td>
<td>21.4</td>
</tr>
<tr>
<td>Quintin Kynaston</td>
<td>13</td>
<td>83.9</td>
<td>19.1</td>
</tr>
<tr>
<td>Sir John Cass and Redcoat</td>
<td>15</td>
<td>83.1</td>
<td>19.8</td>
</tr>
<tr>
<td>Archbishop Michael Ramsey</td>
<td>35</td>
<td>65.4</td>
<td>14.9</td>
</tr>
</tbody>
</table>
Table 3.42. Mean attitude score and statements which were on average agreed/disagreed with by the whole sample.

<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>91</td>
<td>1</td>
<td>It's best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>82</td>
<td>2</td>
<td>We should be allowed out of the school grounds at lunchtime</td>
</tr>
<tr>
<td>81</td>
<td>3</td>
<td>We have to queue too long for school meals</td>
</tr>
<tr>
<td>84</td>
<td>4</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>77</td>
<td>5</td>
<td>If you are last in the queue all you get is leftovers</td>
</tr>
<tr>
<td>72</td>
<td>6</td>
<td>I prefer school chips to french fries (like MacDonalds) DISAGREE</td>
</tr>
<tr>
<td>74</td>
<td>7</td>
<td>I like to spend my lunchtime in the school dining-room DISAGREE</td>
</tr>
<tr>
<td>74</td>
<td>8</td>
<td>I don't like to eat school meals because I am dieting DISAGREE</td>
</tr>
<tr>
<td>71</td>
<td>9</td>
<td>It is bad having a classroom as a dining room</td>
</tr>
<tr>
<td>67</td>
<td>10</td>
<td>It's more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>70</td>
<td>11</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>70</td>
<td>12</td>
<td>The food in school is hotter than the food you can buy outside DISAGREE</td>
</tr>
<tr>
<td>70</td>
<td>13</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>69</td>
<td>14</td>
<td>There's a better variety of food to choose from outside school</td>
</tr>
<tr>
<td>65</td>
<td>15</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>61</td>
<td>16</td>
<td>The school dining-room is cramped</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 80.8

Note: * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree
The statement regarding the better variety which ranked fourth, has already been mentioned. Respondents also agreed with the statement, "cash cafeterias are good because you can spend as much as you like in them" - a clear indication that choice in terms of price is also a significant factor.

The school feeding environment appears to be of particular concern to pupils. They very strongly disagree with the statement "I like to spend my lunchtime in the school dining-room" (ranked 7). Furthermore they think that it is "bad" to use a classroom as a dining-room (ranked 9), and that the school dining-rooms are "cramped" (ranked 16). Perhaps as a result of this dislike for the school feeding environment, there is a very strong desire to leave school during lunch - the statement, "We should be allowed out of the grounds during lunchtime" was ranked second. Any changes in school policy should thus be considered very carefully in the light of the probable impact on the school meals service. Section (iv) has already established that a substantial number of those who take school meals would eat elsewhere if allowed out of school during the lunchbreak (21.5% of the sample said the main reason for having a school meal was not being allowed out at lunchtime).

The role of relaxation during the lunch break has already been identified, and is confirmed by the degree of agreement to the statement "Lunchtime is for relaxing". It would appear that most school dining-rooms are not conducive to this aim, especially when many are converted classrooms.

An aspect of school meals that is clearly perceived as a problem by the respondents in this sample is the need to queue for meals. The statements ranked third and fifth in table 3.42. relate to this point. The first states that diners have to "queue" for too long for school meals, and the second that those who are last in the queue are left with "leftovers" - once again a reduced choice. This should be of some concern to school meals organisers since the importance of choice has already been identified, and it has been established in section (iii) that many respondents are likely to miss a school lunch if it restricts their participation in what they
perceive as a more important activity.

To conclude this section on the attitudes of the sample as a whole, the main findings have been:

- Although the mean attitude score indicates neither a positive or negative attitude, the dispersion of the distribution of scores shows that many respondents have positive attitudes and many have negative attitudes.
- There is a positive correlation between school meal uptake figures and school mean attitude scores. Attitudes as measured by the Likert scale are thus related to feeding behaviour.
- A variety of foods is seen as the most important aspect of lunchtime feeding. Food variety is mainly associated with food sources outside school and with cash cafeterias as opposed to traditional meal sources.
- Queuing is perceived as a particular problem with school meals. This should concern school meals organisers since it is clear that where queuing takes up too much of the valuable lunchbreak, pupils will seek faster alternatives, or miss lunch altogether.
- Cash cafeterias are preferred for the wider choice of foods and also because they allow the pupils to spend as much or as little as they like.
- The school dining environment is not appropriate for relaxation - a major requirement for the lunchbreak. Pupils do not like to spend their lunchtime in the dining-room, they do not like using classrooms as dining-rooms and they feel that the dining-rooms are cramped.
- Respondents feel strongly that they should be allowed out of the school grounds during lunchtime. A change of policy along these lines would have a dramatic affect upon the level of school meal uptake.
2. Attitudes analysed by sex.

The mean attitude scores for boys and girls were 82.8 and 77.9 respectively (the difference between these scores is statistically significant at the 95% level of confidence). These scores indicate that overall the girls in the sample had a slightly more negative attitude to school meals than the boys.

The statements with which the boys on average agreed/disagreed are shown in table 3.43., whilst those with which the girls on average agreed/disagreed are shown in table 3.44. These tables reflect the lower degree of satisfaction for the girls, by the fact that there are more critical statements included in the girls list than there are in the boys. Despite this, there is a large degree of similarity between the two groups - they perceive similar problems with the meals service. Both include all the statements already identified for the sample as a whole.

There are however a number of different factors that are of particular concern to each of the groups. Statements concerning packed lunches appear for both groups. Whilst the girls agree with the statement that they would rather have a packed lunch because of the wider choice of foods (statement ranked 16), the boys state that it is too much "bother" to make packed lunches. This confirms the findings of section (iii), concerning lunchtime activities, where it was established that a much larger percentage of girls (23%) than boys (8.5%) take packed lunches to school.

It would appear from the boys agreement with the statement "It's like a prison camp at lunchtime with all the teachers watching all the time", that the boys find the school dining situation too oppressive in terms of being watched and controlled by the teachers. Again this has relevance regarding the need to relax during lunch - identified by the statement ranked 15.

It is interesting to note the relative importance of eating and relaxation. Whilst the boys rank eating higher than relaxation, the
<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>1</td>
<td>It's best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>82</td>
<td>2</td>
<td>We should be allowed out of the school grounds at lunchtime</td>
</tr>
<tr>
<td>80</td>
<td>3</td>
<td>We have to queue too long for school meals</td>
</tr>
<tr>
<td>83</td>
<td>4</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>75</td>
<td>5</td>
<td>I don't like to eat school meals because I am dieting</td>
</tr>
<tr>
<td>70</td>
<td>6</td>
<td>I prefer school chips to French fries (like MacDonalds)</td>
</tr>
<tr>
<td>71</td>
<td>7</td>
<td>It's bad having a classroom as a dining-room</td>
</tr>
<tr>
<td>70</td>
<td>8</td>
<td>I like to spend my lunchtime in the school dining-room</td>
</tr>
<tr>
<td>73</td>
<td>9</td>
<td>If you're last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>72</td>
<td>10</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>67</td>
<td>11</td>
<td>It's more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>53</td>
<td>12</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>67</td>
<td>13</td>
<td>The food in school is hotter than the food you can buy outside</td>
</tr>
<tr>
<td>65</td>
<td>14</td>
<td>There's a better variety of food to choose from outside school</td>
</tr>
<tr>
<td>62</td>
<td>15</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>62</td>
<td>16</td>
<td>It's like a prison camp at lunchtime with teachers watching all the time</td>
</tr>
<tr>
<td>59</td>
<td>17</td>
<td>The school dining-room is cramped</td>
</tr>
<tr>
<td>59</td>
<td>18</td>
<td>It's too much bother to make packed lunches in the morning</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 82.8

Note: * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree
Table 3.44. Mean attitude score and statements which were on average agreed/disagreed with by girls.

<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>1</td>
<td>Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>83</td>
<td>2</td>
<td>We should be allowed out of the school grounds at lunchtime</td>
</tr>
<tr>
<td>83</td>
<td>3</td>
<td>We have to queue too long for school meals</td>
</tr>
<tr>
<td>83</td>
<td>4</td>
<td>If you're last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>85</td>
<td>5</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>78</td>
<td>6</td>
<td>I like to spend my lunchtime in the school dining-room DISAGREE</td>
</tr>
<tr>
<td>76</td>
<td>7</td>
<td>I prefer school chips to french fries (like MacDonalds) DISAGREE</td>
</tr>
<tr>
<td>71</td>
<td>8</td>
<td>Its bad having a classroom as a dining-room DISAGREE</td>
</tr>
<tr>
<td>74</td>
<td>9</td>
<td>The food in school is hotter than the food you can buy outside DISAGREE</td>
</tr>
<tr>
<td>69</td>
<td>10</td>
<td>Its more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>73</td>
<td>11</td>
<td>I don't like to eat school meals because I am dieting DISAGREE</td>
</tr>
<tr>
<td>70</td>
<td>12</td>
<td>There's a better variety of food to choose from outside school</td>
</tr>
<tr>
<td>70</td>
<td>13</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>69</td>
<td>14</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>72</td>
<td>15</td>
<td>School food is often too greasy</td>
</tr>
<tr>
<td>63</td>
<td>16</td>
<td>I'd rather have a packed lunch from home because you can choose what you want</td>
</tr>
<tr>
<td>67</td>
<td>17</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>59</td>
<td>18</td>
<td>The school dining-room is cramped</td>
</tr>
<tr>
<td>64</td>
<td>19</td>
<td>School meals don't provide enough variety</td>
</tr>
<tr>
<td>68</td>
<td>20</td>
<td>With school meals everything is clean and hygienic DISAGREE</td>
</tr>
<tr>
<td>69</td>
<td>21</td>
<td>The cutlery is always clean and hygienic DISAGREE</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence
Mean attitude score for sample = 77.9

Note: * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree
The girls give a slightly higher ranking to relaxation - further evidence of the need to provide an appropriate feeding environment in order to maximise uptake.

A point of particular concern to the girls was the question of cleanliness and hygiene. They strongly disagreed with both statements, "The cutlery is always clean and hygienic", and that, "With school meals everything is clean and hygienic" (ranked 21 and 20). It is clear therefore that the cleanliness of the lunchtime feeding environment is of some concern to girls, and furthermore that the girls in the sample do not think that the school meals environment is either clean or hygienic.

Finally it is interesting to note that the statement regarding school meals and diets (ranked 11) indicates that girls do not in general avoid school meals because of dietary considerations. They do however think that school meals are "often too greasy". This is important considering the research already discussed regarding the nutritional value of school meals. This has indicated that too much energy is provided in the form of fat. It would appear therefore that both in terms of the nutritional considerations and acceptability that the fat content of school meals should be reduced.

To summarise the main points of this section:

- On average girls had a more negative attitude to the school meals service than boys.
- All the factors identified as important for the whole sample are also relevant for both boys and girls. They both therefore perceive similar problems with the meals service. Organisers of school meals should thus give priority to these items since they should be the most effective in terms of improving attitudes and uptake.
- Girls prefer packed lunches from home because of the wider choice, whilst boys think it is too much "bother" to make a packed lunch, or what is more likely for their parents to make a packed lunch.
Boys find the school lunch environment restrictive and oppressive due to the extent of teacher supervision. 

Cleanliness and hygiene are important factors for the girls. They do not think that the school meals environment is either clean or hygienic. 

Dieting does not deter either boys or girls from taking school meals, but girls do think that the food is often too greasy.

3. Analysis of attitudes by age.

The mean attitude ratings for the three age groups were as follows:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mean Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-12 year olds</td>
<td>85.4</td>
</tr>
<tr>
<td>13-14 year olds</td>
<td>77.0</td>
</tr>
<tr>
<td>15-16 year olds</td>
<td>79.1</td>
</tr>
</tbody>
</table>

These ratings indicate that the older pupils, the 13-16 year olds, have more negative attitudes than the younger pupils, the 11-12 year olds. The differences between the mean scores of the 11-12 year olds and the 13-14 year olds, and between the 11-12 year olds and the 15-16 year olds are both statistically significant at the 95% confidence level. The difference between the means for the 13-14 and the 15-16 year olds is not statistically significant at the 95% confidence level.

The attitudes with which each of the age groups agreed/disagreed are shown in tables 3.45., 3.46. and 3.47. The more negative attitudes of the older children are also reflected in the larger number of statements that identify problems and dissatisfactions with the meals service.

11-12 year old pupils.

The statements with which the 11-12 year old age group agreed/disagreed are shown in table 3.45. Comparing these with the results for the whole sample and with the two other groups, one can see that there are fewer statements included i.e. that fewer were
statistically significant. All the highly ranked statements for the total sample are again highly ranked for the 11-12 year olds. It is in the lower ranked statements that they differ. This indicates that on the main points this group agrees with the rest of respondents, but there are some more lowly ranked items that are of some concern to the younger pupils.

There are three points identified by the main sample that are not included by this group. Despite a very high ranking for a wide choice of foods at lunch, this group do not endorse the view that "There's a better variety of food to choose from outside school". This may be due to the fact that few of these younger pupils are allowed out of the school grounds during lunch and consequently have little experience upon which to judge this statement. The statements concerning the importance of relaxation and the cramped nature of the dining-room are not significant for this group.

Parental influence is evidently significant. The statement "My mum likes me to have school meals so she knows that I've had something to eat during the day", is endorsed and confirms the finding of section (v) that 55% of the 11-12 year olds believe that their parents prefer them to eat in the school canteen.

13-14 and 15-16 year old pupils.

Tables 3.46. and 3.47. show the statements with which the 13-14 and 15-16 year age groups agreed or disagreed. Both of these tables include the statements identified for the whole sample, rating them all highly. There are also additional statements which identify particular matters that concern these age groups.

Both groups disagree with the view that it is not worth going outside school for their lunch. As has already been established, the older pupils tend to go out of school for their lunch and clearly view having lunch out of school a worthwhile alternative to school meals.

As with the girls, both of the older groups of pupils feel that
Table 3.45. Mean attitude score and statements which were on average agreed/disagreed with by respondents aged 11-12.

<table>
<thead>
<tr>
<th>Rank</th>
<th>% Agree/Disagree</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>Agree/D disagree</td>
<td>Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>83</td>
<td>Agree/D disagree</td>
<td>We have to queue up too long for school meals</td>
</tr>
<tr>
<td>83</td>
<td>Agree/D disagree</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>76</td>
<td>Agree/D disagree</td>
<td>We should be allowed out of the school grounds during lunchtime</td>
</tr>
<tr>
<td>76</td>
<td>Agree/D disagree</td>
<td>I don't like to eat school meals because I am dieting DISAGREE</td>
</tr>
<tr>
<td>76</td>
<td>Agree/D disagree</td>
<td>The most important thing at lunchtime is to eat DISAGREE</td>
</tr>
<tr>
<td>69</td>
<td>Agree/D disagree</td>
<td>I prefer school chips to french fries (like MacDonalds) DISAGREE</td>
</tr>
<tr>
<td>70</td>
<td>Agree/D disagree</td>
<td>I like to spend my lunchtime in the school dining-room DISAGREE</td>
</tr>
<tr>
<td>69</td>
<td>Agree/D disagree</td>
<td>Its bad having a classroom as a dining-room DISAGREE</td>
</tr>
<tr>
<td>71</td>
<td>Agree/D disagree</td>
<td>If you're last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>69</td>
<td>Agree/D disagree</td>
<td>Its more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>70</td>
<td>Agree/D disagree</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>64</td>
<td>Agree/D disagree</td>
<td>The food in school is hotter than the food you can buy outside DISAGREE</td>
</tr>
<tr>
<td>64</td>
<td>Agree/D disagree</td>
<td>My mum likes me to have school meals so she knows that I've had something to eat during the day</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 85.4

Note: * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree.
Table 3.46. Mean attitude score and statements which were on average agreed/disagreed with by respondents aged 13-14.

<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>86</td>
<td>1</td>
<td>We should be allowed out of the school grounds during lunchtime</td>
</tr>
<tr>
<td>92</td>
<td>2</td>
<td>Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>83</td>
<td>3</td>
<td>We have to queue up too long for school meals</td>
</tr>
<tr>
<td>83</td>
<td>4</td>
<td>If you're last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>85</td>
<td>5</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>76</td>
<td>6</td>
<td>I prefer school chips to french fries (like MacDonalds) DISAGREE</td>
</tr>
<tr>
<td>76</td>
<td>7</td>
<td>I like to spend my lunchtime in the school dining-room DISAGREE</td>
</tr>
<tr>
<td>73</td>
<td>8</td>
<td>I don't like to eat school meals because I am dieting DISAGREE</td>
</tr>
<tr>
<td>73</td>
<td>9</td>
<td>Its bad having a classroom as a dining-room</td>
</tr>
<tr>
<td>75</td>
<td>10</td>
<td>The food in school is hotter than the food you can buy outside DISAGREE</td>
</tr>
<tr>
<td>72</td>
<td>11</td>
<td>There's better variety of food to choose from outside school</td>
</tr>
<tr>
<td>68</td>
<td>12</td>
<td>Its more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>72</td>
<td>13</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>69</td>
<td>14</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>68</td>
<td>15</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>64</td>
<td>16</td>
<td>The school dining-room is too cramped</td>
</tr>
<tr>
<td>65</td>
<td>17</td>
<td>It's like a prison camp at lunchtime with teachers watching all the time</td>
</tr>
<tr>
<td>66</td>
<td>18</td>
<td>School food is often too greasy</td>
</tr>
<tr>
<td>64</td>
<td>19</td>
<td>We are made to rush our school lunches</td>
</tr>
<tr>
<td>66</td>
<td>20</td>
<td>With school meals everything is clean and hygienic DISAGREE</td>
</tr>
<tr>
<td>60</td>
<td>21</td>
<td>It's not worth going outside school to get lunch DISAGREE</td>
</tr>
<tr>
<td>63</td>
<td>22</td>
<td>School meals don't provide enough variety</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence.
Mean attitude score for sample = 77.0
Note; * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree.
Table 3.47. Mean attitude score and statements which were on average agreed/disagreed with by respondents aged 15-16.

<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>1</td>
<td>We should be allowed out of the school grounds during lunchtime</td>
</tr>
<tr>
<td>91</td>
<td>2</td>
<td>Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>82</td>
<td>3</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>76</td>
<td>4</td>
<td>I like to spend my lunchtime in the school dining-room DISAGREE</td>
</tr>
<tr>
<td>79</td>
<td>5</td>
<td>If you’re last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>73</td>
<td>6</td>
<td>I prefer school chips to french fries (like MacDonalds) DISAGREE</td>
</tr>
<tr>
<td>72</td>
<td>7</td>
<td>Its bad having a classroom as a dining-room</td>
</tr>
<tr>
<td>73</td>
<td>8</td>
<td>I don’t like to eat school meals because I am dieting DISAGREE</td>
</tr>
<tr>
<td>75</td>
<td>9</td>
<td>We have to queue up too long for school meals</td>
</tr>
<tr>
<td>74</td>
<td>10</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>68</td>
<td>11</td>
<td>Its more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>72</td>
<td>12</td>
<td>The food in school is hotter than the food you can buy outside DISAGREE</td>
</tr>
<tr>
<td>71</td>
<td>13</td>
<td>There’s better variety of food to choose from outside school</td>
</tr>
<tr>
<td>66</td>
<td>14</td>
<td>It’s not worth going outside school to get lunch DISAGREE</td>
</tr>
<tr>
<td>65</td>
<td>15</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>74</td>
<td>16</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>65</td>
<td>17</td>
<td>School food is often too greasy</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 79.1

Note: * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree
school meals are too greasy. This is further evidence of the need to reduce the fat content of school meals.

The 13-14 year group also identify a number of factors associated with the dining environment. They feel that the discipline is too oppressive - "Like a prison camp", that they are made to rush their lunches and that things are not clean or hygienic.

Analysis of attitudes to lunchtime feeding by age has revealed the following points:

- All three age groups perceive the points identified by the whole sample as important.
- The older pupils, aged 13 to 16, have more negative attitudes to school meals than the younger ones aged 11-12.
- The younger pupils (11-12 years) identify as relevant the fact that their parents like them to have school meals.
- The older pupils (13-16 years) hold the view that it is worth going out of school for their lunch, a practice that has been confirmed earlier in section (iv).
- The older pupils (13-16 years) feel that school meals are often too greasy.
- The 13-14 year olds are also concerned with the degree of discipline within school at lunchtime - "Like a prison camp", and that they are made to rush their lunches.

4. The attitudes of pupils at schools with traditional meal service and cash cafeteria meal service.

The mean attitude score for respondents who go to schools operating a traditional meal service was 73.6 whilst that for those who go to schools operating a cash cafeteria meal service was 84.6 (the difference between these two means was significant at the 95% level of confidence). There is thus a clear difference in attitude between the two groups. The pupils at schools with traditional meal service having more negative attitudes than pupils at schools with
Table 3.48. Mean attitude score and statements which were on average agreed/disagreed with by respondents at schools with a traditional meal service.

<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>91</td>
<td>1 Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>Disagree</td>
<td>86</td>
<td>2 We should be allowed out of the school grounds during lunchtime</td>
</tr>
<tr>
<td></td>
<td>83</td>
<td>3 Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td></td>
<td>81</td>
<td>4 I like to spend my lunchtime in the school dining-room</td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>5 There's better variety of food to choose from outside school</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>6 If you're last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>7 I prefer school chips to french fries (like MacDonalds)</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>8 We have to queue up too long for school meals</td>
</tr>
<tr>
<td></td>
<td>74</td>
<td>9 I don't like to eat school meals because I am dieting</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>10 I'd rather have a packed lunch from home because you can choose what you want</td>
</tr>
<tr>
<td></td>
<td>73</td>
<td>11 Its bad having a classroom as a dining-room</td>
</tr>
<tr>
<td></td>
<td>73</td>
<td>12 Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>13 The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>14 School meals don't provide enough variety</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>15 The food in school is hotter than the food you can buy outside</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>16 Its more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>17 It's not worth going outside school to get lunch</td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>18 It's worth paying more for food outside school</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>19 I would rather save money than have school meals</td>
</tr>
<tr>
<td></td>
<td>69</td>
<td>20 School food is often too greasy</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>21 It's like a prison camp at lunchtime with teachers watching all the time</td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>22 Lunchtime is for relaxing</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>23 School meals usually look good to eat</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>24 School meals fill me up</td>
</tr>
<tr>
<td></td>
<td>61</td>
<td>25 The school dining-room is too cramped</td>
</tr>
<tr>
<td></td>
<td>62</td>
<td>26 With school meals everything is clean and hygienic</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 73.6

Note; * - Ranking according to degree of agreement/disagreement.
cash cafeteria service.

Investigating the statements with which these two groups either agreed or disagreed will reveal the particular reasons for their attitudes, and will also identify aspects of the lunchbreak that are important for each of them. The statements that respondents at schools with a traditional meal service agreed/disagreed with are shown in table 3.48., whilst those for respondents at schools with a cash cafeteria service are shown in table 3.49.

As well as having the lowest attitude rating of all the groups so far analysed (73.6), the traditional meal respondents also had the highest number of significant agreed/disagreed statements. These include all the statements identified by the whole sample as important, and ten additional ones. All ten of these additional statements are critical of the traditional meal service and may be seen to indicate the particular problems of traditional meals as perceived by the pupils.

Four of the statements in the list for the traditional meal service (table 3.48.) are concerned with the alternatives to school meals. Packed lunches are seen as an attractive alternative, the comment, "I'd rather have a packed lunch from home because you can choose what you want" was endorsed and highly ranked in the list. Furthermore this group of respondents thought that obtaining food from outside school was both worthwhile (they disagree with "It's not worth going outside school to get lunch"), and worth paying extra money for (they agreed with "It's worth paying more for food outside school"). It would appear therefore that there are a substantial number of pupils at schools with traditional meals services who would be willing to pay more for what they perceive as a better lunch (66.3% or 891 individuals). Other endorsed comments indicate that an important aspect of this improved lunch service would be a wider variety of foods - "School meals don't provide enough variety" was strongly endorsed.

Perhaps the most damning comments relate to the perceived value of school meals. Of those at schools with traditional meals services,
Table 3.49. Mean attitude score and statements which were on average agreed/disagreed with by respondents at schools with a cash cafeteria meal service.

<table>
<thead>
<tr>
<th>% Agree/ Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>1</td>
<td>Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>81</td>
<td>2</td>
<td>We should be allowed out of the school grounds during lunchtime</td>
</tr>
<tr>
<td>82</td>
<td>3</td>
<td>We have to queue up too long for school meals</td>
</tr>
<tr>
<td>82</td>
<td>4</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>74</td>
<td>5</td>
<td>I don’t like to eat school meals because I am dieting DISAGREE</td>
</tr>
<tr>
<td>77</td>
<td>6</td>
<td>If you’re last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>69</td>
<td>7</td>
<td>I prefer school chips to french fries (like MacDonalds) DISAGREE</td>
</tr>
<tr>
<td>70</td>
<td>8</td>
<td>Its bad having a classroom as a dining-room</td>
</tr>
<tr>
<td>69</td>
<td>9</td>
<td>I like to spend my lunchtime in the school dining-room DISAGREE</td>
</tr>
<tr>
<td>68</td>
<td>10</td>
<td>Its more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>70</td>
<td>11</td>
<td>The food in school is hotter than the food you can buy outside DISAGREE</td>
</tr>
<tr>
<td>68</td>
<td>12</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>62</td>
<td>13</td>
<td>We have chips too often with school meals</td>
</tr>
<tr>
<td>50</td>
<td>14</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>64</td>
<td>15</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>66</td>
<td>16</td>
<td>I’d rather not eat than have school meals DISAGREE</td>
</tr>
<tr>
<td>61</td>
<td>17</td>
<td>The school dining-room is too cramped</td>
</tr>
<tr>
<td>68</td>
<td>18</td>
<td>I spend most of my time picking out the hairs and the nasty bits from the school lunch</td>
</tr>
<tr>
<td>61</td>
<td>19</td>
<td>My mum likes me to have school meals so she knows I’ve had something to eat during the day</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 84.6

Note: * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree
63.6% (655) would rather save money than have a school meal. Furthermore, 56.6% (760) disagreed with the statement that "School meals are good value for money".

A number of specific comments regarding the traditional school meal arise in table 3.48. The food is viewed as too greasy and the food does not "usually look good to eat". A large number also stated that the school meals do not usually satisfy them - in terms of the quantities of food served. It is probably not appropriate however to merely increase portion sizes, but perhaps better to introduce a greater degree of flexibility such that pupils may have more or less food depending on their appetite.

The statement regarding the "prison camp" like atmosphere is endorsed by this group and yet is not endorsed by the cash cafeteria group (table 3.49.). This is probably the result of the inherently more structured nature of the traditional meal service, including as it does very limited food choices and a number of formal "sittings". The less structured nature of the cash cafeteria is probably more conducive to relaxation.

Table 3.49. shows the statements that were significant for those at schools operating a cash cafeteria system. Once again all sixteen of the items identified as important to the whole sample are also included by this group. In sharp contrast to the results for the traditional service there are two additional positive statements for the cash cafeteria service. These are that the respondents think that their parents like them to have a school meal at lunchtime, and they disagree with the view that they would rather not eat than have a school meal.

The cash cafeteria pupils do however identify that "I spend most of the time picking out the hairs and nasty bits from the school lunch". This is possibly the result of the self-service nature of the cash cafeteria system where customers may see others touching the food. Real or perceived, this problem should be tackled.
To conclude this section, the major points regarding the attitudes of respondents who go to schools with traditional and cash cafeteria meal services were;

- Those with a traditional meal service have on average a more negative attitude to school meals than those with the cash cafeteria service.

- Both the traditional and cash cafeteria groups identified the same factors as important as those identified by the group as a whole. This is an indication that they all perceive broadly similar problems with the meals service.

- The traditional meal service has some additional problems that the respondents have identified as important. These are that;

  (i) alternative food sources to the school meal are regarded favourably, with many pupils stating that they would prefer a packed lunch, that they would pay more for food elsewhere, and that it is worth going outside school for lunch,

  (ii) the school lunch is not perceived by many respondents as very good value for money - 56.6% actually said that it wasn't good value, and 63.8% said that they would rather save money than have a school lunch,

  (iii) two thirds of the respondents said that they would be willing to pay more for food from outside school - a clear indication that many pupils would be willing to pay more for what they perceive as a better meal,

  (iv) the food is perceived as being greasy and the meals are not usually very well presented,

  (v) the dining environment is too oppressive - "like a prison camp".

- Cash cafeterias are perceived as having fewer problems than the traditional meal services. This was reflected in fewer critical
statements being identified as significant. Particular comments that did arise were that,

(i) the pupils' parents like them to have school meals so that they know that they have had something to eat during the day,

(ii) the pupils say they find hairs and other foreign bodies in their food - a problem which may arise because of the self-service nature of the cash cafeteria.

5. Attitudes of pupils who cannot eat one or more foods.

Question 5 of the survey questionnaire (appendix 7) identifies the pupils who cannot eat particular foods either because of their religion/beliefs, or because of medical reasons. This section aims to establish whether, because of this restriction on their feeding behaviour, these respondents have different attitudes and perceptions of school meals to the rest of the sample. It will also be of interest to see whether this group identifies any particular problems with school meals.

The mean attitude score for this group was 78.6 (table 3.50.), which is significantly lower than that for the group as a whole (95% level of confidence). This implies that the attitudes of pupils who are restricted in their feeding are more negative than the attitudes of the sample as a whole. These respondents do however identify the same important factors as the rest of the sample (table 3.50.). It would appear therefore that improving the school meals service along the lines discussed for the whole sample would solve many of the problems for this group. It is essential however that in the light of the extensive list of potential problem foods there is a choice offered in order to ensure that all pupils are able to eat some food.
Table 3.50. Mean attitude score and statements which were on average agreed/disagreed with by those who cannot eat some foods.

<table>
<thead>
<tr>
<th>% Agree/Disagree</th>
<th>Rank</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Its best to have a wide choice of different meals at lunchtime</td>
</tr>
<tr>
<td>89</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>2</td>
<td>We should be allowed out of the school grounds during lunchtime</td>
</tr>
<tr>
<td>82</td>
<td>3</td>
<td>We have to queue up too long for school meals</td>
</tr>
<tr>
<td>81</td>
<td>4</td>
<td>Cash cafeterias are good because you can choose what you like</td>
</tr>
<tr>
<td>78</td>
<td>5</td>
<td>If you're last in the queue then all you get is leftovers</td>
</tr>
<tr>
<td>74</td>
<td>6</td>
<td>I like to spend my lunchtime in the school dining-room</td>
</tr>
<tr>
<td>74</td>
<td>7</td>
<td>It's bad having a classroom as a dining-room</td>
</tr>
<tr>
<td>71</td>
<td>8</td>
<td>I prefer school chips to french fries (like MacDonalds)</td>
</tr>
<tr>
<td>70</td>
<td>9</td>
<td>I don't like to eat school meals because I am dieting</td>
</tr>
<tr>
<td>68</td>
<td>10</td>
<td>The food in school is hotter than the food you can buy outside</td>
</tr>
<tr>
<td>68</td>
<td>11</td>
<td>There's a better variety of food to choose from outside school</td>
</tr>
<tr>
<td>66</td>
<td>12</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
</tr>
<tr>
<td>62</td>
<td>13</td>
<td>It's more important for me to eat my lunch than finish my homework</td>
</tr>
<tr>
<td>67</td>
<td>14</td>
<td>The most important thing at lunchtime is to eat</td>
</tr>
<tr>
<td>64</td>
<td>15</td>
<td>Lunchtime is for relaxing</td>
</tr>
<tr>
<td>62</td>
<td>16</td>
<td>The school dining-room is too cramped</td>
</tr>
<tr>
<td>61</td>
<td>17</td>
<td>It's like a prison camp at lunchtime with the teachers watching all the time</td>
</tr>
</tbody>
</table>

All statements were significant at the 95% level of confidence

Mean attitude score for sample = 78.6

Note; * - Ranking according to degree of agreement/disagreement, not the numbers that agree/disagree.
6. Attitude scores and school characteristics.

The mean attitude scores for the schools were correlated with the information provided on schools by the ILEA (1983). The results of this are shown in table 3.51.

Table 3.51. Mean attitude scores correlated with school characteristics.

<table>
<thead>
<tr>
<th>School Characteristic</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>(percentage of school roll)</td>
<td></td>
</tr>
<tr>
<td>May 1982 school meal uptake</td>
<td>+0.614</td>
</tr>
<tr>
<td>Eligible for free meals</td>
<td>+0.077</td>
</tr>
<tr>
<td>Large families (&gt;4 children)</td>
<td>-0.190</td>
</tr>
<tr>
<td>Parents in non-manual work</td>
<td>-0.112</td>
</tr>
<tr>
<td>Asian origin</td>
<td>-0.151</td>
</tr>
<tr>
<td>West Indian origin</td>
<td>-0.382</td>
</tr>
<tr>
<td>Turkish origin</td>
<td>-0.341</td>
</tr>
<tr>
<td>Not fluent in English</td>
<td>-0.227</td>
</tr>
</tbody>
</table>

The +0.614 correlation of attitudes with uptake indicates a positive relationship between the attitude scale and feeding behaviour. Thus high uptake figures correspond to high mean attitude scores, and lower uptake figures correspond to lower attitude scores. The evidence of this relationship is important since it indicates that the approach involving the Likert attitude scale is valid, that it measures the appropriate variables, and that it should help identify the reasons for the selection/nonselection of school meals.

Low negative correlation coefficients were registered for the minority ethnic groups - particularly the West Indian (-0.382) and the Turkish pupils (-0.341). These coefficients indicate that there is some, although weak, relationship between the percentage of West Indian or Turkish pupils in the school and the mean attitude score. Specifically, the higher the percentage of West Indian or Turkish pupils, the lower, in general, the school mean attitude rating. This was not such a close relationship as for uptake and attitudes.
It would have been interesting to evaluate the attitudes of minority ethnic groups on an individual basis. This was not possible however due to ILEA restrictions on questions regarding race or ethnic background.

Other variables, such as the percentage of the roll eligible for free meals, the percentage of large families and the percentage of parents occupied in non-manual employment showed no relationship with attitudes to school meals.

7. Summary.

This section has investigated the attitudes of schoolchildren to lunchtime feeding. It has also looked at sub-groups of the population in order to identify particular problems as they are perceived by these groups. One of the most important findings of this section has been that there is a core group of items that are important to all of the sub-groups and the sample as a whole. These items of universal concern are as follows.

- There should be a wider variety of foods offered by school meals, particularly in the traditional service.
- Time wasted in queuing is perceived as a particular problem. There are indications that pupils will seek an alternative lunch or may miss lunch completely where queuing time is seen as excessive.
- Cash cafeterias are viewed more favourably than traditional meal services because of the flexibility of choice and spending.
- The school dining environment is perceived as a problem. Pupils do not like to spend their time in the dining-room, they do not like the use of classrooms as dining-rooms, and they feel that the dining-rooms are cramped.
- The majority of pupils feel that they should be allowed out of school during the lunchbreak.

Analysis of the results by sub-groups, such as age and sex, reveals how their attitudes relate to other groups and the sample as a whole - are they more or less positive to school meals? Such analysis
also identifies those factors that are of particular concern to each of the groups in addition to the points mentioned above.

Boys and girls;

- On average girls had a more negative attitude to school meals than boys. Some of the comments written at the end of the questionnaires illustrate some of the more extreme views of some of the girls:
  - "School meals are horrid, nasty and disgusting"
  - "the 'afters' - doughnuts, drip with grease"
  - "Chips have roots and eyes growing out of them"
  - "Same food every day - no variety, chips, chips, chips, and more chips".

- Whilst boys feel that it is too much bother to make/bring packed lunches, the girls prefer packed lunches to school meals because of the wider choice of foods.

- Boys find the dining environment oppressive due to what is perceived as continual supervision by the teachers. This is particularly significant since relaxation is seen as a vital part of the lunchbreak, and indeed too much supervision and discipline may persuade boys to go out of school for lunch. This is well illustrated by a comment written by a thirteen year old boy who said, "It is important to get out of school at lunchtime, to get away from lessons and relax".

- Girls are more concerned with the cleanliness and hygiene of the eating environment. They do not think that school dining-rooms are either clean or hygienic.

- Dieting is not a significant factor in either boys or girls decisions whether to take school meals or not. Some pupils are however aware of nutritional consequences of some of the foods they eat. One boy aged 13 noted, "I dislike school dinners because the dinners tend to be full of carbohydrates that damage teeth".

Age groups;

- On average the older pupils, 15-16 year group, have more negative attitudes to school meals than the 11-12 year olds.
For the 11-12 year olds the belief that their parents prefer them to have school meals is an important factor in their choice of lunch.

Both the 13-14 year olds and the 15-16 year olds think it is worth going outside school for their lunch.

The 13-14 year olds, in common with the boys as a group, find that the supervision by the teachers at lunchtime too oppressive.

Traditional/Cash cafeteria service:

Pupils at schools with traditional meal services tend to have more negative attitudes to school meals than pupils at schools with cash cafeteria service.

Of all the groups analysed, pupils attending schools with traditional meal services had the lowest attitude ratings of all. This group also had the longest list of significant statements, most of which were critical of school meals. These revealed that:

(i) Alternatives to school meals are preferred, and many pupils are willing to pay more for an alternative meal.
(ii) The school lunch is not perceived as good value for money and over half the group stated that they would rather save their money than have a school meal.
(iii) Too much fried food has led to comments that the food is too greasy. One girl's view on this point was; "I think that we shouldn't have so much fried food. The fried food is cheaper than things like meat and boiled potatoes, so that's why if you stay in-dinners (school meals) you are more likely to eat fried foods because you get more for your money".
(iv) Meals are not very well presented and the dining environment is perceived as unclean and unhygienic.
(v) The dining atmosphere is seen as oppressive.

The items that were perceived as important by those at schools with cash cafeteria services were:

(i) Pupils believed that their parents liked them to have school meals.
(ii) That they find foreign bodies in their food is important even if it is untrue since it is perceived as problem.
4.1. The elderly population.

4.1.1. The size of the elderly population.

It has already been noted in chapter 3, that whilst the size of the population of the United Kingdom has been fairly constant since 1971, growth of over 4% is projected to the end of the century and further slow growth is projected up to 2015. The age structure of the population has changed significantly since 1971 and it is expected to continue to change into the next century. The main changes have been the fall in the proportion of children aged under 15, the implications of which were discussed in Chapter 3, and the higher proportion of elderly people aged over 65 (Central Statistical Office 1987).

Figure 4.1 shows the actual and projected numbers of the United Kingdom elderly by age group from 1941 to 2001. Since 1901 the number of people aged over 65 has increased nearly five times to a point where in 1985 they represent 15% of the total population, as opposed to only 5% in 1901. The population of pensionable age (includes females aged 60 to 65) has increased by 2% since 1981, mainly during 1984/5, due to the large numbers of men born around 1920 (Office of Population and Census Surveys 1986). The distribution of the elderly is not even throughout the country. The proportion varies from 9-28% of the population from local authority to local authority (Office of Population and Census Surveys 1986).

Lower birth rates in the 1920's and 1930's mean that increases in the numbers of people of pensionable age are expected to slow down and stabilize to the end of the century. Beyond the year 2000 the proportion of elderly people will again increase to around 22% of the population in 2031 (Office of Population and Census Surveys 1986).

Table 4.1. shows the actual and projected structure of the United
Figure 4.1. Actual and projected numbers of UK elderly 1941 - 2001  

Source: Central statistical office 1986
Kingdom elderly population from 1984 to 2001. Whilst only small increases in the number of people aged over 65 are predicted, the age structure of this group is expected to change significantly. At the beginning of the next century the numbers of very elderly people (over 85) will rise, whilst the numbers of younger elderly (65-75) will decline. In 1985 those aged 75 and over accounted for 42% of the population aged 65 and over, in 2001 they are projected to account for 47%. Much of this increase is attributed to increases in the numbers of people aged 85 and over who are projected to make up 11% of the elderly in 2001 as opposed to 8% in 1985. This age group will increase from 656 thousand in 1984 to 1,047 thousand in 2001 (Central Statistical Office 1986 & 1987).

Table 4.1. Actual and projected structure of the United Kingdom elderly population (1984-2001). (millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>65-74</th>
<th>75-84</th>
<th>85+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>4.8</td>
<td>2.9</td>
<td>0.7</td>
<td>8.4</td>
</tr>
<tr>
<td>1985</td>
<td>4.9</td>
<td>2.9</td>
<td>0.7</td>
<td>8.5</td>
</tr>
<tr>
<td>1986</td>
<td>5.0</td>
<td>3.0</td>
<td>0.7</td>
<td>8.7</td>
</tr>
<tr>
<td>1991</td>
<td>5.0</td>
<td>3.0</td>
<td>0.9</td>
<td>8.9</td>
</tr>
<tr>
<td>1996</td>
<td>4.9</td>
<td>3.0</td>
<td>1.0</td>
<td>8.9</td>
</tr>
<tr>
<td>2001</td>
<td>4.7</td>
<td>3.0</td>
<td>1.0</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Source: Office of Population and Census Surveys 1986

Analysis of the elderly population by sex shows that the number of females far exceeds the number of males, and this imbalance becomes more pronounced with age. Whilst the 65-69 age group shows a male to female ratio of 1:1.2 the ratio is 1:2 for the 80-84 group and 1:4 for those 90 or over (Office of Population and Census Surveys 1986). As Paillat (1981) states, the "21st century will be a century of old people", and that, "In Europe the population pyramid is being replaced by a column - like Nelsons column but with an elderly woman at the top of it".

271
4.1.2. The elderly population and the provision of social services.

In order to support the elderly in the community a number of organisations including the Department of Health and Social Security, the local authorities, and voluntary bodies such as the Womens Royal Voluntary Service and Age Concern, provide a range of domiciliary services. These services are provided free or at a subsidised rate to those elderly people identified as needing them. These aids include retirement pensions, home helps, health visitors, meals-on-wheels, luncheon clubs, day centres, and a whole range of health services such as free prescriptions, spectacles, dental treatment and chiropody. In addition there are also those services that are available to the nation as an whole such as those provided by the National Health Service.

The dramatic increases in the numbers of very elderly people provides a major challenge to the nations policy makers and the future provision of social services. The General Household Survey 1984 (Office of Population Census and Surveys 1986) shows that the proportion of respondents reporting long-term illness increases exponentially with age and that generally elderly females suffer rather higher levels of long term illness than males - at least partly due to their longer life expectancy. These findings are confirmed by Hunt (1978) and Abrams (1978 and 1980) who show that those over 75 are in greater need of help of all kinds, they have a higher illness rate, they spend more time in hospital, more of them live alone, and they are more likely to be mentally confused. Grimley Evans (1981) indicates that those over 75 use residential care 6.5 times as much as those aged 65-70, they use home helps 4.1 times more, chiropody services 5.3 times more, meals-on-wheels 2.7 times more, health visitors 2.3 times more and district nurses 3.4 times more. These findings are largely borne out by the "General Household Survey" (Office of Population and Census Surveys 1986) as shown in table 4.2. This evidence indicates that future planning of services for the elderly should not be based solely upon the numbers of people over the age of 65, but should allow for the age structure of the elderly population - particularly the numbers of the very old.
Table 4.2. Use of some health and personal social services by the elderly, 1984. (percentages)

<table>
<thead>
<tr>
<th></th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home-help</td>
<td>3</td>
<td>5</td>
<td>12</td>
<td>24</td>
<td>31</td>
<td>10</td>
</tr>
<tr>
<td>Meals-on-wheels</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Luncheon club</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Health visitor or District nurse</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>16</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>Chiropodist</td>
<td>4</td>
<td>8</td>
<td>11</td>
<td>15</td>
<td>14</td>
<td>9</td>
</tr>
</tbody>
</table>


The range of disabilities suffered by the elderly is quite diverse. The Department of the Environment (1983) provides the following approximate analysis of the ability of the elderly to look after themselves:

- 2% cannot perform the most basic of tasks without assistance,
- 3% cannot perform most important household or personal tasks, but have some mobility,
- 10% cannot perform a number of important household or personal tasks, and have difficulty leaving home unassisted,
- 35% cannot perform heavy household cleaning,
- 50% can live satisfactorily without the support of others. Thus 50% are to some extent dependent on others,
- 6% in addition to the above suffer behaviour disorders and/or dementia.

The majority of elderly people in the United Kingdom live within the community in private households. The Department of the Environment (1983) states that 97.3% of the elderly reside in the community, this is confirmed by the Central Statistical Office (1987) whose statistics indicate that less than 3% (223,000) of those over the age of 65 (8.5 million) live in local authority or registered voluntary and private homes. Analysis of those who live in private households for 1985 is shown in table 4.3. The significant feature of this table is the proportion of the elderly who live alone and in
particular the very high proportion of females living alone. Over a third of those aged 65 and over live alone, whilst nearly half (47%) of the females live alone, a proportion that rises to 61% in the 80 and over age group. This trend is at least partly due to their greater life expectancy.

Table 4.3. Elderly people in private households by age and sex, 1985 (Great Britain) (percentages)

<table>
<thead>
<tr>
<th></th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80+</th>
<th>&gt;65</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With spouse</td>
<td>80</td>
<td>75</td>
<td>70</td>
<td>52</td>
<td>73</td>
</tr>
<tr>
<td>Without spouse but with others</td>
<td>7</td>
<td>5</td>
<td>9</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Living alone</td>
<td>13</td>
<td>21</td>
<td>21</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td><strong>FEMALES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With spouse</td>
<td>57</td>
<td>44</td>
<td>30</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Without spouse but with others</td>
<td>10</td>
<td>11</td>
<td>15</td>
<td>27</td>
<td>15</td>
</tr>
<tr>
<td>Living alone</td>
<td>33</td>
<td>44</td>
<td>55</td>
<td>61</td>
<td>47</td>
</tr>
</tbody>
</table>

Source: Central Statistical Office 1987

To summarise, the number of very elderly people is projected to increase significantly in both the short-term and the long-term. These people are more prone to illness, use more social services and are therefore more expensive to provide domiciliary care for. Most of the elderly live in private households with a large proportion, especially females, living alone. Around 50% of all the elderly are to some extent dependent upon others.
4.2. The meals-on-wheels service in the 1980's.

Recent developments in the meals-on-wheels service such as privatisation, technological improvements and ethnic and special diets have already been discussed in Chapter 2. This section will outline the current state of the service in 1987.

Perhaps the most significant characteristic of the meals-on-wheels service today is its variability from area to area. As Davies (1981) points out there is no national meals-on-wheels administration and there are no national standards to which areas have to work. As a consequence, the different local services vary in almost all respects. The administration for example may be local authority based, voluntary organisation based (Womens Royal Voluntary Service, Age Concern) with the support of the local authorities, or may in fact be commercially as a result of the recent policies of privatisation. These different forms of administration in themselves help to further the disparity between meals-on-wheels operations.

Guidance over the eligibility of people for delivered meals is provided by the Department of Health and Social Security circular 5/70, "Organisation of meals-on-wheels" (1970) which states that, "Those who receive meals-on-wheels should therefore be elderly or handicapped living in their own homes who cannot provide for themselves a hot main meal daily and cannot be provided with one in any other preferable way". The circular goes on to identify those groups likely to include such people;

- those alone who are sick or mentally confused or so physically infirm that they have difficulty in preparing or cooking a main meal,
- those in temporary difficulty (eg convalescent or bereaved),
- those who have inadequate cooking facilities or have not the will to make proper use of their facilities but cannot get meals from other sources,
Despite these recommendations it is still not clear nor is it really practical to specify, who is entitled to meals-on-wheels. In practice people who are thought to be in need of the service are brought to the attention of the appropriate organisation by the hospital, the doctor (there is no need for a medical certificate), the health visitor or indeed by relatives or neighbours. The vast majority of those who do receive meals-on-wheels are the elderly, aged 65 years and over - less than 2% of recipients are in the younger age groups (Davies 1981).

Somewhat surprisingly, there is no procedure whereby recipients of meals-on-wheels are taken off the service when they have returned to health, and in practice most continue to receive meals once included. As a consequence meals-on-wheels are often used as a convenience and indeed create a reliance mitigating against the policy of maintaining independence. Carpenter (1983) provides two examples illustrating this point.

- Mrs E. - aged 72 years - "Uses meals-on-wheels five days a week. Is well able to shop and cook but after a period in hospital has become dependent. She now, to quote her, "Enjoys the convenience and the cost".

- Mrs K. - aged 83 years - "Required the service following discharge from hospital, but continues it because its one less thing to worry about'. The same rather depressed lady has relinquished much of her independence on the same premise".

The Department of the Environment (1983) provides evidence of the extent to which this over-provision of meals may occur. One of the four boroughs whose meals service it investigated was providing delivered meals to 80% of the "less dependent" members of the community who were in fact able to cook main meals. "Less dependent" being able to perform most personal and household tasks except heavy cleaning.

There is thus a clear requirement for some form of mechanism whereby people can be taken off the meals-on-wheels scheme. This could take the form of regular reviews of recipients needs/condition and the
lengths of time for which meals are expected to be required could be specified at the commencement of the service. Davies, Holdsworth and Purves (1982) suggest the use of an assessment system to ensure the effectiveness of the meals-on-wheels service. They identify ten factors that point to nutritional risk and propose that these may be identified by a series of questions in a questionnaire. In this way it may be determined who should have meals and how many, and who no longer requires them. The service could then be concentrated on those in real need. In this way over dependence on delivered meals could be avoided.

Much has been made of the social role of meals-on-wheels and the extent to which the visits of meals-on-wheels workers/volunteers enable the welfare of the elderly to be monitored. This role is in practice minimal, as the Clearing House for Local Authority Social Services Research (1981) states in a study of meals-on-wheels in Hounslow, "the findings suggest this role (surveillance and social contact) is over emphasised; many clients already receive regular visitors", and that, "other forms of community support are likely to be more effective". This was confirmed by the Policy Studies Institute (1983) who state that "little or no value was to be placed on the welfare side of the meals-on-wheels service..... it was concluded that the contacts were so short that there was little opportunity for any useful welfare check to be made".

The numbers of meals served from 1980 to 1985 (the last year for which figures are currently available) are shown in Table 4.4. There has been a steady increase in the number of meals served during the 1980's, to a level of nearly 30 million in 1985. The number of meals served related to the population aged over 65, however, has only made slow progress. In 1985, 81 meals per week were served per thousand of the population over 65. This falls short of the target set by the Government of 1974 (Hansard 1974) of 200 meals per week per thousand of the population over 65, and it seems unlikely that this figure will be achieved in the foreseeable future unless radical changes in provision are made.
Table 4.4. The number of meals-on-wheels served from 1980 to 1985.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. meals served (m)</th>
<th>Meals served per 1000 over 65</th>
<th>Meals per week per 1000 over 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>27.0</td>
<td>3874</td>
<td>75</td>
</tr>
<tr>
<td>1981</td>
<td>27.0</td>
<td>3823</td>
<td>74</td>
</tr>
<tr>
<td>1982</td>
<td>27.1</td>
<td>3610</td>
<td>69</td>
</tr>
<tr>
<td>1983</td>
<td>27.9</td>
<td>3914</td>
<td>75</td>
</tr>
<tr>
<td>1984</td>
<td>28.9</td>
<td>4085</td>
<td>79</td>
</tr>
<tr>
<td>1985</td>
<td>29.9</td>
<td>4248</td>
<td>81</td>
</tr>
</tbody>
</table>

Source: DHSS Personal Social Services 1981-1986
4.3. Meals-on-wheels and the nutrition of the elderly.

4.3.1. The nutritional requirements of the elderly (aged 65 and over).

The recommended daily amounts of food energy and nutrients for the elderly aged 65 and over are shown in table 4.5. (DHSS 1981). The relevance and application of these recommendations to individual diets and groups of diets has already been discussed in section 3.3.1. It should again be stressed, however, that the recommendations do not represent minimum individual intakes but, "the average amount of the nutrient which should be provided per head in a group of people if the needs of practically all members of the group are to be met." (DHSS 1981).

As with children, discussed in section 3.3.1., the dietary requirements of the elderly are determined more by biological age than by chronological age. Whilst some people may suffer from debilitating degenerative diseases at the age of 60, others may continue to lead a healthy and active life into their 80's and beyond. Clearly the nutritional requirements of the inactive housebound or bedfast person, especially for energy, will be quite different to the requirements of the healthy active person. This holds true for people of all ages. It creates difficulties therefore that biological and chronological ages do not necessarily coincide and that recommendations such as those by the DHSS (1981) are based upon age in years.

Generally it is true to say that the nutritional requirements of the elderly are the same as for the rest of the population. Research has shown that most old people remain physically active and eat diets that are similar to the rest of the population (Exton-Smith & Stanton 1965, DHSS 1972b, DHSS 1979). In a survey of 365 elderly people the DHSS (1979) states that, "The foods eaten and the dietary pattern of the subjects, ..., were no different from what is known about the diet of younger people".

279
Table 4.5. Recommended daily amounts of food energy and nutrients for people aged 65 and over.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65-74</td>
<td>75+</td>
</tr>
<tr>
<td>Energy (MJ)</td>
<td>10.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>60</td>
<td>54</td>
</tr>
<tr>
<td>Thiamin (mg)</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Nicotinic acid (mg) (i)</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Ascorbic acid (mg)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Vitamin A (µg) (ii)</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Vitamin D (µg) (iii)</td>
<td>(iii) (iii)</td>
<td>(iii) (iii)</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Iron (mg) (iv)</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Notes:
(i) Figures are for nicotinic acid equivalents. One nicotinic acid equivalent = 1mg available nicotinic acid or 60mg tryptophan.
(ii) Figures are for retinol equivalents. One retinol equivalent = 1µg retinol or 6µg β-carotene or 12µg other biologically active carotenoids.
(iii) Where children are sufficiently exposed to sunlight no dietary sources are necessary, but during winter they should receive 10µg by supplement daily.
(iv) This may be insufficient for girls with large menstrual losses.

Source: DHSS 1981.
As with any section of the population, as activity declines the need for energy is reduced, and it is a characteristic of the elderly that food energy intake is lower as physical activity is reduced (Fry, Fox & Linkswiler 1963, Exton-Smith et al. 1965, DHSS 1972, DHSS 1979). This is particularly the case when individuals are institutionalised (Exton-Smith et al. 1965, Henrikson & Cate 1971, Justice, Howe & Clarke 1974) and/or are in ill-health (Exton-Smith, Stanton & Windsor 1972). As Exton-Smith et al. (1972) state, "low intakes of nutrients are associated with deterioration in physical and mental health in old people. There is no decline with age, indeed the youngest people had the lowest intakes".

The need for minerals and vitamins, however, remains unchanged. Davidson, Passmore, Brock & Truswell (1979) suggest that a mixed diet providing an energy intake of 8.4 MJ (2000 Kcal) is likely to contain enough of all the essential nutrients. Where such energy levels are not necessary, as in the case of females over 65 leading a sedentary life in the DHSS recommendations, it is recommended that a smaller less energy rich diet with a higher nutrient density should be adopted. This would include higher proportions of such foods as milk, fruits and vegetables (Davidson et al. 1979). As already discussed, appropriate reductions in food energy intake seem to take place naturally in response to lower levels of activity. Problems may arise however with the need to maintain mineral and vitamin intakes since individuals may not adjust their foods to allow for a more nutrient concentrated diet (DHSS 1979). Evidence of this in the feeding behaviour of the elderly is discussed in section 4.3.3.

4.3.2. Contemporary dietary views as guidelines for the feeding of the elderly.

It has already been noted that apart from the likelihood of lower energy requirements due to less activity, the nutritional requirements of the elderly are the same as for the rest of the
population. Contemporary dietary views are therefore just as useful as guidelines for the feeding of the elderly as they are for other groups of the population.

Recent reports concerning the diet and health of the nation have been discussed in section 3.3.2. Most contemporary views are considered in the National Advisory Committee on Nutritional Education (NACNE) discussion paper "Proposals for nutritional guidelines for health education in Britain" (1983). Briefly these are that:

- energy intake should be sufficient to maintain an appropriate height to weight ratio and that the proportion of energy contributed by fat should be reduced to 30% of total energy.
- saturated fats should be reduced to 10% of total energy intake.
- there should be an increased intake of complex carbohydrates rich in fibre from sources such as fruit, vegetables and cereals.
- there should be a decreased intake of simple sugars such as sucrose.
- there should be a reduction in salt intake through reducing salt added at cooking and at the table.
- the regular intake of alcohol should not exceed the equivalent of four pints of beer a day.

The NACNE recognises the potential problems of nutritional deficiencies through reduced energy intake and suggests that "The answer to these deficiencies may therefore depend on greater physical activity leading to a greater lean body mass and an increased total food intake". It is suggested therefore that the aim of any nutrition education programme for the elderly should be the maintenance of physical activity, and that in this light the proposals in the report will be as appropriate for the elderly as for the younger age groups (NACNE 1983).

Although there is no doubt that recent recommendations on diet are appropriate to the elderly, it must be asked to what extent it can be expected that people aged over 65 will change their established feeding habits, habits that have been developed over a lifetime, and
whether it is viable to attempt such changes. Although it may be reasonable to expect to modify the diets of younger members of the population, especially children in their formative years, changes in the diets of the elderly may have to be less ambitious. Exton-Smith et al. (1972) state that “Food propaganda put out by the press, radio and television or talks at old peoples clubs seem to have very little impact”. Davies, Holdsworth and Macfarlane (1986), in discussing the failure of most of their survey sample to achieve NACNE dietary fibre recommendations, state, “In spite of the ready availability of high fibre foods, and publicity from the mass media and nutritional counselling, the increased awareness of the role of dietary fibre in the prevention of constipation had not, for the majority altered food choice”.

Exton-Smith et al. (1972) go on to say that probably the most realistic approach to re-educating the elderly is to provide more practical guidance on aspects such as suitable foods to buy on a limited income, how to store them, perhaps without a refrigerator, and how to use/cook them. This was confirmed by Davies and MacLeod (1971) who found that the use of new products, in this case convenience foods, increased dramatically if the elderly were introduced to the product with demonstrations. These are aspects with which the Gerontology Nutrition Unit at Queen Elizabeth College, and Age Concern have been particularly concerned (Davies 1974). Indeed Bilderbeck, Holdsworth, Purves and Davies (1981) of the Gerontology Nutrition Unit established that, contrary to the assertions of Exton-Smith et al. (1972), “a high proportion of these elderly men and women were making dietary changes, especially where they had been informed (or mis-informed) that the change could improve health”. There is thus clearly a role for nutrition education for the elderly as well as for the rest of the population.

The Gerontology Nutrition Unit ran a conference to encourage the setting up of cookery classes for pre-retirement groups and the over 60’s, and Louise Davies (Head of the Unit) published “Easy cooking for one or two” (Davies 1972) to work in conjunction with these classes. The Unit have also produced a series of sets of
presentation materials for use by dietitians and health visitors. These cover such topics as the need for emergency food supplies, food storage without a refrigerator, and the need for vitamin D and ascorbic acid in the diet (Davies 1974).

Other methods of promoting more healthy diets in the elderly include the provision of appropriate meals at luncheon clubs and by the meals-on-wheels service. Food manufacturers and retailers could also help by providing for the sale of smaller quantities of food-stuffs that are suitable for single people and those with smaller appetites.

4.3.3. Characteristics of the diets and feeding behaviour of the elderly.

Having discussed the nutritional requirements of the elderly aged 65 and over and the implications of contemporary dietary views, the actual diets and feeding behaviour as revealed by research surveys will now be considered.

It has long been suspected that with the social changes associated with old age, especially the high numbers of the elderly living alone (section 4.1.), people tend to abandon ordinary meals for more simple easy meals. Bransby and Osborne (1953) found that in a survey of 303 elderly people that those living alone ate less of the foods requiring preparation than did those living with others. Furthermore, Nutritional Reviews (May 1983) states, "Tea, toast, bread and butter, meat-paste or fish-paste sandwiches tend to be the staple in the diets of these people". It has already been established that although lower energy intakes may be required, mineral and vitamin intakes need to be monitored. Diets as described above are unlikely to provide these nutrients and could indeed lead to deficiency diseases such as scurvy (Nutritional Reviews 1983) and iron-deficiency anaemia.

More specifically changes in eating habits can lead to reduced
consumption of food groups, such as green leafy vegetables and citrus fruits. This may in turn lead to low intakes of particular nutrients. Intakes of riboflavin, vitamin A, calcium and iron have in the past been identified as low in the diets of the non-institutionalised elderly (Jordan, Kepes, Hayes and Hammond 1954, Ohlson, Jackson, Boek, Cenderquist, Brewer and Brown 1950, Lyons and Trullson 1956). Other studies have found evidence of low intakes of vitamin A, thiamin, riboflavin, ascorbic acid, and iron in the diets of nursing home patients (Henrikson and Cate 1971, Leighton and Hamill 1968, Justice, Howe and Clarke 1974).

The above studies have been rather specific and their results too fragmentary to provide a clear view of the diets of the elderly of this country. As Bransby and Osborne (1953) stated of their study, "it is not possible to say whether the nutrient intakes of the groups studied were satisfactory or not, simply because there are so few data for the elderly.

It was against this background that two significant studies into the diets of the elderly were conducted. By coincidence both were initiated as cross-sectional studies, that is looking at a cross-section of the population at a particular point in time, and both developed into longitudinal studies, looking at a particular group of the population over time (more than one survey). This was in order to assess the effects of ageing upon dietary habits.

In 1965 the "Report of an Investigation into the Dietary of Elderly Women Living Alone" was published by the King Edwards Hospital Fund for London (Exton-Smith and Stanton 1965). Although the survey sample was not representative of the population as a whole - no men or any of those who were deaf or mentally confused were included, the results did reveal some interesting behaviour. Firstly they refuted the popular view of the elderly diet being "Tea, toast, bread and butter, meat-paste or fish-paste sandwiches" (Nutritional Reviews 1983). The report stated that respondents "ate a varied diet, cooked at least one meal a day and frequently ate fruit and vegetables". It should be remembered however that the survey did not cover the less able, and as the report itself states "it is
these very people who are likely to be poorly nourished" (Exton-Smith and Stanton 1965).

The study also revealed a significant fall in nutrient intakes with different age groups of elderly people. Comparing those in their late seventies with those in their early seventies, there was a fall of 19% in energy intake, 24% in protein, 30% in fat, 29% in iron and 31% in ascorbic acid. The researchers, however, suspected that this was more a function of health than a direct function of age - those respondents whose health was assessed as worse than average generally had a poorer diet. In order to confirm this thesis a further study was conducted with the original subjects six and a half years later (Stanton and Exton-Smith 1970).

The second study revealed a marked decrease in the intakes of nutrients for those whose physical or mental health had deteriorated. Those who had maintained their health and levels of physical activity, on the other hand, showed similar nutrient intakes to those intakes recorded in the previous study. It was thus confirmed that falls in nutrient intakes are not directly a function of age, but are more a feature of ill-health (Stanton and Exton-Smith 1970).

The same researchers conducted a further study "to assess the nutritional status of the housebound and to compare their dietary intakes with those of more active older people" (Exton-Smith, Stanton & Windsor 1972). They again concluded that low intakes of nutrients are attributable to disease or illness rather than to age alone - the housebound had the lowest intakes whilst the physically active had the highest. Specifically they found particularly low intakes for ascorbic acid and vitamin D, which may be related to osteomalacia in elderly women, and indeed the study found that the vitamin D intake for those who had sustained fractures of the femur was lower than for the group as an whole. Iron intake for the females in the sample was also very low with 30% having less than 5mg per day. Energy intakes for both males and females was lower than the DHSS (1981) recommendations for those leading a sedentary lifestyle, but this may be expected since the sample population was
housebound and are by definition likely to be particularly inactive and therefore have very low energy requirements.

Exton-Smith et al. (1972) make a number of suggestions of ways to increase intakes for the elderly. Nutrition education has already been mentioned as a means of improving diets. As Exton-Smith et al. (1972) state, "The most satisfactory means of improving the nutritional state is to increase the consumption of foods containing appropriate nutrients", but suggest that in practice it may be more practical to improve specific intakes such as ascorbic acid and vitamin D through supplementation.

In 1967/68 the DHSS and the Scottish House and Health Department carried out a major survey into the nutritional status of 879 elderly people in four areas in England and two areas in Scotland. Its findings were reported in "A Nutrition Survey of the Elderly" published by the DHSS in 1972b. This was followed in 1972/73 by a second nutritional survey with 365 of the original sample. The findings of this survey were reported in "Nutrition and Health in Old Age" (DHSS 1979).

The 1967/68 survey was the first to give a comprehensive view of the diets of a reasonably large sample of elderly people. The analysis, in terms of 26 food groups, five protein foods, energy value and thirteen nutrients, found only a small percentage (3%) of people in whom malnutrition was diagnosed and for most of those it was associated with an underlying medical condition (DHSS 1972b). The report states that the identification of undernutrition was difficult due to, "a lack of information upon which a sound estimate of requirements for nutrients could be based", and that this problem was further compounded by the fact that different clinicians associated with the survey used different criteria when making diagnoses of undernutrition (DHSS 1979).

The 1972/73 survey found that 7% of the respondents were considered to be malnourished with twice as many malnourished subjects aged 80 years and over than those aged under 80. This is associated with a similar trend with increasing age in the incidence of medical
conditions such as gastrectomy, poor dentition and dementia. The identified level of malnutrition is however likely to be an over-estimate of the national situation since the sample was not nationally representative (DHSS 1979). In 25 of the 26 malnourished subjects, medical conditions were either the main or a contributory cause. Other factors associated with undernutrition were living alone, bereavement, lack of regular cooked meals, being in the lower social classes and being in receipt of supplementary benefit. Lack of money apart from receiving supplementary benefit did not appear to be the cause of undernutrition in any of the subjects. There was a much higher incidence of malnutrition in Sunderland than any of the other five areas and this seemed to be related to the higher incidence of risk factors as mentioned above. The nature of sampling does not however permit conclusions to be made regarding regional nutritional trends.

The housebound were the most important group at risk from malnutrition and they had an higher incidence of malnutrition than did the non-housebound. This was attributed to the lower mean dietary intakes of this group. Their vitamin D status was of particular concern with low dietary intakes and minimal exposure to sunlight (DHSS 1979).

More recently, the Gerontology Nutrition Unit of Queen Elizabeth College, London, has investigated the diets of people at retirement age (Davies & Holdsworth 1985, Davies, Holdsworth & MacFarlane 1986). It was found that "Mean nutrient intakes met the United Kingdom RDA although the ranges were wide" (Davies & Holdsworth 1985). Indeed the mean intakes for protein, calcium, iron, ascorbic acid, retinol, thiamin and riboflavin were well above the United Kingdom recommended daily allowances. The mean energy intake for women was below the recommended daily allowance. The proportion of energy derived from fat was higher than contemporary dietary views recommend (see section 3.3.2.) with 42% of the total energy derived from fat (Davies and Holdsworth 1985). Data on dietary fibre was also generated and this revealed that 68% of the sample were not reaching the NACNE short-term recommendation of 25gm per day. This was in spite of the publicity concerning dietary fibre and the ready
availability of high fibre foods (Davies, Holdsworth and MacFarlane 1986).

The picture that arises from these surveys of the nutrition and diets of the elderly is one that is fairly similar to the rest of the population. Those elderly members of the population who maintain their health and continue physical activity show similar intakes to other members of the population. Any changes in the feeding behaviour and nutrient intakes, however, are largely due to changes in health and underlying medical conditions such as the effects of gastrectomy, poor dentition and dementia. Social problems are also related to lower nutrient intake and these include living alone and bereavement. The incidence of all the above risk factors rises with increased age and therefore lower intakes are more common with the more elderly members of the population. Reductions in nutrient intakes are not therefore a direct function of age, but are infact features of ill-health and the consequential reduced levels of physical activity.

A matter of some concern is the make-up of the elderly diets. Many have feeding behaviour that results in high proportions of fat and salt, in some high proportions of alcohol and sugar, and in most low fibre intakes (Davies and Holdsworth 1985). Appropriate nutrition education as discussed in section 4.3.2. is thus clearly necessary. Holdsworth and Davies (1982) suggest that such attempts to alter feeding behaviour should take place at a time of change such as retirement. They also suggest there should be an high level of motivation to the change and that indeed that many of the subjects in their studies have such motivation due to concern about personal health or the health of spouses or relatives.

4.3.4. The nutritional role of meals-on-wheels.

Although no specific nutritional requirements are provided by the Department of Health and Social Security, several studies have concluded that meals-on-wheels cannot make any significant contribution to the overall diet unless at least four meals a week
are provided (King Edwards Hospital Fund for London 1965, Stanton 1971). The Department of Health and Social Security thus recommended in 1970 that at least five hot meals a week should be served (DHSS 1970). The same circular also noted that the "over-supply" of fats and carbohydrates should be avoided and that the nutrient content of meals could be boosted with the addition of dried milk and fresh fruit.

Despite the recommendations of the DHSS very few areas have ever achieved the level of delivering five meals per week. In 1972 over 50% of the meals-on-wheels service was operating on a two meal per week basis (Cooper 1973) and by 1974 the average rate of delivery was 2.79 meals per head per week (Manning 1974).

As Davies (1981) points out however, the DHSS circular qualifies its recommendation by stating that meals-on-wheels can "contribute to this objective" by providing meals on days when relatives, neighbours or luncheon clubs are unable to do so. It is clear therefore that delivered meals are only intended as part of a wider system of care, and that in many cases the delivery of fewer than five meals per week is appropriate. Indeed, Davies, Hastrop and Bender (1974b) found that in their survey of old age pensioners in Portsmouth few meals-on-wheels recipients wanted more than three meals a week, and that over 50% were satisfied with the delivery of two meals per week.

It is essential that the maximum benefit is obtained from those meals that are served. There is thus a need for those who are at risk to be identified and for those who are no longer in need to be taken off the scheme. Davies, Holdsworth and Purves (1982) suggest the identification of potential risk factors that point to nutritional risk using a brief questionnaire. The ten potential risk factors they suggest are:

1. Less than five meals per week.
2. Little milk consumed.
3. Absence of fruit and vegetables in the diet.
4. Wastage of food.
5. Long periods without food.
6. Signs of depression.
7. Significant unexpected weight changes.
8. Sleeping difficulties.

The use of such a technique should help ensure that meals are only delivered to those in real need through the identification of those at nutritional risk. It should also help in identifying those who are able to look after themselves and may be removed from the service.

A number of studies investigating the diets of the elderly population have looked at the nutritional aspects of the meals-on-wheels service and the nutritional role of meals-on-wheels within the overall diets of the elderly. In one of the earliest investigations, Stanton (1971) studied the nutritive value of delivered meals for 107 old age pensioners supplied by six different kitchens and two luncheon clubs. Portion sizes were satisfactory for most recipients although a quarter could have eaten more. There was however a high level of waste, 80% of recipients wasted some of the food regularly and some wasted most of the food every day. Of particular significance was the variation in the nutritive value of the meals from different kitchens. Those meals with the highest protein, iron and ascorbic acid contents were twice those of the lowest - probably at least partly a consequence of the lack of nutritional guidance. Clearly with this degree of variation in nutritive content recommendations in terms of the number of meals served are of little value.

In 1970, Davies, Hastrop and Bender carried out an evaluation of meals-on-wheels in the total diets of 100 old age pensioners in Portsmouth. The subjects recorded and weighed all food consumed over a seven day period, including meals-on-wheels. Nutrient contents were calculated using food composition tables (Davies, Hastrop and Bender 1973a). Since some of the subjects were
physically and mentally handicapped, and since by definition meals-on-wheels recipients should be unable to carry out fairly simple tasks such as preparing their own meals, it would seem likely that most of the subjects would have difficulty with the task of weighing and recording meal composition accurately. Although Davies et al. (1973a) state that wherever necessary help was provided, one must question how reliable the results were in those situations where individuals received no help. Davies (1981) recognised this limitation and consequently asked field researchers to grade the reliability of individual diet records. All but eight of the sample were classed as "reasonably reliable", but to what extent does "reasonably reliable" mean that respondents are capable of accurate food measurement?

In addition to recording food consumption, subjects also completed questionnaires concerning the acceptability and social aspects of meals-on-wheels (Davies, Hastrop and Bender 1974b, Davies 1981). The results of this questionnaire are discussed in section 4.3.5. The results of the nutritional part of the survey are discussed in several papers (Davies, Hastrop and Bender 1973b, Davies, Hastrop and Bender 1974a, for example) and rather more comprehensively in "Three Score Years ..... and Then ?" (Davies 1981).

The survey placed special emphasis on the ascorbic acid content of meals-on-wheels as an "index of the quality of the meals". The ascorbic acid content is also of particular relevance due to the nature of the service, involving as it does long periods of warm holding (the time between cooking and consumption) which will tend to reduce the ascorbic acid content. The loss of ascorbic acid due to the warm holding of foods is fairly well documented, see for example, Gleim, Albury, McCartney, Visnyei and Fenton (1946); Hannson, Olsen, Bosund and Rasmussen (1972); Karlstrom and Jonsson (1977); Hill, Baron, Kent and Glew (1977).

Whilst the ascorbic acid intake by calculation from composition tables was similar on days when meals-on-wheels were consumed to that of other days, the content as determined by chemical assay

292
showed substantial losses in meals-on-wheels. The researchers concluded that since home cooked meals were eaten fairly soon after cooking and that fruits and vegetables tended to be eaten on days when meals-on-wheels were not delivered, the "true intake of the vitamin (ascorbic acid) was thus generally lower on those days when meals-on-wheels were supplied" (Davies et al. 1973b). This is a matter of some concern since the average daily intake of ascorbic acid, as calculated from composition tables was only 37mg (47% were less than 30mg) - the result of ascorbic acid loss in delivered meals was to reduce the average intake to 28mg (DHSS recommended daily allowance 1981 - 30mg). There is thus no leeway within the rest of the diet to allow for such nutritional losses. Davies (1981) suggests a number of ways to offset these losses including more efficient delivery and cooking methods, supplementation, fortified foods and the inclusion of more foods rich in ascorbic acid.

The study further confirmed the view that energy intakes relate to physical activity and health - discussed in section 4.3.3. On average, meals-on-wheels provided 38% of the recommended daily allowance (DHSS 1969), although the range was 9% to 59%. The low intake figures were mainly due to wastage which brought the average energy provided by meals (830 kcal - 3.5 MJ) down to an actual average intake of 760 kcal (3.2 MJ). It was also found that on average energy intakes rose on the days when meals-on-wheels were delivered (Davies et al. 1974a, Davies 1981). Delivered meals clearly make a significant contribution to the energy intakes of recipients but the reasons for the high levels of wastage have not been ascertained. It is suggested that portion control is at least partly to blame, that is that some meals supplied far more energy than was required (Davies 1981), but it would also be of value to determine whether wastage was also the result of low energy requirements or due to low acceptability. The acceptability of meals-on-wheels is discussed in section 4.3.5.

Low intakes of vitamin D and limited exposure to sunlight, have already been identified as characteristics of the housebound elderly (Exton-Smith et al. 1972). This survey found that meals-on-wheels
were low in vitamin D, and indeed six of the meals tested during the survey contained no vitamin D. Davies (1981) suggests that deficiencies in the intakes of the housebound elderly could be made-up by more exposure to sunlight, either by allowing the elderly to sit outside in the sunlight or by helpers taking them out more frequently. Interestingly it is also suggested that some particularly immobile patients could benefit from sunlamp treatment. Since there are limited dietary sources of vitamin D, the best being oily fish such as herring or mackerel, it is also suggested that fortified foods such as milk, dehydrated potato or margarine could be given to those most at risk. Clearly the meals-on-wheels service is an ideal vehicle for improving vitamin D intakes since the meals are by definition intended for those who are less able and are therefore more likely to have little exposure to sunlight. This makes the evidence that meals-on-wheels are low in vitamin D all the more significant.

The mean daily protein intake for men during the survey was 67 grams, the DHSS (1981) recommendation for men aged 65-75 is 60 grams, whilst the mean daily intake for women in the survey was 55 grams as compared with the recommended 51 grams (Davies 1981). Exton-Smith and Stanton (1965) recommended that delivered meals should contain at least 25 grams of protein, the meals-on-wheels in this survey averaged 28 grams. The range was wide however (8-58 grams), and indeed 36.5% of the sample of meals contributed less than the recommended 25 grams. Although this was in some cases due to plate wastage there were also a number of cases where insufficient protein was provided in the first place - in one meal the portion of roast meat weighed only 19 grams (0.67oz.). Indeed it was meals that contained the more expensive sources of protein, roast meats for example, that were not achieving the recommended levels of protein. Davies (1981) advises however, that cheaper alternatives should not be adopted since "the roast meats and chops were among the meals most looked forward to by the recipients". It is suggested that attention should be given to other protein sources within the meal such that the total protein content may be made up to 25 grams.
The intake of potassium was also investigated in order to try to establish the extent of "the possible link between potassium intake and depression". The study found that there was "a significant relationship between potassium intake and assessment of depression". Since potassium is available to some degree in most foods, total potassium intake is a function of both food intake and potassium concentration. Depression could therefore lead to low potassium intakes purely due to lack of appetite. On the other hand potassium depletion could itself lead to depression. Nevertheless, low potassium intakes need to be rectified and Davies (1981) suggests increasing milk, the inclusion of orange juice with meals-on-wheels, and the consumption of particular breakfast cereals such as bran.

The Portsmouth study has thus provided useful information on the diets of the elderly, and more particularly the nutritional role of meals-on-wheels within the total diet. Although meals-on-wheels make a positive contribution to the diet, a number of aspects have been pinpointed as requiring improvement. These include, concern over the ascorbic acid content of delivered meals, especially with extended periods of warm holding, the need for more vitamin D either through dietary sources or by exposure to sunlight, the variability in protein contents and finally the relationship between the intake of potassium and the incidence of depression.

Turner, Ryley and Kerwin (1979) looked at the nutritional aspects of meals-on-wheels in the Leeds area. As Stanton (1971) had previously found, there was a lot of variation in portion sizes and consequently the nutrient content of the meals. The average protein content of 26 grams was similar to that in the Portsmouth study although the energy content of 610 kcal (43.6% of the RDA) was much lower. The average calcium and iron contents were 225mg (45% of the RDA) and 3.5mg (43% of the RDA) respectively. There was however a lot of variation in these nutrient intakes mainly due to inconsistent portion sizes. This reaffirms the case for some form of guidelines in terms of the nutritional content of meals-on-wheels. The content of ascorbic acid was established by analysis - the other results were arrived at by calculation from food tables. The meals that were analysed contained an average of
53% of the RDA for ascorbic acid, although the variation was once again very wide with a range of values from 1-127% of the RDA.

Turner et al. (1979) also looked at the implications of the increased use of manufactured frozen foods. They concluded that it led to an increase in the variety of menu items offered, but a decrease in the level of nutrients mainly due to smaller portion sizes and partly due to the types of food served. Manufactured frozen meals were also investigated by Lawson and Thomson (1981). Nutritional analysis (by calculation from composition tables) of seven "typical" meals from each of five frozen meal manufacturers revealed "serious deficiencies" in vitamin D for all five, deficiencies in folic acid for four of the manufacturers, and the energy content was frequently deficient for male needs. The portion sizes were found to vary "considerably".

The results of these two surveys indicate that if prepared meals from frozen meal manufacturers are to be used in meals-on-wheels schemes, there must be some form of standardization and control exercised over the portion sizes and the nutritional content - both in terms of the qualities of foods and the make-up of the meals.

Having reviewed studies into the nutritional role of meals-on-wheels a number of points have become apparent. These are that:

- Meals-on-wheels can make a significant contribution towards the objective of serving at least five hot meals per week.
- The diets of the housebound elderly exhibit a number of characteristics (Exton-Smith and Stanton 1972) such as low intakes of ascorbic acid and vitamin D which the service could address.
- The average portion sizes, energy values and protein contents of meals-on-wheels are adequate, the variation in these figures is often enormous. Davies et al. (1976a) found that meals provided from 9-59% of the RDA for energy (DHSS 1969).
- Plate waste of meals-on-wheels is often high - Stanton (1971) found that 80% of his sample wasted some of the food regularly.
- True intakes of ascorbic acid from meals-on-wheels are low,
mainly because of the long warm-holding periods during delivery. 
- intakes of vitamin D from meals-on-wheels are low. 
- if commercially prepared frozen meals are to be used there should be some monitoring and control of portion sizes and nutritional contents.

4.3.5. The acceptability of meals-on-wheels.

Several of the studies discussed in previous sections have also investigated the acceptability of meals-on-wheels. These studies have looked at acceptability in terms of portion sizes, the quality of the meals, preferred foods, the temperature of the meals and the times of delivery.

Portion sizes were discussed in terms of nutritional adequacy in section 4.3.4. In terms of acceptability, Stanton (1971) found that most people thought that the portions were acceptable but around a quarter of the sample could have eaten more. Davies (1981) confirmed that in general portions were of "acceptable size" but more specifically identified that:

- 46% of recipients found portions of potatoes too large.
- 30% would have preferred more meat.
- 24% would have liked larger portions of other vegetables.

Studies that have sought to identify how recipients perceive the quality of delivered meals have found that most people rate them as being good or acceptable (Stanton 1971, Kemm 1981, for example). Davies et al. (1974b) established that 94% of their sample rated their meals-on-wheels as excellent, good or adequate. It is suspected however that these results could be largely the result of low expectations and fear that criticism would lead to the withholding of meals. Johnson, DiGregario and Harrison (1982) found that when respondents were questioned directly about meal quality, 72% said that they were good or very good and only 4% thought that they were poor. The results of less direct and more general questions however, revealed that only 52% rated the meals as good
and 17% indicated that they were poor. They attribute these distorted results to those reasons identified above, but also to a lack of good comparison - when meals have changed recipients usually noted how bad the meals previously were (Johnson et al. 1982).

Whilst Kemm (1981) also found that most recipients praised the meals-on-wheels service, he did find those who were less pleased. Examples of the comments he received from the less positive respondents included:

- "lack of imagination of the menus would get unbelievably boring and unappetising if received on a permanent basis"
- "when you take the lid off and see what's there it turns you right off. They are not packed nice, all in a heap"

(Kemm 1981)

The available evidence thus indicates that whilst most meals-on-wheels recipients say that they are satisfied with the quality of delivered meals, there are those who are more critical, and there is some scope for improvement. Johnson et al. (1982) suggest that quality expectations are low because recipients recognise the constraints and the very low prices charged whilst few are aware of the subsidy and therefore the real cost of the meals.

Research has shown that the most popular types of delivered meals are those that include roast meats (Stanton 1971, Davies 1981), whilst meals including fish are also popular (Stanton 1971, Ruane, Cohen and Heiser 1983). Preferences do vary however from region to region - probably reflecting local production methods and the quality of materials used rather than actual regional food preferences. This is illustrated by the fact that whilst the Portsmouth recipients of meals-on-wheels identified "pies" as a preferred meal item (Davies 1981), the respondents in the survey conducted by Ruane et al. (1983) specified pies as a disliked item due to the large proportion of pastry. Other disliked foods in delivered meals include tough meat (Ruane et al. 1983), cereals and dried pulses, cheese as an alternative for meat (Stanton 1971), and
undercooked vegetables (Stanton 1971, Ruane et al. 1983).

Sweets and desserts are in general liked (Ruane et al. 1983), especially sponge type puddings (Davies 1981). Interestingly, in the light of the nutritional recommendations regarding ascorbic acid and potassium, Ruane et al. (1983) found that 90% of their respondents liked orange juice. The provision of orange juice would thus be an ideal means of ensuring adequate intakes of ascorbic acid, countering the losses due to the warm-holding of foods, and would also help supplement the intake of potassium.

A major cause of concern in terms of both acceptability and hygiene is the temperature of the food on delivery, and the incidence of reheating meals (Clearing House for Local Authority Social Services 1981). Ruane et al. (1983) found that half their sample said the food was regularly not hot enough and some said it was delivered "stone cold". Both Stanton (1971) and Ruane et al. (1983) established that over half the recipients of meals-on-wheels keep the food for some time after delivery, often until the next day, and then reheat it.

To conclude, there is evidence that whilst most meals-on-wheels recipients, when asked directly, state that they are at least satisfied with the service, such judgements are largely the result of low expectations, and that in fact there is little room for complacency. A general fear on the part of recipients that the service may be withdrawn makes the identification of specific problem areas difficult. It is clear nevertheless that one problem area that should be addressed is the delivery temperature of meals.
4.4. The delivery of meals-on-wheels.

4.4.1. The problems associated with the delivery of meals-on-wheels.

Although trials have been conducted using alternative meal systems such as cook-chill, cook-freeze, boil-in-the-bag, and a range of self-help systems (see for example Armstrong 1979, Kerwin & Ryley 1979, Glew 1984), virtually all meals-on-wheels schemes in the United Kingdom still operate a system based on the transportation and delivery of hot meals. This approach does however suffer from a number of inherent problems, some of which have already been mentioned in earlier sections.

Most areas for concern arise from the fact that meals are transported and delivered in a hot form and that the process of delivery can extend over long periods of time. The result is that time lapses can occur between cooking and final delivery to the recipient, and that meals may be kept hot or warm for extended periods of time. In a survey carried out by P.A. Management Consultants (1973), for the Department of Health and Social Security, it was found that only 27% of meals were delivered in under 2.5 hours. Lawson and Thomson (1981) carried out a major survey of the average delivery times for 233 meals-on-wheels schemes and found that the "average time of delivery was between 1.5-2 hours", but that eight schemes had delivery rounds lasting from three to four hours. These results are largely confirmed by Turner and Glew (1982).

The problems that arise from these extended periods of warm-holding fall into three broad areas. These are acceptability, both in terms of delivery temperature and food quality, nutrition and hygiene. In addition to these problems there are also health and safety considerations which relate to the equipment used in the delivery of meals-on-wheels. These include such things as the weight of transportation containers and the safety of the heat sources.
(i) Delivery temperature;

The Clearing House for the Local Authority Social Services in its "Survey of Meals-on-Wheels and Luncheon Clubs recipients in Hounslow" (1981) identifies the main cause of concern with delivered meals as dissatisfaction with the heat of food on arrival. Turner and Glew (1982) looked at the temperature of delivered meals and found that in "many cases the temperature of the meals-on-wheels at the point of service was lower than would normally be considered acceptable by consumers" (Glew 1984). Specifically Turner and Glew (1982) found that the average temperature of the first delivered meal was 47°C (range 36-62°C) and the average temperature of the last delivered meal was 41°C (range 30-55°C). It is interesting to note that none of the sample of meals was served above the statutory minimum temperature of 62.8°C (145°F) as specified by the Food Hygiene Regulations 1970.

Although it is difficult to be specific about acceptable serving temperatures due to the variation in individual preferences - Thompson and Goldin (1975) state that "the outstanding finding of our study was the wide range of temperatures patients considered acceptable" - there are however several studies that provide some guidance. Stanton (1955) identifies the range of temperatures at which foods are acceptable as 54°C (130°F) to 68°C (155°F) for meats and 63°C (145°F) to 65°C (150°F) for vegetables. Blaker, Newcomer and Ramsey (1961) suggest minimum serving temperatures of 60°C (140°F) for foods and 63°C (145°F) for beverages and soups. Thompson and Johnson (1963a & b) make recommendations based upon the opinions of 500 hospital patients, a sample that would be similar in characteristics to the meals-on-wheels population. They suggest serving temperatures of between 71°C (160°F) and 77°C (170°F) for potatoes and vegetables and between 66°C (150°F) and 71°C (170°F) for meats. Although there is some variability between these suggestions, they all lie around the 60°C to 70°C range. Glew (1984) suggests that 65°C is an appropriate minimum serving temperature - "Most British consumers describe food served at a temperature below 65°C as cold" (Glew 1984).
Having considered views on acceptable serving temperatures, it is clear that the serving temperatures of meals-on-wheels as identified by Turner and Blew (1982) – averaging between 41°C and 47°C – are well below those normally considered to be acceptable.

(ii) Food quality;

The acceptability of delivered meals in terms of organoleptic qualities other than serving temperature are also determined by the extent of warm-holding prior to consumption. This is perhaps best illustrated by the following examples of comments from recipients of meals-on-wheels;

"often the potatoes are lumpy, badly cooked and tasteless, very often the meal has the flavour of having been cold and warmed up ... "

"when you take the lid off and see what's there it turns you right off. They are not packed nice, all in a heap"

(Kemm 1981)

Research has attempted to identify the changes in acceptability that arise as a result of the warm holding of foods (Hansson, Olsson, Bosund and Rasmussen 1972, Hill, Baron, Kent and Blew 1977, Karlstrom and Jonsson 1977). The results of these studies indicate that acceptability in terms of organoleptic quality falls with the length of time for which foods are kept warm, although for different rates for different types of foods. Hill et al. (1977) found that creamed potato prepared from fresh potatoes suffered changes in flavour after only 15 minutes of warm holding at 80°C, whilst cauliflower and cabbage showed no significant differences in flavour after one hour (interestingly there is no mention of the extent to which the cauliflower and cabbage was cooked in the first place).
Hansson et al. (1972) state that a number of food products such as potatoes, vegetables and breaded fish suffer noticeable deterioration in organoleptic quality after one hour's storage and that "After 2-3 hours, the changes are so marked that the product would be rated as unacceptable by the average consumer". Karlstrom and Jonsson (1977) maintain that for the overall impression of food acceptability, the flavour and the texture appear to be the most important sensory parameters.

(iii) Nutrient content;

The effects of warm holding on the nutrient content of meals can be quite dramatic. In general it is the water soluble vitamins that are most at risk in the cooking and hot delivery process. More particularly with extended storage at high temperatures there are likely to be losses in heat labile nutrients such as ascorbic acid. As long ago as 1946, Gleim et al. investigated the nutrient retention of potatoes in large-scale food service. Their conclusion was that keeping potatoes warm resulted in "progressive loss of ascorbic acid", but that thiamin, riboflavin and niacin (nicotinic acid) retentions were not significantly affected.

Losses in ascorbic acid due to warm holding have been confirmed by other studies. Hill et al. (1977) found losses of over 75% in fresh creamed potatoes, 35% in cauliflower and 25% in peas, during the first 30 minutes of hot storage. Karlstrom et al. (1977) found that in potatoes "The ascorbic acid was found to decrease very rapidly during the first hour of warm holding". Coupled with normal losses in cooking (around 50% is suggested by Davidson, Passmore, Brock and Truswell 1979) it can be seen that the total loss of ascorbic acid from preparation to service can be considerable.

Most other water soluble vitamins, whilst suffering losses due to leaching when foodstuffs are cooked in water, are not usually destroyed by warm holding temperatures below 100°C (Davidson et al. 1979). The exceptions to this are folic acid which is lost when
foods are subjected to prolonged heating and reheating (Davidson et al. 1979) and vitamin B6 which Karlstrom et al. (1977) found was lost in protein rich foods when they were held at high temperatures.

(iv) Hygiene;

All foods are of biological origin and as such they are all perishable to some degree. Spoilage may take place as a result of several mechanisms, one of which is through the effects of contamination by micro-organisms, which may in some cases lead to food poisoning, infection or the transmission of disease. Since meals-on-wheels involve large scale catering for the elderly and infirm, the possibility of any such contamination and the associated health risk is a matter of major concern.

Many raw foods may carry large numbers of bacteria, yeasts and moulds, and whilst most of these micro-organisms are relatively harmless there are a few pathogenic bacteria such as food poisoning salmonellas, which are potentially harmful to man. Other food poisoning micro-organisms such as staphylococcus aureaus, clostridium perfringens and escherichia coli are natural inhabitants of the human skin, the respiratory passages and the intestinal tract, and as such may be transferred to food through human contact. The potential dangers associated with pathogenic bacteria are magnified by the risk of their growth and multiplication in foods kept at incubating temperatures. With meals-on-wheels this means that there is the possibility of large numbers of those who are weak and particularly susceptible to serious illness becoming infected.

Since most foods are very good media for bacterial growth, it is essential that hygienic practices are followed in order to minimise the initial contamination during the handling, processing and preparation of food. Such practices should help to ensure reasonable storage times whilst minimising the risks of food spoilage and food poisoning.
For the transportation and delivery of meals in a system such as the meals-on-wheels service, the most critical parameters from a microbiological point of view are the times and temperatures of incubation. Most bacteria that cause food poisoning are mesophilic, that is they multiply best at temperatures between 30°C and 40°C, and as such foods should not be held within this temperature range. It should also be noted that mesophiles are still capable of multiplication at temperatures outside this optimum growth band although at slower rates.

Mallmann (1970) states that whilst pathogenic bacteria have an optimum growth temperature of 95-98°F (35-36.7°C), their maximum growth temperature is 113-116°F (45-46.7°C). Mallmann (1970) also cites the work of Angelotti, Wilson, Foter and Lewis (1960) who investigated the growth temperatures for salmonellae and staphylococcus in custard, chicken à la king and ham salad. They found that no growth occurred during storage at 116°F (46.7°C), and that all organisms were killed when held at 150°F (65.6°C) for 4-8 minutes.

Generally most pathogenic bacteria do not multiply at temperatures below 3°C or above 65°C. It is thus essential that in order to minimise the growth of micro-organisms, food should be kept at temperatures either above or below those at which micro-organisms can thrive. For this purpose the Food Hygiene Regulations 1970, Section 27, stipulate that, "food which has been cooked or partly cooked ..... shall either be kept at a temperature of not less than 145°F (62.8°C) until it is required for serving for immediate consumption, or if the temperature is brought or allowed to fall below 145°F be cooled to a temperature below 50°F (10°C) under hygienic conditions as quickly as is reasonably practicable, and thereafter kept below 50°F until it is required for serving" (appendix 5).

It is thus a requirement that meals-on-wheels should be transported and delivered for "immediate consumption" at temperatures above
62.8°C. This conveniently fits into the temperature requirements in terms of food acceptability as identified earlier, but as has already been mentioned research indicates that in practice this requirement is not being met (Karlstrom et al. 1977, Turner and Glew 1982)

(v) Transportation and delivery equipment;

A number of problems may arise due to the nature of the equipment used in the transportation and delivery of meals-on-wheels. Because most systems depend upon the transportation of hot meals it is necessary that the food is stored in some form of container that helps maintain the temperature of the meal until consumption. In some cases where loading temperatures are high and delivery times short, insulating the food is sufficient. More frequently however, it is necessary to provide additional sources of heat in order to maintain the food temperature. It is the addition of a heat source that creates potential problems and danger since the methods adopted by past and present systems have either been based on electrical heat stores which are heavy, or the combustion of some form of fuel, which is potentially dangerous in terms of fire hazards and the flue gases which may result from combustion.

The transportation of hot meals thus poses a number of problems that need to be addressed. Although alternative systems exist such as cook-chill, cook-freeze and boil-in-the-bag (see Armstrong 1979, Kerwin and Ryley 1979, Glew 1984), they all involve significant changes in approach, which would be difficult to implement due to the significant voluntary contribution from the WRVS, and also involve major capital expenditure, which neither the Local Authorities or the Department of Health and Social Security are willing to commit. The Department of Health and Social Security thus sponsored the University of Surrey to investigate the transportation of hot meals and the suitability of the equipment available for that purpose. The rest of this chapter details the
research into the transportation of meals for the meals-on-wheels service looking at the problems identified above.

The results of this investigation were published and submitted to the Department of Health and Social Security in "Meals-on-Wheels - thermal performance, safety and durability of equipment used in the meals-on-wheels service" (Hemmington 1981), as part of a larger report, "Meals-on-wheels" (Lawson and Thomson 1981). A summary of the findings was published in, "Meals-on-Wheels Service - Summary of recommendations and draft specifications" (Hemmington, Lawson Thomson 1981).

4.4.2. Research into delivery systems for meals-on-wheels.

Although there have been a number of studies that have investigated meal delivery systems, none have provided a comprehensive analysis of their performance. They have either focussed on one aspect of delivery, particularly thermal performance (Bishop 1975, Jonsson, Ohlsson & Lindholm 1977, De Fiellietaz Goethart, De Boer, Coen & Lassche 1979 for example), or they have looked at a very limited range of systems (Mallmann 1970, Harvey 1977 for example). Furthermore, most of the studies have been concerned with the delivery of meals within hospitals, usually tray systems, and whilst many of these systems could be adopted by the meals-on-wheels service, none of the systems that are specifically designed for the delivery of meals-on-wheels have been investigated.

As has already been stated, a number of studies have investigated the thermal performance of tray distribution systems. Mallmann (1970) looked at the performance of the Temp-rite "insulated server packs" using 9oz of custard as the food medium. It was found that when loaded at 82°C the custard would keep above 60°C for three hours. Mallmann concluded that warm holding times were a function of the loading temperature of foods. This was confirmed by Bishop (1975) in a study that investigated the same delivery system but used different food media (rice pudding & chicken à la king).
Jonsson et al. (1977) carried out a rather more broad based study looking at the performance of three types of tray distribution system in the delivery of a "representative choice of dishes" from a hospital menu. Two of the systems were based upon heat store pellets on which food plates were placed, the other was the Temp-rite insulated tray system. The authors noted the importance of high loading temperatures but found it "extremely difficult" to achieve the manufacturers recommended loading temperature of 90°C, and that "in practice an initial temperature of 70°C is not often achieved". Indeed an earlier study of hospital kitchens found a mean loading temperature of only 63°C (Hansson, Olsson, Bousund & Rasmussen 1972). The results of the heat retention tests found that the Temp-rite system performed significantly better than the two heat store plated systems.

De Fiellietazz Goethart et al. (1979) carried out a more extensive study looking at the thermal performance of six different types of tray distribution system. These included the insulated plastic trays, plated systems with heat store pellets and plates within insulated trays. They concluded that the insulated plastic trays such as the Temp-rite and Ico-set systems were the most efficient in terms of heat retention and the longest warm holding times.

Apart from the thermal performance, Mallmann (1970) also looked at the microbiological aspects of the Temp-rite system. Cultures of Staphylococcus aureus and Salmonella senftenberg were added to custard at different initial temperatures. The custard was then stored in the trays for four hours after which population counts were made. It was concluded that at 82°C all the disease producing bacteria were destroyed and that because of the efficient sealing of the trays no further contamination was possible during handling.

Bishop (1975) assessed the nutritional quality of food stored in the Temp-rite system by monitoring the retention of ascorbic acid in peas and cauliflower. It was found that losses in ascorbic acid were related to storage temperature (the higher the temperature the greater the loss) and the time for which food was stored (the longer the time the greater the loss). Peas for example suffered a 50% reduction in ascorbic acid over the first hour.
These studies show that there has been some research into delivery systems for hospitals, particularly the Temp-rite system, and some of these could be used in the meals-on-wheels service. The Temp-rite system would seem appropriate for example. There are however a number of meal delivery systems that are more specifically designed for the meals-on-wheels operation. These have not been investigated in terms of their performance and suitability for meals-on-wheels and there is therefore a clear need for such an investigation to be conducted.

4.4.3. Approach to the investigation of the delivery of meals-on-wheels.

The objectives of this investigation are:

- To investigate the performance of the alternative delivery systems currently available.
- To determine how well the available systems meet the requirements of the meals-on-wheels service. Especially as discussed in section 4.4.1.
- To determine the limitations of each of the systems.
- To make recommendations on procedures, codes of practice and provide equipment specifications.

In order to achieve the objectives specified above and to take account of the various factors which affect the meals-on-wheels operation and the design of delivery equipment in particular, the following approach was adopted. This approach and the sequence of enquiries and tests is shown in figure 4.2.

Initially it is important to identify which characteristics of the meals-on-wheels service have a direct relevance to the delivery of meals. These characteristics are shown in figure 4.3. From these can be determined the needs and design requirements of the delivery systems as shown in figure 4.3.
Figure 4.2. Approach to the investigation of delivery systems for the meals-on-wheels service

Characteristics of the meals-on-wheels operation → Characteristics of the delivery systems

Areas for investigation:
(i) Thermal performance
(ii) Hygiene
(iii) Ergonomics
(iv) Heat sources
(v) Durability cost effectiveness

Fieldwork / Laboratory tests

Results and observations:
(i) Comparative data - between alternative systems
(ii) Relative data - to the meals-on-wheels operation

Recommendations and specifications in terms of:
(i) System performance
(ii) System application
(iii) Procedures and codes of practice
Figure 4.3. Characteristics of meals-on-wheels operations and their implications for delivery systems.

<table>
<thead>
<tr>
<th>Characteristics of the meals-on-wheels operation</th>
<th>Required characteristics of delivery equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>D E S I G N</td>
<td></td>
</tr>
<tr>
<td>o Delivery of hot meals</td>
<td>o Thermal performance</td>
</tr>
<tr>
<td>o Extended warm holding periods</td>
<td>o Hygiene</td>
</tr>
<tr>
<td>o Wide range of types of delivery urban/rural, times, vehicles</td>
<td>o Thermal performance</td>
</tr>
<tr>
<td>o Labour intensive</td>
<td>o Flexibility and range of alternative systems</td>
</tr>
<tr>
<td>o Volunteer workforce</td>
<td>o Safety</td>
</tr>
<tr>
<td>o Elderly and mainly female workforce</td>
<td>o Acceptability</td>
</tr>
<tr>
<td>o Limited finances</td>
<td>o Ergonomics</td>
</tr>
<tr>
<td></td>
<td>o Cost effectiveness</td>
</tr>
</tbody>
</table>

Conversely some features of the equipment, once designed for meals-on-wheels purposes, will by its nature determine some of the characteristics of the meals-on-wheels operation, particularly in terms of the working practices and the procedures employed. These are shown in figure 4.4.

From these considerations and the points discussed in section 4.4.1, it is possible to identify a number of areas which require detailed investigation. These form the body of this section of the thesis. Within each of these areas the requirements of the meals-on-wheels sector are specifically identified and the ability of existing delivery systems to satisfy these needs is determined. Systems are also compared in terms of their performance and suitability for meals-on-wheels.

The outcome of these investigations are test results and observations in two forms. Comparative data facilitates direct comparisons between alternative systems and enables the most suitable to be identified. However, due to the strict controls necessary to generate comparative data the results are often too specific to apply directly to real situations. Because of this, relative data is also provided on order to relate the test results
to actual meals-on-wheels situations and thus enable the suitability of systems to meals-on-wheels to be determined. Finally, arising out of the results and observations, are recommendations, codes of practice and specifications. These enable the suitability of different systems to different situations to be identified, provide specifications in terms of performance, and identify appropriate procedures for the optimum performance of systems.

Figure 4.4. Characteristics of delivery systems and their implications for meals-on-wheels operations.

<table>
<thead>
<tr>
<th>Characteristics of systems</th>
<th>Characteristics of meals-on-wheels operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight and size</td>
<td>Use of vehicles, nominal male workforce.</td>
</tr>
<tr>
<td>Heat storage</td>
<td>Loading and delivery methods</td>
</tr>
<tr>
<td>Heat sources</td>
<td>Safety procedures and safe practices</td>
</tr>
</tbody>
</table>

4.4.4. Transportation systems.

In advance of the experimental work it was necessary to identify the range of delivery systems available and the manufacturers of such systems. The range of systems used in the London boroughs was investigated and this served to reveal the alternative systems available. The results of this are shown in table 4.6. Communications with the Department of Health and Social Security and the manufacturers of equipment ensured that all available systems had been identified. The complete range of alternative systems and models are shown in table 4.7.

Because of the large number of different models available it was decided that a smaller more practical number should be selected for detailed investigation. In order to cover the range of alternative of systems, one model was chosen from each of the eight different
Table 4.6. Delivery systems used by the meals-on-wheels services in the London boroughs.

<table>
<thead>
<tr>
<th>Alcan Ecko - Excelarc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kensington</td>
</tr>
<tr>
<td>Barking</td>
</tr>
<tr>
<td>Barnet</td>
</tr>
<tr>
<td>Brent</td>
</tr>
<tr>
<td>Bromley</td>
</tr>
<tr>
<td>Ealing</td>
</tr>
<tr>
<td>Enfield</td>
</tr>
<tr>
<td>Hillingdon</td>
</tr>
<tr>
<td>Kingston-upon-Thames</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcan Ecko - Polystyrene container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hackney</td>
</tr>
<tr>
<td>Westminster</td>
</tr>
<tr>
<td>Richmond-upon-Thames</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corsair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camden</td>
</tr>
<tr>
<td>Hackney</td>
</tr>
<tr>
<td>Hammersmith</td>
</tr>
<tr>
<td>Islington</td>
</tr>
<tr>
<td>Westminster</td>
</tr>
<tr>
<td>Bromley</td>
</tr>
<tr>
<td>Croydon</td>
</tr>
<tr>
<td>Haringey</td>
</tr>
<tr>
<td>Harrow</td>
</tr>
<tr>
<td>Merton</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hotlock - Charcoal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenwich</td>
</tr>
<tr>
<td>Southwark</td>
</tr>
<tr>
<td>Tower Hamlets</td>
</tr>
<tr>
<td>Barnet</td>
</tr>
<tr>
<td>Bexley</td>
</tr>
<tr>
<td>Havering</td>
</tr>
<tr>
<td>Hillingdon</td>
</tr>
<tr>
<td>Hounslow</td>
</tr>
<tr>
<td>Kingston-upon-Thames</td>
</tr>
<tr>
<td>Merton</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hotlock - Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enfield</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Huskybox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Croydon</td>
</tr>
<tr>
<td>Newham</td>
</tr>
<tr>
<td>Redbridge</td>
</tr>
<tr>
<td>Sutton</td>
</tr>
<tr>
<td>Lambeth</td>
</tr>
<tr>
<td>Lewisham</td>
</tr>
<tr>
<td>Tower Hamlets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insulated Containers - Polystyrene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wandsworth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temprite</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of London</td>
</tr>
</tbody>
</table>
types of system. The models selected were those actually in use in the industry and those identified by the manufacturers as most suitable for the meals-on-wheels service. Table 4.8 provides a basic description of each of the tested delivery models, which are also illustrated in plates 1 to 8.

There are essentially two types of delivery system, the purely insulated and those that have some form of heat source. Four of each were investigated. The selected heated systems cover the range of alternative forms of heat source. The Excelarc (plate 1) and Corsair (plate 2) are both aluminium containers adopting an electrically heated heat store. The Huskybox (plate 3) is also constructed of aluminium and uses the combustion of a methylated gel as the source of heat. The Hotlock (plate 4), the earliest type of container for meals-on-wheels and the most widely used at the time of this study, uses the combustion of charcoal as the source of heat.

The purely insulated systems are more basic and therefore less variable. The main variations being the insulation materials and the size. Since the Carrypack and the Insulated Container are made of the same material (polystyrene) and are similar in construction (dimensions and thickness of insulation), one large model, the Carrypack (plate 5), and one small model, the Insulated Container (plate 6), were tested. The Nutri-System (plate 7) is a far more robust container being constructed of an impact resistant plastic injected with foamed polyurethane. It also incorporates two interesting design features, thermally independent compartments and side opening cabinet doors.

The Temprite (plate 8) introduces another concept in design with individual moulded meal trays which are stacked on top of each other to form independent thermal columns (ie each tray is insulated around the sides and is covered by the uninsulated base of the next tray thereby allowing internal heat transfer. The top and bottom the stack is insulated.)
Table 4.7. The range of alternative meals-on-wheels delivery systems.

<table>
<thead>
<tr>
<th>Marketing company</th>
<th>System</th>
<th>Type</th>
<th>Models and meal capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcan Ecko</td>
<td>Excelarc</td>
<td>Heated.</td>
<td>HB 6 - 6 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electric</td>
<td>HB12 - 16 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>heat store</td>
<td>HB24 - 25 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HB45 - 52 meals</td>
</tr>
<tr>
<td>Alcan Ecko</td>
<td>Carrypack</td>
<td>Insulated.</td>
<td>PB20 - 15 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>polystyrene</td>
<td></td>
</tr>
<tr>
<td>Corsair</td>
<td>Corsair</td>
<td>Heated.</td>
<td>CH201 - 12 meals</td>
</tr>
<tr>
<td>Heating &amp; Catering</td>
<td>Hotlock</td>
<td>Electric</td>
<td>CH202 - 7 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>heat store</td>
<td>CH203 - 15 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CH204 - 15 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CH205 - 24 meals</td>
</tr>
<tr>
<td>Food Conveyors</td>
<td>Nutri-System</td>
<td>Insulated</td>
<td>6 meal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 meal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18 meal</td>
</tr>
<tr>
<td>Insulated Containers</td>
<td>Insulated Container</td>
<td></td>
<td>Princess - 4 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insulated.</td>
<td>Queen - 7 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polystyrene</td>
<td>Prince - 14 meals</td>
</tr>
<tr>
<td>Smith &amp; Wellstood</td>
<td>Huskybox</td>
<td>Heated.</td>
<td>B12 - 25 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Methylated gel</td>
<td>B13 - 40 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B22 - 25 meals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B23 - 40 meals</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>Temp-tainer</td>
<td>Insulated</td>
<td>Citizen - 6 meals</td>
</tr>
</tbody>
</table>
Table 4.8. Basic description of delivery systems and models tested.

<table>
<thead>
<tr>
<th>Marketing company</th>
<th>System</th>
<th>Type</th>
<th>Models and meal capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcan Ecko</td>
<td>Excelarc</td>
<td>Heated, Electric heat store</td>
<td>HB24 - 25 meals</td>
</tr>
<tr>
<td>Alcan Ecko</td>
<td>Carrypack</td>
<td>Insulated, polystyrene</td>
<td>PB20 - 15 meals</td>
</tr>
<tr>
<td>Corsair Heating &amp; Catering</td>
<td>Corsair</td>
<td>Heated, Electric heat store</td>
<td>CH203 - 15 meals</td>
</tr>
<tr>
<td>Food Conveyors</td>
<td>Hotlock</td>
<td>Heated, Charcoal combustion</td>
<td>18 meal</td>
</tr>
<tr>
<td>Food Conveyors</td>
<td>Nutri-System</td>
<td>Insulated</td>
<td>13 meals</td>
</tr>
<tr>
<td>Insulated Containers</td>
<td>Insulated Container</td>
<td>Insulated, Polystyrene</td>
<td>Queen - 7 meals</td>
</tr>
<tr>
<td>Smith &amp; Wellstood</td>
<td>Huskybox</td>
<td>Heated, Methylated gel</td>
<td>813 - 40 meals</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>Temp-tainer</td>
<td>Insulated</td>
<td>Citizen - 6 meals</td>
</tr>
</tbody>
</table>
Plate 1: Excelarc UB 20

Plate 2: Corsair CU 203
Plate 3: Huskybox 813

Plate 4: Hotlock - 18 meal
Plate 5: Carrypack PB 20

Plate 6: Insulated Container
Plate 7: Nutri-System

Plate 8: Temp-Rite Citizen
4.5. Thermal performance.

4.5.1. Objectives.

The objectives of this section are to:

- determine the effectiveness of each of the delivery systems in terms of keeping food hot (ie above 62.8°C) over time,
- determine the thermal performance of each of the delivery systems under simulated meals-on-wheels conditions,
- compare the delivery systems in terms of the above factors and identify the most appropriate for the meals-on-wheels service,
- identify critical design and procedural aspects that affect the thermal performance of systems.

4.5.2. General testing methodology.

Each delivery system was subject to a series of tests and investigations in order to provide a comprehensive analysis of the thermal performance. These investigations were:

- Thermal conductivity of insulation material.
- Temperature gradients across container walls.
- Insulation performance of complete system.
- Heating performance (where appropriate).
- Efficiency of heat distribution.
- Simulated meals-on-wheels delivery.

In order to ensure consistency during the testing programme and to ensure that the data generated is strictly comparable between systems, a number of variables need to be standardised. These standards were employed throughout the thermal investigations and therefore any data arising out of the tests should be considered in the light of these standard conditions.
1. Environmental conditions.

All tests were conducted in the Luncheon Voucher Research Centre Laboratory at the University of Surrey. In order to maintain consistent conditions the following measures were taken:

- The ambient room temperature was maintained within the range 20–23°C. This range was sufficiently small to be within the tolerances of the test measurements,
- Air-flows were minimised by ensuring all doors and windows were closed and by shielding testing areas,
- Test positions were consistent relative to walls, ceilings and floors, and were well away from doors and windows.

2. Instrumentation.

Three temperature measuring systems were employed for flexibility and to ensure the accuracy of results. They were:

- Comark Digital Thermometer with one nickel chromium/nickel aluminium (NiCr/NiAl) thermocouple input. This was used for quick single point readings and for checks.
- GEC-Elliot Process Instruments Series 550 Multi-point Recorder with twelve copper/constantan (Cu/Con) thermocouple inputs. This is an automatic recorder which gives a virtually continuous reading and print-out on all twelve thermocouples – readings provided every 23 seconds per thermocouple. This equipment was used for all laboratory tests and thus provides most of the data.
- Comark Electronic Analogue Thermometer (Type 1601-1) with a twenty way manual selector unit and twenty NiCr/NiAl thermocouple inputs. This system could be used in conjunction with a battery pack to provide full portability and was thus suitable for use in the field. This instrument along with a recorder is also able to provide print-outs of results.
All three systems were calibrated by the manufacturers before testing began and checks were carried out regularly during the testing programme to ensure continued accuracy. Thermocouples were chosen as the means of recording temperatures for the following reasons:

- rapid responses
- high degree of accuracy
- centralised reading and/or recording from one or many remote points
- the flexibility and fine gauge of the thermocouples enables access into containers with the minimum of disruption
- ability to record wide temperature ranges, especially with the use of alternative metal combinations in thermocouples.

In order to pre-heat meals a forced air convection oven in conjunction with the twenty input thermometer were used. This provided a reasonably even heat distribution and with sufficient heat stabilisation periods (approximately one hour) a consistent temperature for all meals could be achieved. Meal temperatures were closely monitored during the whole pre-heating and loading process.

3. Food media.

In order to determine how well each system is able to keep meals hot it is necessary to conduct extensive tests with some form of food media or food representation. Whilst real meals should ideally be tested, this was not practical due to the cost, lack of consistency and the loss of comparability. After much consideration and many trial experiments with various alternative food media such as mashed potato, texturised vegetable protein and gelatine mixes, it was decided that a standard gruel mix was most suitable for testing purposes. The composition of the standard mix, by weight, was as follows:

- 16% dried oats
- 69% water
- 15% salt.
This standard food media satisfies the requirements of this testing program for the following reasons:

- It is consistent - virtually homogenous material and therefore all meals the same.
- It is reproducible - several identical batches may be produced over an extended testing program.
- It is stable - does not change significantly over a number of heatings. The only change that must be allowed for is the loss of moisture - a major problem with mashed potato - but this was minimised partly by the gelatinous nature of the gruel and partly by the high salt content. Tests of moisture loss in gruel with different salt concentrations are shown in appendix 3. Some moisture loss is nevertheless unavoidable and this is of fundamental importance to the heat retention properties of the food. In order to correct these losses the weight of meals was checked after each test and any loss in weight was made up with the addition of water.
- Its usable life may be extended through high salt concentrations. In practice the usable life of these meals was around one month.

4. Meal mass.

The typical meal mass within the meals-on-wheels sector was identified from data supplied by local authorities and frozen food manufacturers (Lawson and Thomson 1981). The mean weight of the main courses was 288 grams and the mean weight of sweet courses was 156 grams. It was thus decided that for this investigation main courses would be represented by 300 grams of gruel and that sweets would be represented by 150 grams. The gruel was thus portioned into 150 gram packs with one pack representing the sweet and two packs representing the main course.

Foil containers were used as the packaging medium in common with current trend in within the meals-on-wheels sector. The most
appropriate foil container was identified as the 10cm x 12.5cm x 3.5cm (Alcan Ecko 8325, Bacofoil 10469), which is in fact the most widely used in meals-on-wheels operations.

The quantity of meals to be contained within each delivery system is important as it determines the heated mass and therefore the amount of heat provided by the meals. This is particularly critical to the performance of those systems that rely solely on the insulation of meals. In order to make the results strictly comparable therefore, each system was filled to a fixed percentage of its internal volume. By loading each system with foil containers it was possible to determine how many meals each could hold. A 20% fill (gruel mass, excluding foil container) was identified as the lowest maximum possible fill of all the systems - determined by foil and container dimensions. This percentage was therefore adopted for all systems.

4.5.3. Thermal conductivity of insulation materials.

(i) Objective - To determine the insulation qualities of the materials used as insulators in each delivery system.

(ii) Method - The insulating material in each system was identified by reference to the manufacturer or by simple identification techniques (Building Research Establishment 1977). The thermal conductivity of these materials was then established from manufacturers specifications and by reference to thermal conductivity tables - “Thermal Conductivity Thermophysical Properties of Matter”, Touloukian, Liley and Saxena (1970).

(iii) Results and conclusions - Thermal conductivity values for each of insulating materials are shown in table 4.9. These are expressed in the form watts per degree centigrade;

\[-1.0^{-1}\text{Wm}^{-1}\text{C}^{-1}\]

The lower the thermal conductivity value the more efficient the insulator.
<table>
<thead>
<tr>
<th>System</th>
<th>Insulation material</th>
<th>Thermal conductivity (W/m·°C)</th>
<th>Temp. difference between wall surfaces (°C)</th>
<th>Wall thickness (cm)</th>
<th>Temp. gradient</th>
<th>Mean holding time (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrypack</td>
<td>Expanded polystyrene</td>
<td>0.033-0.035</td>
<td>26.9</td>
<td>2.5</td>
<td>10.76</td>
<td>173</td>
</tr>
<tr>
<td>Insulated container</td>
<td>Expanded polystyrene</td>
<td>0.033-0.035</td>
<td>27.8</td>
<td>2.5</td>
<td>11.00</td>
<td>153</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>Rigid foamed polyurethane</td>
<td>0.020-0.025</td>
<td>31.3</td>
<td>3.4</td>
<td>9.21</td>
<td>155</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>Rigid foamed polyurethane</td>
<td>0.020-0.025</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>65</td>
</tr>
<tr>
<td>Corsair</td>
<td>Mineral fibre</td>
<td>0.036-0.045</td>
<td>18.4</td>
<td>3.2</td>
<td>5.75</td>
<td>31</td>
</tr>
<tr>
<td>Excelarc</td>
<td>Rigid foamed polyurethane</td>
<td>0.020-0.025</td>
<td>15.8</td>
<td>5.0</td>
<td>3.16</td>
<td>22</td>
</tr>
<tr>
<td>Hotlock</td>
<td>Fibreglass wool</td>
<td>0.040</td>
<td>18.5</td>
<td>2.7</td>
<td>6.85</td>
<td>23</td>
</tr>
<tr>
<td>Huskybox</td>
<td>Rigid foamed</td>
<td>0.020-0.025</td>
<td>17.7</td>
<td>3.3</td>
<td>5.36</td>
<td>37</td>
</tr>
</tbody>
</table>
With the development of foamed and expanded plastics with low density (<80 kg per cubic metre) and extremely low thermal conductivity values (<0.03 watts per metre per degree celsius), a range of very light and efficient insulating materials have become available. These materials also have the advantage of being able to be sprayed, moulded or injected in situ.

Of the investigated meals-on-wheels delivery systems, six use plastics as insulators (including all the purely insulated systems) in the form of expanded polystyrene or foamed polyurethane. This is reflected in their very low thermal conductivity values. The Corsair and Hotlock systems use mineral fibre and fibre glass respectively. Both of these materials have higher thermal conductivity figures than expanded polystyrene or foamed polyurethane, but are still fairly good insulating materials. All eight systems incorporate good insulating materials therefore but the most efficient in terms of low thermal conductivity is the rigid foamed polyurethane as used by the Excelarc, Huskybox, Nutri-system and Temp-rite systems.

4.5.4. Temperature gradients across container wall.

(i) Objective - To establish the thermal transmittance loss through the container wall and therefore determine the insulating qualities of the wall as a unit. This will reflect the performance of the insulation material (already identified in section 4.5.4.), the structural materials and the wall design and manufacture.

(ii) Method - The adopted method involves the measurement of temperatures at various points through the container wall - from the hot interior to the ambient exterior - and then plotting these temperatures against the distance from the wall centre. The resulting graph produces a temperature gradient and indicates the rate of heat-loss through the wall. The positions of the sampling points are shown in figure 4.5.

Meals of 150 grams, as used in the other thermal tests, were preheated in the forced air convection oven to an average
temperature of 80°C. Each container was then loaded with these meals to 20% full by volume thus relating total heated mass (quantity of heat) to the capacity of the container. The containers were then closed. The loaded system was then left for at least 30 minutes - to allow a steady state of heat-loss to be achieved - and then until a temperature of 60°C was recorded at the point 2cm from the internal wall surface (point A in figure 4.5.). At this point the temperatures for the gradient were taken. In order to minimise the effects of adjacent walls, the lid, and the base, the sampling point was taken at the centre of the largest wall of the container.

![Diagram showing sampling points for temperature gradients](image)

Figure 4.5. **Sampling points for temperature gradients**  
(Scale 1:1)

(iii) Results - Results in the form of graphs and temperature gradients are shown in figures 4.6. to 4.12. and table 4.9. respectively. The Temp-rite system was not tested since there are
no container walls as such. The graphs show visually the fall in
temperature from the warm internal point (A) to the ambient external
point (B). Referring to figures 4.13 and 4.14, one can compare
typical good and bad insulators with the actual results. These
results indicate that the best insulators are the Nutri-System,
Insulated Container and the Carrypack, whilst the least efficient
insulator is the Excelarc.

For comparative purposes however, the data in table 4.9 provides
more accurate information. The temperature difference between the
internal and external wall surfaces establishes the insulating
efficiency of the wall as an whole, since the greater the difference
the more efficient the wall. This is expressed by:

\[
H = \frac{K \cdot \Delta t}{L}
\]

where:
- \(H\) = Heat transfer per unit area (watts per square metre)
- \(K\) = Thermal conductivity (W m\(^{-1}\)°C\(^{-1}\))
- \(\Delta t\) = Temperature difference (°C)
- \(L\) = Thickness (m)

For containers of homogenous material, such as expanded polystyrene,
the temperature difference is a function of the wall thickness and
the thermal conductivity. Based on temperature retention alone, the
Nutri-System provides the best results. However, if one considers
the temperature gradient (temperature difference divided by wall
thickness) - which is a function of thermal conductivity alone - one
can see that the Insulated Container and the Carrypack have the best
wall insulation properties when related to the thickness of the
wall. This means that although these are both less efficient in
their present design, when compared with the Nutri-System, if the
walls were made to the same dimensions as the Nutri-System they
would indeed be more thermally efficient.

The worst performance figures are provided by the four heated
systems, the Corsair, Excelarc, Hotlock, and Huskybox. Since we
know that their insulation materials are satisfactory, from analysis
of the thermal conductivity of the insulation materials, the fault
must lie with the wall construction and the structural materials
Figure 4.6. Temperature gradient through Carrypack wall (Scale 1:1)

Figure 4.7. Temperature gradient through Insulated Container wall (Scale 1:1)
Figure 4.8. Temperature gradient through Nutri-System wall (Scale 1:1)
Figure 4.9. Temperature gradient through Hotlock wall (Scale 1:1)

Figure 4.10. Temperature gradient through Corsair wall (Scale 1:1)
Figure 4.11. Temperature gradient through Huskybox wall (Scale 1:1)

Figure 4.12. Temperature gradient through Excelarc wall (Scale 1:1)
Figure 4.13. Temperature gradient of good insulator

Figure 4.14. Temperature gradient of poor insulator
employed. In fact these results are almost certainly due to the use of an aluminium structure which has a high thermal conductivity value of 2.36 W/cm°C (Touloukian et al. 1970). This aluminium structure will very quickly conduct heat to the outer skin via the top of the wall and the lid. This is confirmed when the temperatures from the internal centre to the external centre around the wall edge are plotted. Thermocouple positions for this are shown in figure 4.15. The graphs showing the results for an aluminium skinned container and a polystyrene container are shown in figure 4.16. Whereas the polystyrene container temperatures rise gradually to the top of the wall and then fall rapidly (to within 2°C of the final temperature) across top of the wall, the temperatures for the aluminium skinned container fall steadily from interior to exterior. This shows that whilst heat is being retained in the polystyrene container, the aluminium container is steadily losing heat via the aluminium surface.

(iv) Conclusions - In terms of insulation the Carrypack, Insulated Container and Nutri-System all have well constructed heat retaining properties. The four heated systems - Hotlock, Excelarc, Huskybox and Corsair - have good insulation material but have nullified the heat retaining properties of this by the use of aluminium structure on both the external and the internal surfaces. This problem could be reduced by redesigning the walls to contain an insulating barrier along the top of the wall as shown in figure 4.17. This would isolate the warm internal surface from the external surfaces of the walls and the lid and therefore reduce the heat-loss over these areas. A suitable material for this barrier would be a reinforced sheet of glass fibre. This has a low thermal conductivity (0.03 - 0.04 W/m°C), can withstand temperatures of up to 120°C and is easily cleaned. It would be necessary however to add a flame retardent to reduce the combustibility of the fibreglass and to maintain safety standards.
Figure 4.15. Thermocouple positions over wall for heat loss curve
Figure 4.16. Heat-loss curves over the walls of aluminium skinned and polystyrene containers.
Figure 4.17. Aluminium wall with insulating barrier
4.5.5. Insulation performance of complete system.

(i) Objective - To determine the insulation qualities of each system as a complete unit and to identify the length of time for which each system will keep food above 62.8°C - Warm holding time.

(ii) Method - Each system was loaded to 20% full with food mass (gruel) preheated in the forced air convection oven to an average predetermined temperature. Thermocouples were passed into a number of meals through tight fitting holes in the lid and were then sealed closed. Thermocouples were placed in the meals in locations as shown in figure 4.18, in order to cover the range of meal temperatures from the hottest meal in the centre to the coolest meals in the bottom corners of the container. The heat-loss of the meals within the box was thus monitored over time until all had fallen to a temperature of less than 62.8°C.

(iii) Results - These tests provide data on the warm holding time of meals in the various delivery systems when the container remains closed. From preliminary results it was found that the most acceptable loading temperature with regard to providing a sufficient head of heat, food quality and the practicalities of food preparation was 80°C. Loading temperatures below this lead to a dramatic reduction in the warm holding time whilst observations in the industry indicate that temperatures above 80°C are in practice very difficult to achieve. These tests were therefore conducted with loading temperatures of 80°C.

Each system was tested three times and the mean warm holding time for each of the systems is shown in table 4.9. These figures are the mean warm holding times for the first meals in each system to fall below 62.8°C - this was taken as the warm holding time for the whole system. In practice the first meal to fall below 62.8°C in all cases was the meal in the bottom corner of the container.

Under these controlled test conditions the purely insulated systems retained heat well and in particular the Carrypack was able to keep meals hot for three hours. The criterion for success in this test
F1 - Centre of bottom layer
F2 - Corner of bottom layer
F3 - Centre of middle layer
F4 - Corner of middle layer
F5 - Centre of top layer
F6 - Corner of top layer

Figure 4.18. Thermocouple positions in meals within containers
is mainly the quantity of heated mass in each system since all four of the purely insulated systems have similar insulating qualities. This is perhaps best illustrated by the polystyrene containers where the smaller model (Insulated Container) has a shorter warm holding time than the larger model (Carrypack) of some 20 minutes. It is however made of the same material and has the same insulation thickness.

The heated systems do not perform well in this test (see table 4.9.) for a number of reasons. These are:

- Wall construction - allows rapid heat-loss as discussed in section 4.5.5.
- Design - air access and exhaust points in the Huskybox and the Hotlock, and the poor fitting lid in the Excelarc, all permit rapid heat-loss.
- Container mass and specific heat - because the containers are not preheated the meals supply heat to the interior of the container until thermal equilibrium is reached. With materials with high specific heats used as heat stores in the Excelarc and Corsair much of the food heat is lost to the container itself. In practice these systems would be preheated and this problem would not arise.

(iv) Conclusions - The results indicate that for long warm holding periods based upon insulation alone it is necessary to have as large a heated food mass as possible rather than a number of smaller heated masses. Thus the Carrypack gives the best performance with a warm holding period of three hours, the Insulated Container and the Nutri-System two and a half hours and the Temp-rite system one hour.

These warm holding periods correspond to the maximum delivery time to a single delivery point such as a luncheon club. They do not relate to multi-delivery situations such as meals-on-wheels which are covered in the tests carried out in section 4.5.9.
4.5.6. Performance of heated systems.

(i) Objectives - To determine the efficiency of the heated delivery systems and to determine the warm holding times of meals in these systems.

(ii) Method - Tests were conducted to monitor the preheating of each system. This is especially important with the Corsair and the Excelarc systems which depend upon heat stores for the maintenance of meal temperatures during delivery. Thermocouples were placed on the inside surfaces of the containers as shown in figure 4.19.

Each system was then tested five times to establish warm holding times. They were preheated according to the manufacturers instructions (see table 4.10.) and were then loaded, 20% full, with food mass preheated to an average temperature of 80°C. Thermocouples were placed in meals as described in section 4.5.6, and in the meals as indicated in figure 4.18. The system was then closed and the temperatures were monitored over time until the first meals fell below the critical temperature of 62.8°C.

(iii) Results - The ideal heated system would raise the internal temperature during preheating to a level sufficiently above 62.8°C to allow for heat loss during loading. It would then supply heat at a rate that equals the heat loss from the meals and thus maintain a steady temperature of around 65-70°C over the delivery time. Such a performance would ensure delivery at satisfactory temperatures and also minimise food spoilage due to high storage temperatures identified in section 4.4.1.

In practice this is very difficult to achieve and so a balance has to be struck between supplying too much heat too quickly, and thus exaggerating food deterioration, and supplying heat too slowly and allowing the food to fall below 62.8°C. Table 4.10. shows the results of the tests, and figure 4.20. shows the preheating curves for each system.
Figure 4.19. Thermocouple positions on interior of container
Table 4.10. Performance of heated systems.

<table>
<thead>
<tr>
<th>System</th>
<th>Type of heat source</th>
<th>Quantity</th>
<th>Recommended preheat time</th>
<th>Mean preheat temp. (°C)</th>
<th>Warm holding time (mins)</th>
<th>Maximum meal temp. (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corsair</td>
<td>Electric heat store (500 watt)</td>
<td>1 kw hour</td>
<td>2 hours</td>
<td>78</td>
<td>244</td>
<td>102</td>
</tr>
<tr>
<td>Excelarc</td>
<td>Electric heat store (500 watt)</td>
<td>0.75 kw hour</td>
<td>1.5 hours</td>
<td>63</td>
<td>75</td>
<td>85</td>
</tr>
<tr>
<td>Hotlock</td>
<td>Combustion of charcoal</td>
<td>120 gms</td>
<td>1 hour</td>
<td>63</td>
<td>158</td>
<td>104</td>
</tr>
<tr>
<td>Huskybox</td>
<td>Combustion of methylated gel</td>
<td>74 gms</td>
<td>15 mins</td>
<td>72</td>
<td>175</td>
<td>124</td>
</tr>
</tbody>
</table>

1. Mean temperature of interior after recommended preheating.
2. Mean of minimum WHT's recorded, determined by first meal to fall below 62.8°C.
3. Maximum meal temperature recorded.
Figure 4.20. Average internal temperature during recommended pre-heating periods
It can be seen that the Huskybox has a very rapid build-up of heat, reaching an average temperature of 77°C in only 15 minutes. It is thus apparent that this preheat period is adequate and indeed must not be extended since tests indicated that if left for 30 minutes temperatures of 200°C can be attained. A mean warm holding time of nearly three hours is achieved with this system. The release of energy over the first hour is very rapid and intense (as would be expected from the results of the preheating tests) with the result that combustion is usually complete within around 71.5 minutes (mean of five tests) which is far less time than that suggested in the manufacturers specifications (3 hours). In addition the temperatures generated within the container are unacceptably high (124°C) - see table 4.10. Finally the performance of the heat source is highly inconsistent. The combustion period varied by 20 minutes over these tests, and maximum meal temperature (in all cases the bottom centre meal which is directly above the heat source) varied by 30°C. This is reflected in the variability of the warm holding times as shown in table 4.10.

The Hotlock system provides a much more steady preheating curve and reaches an average internal temperature of 63°C after the recommended hour. Although this is not an high initial temperature, tests have shown that sufficient heat is provided subsequently to maintain loaded meal temperatures above 62.8°C for a mean of 158 minutes. Furthermore, the release of energy over time is fairly constant thus maintaining meals at even temperatures over time. As with the Huskybox, however, the consistency of performance is suspect. On several occasions the charcoal failed to burn despite following the manufacturers ignition recommendations. In these instances the tests were aborted and were then restarted with fresh batches of charcoal.

During the 90 minute preheat period recommended for the Excelarc system, the average internal temperature reaches 63°C. Since the rate of heat supplied to the container is in proportion to the rate of heat-loss in the heat store, the maximum rate of supply will occur in the initial stages. The internal temperature of 63°C therefore is a result of the maximum rate of heat supply which will
clearly prove inadequate to cover heat-loss during loading and delivery. Indeed food heated to 80°C will itself lose heat to the delivery system during the initial stages of storage.

The result of this inadequate heat supply is reflected in the test results which show a warm holding time of only 75 minutes. Extending the preheat period will not improve the performance since figure 4.20. shows that at 90 minutes the temperature has stabilised at 63°C. This indicates that the heat lost by the heat store is equal to the energy supplied at this point and that there is therefore no net gain.

The Corsair system reaches the highest average internal temperature (78°C) during preheating. This ensures that it provides adequate heat balance and indeed achieves a very good mean warm holding time of over four hours. The performance during the testing programme was also reasonably consistent. The maximum meal temperature is fairly high however, but further investigation revealed that this degree of heating only affects one meal located in the bottom centre of the container. All the other meals were well below this temperature.

(iv) Conclusions - three of the four heated systems have serious drawbacks in terms of their thermal performance. The heat distribution and lack of control over the heat source in the Huskybox system is unsatisfactory and inconsistent. Meals directly above the heat source become overheated with the result that the food either boils or burns. The performance of the heat source is also variable depending upon the age of the fuel and the supply of oxygen to the system. Thus despite an acceptable mean warm holding time the system is seriously handicapped by these faults.

The Hotlock normally performs adequately but is inconsistent, the performance depending largely upon the charcoal quality and density (which varies from batch to batch), and the oxygen supply. The ignition of the charcoal is also a problem area.

The Excelarc has a relatively short warm holding time due to the inadequate heat supply provided by the heat store. Since the
element is of the same rating as the Corsair (500 watts), which has a much better performance, the fault must be due to an incorrectly adjusted thermostat, the use of a less efficient heat store or a design fault allowing the escape of heat. The short warm holding time effectively rules this system out as an alternative for the meals-on-wheels service.

The Corsair system is clearly the most effective of the four heated systems and indeed has the longest warm holding time of all eight tested systems. It also has a higher degree of reliability and a relatively consistent performance coupled with an acceptable storage temperature that ensures delivery above 62.8°C whilst avoiding excessively high storage temperatures.

4.5.7. Heat distribution.

(i) Objective - To determine how evenly heat is distributed within each system and to identify the existence of any hot or cold spots.

(ii) Method - During the programme of tests already described, the range of temperatures of meals within each container was monitored. Internal surface and air temperatures were also monitored with thermocouples placed in positions as indicated in figure 4.19.

(iii) Results and Conclusions - The results of the data generated are shown in table 4.11, in the form of temperature ranges, differences in warm holding times and identified hottest and coldest meals. The data for the temperature ranges was taken before any meals had fallen below 62.8°C, and at the point when the difference between the highest and lowest temperature was greatest.

The even distribution of heat is of importance to the efficient storage and delivery of meals because it avoids the overheating and associated spoilage of meals, it extends the warm holding time since this is a function of the temperature of the coldest meal, and it makes the maximum use of energy.
### Table 4.11. Heat Distribution

<table>
<thead>
<tr>
<th>System</th>
<th>Meal temp. range (°C)</th>
<th>Internal air &amp; surface temp. range (°C)</th>
<th>Hottest meals</th>
<th>Coolest meals</th>
<th>WHT difference (mins)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrypack</td>
<td>11</td>
<td>20</td>
<td>Middle centre</td>
<td>Bottom corners</td>
<td>138</td>
</tr>
<tr>
<td>Insulated container</td>
<td>9</td>
<td>10</td>
<td>Middle centre</td>
<td>Bottom corners</td>
<td>62</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>8</td>
<td>9</td>
<td>Middle centre</td>
<td>Bottom corners</td>
<td>67</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>7</td>
<td>5</td>
<td>Middle centre</td>
<td>Bottom corners</td>
<td>85</td>
</tr>
<tr>
<td>Corsair</td>
<td>30</td>
<td>32</td>
<td>Bottom centre</td>
<td>Top corners</td>
<td>125</td>
</tr>
<tr>
<td>Excelarc</td>
<td>12</td>
<td>21</td>
<td>Bottom &amp; middle centre</td>
<td>Top corners</td>
<td>67</td>
</tr>
<tr>
<td>Hotlock</td>
<td>24</td>
<td>12</td>
<td>Bottom centre</td>
<td>Top corners</td>
<td>117</td>
</tr>
<tr>
<td>Huskybox</td>
<td>41</td>
<td>115</td>
<td>Bottom centre</td>
<td>Top corners</td>
<td></td>
</tr>
</tbody>
</table>

* - Difference between the longest and the shortest warm holding times.
The heat distribution within the insulated systems is reasonable, largely because meals were all loaded at the same temperature and there was no further introduction of heat. Variations do occur however and normal convection currents dictate that the hottest meals are located in the top of the container. The coldest meals were in all cases in the corners of the containers. Variations in the internal temperatures of the insulated systems were largely a function of the size of the container - the larger the container the larger the variation in temperature as is shown in table 4.11. The affect upon the warm holding times of meals is quite dramatic, especially in the case of the Currpack where the difference in the warm holding time of the hottest and the coldest meals was over two hours (table 4.11.)

The heated systems have considerably more varied internal temperatures due to the introduction of heat from a supplementary heat source. This is reflected by the fact that in all cases the hottest meal was on the base centre, directly above the heat source, and that the coolest meals were those in the top corner of the container, those most distant from the heat source. The Excelarc has the smallest variation, but this is merely a consequence of the inadequate heat supply as discussed in 4.5.6. The greatest variations in temperature occur within the Huskybox where temperatures can rise to over 200°C directly above the heat source, and variations of some 100°C can arise. These results are again due to the rapid and intense release of heat from the uncontrolled combustion of the methylated gel. The Hotlock and Corsair systems have more moderate temperature ranges of 24°C and 30°C respectively. Despite this small variation there is still some evidence of meals directly over the heat source being overheated.

The differences in the warm holding times between the hottest and the coolest meals indicate how variations in temperatures affects the performance of the delivery system. Table 4.11. shows quite
clearly the enormous differences in the warm holding times, at least one hour for all eight systems and over two hours for the Carrypack and the Corsair. In meals-on-wheels operations this could be turned to advantage if it was possible to deliver those meals in the coolest parts of the container first and those in the warmer parts with the longer warm holding times last. This is indeed possible with the heated systems where the coolest meals are at the top of the container and are thus readily removed, but with the purely insulated systems it is not practical since the coolest meals are invariably at the bottom of the container. These points are further discussed in section 4.5.8.

4.5.8. Simulated meals-on-wheels delivery.

(i) Objectives - To determine the efficiency of each delivery system in terms of the number of successfully delivered meals, that is meals delivered at a temperature above 62.8°C, in a simulated meals-on-wheels situation.

(ii) Method - Each delivery system was preheated, where applicable, according to manufacturers instructions and then loaded 20% full with 150 gram meal packs preheated to an average temperature of 80°C. In order to monitor meal temperatures without disturbing the system, thermocouples were placed in meals as shown in figure 4.18. Surveys of the London Boroughs established that the mean time between deliveries of meals was 2.6 minutes (Lawson and Thomson 1981). This is probably less than the national average since these deliveries were all in urban areas. For the purpose of this test therefore, the average of 2.6 minutes was rounded up to three minutes. It was found that 15 seconds was an adequate time for one meal to be unloaded.

Once the delivery container was loaded therefore, a meal comprising three 150 gram packs was unloaded in 15 seconds every three minutes. The temperature of each pack was recorded and the mean temperature
<table>
<thead>
<tr>
<th>System</th>
<th>Meal capacity (3x150 gms)</th>
<th>Successfully delivered meals (mean)</th>
<th>No. full containers</th>
<th>Length of successful delivery period-mins (Mean No. meals x 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insulated systems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Nutri-System</td>
<td>13</td>
<td>40</td>
<td>3</td>
<td>120</td>
</tr>
<tr>
<td>2. Insulated container</td>
<td>7</td>
<td>34</td>
<td>4</td>
<td>102</td>
</tr>
<tr>
<td>3. Temp-rite</td>
<td>6</td>
<td>23</td>
<td>3</td>
<td>69</td>
</tr>
<tr>
<td>4. Carrypack</td>
<td>15</td>
<td>14</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td><strong>Heated systems.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Corsair</td>
<td>21</td>
<td>79</td>
<td>3</td>
<td>237</td>
</tr>
<tr>
<td>2. Hotlock</td>
<td>16</td>
<td>60</td>
<td>3</td>
<td>180</td>
</tr>
<tr>
<td>3. Huskybox</td>
<td>16</td>
<td>60</td>
<td>3</td>
<td>180</td>
</tr>
<tr>
<td>4. Excelarc</td>
<td>16</td>
<td>32</td>
<td>2</td>
<td>96</td>
</tr>
</tbody>
</table>
of the three was taken as the meal temperature. Unloading of the meals followed a standard procedure for all systems, that is meals were unloaded from the sides to the centre and from the top to the bottom. This procedure balanced the desire to maximise delivery times with the practicality of unloading the meals.

If all the meals from one container were acceptable in terms of the delivery temperature, the test was continued by preheating the container again (once fully cooled from the first test), and reloading with 80°C meals. The system was then left for the equivalent of the delivery of the first complete container and then unloaded as before one meal every three minutes. This procedure was followed until meals registered temperatures of below 62.8°C.

In this way the maximum number of successfully delivered meals, delivered at three minute intervals, was determined. Furthermore the number of containers that could be unloaded one after the other was also established.

(iii) Results - The meals-on-wheels simulation was carried out three times for each of the eight delivery systems. The results of these tests are shown in table 4.12, in the form of the number of successfully delivered meals (mean) and the number of successfully delivered complete containers.

The performance of the insulated systems varies from the 14 successfully delivered meals of the Carrypack to the 40 of the Nutri-System. Comparing these results with those for the warm holding time in section 4.5.5., it is clear that for the delivery of meals-on-wheels it is necessary to balance the need for a large heated mass with the need to minimise the number of times the container is opened and therefore the heat-loss.

Whilst the Carrypack has a very good warm holding time, 173 minutes, the large number of meals it contains means that there is frequent opening of the system during a meals-on-wheels round and therefore accelerated heat-loss for those meals delivered at the end of the round. This is reflected in the fact that the system was only able
to deliver a mean of 14 meals - less than one full container.

Conversely, the Temp-rite system, with a capacity of only six meals is limited by its short warm holding time (see section 4.5.5.), which is the result of the relatively small heated mass within the system.

The Insulated Container and the Nutri-System, with successful deliveries of 34 and 40 meals respectively, appear to strike the correct balance between heated meal mass and the number of meals contained. The Insulated Container holds 7 meals whilst the Nutri-System holds 13 meals in two thermally separate containers. Section 4.5.5. shows that the Nutri-System has the better insulating properties of the two and this is reflected in its superior performance. The Nutri-System also has a design advantage in the use of side opening doors which allow far less heat-loss than top opening doors such as used by the Insulated Container.

It should be noted that where insulated systems are shown to successfully deliver more than one container full of meals, it is not correct to assume that the number of meals above one container may be loaded into a further container and be successfully delivered. This is because the successful delivery of that proportion of a full container is dependent upon the total heated mass of a full container. Thus, if there is less than a full container of meals the delivery period will be shorter. In such situations it thus advisable to unload the partially full container and then to unload the full container.

The heated systems also produce widely varied results. Due to its poor heat supply (identified in section 4.5.6.) the Excelarc performs only moderately with a mean of 32 successfully delivered meals - indeed it is less successful than two of the purely insulated systems.

The Hotlock achieves a delivery period of three hours (60 meals). This is some 22 minutes longer than its warm holding time, as identified in section 4.5.6. The reason for this is the fact that
the coolest meals, which fall below 62.8°C first, are indeed unloaded first. Thus these meals are delivered before they able to cool to unacceptable temperatures.

The Huskybox performs marginally better than the Excelarc, delivering 42 meals over 126 minutes. Unlike the other heated systems however, under simulated conditions the Huskybox delivery period is far short of its warm holding time, identified in section 4.5.6. The reasons for this loss of performance have been identified as follows:

- The hinged lid on the model tested promotes massive heat-loss every time the container is opened. This was shown by

![Diagram showing heat-loss due to hinged lid in Huskybox]

Figure 4.21. Heat-loss due to hinged lid in Huskybox
the dramatic fall in the temperature of the internal air every time the lid was opened. The reason for this was the very large lid area which when opened would draw out the hot air by suction and draw in cold air through the air vents in the base of the container (see figure 4.21.). Thus with every delivery the hot air within the container was sucked out and replaced with cold air which would in effect cool the meals. Other systems avoid this problem by using either sliding lids, thus exposing a minimum area for heat-loss and not creating a suction effect, or in the case of the Nutri-System by using side opening doors.

o Since the combustion chamber is not isolated from the food chamber, the fresh air drawn into the container promotes more rapid combustion and therefore reduces the combustion period.

The Corsair system provides the best results by some considerable margin. It is able to deliver 79 meals, under simulated conditions, over a period of nearly four hours. This represents nearly three complete delivery containers.

(iv) Conclusions - These tests have established a number of important points with regard to the delivery of meals-on-wheels. These are;

1. The successful delivery of meals-on-wheels using purely insulated systems depends upon the correct balance between the quantity of heated food mass and the number of meals to be delivered i.e. the frequency of opening and closing the container. With the levels of insulation in the systems tested the correct number of 450 gram meals is around six or seven as adopted by the Insulated Container and the Nutri-System.

2. The Nutri-System, delivery of a mean 40 meals over 120 minutes, and the Insulated Container, delivery of a mean 34 meals over 102 minutes, produced the best results of the four purely insulated systems.
3. The heated delivery systems must provide sufficient additional heat to compensate for losses due to repeated opening during delivery.

4. The design of lids and doors for access and meal removal is an important factor in minimising heat loss.

5. Heat distribution within containers and unloading procedures should be such that the coolest meals, that is those that will fall below 62.8°C first, will be unloaded first.

6. The most effective system in this test was the Corsair which had a mean delivery of 79 meals over 237 minutes. Indeed this systems performance was far superior to that of any of the others.

4.5.9. Summary and conclusions.

Table 4.13. provides a summary of the most important results in terms of thermal performance. It also ranks the two different types of system according to their performance in these tests.

The performance of those systems that rely on insulation is determined by four important factors;

1. Insulation - all four systems utilise very good insulating materials, the best being the rigid foamed polyurethane as used by the Nutri-System and the Temp-rite.

2. Loading temperatures - It was determined during preliminary tests that a loading temperature of 80°C is appropriate in terms of ensuring a reasonable warm holding time, balancing the effects of high temperatures on food quality (section 4.4.1.) and the practicality of food preparation and loading.

3. Quantity of heated meal mass - along with the need for adequate loading temperatures it is essential to have a sufficient quantity of heated meal mass.

4. Number of meals/deliveries - It is necessary to balance the quantity of heated meal mass with the number of deliveries since each delivery inevitably results in some degree of heat-loss. The tests indicated that in the meal-on-wheels situation where
## Table 4.13. Ranking and summary of thermal performance.

<table>
<thead>
<tr>
<th>System</th>
<th>Mean no. acceptably delivered meals</th>
<th>No. full containers</th>
<th>Mean warm holding time unopened (mins)</th>
<th>Heat distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insulated systems.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Nutri-System</td>
<td>40</td>
<td>3</td>
<td>155</td>
<td>Very good</td>
</tr>
<tr>
<td>2. Insulated container</td>
<td>34</td>
<td>4</td>
<td>153</td>
<td>Very good</td>
</tr>
<tr>
<td>3. Temp-rite</td>
<td>23</td>
<td>3</td>
<td>65</td>
<td>Very good</td>
</tr>
<tr>
<td>4. Carrypack</td>
<td>14</td>
<td>0</td>
<td>173</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Heated systems.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Corseir</td>
<td>79</td>
<td>3</td>
<td>244</td>
<td>Poor</td>
</tr>
<tr>
<td>2. Hotlock</td>
<td>60</td>
<td>3</td>
<td>158</td>
<td>Average</td>
</tr>
<tr>
<td>3. Huskybox</td>
<td>42</td>
<td>2</td>
<td>175</td>
<td>Very poor</td>
</tr>
<tr>
<td>4. Excelarc</td>
<td>32</td>
<td>2</td>
<td>75</td>
<td>Good</td>
</tr>
</tbody>
</table>
each meal usually represents a single delivery, those systems containing six or seven meals were the most effective. Where there is one single delivery to a group of recipients such as bulk deliveries to luncheon clubs, it is better to have larger capacity containers so that there is a maximum of heated mass and therefore a longer warm holding time.

From the summary of results in table 4.13, it is clear that the best of the purely insulated systems for meals-on-wheels purposes is the Nutri-System which can deliver meals at an acceptable temperature for up to two hours. The Insulated Container also performed well with deliveries of up to one and a half hours possible. Indeed these two systems performed better in these tests than one of the heated systems discussed below.

In general, and not suprisingly, the heated systems perform better in these tests in terms of keeping food hot over time than the purely insulated systems. The success of their performance depends upon the following factors:

1. The heat source - The heat source should provide a sufficient and steady supply of heat to compensate for heat-loss during transportation and during the unloading of meals. It should not however provide so much heat that food temperatures are raised to cooking levels or that the food burns. This appears to be a difficult balance to achieve since the Huskybox overheats meals and on the other hand the Excelarc provides insufficient heat to maintain meal temperature above 62.8°C.

2. Heat distribution - Heat supplied to the system is of little value if it is not effectively distributed throughout the container so that all meals benefit from extended warm holding times. All four of the heated systems have unevenly distributed heat (except the Excelarc which generates insufficient heat to create an imbalance), but the Corsair and Hotlock systems turn this to advantage by supplying most heat to those meals that will be delivered last and less to those that will be delivered first.
3. Insulation and heated mass - whilst insulation qualities and heated food mass are not as critical as the above factors, or as important as for the insulated systems, they are still factors that will extend warm holding times and also help to maintain fairly even temperatures throughout the container. All four of the heated systems incorporate efficient insulation materials but design faults have all but nullified the effects of this insulation (see section 4.5.5.). If these faults were corrected there would be less heat needed from the heat source and the heat distribution would probably be better.

Of the four heated systems that were tested, the Corsair was clearly the most effective in terms of both the warm holding time and the simulated meals-on-wheels delivery - both around four hours. The Hotlock is the next best with a simulated delivery time of three hours. The least effective system of the four was the Huskybox which despite its simulated delivery time of two hours, is highly erratic in its performance and due to the intense release of heat causes the meals to boil or burn.
4.6. Hygiene.

Since all foods are of biological origin they are all therefore perishable to some degree. Foods may become spoiled by a variety of mechanisms, the type of spoilage investigated in this section is confined to that caused by the possible effects of microbial contamination of food. This is clearly a matter for some concern in situations such as meals-on-wheels where there are large numbers being catered for and particularly when the contaminating organisms are capable of causing food poisoning, infections or the transmission of disease.

4.6.1. Objectives.

The objectives of this section are as follows;

- To identify how effectively each system may be cleaned in order to minimise the risk of microbial contamination of the food.
- To determine the effectiveness of the cleaning methods currently adopted in the industry.
- To identify the extent to which the delivery of hot meals inhibits or promotes the growth of micro-organisms during transportation periods.


Raw food materials may well carry large numbers of bacteria, yeasts and moulds, each food having its own selection and quantity of microbial flora. Of the micro-organisms that may be initially found associated with raw food stuffs, most yeasts and moulds are relatively harmless and of the bacteria only a very few pathogenic types are potentially harmful to man. Nevertheless, the non-pathogenic types are of importance to food processors and
handlers since whilst they may not be directly harmful, by increasing their numbers, utilising nutrients, producing enzymatic changes and creating off-flavours they can spoil foods rendering them unacceptable for consumption.

The potential risks associated with pathogenic bacteria are magnified by the risk of their growth and multiplication in foods kept at incubating temperatures. In meals-on-wheels services this carries the consequent risk of large scale outbreaks of food poisoning in groups of elderly and infirm members of the population. Food poisoning, a form of gastro-enteritis, usually manifests itself within a few hours of eating contaminated food with an acute attack of abdominal pain and diarrhoea usually accompanied by vomiting. The incubation periods and typical symptoms of food poisoning due to different micro-organisms is shown in table 4.14.

Food-borne diseases may be subdivided into:

1. those due to poisonings, caused by the presence of bacterial toxins in food. The two chief kinds being botulism caused by the presence in food of toxin produced Clostridium botulinum, and staphylococcal intoxication caused by toxin from Staphylococcus aureus.

2. those due to infections, caused by the entrance of bacteria into the body through the ingestion of contaminated foods and the reaction of the body to their presence. This group includes members of the Salmonella genus, Bacillus cereus and Esherichia coli.

(i) Sources of food poisoning/infection micro-organisms;

The major sources of food poisoning/infection micro-organisms are usually the food itself - Salmonella may be found in milk, eggs and poultry products, meats, fish and shellfish - and man - Staphylococcus aureus and Esherichia coli are natural inhabitants of the skin, respiratory passages and the intestinal tract.
Table 4.14. Incubation period and typical symptoms of food poisoning.

<table>
<thead>
<tr>
<th></th>
<th>Salmonella</th>
<th>Staphylococcus</th>
<th>C. welchii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation</td>
<td>12-24 hours</td>
<td>2-6 hours</td>
<td>8-22 hours</td>
</tr>
<tr>
<td>Duration</td>
<td>1-14 days</td>
<td>6-24 hours</td>
<td>12-24 hours</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>Very common</td>
<td>Common</td>
<td>Extremely common</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Not common</td>
<td>Extremely common</td>
<td>Very rare</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Fever</td>
<td>Very common</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Prostration</td>
<td>Rare</td>
<td>Common</td>
<td>Common</td>
</tr>
</tbody>
</table>
(ii) The growth of micro-organisms in food;

Most foods are good media for bacterial growth and therefore hygienic practices to reduce contamination during processing, handling, preparation and service are essential to allow extended storage time without spoilage or serious risks of food poisoning. The factors that affect the growth of micro-organisms in food are:

- nature of the food,
- initial number and type of contaminating organisms,
- pH of the food,
- availability of water,
- availability of oxygen,
- presence of inhibitory substances such as salt,
- time and temperature of incubation.

(iii) Time and temperature relationships;

Although all the above factors are important in the development of high levels of micro-organisms, as far as the meals-on-wheels service is concerned the most important factors are the times and temperatures of incubation. As discussed in section 4.4.1, most food poisoning bacteria are mesophilic, i.e., they multiply best at temperatures of 30-40°C, and most pathogenic bacteria do not multiply at temperatures below 3°C or above 63°C. For these reasons it is essential that foods are transported at temperatures either above or below the range 3-63°C. This is indeed a requirement of the Food Hygiene Regulations 1970.

4.6.3. Hygiene evaluation of delivery systems.

In order to evaluate the delivery systems in terms of hygiene, the criteria for such an evaluation should be identified. The ability of systems to maintain meals at acceptable temperatures during delivery is not considered in this section - this was extensively covered in section 4.5.
In all the systems investigated meals are usually served into disposable foil containers (or plastic in the case of the Temp-rite) and are then placed into the transportation container. Even though the meal containers are lidded, it is evident from observations in the field that food spillage occurs and that the transportation containers become soiled with food debris.

At the most basic level, therefore, any delivery system should protect the food from contamination and should also be easily cleaned. Some of the factors that are important in the design from a hygiene point of view are discussed below.

(i) Construction materials (Food Manufacturers Federation and Food Machinery Association 1970).

- No chipping or flaking should occur under conditions of repeated intensive use.
- The construction must be strong enough to resist damage and significant deformation during use.
- All surfaces should be inert to food under all conditions.
- Materials used in construction should be easily cleaned and be resistant to recommended cleaning agents and abrasion.

The material recommended for equipment used in general food preparation and service is stainless steel. In some applications such as meals-on-wheels however, lighter materials such as aluminium might be suitable.

(ii) Avoidance of food debris.

The equipment should be suitable for effective cleaning so that the build-up of food debris is avoided and the equipment is sufficiently clean for further deliveries. To this end the equipment should be designed so that no food material is harboured in inaccessible areas, such as seams and corners, where the growth of micro-organisms may be encouraged. Over time food could accumulate and could therefore be a source of future contamination.
The construction design should therefore, consider the following points;

- The internal walls and fittings should be as smooth as possible, especially joints between walls and fittings, and there should be a minimum of seams and crevices.
- Surfaces should be sufficiently strong and rigid to resist damage and pitting.
- Surfaces should be inert to foodstuffs and should be resistant to flaking and chipping.
- Sharp corners should be avoided by the use of suitable curvatures.

It should also be noted that equipment is more likely to be cleaned regularly if it is well designed and is constructed from suitable materials that may be readily cleaned.

Each of the delivery systems will now be considered in terms of the criteria identified above.

(i) Excelarc;

The model supplied was manufactured in an aluminium alloy. The construction was poor and in particular the aluminium sheets were badly welded giving rise to sharp seams and rough corners where food debris could accumulate. The lid was constructed from a smooth hard laminated plastic resin which could be easily cleaned. This system employs an electric heat source and therefore may not be immersed during the cleaning operation. It should therefore be wiped out with a damp cloth followed by further wiping with a sanitising solution. The container should then be air dried to minimise the possibility of contamination.

(ii) Corsair;

The construction was of textured aluminium on the outside of the container and smooth aluminium on the inside. There were some very
sharp corners and also irregular welds along the seams which could harbour food debris and would hamper effective cleaning. As with the Excelarc, this system employs an electrical heating element which precludes the container being immersed during cleaning. Inspection of the container revealed that this would also be inadvisable because seams were not sealed and water could enter the insulation of the container. The manufacturer recommends cleaning with a damp cloth but there is no reference to the use of a sanitising agent which should be used for maximum benefit.

(iii) Huskybox;

The construction was of smooth aluminium both on the interior and the exterior. Again joints and corners on the interior surfaces were very sharp making effective cleaning difficult. Foil meal containers are placed on a wire grid above the combustion area where methylated spirit gel burns to provide additional heat. The grid and the methylated gel container are readily removed so that the container may be easily cleaned with copious quantities of water and sanitiser after use. Total immersion is not advisable since there is the possibility of water penetrating the insulation areas.

(iv) Hotlock;

The exterior is constructed of aluminium covered in textured plastic with the lid being made of aluminium without the plastic covering. The interior surfaces are made of smooth aluminium. Corners and seams are again poorly constructed providing ideal areas for the accumulation of food debris. As with the Huskybox, the heat source may be removed and the interior may be wiped clean with plenty of water and sanitiser. The container should not be immersed in water.

(v) Carrrypack and Insulated Container;

Both systems are constructed from expanded polystyrene which provides a soft granular surface on both the inside and the outside. This surface is very difficult, if not impossible, to clean satisfactorily. It readily absorbs soiling and once impregnated
with food material it is impossible to remove. Polystyrene is also very easily damaged giving the container an extremely short lifespan (discussed in section 4.9.2.). In order to minimise the build-up of food debris the container should be wiped clean after each use, and once soiled beyond effective cleaning should be discarded. It would be beneficial to line these containers with a disposable lining such as aluminium foil which would protect the surfaces and so extend the usable life of the containers.

(vi) Temp-rite;

This system is significantly different from the other transportation containers since it is made-up of insulated plastic trays which when stacked together form a transportable pack of meals. The trays are constructed of a plastic which is machine washable, and which can be finally rinsed at a final temperature of 80°C. The trays should then be air dried. Following the manufacturers recommended cleaning practices should ensure that this system is maintained in an hygienic condition.

(vii) Nutri-System;

Both the outer and the inner surfaces and the lid are made of an impact resistant plastic, the inner surface being smooth and the outer surface being embossed. The corners and the joints at the side are well rounded and are easily cleaned. The whole container may be safely immersed in water and will withstand cleaning by all normal detergents and sanitisers. The manufacturers, however state that it may be damaged by steam cleaning treatment.

Table 4.15. provides a summary of the hygiene aspects associated with each system.
Table 4.15. Hygiene aspects and recommended cleansing.

<table>
<thead>
<tr>
<th>System</th>
<th>Construction material</th>
<th>Ease of cleaning</th>
<th>Recommended method of cleansing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excelarc</td>
<td>Aluminium</td>
<td>Poor</td>
<td>Wiping with sanitizer</td>
</tr>
<tr>
<td>Corsair</td>
<td>Aluminium</td>
<td>Poor</td>
<td>Wiping with sanitizer</td>
</tr>
<tr>
<td>Huskybox</td>
<td>Aluminium</td>
<td>Good</td>
<td>Copious quantities of water/sanitizer</td>
</tr>
<tr>
<td>Hotlock</td>
<td>Aluminium</td>
<td>Poor</td>
<td>Wiping with sanitizer</td>
</tr>
<tr>
<td>Carrypack</td>
<td>Expanded polystyrene</td>
<td>Very poor</td>
<td>Wiping with wet cloth</td>
</tr>
<tr>
<td>Insulated Container</td>
<td>Expanded polystyrene</td>
<td>Very poor</td>
<td>Wiping with wet cloth</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>Plastic</td>
<td>Good</td>
<td>Immersion in water/detergent</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>Plastic</td>
<td>Good</td>
<td>Machine washable</td>
</tr>
</tbody>
</table>
4.6.4. Microbiological field study of the hygiene of delivery systems.

A microbiological investigation was carried out with the meals-on-wheels service in order to determine the effectiveness of the typical cleansing methods used in the industry. Experience and observations along with the recommendations of the manufacturers revealed that the most common method of cleaning was wiping the interior with a damp cloth. This was the practice in the situation investigated in this study.

(i) Method;

Permission to sample from a selection of delivery containers was obtained from the local authority. The actual containers tested in this situation were Hotlocks but the test could equally apply to any one of the four aluminium containers since they are all similar in their construction and suffer the same faults of design.

Samples were taken after the containers had been cleaned in the normal way and before preheating for the next delivery. Sterile calgitex wool swabs were used to sample the microbial contamination of four 10 cm square sites on each of the containers. The sites for sampling are shown in figure 4.22.

(ii) Observations and results;

The observed procedure for cleaning containers was merely a wipe with a damp cloth. There was no evidence of proper cleaning or the use of detergent or sanitiser.

Visually all containers (14) were dirty - there were copious food stains and food debris was evident in all cases. The results of samples taken are shown in table 4.16. From these results the following points may be made;

- The cleaning procedures employed in this situation which are typical of most meals-on-wheels operations, are inadequate. This
is partly the fault of the container with its inaccessible corners, sharp edges and poorly finished seams which harbour food debris. The cleaning process may be improved by the use of detergents or disinfecting solutions. Visual evidence of staining is also an indication of poor attitudes to hygiene, probably a result of the difficulty of cleaning thoroughly.

Even though the contamination was relatively low, it showed a logical distribution with the lowest levels being nearest to the heat source and the highest furthest away. Interestingly the lid of the container was the most contaminated and yet it would be the easiest surface to clean and would be the most difficult to contaminate with food debris.

1 - Underside of lid
2 - Base upon which meals are placed
3 & 4 - Upright seams at corners of container

Figure 4.22. Positions for microbiological sampling
Table 4.16. Contamination by micro-organisms in delivery containers.

<table>
<thead>
<tr>
<th>Number of container</th>
<th>No. of micro-organisms per cm² of surface area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position (i) (ii) (iii) (iv)</td>
</tr>
<tr>
<td>1</td>
<td>2 2 1 0</td>
</tr>
<tr>
<td>2</td>
<td>0 17 4 0</td>
</tr>
<tr>
<td>3</td>
<td>2 0 0 11</td>
</tr>
<tr>
<td>4</td>
<td>5 0 0 5</td>
</tr>
<tr>
<td>5</td>
<td>0 0 7 0</td>
</tr>
<tr>
<td>6</td>
<td>0 0 0 1</td>
</tr>
<tr>
<td>7</td>
<td>0 4 2 3</td>
</tr>
<tr>
<td>8</td>
<td>12 0 0 18</td>
</tr>
<tr>
<td>9</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>10</td>
<td>310 3 4 13</td>
</tr>
<tr>
<td>11</td>
<td>76 4 10 4</td>
</tr>
<tr>
<td>12</td>
<td>15 2 9 3</td>
</tr>
<tr>
<td>13</td>
<td>0 11 18 5</td>
</tr>
<tr>
<td>14</td>
<td>2 6 320 0</td>
</tr>
<tr>
<td>Mean</td>
<td>30 3 21 4</td>
</tr>
</tbody>
</table>

372
The contamination by micro-organisms, as indicated by the results in table 4.16., are rather lower than might have been expected from the visual appearance of the interior of the containers. This is largely due to the fact that the containers are heated prior to use and therefore the food deposits which were clearly present are continually subjected to a heat treatment sufficient to kill most of the micro-organisms present each time the equipment is used.

4.6.5. Microbiological field study of delivered meals.

As mentioned in earlier sections, the most critical factor for the growth of micro-organisms during the delivery of meals-on-wheels is the time and temperature of incubation. Fieldwork was thus carried out to identify the effect that these factors have on the growth of micro-organisms in a sample of delivered meals.

(i) Method;

With the co-operation of a local authority a meal delivery round was duplicated. This was carried out by filling a container of the same type as that used in the actual round with the same number of meals and then following the actual delivery vehicle in a van simulating each delivery. Using a duplicate container of meals ensured that the sampling of meals did not hinder delivery and that the food for consumption was not tampered with.

At the central production kitchen the loading temperatures of the meals were recorded and samples were taken from the gravy of each entree and the custard of each sweet course of the meal. The average loading temperature of the meals was 76.1°C and the average number of micro-organisms per gram of food was 605 for the custard and 9.4 for the gravy.

When loaded the meals were despatched to a Womens Royal Voluntary Service distribution point and one hour after loading the actual
delivery round was started. At each delivery point during the round a meal, or where appropriate more than one meal, was removed from the duplicate container, the temperature was recorded and a food sample was taken.

(ii) Results;

The times and temperatures of delivery are shown in table 4.17, along with the counts of micro-organisms per gram of food. From these results the following comments may be made:

- Both the custard and the gravy showed some contamination at the starting point, which although unlikely to cause any problems at this stage, could increase to dangerous levels given sufficient time and a favourable temperature range.
- The custard was much more heavily contaminated than the gravy. This could be a reflection of the original production methods of the frozen food manufacturer who supplied the food to the authority.
- Higher initial temperatures would have helped reduce these levels of contamination.
- Since the frozen food items did not come from the same batch no clear trend of microbial loading against temperature could be investigated, but nevertheless, the lowest temperature custard samples gave the highest figures for microbial contamination.
- The contaminating micro-organisms may be spore forming organisms. The most common of such organisms occurring in meat and gravy foods, and often implicated in food poisoning from such sources is Clostridium perfringens. The custard could be contaminated by Bacillus cereus. The spores of Cl. perfringens will survive in food after most normal cooking procedures. Long slow cooling and warm storage will encourage the multiplication of this organism, which has a short generation time of about 10-12 minutes, and an optimum growth temperature of 43-47°C. A similar sequence of events will promote the growth of Bacillus cereus. Both organisms are ubiquitous and except by strict attention to cleanliness it is impossible to eliminate them altogether. Thus
Table 4.17. Microbial counts per gram of food delivered.

<table>
<thead>
<tr>
<th>Meal number</th>
<th>Delivery time</th>
<th>Gravy</th>
<th>T°C</th>
<th>Custard</th>
<th>T°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>68</td>
<td>0</td>
<td>73.8</td>
<td>412</td>
<td>63.1</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
<td>107</td>
<td>74.6</td>
<td>351</td>
<td>64.1</td>
</tr>
<tr>
<td>3</td>
<td>78</td>
<td>193</td>
<td>70.1</td>
<td>153</td>
<td>65.9</td>
</tr>
<tr>
<td>4</td>
<td>83</td>
<td>181</td>
<td>71.4</td>
<td>206</td>
<td>65.9</td>
</tr>
<tr>
<td>5</td>
<td>91</td>
<td>114</td>
<td>65.0</td>
<td>119</td>
<td>63.7</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
<td>155</td>
<td>67.7</td>
<td>205</td>
<td>58.7</td>
</tr>
<tr>
<td>7</td>
<td>105</td>
<td>57</td>
<td>59.2</td>
<td>268</td>
<td>54.0</td>
</tr>
<tr>
<td>8</td>
<td>106</td>
<td>50</td>
<td>56.2</td>
<td>6071</td>
<td>50.3</td>
</tr>
<tr>
<td>9</td>
<td>111</td>
<td>48</td>
<td>66.2</td>
<td>365</td>
<td>67.1</td>
</tr>
<tr>
<td>10</td>
<td>114</td>
<td>55</td>
<td>66.9</td>
<td>534</td>
<td>62.8</td>
</tr>
<tr>
<td>11</td>
<td>118</td>
<td>36</td>
<td>66.7</td>
<td>496</td>
<td>65.4</td>
</tr>
<tr>
<td>12</td>
<td>119</td>
<td>21</td>
<td>66.4</td>
<td>452</td>
<td>60.5</td>
</tr>
<tr>
<td>13</td>
<td>121</td>
<td>45</td>
<td>58.8</td>
<td>692</td>
<td>60.1</td>
</tr>
<tr>
<td>14</td>
<td>124</td>
<td>153</td>
<td>59.3</td>
<td>429</td>
<td>65.7</td>
</tr>
<tr>
<td>15</td>
<td>126</td>
<td>48</td>
<td>49.1</td>
<td>12620</td>
<td>43.7</td>
</tr>
<tr>
<td>16</td>
<td>128</td>
<td>21</td>
<td>59.0</td>
<td>15876</td>
<td>50.0</td>
</tr>
<tr>
<td>17</td>
<td>131</td>
<td>49</td>
<td>51.7</td>
<td>205</td>
<td>53.7</td>
</tr>
<tr>
<td>18</td>
<td>141</td>
<td>54</td>
<td>59.6</td>
<td>249</td>
<td>59.9</td>
</tr>
</tbody>
</table>
their presence in foods in small numbers has to be accepted, but their development into large numbers cannot be tolerated. When the foods are reheated, as in the case of frozen food in the meals-on-wheels service, the mass of the food must boil through to the centre. This was clearly not happening in the local authority where the field study was carried out.

4.6.6. Summary and conclusions.

Microbial contamination may arise via the food material itself, from food handling, or from unhygienic utensils used in the preparation or conveyance of meals.

The most effective means available to the meals-on-wheels operation for the control of the contamination levels, are the food heating and cooking temperatures and the time and temperature of transportation and delivery. When food is preheated, in preparation for despatch, it is essential that the food mass is heated thoroughly to a temperature of 100°C. During distribution and delivery the temperature of meals must be maintained above 62.8°C and the time for which meals are held in the range 63-65°C must be kept to a minimum. These requirements are in addition to, not instead of the normal kitchen hygiene procedures which should also always be followed.

The hygienic design of delivery equipment requires that:

- materials used are inert to food and moisture, are non-absorbent and are highly durable and resistant to damage,
- all surfaces are smooth, easily cleaned and free from pits and crevices, and sharp or otherwise inaccessible corners.

Investigation of the delivery systems available, indicate that many do not fulfill the above requirements. The polystyrene containers are easily chipped and damaged and are nearly impossible to clean adequately. All four of the aluminium containers have inaccessible corners and poorly finished seams which may harbour food debris and dirt and which are very difficult to clean. The Excelarc, Corsair
and Hotlock are also limited in that they may only be cleaned using a damp cloth. Fieldwork established that this was inadequate and should be accompanied by the use of a sterilising solution. The best systems in terms of cleansing and hygiene are the Nutri-System and the Temp-rite which may be totally immersed in water and detergent - the Temp-rite is also machine washable. Both these systems have smooth impervious surfaces that are well rounded to ensure easy and effective cleaning.
4.7. **Ergonomics.**

Due to the labour intensive nature of the meals-on-wheels sector and the use of voluntary workers whose goodwill it is essential to maintain, it is important that delivery systems are ergonomically designed. Such design ensures that the systems are suitable for extensive handling in terms of ease of use and safety. Three areas will be investigated - the weight of the transportation containers, the size and dimensions of the containers and the external temperatures of the surfaces of the delivery containers.

4.7.1. Objectives.

The objectives of this section are as follows;

- To identify the handling requirements of the meals-on-wheels operation.
- To determine how well these requirements are met by the systems being investigated.
- To identify specific areas for improvement in the design of the systems in terms of ergonomics.

4.7.2. Weight.

The meals-on-wheels operation requires that the delivery equipment should be portable, and even where trolleys are available, the containers should be of a weight that can be lifted safely. In some meals-on-wheels operations, such as those in urban areas, it is also important that the container should be fully portable in order that meals may be delivered, directly from the container, to homes in places inaccessible to motor vehicles. This would include such places as blocks of flats, residential homes and some sheltered housing.

The legislation concerning the lifting and carrying of heavy weights
is vague. Apart from the general requirements of the Health and Safety At Work Act 1974, The Factories Act (1961) states that, "A person must not be employed to lift, carry or move any load so heavy as to be likely to cause injury to him". Specific maximum weights are only mentioned in regulations for particular industries (Jute Safety, Health and Welfare Regulations 1948, Woollens and Worsted Textiles Regulations 1926, for example). This legislation indicates that the maximum weights of materials or appliances that may be lifted by women is 16-30kg, and for men 68kg, according to age and fitness.

The specific requirements of the meals-on-wheels operation will be determined by the nature of the workforce at its disposal. That is whether they are young/old, male/female, and whether they are active and fit. From the survey carried out by Lawson and Thomson (1981), and personal observations in the field, it is evident that the majority of the meals-on-wheels workforce is made up of women contributing their services through voluntary organisations. Furthermore, the majority of these women are in the middle to elderly age groups. This would indicate therefore that these people are unlikely to be able to safely lift the weights indicated for younger workers.

The weights of each delivery system, loaded and unloaded, are shown in table 4.18. Since not all of the containers have recommended capacities and many of those that do are vague, the table includes the weights of containers when 20% full (food mass) by volume, as used in the thermal tests. This amount virtually fills all the containers and therefore the weights shown give a good indication of the likely weights of containers used in the field. Furthermore, using a percentage fill allows fair comparisons to be made between alternative systems.

The weights of the systems as shown in table 4.18, conveniently fall into two groups, corresponding to those systems that are purely insulated and those that are heated. The polystyrene containers such as the Insulated Container and the Carrypack weigh very little when empty (less than 1kg) and between 4 and 8 kg according to model
Table 4.18. Delivery system weights.

<table>
<thead>
<tr>
<th>System</th>
<th>Unladen weight (kg)</th>
<th>Recommended No. meals (450gm)</th>
<th>Laden weight (kg)</th>
<th>No. Meals</th>
<th>Laden weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrypack</td>
<td>0.55</td>
<td>--</td>
<td>16</td>
<td>7</td>
<td>7.75</td>
</tr>
<tr>
<td>Insulated</td>
<td>0.36</td>
<td>--</td>
<td>7</td>
<td>3.51</td>
<td></td>
</tr>
<tr>
<td>Container</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp-rite</td>
<td>3.33</td>
<td>6</td>
<td>6.03</td>
<td>13</td>
<td>12.95</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>7.10</td>
<td>--</td>
<td>25</td>
<td>17</td>
<td>25.65</td>
</tr>
<tr>
<td>Excelarc</td>
<td>18.00</td>
<td>40</td>
<td>32.00</td>
<td>18</td>
<td>22.10</td>
</tr>
<tr>
<td>Corsair</td>
<td>17.20</td>
<td>18</td>
<td>24.90</td>
<td>17</td>
<td>24.45</td>
</tr>
<tr>
<td>Huskybox</td>
<td>14.00</td>
<td>15</td>
<td>23.95</td>
<td>21</td>
<td>26.65</td>
</tr>
<tr>
<td>Hotlock</td>
<td>16.80</td>
<td>18</td>
<td>24.90</td>
<td>17</td>
<td>24.45</td>
</tr>
</tbody>
</table>

size, when full. The Nutri-System, due to its more robust construction, is heavier at nearly 13kg when loaded. This would still appear to be a manageable weight for most women however, especially if carried between two as would seem most practical. In terms of total portability, that is those systems that may be carried to the recipients door for example, both the polystyrene and the Temp-rite containers are suitable. The Nutri-System may be too heavy to be carried over extended distances and particularly up stairways by the more elderly female volunteers.

The heated systems are all considerably more heavy and even when unloaded their weights approach 18kg. When loaded these systems all weigh in excess of 20kg, and the Excelarc and Corsair weigh over 25kg (the Hotlock is also very close to this weight). These weights make it clear that none of these systems is fully portable and they could not be practically carried to the doors of meals-on-wheels recipients.

The lifting and carrying of any of the four heated systems should be
carried out by two people, even when the container is unloaded. Indeed the design of the containers, with widely spaced handles at each end, indicates that this is the only practical way of carrying them. Discussions with the manufacturers confirm that this is the expected procedure.

With regard to the need for two people to lift and carry equipment, supervisors of meals-on-wheels schemes should be aware of the implications of precedents in case law. In Peat vs. N.J. Muskham and Co. Ltd. (1969) it was held that the company was not liable for injury where a person lifts a heavy load himself when he has been told to ask for help which is readily available to him. On the other hand, in Brown vs. Allied Ironfounders Ltd. (1974), it was found that, where to the employers knowledge some employees moved heavy loads by themselves, whilst others called for assistance, the employers failure to instruct them to call for assistance made the company liable. Thus all employees and volunteers within the meals-on-wheels operation should be given specific instructions about lifting heavy equipment. Supervisors also have an obligation to ensure that assistance is readily available for this purpose.

In conclusion the following points should be emphasised;

- All four of the insulated systems are fully portable and may be carried to the door of meal recipients.
- None of the four heated systems is fully portable and the containers should remain within the transportation vehicle during meal delivery.
- Lifting, carrying or moving any of the four heated systems, particularly when loaded, should be undertaken by two people, male or female. This should be clearly explained to staff and sufficient staff should be available for this purpose.

4.7.3. Size and dimensions.

The size and the external dimensions of the equipment must be considered in relation to the ease with which they may be carried,
particularly those that are intended to be fully portable, and in relation to the vehicles within which they are to be transported. The vehicles used for transporting meals-on-wheels range from private cars provided by volunteers to the local authority vans specifically intended for delivering meals.

Because of the variety of different delivery vehicles the main requirement in terms of size is that the transportation equipment should be flexible and suitable for use with a range of vehicles. The containers should not therefore be either so large or so unusually shaped as to preclude the use of certain vehicle types. Table 4.19. shows the size and dimensions of each of the investigated containers and table 4.20. indicates whether each of the systems can be loaded into a range of transportation vehicles. The vehicles shown were selected as representative of the range of typical vehicles used in the meals-on-wheels service.

The results of table 4.20. show that most of the containers will fit into most of the vehicles. The only vehicle to present problems was the Mini which has a particularly small boot and limited space inside to accommodate the containers. Even this vehicle however could accommodate the smaller versions of the insulated systems. There were also some problems with two door cars where it was very difficult to get the larger containers onto the back seat. This problem is usually overcome by using either the boot or the hatchback. The most flexible systems were the Temp-rite and the Insulated Container purely because of their small size. Nevertheless, all the systems would fit into all the vehicles albeit with difficulty in some cases.

Questions regarding the ease with which containers may be carried relate mainly to the fully portable systems. Of these, only the Carrypack presents real problems due to its size and shape (cubic) which makes it very awkward to carry and manoeuvre. All the heated systems have adequate handles on the side to enable the containers to be carried by two people.

The final requirement of the equipment in terms of size is that the
Table 4.19. Equipment size and dimensions.

<table>
<thead>
<tr>
<th>System</th>
<th>External dimensions</th>
<th>Internal dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length x width x height (cm)</td>
<td>Volume (cm³)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length x width x height (cm)</td>
</tr>
<tr>
<td>Carrypack</td>
<td>40.0 x 37.0 x 32.0</td>
<td>47,360</td>
</tr>
<tr>
<td>Insulated Container</td>
<td>39.0 x 23.6 x 27.5</td>
<td>25,526</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>39.0 x 21.0 x 45.0</td>
<td>36,855</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>54.0 x 38.5 x 30.5</td>
<td>63,410</td>
</tr>
<tr>
<td>Excelarc</td>
<td>58.4 x 45.1 x 32.1</td>
<td>84,546</td>
</tr>
<tr>
<td>Corsair</td>
<td>59.4 x 41.3 x 34.4</td>
<td>84,017</td>
</tr>
<tr>
<td>Huskybox</td>
<td>60.5 x 42.8 x 41.7</td>
<td>107,978</td>
</tr>
<tr>
<td>Hotlock</td>
<td>57.8 x 43.2 x 39.4</td>
<td>98,380</td>
</tr>
</tbody>
</table>

Table 4.20. Equipment loading into a range of transportation vehicles.

<table>
<thead>
<tr>
<th>System</th>
<th>Mini 1000</th>
<th>Mini Metro</th>
<th>Ford Cortina</th>
<th>Datsun Van</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boot Back seat</td>
<td>Boot Back seat</td>
<td>Boot Back seat</td>
<td></td>
</tr>
<tr>
<td>Carrypack</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Insulated Container</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Excelarc</td>
<td>Yes</td>
<td>Difficult</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Corsair</td>
<td>Yes</td>
<td>Difficult</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Huskybox</td>
<td>Yes</td>
<td>Difficult</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hotlock</td>
<td>Yes</td>
<td>Difficult</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
capacity should be appropriate to the number of meals being delivered. It is almost impossible however to identify the typical number of meals in a delivery round due to the variation from area to area. It would be appropriate therefore for a range of alternative containers with different capacities to be available so that appropriate containers may be selected. Table 4.7. indicates that most of the systems offer a range of alternative models and sizes.

In conclusion, as far as size is concerned, the most important factor is flexibility either in terms of the range of models offered or sufficiently small containers to make up the required capacity and also able through their small size to fit into a range of transportation vehicles. The most practical systems in these terms are the small polystyrene containers and the Temp-rite which may be tailored to exact requirements because of the individual meal tray principle.

4.7.4. External surface temperatures.

The external surface temperatures of delivery containers should be sufficiently cool to allow handling without discomfort or the risk of skin burns. Furthermore, since it is likely that containers will be carried in private vehicles there should be no risk of them burning or melting surfaces such as seats or carpets. Table 4.21. shows the maximum temperatures recorded during tests at a number of points on the container surface. These show that all the insulated systems remain cool, none of them exceeds 27°C, and therefore present no risk in terms of the external temperature.

The heated systems all have higher external temperatures at least partly due to the use of additional heat sources. Most fall within the temperature range of 28-38°C which would feel warm to the touch. The Huskybox however, has external temperatures reaching 46°C on the lid. This temperature would feel hot to the touch and indicates the need for care when opening and closing the container, especially
Table 4.21. **External surface temperatures (°C)**.

<table>
<thead>
<tr>
<th>System</th>
<th>Maximum wall</th>
<th>Maximum lid</th>
<th>Handles</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrypack</td>
<td>24</td>
<td>26</td>
<td>24</td>
<td>24-26</td>
</tr>
<tr>
<td>Insulated Container</td>
<td>26</td>
<td>27</td>
<td>24</td>
<td>24-27</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>23</td>
<td>23</td>
<td>24</td>
<td>21-24</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>21</td>
<td>23</td>
<td>23</td>
<td>21-23</td>
</tr>
<tr>
<td>Corsair</td>
<td>38</td>
<td>35</td>
<td>36</td>
<td>31-37</td>
</tr>
<tr>
<td>Excelarc</td>
<td>32</td>
<td>34</td>
<td>27</td>
<td>25-34</td>
</tr>
<tr>
<td>Huskybox (i)</td>
<td>35</td>
<td>46</td>
<td>32/39</td>
<td>22-46</td>
</tr>
<tr>
<td>Hotlock (ii)</td>
<td>29</td>
<td>36</td>
<td>28(57)</td>
<td>28-57</td>
</tr>
</tbody>
</table>

Temperature guide;

- o <28°C feels cool
- o 28-38°C feels warm
- o >38°C feels hot

Notes;

(i) Plastic/metal handle, temperature for each.

(ii) Temperature of combustion chamber handle in brackets.

since the lid has no handle and the lid surface itself has to be held. Whilst the surfaces of the Hotlock are generally satisfactory, the one area for concern is the exposed face and handle of the combustion tray. Temperatures of over 55°C were recorded on the external surface of this tray. These temperatures are not really acceptable since they are very hot to the touch. Care should therefore be exercised in handling this container. It should also be noted that if any of the heated systems are only partly full, or indeed empty, the external surface temperatures will be higher.
4.7.5. General design and manufacturing features.

The following are the specific design and handling characteristics of each of the systems investigated based on observations in the field and experience of use:

(i) Carrypack - the carrying strap is too narrow for the weight of the container making it uncomfortable to carry, and insufficiently strong for the weight of container.

(ii) Insulated Container - no specific handling problems identified.

(iii) Nutri-System - a well designed system with no identified problems.

(iv) Temp-rite - the strap that holds the trays in a stack which is intended as a handle is awkward to use, but in general a well designed system.

(v) Corsair - a number of sharp edges and corners which could tear materials or cause minor skin cuts or abrasions.

(vi) Excelarc - sharp edges and corners that could again cause minor injury and may damage delivery vehicles, seats in particular.

(vii) Hotlock - better finish to edges and corners of container, but could be improved if these were actually rounded.

(viii) Huskybox - sharp edges and corners, particularly sharp edges to hinges on lid. Hinged lid was found to be easily broken off. Plastic grips on handles good design point.

4.7.6. Summary and conclusions.

Delivery systems for use in the meals-on-wheels sector should be designed with a view to the labour aspects of the service. They should be appropriate for use by a volunteer workforce that is predominantly female and often quite elderly. Specifically they should be suitable to be lifted manually and in some cases fully portable so that deliveries may be made to those in less accessible places such as flats and pedestrian only residential areas. The insulated systems present no problems in terms of portability since
they are all sufficiently light, even when loaded, to be carried by hand. The heated systems are considerably heavier however, and thus restrict meal delivery. When manually moved these systems must always be carried by two people, even when empty.

The size of containers is an important consideration in terms of capacity and portability, and their suitability for transportation in meal-on-wheels vehicles. Since the nature of delivery rounds and the types of delivery vehicles vary to such an extent it is impossible to satisfy all requirements. It is therefore most important that delivery systems are flexible either in terms of providing a range of alternative models, or being sufficiently small to enable appropriate capacities to be made-up. The most flexible of the investigated systems is the Temp-rite with its individual meal tray principle. The Insulated Container is also quite flexible since it has a small capacity of only seven meals and a number of containers could be used to make up the requirements of a particular delivery round. The heated systems provide flexibility in terms of the range of alternative models they offer, the widest ranges being offered by the Corsair and Excelarc systems.

It is essential that for safe and comfortable handling the external temperatures of the containers should not be too high. All of the insulated systems have temperatures of less than 27°C which are acceptable. The heated systems are all warmer than this with most within the range 28-38°C. The Huskybox and the Hotlock however, record unacceptably high temperatures and must be used with caution.

Finally, the finish of all the aluminium containers, in terms of the seams, corners and edges, was poor. This results in the risk of surfaces being torn and scratched. These should be smoothed and rounded off to minimise the potential handling problems.

Four of the investigated systems incorporate a source of heat in addition to that provided by the meals. The performance of these heat sources has already been evaluated in section 4.5. This section will consider the safety of such heat sources in the meals-on-wheels situation.

4.8.1. Objectives.

The objectives of this section may be defined as follows;

- To identify the fire risks associated with the use of each of the types of heat source,
- To identify any potential health risks associated with the heat sources, particularly flue gases.

4.8.2. Fire risks.

With the use of a heat source there is always a certain degree of fire-risk which needs to be minimised. The materials and nature of the heat source will now be considered in terms of this risk.

(i) Materials.

The materials used in the construction of heated delivery containers should be non-inflammable and preferably flame retardant in order to minimise any fire-risk. Tests were carried out on the insulation materials of each of the heated systems and it was found that the materials used in the Corsair, Hotlock and Excelarc are all non-inflammable. Indeed, the Excelarc uses a patented flame resistant form of foamed polyurethane. The polyurethane foam used in the Huskybox will burn but not readily, and since it is self-extinguishing it will not promote fire.
The structural materials of all four heated containers are essentially aluminium alloys which will not burn and will not therefore present any fire-risk. The only exception to this is where intense heat inside the container may be conducted to outside surfaces and burn materials in contact with the container. Tests have shown that none of the containers generates such external temperatures.

Tests on the insulated containers revealed that both the polystyrene and the polyurethane are inflammable. Clearly flame retardent grades have not been employed. In addition the structural plastics of the Nutri-System and the Temp-rite will melt at high temperatures and the Temp-rite will actually burn. Since these do not contain internal heat sources the risk of fire only arises from external sources. It should thus be stressed that none of these insulated systems should be exposed to high temperatures which will melt and possibly burn them.

(ii) Electrics.

The Excelarc and the Corsair systems both obtain the power for their heat source from an electrical supply at the distribution point. The energy is provided during a preheating period in the kitchen before loading with meals. Any electrical risks are therefore confined to this period of preheating. Any fire-risk associated with short-circuits in the power supply is reduced by the use of fuses in both the container and the mains plug. It should however be ensured that the fuse in the plug is of the correct rating. Both electrical systems are fully enclosed and no combustible materials are present within either container. The element in the Excelarc system is packed in a "non-asbestos bearing compound" which will contain any fire in the unlikely event of a fault occurring. The electrical aspects of the Corsair and Excelarc would thus appear to have been made reasonably safe, as long as the protection of the fuses is maintained.
(iii) Heat source.

The Corsair and Excelarc systems both have their heat stores located in well insulated compartments in the base of the container and both have thermostats to regulate the heat input. These precautions ensure that the heat generated at any surface point is insufficient to ignite combustible materials.

The Hotlock and the Huskybox both utilise the combustion of a fuel as their source of heat. These by their very nature are far less easily controlled than the electrical systems and are clearly capable of igniting any combustible material. The Hotlock attempts to reduce the danger inherent in this form of heating by enclosing the burning charcoal in a combustion chamber which is itself isolated from the rest of the container. This prevents any combustible materials, except liquids and gases, coming into contact with the charcoal. The combustion of the methylated gel within the Huskybox takes place within the food chamber and is only separated by a metal grid. This is inadequate since combustible materials can easily fall into the combustion chamber and thus create an uncontrolled fire. A matter of major concern with both the Hotlock and the Huskybox is the danger associated with their transportation in petrol driven vehicles. This is especially the case where containers are transported in the boots of cars, usually next to the petrol tank, and where vehicles enter petrol stations. Discussions with a number of insurance brokers who deal with meals-on-wheels services have revealed that whilst they were aware of the use of hot containers for meal delivery purposes, they were not aware that actual combustion was taking place within these containers and point out that this may invalidate normal car insurance unless the insurance company is made aware of the fact and agrees to cover it. This is clearly a point that should be clarified by all delivery organisations since in the event of an accident they may themselves be held liable (unless the volunteer has signed a disclaimer). It should also be considered whether the local authorities are willing to accept such risks.
4.8.3. Flue gases.

Two of the heated delivery systems, the Hotlock and the Huskybox, utilise the combustion of fuels as a source of heat. The Huskybox burns a patented methylated spirit gel called "Huskyheat". This system was however, taken off the market at this stage of the research and since relatively few were still in operation the system was not investigated in terms of flue gases. The Hotlock, which burns charcoal, is the oldest of the investigated systems and is also the most widely used. This system was investigated in terms of potential hazards to health due to flue gases.

The fuel used in the Hotlock is a charcoal which is composed of about 92% carbon and 8% ash (by weight). The heat derived from the charcoal is due to the exothermic chemical reaction, combustion, which involves the combination of carbon and oxygen from the air to produce heat and carbon dioxide and/or carbon monoxide. When carbon burns completely with a plentiful supply of oxygen the products are carbon dioxide and heat. When carbon burns incompletely, due to a lack of oxygen, the products are carbon monoxide and a lesser quantity of heat. The determinant of whether the flue gases will be composed of carbon dioxide or carbon monoxide and in what proportions, is therefore the quantity of oxygen in the air available for the reaction.

(i) Flue gases and health;

The constituents of the flue gases arising from the combustion of carbon in air have been identified as carbon dioxide, carbon monoxide and nitrogen. Both carbon dioxide and nitrogen are essentially physiologically inert gases which only affect health in terms of oxygen dilution. The symptoms of excess of either of these gases are largely those of oxygen deficiency, i.e. headache, sweating, dizziness, unconsciousness and finally death. Unless breathing has stopped the subject will normally make a complete recovery. The threshold limit value for carbon dioxide as set by the Health and Safety Executive (1976) is 5,000 parts per million (p.p.m.).
Carbon monoxide is a far more hazardous gas in terms of health. It is both colourless and odourless and having a lower density than air, tends to rise to around head level. When inhaled it causes asphyxiation due to its greater affinity for the haemoglobin of the blood, some 300 times that of oxygen. It therefore readily forms carboxyhaemoglobin in the red blood corpuscles which cannot then carry their full quota of oxygen to the tissues. The resulting physiological effect is similar to, but in some respects more serious than, a lack of oxygen such as due to altitude or dilution with physiologically inert gas. The symptoms to be expected when resting individuals in normal health are exposed to atmospheres containing various concentrations of carbon monoxide are shown in Table 4.22.

**Table 4.22. Effects of different concentrations of carbon monoxide on resting individuals.**

<table>
<thead>
<tr>
<th>Concentrations of carbon monoxide in air p.p.m. by volume</th>
<th>50</th>
<th>100</th>
<th>200</th>
<th>500</th>
<th>1,000</th>
<th>1,500</th>
<th>4,000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effects on resting individuals</strong></td>
<td>58</td>
<td>116</td>
<td>232</td>
<td>580</td>
<td>1,160</td>
<td>1,740</td>
<td>4,640</td>
</tr>
</tbody>
</table>

- 50 p.p.m. (58 mg/m³): Nil
- 100 p.p.m. (116 mg/m³): Nil
- 200 p.p.m. (232 mg/m³): Headache after 3-4 hours, not severe
- 500 p.p.m. (580 mg/m³): Severe headache, palpitation, nausea and dizziness after 1-1.5 hours.
- 1,000 p.p.m. (1,160 mg/m³): Mild symptoms after 1-1.5 hours, severe after 2.5 hours with collapse, prolonged exposure may be fatal.
- 1,500 p.p.m. (1,740 mg/m³): Dangerous to life after 1 hour.
- 4,000 p.p.m. (4,640 mg/m³): Death within 1 hour.

Source: H.M. Factory Inspectorate, Ministry of Labour 1955
The effects of carbon monoxide on workers depend upon the following factors:

- The carbon monoxide content of the blood.
- The duration of exposure.
- The partial pressure of the oxygen in the air - affected by altitude or by dilution.
- The work effort - with greater respiratory exchange of air contaminated with carbon monoxide the symptoms appear faster and are more severely felt due to the greater demand for oxygen by the active tissues. The rate of uptake of CO by blood increases by 3-6 fold between rest and heavy work (Drinker 1938).
- Ambient temperature - the higher the temperature the greater the effect.
- The health of the worker and the metabolic efficiency.

People who show particular sensitivity to carbon monoxide poisoning include:

- the young,
- the aged,
- pregnant women,
- people with heart trouble,
- people with poor lung functions - asthma and bronchitis for example,
- people with existing hypoxia - anaemia, thyroid disease, alcoholism and the effects of many drugs.

Treatment for CO poisoning depends upon the severity of the case. For mild cases removal of the subject from the exposure area and rest will allow natural excretion of the carboxyhaemoglobin. In moderate cases oxygen may be administered in order to hasten the excretion. Where the patient is unconscious, but breathing, an adequate airway should be maintained - semi-prone position - and oxygen administered by an "on demand" method. If the patient is not breathing artificial respiration and cardiac massage will be necessary.
The threshold limit value for carbon monoxide is 50 p.p.m. (parts of gas per million parts of contaminated air by volume at 25°C and 760mg) over a time weighted working day (7/8 hours) and a 40 hour week (Health and Safety Executive 1976). The short-term limit is 400 p.p.m. over a maximum of 15 minutes (Health and Safety Executive 1976). Thus over a working day/week the CO levels must not exceed an average of 400 p.p.m. over any 15 minute period, and over the whole day/week the time weighted average must not exceed 50 p.p.m. These are the limits that should be used as guides in the control of health hazards and should not be used as fine line between safe and dangerous levels.

(ii) Carbon monoxide levels produced by the Hotlock delivery system;

The charcoal used for combustion in the Hotlock container, as supplied by Food Conveyors Limited, has been identified as being 92% carbon and 8% ash. Included in the carbon percentage are likely to be other volatile materials such as nitrogen, sulphur, oxygen, hydrogen and moisture, but these are in sufficiently small quantities to be disregarded in this study.

The rate of combustion of the charcoal is controlled within the Hotlock by the air inlet and exhaust holes (figure 4.23.). These effectively regulate the quantity of air, and therefore the oxygen, to the system and so determine whether it burns rapidly and efficiently - to produce carbon dioxide - or slowly and inefficiently to produce carbon monoxide. In fact, the air supply is restricted by these vents in order to extend the combustion period. This process increases the levels of carbon monoxide and furthermore reduces the amount of heat generated by the reaction. The oxygen supply is therefore fixed by the design of the container and the quality of the air it uses. This means that the only effective means of minimising the concentrations of CO (without actually pumping air into the system) is by ensuring the availability of unpolluted air to dilute the flue gases that are emitted.
Experiments were conducted in the laboratory to determine the carbon monoxide and the carbon dioxide concentrations in the flue gas when unpolluted air is freely available to the system. Four blocks of charcoal (120 grams), the maximum that is likely to be used, were ignited in the burner for the manufacturers recommended period of 15 minutes. The charcoal was then loaded into the Hotlock and flue gas samples were taken from one of the exhaust ports as shown in figure 4.24. This sampling point was carefully selected in order to
ensure that representative samples were taken. Measurements of the carbon monoxide and carbon dioxide concentrations were taken over time using a G.M.I. CO/CO₂ Ratio Analyser. This instrument was calibrated against gases of known CO/CO₂ concentrations before each set of tests. The accuracy of the results was also verified by the use of a portable Interscan CO Analyser. The test was carried out five times and for each the carbon monoxide and carbon dioxide concentrations were recorded over time for a period of 425 minutes to ensure complete combustion of the charcoal. The mean concentrations of carbon dioxide and carbon monoxide over the three hours are plotted in figures 4.25. and 4.26. respectively.

The two graphs show that during the early stages of combustion there are high concentrations of both carbon monoxide and carbon dioxide in the flue gas. These concentrations however fall over time until combustion is complete and no more flue gas is generated. At the highest levels there was nearly 4,500 p.p.m. of carbon monoxide and 4% of carbon dioxide in the flue gas. The levels of CO are very high and would, clearly, unless sufficiently diluted, exceed the Threshold Limit Values for workplaces as set by the Health and Safety Executive (1976).
Figure 4.25. Carbon dioxide in Hotlock flue gas over time
Figure 4.26. Carbon monoxide in Hotlock flue gas over time
The CO levels around the exhaust ports of the Hotlock container were monitored and the results are shown in figure 4.27. These show that the CO levels become diluted within the atmosphere in a short distance from the exhaust ports. It is also worth noting that CO rises and therefore higher concentrations exist directly above the portholes.

The fact that CO rises and therefore tends to accumulate in the upper areas of the atmosphere is useful since it is clearly most beneficial under these conditions to place extractor fans in the ceiling of the kitchens or storerooms. This point is emphasised by analysis of the CO levels around the equipment used to ignite the charcoal. The results of this are shown in figure 4.28. Concentrations of 400ppm were recorded up to 90cm above the burner and up to 3,750ppm directly above the charcoal. With levels in excess of 3,500ppm which need a dilution factor of 75 to bring them down to safe levels of 50ppm, the need for ventilation is clear. It should also be stressed that staff should avoid breathing air directly above the charcoal burner. Extractor fans should be placed directly above burners in order to remove the maximum amount of CO - extraction will be helped by the fact that CO naturally rises in this direction.

Finally it should be ensured that the extracted gases are removed by the ventilation system to a safe disposal point where they will be fully diluted and therefore rendered harmless.

(iii) Carbon monoxide levels within delivery vehicles;

Having determined the levels of CO emitted by the system, it is important to relate the data to conditions during delivery. Whilst the information already discussed is useful where known volumes and quantifiable airflows exist such as in kitchens, it is difficult to relate directly to CO levels in delivery vehicles due to the unknown volumes and airflows.
Figure 4.27. CO emission and concentrations around Hotlock exhaust portholes
Figure 4.28. CO emission and concentrations around charcoal ignition equipment (p.p.m.)
Measurements were therefore taken in a range of vehicles under different conditions. Four different vehicles were selected as representative of the different types of vehicle used in meals-on-wheels operations. These were:

- 7 cwt. van - similar to those used by local authority schemes in many urban boroughs.
- Ford Cortina - to represent an average/large saloon car.
- BL Mini Metro - to represent a small hatchback car.
- BL Mini 1000 - to represent a small saloon car.

The tests were carried out by two research staff. One was the driver of the vehicle who had a sampling tube connected to a portable CO analyser (InterScan) fixed to the side of the mouth. This ensured that the gas samples were taken as close as possible to those that would be inhaled by delivery workers. Readings were taken every minute. For all tests the Hotlock container was loaded with 120 grams of charcoal which is the maximum quantity likely to be used in practice. The container was then loaded into the vehicle either on the back seat or in the rear carrying area in the case of hatchbacks. Storage in the boots of vehicles was not tested.

Tests were then carried out under a number of different driving and ventilation conditions. The three ventilation alternatives were:

- Window open - drivers side window fully open.
- Vents open - all air vents within the car open and also all air fans switched on maximum. Windows closed.
- All ventilation closed - all vents and windows closed.

Each of these alternatives was tested under three types of driving conditions:

- Urban - slow moving (5-10 mph), stopping and starting to simulate driving through congested urban area.
- 30 mph - driving at a steady 30 mph on open roads.
- 40 mph - driving at a steady 40 mph on open roads.
The results of the tests are shown in table 4.23, in the form of mean CO levels (parts per million) and the maximum CO level recorded under each of the conditions. There are a number of consistent results arising out of this data.

- Under none of the conditions tested were the levels of CO above or even close to the short-term exposure limit of 400ppm. The highest recorded level was 220ppm. These levels were generated by one container however and further containers within vehicles will produce consequently higher CO concentrations.
- Mean CO levels in excess of the Threshold Limit Value of 50ppm, for extended periods of exposure, were largely limited to conditions of minimal ventilation where no windows or air vents were open.

Table 4.23. Carbon monoxide concentrations produced in a range of delivery vehicles. (p.p.m.) — May 1981

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Ventilation</th>
<th>40 MPH</th>
<th>30 MPH</th>
<th>URBAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
</tr>
<tr>
<td>7 Cwt Van</td>
<td>Window open</td>
<td>33</td>
<td>60</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Vents open</td>
<td>22</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>All closed</td>
<td>83</td>
<td>115</td>
<td>80</td>
</tr>
<tr>
<td>Cortina</td>
<td>Windows open</td>
<td>36</td>
<td>57</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Vents open</td>
<td>29</td>
<td>46</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>All closed</td>
<td>52</td>
<td>100</td>
<td>73</td>
</tr>
<tr>
<td>Mini Metro</td>
<td>Windows open</td>
<td>32</td>
<td>45</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Vents open</td>
<td>15</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>All closed</td>
<td>52</td>
<td>60</td>
<td>71</td>
</tr>
<tr>
<td>Mini 1000</td>
<td>Window open</td>
<td>22</td>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Vents open</td>
<td>16</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>All closed</td>
<td>21</td>
<td>30</td>
<td>23</td>
</tr>
</tbody>
</table>
The lowest CO levels were consistently found when all vents were open and the windows closed. This is a clear illustration of how much more efficient the controlled ventilation of the vehicle is when compared with ventilation generated by open windows.

The driving conditions associated with the highest CO levels were the simulated urban conditions where minimal airflows are generated. These higher levels were also at least partly due to higher CO levels in the atmosphere created by the exhaust gases of other vehicles. Levels of up to 50 ppm were recorded in the background atmosphere.

4.8.4. Summary and conclusions.

This section has identified a number of important points with regard to the heat sources and the safety of the tested delivery systems. The main points are:

- The fire risk associated with each system varies according to the nature of the heat source used. The electrical systems, the Excelarc and the Corsair have sufficient control (thermostats) and safety mechanisms (fuses) to ensure reasonable safety especially when it is considered that they are not connected to the electrical supply during delivery. The Hotlock and particularly the Huskybox appear far less reliable and less controlled since they involve combustion of fuels. It is a matter of great concern that these containers, with their burning fuels, may be placed in close proximity to the vehicles fuel tank or may be taken into petrol stations. Local authorities and the WRVS should ensure that their insurers are made aware of this situation and that cover is effective. They should also identify the extent of their liability in the case of an accident. Ideally such containers should not be transported in motor vehicles.

- It has been established that the Hotlock system produces carbon monoxide during its operation. Although the levels of carbon monoxide vary during the combustion period, concentrations of
over 4000 ppm have been recorded at the exhaust point.

The dilution of these CO levels should be achieved by a ventilation system of the appropriate rating. It is not sufficient to rely upon ventilation from windows as the resulting air-flows are neither sufficiently controlled or reliable.

The carbon monoxide levels recorded in transportation vehicles were found to be below the short-term exposure limit of 400 parts per million in all cases. This included a situation where all ventilation was closed and urban driving conditions were simulated.

The Threshold Limit Values of 50 parts per million carbon monoxide, which applies for extended periods of exposure of up to 8 hours, was only consistently exceeded when ventilation was closed. An open window and/or open air vents reduces this to levels below 50ppm.

In all the vehicles except the Mini 1000, it was found that the most effective method of ventilation was using the vehicles system of air vents with the fan or air blower on full with the windows closed. This system of ventilation also ensures adequate air quality when the vehicle is stationary which is not the case with open windows.

Tests carried out in urban and heavily congested areas indicate that the background carbon monoxide level in the atmosphere could itself exceed 50 ppm. This was mainly the result of the exhaust fumes from motor vehicles.
4.9. Durability and costs.

The durability and the cost effectiveness of delivery systems is an important factor since meals-on-wheels schemes are invariably operated on small and very closely controlled budgets. This is especially the case in an environment where the Government is concerned with public spending levels and has an active policy of privatisation of public services. It is also important for the users of delivery systems to have some indication of the durability and lifespan of the systems.

4.9.1. Objectives.

The objectives of this section are as follows:

- to establish the durability of each system,
- to estimate the expected life-span of each system,
- to estimate the costs associated with each of alternative systems,
- to identify the most cost effective delivery systems.

4.9.2. Durability;

The durability of each of the eight systems is discussed on the basis of:

- known properties of the materials employed,
- inspection of the structure and construction,
- experience and observations during the testing program, particularly field trials,
- life-span in industry.

The life-span of the systems is difficult to estimate due to variations in the intensity of use and in the treatment they receive. Furthermore, some of the systems have not been on the market long enough for any form of statistical analysis of
life-span. The following estimates were therefore made on the basis of:

- the previously evaluated durability,
- manufacturers recommendations,
- life-span established in the industry.

(i) Carrypack;

This container is made entirely of expanded polystyrene which is particularly susceptible to damage by impact and has a very low compression strength. The structural strength of this container is also low due to the nature of the polystyrene and the design ie. large cubic structure and relatively thin walls. Although the carrying strap is itself strong, the connections to the side of the container are inadequate and are likely to fail when the container is fully loaded. This strap should be extended so that it goes around the base of the container and the ends are joined. In this way the base will be supported and the weight will be spread more evenly along the carrying strap. The average life-span of this container under normal meals-on-wheels conditions would be no longer than six months. It is thus essential that the condition of containers is closely monitored and that damaged units are replaced immediately - an inspection of the containers in use in one London borough revealed that 37% were no longer serviceable and should have been replaced.

(ii) Insulated Container;

The comments regarding the strength qualities of the materials for the Carrypack (ie. polystyrene) apply equally to this container. The design of the Insulated Container is different however, in that it is smaller and more compact but still has similar wall thicknesses. This gives the Insulated Container considerably more structural strength and would thus indicate a longer life-span. Enquiries in the field reveal that the average life of these containers is 8 months.
(iii) Nutri-System;

This container is an insulated system which has a structure based upon an impact resistant plastic. The insulation material is contained within this structure. This plastic provides a highly resistant surface to damage by impact and also very good structural strength. The only potential weaknesses are the door hinges which may break away from the body. Tests on durability and the systems usage in other countries (this system has only recently come onto the U.K. market) indicate that an average life-span of around eight years could be expected, depending largely upon the hinge rivets already mentioned.

(iv) Temp-rite;

This is another insulated system employing a plastic structure which provides it with good structural strength. The impact resistance is not as good as the Nutri-System but is still quite good. A major advantage of this system is that there are no moving parts that are easily damaged, such as doors, and also that each meal tray is an individual unit which may be easily replaced if damaged. The manufacturers suggest a life-span of 10 months based on a replacement rate of 20% per annum. This seems a rather conservative estimation and reasonable usage in the field would probably extend this.

(v) Corsair;

Constructed from what the manufacturers call "rigidized aluminium", this container is structurally strong and fairly resistant to damage by impact. It is however susceptible to denting and to distortion. The main problems with this container arise from its weight which means that if dropped it could be damaged, particularly the electrical components and the aluminium seams. This is especially true if impact occurs on the corners or edges of the container - which may also damage floor surfaces. The average life-span of this container has been identified as seven years although this assumes maintenance over the period.
(vi) Excelarc;

This is a very solidly constructed container the structure of which is formed of a thick gauge aluminium. The structure is also reinforced by aluminium straps around the base. This makes a very strong container but also adds to the weight. As with the Corsair the potential problem areas are the electrical components which could be damaged with rough treatment. The probable life-span is difficult to determine due to the short period for which the container has been on the market (three years). Comparisons with other systems would indicate a usable life of at least five years and probably around seven.

(vii) Hotlock;

The Hotlock is constructed of aluminium with an embossed external surface and reinforced edges and corners. As with the other aluminium containers it is fairly strong but will dent and distort with impact. With repeated rough handling seams will split and the distortion of the container will become serious. The average useful life-span of a Hotlock has been identified as six years. Many local authorities however, use very old containers which are clearly no longer effective.

(viii) Huskybox;

The fact that the Huskybox was only available for a short period before it was withdrawn from the market means that it is impossible to estimate its expected life-span.

4.9.3. Cost Effectiveness;

The costs of each delivery system, including capital costs, running costs and maintenance costs, were established as at 1st July 1981. No figures were available for the Huskybox because of its removal from the market earlier in 1981. Relating these costs to the
earlier estimated life-spans of the systems enables a total cost of the delivery systems per 1000 meals to be calculated. This figure is based upon the assumption that each system delivers one load of meals per day five days per week throughout its life-span.

The cost information generated is shown in table 4.24. The insulated systems show a wide range of costs both in terms of the initial capital costs, and the total costs per delivery of 1000 meals. Both the Nutri-System and the Temp-rite are considerably more expensive than the polystyrene containers and this greater initial expense is not offset by their longer life-spans. It should be noted that the very expensive costs for the Temp-rite are largely the result of conservative estimations of the its life-span. The Nutri-System, however, is only marginally more expensive than the polystyrene containers because of its very long life-span.

The three heated systems have high capital costs and also incur running costs with each use (table 4.24.). Taking all these costs into consideration, it can be seen that there is little to choose between all three systems - the lower capital costs for the Hotlock are offset by the higher running costs which are twice as expensive as the electrical running costs. The use of a heated system costs around two to three times the costs of using a purely insulated system.

4.9.4. Summary and conclusions;

The durability and therefore the life-span of any delivery system is mainly a function of the treatment it receives and the care with which it is handled. The polystyrene containers are very susceptible to damage and therefore have a very limited life-span (6-8 months). They are very cheap however and may therefore be replaced frequently without incurring great costs.

Whilst the Temp-rite system is a very well manufactured container, the very high initial cost virtually rules it out as an alternative for the meals-on-wheels service. The most durable of the insulated
Table 4.24. Delivery system costs as at July 1981.

<table>
<thead>
<tr>
<th>System</th>
<th>Capital cost (£)</th>
<th>Running costs per round (p)</th>
<th>Maintenance cost (£)</th>
<th>Life-span</th>
<th>Total cost per 1,000 meals (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrypack</td>
<td>3.66</td>
<td>None</td>
<td>None</td>
<td>6 months</td>
<td>2.03</td>
</tr>
<tr>
<td>Insulated container</td>
<td>3.75</td>
<td>None</td>
<td>None</td>
<td>8 months</td>
<td>3.09</td>
</tr>
<tr>
<td>Nutri-System</td>
<td>100.00(1)</td>
<td>None</td>
<td>None</td>
<td>8 years</td>
<td>3.70</td>
</tr>
<tr>
<td>Temp-rite</td>
<td>10.50(2)</td>
<td>None</td>
<td>None</td>
<td>10 months</td>
<td>48.61</td>
</tr>
<tr>
<td>Corsair</td>
<td>199.00</td>
<td>4(3)</td>
<td>None</td>
<td>7 years</td>
<td>7.11</td>
</tr>
<tr>
<td>Excelarc</td>
<td>195.30</td>
<td>3(3)</td>
<td>37.50(4)</td>
<td>7 years</td>
<td>8.58</td>
</tr>
<tr>
<td>Hotlock</td>
<td>94.60</td>
<td>8(5)</td>
<td>None</td>
<td>6 years</td>
<td>8.89</td>
</tr>
<tr>
<td>Huskybox</td>
<td></td>
<td>No longer marketed and no appropriate costs available.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: - All costs exclude V.A.T.

1. Marketing companies estimated selling price.
2. Cost of one meal tray, based on the cost of 6 meal system divided by 6.
3. Based on electricity unit cost of 4p per Kw/hour.
4. Based on £15 repair (flat rate) 2/3 times per container.
5. Using 120 grams charcoal.
systems was the Nutri-System. This durability justifies the high initial cost and indeed when related to the expected life-span the cost per 1000 delivered meals is only marginally above that of the polystyrene containers.

The heated systems, being constructed of aluminium, are all more resistant to minor damage, but are still susceptible to distortion, denting and also the seams between the aluminium sheets splitting. In terms of costs they are all very similar when the costs per 1000 delivered meals are compared but the Corsair is marginally cheaper.

Thus, the most cost effective delivery systems are the insulated containers at around £3 per 1000 delivered meals. The slightly greater cost of the Nutri-System should be considered in the light of other factors already discussed in earlier sections such as hygiene and safety. The most cost effective of the heated systems was the Corsair with a cost of around £7 per 1000 delivered meals. It should be stressed that regular checks of the condition of containers are essential in order to maintain efficiency. During the fieldwork there were many situations where damaged and unserviceable containers were being used well beyond their practical life-span.
4.10. **Recommendations and conclusions.**

Section 4.4.3. identified the fact that the nature of the meals-on-wheels service and the delivery systems available will determine many of the procedures adopted within the delivered meals service. These procedural requirements will now be discussed. Furthermore, having investigated the alternative systems available, those most appropriate to the meals-on-wheels service will be identified.

4.10.1. **Objectives.**

The objectives of this section are:

- to identify the necessary procedures and methods which will maximise the performance of delivery systems,
- to identify procedures necessary to ensure safety with the use of delivery systems,
- to identify those delivery systems that are most suitable for particular meals-on-wheels situations.

4.10.2. **Meal preparation.**

The appropriate procedures for the preparation of meals, in terms of cooking, portioning, and packaging are vital to the successful delivery of meals. The two main areas of concern are hygiene and the temperatures of cooking and loading.

(i) **Hygiene;**

Adequate levels of hygiene in the meals-on-wheels kitchen are of paramount importance. This is because, unlike other kitchens, meals are not for immediate consumption but will be stored for up to three hours before delivery. This is an adequate time for the growth of micro-organisms and for them to multiply to dangerous levels should
the meals fall to incubating temperatures.

Factors affecting the growth of micro-organisms have been described in section 4.6. Most prepared foods are extremely good media for bacterial growth and the methods used to reduce contamination during the processing, handling, preparation and packaging of meals must be maintained in order to minimise the risks of food poisoning. The following factors should be considered;

1. Raw materials - most raw materials introduce some risk of contamination which should be kept to a minimum.

- Vegetables are usually very heavily contaminated and must be kept separate from prepared foods until cooked.
- Meat and poultry are always likely to carry micro-organisms and should therefore be thoroughly cooked in order to minimise risks. Raw and cooked meats should be stored and prepared in separate areas to avoid cross-contamination.
- Dehydrated foods are not sterile and once regenerated should be treated as fresh since spores will multiply on rehydration and warming.
- Frozen foods are not sterile and once defrosted should be treated with care since any micro-organisms will multiply in warm environments.

2. Utensils and equipment - the utensils and equipment used in kitchens cannot avoid being contaminated when in use. Adequate regular cleansing and sterilization of all equipment used in the preparation of food is therefore very important in minimising cross-contamination to cooked and prepared meals. After use all equipment should be soaked to remove gross deposits, thoroughly washed in hot water (>60°C) containing detergent, rinsed in clean hot water, and then finally sanitized in water at high temperature (80°C) for 30 seconds or by the use of a sanitizer. They should then be air dried.
3. Food handlers - man is a natural carrier of many micro-organisms and may also act as the vehicle for the transfer of others. The Food Hygiene Regulations (1970) govern the minimum standards of hygiene to be met in the handling and preparation of food as well as in personal hygiene.

In addition to controlling the levels of contamination it is important to destroy the majority of the remaining micro-organisms by heat treatment. Final heating temperatures should be sufficiently high throughout the food mass for long enough to kill the micro-organisms present. This is particularly the case when reheating prepared meals.

(ii) Temperature;

The maintenance of meal temperature and the amount of heat stored within the meal during processing is important for the successful delivery of meals above the minimum of 62.8°C. It is essential therefore that meals are loaded into the transportation system at a temperature that will maximise the delivery time and also minimise the deterioration of meal quality. The critical stages in the maintenance of adequate temperatures will now be discussed.

o Food processing;

When food has been cooked, subsequent processing will often be a major source of heat-loss. A good example of this is where potatoes are mashed after cooking. Fieldwork carried out at the kitchens of one local authority indicated that this process could lead to drops in temperature of up to 15°C during mashing alone. Reconstituted mashed potato shows similar losses when the dehydrated potato is mixed with boiling water (figure 4.29.). All such processes carried out after cooking will lead to a loss in temperature and may only be overcome by some form of reheating.
Figure 4.29. Heat-loss curve for mashed potato during processing
Food portioning and packaging;

This is an area where major heat-loss frequently occurs. It is also an area where significant improvements could be made by sound organisation and planning of work methods. The heat-loss problems are largely the result of the process of weighing and portioning meals into individual containers. This exercise is very time consuming and results in food being exposed to ambient temperatures and consequent heat-loss. Furthermore weighing and processing is usually carried out on a batch basis which means

![Graph of temperatures over time](image)

**Figure 4.30. Temperatures of packed meals portioned from one batch**
that the last meals to be processed will be far more cool than those meals processed first. The effect of these processes has been monitored in meals-on-wheels kitchens and the falls in meal temperatures as one batch is processed are shown in figure 4.30. Although the initial temperature in this case is low, the rate of heat-loss indicates the sort of temperature losses during the exercise.

It is clear that in order to preserve heat the time spent in portioning and packaging should be kept to a minimum. Ideally some form of continuous production line should be employed where meals move directly into delivery containers. Although the nature of current cooking equipment means that meals have to cooked in batches, the operation should try to approximate to such a system in the following ways:

1. Food should be cooked in small batches rather than one large batch. This will also reduce the excessive cooking periods that occur whilst food is portioned. During fieldwork one batch of cabbage was observed cooking for over three hours!

2. Batches of food being portioned should be kept hot during this process either in a bain-marie or on top of a hotplate.

3. A steady supply of food for portioning should be ensured such that the process is not interrupted - staff involved in portioning and packaging should not have to collect food for processing.

4. In larger operations a continuous line of portioning and packaging, similar to a conveyor belt system should be set up to accelerate these operations.

5. Packaged meals should be loaded into hot transportation containers as quickly as possible and the container closed as soon as they are full. Once loaded, the container should not be reopened until delivery.
Operations that are not highly organised and planned along the lines described above, invariably prove to be inadequate in terms of the temperature of loaded meals.

Problems with processing meals and loading at adequate temperatures point to the advantages of using pre-portioned meals such as frozen or chilled meals. Indeed of all the meals-on-wheels operations that were investigated for this study, the only ones where meals were loaded at adequate temperatures were those using pre-portioned frozen meals. There are however nutritional and cost implications with the use of such meals which are discussed in Lawson and Thomson (1981). In particular, manufacturers should be made aware of meals-on-wheels requirements in terms of hygiene. The microbiological fieldwork for this study (section 4.6.) revealed one particular authority using such meals where there was some microbial contamination which, although unlikely to cause any problems if consumed immediately, could multiply to dangerous levels given time and favourable conditions.

Meal heating;

Whenever meals are reheated or regenerated they should be heated thoroughly so that the complete food mass has boiled or reached a temperature of 100°C. Equipment for this purpose must therefore generate an even temperature throughout so that all meals are heated evenly. Traditional ovens do not satisfy this requirement. Forced air convection ovens and steam ovens are suitable since fairly even heat distributions are achieved throughout the oven space. Microwave ovens are not suitable because meals are usually packed in foil containers, meals composed of different foods will heat at different rates and only small numbers of meals may be heated at any one time.
4.10.3. Loading, unloading and delivery.

The importance of loading meals at adequate temperatures of around 80°C has already been discussed. This is particularly the case where insulated delivery systems are used. In order to maintain maximum temperatures meals should be packed into delivery containers as soon as possible after cooking. Tests have shown that the 150 gram gruel meals used in the simulations for this study will fall from 80°C to 63°C within 16 minutes (mean) in an ambient temperature of 13°C. This indicates the limited time available for meal loading. The main points to consider when loading delivery containers are:

- only one container should be loaded at a time in order to minimise the time for which containers are left opened,
- each container should be loaded with complete meals - sweet and main course - so that containers are opened as infrequently as possible,
- sweets and main courses should be loaded so that they are both readily accessible during delivery.

Just as loading is important for temperature maintenance, unloading and delivery are also vital, especially since external ambient temperatures will almost certainly be lower than those in production kitchens. Tests have shown that the 150 gram gruel test meal will fall from 80°C to 63°C in under 5 minutes, in an ambient temperature of 7°C. The main points to consider as regards the unloading of delivery containers are:

- the container should be open for the minimum period of time and any opening for reasons other than the removal of meals should be avoided,
- container lids should be opened as little as possible to permit the removal of meals whilst allowing the minimum of heat-loss,
- meals should be unloaded from the edges to the centre of the container and from top to bottom so that meals with the shortest warm holding times are removed first.

It is vital to the successful delivery of meals that periods of
exposure to ambient temperatures are kept to a minimum. Systems that may be carried to the door of the recipient thus have a distinct advantage over those that are not fully transportable. This is especially the case in urban areas where meals may have to be delivered to recipients in blocks of flats or restricted access areas. Of the systems that were investigated in this report only the insulated containers are fully portable. The results of section 4.5, however, have shown that these systems are only suitable for delivery rounds of between 90 and 120 minutes.

Finally, it is best to plan delivery rounds so that bulk deliveries and groups of meals are delivered last. In this way the maximum heated mass is retained for as long as possible.

4.10.4. Delivery systems.

Having investigated a range of currently available delivery systems it is now possible to identify specific systems for particular types of meals-on-wheels delivery round. Whilst for the purpose of testing it was convenient to use an average standard round, in practice rounds vary significantly between the local authorities. Lawson and Thomson (1981) carried out a national survey of meals-on-wheels schemes and found extreme variations between the nature of their delivery rounds. The mileage covered per route varied considerably, whilst some rounds covered less than a mile, others covered over 30 miles - at the extreme one scheme claimed to have an average of 75 miles per round! The average time of delivery per round was 1.5 to 2 hours, but some schemes had rounds lasting four hours and more, and others had rounds lasting less than 30 minutes.

The most important factor as far as delivery systems are concerned is the time of delivery. That is the length of time for which meals must be kept above 62.8°C. With the degree of variation discussed above, it is clear that certain systems will be suitable for certain types of round.
The systems available fall into two distinct types. The purely insulated systems are simple and cheap to operate, are easily carried, but have restricted warm holding times. The powered systems are more expensive and are less portable, but have longer warm holding times. In terms of performance, the best of the insulated systems is the Nutri-System. The testing program has identified that this system:

- will deliver meals-on-wheels at an acceptable temperature for up to 1.5 hours - this allows a degree of safety since during tests a warm holding time of two hours was achieved.
- may be effectively cleansed - there are smooth impervious surfaces, rounded corners and edges, and the system is waterproof.
- is portable.
- is durable and resistant to damage.
- is cost effective because despite its high initial cost its durability ensures a lifespan that will offset this cost.

The other insulated systems suffer a number of drawbacks. The Temp-rite system, whilst performing quite well in all tests and being well suited to hospital operations (see section 4.4.2.), is much too expensive and too bulky for the meals-on-wheels operation. Of the two polystyrene containers, the Carrypack was totally unsuitable for meals-on-wheels. Because of its large size it is not fully portable, and the large number meals leads to frequent opening with the result that the last meals are delivered at unacceptably low temperatures. The smaller Insulated Container is more suitable for meals-on-wheels because it is fully portable and has a good thermal performance. The major drawback with this container is that it is easily damaged and once soiled is difficult to clean.

The Nutri-System is thus the most suitable of the insulated systems and should be used for delivery rounds of up to 90 minutes. Since this system is fully portable it would also be suitable for those situations where meals have to be carried some distance from the delivery vehicle. This would be particularly relevant to urban areas.
Of the powered systems the Corsair is clearly the most suitable for meals-on-wheels. This system:

- will deliver meals-on-wheels at acceptable temperatures for up to 3.5 hours - during tests deliveries of almost 4 hours were achieved,
- will not over-heat meals,
- is safe in terms of the heat source,
- is robust and durable,
- is the most cost effective of the heated systems.

The other three heated systems have serious problems associated with them. The Huskybox is very unreliable and overheats the food - this container is no longer available. The Excelarc provides insufficient heat resulting in a poor performance which is indeed inferior to some of the insulated systems. The Hotlock creates concern because of the nature of the heat source. The combustion of charcoal produces carbon monoxide at levels that exceed the minimum safety requirements and also creates a fire-risk especially in relation to petrol driven vehicles.

The Corsair is thus the most appropriate powered system for delivery rounds of up to 3.5 hours duration. Since it is not fully portable it should only be used in those situations where delivery vehicles have close access to the recipients home. This would probably restrict its use in highly urban areas.

4.10.5. Summary.

A number of procedures are important to ensure the optimum performance of delivery systems. The main points are as follows:

- Because meals are not for immediate consumption and will not be reheated, it is essential that very high standards of hygiene are maintained.
- Regenerated meals should be thoroughly reheated to as near 100°C as possible.
Meals should be loaded at a temperature of at least 80°C in order to maximise the delivery period.

Portioning and packaging must be carried out as rapidly as possible to minimise heat-loss.

Meals should be loaded and unloaded quickly and the delivery container opened as infrequently as possible.

Meals should be unloaded from the sides to the centre and from the top to the bottom of the container.

In densely populated areas where access by vehicles is difficult, fully portable systems such as the insulated containers, should be used. The most effective insulated container is the Nutri-System. Delivery using this system will be restricted by the limited warm holding time of this container - up to 90 minutes.

In rural areas where access is easier, heated systems may be used. The most suitable of the heated systems is the Corsair. The longer warm holding times associated with this system means that longer delivery rounds of up to 3.5 hours may be adopted.
5.1. Feeding within the Welfare State.

5.1.1. The nutritional role of school meals.

The nutrition of school age children and the nutritional role of school meals within the diet are discussed in section 3.3. This section looks at the nutritional requirements of children aged 12-17 as identified by the DHSS (1981), discusses contemporary dietary views and their implications for school feeding, identifies a number of important characteristics of adolescent feeding behaviour and finally reviews the findings of published research into the nutritional contribution of school meals to the adolescent diet.

Whilst the DHSS (1981) recommendations provide useful guidelines for the analysis of groups of peoples diets, a number of factors make accurate dietary recommendations difficult:

- Individual requirements will vary and some individuals will have intakes well below those recommended, the DHSS recommendations represent the average nutritional requirements of groups of the population.
- The specific dietary requirements of children and adolescents are subject to variations in the timing of the growth spurt for both boys and girls, and also the onset of the menarche for girls.

Despite these complications the DHSS recommendations do have value as guidelines for the analysis of groups of individuals, especially if the samples are large and representative of the population in question. For these reasons they are usually the yardstick against which most studies compare diets.

A considerable number of reports have made recommendations concerning the dietary behaviour and health of affluent countries.
The National Advisory Committee on Nutrition Education (NACNE) encompasses most of these contemporary views in the discussion paper, "Proposals for nutritional guidelines for health education in Britain" (1983). Recommendations are made in terms of the intakes and contributions of energy, carbohydrate, dietary fibre, fat, salt and alcohol. It is clear that in the interests of the current and future health of today's children such dietary guidelines should be adopted for school feeding as well as for the general diet. It is suggested therefore, that these guidelines are used in conjunction with the recommended intakes, as provided by the DHSS (1981), to provide the basis for the nutritional planning of future school meals programme.

Although it is possible to plan and provide a nutritionally sound school meals programme, it is of little value unless such meals are consumed. It is important therefore to consider the feeding behaviour of adolescents and the way it affects their diets. The implications of such behaviour and the extent to which it may be used or modified should then be allowed for in the school meals programme. Reviewing the literature concerning the feeding behaviour of adolescents, a number of relevant characteristics become apparent. These characteristics include missing meals, in particular breakfast and to a lesser extent lunch, the consumption of relatively high numbers of snacks and fast food/takeaway meals, unconventional meal behaviour which is to some extent a reflection of the above characteristics, and finally a large proportion of adolescent girls attempting to reduce their weight through dieting.

The results of this type of feeding behaviour have been identified as low intakes of particular nutrients — iron, vitamin D and calcium in particular. Furthermore, in extreme cases of dieting, under-nutrition and the risk of anorexia nervosa may arise. At the other extreme inappropriate feeding habits have led to significant numbers of adolescents suffering from obesity.

The school meals service thus has the twin objectives of providing meals that are nutritionally sound, particularly in the light of contemporary dietary views, and of providing meals that are
sufficiently acceptable to adolescents such that they will be consumed. This is the major problem facing the school meals service since the evidence (discussed above) would suggest that these objectives are diametrically opposed, indicating as it does that adolescents prefer foods that are high in fats, sugar and salt, and low in dietary fibre. The task facing the school meals service is therefore twofold. On the one hand it must contribute towards a healthy and varied diet providing foods that the children will eat, and on the other it needs to be part of a wider programme of nutrition education that will modify feeding attitudes and behaviour. The potential role of the school meals service in nutrition education is clearly illustrated in the Gloucestershire schools "healthy eating" campaign. The county catering service has used promotional techniques to educate the children in healthy eating and has linked the campaign to events such as school sports to create whole days themed on the wider concept of diet and health.

As with any attempts at significant changes in behaviour the initial changes should be small and further changes then developed over time. It is therefore important that school meals should move gradually towards a more healthy form of diet rather than making sweeping wholesale changes immediately. It is particularly important that in offering a more healthy diet the meals should not be made dull and uninspiring. There is still a place for hamburger and chips as long as they are not eaten everyday and are supplemented with other foods such as fruit or vegetables. This is true for many of childrens popular foods, they need not be removed from the diet but should be consumed in moderation and along with other food types that will supplement them.

Studies of the nutritional role of school meals have produced varied results which are probably a reflection of the variability of the service from area to area. Whilst there is evidence that in some areas school meals do not provide the recommended levels of nutrients, there is also evidence that school meals make a greater contribution to the diet than alternative forms of lunch. This is particularly the case for those children from low income families. The results of these studies therefore indicate the need for some
form of nutritional guidelines indicating minimum energy levels, including the proportions of energy from different sources (fat, carbohydrate, protein), and also indications of the types of foods that should be offered in order to enable children to select nutritionally balanced meals. There is however, a clear nutritional and educational case for the maintenance of a school meals service. As the British Dietetic Association (1980) stated, the primary school years provide the "opportunity to develop good dietary habits during a time of relatively closely controlled school feeding". With regard to secondary school feeding the BDA (1980) stated that this is a "period of rapid growth and development, when greatly increased demands are made on the bodies resources which will only be met if sound eating habits are continued from earlier years".

5.1.2. The nutritional role of meals-on-wheels.

The nutrition of the elderly and the nutritional role of meals-on-wheels within the diets of the elderly are discussed in section 4.3. This section follows a similar format to that adopted for the nutritional aspects of school meals, but also looks at the acceptability of meals-on-wheels.

As with children, the nutritional requirements of the elderly are more closely related to biological age and health, than to chronological age. Generally it is true to say that the requirements of the elderly are the same as for the rest of the population but as with any section of the population, as activity declines the need for some nutrients, particularly energy, also declines. Thus, where individuals are healthy and active they will require a similar diet to that of a normal healthy adult. Whilst those who are sick and/or inactive will have a reduced need for energy, the need for minerals and vitamins remains unchanged and it is therefore necessary for these individuals to have a less energy rich diet with a higher nutrient density. Recommended intakes for men and women over the age of 65 are provided by the DHSS (1981), as shown in table 4.5.
Contemporary dietary views are as useful as guidelines for the elderly as for the rest of the population. Indeed the NACNE (1983) report suggests that the problems of nutrient deficiencies, due to reduced energy intake, should be solved through increasing physical activity and therefore encouraging increased total food intake rather than through supplementation.

The main problem however is modifying the feeding behaviour of the elderly along the lines of the NACNE recommendations. A number of approaches have been suggested including the provision of practical guidance in the form of talks and publications, on the purchasing, storage and cooking of appropriate foodstuffs. Food manufacturers may also contribute by providing for the sale of smaller quantities of foodstuffs for those who live alone or have reduced appetites. Healthy diets may be promoted through the meals served at luncheon clubs and meals-on-wheels. Care should be exercised however, since these meals may be the main source of food for some people and therefore acceptability should take precedence in order to ensure that meals are consumed.

Investigations into the feeding behaviour of the elderly emphatically confirm the point that falls in nutrient intake are a function of health rather than a direct function of age. The larger number of individuals with reduced intakes in the older age groups is due to the fact that ill-health is more common in these groups. It is the elderly people who are in ill-health who are at most nutritional risk since their reduced need for energy results in falls in food intake and in some cases nutrient deficiency. Nutrients of particular concern are ascorbic acid, vitamin D, and for women iron. Since the meals-on-wheels service is specifically intended for those in ill-health, it should address itself to these specific nutritional problems through providing nutrient rich meals.

Studies that have investigated the nutritional aspects of meals-on-wheels have found that they do not provide sufficient of the important nutrients identified above. Indeed, the actual intakes of ascorbic acid and vitamin D from meals-on-wheels are low. The nutrient content of meals-on-wheels is also extremely variable.
These points indicate that there is a need for nutritional guidelines for meals-on-wheels in order to maximise the benefit of the meals. Despite the potential for improvement it is clear that meals-on-wheels nevertheless make a significant contribution to the diets of the elderly.

The dependence of many elderly people on delivered meals means that the acceptability of the meal is critical. Although most meals-on-wheels recipients when asked directly state that they are satisfied with the service, there is evidence that such judgements are the result of low expectations and the fear of meals being withdrawn. The results of investigations into the levels of plate waste, however, indicate that in many cases much of the meal is not eaten. An area of particular concern in many cases was the delivery temperature of the meal. This would imply that acceptability is not as high as it might be and there is no room for complacency. There is little point in providing nutritionally sound meals unless they are eaten.

5.1.3. The future of catering within the Welfare State.

Preceding sections have established the nutritional value of existing catering services in schools and for the elderly at home through meals-on-wheels. In purely nutritional terms therefore, the future of such welfare catering services should with some modification and improvement be assured. A number of other factors will however have a bearing on the future of catering within the Welfare State.

At a most fundamental level, the size of the demand for such services will have an important influence on their future. For future planning the welfare services are primarily concerned with the size and the proportion of the dependent population. Population projections give a good indication of the future numbers of different groups of the population, such as children and the elderly, and therefore indicate the likely numbers of the dependent population.
During the 1980's the number of children aged 0-15 has fallen, and in particular the number of school age children has fallen by 10%. This trend is expected to continue until the 1990's. Whilst the total number of school pupils has been falling since 1976, the fall in the number of secondary school pupils is expected to continue into the 1990's - from 1991 to 1996 there will be 18% fewer secondary school pupils. The declining school population has been reflected in a reduction in the number of schools, a reduction that will continue until the 1991. Clearly, with falls in the number schoolchildren and rationalisation of the number of schools there will also be a contraction in the school meals service. It has been estimated by the Audit Commision that 1,000 secondary schools will have to close as a result of this rationalisation (The Times 1986).

Projections of the future numbers of the elderly also reveal significant trends. Whilst the number and the proportion of the population aged over 65 has been increasing since 1900, these increases are expected to slow down and stabilise until the end of the century. The age structure is expected to change significantly however with major increases in the numbers of those aged over 85 whilst the numbers of the younger elderly will decline. The change in the age structure of the elderly is significant because it has been shown that the proportion of people reporting long-term illness rises exponentially with age. Their demands upon social services are also greater, and with increased numbers of the very old the requirements for social services will increase. This is especially true of services that enable the elderly to live at home.

There are thus clear future trends in the potential national demand for school meals and for domiciliary services for the elderly such as meals-on-wheels. The total market for school meals will fall in sympathy with the numbers of school children, up to the beginning of the next century. The total market, and probably the demand for meals-on-wheels, will on the other hand increase significantly unless there are fundamental changes in the nations policy towards domiciliary care and its alternatives.
National policy is another significant factor in the future of welfare catering. Since the late 1970's most welfare services have been under considerable pressure to reduce their costs. This is particularly the case for those services that are seen as ancillary to some other social provision. The policy of the Conservative Government is well illustrated by a personal communication from Mr S Sexton (Advisor to the Secretary of State for Education and Science) to Miss G Macquarie (Central London Polytechnic) dated 5th January 1982. Mr Sexton states that "Our attitude towards school meals is that it is a service provided for children, and through children for their parents, but it is not education,... We seek to spend as much as possible of the available money on education within the class-room, rather than on services which parents themselves could and should properly pay for". For these reasons both the school meals service and the hospitals meals service have been under particular pressure. The Public Expenditure White Paper of 1979 expressed the Governments desire to see considerable reductions in net expenditure on the school meals service and the 1980 Education Act was intended to enable the local authorities to achieve this. Whilst the privatisation of the school meals service was not a requirement, it was an obvious option which a number of local authorities took.

The National Health Service was required however to seek private tenders for catering services and to identify by 1986 the cheapest alternatives. This was a direct expression of the Governments policy of privatising what it perceives as ancillary social services. By 1984 only 0.23% of hospital catering had been privatised producing savings of £9.4 million (Caterer & Hotelkeeper 11th July 1985). The Conservative victory in the 1987 General Election would seem to assure the continuation of these policies of privatisation. Indeed it would appear likely that this re-election will stimulate the Government into further action to privatise many other social and welfare services of which catering is a part.

Other policy and structure changes could also take place in the
light of the Governments desire to reduce or even remove the cost of hospital and school feeding from the national finances. These could include moving schools onto a "continental day" where the lunch break is abolished and classes finish in the early afternoon. This is indeed a policy that has already been adopted in some schools such as Courtmoor Comprehensive in Fleet, Hampshire (see The Sunday Times 26th May 1985). Hospital catering may be moved onto a commercial basis where patients have to contribute towards the cost of their meals - pensioners already have some of their pension removed in lieu of meals received during periods in hospital.

The short to medium-term future of catering within the Welfare State is thus subject to many possible changes. The most probable of these changes is however further privatisation. It is clear nevertheless, that the demand for services such as hospital meals and meals-on-wheels remains, particularly with the projected increases in numbers of the very old, and that whether they are operated by the local authorities or private contracters, catering within the Welfare State will continue.
5.2. The uptake of school meals and the attitudes of schoolchildren to school feeding.

5.2.1. Methodology.

The methodology adopted for investigating the attitudes of schoolchildren towards school meals is described in detail in section 3.4.6. Before this specific approach could be formulated however, there was considerable research into the background to school feeding, the uptake of school meals, and the techniques available for the investigation of attitudes. These areas of investigation are all described in sections 3.4.1. to 3.4.5.

Having discussed the nutritional requirements of schoolchildren and the role of school meals within the adolescent diet, the value of school meals from a nutritional point of view was investigated. A number of studies (see section 3.3.4.) have found that school meals make a positive contribution to the diet, and that this nutritional contribution is greater than for any of the alternatives to school meals. The benefits of school feeding however depend on the children taking school meals. The percentage of pupils taking school meals, the uptake, is thus a major factor in the success of the school feeding programme. Apart from the nutritional case for maximising uptake levels, the commercial case for providing larger numbers of meals is also significant. Whilst all local authorities recognise this fact, the Inner London Education Authority was particularly concerned and was interested in establishing the reasons for high and low uptake at different schools within London. The authority was therefore used for the fieldwork in this study.

The problem had been identified as one of identifying the reasons for the different levels of uptake at different schools. A consumer based approach was required since it is ultimately the school pupils who decide where and what they eat. It was therefore necessary to determine those factors that are perceived by the pupils as important in lunchtime feeding at school. Many studies have looked at food preferences, but this study was concerned with identifying
the wider aspects of school feeding of which food is only one.

Research indicates that an attitude based approach is appropriate, and indeed scales for the measurement of attitudes both identify the important aspects of a stimulus and also assign values to the individuals attitude to that stimulus. These values would enable attitudes to be related to demographic variables such as age and sex. The Likert method of attitude measurement was selected for the reasons described in section 3.4.6. The detailed methodology was thus formulated around the use of a Likert scale following standard social survey techniques.

Since LaPiere's rather informal study of the attitudes of hoteliers towards Chinese guests, the extent to which attitudes predict behaviour and the conditions under which they might predict behaviour, has been the subject of much debate (see section 3.4.3.). A thesis of this study is that where the attitude scale actually measures the attitude towards the behaviour in question, rather than the object of the behaviour, that attitude will usually predict behaviour. It is important to note however that the attitude will only "usually" predict behaviour because at any one point in time there will be circumstances that may restrict responses. For this reason, the larger the number of respondents tested the more likely that on average attitude measures will predict their behaviours.

The results of this study indicate that this is true since there was a positive correlation between the attitude measure and the measure of behaviour of +0.614. Although this is far from a perfect positive relationship it does nevertheless indicate a clear relationship between the measured attitude and the measured behaviour. This correlation is also significant in the light of Wickers (1973) review of previous empirical studies which led him to suggested that attitudes were "unrelated or only slightly related" to behaviour.

The approach as detailed in section 3.4.6. achieved the objectives for which it was designed. The success of the approach is largely due to the fact that there has been much previous work on the use of
attitude scales, although not with such large samples or related to feeding, and previous experience in the use of social survey techniques. One of the most crucial aspects of the study was the use of an extensive pilot study before the actual survey. This revealed a number of weaknesses in the survey, and faults in the questionnaire, which could have created major problems had they not been identified early in the exercise.

The Likert scale itself could be refined by one change in the way it is developed. The quality of the attitude statements is critical and will largely determine the quality of the final scale. This is particularly the case where the statements are used as indices of the factors that are perceived as important. In this survey group discussions were used to generate attitude statements. Whilst the statements appeared representative of the views of children, more effective methods of statement generation might include indirect projective techniques such as sentence completion and picture interpretation (see section 3.4.6.). In this survey it was found that the children were very forthcoming with their views, but in situations where genuine attitude comments are more difficult to generate, indirect projective techniques would prove very useful.

Another aspect that could have improved the survey would have been the translation of the questionnaire into the major non-English languages as identified in section 3.4.5. There was at least one case of a school where the pupils spoke little or no English and appropriately translated questionnaires would have been useful. Despite this problem these pupils were still included because in all situations where this occurred teachers who spoke the language in question were available to translate and give assistance.

5.2.2. Factors affecting the uptake of school meals.

The first section of the survey questionnaire was concerned with identifying lunchtime feeding behaviour and establishing the importance of general factors that may affect uptake. These included such aspects as food restrictions (due to beliefs or
health), parental influence, priority of lunchtime activities, and usual source of lunch.

Food restrictions are a significant factor in determining feeding behaviour. Nearly a quarter of the sample claimed that they were unable to eat some type of food for either medical reasons or because of their beliefs. Pork was most frequently specified, but a wide range of foods were identified over the whole sample. There is thus a clear need to provide a variety of foods for school lunch rather than to merely avoid the use of these identified foods. In terms of the priority of activities during lunchtime, half the sample indicated some other form of activity than having lunch as the most important. For these pupils it would seem likely that lunch would be missed if it restricted their participation in these priority activities. The attitudinal section of the questionnaire identified time spent in queuing for lunch as a particular problem. Another very highly ranked factor was the need for relaxation. The school meals service should thus ensure that having a school lunch does not restrict participation in other activities, particularly in terms of the time taken in obtaining the meal and that the feeding environment is conducive to relaxation. The most common source of lunch was school meals, although more so for the boys than for the girls. A larger percentage of the girls however took packed lunches, and nearly a third of the older pupils go outside school for their lunch. As well as preferring the food, a major factor in the choice of lunch place was the ease with which a meal could be obtained. This confirms the point made earlier regarding other activities and relaxation.

Although most pupils said that they were not influenced by their parents in their choice of lunch, the majority still obtained their lunch from the place preferred by their parents. Most of the sample believed their parents preferred them to eat school meals. The younger pupils were more likely to be influenced by their parents than the older ones. When questioned which type of school meals service they prefer, traditional or cash cafeteria, far more pupils expressed a preference for the cash cafeteria service than expressed a preference for the traditional meal service. This was
particularly the case for the older pupils.

Several determinants of the lunchtime feeding behaviour of school children have emerged. These have important implications for the school meals service.

- There should be a variety of foods available such that those who cannot eat particular foods are still able to select an appetising and nutritious meal.
- The most important factors in the choice of lunch place are the food and the ease with which a meal may be obtained.
- Having a school meal should not preclude participation in other activities. Speed of service is thus critical in order to minimise time spent queuing as well as maximising the ease with which a meal may be obtained.
- The school meal environment should be conducive to relaxation.
- Parental influence would seem to be significant despite the denial of this influence by the pupils.
- Pupils prefer cash cafeteria systems to the traditional system of school meals.

5.2.3. The attitudes of schoolchildren to school feeding.

The second section of the survey questionnaire is concerned with attitudes as measured by the Likert attitude scale. This section attempts to measure positive or negative attitudes to school feeding and to evaluate the relative importance of the different factors concerning school meals. These factors were identified in group discussions.

An important finding was that when analysed as a whole and by groups according to age and sex, there was a core group of factors that were important for all groups. These factors were that;

- there should be a wider variety of foods offered,
- cash cafeterias are preferred because of the better choice,
- long queues are perceived as a particular problem,
school dining-rooms are not liked and are often too cramped, pupils feel that they should be allowed out of school during lunchtime.

These factors largely confirm the importance of the points identified in the previous section. They also indicate the areas that should be addressed by the meals service - food choice, queuing and the dining environment in particular. Analysis by sex revealed that girls have a more negative attitude to school feeding than boys. In general they prefer packed lunches. A particular problem that was identified by the girls was the standard of cleanliness and hygiene. Boys found the discipline imposed by teachers a negative factor in school meals. Analysis by age indicated that the older pupils have more negative attitudes than the younger ones. Most of the older pupils would prefer to go outside school for their lunch. Parental influence appeared to be the significant factor in persuading the younger pupils to use the school meals service.

Pupils at schools with a traditional meals service have a more negative attitude to school meals than those at schools with a cash cafeteria meals service. Indeed the pupils at schools with the traditional meals service had the lowest attitude ratings of all groups investigated. They also identified the greatest number of problems with school meals. These problems were greasy food, poor presentation, poor standards of hygiene and the dining room environment. These were in addition to those general problems identified earlier. Although pupils at schools with the cash cafeteria service were more satisfied with school meals, one particular problem that they identified was that people touch the food and they sometimes find extraneous matter in the food.

The attitudinal part of the survey has thus identified specific aspects of the school feeding experience that are perceived by pupils as important. It has also indicated which groups of pupils have less positive attitudes than others, and the reasons for those attitudes. With this information the ILEA will be able to tailor
the school meals service more accurately to the desires of schoolchildren, bearing in mind the nutritional aspects already discussed. The authority should thus have the information to enable it to maximise the uptake of its school meals.

5.2.4. Further investigation and research.

This study has investigated two areas, the motives and feeding behaviour of children at school, and the use of Likert attitude scales in the prediction and explanation of consumer behaviour. The scope for further investigation will be discussed in terms of these two areas.

(i) The uptake of school meals;

This study has looked at the factors that determine uptake in the broadest sense. Preference for the food was identified as a major factor in the decision of where to eat. It would therefore be of value to determine exactly what foods schoolchildren prefer. A number of studies have looked at food preferences using a number of techniques such as hedonic rating scales and scales of willingness to eat - research and methods for determining food preference are discussed in section 3.4.2. Whilst the results of such a study would indicate the sorts of foods that should be offered, the desire to provide preferred foods should be balanced with the need to maintain adequate nutritional standards and to promote healthy feeding behaviour.

The results of this research have provided detailed information on both the nutritional aspects of school meals and the factors that affect uptake. The ILEA school meals service should use this information as the basis of its future planning in order to create a service that makes a positive contribution to the diets of London schoolchildren. It would be particularly useful to conduct further research, after the suggested adjustments to the service have been made to determine how effective the adopted policies have been in terms of changing pupils attitudes. Using the same attitude scale
would indicate the extent of attitude change over time. Ideally it
would be best to survey a sample at schools where changes in the
service have been implemented, and to compare the results with a
control sample at schools where the meals service has not been
changed. This would reveal the extent of attitude change due to
changes in the meals service rather than due to other more general
changes in attitudes over time.

Having developed an effective tool for the investigation of
attitudes to feeding in schools, this tool could be adapted for use
in other areas of the country. The general approach would be
applicable in any area, but the validity of specific precoded
responses and attitude statements should be tested with a trial
sample of the schoolchildren in the area to be investigated. Most
of the responses and the attitude statements should be valid, but it
would be relatively easy to add or delete them where necessary.
Both Gloucestershire County Council and Wiltshire County Council
have expressed interest in the technique and are currently
considering its use for the analysis of children's attitudes to their
school meals services.

(ii) Likert attitude scales and the prediction/explanation of
consumer behaviour;

The relevance of the success of the Likert scale technique has been
discussed under methodology in section 5.2.1. This section has also
identified a modification to the technique that would improve the
quality of the attitude statements. This modification would
generate attitude statements through the use of indirect projective
techniques such as sentence completion and picture interpretation.
The aim is to obtain genuine attitude statements that transcend the
problems of awareness or social facade. In this way more of the
important factors will be identified and a better pool of attitude
statements will be generated for the Likert scale. There is thus
scope for such a methodology to be tested in the field and for its
relevance and value to be assessed.

Further research is also required to identify the conditions and
factors that help maximise the attitude-behaviour relationship. Although a number of such factors have been identified, discussed in section 3.4.4., the extent to which factors such as previous experience of the behaviour and the importance of the behaviour to the individual effect the relationship should be quantified. To what extent does timing effect the measurements of attitudes or behaviour? Research to establish the affects of such factors will help to produce more accurate attitude measuring tools for the prediction of behaviour.

The use of attitude measuring devices, such as Likert scales, in the prediction or explanation of consumer behaviour is a field that should be further investigated. Marketing is a major aspect of today's commercial environment, and understanding the behaviour of the consumer is fundamental to that function. Any technique that helps in that understanding is therefore significant. The Likert scale should be tested as a marketing tool in other commercial areas. Within the hotel and catering industry for instance it could be used to identify exactly what aspects of the total product the consumer perceives as important. On the basis of such an investigation the existing products may be evaluated and either maintained, modified or reformulated.
5.3. The delivery of meals-on-wheels.

5.3.1. Methodology.

The investigation into the delivery systems for meals-on-wheels is introduced in section 4.6. This section also includes the general methodology adopted for the investigation of systems.

The starting point of the study is the identification of the general problems associated with the delivery of meal-on-wheels. These are identified as;

- delivery temperature,
- food quality,
- nutrient content,
- aspects of hygiene,
- problems directly associated with the nature of delivery systems in use - in particular heat sources.

Research indicated that although some studies into delivery systems have been conducted, virtually all of these studies have looked at delivery systems for hospital meals. Few of these however, are suitable for meals-on-wheels operations. Furthermore, most of these studies have concentrated on the problems associated with heat retention, and none provide a comprehensive analysis of the performance of delivery systems. Despite this, these studies have indicated the strengths and weaknesses of different approaches to the investigation of delivery systems, and also highlight the need for a comprehensive analysis of systems suitable for the meals-on-wheels service.

On the basis of having identified the problems and studied previous work in the field, it was possible to formulate the methodology for this study. The general methodology is described in section 4.4.3., and the approach for each of the parts of the study are described in the appropriate section. Objectives are identified for each of the sections of the investigation.
The methodology was intended to provide a comprehensive analysis of the performance of the delivery systems. Whilst clearly not all facets of the delivery of meals-on-wheels could be investigated with the time and resources available, the study does provide a fairly complete analysis of the performance of the systems. The identification of existing problem areas ensured that the study concentrated on those aspects of most relevance.

There are several ways in which the approach could have been improved to provide more comprehensive and reliable results. In terms of the thermal performance, it would have been of value to carry out a greater number of runs of each test. Whilst the results of the insulation tests were fairly consistent, the performance of the heated systems was far less reliable and further tests on warm holding times and simulated delivery runs would have provided more comprehensive results, particularly in terms of the degree of variability of performance.

The use of gruel as a food medium was particularly successful. It was a very stable and consistent material that contributed much to the reliability of the tests. The only problem with using a food substitute, however is in relating the results to real meals. Not only are meals rarely homogenous, but also, their food components are likely to have different thermal qualities, particularly in terms of their specific heat. In this respect gruel is probably a poor-meal substitute since it has a relatively high specific heat when compared to most foodstuffs. Nevertheless it is totally impractical to carry out an extensive testing program on real meals. Some form of meal substitute was therefore necessary.

The tests on hygiene aspects of both delivered meals and the delivery containers were rather limited in their scope. Tests were conducted on only one type of container and two foodstuffs. Testing a wider range of containers and a varied sample of foods would have provided a more complete picture.
Analysis of the ergonomic aspects of delivery equipment could have been supplemented with views from users in the industry. Some expression of how conveniently systems may be handled and how appropriate they are for the purposes of meals-on-wheels would have been useful. In order to generate such data however, some form of survey would be necessary. There was insufficient time in this study for such an exercise.

Finally, the investigation of flue gas concentrations within transportation vehicles was carried out in a sample of representative cars and one van. At the time of the research there were very few delivery vans with any form of additional ventilation to deal with flue gases and consequently such vans were not investigated in this study. They are much more common today and should therefore be tested to evaluate the efficiency of the ventilation system and to determine whether they maintain flue gas concentrations at safe levels.

All the above points would have made for a more comprehensive analysis of meals-on-wheels delivery systems. With finite resources and time however, there are limitations to what may be done. A balance must be struck between attempting too wide an investigation that has no depth, and too narrow an investigation that fails to reveal the important aspects of the systems under scrutiny. The approach adopted in this study was to identify the important factors in the delivery of meals and to set testing objectives for each of these. In this way it was possible to ensure that the testing programme remained relevant and resource effective.

5.3.2. The transportation and delivery of meals-on-wheels - existing systems.

Investigating the transportation systems for the delivery of meals-on-wheels has led to a number of conclusions regarding procedure and the systems themselves. The recommendations and
conclusions of the study are discussed in detail in section 4.10.

The successful delivery of meals depends upon a number of procedural requirements that cover the range of operations from meal preparation through to final delivery to the recipient. Two factors are of major importance in the preparation of meals. These are hygiene and meal temperature. Hygiene is critical since meals are to be stored and will not be reheated before consumption. It is essential therefore that particularly high standards of hygiene are maintained in order to reduce the risk of unnecessary contamination. If contamination should occur there is always the possibility that during the period of delivery any micro-organisms could reach dangerous levels, especially if meals fall below the critical temperature of 62.8°C. Frozen or chilled meals that are to be regenerated before delivery must be thoroughly reheated to around 100°C.

In order to help ensure that meals do not fall below 62.8°C, the loading temperature should be at least 80°C. This loading temperature will provide sufficient heat to maximise the delivery period. Not only does this require that meals are heated through to a sufficiently high temperature, but it also means that methods of portioning and loading should be highly organised in order to minimise heat-loss. During transportation the delivery containers should be opened as infrequently as possible, and when unloading, meals should be removed from the sides to the centre, and from the top to the bottom. The systems available for the delivery of meals-on-wheels fall into two categories - those that rely purely upon the insulation of meals, and those that use a secondary heat source to keep meals hot. It is convenient that these two types of system fulfil the requirements of two identifiable types of delivery round. These are;

- The urban round - which is usually shorter, in time and distance because of the density of population, and which often involves delivery to homes where access by vehicle is difficult (blocks of flats, pedestrian residential areas).
- The rural round - which usually involves longer distances
and more time, but where access by vehicles is usually much easier.

In general, the insulated systems are suitable for urban delivery because although they have limited warm holding times they are more portable than the heated systems. This enables meals to be delivered within the container to the door rather than being unloaded and carried over distances to the recipient. Of the systems that were investigated the most suitable was the Nutri-System. Where this container is unobtainable the smaller (7 meal size) polystyrene container is a reasonable substitute - hygiene and durability will be problems however. For both these systems the maximum delivery period is 90 minutes.

For rural areas where delivery takes over 90 minutes and access is no problem, the heated systems are suitable. The most suitable of these is the Corsair with a warm holding time of up to 3.5 hours. Although this system will keep meals hot for this period, such extended delivery times should wherever possible be avoided since nutrient loss and food deterioration will be extensive. The Hotlock delivery system, which is used extensively within the industry, cannot be recommended because of the nature of the heat source.

5.3.3. Alternative meal delivery systems.

Although the meals-on-wheels service has been by tradition based on the transportation and delivery of hot meals, there are a number of alternative meal systems that could be considered. The aim of all these alternatives is to avoid the problems inherent in the existing system, as described in section 4.4.1. Armstrong (1979) and Glew (1984) have investigated a number of these systems.

The alternatives available may be broken down into three groups;

- those where meals are heated "en route" just prior to delivery,
- those where meals are provided more locally and
transportation creates no problems, and,
o those where a degree of self-help is required.

Regeneration during delivery implies the need for quick reheating at the point of delivery. This generally requires the use of a microwave oven. Prepared meals may be either chilled or thawed and chilled frozen meals, both stored at 2-5°C during the round. Leeds University carried out field trials on such a system using a converted van fitted with a microwave oven. Their results indicated that meals were served at higher temperatures using this system than those achieved with a traditional system (Glew 1984). There are, however a number of problems with such a system;

- High capital costs - specially converted vehicles with microwave ovens and generators to drive the ovens are needed. This would also preclude the use of volunteer vehicles.
- Regeneration - microwaves do not heat all foods at the same rate. Meals composed of a number of food items may therefore heat unevenly.
- Storage during transportation - just as hot meals must not be allowed to fall below 62.7°C, chilled meals must not be allowed to rise above 5°C. The transportation problem has merely therefore been reversed.

There are a number of options where the transportation of meals would be unnecessary. The ideal system would be some form of good neighbour scheme where meals are prepared and cooked by someone in the immediate vicinity of the elderly person. A nominal payment to cover food costs could be made, and the added benefit of such a scheme would be that the welfare of the recipient could be more closely monitored. Furthermore, the costs would almost certainly be lower than those involved in running a traditional meals-on-wheels scheme (see Lawson and Thomson 1981 for an analysis of the costs of meals-on-wheels schemes). Another community based scheme would be to feed the elderly from organisations where meals are already being produced for other groups. Schools would be particularly appropriate. Where recipients are confined to bed the meals could be delivered, but where some mobility remains it would be beneficial
to take the elderly to the school and feed them within a community environment. There would be social and nutritional benefits for both the schoolchildren and the elderly in such a community based feeding scheme.

Self-help schemes would involve the delivery of prepared meals for regeneration by the recipient. The meals could be chilled (maximum 5 day storage), frozen (storage for up to one month depending on conditions), or cooked and chilled in vacuum packs (sous-vide). The use of any of these catering systems requires appropriate storage facilities (unless meals are delivered every day) and some form of cooking facility. Glew (1984) states that nearly 70% of those aged 75-84 possess refrigerators, and it is reasonable to assume most people have cooking facilities. The major concern with this system is the ability of recipients to reheat the meals. By definition these people have difficulty in preparing their own meals. It is probably the case that with having the burden of shopping for foodstuffs and the preparation of the meal removed, many of recipients will be able to reheat prepared, delivered meals themselves. There will nevertheless, still be a proportion who are incapable of this task and to whom hot meals will still have to be delivered.

Looking at the merits and the problems associated with each of these alternatives, the community based schemes would seem to be the most suitable. Those who still have some mobility could be taken to eat at schools or luncheon clubs and others for whom this option is not suitable could be catered for under the good neighbour scheme. The main problem with such a system would be the logistics and organisation since it would involve the devolution of the meals-on-wheels service to many smaller, local operators - schools or individuals. There would however be the advantages of freshly cooked meals, community involvement and the facility to closely monitor the welfare of the elderly through the greater commitment of neighbours.
5.3.4. Further investigation and research.

The preceding discussions of the methodology and the alternatives to the existing delivery systems indicate that there remain a number of areas that should be investigated. These include further investigation of aspects relating to the existing systems for the delivery of meals, and the investigation of the alternatives mentioned above.

In terms of the transportation of hot meals, two areas are of particular interest. These are the acceptability of delivered meals using different systems, and the nutrient content of delivered meals. The acceptability of meals-on-wheels has been discussed in section 4.3.5. Whilst a number of studies have investigated the acceptability of meals-on-wheels (see section 4.3.5.), none have evaluated the acceptability of meals delivered using different systems, or delivered under different conditions. It would be of value to identify whether particular systems are capable of delivering meals in a more acceptable condition than others.

Although delivery temperature was investigated in this study, and a number of general comments were made on meal condition, no quantified results in terms of the acceptability to the recipient were made. It would also be of value to know the maximum delivery times, under various specific conditions, beyond which meals become unacceptable.

The specific nutrient content of meals delivered under different conditions is another area that could be investigated. This study has made a number of comments on the likely effects of hot storage on nutrient retention on the basis of the known effects on specific nutrients. Other studies have looked at the nutrient content of delivered meals in specific meals-on-wheels schemes (see section 4.3.4.). It would however, be of value to quantify nutrient losses under various conditions such as different storage temperatures, different packaging systems (sous-vide systems in particular), and over various delivery times. This data would enable the best conditions in terms of nutrient retention to be identified.
Some research on alternative delivery systems has already been undertaken. Armstrong (1984) and Glew (1979) have carried out trials on systems where meals are regenerated by microwave during delivery, and have investigated a number of self-help options. There has been little research into the use of community based systems however. Investigations of the logistics, organisation and acceptability of this option should take place because this could be the cheapest and the most effective of the alternative systems available.
REFERENCES


ARMITAGE, B.E., "Survey of Patients Reaction to the food offered in five selected geriatric hospitals with in the Kent Area Health Authority", South East Thames Regional Health Authority, 1976.


BANNISTER, O., "Personal Construct Theory; A Summary and Experimental Paradigm", Acta Psychologica XX, 1962, pp104-120.


BARRET-GRAY, T., "The Distribution of Hospital Meals", Hospital Engineering, August 1979, pp18-21.


BEVERIDGE, W., "Beveridge Papers", Memorandum dated 16th January, 1942.


BISHOP, K., "The heat retention properties and nutritional consequences of the use of an insulated tray system in large scale food service", Procter Dept. of Food Science, University of Leeds, April 1975.


BOOTH, W., "In Darkest England and the Way Out", 1890, p47.


BROCKBANK, W., "Portrait of a Hospital to Commemorate the Bicentenary of the Royal Infirmary, Manchester, 1752-1948", William Heinemann, 1952.
BROWN, R., "Reorganising the National Health Service", Blacknell, 1979a.
BROWN, R., "Good food costs less in Hospital Groups Scheme", Staff and Welfare Caterer, May 1979b, pp11-13.
CENTRAL OFFICE OF INFORMATION, "Health Services in Britain", HMSO, 1977.
COMMITTEE ON DIETARY ALLOWANCES, "Recommended Dietary Allowances", Food and Nutrition Board, Division of Biological Sciences, Assembly of Life Sciences, NRC, NAS, Washington, 1980.
COMMUNITY CARE, " 'Disasterous' private meals - SCA calls for an enquiry", Community Care, No.523, 2nd August 1984a, p5.
COMMUNITY CARE, "Privatising meals service unlikely to save cash", Community Care, No.526, 30th August 1984b, p5.
CONNELLY, N., & GOLDBERG, T., "Looking at meals-on-wheels", Community Care, 14th June 1979, pp20-23.


CORRY-MANN, H.C., "Diets for boys during the school age", Medical Research Council Specialist Report Series No.105, HMSO, 1926.

CRICHTON BROWNE, Dr., "Report to the Education Department upon the alleged over-pressure of work in public elementary schools", 1885, in B.Simon, "Education and the Labour Movement", Lawrence & Wishart, 1965, pp133-4.


DAVIES, L., "Three score years ... and then?", William Heinemann Medical Books Ltd., 1981.
DEPARTMENT OF EDUCATION AND SCIENCE, Circular No.97, 1946.


DEPARTMENT OF HEALTH AND SOCIAL SECURITY, "Recommended Daily Amounts of Food Energy and Nutrients for Groups of People in the United Kingdom", Committee on Medical Aspects of Food Policy, HMSO, 1981.


DEPARTMENT OF HEALTH AND SOCIAL SECURITY, "Diet and Cardiovascular Disease", Committee on Medical Aspects of Food Policy, HMSO, 1984.


Dyson, M.R., "N.H.S. Catering '84", Hospital Equipment and Supplies, Vol.30 No.8, August 1984, pp16-17.

Dyson, R., "N.H.S. Catering; Competitive Tendering", Hospitality, May 1984, pp5-6.


Essex County Council, "Dinner at School", Essex County Council, December 1943.


FACTORIES ACT 1961, Section 72, Subsection (i), HMSO, 1961.


FAST FOOD, "East Sussex takes up the challenge of school catering", Fast Food, July/August 1982, pp75-81.


FOOD HYGIENE REGULATIONS, Section 27, Subsections (i) & (iii), HMSO, 1970.


GERIATRIC MEDICINE, Vol.II No.6, June 1981.


GREENER, E.A., "The Purchase, Preparation and Service of Food Supplies", The Modern Hospital, No.2, May 1914, p291.


"THE HADLOW REPORT", HMSO, 1926.


HANSARD, House of Commons, 29th April 1909.


HARRIS, A., "Meals-on-Wheels for Old People", National Corporation for the Care of Old People, 1961a.


HYNDMAN, I., & GOODMAN, R., "A fresh, hot dinner straight from the oven is something all old people may soon enjoy", Hospital Journal of Australia, March 1981, pp18-21.

INDUSTRIAL CATERER, "Hospital Caterer in-depth review", Industrial Caterer, October/November 1984, p1.

INNER LONDON EDUCATION AUTHORITY, "Cash Cafeterias - Analysis of increased demand", ILEA, May 1981.

INNER LONDON EDUCATION AUTHORITY, "Language survey of pupils in primary and secondary schools", ILEA, 1981.


ISAACS, B., & THOMPSON, J., "Holiday Admissions to a Geriatric Unit", The Lancet, 21st December 1960, pp 969-971.


KAHRS, E.J., "We need a new perspective on Hospital Food Service", The Modern Hospital, No.70, March 1948, p110.


KENNEDY, B.N., "Food Preferences of Pre-Army Age California Boys", Food Technology, Vol.6, 1952, p93.


KING EDWARDS HOSPITAL FUND FOR LONDON, "Memorandum on Hospital Diets", King Edwards Hospital Fund for London, 1943.


LESTER SMITH, W.D., "Education in Great Britain", Oxford University Press, 1956
LEWIS, B., "Dietary Prevention of Ischaemic Heart Disease - a policy for the '80's", British Medical Journal, 2, 177, 1980.

469


MINISTRY OF EDUCATION, "School Meals and Mid-day Supervision", Circular No.97, HMSO, 1946.
MINISTRY OF HEALTH, "Wartime Feeding in Hospitals", HMSO, 1942.
MINISTRY OF HEALTH, H.M. Circular No.44/45, 15th March 1945.
NATIONAL ASSISTANCE ACT, Chapter 29 Part III Section 31, HMSO, 1948.
NATIONAL DAIRY COUNCIL, "What are children eating these days.?", National Dairy Council, 1981.
NATIONAL OLD PEOPLES WELFARE COMMITTEE, "Second enquiry regarding hardships which old people may be suffering owing to the present food restrictions", Age Concern Archives, 21st February 1944.
NATIONAL OLD PEOPLES WELFARE COMMITTEE, Circular Dated 13th March 1948, held by DHSS Archives.
NATIONAL UNION OF TEACHERS & the GLOUCESTERSHIRE TRAINING COLLEGE OF DOMESTIC SCIENCE, "School Canteen Handbook", National Union of Teachers, May 1940.


NEW AGE, Summer, 1981.


OPPENHEIM, A.N., "Questionnaire design and attitude measurement", Heinemann, 1968.


PACKARD, F.R., "Some Accounts of the Pennsylvania Hospital from its first Rise to the Beginning of the year 1938", Pennsylvania Hospital, 1938.


PEAT vs. N.J. MUSCHAMP & CO. LTD. (1969), 7 KIR 469, CA.


POOR LAW AMENDMENT ACT, 1834, "An Act for the Amendement and better administration of the Laws relating to the Poor in England and Wales", G.Eyre & A.Spottiswoode (pubs), 1834.


REGINA LEADER POST, Glasgow, 24th March 1970.


SCAN, "Ethnic Meals; Whatever happened to all the Asians", Scan, No.1, 1984, pp6-7.
SCOTTISH HEALTH SERVICES COUNCIL (Joint Committee of the Standing Medical Advisory Committee and the Standing Advisory Committee on Hospital and Specialist Services), "Hospital Catering", HMSO, 1962.
SELF, S., "Hospital Catering where innovation is King", Hospitality, March 1985, pp11-13.


"THE SPENS REPORT", HMSO, 1938.


STANTON, M., "The cafeteria comes to the patient", Modern Hospital, Vol.84, May 1955, p11B.


THE SUNDAY TIMES, "Schools now opting for shortest day", 26th May 1985.


THE TIMES, Times Newspapers Ltd., 30th January 1906.


Womens Voluntary Service, Circular dated 22nd March 1948, (held in WRVS Archives).
Womens Voluntary Service, Circular dated 22nd April 1948, (held in WRVS Archives).
WOOLENS AND WORSTED TEXTILES (LIFTING OF HEAVY WEIGHTS) REGULATIONS, SR&O, No.1463, 1926.
1. General School Data

<table>
<thead>
<tr>
<th>School name</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>Tel. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Head Teacher</th>
<th>Type of School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of pupils on roll</th>
<th>Boys : Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnic mix</th>
<th>% of pupils using languages other than, or as well as, English</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Main ethnic groups of such pupils:

Comments:
### 2. School Catering Data

<table>
<thead>
<tr>
<th>Person through whom catering contact made</th>
<th>___________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>___________________________</td>
</tr>
<tr>
<td>Telephone No.</td>
<td>___________________________</td>
</tr>
</tbody>
</table>

**Catering Superintendent/Cook Supervisor / Cook in Charge**

<table>
<thead>
<tr>
<th>Type of school catering:</th>
<th>Cash Cafeteria</th>
<th>_______</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>_______</td>
</tr>
</tbody>
</table>

If cash cafeteria, when started

| % meal uptake | _______ % |

Are pupils allowed outside the school grounds during lunchtime (except to go home)

| Yes/No |
3. **Dining Conditions and Environment**

Is dining the sole use of room/s  
Yes/No

Other uses: ________________________________________________________________

No. of dining rooms: ___________________ No. of settings: ______________________

Total No. of diners $\overline{x}$ $m^2$

No. of diners per room per sitting

No. of diners per $100m^2$ per sitting

No. of serving points __________ No. of diners/serving point ____________

Supervision: No. of supervisors ______ Children/Supervisor ____________

Seating:  
- Pre-allocated □  
- Cluster □  
- Lined □  

Type:  
- Bench (wooden) □  
- Bench (upholstered) □  
- Chairs □

Cleanliness:  
- Good □  
- Average □  
- Poor □  

Lighting:  
- Natural □
- Fluorescent □
- Bulbs □

Noise level (decibels) __________ Queuing time (mins.) __________

comment __________  $\overline{x}$ of sample pupils

from joining queue to leaving counter.
4. Alternative Food Facilities

(i) On-site (within school grounds)

- Own Food: Do pupils bring in their own food from home? Yes/No

  How many? 

  Where is this food eaten? Classroom, Dining room, Sep. dining rm., Outside

- Tuck Shop: Is there a tuck shop? Yes/No

  What items does it sell? ____________________________

  When is it open? ________________________________

- Vans: Are food vans allowed on site? Yes/No

  What do they sell? ______________________________

(ii) Off-site

What alternative food facilities are there locally? Take aways, Shops, Public Houses
5. **Meal Selection**

The days menu and a sample of food choices will be monitored on the checklist. The average spend will also be noted.

Waste (observations)

Is there any compulsion to have food if not wanted?  
Yes/No

Layout of service counter/area.
6. **Kitchen**

Is the kitchen on or off-site?

Are the kitchen facilities adequate (observations stating specific inadequacies) for the food intended to be produced?

Are cooking and preparation practices good?

**Specifically:** Cook time of vegetables

Warm holding time of vegetables

Observations:
Comments on school lunchbreaks made by pupils at Bacon's School and Prendergast School during group discussions

1. First Year Pupils

   The dinners are nice.
   Not enough time at play time.
   The dinners are really cheap.
   There are not enough clubs at lunchtime.
   There are not enough tables in the dining hall.
   You get a lot of half days.
   The 4th, 5th and 6th years push in in the cold (food) queue.
   I think there should be more school activities.
   Stay inside and get better dinners.
   I would like to go out during school time.
   I would like to go to MacDonalds for lunch and to go out during the lunchtime.
   It's best to have a cafe (cash cafeteria) than sticking to the same thing all the time.
   I would like to go to the chip shop for dinner.
   I would like to have cafe (cash cafeteria) or to be able to go out at lunchtime.

2. Second Year Pupils

   I think we should be able to go out in the dinner hour.
   We should be able to have a canteen (cash cafeteria) or be able to go out in the dinner hour to get a dinner of our choice.
   I think we should have more of a choice and a canteen (cash cafeteria should be introduced.
   I think the dinner system should be improved and more clubs introduced that people would enjoy.
   We should not have a set menu and have more variety every day.
   When you go over last there's nothing left that you like.
I think that when you go home to dinners it's warmer and if you forget to do homework you can copy it up indoors.

There's a variety of food but always with chips.

I think that the food should be put away properly and they should make sure the plates are clean.

I think that the food should be kept warm and should be cooked thoroughly.

I think the food should not be brought out the next day if we don't eat it.

I think that pupils should not be able to handle the food to feel what it is like, it should be put on their plate by a cook.

I think that there should be a certain amount of food for each group that goes over so that every group has a reasonable choice of food.

I think that they should not have chips every day, but to have different things.

3. Fifth Year Pupils

Not enough time to eat dinners

We need a shelter because we have to stand in the rain when it's not raining hard enough (to be called in)

We need to get out at dinner time because we are stuck in the building all the morning and afternoon. Also we need a common room to go to

There should be three separate sittings in the dining hall of 1st, 4th and 5th years. And tables and chairs should be cleaned between sittings. It's too crowded at lunchtimes

We should have hot drinks in Winter

Variety in dinner

We need a large meal with variety, which needs to be hot and hygienic

The food should be hot and soups should be served during winter

I think the cafeteria system should be allowed because you ask for what you want, and you can make up your own mind and you don't have to pay for stuff you don't want

We want hot, substantial meals which fill us up, and things we like, not stuff we don't.
TESTS TO DETERMINE THE EFFECT OF DIFFERENT SALT CONCENTRATIONS (1% & 10%) UPON THE EVAPORATION OF WATER FROM GRUEL

1. Method

A standard gruel mix was made up with 69% water and 16% oats (by weight) and was boiled for five minutes.

Gruel was then placed into two foils of weight 6.3 grams and salt was added to produce 10% and 1% concentrations.

90 gms gruel + 10 gms salt + 6.3 gms foil + 50 gms lid = 111.3 gms
99 gms gruel + 1 gm salt + 6.3 gms foil + 50 gms lid = 111.4 gms

Lids with 1 mm diameter holes were then placed on the foils which were then closed.

The samples were placed in an oven at 200°F (93.5°C) and cold weights over time were monitored and recorded.

2. Results

The results of two tests carried out as above are shown in Tables A and B and in Figures A and B.

3. Conclusions

Figures A and B illustrate a consistent trend in both tests. The gruel samples containing 10% salt lose water through evaporation at a much slower rate than the samples containing 1% salt. In both tests the difference between the gradients of the two lines joining the gruel weight over time is approximately 0.5.

It is reasonable to conclude, therefore, that the addition of a high concentration of salt (10%), which is more than is required for purely preservative purposes, helps to inhibit the water loss from the gruel. This is a very useful property for the purposes of the Meals-on-Wheels testing programme.
### TABLE A

**Test 1:**

<table>
<thead>
<tr>
<th>Heating Time (hrs)</th>
<th>Cold Weight (gms)</th>
<th>Net Cold Weight (gms)</th>
<th>Weight Loss (gms)</th>
<th>Cum. Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>107.1 106.3</td>
<td>95.8 94.9</td>
<td>4.2 5.1</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>100.0 97.4</td>
<td>88.7 86.0</td>
<td>7.1 8.9</td>
<td>11.3 14.0</td>
</tr>
<tr>
<td>6.0</td>
<td>97.2 94.6</td>
<td>85.9 83.2</td>
<td>2.8 2.8</td>
<td>14.1 16.8</td>
</tr>
<tr>
<td>7.5</td>
<td>93.2 89.3</td>
<td>81.9 77.9</td>
<td>4.0 5.3</td>
<td>18.1 22.1</td>
</tr>
<tr>
<td>9.5</td>
<td>89.4 84.4</td>
<td>78.1 73.0</td>
<td>3.8 4.9</td>
<td>21.9 27.0</td>
</tr>
<tr>
<td>11.0</td>
<td>85.8 80.3</td>
<td>74.5 68.9</td>
<td>3.6 4.1</td>
<td>25.5 31.1</td>
</tr>
<tr>
<td>12.0</td>
<td>82.9 77.0</td>
<td>71.6 65.4</td>
<td>2.9 2.7</td>
<td>28.4 33.8</td>
</tr>
</tbody>
</table>

### TABLE B

**Test 2:**

<table>
<thead>
<tr>
<th>Heating Time (hrs)</th>
<th>Cold Weight (gms)</th>
<th>Net Cold Weight (gms)</th>
<th>Weight Loss (gms)</th>
<th>Cum. Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>108.0 107.1</td>
<td>96.9 96.0</td>
<td>3.1 4.0</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>104.2 102.4</td>
<td>93.1 91.4</td>
<td>3.8 4.6</td>
<td>10.0 8.6</td>
</tr>
<tr>
<td>4.5</td>
<td>101.1 98.6</td>
<td>90.0 87.6</td>
<td>3.1 3.8</td>
<td>10.0 12.4</td>
</tr>
<tr>
<td>5.5</td>
<td>98.9 95.9</td>
<td>87.8 84.9</td>
<td>2.2 2.7</td>
<td>12.2 15.1</td>
</tr>
<tr>
<td>6.5</td>
<td>97.2 93.7</td>
<td>86.1 82.7</td>
<td>1.7 2.2</td>
<td>13.9 17.3</td>
</tr>
<tr>
<td>9.0</td>
<td>91.5 86.6</td>
<td>80.4 75.6</td>
<td>5.7 7.1</td>
<td>19.6 24.4</td>
</tr>
</tbody>
</table>
Test 1. Weight-loss (%) of 100 gram gruel meals with different salt concentrations (1% & 10%) when re-heated
Test 2. Weight-loss (%) of 100 gram gruel meals with different salt concentrations (1% & 10%) when re-heated.
## SAMPLE OF SCHOOLS

<table>
<thead>
<tr>
<th>No.</th>
<th>School</th>
<th>Address/Telephone No.</th>
<th>Head Teacher</th>
<th>Div.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Acland Burghley</td>
<td>Burghley Road, NW5</td>
<td>D.M. Kelly</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 485 8515 / O1 485 5266</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 5</td>
<td>Bacons</td>
<td>Delaford Road, SE16</td>
<td>W.D. Ing</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 237 5243</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Battersea County</td>
<td>Culvert Road (Battersea Park Rd)</td>
<td>W. Deakin</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SW11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 622 0026</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Beaufoy</td>
<td>Lollard Street, SE11</td>
<td>E.S.J. Riches</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 735 3105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Blackheath Bluecoat</td>
<td>Old Dover Road, SE3</td>
<td>Miss S.M. Houlston</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 858 8221/4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Clapham College</td>
<td>Malwood Road, SW12</td>
<td>M. Gleeson</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 673 7122</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Camden School for Girls</td>
<td>Sandall Road, NW5</td>
<td>Mrs. C.M. Handley</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 485 3414</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Cardinal Pole R.C.</td>
<td>Kenworthy Road, E9</td>
<td>Miss J.F. Lowe</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 985 5150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Central Foundation Boys</td>
<td>Cowper Street (City Rd) F22</td>
<td>T.A.T. Barnes</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 253 3741</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 29</td>
<td>Walsingham</td>
<td>Clapham Common West Side SW4'</td>
<td>Mrs. A. Wilson</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1-223-7573</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Convent of the Holy Family</td>
<td>91 Tooting High Street, SW17</td>
<td>Miss F.G. Shine</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1-672-1043</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Sir Walter St. Johns</td>
<td>Battersea High St. SW11</td>
<td>J.J. O'Brien</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1-223-93556</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Furzedown</td>
<td>Welham Road SW17</td>
<td>J.R. Phillips</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1-769-4531</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Elliot</td>
<td>Fulman Garden SW15</td>
<td>Mr Burgess</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1-784-3421 or O1-789-8280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Ensham</td>
<td>Francis Road (Mitchan Rd) SW17</td>
<td>Mrs I M Wild</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 672 6626</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>George Greens</td>
<td>80 Manchester Road, E11</td>
<td>J.B. Wilkinson</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 987 6032</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Haberdashers Askes Boys</td>
<td>Pepys Road, SE14</td>
<td>G.J. Walker</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O1 639 0470</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Already used for pilots
* Reorganised
<table>
<thead>
<tr>
<th>No.</th>
<th>School</th>
<th>Address/Telephone No.</th>
<th>Head Teacher</th>
<th>Div.</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>Hackney Free and Parochial</td>
<td>Paragon Road, E9 01 985 2430</td>
<td>B. Aspey</td>
<td>4</td>
</tr>
<tr>
<td>56</td>
<td>Hampstead</td>
<td>Westbere Road, NW2 01 794 8133</td>
<td>E.F. Field</td>
<td>2</td>
</tr>
<tr>
<td>59</td>
<td>Highbury Grove</td>
<td>Highbury New Park, N5 01 226 7993</td>
<td>L.J. Norcross</td>
<td>3</td>
</tr>
<tr>
<td>*62</td>
<td>Isaac Newton</td>
<td>Wornington Road, W10 01 959 3982</td>
<td>R.J. Hawken (acting)</td>
<td>1</td>
</tr>
<tr>
<td>65</td>
<td>Kennington</td>
<td>Cormont Road (Hyatts Fields) SE5 01 274 1666</td>
<td>I.B. Morgan</td>
<td>9</td>
</tr>
<tr>
<td>68</td>
<td>La Retraite High</td>
<td>Atkins Road (Cavendish Rd) SM12 01 673 5644/6</td>
<td>Miss E. Healy (Sister Eileen)</td>
<td>9</td>
</tr>
<tr>
<td>71</td>
<td>Lady Margaret</td>
<td>Parsons Green, SW6 01 736 7138</td>
<td>Mrs. R.A. Cairns</td>
<td>1</td>
</tr>
<tr>
<td>74</td>
<td>London Nautical</td>
<td>61 Stamford Street SE1 01 928 6601</td>
<td>P.J. Hobson</td>
<td>8</td>
</tr>
<tr>
<td>77</td>
<td>Mayfield</td>
<td>Westhill SW15 01 870 7391</td>
<td>Mrs. P. Molnar</td>
<td>10</td>
</tr>
<tr>
<td>80</td>
<td>John Roan</td>
<td>Maze Hill, SE3 01 858 8981</td>
<td>Dr.A.J.Taylor</td>
<td>6</td>
</tr>
<tr>
<td>83</td>
<td>Geoffrey Chaucer</td>
<td>Harper Road, SE1 01 407 6877</td>
<td>M.P.B. Read</td>
<td>8</td>
</tr>
<tr>
<td>86</td>
<td>Our Lady's Convent High</td>
<td>Anshurst Park (Stamford Hill) N16 01 800 2158</td>
<td>Ms. M.M. Murdoch (Sister John)</td>
<td>4</td>
</tr>
<tr>
<td>*89</td>
<td>Peckham</td>
<td>Peckham Road, SE15 01 703 4417</td>
<td>Miss V.I.Thompson</td>
<td>8</td>
</tr>
<tr>
<td>92</td>
<td>George Orwell</td>
<td>Turle Road, N4 01 253 1465</td>
<td>Mrs. H.M. Dance</td>
<td>3</td>
</tr>
<tr>
<td>95</td>
<td>Roger Marwood</td>
<td>Kilsomie Road, SE23 01 291 1250</td>
<td>B. Morgan</td>
<td>7</td>
</tr>
<tr>
<td>98</td>
<td>St. Aloysius College</td>
<td>Hornsea Lane (Highgate) N6 01 263 1391</td>
<td>Rev.D.Fitzpatrick (Brother Claude)</td>
<td>3</td>
</tr>
<tr>
<td>104</td>
<td>St. Joseph's Academy</td>
<td>Lee Terrace, SE3 01 852 7433</td>
<td>Rev.Bro. John Swift</td>
<td>7</td>
</tr>
<tr>
<td>107</td>
<td>St. Marylebone</td>
<td>64 Marylebone High Street, W1 01 935 4704</td>
<td>A.J.C. Stevenson</td>
<td>2</td>
</tr>
<tr>
<td>No.</td>
<td>School</td>
<td>Address/Telephone No.</td>
<td>Head Teacher</td>
<td>Div.</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>110</td>
<td>St. Paul's Way</td>
<td>Shelmerdine Close, E3 01 987 1881/5</td>
<td>M. Bannister</td>
<td>5</td>
</tr>
<tr>
<td>113</td>
<td>St. Theresa's</td>
<td>Belmont Hill, SE13 01 852 9416</td>
<td>Miss M.M. Dobbin <em>(Sister Margaret)</em></td>
<td>7</td>
</tr>
<tr>
<td>116</td>
<td>St. Thomas the Apostle</td>
<td>St. Mary's Road, SE15 01 639 0106</td>
<td>W. Uden</td>
<td>8</td>
</tr>
<tr>
<td>119</td>
<td>St. William of York</td>
<td>Clifford Street, N1 01 607 4157</td>
<td>P.A. Martin</td>
<td>3</td>
</tr>
<tr>
<td>122</td>
<td>Sedghehill</td>
<td>Sedghehill Road, SE6 01 698 8911</td>
<td>N. Davies</td>
<td>7</td>
</tr>
<tr>
<td>*125</td>
<td>Silverthorne</td>
<td>amalgamated to Peckham</td>
<td></td>
<td></td>
</tr>
<tr>
<td>128</td>
<td>Skinners Company</td>
<td>117 Stamford Hill, N16 01 800 7411</td>
<td>Miss P.M.Y. Edwards</td>
<td>4</td>
</tr>
<tr>
<td>*131</td>
<td>Hurlingham Chelsea</td>
<td>Peterborough Road, SW6 01 731 2581/4</td>
<td>Mrs. R.K. Clarke</td>
<td>1</td>
</tr>
<tr>
<td>134</td>
<td>Stepney Green</td>
<td>Ben Johnson Road, El 01 790 6361/2</td>
<td>J. Taylor</td>
<td>5</td>
</tr>
<tr>
<td>*137</td>
<td>Thomas Calton</td>
<td>amalgamated to Peckham</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*140</td>
<td>Upton House</td>
<td>amalgamated into Homerton House School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>Wandsworth</td>
<td>Sutherland Grove, SW18 01 788 4253</td>
<td>A.J. Smetham</td>
<td>10</td>
</tr>
<tr>
<td>*146</td>
<td>Woodbury Down</td>
<td>reorganised</td>
<td></td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>John Griffiths R.C.</td>
<td>Princes Way, SW19 01 788 8142</td>
<td>J. Hughes</td>
<td>10</td>
</tr>
<tr>
<td>152</td>
<td>Quintin Kynaston</td>
<td>Marlborough Hill, NW8 01 722 8141</td>
<td>P.J. Mitchell</td>
<td>2</td>
</tr>
<tr>
<td>155</td>
<td>Priory Park</td>
<td>Priory Grove, Lansdowne Way SW8 01 622 3014</td>
<td>Miss S.A. Keefe</td>
<td>9</td>
</tr>
<tr>
<td>158</td>
<td>Sir John Cass and Redcoat</td>
<td>Stepney Way (Walter Terrace) 01 790 6712</td>
<td>Miss J.M. Hayes</td>
<td>5</td>
</tr>
<tr>
<td>161</td>
<td>Notre Dame High</td>
<td>8 Battersea Park Road, SW8 01 720 5493</td>
<td>Miss P. Doherty <em>(Sister Philomena)</em></td>
<td>10</td>
</tr>
<tr>
<td>164</td>
<td>Archbishop Michael Ramsey</td>
<td>Westhill Road, SE5 01 701 4166</td>
<td>Mrs. S. Hase</td>
<td>8</td>
</tr>
</tbody>
</table>
Temperature at which certain foods are to be kept. 27 (i) The provisions of this regulation shall apply to all food consisting of meat, fish, gravy or imitation cream, or prepared from or containing any of those substances or any egg or milk ....

(3) Subject to the provisions of this regulation, food which has been cooked or partly cooked at any such food premises and food such as is mentioned in the last preceding paragraph, shall either be kept at a temperature of not less than 145°F (62.8°C) until it is required for serving for immediate consumption, or if the temperature is brought or allowed to fall below 145°F (62.8°C) be cooled to a temperature below 50°F (10°C) under hygienic conditions as quickly as is reasonably practicable, and thereafter kept below 50°F (10°C) until it is required for serving, or is further cooked or is reheated for service.
PUPIL QUESTIONNAIRE - 2ND DRAFT

1. School Name .......................... 1-3
2. Age .... years .......................... 4-5
3. Sex ..........................
   Boy .......................... 1 6
   Girl .......................... 2

4. Are there any foods that you cannot or are not allowed to eat?
   All meat .......................... 7
   All meat except hallal meat .... 2
   Pork only .......................... 3
   Eggs .......................... 4
   Milk .......................... 5
   All meat except kosher meat .... 6
   Any other foods - specify ....... 9

5. Why are you unable to eat these foods?
   They make me sick/ill .......................... 8
   Because of my religion (I am not allowed to) .... 2
<table>
<thead>
<tr>
<th>Question</th>
<th>Responses</th>
<th>Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. What did you do during lunchtime yesterday?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>studied/homework</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>&quot;messed around&quot;</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>lunchtime club activity</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>had lunch</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>went outside school</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>reading</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>something else - what?</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. What do you think is the most important thing for you to do at lunchtime?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>study/finish homework</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>&quot;mess around&quot;</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>just relax</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>get out of school (if allowed)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>lunchtime club activity</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>have lunch</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>something else - what?</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Where did you get your lunch from yesterday?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>home (packed lunch, etc)</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>school canteen</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>shop (outside school)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>chip shop/take-away</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>somewhere else - where?</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
9. **Why did you get it there?**

<table>
<thead>
<tr>
<th>Response</th>
<th>Column</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

10. **Do your parents influence your choice of what/where you eat at lunchtime?**

How do they influence you?

- by the amount of money they give me
- by telling me where I must eat
- they don't influence me at all
- they influence me in some other way - what?

<table>
<thead>
<tr>
<th>Response</th>
<th>Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

11. **Where would your parents prefer you to get your lunchtime food from?**

<table>
<thead>
<tr>
<th>Response</th>
<th>Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>chip shop/take-away</td>
<td>1</td>
</tr>
<tr>
<td>home</td>
<td>2</td>
</tr>
<tr>
<td>school canteen</td>
<td>3</td>
</tr>
<tr>
<td>shop</td>
<td>4</td>
</tr>
<tr>
<td>they don't mind</td>
<td>5</td>
</tr>
</tbody>
</table>

12. **From your experience, which type of school canteen do you prefer?**

<table>
<thead>
<tr>
<th>Response</th>
<th>Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>traditional meal service</td>
<td>1</td>
</tr>
<tr>
<td>cash cafeteria</td>
<td>2</td>
</tr>
<tr>
<td>don't mind</td>
<td>3</td>
</tr>
</tbody>
</table>
Read each of the following statements about school lunchbreaks and then tick (✓) the most appropriate response according to whether you agree or disagree with the statement.

For example:

- I like to play football at lunchtime

This means that you do not agree with the statement and therefore do not like to play football at lunchtime.

Now consider the following statements:

1. We should be allowed out of the school grounds during lunchtime

   Strongly Agree  Don't Dis- Strongly Agree
   Agree         Care       Agree         Disagree
   1             2          3            4            5

2. You get better value for money with school meals than at the chip shop

   5             4          3            2            1

3. It is bad having a classroom as a dining room

   1             2          3            4            5

4. There is a better variety of food to choose from outside school

   1             2          3            4            5

5. School meals are good value for money

   5             4          3            2            1

6. I prefer school chips to french fries (like at MacDonal's)

   5             4          3            2            1

7. It is good having a set meal

   5             4          3            2            1
<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don't Agree</th>
<th>Care</th>
<th>Strongly Disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>School food is often too greasy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>9</td>
<td>School meals usually look good to eat</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
<td>It is best to have a wide choice of different meals at lunchtime</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>11</td>
<td>I like to spend my lunchtime in the school dining room</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>12</td>
<td>School meals don't provide enough variety</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>13</td>
<td>School meals fill me up</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>14</td>
<td>Meals at school are usually hot</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>15</td>
<td>I can relax in the school canteen</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>16</td>
<td>We get hairs and things in school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>17</td>
<td>Dinner ladies tell us off if we complain</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>18</td>
<td>I would rather save my money than have school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td>19</td>
<td>The most important thing at lunchtime is to eat</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>20</td>
<td>I don't like to eat school meals because I am dieting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Don't Care</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>------------</td>
<td>-------</td>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>21.</td>
<td>It is not worth going outside school to get lunch</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>I think the dinner ladies care about our food and what we eat</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>We have to queue up too long for school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>It is worth paying more for food outside school</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>School meat is all gristley</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>It is boring in the dining room</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>I like to stay indoors at lunchtime because it is warm</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>It is too noisy in the dining room</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>I would much prefer to buy my lunch at MacDonalds even though it costs more</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>It is boring in school at lunchtime</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>The dinner ladies are nice and kind</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Cash cafeterias are good because you can choose what you like</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>The school dining room is cramped</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Don't Care</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>We have chips too often with school meals</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>35.</td>
<td>I like to be able to buy fresh fruit at lunchtime</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>36.</td>
<td>There are not enough tables in the dining room</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>37.</td>
<td>The dinner ladies moan too much</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>38.</td>
<td>The cutlery is usually dirty and that puts me off school meals</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>39.</td>
<td>I'd rather have packed lunches from home because you can choose what you want</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>40.</td>
<td>It is like a prison camp at lunchtime with the teachers watching all the time</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>41.</td>
<td>People keep touching the food</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>42.</td>
<td>I just want to be inside at lunchtime</td>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>43.</td>
<td>The cutlery is always clean and hygienic</td>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>44.</td>
<td>I don't like carrying packed lunches to school</td>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>45.</td>
<td>Cash cafeterias are good because you can spend as much as you like in them</td>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Question</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Don't Care</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>------------</td>
<td>----------</td>
<td>-------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. I like to spend lunchtime in the library</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. With school meals you get more fat than meat</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. With a cash cafeteria in the school I am not so keen to eat in other places</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. I'd rather not eat than have school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Lunchtime is for relaxing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. If you're last in the queue then all you get is the leftovers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. School meals are good when we have chips</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. With school meals everything is clean and hygienic</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. We are made to rush our school lunches</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. I spend most of my time picking out the hairs and nasty bits from the school lunch</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. It is more important for me to eat my lunch than finish off my homework</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. If you complain the dinner ladies get annoyed and shout at you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. The food in school is hotter than the food you can buy outside</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 8 -
<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>59.</td>
<td>There is nothing I like about school meals</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Don't care</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td></td>
</tr>
<tr>
<td>60.</td>
<td>I'd rather have &quot;pot noodles&quot; than a school lunch</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>74</td>
</tr>
<tr>
<td>61.</td>
<td>It's too much bother to make packed lunches in the morning</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>75</td>
</tr>
<tr>
<td>62.</td>
<td>My mum likes me to have school meals so she knows I've had something to eat during the day</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>76</td>
</tr>
<tr>
<td>63.</td>
<td>With the cash cafeteria you get the same lot of stuff every day so it's boring</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>77</td>
</tr>
<tr>
<td>64.</td>
<td>The dinner ladies are really nice</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>78</td>
</tr>
<tr>
<td>65.</td>
<td>My mum and dad think school meals are good and nourishing</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>79</td>
</tr>
<tr>
<td>66.</td>
<td>I don't think the cooks know what they are doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>67.</td>
<td>I have school meals because my mum and dad like me to</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>81</td>
</tr>
<tr>
<td>68.</td>
<td>We don't get enough time to eat our school lunch</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>82</td>
</tr>
<tr>
<td>69.</td>
<td>Lunch is much cheaper at school</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>83</td>
</tr>
</tbody>
</table>
ILEA SCHOOL MEALS SURVEY 1983 - PUPIL SURVEY

Please read all parts of the following questionnaire carefully. If there is anything you do not understand, or you find confusing, PLEASE ASK.

To answer each question tick (✓) the box alongside the answer you wish to give.

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>COLUMN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. ● Name of School .................................... 1-3

2. Your AGE (years) ........................................ 4-5

3. Your SEX  Boy 1  Girl 2

4. ● Are there any foods that you cannot or are not allowed to eat? (You may tick more than one box)

   - I can eat all foods 0
   - I do not eat any meat 1
   - I do not eat any meat except Halal meat 2
   - I do not eat pork 3
   - I do not eat eggs 4
   - I do not drink milk 5
   - I do not eat any meat except Kosher meat 6
   - I do not eat beef (meat from the cow) 7
   - Any other foods you can't eat? What are they? 8-9

-1-
5. Why are you unable to eat these foods?

- I can eat all these foods
- They make me sick/ill
- Because of my religion/beliefs (I am not allowed to)

6. What did you do during lunchtime yesterday?
(If today is Monday, what did you do during Friday lunchtime?)
(You may tick more than one box)

- studied/homework
- "messed around"
- lunchtime club activity
- had lunch
- went outside school
- reading
- something else - what?

7. What do you think is the most important thing for you to do at lunchtime?
(Tick ONE box only)

- study/finish homework
- "mess around"
- just relax
- get out of school (if allowed)
- lunchtime club activity
- have lunch
- something else - what?
8. • Where do you usually get your lunch from on school days?
   (Tick ONE box only)
   I don't usually have lunch 0
   I go home 1
   Packed lunch from home 2
   School canteen 3
   Sweet shop (outside school) 4
   Chip shop / Take away 5

9. • Where did you get your lunch from yesterday?
   (If today is Monday, where did you get your lunch from on Friday?)
   (Tick ONE box only)
   I didn't have any lunch 0
   I went home 1
   Packed lunch from home 2
   School canteen 3
   Shop (outside school) 4
   Chip shop / Take away 5

10. • Why did you get it there?
    (Tick ONE box only)
    I like the food 1
    I don't like the food in other places 2
    It is easier 3
    It is quicker 4
    It is cheaper 5
    It is free 6
    My mum likes me to 7
    There's a better variety 8
    Because of the weather 9
    Because we aren't allowed out 0
11. * Do your parents influence your choice of what or where you eat at lunchtime?  
How do they influence you?  

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>COLUMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>By the amount of money they give to me</td>
<td>1</td>
</tr>
<tr>
<td>By telling me where I must eat</td>
<td>2</td>
</tr>
<tr>
<td>They don't influence me at all</td>
<td>3</td>
</tr>
</tbody>
</table>

12. * Where do you think your parents prefer you to get your lunchtime food from?  
(Tick ONE box only)  

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>COLUMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chip shop / Take away</td>
<td>1</td>
</tr>
<tr>
<td>Home</td>
<td>2</td>
</tr>
<tr>
<td>School canteen</td>
<td>3</td>
</tr>
<tr>
<td>Shop</td>
<td>4</td>
</tr>
<tr>
<td>They don't mind</td>
<td>5</td>
</tr>
</tbody>
</table>

13. * From your experience, which type of school canteen do you prefer?  

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>COLUMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional meal service</td>
<td>1</td>
</tr>
<tr>
<td>Cash cafeteria</td>
<td>2</td>
</tr>
<tr>
<td>Don't mind</td>
<td>3</td>
</tr>
</tbody>
</table>
Read each of the following statements about school lunchbreaks and then tick (✓) the most appropriate response according to whether you agree or disagree with the statement.

FOR EXAMPLE:

<table>
<thead>
<tr>
<th>Strongly</th>
<th>Agree</th>
<th>Don't</th>
<th>Disagree</th>
<th>Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I like to play football at lunchtime

This means that you do not agree with the statement and therefore you do not like to play football at lunchtime.

NOW CONSIDER THE FOLLOWING STATEMENTS:

<table>
<thead>
<tr>
<th>Att.1</th>
<th>School meals usually look good to eat</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att.2</td>
<td>With school meals you get more fat than meat</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Att.3</td>
<td>School food is often too greasy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Att.4</td>
<td>I'd rather have packed lunch from home because you can choose what you want</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>Att.5</td>
<td>I think the dinner ladies care about our food and what we eat</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>Att.6</td>
<td>School meals fill me up</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>Att.7</td>
<td>Meals at school are usually hot</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>Att.8</td>
<td>We get hairs and things in school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Att.9</td>
<td>Dinner ladies tell us off if we complain</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>Att.10</td>
<td>I would rather save money than have school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>Att.11</td>
<td>The cutlery is always clean and hygienic</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Don't Care</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
<td>COLUMN</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>------------</td>
<td>----------</td>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Att.12</td>
<td>It is not worth going outside school to get lunch</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Att.13</td>
<td>School meat is all gristy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>Att.14</td>
<td>It is boring in the dining room</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>36</td>
</tr>
<tr>
<td>Att.15</td>
<td>The dinner ladies moan too much</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td>Att.16</td>
<td>It's like a prison camp at lunchtime with teachers watching all the time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>38</td>
</tr>
<tr>
<td>Att.17</td>
<td>People keep touching the food</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>Att.18</td>
<td>I spend most of my time picking out the hairs and nasty bits from the school lunch</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Att.19</td>
<td>If you complain the dinner ladies get annoyed and shout at you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>41</td>
</tr>
<tr>
<td>Att.20</td>
<td>The food in school is hotter than the food you can buy outside</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Att.21</td>
<td>I'd rather not eat than have school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>43</td>
</tr>
<tr>
<td>Att.22</td>
<td>If you're last in the queue then all you get is the leftovers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>44</td>
</tr>
<tr>
<td>Att.23</td>
<td>With school meals everything is clean and hygienic</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>Att.24</td>
<td>The dinner ladies are really nice</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>Att.25</td>
<td>School meals are good value for money</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>47</td>
</tr>
</tbody>
</table>

-6-
<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don't Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att.26 • I don't think the cooks know what they're doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Att.27 • There is nothing I like about school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Att.28 • We don't get enough time to eat our school lunch</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Att.29 • School meals don't provide enough variety</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Gen.1 • It is worth paying more for food outside school</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.2 • The most important thing at lunchtime is to eat</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.3 • I don't like to eat school meals because I am dieting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.4 • Cash cafeterias are good because you can choose what you like</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.5 • It's boring in school at lunchtime</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.6 • I like to stay indoors at lunchtime because it is warm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.7 • It's too noisy in the dining room</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.8 • We have to queue up too long for school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.9 • The school dining room is cramped</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.10 • We have chips too often with school meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Statement</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Don't Care</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>------------</td>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Gen.11 There are not enough tables in the dining room</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.12 I prefer school chips to french fries (like MacDonaladis)</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.13 It's good having a set meal</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.14 We should be allowed out of school grounds during lunchtime</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.15 You get better value for money with school meals than at the chip shop</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.16 It is bad having a classroom as a dining room</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.17 There's a better variety of food to choose from outside school</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.18 It's best to have a wide choice of different meals at lunchtime</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.19 I like to spend my lunchtime in the school dining room</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.20 School meals don't provide enough variety</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gen.21 I don't like carrying packed lunches to school</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.22 Cash cafeterias are good because you can spend as much as you like in them</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.23 It's too much bother to make packed lunches in the morning</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.24 My mum likes me to have school meals so she knows I've had something to eat during the day</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gen.25</td>
<td>With the cash cafeteria you get the same lot of stuff every day so it's boring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.26</td>
<td>We are made to rush our school lunches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.27</td>
<td>School meals are good when we have chips</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.28</td>
<td>Lunchtime is for relaxing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.29</td>
<td>It's more important for me to eat my lunch than finish my homework</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THANK YOU!