The Factors Influencing the Food Choice and Nutritional Status of Elderly People Living Freely on Merseyside

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A thesis submitted in partial fulfilment of the requirements of the Liverpool John Moores University for the degree of Doctor of Philosophy

September 2000

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ABSTRACT

Due to the growing number of elderly people and the gap in the existing knowledge about their dietary behaviour, the need for studies investigating food habits and nutritional status of this group is well recognised. A cross-sectional study using qualitative and quantitative methods was designed to investigate factors that influence the food choice and to assess the nutritional status of elderly people living freely on Merseyside.

Eighty elderly people, 39 men (mean age 73.9 years) and 41 women (mean age 74.7 years) were recruited randomly from the Family Practice Register. Respondents were divided into, younger elderly (65-74 years) and older elderly (75 years and over). Age and sex related influences on food choice and nutritional status were explored.

Taste was the most important factor of food choice for the whole group, followed by familiarity for older elderly and healthy choice for younger elderly people. Women exhibited greater nutritional awareness and knowledge than men and were the main decision-makers regarding dietary behaviour of the household. Food choice was least likely to be influenced by advertisement; the media however was quoted to be the most important source of nutritional information. Younger elderly respondents were seen to be more flexible to introducing dietary changes and the older elderly were more traditional in their dietary habits.

The mean reported energy intake of women (6.1 MJ) was significantly lower than that of men (7.3 MJ) (P= 0.000) and was well below the recommended levels of intake for elderly people. Men were more likely to under-report energy intake than women and the level of dietary under-reporting was significantly lower in older elderly than in younger elderly respondents (P=0.04). The levels of total dietary fat as a percentage of total energy (34.3%) were desirable, however the saturated fat intake of the group was higher than the recommended 13% of total energy intake. With more than 21% dietary energy contributed by sugars, the nutrient diluting effect of sugar was observed by a concomitant low intake of NSP and lower than recommended intakes of retinol equivalents, vitamin D, folate, iodine and selenium for all and calcium for women.

Based on the BMI (26.4 for men and 27.0 for women), although the majority of the respondents were overweight, the prevalence of obesity was low. Women had significantly higher percentage of body fat (23.6%) than men (9%) (P=0.000) and this was mainly due to propensity of peripheral fat deposition in women. Men had greater tendency to central fat deposition (mean waist circumference men 93.4 cm, women 89.2 cm). With a waist circumference of 96.3 cm younger elderly men were most vulnerable to health risks of central adiposity. Thirty five percent of the respondents had untreated hypertension and younger elderly men were more likely to suffer from mild hypertension than any other group.

The nutritional status of the elderly respondents was inadequate to provide required dietary energy and a number of essential nutrients. The group would however benefit from tailored dietary advice targeting younger and older elderly people. They would also benefit from increasing total dietary energy intake, regular monitoring of blood pressure and supplementation with folate and vitamin D.

Acknowledgements

I would like to thank my director of studies Dr Anne. M. Miller and my supervisors Dr Sheila M. Maxwell and Lindsey Dugdill for their supervision, support and guidance.

I would like to thank Liverpool John Moores University for providing the funds that made this research possible. I am also very thankful to all the people who took part in the study.

Finally I would like to thank my husband Dharminder, my daughter Natasha and my son Nanak-Daniel for their immense patience and support through the good and bad times.

For

Dharminder, Natasha and Nanak-Daniel

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CHAPTER 1

Introduction

1.1 Demographic trends

During the twentieth century in Britain, due to improvements in nutrition, sanitation and health care services more people are surviving to older ages and there are now more elderly people relatively and absolutely than ever before. People over the age of 65 years currently account for eighteen percent of the population (Office of National Statistics, 2000). This proportion is forecast to rise and by the year 2030, elderly people will account for one in four of the adult population (Department of Health, 1992). More women survive to live beyond the age of 85 years. This trend will continue and the number of women over the age of 85 years in the UK is predicted to rise from 0.68 million recorded in 1998 to 1.0 million in the year 2021 (Office of National Statistics, 2000). Although men are less likely to live beyond the age of 85 years, their number is also predicted to rise from 0.29 million recorded in 1998 to an estimated 0.57 million in 2021 (Office of National statistics, 2000). Therefore in the UK by the year 2021 there will be a great increase in number of people aged 85 years and over. It has also been documented that at present, fifty-percent of women over the age of 80 years are widows and live alone, elderly widowers on the other hand are more likely to be looked after and cared for by their families (Department of Health, 1992a).

The mid year population predicted by the Office of National Statistics (1996) showed that the number of people aged 65 years and over in the North West of England (comprising Merseyside, Lanchashire, Greater Manchester, Cheshire and South Cumbria) will have an overall increase of 19%, the pattern will however not be uniform across all age bands above the age of 65 years. In the Northwest of England (similar to the rest of England), the most dramatic increase will be in the over 85 years age group, which doubled in size between 1981 and 1994. This trend is predicted to continue and although the rate of growth is predicted to slow down by the year 2018, by then the number of people in this age group will have grown by 144 percent (The Regional Health Authority, 1995).

The main reasons for this increase in the elderly population are fall in birth rate and fall in death rates. The gradual decrease in death rate is mainly attributable to better childhood and adulthood health, control of infectious diseases and better health care and improved nutrition (O' Neill, 1996).

1.2 Life expectancy

Life expectancy for men increased from 69.2 years in 1974 to 73.8 years in 1993 and life expectancy for women increased from 75.5 years to 79.5 years over the same time period (Office of National Statistics, 1996). In 1991, in England and Wales the total expectation of life at 65-74 years was 14.2 years for men and 17.9 years for women, at the same time expectation of life without disability was 7.9 years for men and 9.8 years for women. Thus it seems that although life expectancy has increased, half of the extended period is spent with disability (Bone *et al.*, 1995). The expectancy of life for elderly people at the age of 65 years in the Northwest was however less than that of 65 years olds of England and Wales (The Regional Health Authority, 1998). Life expectancy has been shown to be affected by levels of deprivation (Kiri & Raleigh, 1999). In their study comparing life expectancy of people from different regions of England, Kiri and Raleigh (1999) found a significant negative correlation between longevity and deprivation, the association being stronger for men ($r= -0.74$, $p<0.001$) than women ($r= -0.52$, $p<0.001$). Liverpool, along with Manchester and inner city London was found to have highest deprivation index (7) and the lowest life expectancy. Due to shorter life expectancy, in 1996 in the Northwest sixty-three percent of all male and 42% of all female deaths in people aged 65 years and over occurred by the age of 80 years (Regional Health Authority, 1998). Although women are generally more likely to live to an age of 90 years, it has been suggested that they spend the extra years in a dependent state (Grimley Evans, 1997). Depending on age and health status, elderly people live in a wide range of settings. In the UK overall 95% of people over the age of 65 years live in their own homes, with only five percent living in institutions, but this number rises steeply above the age of 85 years (The Caroline Walker Trust, 1995).

1.3 Nutrition and ageing

Elderly people are a more diverse population group than any other. This is mainly because people age at different rates and have different life experiences. On the whole, as compared

to the young, elderly people are more likely to suffer from chronic diseases and marginal nutritional deficiencies. Ageing itself is associated with biological, physiological, psychological and social changes that can have a bearing on the nutritional status of elderly people.

1.3.1 Food intake and biological changes associated with ageing

Surveys and studies conducted over the past 3 decades have shown a fall in intake of most nutrients with advancing age (DoH, 1972; de Groot *et al.*, 1991; Finch *et al.*, 1998). This reduced nutrient intake can be due to a reduction in the total amount of food consumed by elderly people. Wurtman *et al.* (1988) compared dietary intakes of young adults and elderly people under identical clinical conditions. The subjects were given identical food and it was observed that elderly subjects significantly consumed less calories, carbohydrates and fat than younger subjects. It was also observed that the younger subjects obtained more calories from snacks than elderly subjects. This study highlighted a possible role of change in the homeostatic mechanisms with age that might have a bearing on the food intake.

It has been reported that elderly people are less sensitive to both internal and external environmental changes (Leal, 1984). Phillips *et al.* (1984) found that after being subjected to a period of dehydration, healthy elderly men had a reduced ability to experience sensation of thirst. They also reported that, compared with young healthy males, the elderly male subjects did not drink adequate amounts of liquid to restore their fluid balance. Similarly American researchers, (Roberts *et al.*, 1994) reported that elderly men did not adjust their food intake after periods of over or under-feeding. They found that after 21 days of over-feeding both younger and older men gained weight, however on reverting to normal eating pattern they further observed that although the younger men lost the excess weight gained, the elderly men did not. A similar indication of impaired regulatory ability was seen as a result of period of under-feeding, the younger subjects regained the weight lost during the study period but the elderly subjects did not. Regardless of the reasons, reduction in amount of food intake can lead to an increased risk of deficiencies of certain micronutrients (Lonergan *et al.*, 1975; Le Clerk & Thornbury, 1983) making nutrient density very important to maintain nutritional adequacy in elderly people (Steen, 1986). Elderly people often comment that food does not taste as it used to. This may be due to changes in sensory

perception with advancing age, and it may have a bearing on the amount and type of food eaten by the elderly.

1.3.1.1 Sense of taste

There are conflicting data on changes in sense of taste with age. Some studies have reported that the threshold sensitivity for taste stimuli increases with age (Murphy, 1986; Schiffman, 1986, Doty *et al.*, 1984). Steven *et al.* (1991) observed in their study that elderly people require twice as much salt in their soup to notice it. These findings did not support the findings of research carried out by Enns *et al.* (1979) who found no significant differences in perception of taste between young and elderly people. Reduction in sensory perception aside, some researchers have attributed the blunting of sense of taste to poor oral hygiene (Bartoshuk *et al.*, 1986), or to drugs such as pain killers and antidepressants commonly prescribed for elderly people (Schiffman, 1994).

1.3.1.2 Sense of smell

Perception of food is greatly influenced by the sense of smell of an individual, as it translates itself into an ability to detect food aromas. Stimulation of these aromas through sense of smell provides all the secretions (saliva, gastric juices etc) needed to eat, enjoy and digest food. Doty *et al.* (1984) tested the ability of subjects aged 5-99 years to detect and identify certain smells and aromas. They found that 60% of the subjects aged 60-80 years of age had major deficits in their sense of smell and this deficit increased to 80% above the age of 80 years.

1.3.1.3 Appearance of food

Clydesdale (1994) reported that elderly people rely heavily on visual cues to determine characteristics of food and an improvement in colour can result in greater acceptance of food. This might be due to the fact that appealing colours and textures could make food more appealing to an elderly person with poor appetite or failing vision.

1.3.2 Food intake and pathological factors associated with ageing

Anorexia among elderly people can be related to drugs and disease conditions. Patients suffering from dementia or Alzheimer's disease can refuse food due a number of reasons

including, inability to recognise foodstuff and reduction in sense of smell (Norberg & Athlin, 1989; Doty, 1991). Patients with Alzheimer's disease may also have reduced appetite due to reduced levels of plasma and brain neuropeptide Y and neuroepinephrine, both appetite stimulants (Mayeux & Schofield, 1994). Depression has been found to be the most common cause of weight loss among elderly people, both in the community (Thompson & Morris, 1991) and in institutional settings (Morley & Kraenzle, 1994). The mechanism behind anorexia in depression is not fully understood, however it was reported by Nemeroff *et al.* (1984) that it may be attributable to elevated levels of Corticotrophin- releasing hormone, which has been reported to be anorexigenic by Morley (1997). Eating problems are also common among patients who have suffered from stroke and include difficulties in performing the act of eating, dysphagia and loss of interest in food due to depression (Axelsson *et al.*, 1984). Cancer patients often suffer from anorexia and this may be due to difficulties in chewing, or loss of appetite as a side affect of drugs and chemotherapy.

Other acute and chronic diseases may similarly cause anorexia as a direct result of the disease or as a side affect of drugs and other treatments. Chronic diseases are common among the elderly and may lead to micro- and macro- nutrient deficiencies. Previously it was thought the under-nutrition was only related to diseases of the gastrointestinal tract, but Mowe and Bohmer (1991) found under-nutrition in all groups of diseases. This suggests that under-nutrition might not only be related to the effects of disease itself but also to the social situation of having a disease such as limited physical and social activity (Mowe and Bohmer 1996). Dyspepsia is extremely common in elderly people and is associated with loss of appetite and reduced food intake (Pound and Heading, 1995). Portnoi (1997) cited Helicobacter pylori (H pylori) as a common cause of dyspepsia and gastritis in elderly people. Tan *et al.* (1999) showed in their study that even after successful treatment of H pylori, less than 50% of patients with functional dyspepsia stopped acid-suppressive therapy. These findings were supported by Rhee *et al.* (1999). Reduction in number of endoscopies, reduction in dyspeptic symptoms and reduction in prescription of acid-secretory drugs was however reported in subjects aged under 40 years, treated for H pylori infection by Moayyedi *et al.* (1999).

Drug consumption increases with age because morbidity increases with age. In the National Diet and Nutrition Survey (NDNS) of elderly people aged 65 years and over, Bates *et al.* (1999a) reported that seventy-eight percent of people living in the community and ninety-

three percent of those living in institutions used medication. Drug consumption can have a bearing on the dietary intake and hence nutritional status. Thompson and Morris (1991) found that drugs were the cause of weight loss in 9% of ambulatory elderly people. Morley and Kraenzle (1994) reported that depending on the length of stay, drugs accounted for 4-20% of cases of weight loss among nursing home residents. Drugs can affect dietary intake and reduce appetite by altering taste and smell (Schiffman, 1997), and inducing nausea and vomiting (Carr-Lopez and Phillips, 1996).

1.3.3 Food intake and physiologic changes associated with ageing

1.3.3.1 Physical activity levels

Hanson *et al.* (1987) assessed dietary intake against different social variables, including physical activity. They found low physical activity to be an independent risk indicator of inadequate dietary habits. It is known that activity levels fall with increasing age, the reason for this is not fully understood. A survey of the activity levels of elderly people in Nottingham showed that the average reported daily time in active pursuits could be less than one hour and even lower for those aged over 75 years of age (Patrick *et al.*, 1986). Different explanations have been put forward for this fall in physical activity with age such as, changes in lifestyle, family structure and presence of chronic disease (Herne, 1995). Ageing is not only associated with reduction in levels of physical activity and indeed individuals with sedentary jobs, after retirement, can take up pursuits such as walking, rambling, cycling, gardening and swimming (Whitehead, 1992). Havlik (1991) reported that at all the older ages except perhaps the oldest women, there is usually a subgroup of about 25% that report exercising regularly.

It has been shown that elderly people benefit from regular exercise by enhancing general health (Powell *et al.*, 1987; Berlin and Colditz, 1990). Hanson *et al.* (1987) highlighted that increasing physical activity in free-living elderly people improved their dietary intake. Krondle *et al.* (1982) proposed that increased nutrient intake among physically active elderly might be due to the more varied diet consumed when a person is physically and socially active, Herne (1995) postulated that the increased consumption of food could be due to appetite stimulus of physical activity.

Physical activity contributes to better physical and psychological health at all ages (Royal College of Physicians, 1991). The COMA panel on nutrition of the elderly (DoH, 1992) emphasised that the current perceptions of value of physical activity for the elderly need to be changed and it needs to be recognised that physical activity is beneficial in promoting health and barring illness well into eighth decade of life.

1.3.3.2 Physical disability

Disability in older people leads to reduced intake of food and it has been suggested that elderly people reduce their calorific intake in response to reduced levels of physical activity associated with disability (Munro *et al.*, 1987). Most of the studies on nutritional status lack in information regarding the physical ability of the participants, which may account largely for the age-related reduction in dietary intake. This is usually due to problems associated with assessment of physical activity level. Immobility due to physical disability can also lead to imbalance of energy intake and expenditure, which can lead to accumulation of weight. Reducing energy intake to maintain weight to a level lower than that expended could lead to deficiency of important vitamins and minerals as energy expenditure can be quite low in majority of disabled elderly people.

1.3.4 Food intake social changes with ageing

Ageing brings with it social changes such as changes in friendship networks, reduced socialisation and changes in income levels, all of which can have a bearing on nutritional status. This is mainly because eating is not just a biological action; it also has social, cultural and symbolic meanings. McIntosh *et al.* (1989) assessed the relationship between social support and dietary intake in free-living elderly people. They found that people with a good friendship network had better appetites and nutrient intake than those with a poor friendship network. Rosenbloom and Whittington (1993) found that widowed women reported significantly less enjoyment in meals, had poorer appetites and more weight loss than married women. Pearson *et al.* (1998) compared the nutrient intake and nutritional status of European elderly people living alone and those living with a partner or spouse. They found that elderly women living alone had lower energy, carbohydrate and protein intakes and lower BMI, and elderly men living alone had significantly lower vitamin C intake than those living with partner or spouse.

1.3.5 Other age related changes

Ageing is associated with other changes, which may or may not be related to nutrient intake but may however have an important influence on the nutritional status of the elderly.

1.3.5.1 Immune system

There is a higher prevalence of acute and chronic diseases among elderly people than in any other group (Roebothan & Chandra, 1994). Infection among the elderly is a very common reason for referral to a physician and is the fourth most frequent cause of death in old age (Chandra, 1990; Berk & Smith, 1983). The high susceptibility to opportunistic infections may be due to poor nutritional status (Chandra, 1990; Morely, 1986) and a decline in immune function with age (Lesourd and Mazari, 1999). Roebothan and Chandra (1994) found that elderly subjects, who had a poor nutritional status at the time of hospital admission, responded most to nutritional supplementation. They observed an improvement in the serum levels of the deficient nutrients, which was also accompanied by an increase in T-lymphocytes. Similar findings were reported by Beisel (1982). However this is not true for all nutrients and different nutrients have different effects on the immune status of the elderly (Good & Lorenz, 1992). Roebothan and Chandra (1994) found zinc to be a nutrient of special interest in their study as supplementation with zinc improved serum levels of zinc in subjects deemed nutritionally deficient during the initial assessment, by a minimum of 80% and mean of 134%. In this subgroup, the percentage of lymphocytes represented by T-cells also displayed a greater rise during the supplementation period compared with those deficient in other nutrients, 15.9% compared with 11.9%.

Other studies have shown supplementation with zinc (Boukaiba *et al.*, 1993), vitamin B6 (Talbott *et al.*, 1987), or a combination of several nutrients (Penn *et al.*, 1991) to improve immune function of the elderly. Caution needs to be exercised while recommending supplements to healthy elderly as high doses of micronutrients such as zinc (Bogden *et al.*, 1990) and vitamin A (Fortes *et al.*, 1993) can have detrimental effects on their health.

1.3.5.2 Renal function

Decline in renal function with ageing is the most dramatic among all organ systems with the glomerular filtration rate of a healthy Octogenarian falling to only half or two thirds of that measured in young adults (Sato *et al.*, 1992). The age related changes in the function and

structure of the kidney are induced by the natural ageing process, and may also be accelerated by hypertension, dehydration and infections, all of which are more common among the elderly as compared to young people (Lindeman, 1990). Nutrient intake can have a considerable bearing on renal function and age related changes in the kidneys. In animal studies, limitation of the total energy intake was originally shown to delay the development of glomerular lesions (Tucker *et al.*, 1976). In humans dietary carbohydrates have little effect on the kidneys, whereas protein intake influences renal size, structure and function (Anderson and Brenner, 1986). Brenner *et al.* (1982) showed that a low protein diet led to a reduction in proteinuria and delayed age related glomerular sclerosis.

1.3.5.3 Endocrine function

The most important and spectacular changes of ageing on endocrine function are observed in sex hormones. This is especially true for women as changes in sex hormones with age can have significant effects on their nutritional requirements and nutritional status. These effects are mainly due to cessation of oestrogen secretion after menopause, which leads to atrophic changes in the genital tract, breast and skin. Osteoporosis is the most serious and important consequence of the menopause. McPherson *et al.* (1978) found that increase in serum levels of alkaline phosphatase, calcium and inorganic phosphate are all related with the menopause. In addition to these, Crilly and colleagues (1980) found increased urinary excretion of hydroxyproline in postmenopausal women. The importance of these findings for postmenopausal women is that these changes are mainly associated with bone loss, which is associated with oestrogen withdrawal and menopause. Thus as a result of cessation of oestrogen secretion, women experience increased bone loss, which can lead to post menopausal osteoporosis.

1.3.5.4 Changes in body composition

Cross-sectional studies have generally shown a marked decrease in average height with age, in such studies the decline in height seems to begin during the third decade of life (Khosla and Lowe, 1968; Trotter and Gleser, 1951). A percentage of the age-related decline in height could be attributable to a secular trend towards greater stature, which would produce a birth cohort effect. This is supported by evidence that the average height has been increasing over the past century (Holmgren, 1952). There is evidence to support that a part

of the recorded difference in height in the elderly of different cohorts is a result of an actual decrease in height with age (Borkan *et al.*, 1983; Miall *et al.*, 1967). This decline in height appears to begin slightly earlier in men than women but the rate of decline per year is less in men than in women. This higher rate of decline in height in women is consistent with the higher incidence of osteoporosis and its complications in elderly women (Herndon, 1986). Part of the reduction in height may also be due to postural changes, disk deterioration and spinal deformities such as kyphosis and scoliosis (Trotter and Gleser, 1951). The age related changes in height are of interest because height is not only an indicator of satisfactory nutritional status among growing children, but is also used to assess body mass index in adults and in elderly people, as lean body mass is a function of height.

Based on cross-sectional data, the adult years are also characterised by a slow fall in lean body mass (LBM). This fall in LBM takes place more rapidly in men and LBM in women is preserved until menopause (Forbes, 1994). This reduction in LBM with age is primarily due to muscle loss and additional loss of bone mineral in women (Mazess, 1982). There is evidence to support the fact that basal metabolic rate (BMR) falls with age. Fall in BMR is mainly attributable to fall in LBM with age (Whitehead, 1992). This fall in BMR due to reduction in LBM with age has important implications for working out the energy requirements of the elderly.

Another change in body composition accompanying ageing is redistribution of fat. In the elderly there is a greater deposition of fat in internal fat depots as opposed to subcutaneous depots (Durnin and Womersley, 1974). Lohman (1981) calculated from cross-sectional data, that when adjusted for total body fatness, women had proportionately less subcutaneous fat than men. He also found that elderly subjects of the same sex have less subcutaneous fat than their younger counterparts in proportion to their total fat mass.

It is now known that distribution of fat rather than general fatness is an important consideration in the relationship between obesity, metabolism and health (Després *et al.*, 1990). In the hypotheses linking body fat distribution to metabolic abnormalities, fat in the abdominal cavity plays a very important role and is a reliable predictor of cardiovascular disease (Perry *et al.*, 1997).

1.3.5.5 Vision and visual acuity

Sight threatening problems are common among elderly people, with cataract, age related macular degeneration and open angle glaucoma being most prevalent (Gibson *et al.*, 1985). The register for the blind in the UK shows that visual loss is age related, as a great majority of registrations are for people over the age of 65 years (Bron and Caird, 1997). Impairment of vision in old people is associated with poor quality of life (Branch *et al.*, 1989) and increased mortality (Thompson *et al.*, 1989). British researchers, Long *et al.* (1991) reported that in their study, 98% of the 202 elderly subjects who had their vision tested for the study wore distance or reading glasses, however twelve percent reported that their vision was not improved by glasses. Of the subjects who wore distance glasses, 17% did not have their glasses with them at the time of the test. Research into effect of deteriorating vision and visual acuity on nutritional status is lacking in elderly people. Problems associated with sight can have a huge influence on the nutritional status of elderly people. Impaired vision can affect an elderly person's ability to cook, get to the shops, shop for food and read labels and instructions.

1.4 Nutrition related diseases of the elderly

Ageing is associated with an increased incidence of acute and chronic diseases. Some of these diseases associated with ageing can be nutrition related and can be wholly or partly attributable to excess or deficiency of one or more nutrients. According to Dwyer *et al.* (1991), 85% of the elderly population have at least one chronic condition that could benefit from dietary intervention. Cardiovascular diseases (CVD) such as coronary artery disease and stroke; musculo-skeletal diseases such as arthritis and osteoporosis; neurodegenerative diseases such as memory loss and dementia; neuropsychiatric disorders such as depression; cancer of breast, stomach, prostate and colon; visual and hearing loss. All these chronic diseases associated with advancing age can have a bearing on the nutritional status.

1.4.1 Coronary artery disease

Coronary artery disease is a major cause of morbidity, disability and mortality among elderly people (Ettinger *et al.*, 1994), it is estimated that 40% of all deaths amongst the over 65 year olds can be attributed to coronary artery disease and stroke (Schaefer, 1995). It has been suggested that weight gain leading to an elderly person being classified as overweight

on the basis of BMI, may carry relatively little health risk (Andres *et al.*, 1985). However increased weight with increased waist circumference has been linked to cardiovascular risk factors common in old age, including elevated blood pressure and lipid abnormalities (Burack *et al.*, 1985). Elevated levels of low-density lipoproteins (LDL) and low levels of high density lipoproteins (HDL) are the major dyslipaemic factors associated with coronary artery disease (Castelli *et al.*, 1989). Total cholesterol, LDL cholesterol and triacylglycerols, all increase with age, thus contributing to an increased risk of coronary artery disease. Before menopause, women have a lower incidence of coronary artery disease, due to loss of the protective effect of HDL, after menopause women have the same incidence of coronary artery disease as men (Schaefer, 1994).

Dietary interventions focusing on weight reduction, reduction in saturated fat intake (American Heart Association, 1988) and increasing physical activity levels have been found to reduce risk factors for coronary artery disease (Fox *et al.*, 1996). Consumption of oily fish (rich in n-3 PUFA) lowers plasma triacyglcerols and improves HDL cholesterol levels, both of which offer protection against coronary artery disease (Mori *et al.*, 1999).

Thus encouraging older people to consume oily fish may play an important role in preventing morbidity and mortality from coronary artery disease and stroke (Department of Health, 1992).

1.4.2 Hypertension

In Western societies, blood pressure rises with age. It is not clear whether the increase in blood pressure with age is pathological or physiological. Although treating hypertension with drugs helps prevent stroke and coronary heart disease in young elderly, there may be no benefit of drug therapy for hypertension for the old elderly (Dahlöf *et al.*, 1991). Merlo *et al.* (1996) found that in elderly men with diastolic pressure > 90mm Hg, antihypertensive treatment was associated with a twofold increase in the incidence of ischaemic cardiac events. This increase however vanished after adjustment for potential confounders. They further found that in subjects with diastolic pressure </= 90 mm Hg, antihypertensive treatment was associated with a four-fold increase in the incidence of ischaemic cardiac events, which remained after adjustment for potential confounders. They thus concluded that antihypertensive treatment might actually increase the risk of myocardial infarction for elderly men with mild hypertension.

There is little disputation that blood pressure can be reduced by changes in diet and physical activity. Jones *et al.* (1999) showed weight loss to be an effective step towards lowering blood pressure in overweight subjects as excess body fat is a predominant cause of hypertension with added effects of dietary salt, alcohol and physical inactivity. It is now widely accepted that dietary changes which independently influence both atherosclerosis and hypertension are likely to be of greatest importance in helping to control morbidity and mortality from hypertensive cardiovascular disease (Beilin, 1989). These changes include low intake of saturates, energy intake balanced with energy expenditure to achieve or maintain optimal weight, diet low in salt and high in fruits, legumes, vegetables and whole grains. A modest increase in levels of physical activity (walking etc.), on average reduces blood pressure by two to four mm Hg (Margetts *et al.*, 1999). Bao *et al.* (1998) showed that incorporating a daily meal of oily fish lowers blood pressure in hypertensive overweight individuals. The dietary and lifestyle changes to control hypertension may be thus of a greater importance in lowering blood pressure in the elderly population because of high prevalence of overweight and cardiovascular disorders, reduced levels of physical activity and possible detrimental effects of antihypertensive drugs.

1.4.3 Age related bone loss

Bone mineral density is a predictor of osteoporotic fracture (Nguyen *et al.*, 1993) and depends on both the peak bone density achieved at skeletal maturity and subsequent bone loss related to age and menopause (Hui *et al.*, 1990). Although some bone loss is inevitable with age, the rate of loss is different for different sub- populations (Christiansen *et al.*, 1987). Cross-sectional studies show that there is increased bone loss with age (Steiger *et al.*, 1992; Hannan *et al.*, 1992), however these have not been able to measure the rate of loss of bone. A longitudinal study was undertaken by Jones *et al.* (1994) to study rates of change in bone density in elderly people to examine the relationship between life style factors and rate of change in bone density. They found that rate of bone loss at femoral neck (a common site for fracture among the elderly) increased in both sexes with advancing age. They also found that lifestyle factors had a modest effect on the rate of bone loss and body mass index was an important predictor of the rate of change at femoral neck, particularly in women. In postmenopausal women, body mass index, may also be an important predictor of oestrogen levels, which is largely produced by the adipose tissue. Jones *et al.* (1994) found

a negative interaction between age and dietary calcium, they found that those subjects with higher intakes of calcium had greater rates of bone loss. They attributed this to a selection bias whereby subjects at increased risk of osteoporosis may have increased their calcium intake.

Dawson *et al.* (1990) conducted a controlled intervention study and found that calcium supplementation was beneficial for bone health. Reid *et al.* (1995) found that calcium supplementation reduced the rate of annual bone loss by approximately 0.25% compared with rates of loss observed in untreated women. The positive effects of calcium supplementation were also not observed in women during early postmenopausal period when bone loss is rapid (O' Brien, 1998). This conflicting evidence on benefits of calcium supplementation on bone health can be due to differences in supplementation levels, baseline calcium intake, age and menopausal status of the study sample.

Besides calcium, supplementation with vitamin D can also have beneficial effects on bone health. Krall *et al.* (1989) found that vitamin D intakes above 220 IU/ day were found to maintain serum levels of 25-hydroxyvitamin D and prevent seasonal increases in parathyroid hormone in postmenopausal women. Therefore combined supplementation of calcium and vitamin D could provide greater benefits for bone health. Taken together, calcium and vitamin D not only provide an available substrate for mineralization, but also ensure that optimal levels are achieved so that the available calcium can be efficiently absorbed. Dawson *et al.* (1997) conducted a placebo controlled double blind study of 445 adult men and women over age of 65 years. They studied the effect of combined supplementation of calcium and vitamin D on various indicators of bone health. At the end of the three-year intervention period they found that in 82% of their subjects, supplementation had significantly positive effect on the change in bone mineral density of the femoral neck, spine and total body. They also observed that the cumulative fracture incidence of a first fracture at 3 years was 5.9% in the dual supplement group as compared to 12.9% in the placebo group. The incidence of osteoporotic fractures was significantly lower for the dual supplement group as compared to the placebo group. Thus the evidence seems to suggest that combined supplementation with vitamin D and calcium may be better for maintaining bone health of elderly people.

1.4.4 Overweight and obesity

The problem of obesity and overweight is a commoner finding amongst the elderly than being undernourished and underweight. The findings of the NDNS show 67% of men and 63% of elderly women living freely in the community, to be overweight or obese (Finch *et al.* 1998). Although underweight or poorly nourished elderly people are more prone to osteoporotic fractures (Tromp *et al.*, 2000), being overweight, apart from possible protection from osteoporosis for postmenopausal women, is associated with an increased incidence of hypertension, coronary heart disease and osteoarthritis. The evidence on the health risks of being an overweight elderly person however remains conflicting. According to an American prospective study by Tayback *et al.* (1990), of men and women aged 55-74 years, no additional health risk for women was attributable to being overweight, provided there was no other clinical condition associated with being overweight. Similar trends were observed for men. The researchers however found that low body weight (BMI < 22kg/ m^2) was associated with a substantial increase in mortality and morbidity. In addition to increased risk of chronic diseases, greater adiposity in elderly women is associated with lower everyday physical functioning, such as climbing stairs or other moderate activities, as well as lower feelings of well being and greater burden of pain (Coakley *et al.*, 1998). Similar research in older men is lacking.

Felson *et al.* (1992) found that weight change significantly affected the risk of development of knee osteoarthritis. They observed that a decrease in body mass index by 2 units or more over the 10-year period preceding examination, decreased the likelihood of developing osteoarthritis by over 50%. This was also the case for women who were at a high risk of suffering from osteoarthritis due to high BMI. They also found that weight gain increased the risk for osteoarthritis. A prospective study by Launer *et al.* (1994) highlighted the significance of weight stability in predicting disability in elderly women. In their study they found that women with a high past BMI had a twofold increase in total disability compared with women with low past BMI. They also found that high current BMI was as strongly related as past BMI, to the risk of disability in young elderly women (mean age 60 at baseline and mean age 65 at follow up) but it was not as strong a predictor in the old elderly women (mean age 76 at baseline and 80 at follow up). Weight loss of more than 5% in women in the old elderly group was associated with a twofold increase in risk of disability compared with weight stable women.

Fine *et al.* (1999) studied a cohort of 40098 American women aged 46-71 years to see the impact of weight change on functional health status. These women were grouped according to patterns of weight change over a four year period; women whose weight remained within 5 lbs. of their baseline weight, women who lost 5 lbs. or more and women who gained 5 lbs. or more. Weight gain was associated with decreased physical function and vitality and increased bodily pain regardless of baseline weight. Weight loss in overweight women was associated with improved physical function and vitality as well as decreased bodily pain. Weight change was more strongly associated with physical than mental health. The impact of weight change, especially weight gain, was as strong for women over 65 as in women under 65 years of age.

1.4.5 Bowel problems

Approximately 20% of elderly people in Britain suffer from constipation, which has been attributed to low intake of non-starch polysaccharides (NSP) (Cummings and Bingham, 1992). A low intake of NSP has also been linked to diverticular disease and bowel cancer in the elderly (Department of Health, 1992). The feeling of ill health associated with bowel disorders, especially constipation is very high due to these being refractory to treatment (Bowman *at al.*, 1992).

1.4.6 Self rated health

Self-rated health or self- perceived health is an independent predictor of mortality in older people (Bath, 1999). Although old age is associated with increased incidence of chronic diseases, elderly people usually have a positive perception of self- health. This may be explained on the basis that elderly people accept some deterioration of function as a part of normal process of ageing. Self-perceived health may however be influenced by other factors such as loneliness, contentment, type of dwelling and social support network (Berkman & Syme, 1979; Orth- Gomér & Johnson, 1987; Hanson *et al.*, 1989). In an epidemiological study of Swedish people aged 75 years and over, Lindgren *et al.* (1994) found that in their sample poor eyesight and hearing did not affect self-perceived health to a large extent. Mobility problems, discontentment, and disturbances of sleep however had major impact on self- perceived health.

1.5 Food choice

Food choice is defined as a set of conscious or unconscious decisions made by an individual at the point of purchase of food, at the point of its consumption or at any point between them (Herne, 1995).

Models of food choice vary widely and a model developed by Khan (1981) classifies factors influencing food choice into: personal, socio-economic, educational, biological, physiological, psychological, cultural, religious, intrinsic and extrinsic factors. These factors operate at different levels for different population groups.

Food choice in elderly people is often further complicated by age related changes such as reduced mobility, social support and increased disability. Food is not only something that is eaten to sustain life, but is also often seen as a vehicle for social comfort and thus can sometimes become a cause for anxiety and concern among the elderly (Walsh & Clark, 1997). There are only a handful of studies, which have looked at the factors that influence the food choice of healthy elderly people in the UK (Walsh and Clark, 1997; Bilderbeck *et al*, 1981; Howarth, 1993, Lilley and Johnson, 1996).

1.5.1 Shopping and food availability

Access to food outlets and getting to and from the shops may pose a special challenge for the elderly. Almost one in six people aged 65-74 years and nearly two in five of those aged 75 years and over have difficulty getting out and about on their own (OPCS, 1994). Musculo-skeletal disorders of weight-bearing joints may make it difficult for older people to get to and from the shops and arthritis of the small bones of hands may reduce their ability to open jars or screw top bottles. Five percent of men and 14% of women aged 65 years and over have difficulties opening bottles and jars (OPCS, 1994). This may have implications for nutrients derived from foods packaged in bottles, cans and jars such as oily fish, milk, fruit juice etc. which may thus become inaccessible to the elderly people. Arthritis in the hands may also make it difficult for elderly people to carry heavy shopping bags, elderly shoppers may end up buying little and often, thus missing out on benefits of bulk buying as special offers are usually on items bought in bulk.

Getting to and from the shops can be quite a challenge for the elderly and can be affected by lack of means of transport, poor social support and presence of disability. Other factors affecting the shopping decisions of an elderly person include, price and storage space

available. Study by Walsh and Clark (1997), showed that elderly people living in the community in Leeds with or without personal means of transport used a range of shops and supermarkets to buy food. A poor view of local shops was held by the study participants, who described them as being over priced. Cooking skills can have a very important bearing on food choice and people with poor cooking skills are more likely to buy ready made or convenience foods. Lack of cooking skills are more common among men than women, but despite having better cooking skills than men, elderly women living alone may be more vulnerable to nutritional deficiencies than men because of greater incidence of social isolation among widows (DoH, 1992a).

Depression and loneliness following the loss of a life long marriage partner and a meal time companion can have detrimental affect on motivation to cook and shop for food (Howarth, 1993). In her study of widowed elderly people of North London, Howarth found that both women and men attempted to maintain continuity of food consumption after the death of a partner. Women however had the added advantage of having cooking skills whereas men tended to rely on convenience food and agencies such as lunch clubs.

1.5.2 Income and cost

Access to resources in old age is pre-eminently a life course issue and the amount available at retirement is closely related to income during working life (Wilson, 1993). Income levels are not the same for all retired people and hence price of food can have a bearing on food purchased by the elderly. There is a dearth of specific studies looking at the relationship between income, cost and food choice among the elderly. Bilderbeck *et al.* (1981) studied the food habits of 100 elderly people living in Surrey. They found that price of food had a very important bearing on food choice of the elderly and was the greatest consideration for a third of their elderly respondents. Walsh and Clark (1997) also reported that elderly respondents living in Leeds reported having to choose food wisely and cautiously by noting prices and trying to get the best value for money. They however do not clarify that how much of this behaviour was age related.

1.5.3 Meals provided by others

Meals may be provided by external agencies and various organisations and schemes for the elderly. Elderly people who have a meal delivered to their house generally prefer it to be hot

and usually choose it for a main meal. Tilston *et al.* (1992) found that only 1% of the elderly people in their study preferred the meal to be their evening meal and that most of the participants of their study preferred it to be the mid- day meal. Tilston *et al.* (1992) found that elderly recipients of meals on wheels in Leicester were generally satisfied with their meals, but portion sizes were considered to be too big and subjects were generally unhappy about the way their potatoes were cooked. Although there is sketchy data on meals provided by external agencies, data on meals provided by family and friends for elderly people are lacking.

1.5.4 Eating out

The practice of eating outside the home is very common among younger age groups. The National Food Survey (Ministry of Agriculture Fisheries and Food, 1997) found that among all age groups, older people had the lowest expenditure on food consumed outside the home. The survey also revealed that the most money spent on meals and snacks eaten outside the home was spent by middle-aged people (45- 54 years). This age group is essentially the next generation of elderly people. Thus the finding of low expenditure on food consumed outside the house may be a cohort effect of the elderly of the present time. If the current trends continue, the next generation of elderly people may be eating out more regularly than the elderly of the present. There is lack of research on factors that influence the eating out behaviours of the elderly. Howarth (1993) commented that eating out, including going to luncheon clubs and eating with family and friends allows elderly people to be more involved in the social element of eating and hence may have a beneficial effect on their appetite and hence nutritional status.

1.5.5 Nutritional knowledge and attitudes

The level of nutritional knowledge in any population group depends upon a number of factors such as age, access, education, economic status etc. It is generally believed that nutritional knowledge of the elderly is poorer than that of younger age groups (Griffiths *et al.*, 1994; Tate & Cade, 1990, Vetter *et al.*, 1990, Whichelow, 1993). In their study Tate and Cade (1990) found that, compared to people aged 18- 65 years of age, those aged 66-89 years had poorer dietary knowledge. This was explained on the basis of poor memory and lack of motivation to learn new things. Herne (1993) recommends that this can be

overcome by targeting information and making it more relevant to the problems of the elderly. Charny and Lewis (1987) investigated how improved nutritional knowledge affected eating habits of people living in Cardiff. They observed a trend that elderly people were least likely to make healthy dietary changes and this was particularly true for those 75 years and over. However it was found that persons in these age groups had poor levels of nutritional knowledge.

Lilley and Johnson (1996) on the other hand showed in their study of elderly people living in rural Nottinghamshire that although elderly people had good levels of nutritional knowledge, this was not always accompanied by appropriate dietary behaviour. They found that there was poor association between knowledge and behaviour for salt and animal fat intake. They however found that the subjects had made dietary changes to incorporate reduced fat milks and spreads in their diet despite their taste preferences for full fat milk and butter.

1.5.6 Access to nutritional information and advice

One of the major barriers for elderly people to acquire better nutritional knowledge and hence be in a position to make appropriate dietary changes may be lack of access to nutritional information and advice. The general trend towards healthier eating and lifestyle in recent years has led to an increased consumer demand for more detailed, accessible and accurate information on the matters of health and nutrition. There is however lack of research on how better access to nutritional advice and information may affect the dietary choices made by elderly people.

Davies *et al.* (1985) reported that the most frequently mentioned source of information among elderly people reaching the retirement age, living in Southern England, was newspapers and magazines (85%), followed by television (69%). Although only 10% of the study participants mentioned getting such information from their doctor, this source was found to be the most effective as it was most likely to result in a change in dietary behaviour. Davies *et al.* (1981), however reported in their study of a very small number of old elderly people receiving meals on wheels that convenience, 'hearsay', relatives and media were the main influences of food choice. Thus age of an elderly person might influence their access to nutritional information. There is a general view that nutritional advice and information needs to be more targeted towards the elderly people for it to be

effective (Herne, 1995). This view was supported by the findings of Vetter *et al.* (1990). They found that almost three fourths of 456 study participants aged 65- 74 years of age and two thirds of 236 participants aged 75 years and over responded positively to the statement 'I would like more information on food labels'. Similar positive response was evoked when elderly people were asked whether improved information on food labels would influence their decision to buy. These findings suggest that perhaps elderly people want to know more about nutrition and many do not cite food labels as an important source of nutritional information because they find them inadequate due to one reason or the other.

1.5.7 Attitudes and beliefs

The Scottish Heart Health Survey (McKay and Bolton- Smith, 1995), a ten-year follow-up study, reported data from a food health questionnaire completed by 119 elderly men and 113 elderly women. Respondents were asked what would persuade them to make a dietary change in the future. Two thirds stated that major illness such as heart disease, liver disease and cancer would persuade them to make such a change. Sixty-five percent of men and 57% women said advice from their doctor would persuade them to make a change in their diet. Fifty-percent of the women and 32% of men participating in the Scottish Heart Health Survey said that reduction in price of 'healthy foods' would help them make a change. The cost of healthy foods may have been more important for women of this study than men because elderly women generally have poorer incomes than elderly men or perhaps because women are generally more aware of food prices. The Scottish Heart Health Survey found that 33% of men and 26% of women claimed that they would not change their diet even when faced with a major life threatening illness. This finding suggests that elderly people may be quite resistant to introducing changes in their dietary intake or may reflect that elderly people are not convinced about the association between poor dietary practices and ill health. Griffiths *et al.* (1994) showed in their study of health and lifestyles of inner city adults that motivation to improve eating habits and aspirations of a healthy diet consistently declined with increasing age and a particular slump was observed in those over 60 years of age. In their study, Griffiths and colleagues found that 91% of the 287 elderly people studied believed that they had a healthy diet. This was higher than in any other age category. It was also reported in this study that the greatest percentage of people who incorrectly believed that they had a healthy diet was also highest among people over 65 years of age.

Griffiths *et al.* concluded that the findings indicate that elderly people might not have a clear idea of what healthy diet is. This theory is not supported by the findings of study on dietary habits of elderly people of Nottingham by Lilley and Johnson (1996). They reported that elderly people not only had adequate knowledge about dietary fats, they had also made dietary changes to incorporate low fat alternatives to high fat foods.

Bilderbeck *et al.* (1981) found that any resistance to change in dietary practices of elderly people of Surrey was primarily due to taste, habit and price in that order. They also reported that the majority of elderly women in their study, preferred convenience foods. These findings are contradictory to the findings of Howarth *et al.* (1993) who reported that men were more likely to prefer convenience foods than women. This discrepancy could in part be due to differences in the definition and understanding of the term 'convenience foods'.

1.6 Dietary requirements of elderly people

The Working Party on Nutrition of Elderly People recommended in their report (DoH, 1992) that the 'majority of people aged 65 years and over should adopt, where possible, similar patterns of eating and lifestyle to those advised for maintaining health in younger age groups'. The Panel was particularly concerned about the impact of illness and disability on nutritional status of the elderly. There was also concern regarding the findings of 'institutional starvation', which is the high incidence of low body weight among people living in long-term care facilities. The Panel recognised the lack of data concerning energy and nutrient requirements for well elderly people living in the community and sick and disabled elderly people cared for in institutions. The Panel also highlighted the need for greater awareness of the importance of good nutrition for maintaining health of elderly people and its contribution to recovery from illness. The Panel thus recommended that nutrition education programmes should target elderly people.

Lack of research has lead to a gap in knowledge and insufficient data on nutritional intake and nutritional status of elderly people. There is an interval of nearly 30 years between the two national surveys of diet and nutritional status of the elderly Britons carried out in 1968/69 and 1995/96 (DHSS, 1972; Finch *et al.*, 1998). The main recommendations made for reference nutrient intake for elderly by the COMA Panel for Nutrition of the Elderly are either based on the findings of the survey carried out in the late sixties (DHSS, 1972) or are

extrapolated from the requirements of young adults. Requirements for energy and all nutrients listed below are based on those outlined by the recommendations of The Panel on Dietary Reference Values for the UK (DoH, 1991).

1.6.1 Energy

Energy is needed to maintain bodily functions and to undertake physical activity. Information on energy expenditure in elderly people is very limited. Low levels of energy expenditure in elderly people were reported by Durnin (1985). Energy requirements of elderly people are influenced by basal metabolic rate and physical activity levels, both of which fall with increasing age.

Because of low physical activity levels among most elderly people, if derived incrementally, estimated average requirements for energy would be so low that in some cases achieving an adequate diet from normal food would be near impossible. With the fall in body weight and physical activity levels, providing an adequate nutrient intake for elderly people becomes difficult. Many elderly people spend as little as one hour per day on their feet. Thus the panel for nutrition of the elderly postulated that a value of 1.3 x basal metabolic rate might apply to maintain energy balance in the elderly. The problem with this level of energy intake is that the risk of deficiencies of essential vitamins and minerals increases. Thus, although elderly people consuming food energy equivalent to 1.5 x basal metabolic rate may become overweight, the panel recommended that elderly people should have the standard value of 1.5 x basal metabolic rate for estimated average requirement for energy set by the panel on dietary reference values for UK.

Table 1.1 Estimated Average Energy Requirements for elderly men and women

Age	Estimated Average Requirement mj/d (Kcal/d)	
	Males	Females
65- 74 years	9.71 (2330)	7.96 (1900)
75 years and over	8.77 (2100)	7.61 (1810)

1.6.2 Carbohydrates

1.6.2.1 Dietary sugars

The British population obtains between 10-20% of food energy from simple sugars and elderly people are expected to be closer to the upper end of this range and on average exceed the national recommended average (DRV) by approximately 11% (Finch *et al.* 1998).

Due to relationship of frequency and amount of simple sugars and dental caries, the COMA reference panel for nutrition of the elderly recommended that the intake from non-milk extrinsic sugars should be reduced and recommended that 10% of food energy should be obtained from this source. This recommendation applies to all population groups.

The rationale behind this recommendation was:

- If elderly people consume foods rich in simple sugars, their appetite for more varied and nutrient rich foods may be blunted.
- Increased sucrose load in the elderly, especially those who are obese or overweight, increases abnormal metabolic responses.
- Retaining teeth is very important, in elderly people to improve chewing and hence improving nutrient intake with or without partial dentures.

The panel however made allowances for the very old elderly or for those who are ill or are being cared for in nursing homes. Elderly people who are ill may not be able to consume foods rich in complex carbohydrates and adding sugar may increase palatability of food, thus encouraging them to eat more food.

1.6.2.2 Starch

Due to lack of data on dietary intake of starch in the elderly, the panel recommended that parallel to all segments of the population, the elderly would benefit from increasing the intake of foods rich in starch in their diet.

1.6.2.3 Non starch polysaccharides (NSP)

Due to high incidence of constipation among the elderly (20%), (Cummings and Bingham, 1992) and the beneficial effects of dietary NSP on bowel health, the COMA panel recommended that elderly people would benefit from an intake of 12- 18 grams of NSP per

day. The panel recommended the exercise of caution as NSP from sources such as raw bran contains phytates, which bind to divalent mineral cations and reduce availability of minerals such as calcium, zinc, iron and copper. Although this advice is applicable to all population groups, it is more relevant for the elderly who might already have low intakes of these micronutrients due to reduction in total amount of food consumed.

1.6.3 Protein

The current nutritional requirements of the elderly of the UK and most other countries derive from the recommendations of 1985 Food and Agriculture Organisation (FAO), World Health Organisation (WHO) and United Nations University (UNU) expert consultation (FAO/WHO/UNU, 1985). The FAO/WHO/UNU (1985), on the basis of limited data from nitrogen balance studies recommended that, healthy elderly people have a dietary requirement of 0.75 g protein/ kg body weight per day, in common with that of younger adults. The COMA panel on nutrition for the elderly endorsed this level of intake in their report (DoH, 1992). The panel however acknowledged that due to a fall in lean body mass and impaired protein utilisation with normal ageing, this level of intake might be too high. However the requirements for protein increase in the presence of disease, thus elderly people who are sick and in long term care may have increased need. Thus the panel recommended more research to determine the protein requirements of elderly people.

1.6.4 Fat

The COMA panel on dietary reference values recommended that in line with the rest of the population, elderly people should have no more than 10-35% of total energy from total fat. Saturated fat should not exceed 13% of dietary energy, cis- monounsaturated fatty acids should continue to provide on average about 12% of dietary energy. Dietary intake of PUFA should not exceed 10% of total energy and trans fatty acid intake should not exceed 2% of the total dietary energy.

1.6.5 Vitamin D

It can be difficult to achieve an adequate amount of vitamin D through diet alone as rich sources of vitamin D are limited to fatty fish, eggs and liver. Adequate exposure to sunlight alone can be sufficient to meet vitamin D requirements. The COMA working group on the

fortification of yellow fats with vitamins A and D has recommended that this practice should continue in the future as it is a major source of these vitamins for the elderly (DoH, 1991a). Gregory *et al* (1990) reported that the mean dietary intake for vitamin D for British adults is 3μg/ day. It has also been reported that in the absence of exposure to sunlight, 5- 10μg of vitamin D is required per day to ensure plasma 25 hydroxy- vitamin D above the level associated with osteomalacia (Krall *et al.*, 1989).

The COMA panel on DRV (DoH, 1991) thus recommended that vitamin D intake of 10μg per day should meet the needs of virtually all people aged 65 years and over (DoH, 1991). The COMA panel on nutrition of the elderly (DoH, 1992) also recommended vitamin D supplementation for housebound elderly people.

1.6.6 Vitamin A

In the UK yellow fats such as margarine are statutorily fortified with vitamin A and D, which mainly ensures an alternative source of these vitamins are available to special groups such as the elderly. Vitamin A can be obtained from animal sources in the form of retinol or from dietary carotenoids such as β-carotene. One micro-gram of retinol is equivalent to six micro-grams of dietary carotene. Due to lack of information on vitamin A intake in elderly people, the COMA reference values for vitamin A are based on figures obtained from the diet and nutrition survey of adults aged less than 65 years of age (Gregory et al., 1990). This survey showed that although the range of intake of retinol equivalent was wide and skewed, the population studied had adequate intake. The COMA panel extrapolated these findings to the elderly and felt that there was no evidence to support an increase or decrease in requirements for vitamin A for elderly people.

Table 1. 2 Reference nutrient intake for Vitamin A for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Vitamin A (μg/ day)	700	600

1.67 B vitamins

1.6.7.1 Thiamin

Thiamin requirements are related to energy metabolism and thus in most people to energy intake. The estimated average requirement to achieve both clinical and biochemical

normality is 0.3 mg/ 1000 kcal. The requirement for intake is same for men and women and is not influenced by age.

Table 1.3 Reference nutrient intake for Thiamin for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Thiamin (mg/ 1000kcal)	0.4	0.4

1.6.7.2 Riboflavin

Although riboflavin intake reduces with age, the DHSS (1979) and the Diet and Nutrition Survey of British Adults (Gregory *et al.*, 1990), upon which the COMA panel based their recommendation, found no evidence of deficiency of riboflavin among free living older people. There is evidence that the institutionalised elderly may be more at risk of low intakes of riboflavin (Thomas *et al.*, 1988). More recently the National Diet and Nutrition Survey of British elderly found that average daily intakes for riboflavin, thiamin, niacin, vitamin B6, vitamin B12 and folate from food sources were well above the RNI (Finch *et al*, 1998). The DHSS survey (1979) showed low biochemical status for riboflavin for 30% of institutionalised elderly. Low biochemical status for riboflavin was also observed in 40% of free living and institutionalised elderly in the National Diet and Nutrition Survey (Finch *et al.*, 1998). The COMA recommended the same RNI for riboflavin for elderly people as the rest of the population and saw no reason to recommend increased intake mainly due to the complex relationship between the riboflavin status and non-dietary factors (Rutishauser *et al.*, 1979).

Table 1.4 Reference nutrient intake for riboflavin for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Riboflavin mg / day	1.3	1.1

1.6.7.3 Vitamin B12

Vitamin B12 is only present in animal products. Strict vegetarians especially vegans excepted, vitamin B12 deficiency among omnivores is usually not diet related and is often due to disorders that hinder its absorption. Vitamin B12 levels may or may not fall with age and it is not clear that if they do fall, whether they do so due to decreased intake or reduction in absorption or both. The COMA panel thus recommended that elderly people with impaired absorption of vitamin B12 would benefit from its increased intake. The RNI for elderly however was set at the same level as that for the rest of the population.

Table 1.5 Reference nutrient intake for vitamin B12 for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Vitamin B12 µg /day	1.5	1.5

1.6.7.4 Folate

The DHSS survey (DoH, 1979) found that 22% of the elderly had borderline red cell folate deficiency and 5.4% had subnormal values but there was no clinical disorder due to folate deficiency. The National Diet and Nutrition Survey also found low red cell folate in 40% of institutionalised and 15% of the free-living elderly participants. The reasons for folate deficiency can be complex and can range from destruction of the vitamin due to prolonged cooking, a 'tea and toast' type of diet among the elderly and also due to reduced absorption due to conditions like coeliac disease and bacterial overgrowth in the bowel (DoH, 1992). Due to the complex relationship between folate intake and folate status, the COMA panel saw no reason to recommend increased requirements and intake of folate for elderly people.

Table 1.6 Reference nutrient intake for folate for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Folate µg /day	200	200

1.6.8 Vitamin C

Although the DHSS survey 1972/73 (DHSS, 1979) recorded intakes of vitamin C which were below 40 mg per day for more than 50% of the population of elderly people studied. The COMA panel for nutrition of the elderly, based on the recommendations of the panel for dietary reference values for the UK (DoH, 1991), set the RNI for vitamin C for elderly at 40 mg per day. The National Diet and Nutrition Survey reported low biochemical status for vitamin C in 40% of institutionalised elderly and 15% of free-living elderly people.

The panel however acknowledged that elderly people with chewing difficulties and those having difficulties with pealing and cutting fruit, might be at an increased risk of deficiency. Due to rapid oxidation of vitamin C during transportation, delivery and cooking the COMA panel also recommended that special care should be taken in preparation and delivery of meals for the elderly in institutions and for those relying on meals on wheels (DoH, 1992).

Table 1.7 Reference nutrient intake for vitamin C for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Vitamin C mg/ day	40	40

1.6.9 Iron

Iron is essential for the synthesis of haemoglobin and for maintenance of metabolic processes dependent on iron containing enzymes and co- factors (Schultz and Freedman, 1987). The iron requirements may fall for women with increasing age due cessation of menstruation. Elderly people may however have greater incidence of disorders such as atrophic gastritis and post-gastrectomy syndrome (Shultz and Freedman, 1987). Elderly people with iron deficiency can however increase iron absorption by a feed back mechanism (Marx, 1979). Iron deficiency in elderly people may not always be nutrition related and it may be a result of blood loss associated with pathological conditions like hiatus hernia, peptic ulcer, haemorrhoids, cancer and as a side effect of non steroidal anti-inflammatory drugs. Absorption of iron depends upon the dietary source and foods containing haem-iron (red meat and offal) have the most bioavailable iron. The findings of the NDNS showed that consumption of meat, poultry and fish were positively associated with six measures of iron status, and vegetables and potatoes with four measures (Doyle *et al.*, 1999). Doyle and colleagues also found that calcium, dairy products and tea generally had a negative association with measures of iron status.

The COMA panel on the nutrition of elderly people made recommendations that before a diagnosis of diet related iron deficiency anaemia is made in the elderly, pathological causes should be ruled out. Due to impaired absorption, the elderly also perhaps need to increase intake of foods, which are a source of more bioavailable iron. The COMA panel on nutrition of the elderly endorsed the recommendation of panel on dietary reference values for the UK and set the RNI for iron at 8.6 mg per day. This level of intake is the same as that recommended for adult men but is lower than that (14.8 mg/day) recommended for menstruating women.

Table 1.8 Reference nutrient intake for iron for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Iron (mg /day)	8.6	8.6

1.6.10 Calcium

Most studies have failed to show a relationship between usual calcium intakes and the rate of postmenopausal bone loss. Some studies have shown significant reduction of bone loss with additional dietary calcium alone (Albanese *et al.*, 1975; Polley *et al.*, 1987), or with

combined calcium and oestrogen supplements (Ettinger *et al.*, 1987). On the other hand studies have failed to show any change in bone loss with calcium supplementation (Nilas *et al.*, 1984; Recker and Heaney, 1985).

Due to uncertainty about the role of dietary calcium in age related bone loss, the COMA panel for nutrition of elderly people saw no basis for recommending an increased intake for this group. The problem of bone loss may be greater for housebound elderly people as they may have lower levels of vitamin D as well, which may further compromise their calcium status due to reduction in the gut's ability to absorb calcium (Francis *et al.*, 1983).

Table 1.9 Reference nutrient intake for calcium for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Calcium (mg/ day)	700	700

1.6.11 Zinc

The assessment of zinc requirements in adults is calculated on the basis of basal losses calculated during metabolic studies of deprivation, turnover time of radio- labelled endogenous zinc pools and deduction from metabolic studies of patients receiving total parenteral nutrition and factorial analysis (DoH, 1991). Adequate intake of zinc in the diet can promote cellular immunity (Boukaiba *et al.*, 1993), and hence zinc levels can be particularly important for elderly people as cellular immunity reduces with age. The COMA reference panel endorsed the recommendation for zinc intake made by the panel on dietary reference values for the UK (DoH, 1991), as there is no evidence of reduced intake in elderly people living in the community (Bunker and Clayton, 1989). Due to evidence of prevalence of zinc deficiency among elderly people in institutional settings (Thomas *et al.*, 1988), the panel acknowledged that elderly people living in institutional settings might be vulnerable to zinc deficiency.

Table 1.10 Reference nutrient intake for zinc for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Zinc (mg/ day)	7.0	9.5

1.6.12 Selenium

Between 55 and 65 percent of dietary selenium is absorbed and the major route of excretion is in the urine, which reflects dietary intakes, as do levels in tissues and blood. Thus the selenium status of people is a good indicator of their dietary and geochemical amount and availability of selenium. The COMA panel for DRVs recommended 75μg and 60μg of

selenium per day for men and women respectively. The COMA panel on the nutrition of the elderly endorsed this level of intake for the elderly, as there is no evidence of low intakes of selenium among healthy and housebound elderly people (Bunker and Clayton, 1989).

Table 1.11 Reference nutrient intake for selenium for elderly men and women

	Men (65 years and over)	Women (65 years and over)
Selenium (μg/ day)	75	60

1.7 Need for the Survey

The most recent survey of the diet and nutritional status of elderly people (Finch *et al.*, 1998) was carried out nearly 30 years after the survey of the Department of Health and Social Security (DoH, 1972). The 42 recommendations (Annexe 1) made by the COMA panel on nutrition of the elderly, embody the need for more research, more data, and in general greater involvement of elderly people in health education and health promotion strategies. They also highlight the growing importance of nutrition of the elderly and the huge gap in knowledge that exists regarding the nutritional status of the elderly. The NDNS survey provides the much-needed up-to date information on nutritional status of British elderly people. However for practical reasons, studies of representative samples usually recruit only a few people from a specific area of the country. More detailed investigations such as the present study are needed at a local level to complement the findings of a national survey. Findings of the two may indeed be different and that would be perfectly normal as different areas have different dietary practices, incidence of disease and health care and support programmes. For the local study itself however the same differences would not be operating and due to relative uniformity of certain variables, changes in dietary practices and nutritional status which are age- related may indeed become more apparent.

The changes in the population age structure represent great achievements in health and social development such that more people than ever before are likely to survive to old age (Khaw, 1999). Such changes in the population structure bring with them new challenges for all aspects of society and because ageing is generally related to disability and disease, these changes pose special challenges for health care provision. As a result of curative and life prolonging strategies, people are living longer. To make these extra years free from disabilities, preventative strategies would need to be employed. One of these strategies would be improved nutrition, which has only recently been recognised as an important factor influencing the functional outcome of ageing. It is now becoming evident that nutrients consumed during adult life as well as in later years can affect the quality of terminal years of life span (Munro, 1992). An understanding of the role of both early and later nutrition in modulating the ageing process is required. The dietary habits of the healthy elderly of the present can be used to quantify nutrients needed to maintain optimal health of elderly of the future.

1.8 Aims and objectives

1.8.1 Aim

To assess the nutritional status and the factors influencing food choices of elderly people, living on Merseyside.

1.8.2 Objectives

1.8.2.1 Objective 1

To investigate the factors that influence the food choices of elderly people.

Phase I (Conceptualisation of Food Choice Questionnaire) (FCQ)

- To recruit approximately 30 elderly people (pilot sample) and hold in-depth interviews to inform the FCQ.

Phase II (Main Survey)

- To recruit approximately 100 elderly people (survey sample) and using the FCQ, investigate their dietary habits and factors that influence their food choice.

1.8.2.2 Objective 2

Assessment of nutritional status by measurement of:

Nutrient intake, anthropometric indices and blood pressure.

Phase I (Feasibility Study)

- To test all equipment and fieldwork procedures used to assess nutrient intake and nutritional status.
- To calculate technical error of measurement (TEM) for anthropometric measurements.

Phase II (Main Survey)

To assess nutritional status of the survey sample by measuring:

- Nutrient intake using a three- day diet diary.
- Anthropometric measurements and blood pressure.

CHAPTER 2

Method

2.1 Study design

The study was designed as a cross-sectional study, qualitative and quantitative methods were used to investigate the factors that influence food choice and nutritional status of free-living elderly people. A multistrategy approach was used to investigate factors influencing food choice and nutritional status of elderly people, such an approach has been described as a form of disciplined flexibility, as it does not impose theory on data (Layder, 1993). Another aspect of such an approach is that qualitative and quantitative data are viewed as complementary to each other.

In the current study there were no hypotheses, the study was designed to uncover facts about food habits and nutritional status of elderly people. Furthermore, quantitative methods were used to establish a current database on food habits and nutritional status of elderly people and qualitative methods were used to explore the complex issues of food choice. Principally, the research methods met the objectives of the study by tracing the process of food consumption without isolating one aspect from the other.

2.2 Study protocol

The study was carried out in two phases.

2.2.1 Phase 1 (Pilot study/Qualitative phase)

A pilot study was carried out to test the method and equipment to be used to study the food habits and nutritional status of free-living elderly people. During this phase reproducibility of anthropometric measurements (taken as a part of assessment of nutritional status), was tested by computing the intraobserver technical error of measurement. This phase also constituted the qualitative phase of the study. One-to-one in-depth interviews on topics related to food choice were tape recorded and transcribed. The emerging themes were used to explain dietary behaviour and to conceptualise the food choice questionnaire.

2.2.1.1 Pilot sample

The pilot sample comprised 33 elderly people, 11 men (mean age 75.6 years) and 22 women (mean age 73.6 years). These elderly people were recruited using voluntary agencies such as Age Concern, University of the 3rd Age, Graduate Womens' Club, Christian Council of Age and Ageing and Liverpool Housing Association (respondent profile Annexe II). The respondents of the pilot study came from a wide range of backgrounds. The procedure used to invite the pilot sample to take part in the study was the same as that used for the main sample and all the instruments (letter of introduction and invitation to join the study, consent form etc.) were tested for their efficiency. Method to assess nutritional status (anthropometric measurements, blood pressure and diet diary) was also tested (findings Annexe II). These tools were found to be effective (Saini *et al.*, 1998), minor changes were made to further refine them and one of these was to include a response slip with a pre paid envelope for the convenience of the subjects.

2.2.1.2 Conceptualisation of the food choice questionnaire (FCQ)

During the pilot study one to one interviews were held with 33 elderly respondents. These interviews were semi-structured and centred around topics related to food and health (Appendix 1). Each interview lasted forty to sixty minutes. Although there was a schedule, the flexibility to adhere to it was dependent on the interview situation. All interviews were based on the same semi-structured interview schedule. All interviews were audio taped and transcribed in verbatim (Chapter 3). This was a unique point of the study whereby qualitative data was used to inform the subsection on knowledge attitudes and beliefs of the FCQ (Appendix 2). The FCQ was based on a questionnaire used to assess dietary habits of European elderly people by the SENECA investigators (de-Groot *et al.*, 1991). Using this approach, the FCQ was tailored to the British elderly people. The manner of designing and developing the FCQ also supported the plan of the study, which was not to test hypotheses but to form theories, concepts and propositions. Emergent themes were explored and responses were coded. The questionnaire was tested on a pilot sub-sample of 8 elderly people to clarify ambiguities. The FCQ was used as a quantitative tool to investigate dietary habits of elderly people recruited for the main study (Phase II).

2.2.2 Phase II (Main Study/Quantitative phase)

2.2.2.1 Ethical approval

The main study was approved by Liverpool John Moores University Research Ethics Committee and was funded by John Moores University. Ethical approval was also obtained from each of four (Liverpool Health Authority, Wirral Health Authority, Sefton & Southport Health Authority and St Helens & Knowseley Health Authority) NHS Local Research Ethics Committees.

2.2.2.2 Survey sample (respondents of the main study)

The Family Practice Register, held at the Central Processing Unit in Liverpool, was used as the sampling frame. The Health Authority confirmed that The Family Practice Register was reliable, as it was updated daily by electronic links with general practitioners (for notification of new registrations), and the office of the Registrar of Births and Deaths. Elderly people selected at random from The Register were approached by a letter of introduction (Appendix 3). Criteria for inclusion required that the respondents were over 65 years of age, were living freely in the community and eating self-selected diets. No exclusions were made on the basis of health or disability. A response sheet (Appendix 4) and a stamped addresses envelope accompanied the letter of introduction. The letter was posted to reach the respondents no more than one week in advance of the suggested appointment.

A computer generated list of 800 randomly selected names and addresses of people aged 65 years and over from the Family Practice Register for Merseyside was provided by the Central Processing Unit at Liverpool. Expecting a 75% acceptance rate, 320 elderly people needed to be contacted by the letter of introduction. Eighty letters were thus posted for each of the four boroughs of Merseyside. A 75% acceptance rate would have amounted to 60 people or 120 interviews (two visits/interviews per respondent), or six weeks of interview time per borough. The pilot study revealed that on average, three interviews could be conducted per day, due to constraints of time and other resources; a period of 8 months was allocated to complete all fieldwork for the main survey. The fieldwork was carried out in four waves, each of 6- week duration, with 2- week period between each wave. During this 2- week period appointments were organised for the next wave.

The respondents were divided into three categories, those who agreed to take part in the study, those who refused, and those who did not respond to the letter of introduction. The respondents who agreed to take part and those who did not respond were visited in their own homes. The latter were classified as those who were unobtainable, agreed or refused to participate in the study. Due to limited resources the unobtainable were not visited again. A note was however left to notify them of the visit.

2.2.2.3 Summary of procedure followed

The respondents were visited twice in their own home, each visit lasted 35-45 minutes.

First visit

After introduction, a detailed explanation of the study was given to the respondents, questions or queries were answered before they were asked to sign a 'no obligation' consent form (Appendix 5). A set pattern was followed in administration of the various components of the study. After the completion of a short socio-demographic questionnaire (Appendix 6), a full explanation of the procedure for recording food intake in the food diary was given. An appointment was made to see the respondents between the fourth and seventh day i.e. within three days of completion of the dietary record.

Second visit

During this visit the food diary was checked and the portion sizes were quantified using a photographic food atlas (Mullan and Luke, 1994). The FCQ was administered after the quantification of the food diary, this was done to minimise bias in dietary reporting.

2.3 Assessment of food choice

Food choice can be influenced by a wide range of factors and investigating food choice as an integral part of a study of nutritional status can help present a complete picture of the complex issue of dietary intake. Although this has been recognised time and again, there seems to be no consensus regarding which particular questions should be included and which way they should be scored. This is especially true for measuring knowledge, attitude and beliefs about food as there is little standardisation of these (Thompson and Byers, 1994). Information on attitudes, knowledge and beliefs is very important, it may not always

help predict behaviour, but can have an impact on diet and health related behaviour. People are exposed to a wide range of scientific issues, which they need to understand to make informed decisions and one of these issues has been recognised as the choice of diet (Abbot, 1997). According to Durant *et al.* (1992) although many scientific issues are far removed from everyday life, nutritional science is an exception, making nutritional knowledge a necessity. This is because knowledge about nutritional science, its correct understanding and adoption in practice, can enhance well-being and prolong lifespan. Charny and Lewis (1987) reported a consistent association between the level of nutritional knowledge and an intention to make positive dietary changes.

An attitude may be defined as a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object (Fishbein and Ajzen, 1975). Attitudes are traditionally described as having three components (McCullough, 1980): affective - the emotional response to a stimulus; cognitive - the beliefs and knowledge held about the stimulus and behavioural - the intended actions taken towards a product. Although the behaviour component may be observed directly, neither the affective, nor the cognitive components of attitude can generally be observed. These components must therefore be inferred from indirect measurements, usually through questionnaires or other testing instruments (McCullough, 1980). Thompson and Byers (1994) suggested that investigators should carefully assess the needs of their study and their population's dietary patterns before choosing an 'off-the-shelf' instrument designed for measurements in other settings. A reasonable way to develop and refine a set of questions tailored to the population to be studied is by convening a focus group of five to ten people who discuss their knowledge, attitudes and beliefs in a non-judgemental and non-threatening way. The most commonly elicited beliefs can be included in the questionnaire. However the way questions are asked and the interview setting can have a bearing on responses. Social desirability of foods leading them to be seen as "good" and 'bad', presence of other people and interviews held in health settings such as clinics can enhance biases related to the perceived social desirability of certain foods (Thompson and Byers, 1994).

For these reasons for the present study it was decided that in-depth one to one interviews would be better for elderly people as they might have hesitated to discuss their food habits and any financial constraints of food choice in the presence of peers. The cognitive aspect of attitudes of the survey sample was examined by testing knowledge and beliefs on issues of

food and nutrition using the FCQ and the behavioural aspect was observed from the dietary diary. The in-depth interviews were also used to explore reasons for reported dietary behaviour. The FCQ was administered during the second visit to the respondents of the main survey and was used to assess a range of factors such as cooking abilities and facilities, shopping habits, smoking, knowledge, attitudes and beliefs about food and nutrition. Questions regarding dentures, personal food preferences were also asked, aiming to assess their influence on food intake.

Older people have higher than average record for taking medication and a majority of elderly people take some form of prescribed medication (Bliss, 1981). Information on drugs (prescribed or over the counter) is important as drugs may have interactions with food, may suppress appetite and reduce motivation to eat (Herne, 1993). Any drugs taken by the respondents were recorded along with their dosage in an open-ended format and were coded subsequently for analysis. In total ten questions were asked on health including, self perceived health, health compared with peers, quality of life, chronic diseases, information was also collected about specific conditions such as hearing loss and visual acquity.

Respondents were asked whether they currently smoked cigarettes and, if they did, how many they smoked per day. People who were currently non- smokers were asked if they smoked in the past and reasons for giving up smoking. The system used to classify people on the basis of smoking was the same as that used by the National Diet and Nutrition Survey (NDNS) (Finch *et al.*, 1998). Non-smokers (those who had never regularly smoked), ex-regular smokers (those who regularly smoked in the past), current light smokers (those who presently smoked less than 20 cigarettes daily) and current heavy smokers (those who currently smoked more than 20 cigarettes per day).

The subsection of the FCQ testing beliefs and knowledge about food and nutrition and sources of nutritional information explored their influence on the nutritional status of the survey sample. Participants were asked to name food sources of saturated fat, fibre, iron, and vitamin D. The answers were deemed correct if the respondents named one good source or two average sources of the nutrient in question. The subjects were also given a food label (Weetabix breakfast cereal) (Appendix 7) and were asked questions regarding the terms printed on the nutritional label, to assess their knowledge of commonly used nutritional terminology. These terms were energy, saturated fat, g (grams), kJ (kilo joules), kcal (kilo calories) and RDA (recommended daily allowance). The correct definition

accepted for the questions on energy and saturated fat was the one outlined in the Manual of Nutrition (MAFF, 1995). All responses were scored. A scoring system was developed whereby subjects were given scores of 1-10 depending on the number of correct answers.

Thirteen statements were constructed from the in-depth interviews held at the pilot stage of the study. Factor analysis was applied to these for 'construct' validity. All thirteen statements were retained for the final analysis as outcome of factor analysis showed that the statements were highly correlated. The output of factor analysis also showed that 98.9% of the variance was accounted for by the first factor. This means that there was a strong, simple underlying structure showing that all or most of the variables essentially measured the same dimension.

The statements were aimed to test the attitudes of the respondents to nutrition and its relationship with age, health and disease. Each respondent was handed a cue card which had options such as strongly agree, agree, neither agree nor disagree, disagree, strongly disagree and don't know, printed clearly. The statements were read to the respondents and they were asked to respond by choosing an option which best described their attitude towards the given statement. The options were then coded as, strongly agree (1), agree (2), neither agree nor disagree (3), disagree (4) and strongly disagree (5).

2.4 Assessment of nutritional status

Clinical signs, biochemical assessment, body composition and dietary intake can be used to assess nutritional status. Each method has its merits and demerits; the suitability of each can only be assessed on the basis of the aims of the study, study population, time and other resources available.

Deficiency of one or more nutrients would ultimately lead to signs clinically associated with that particular deficiency. Clinical assessment is cheap, quick to administer and does not require elaborate and expensive equipment. However many clinical signs of nutritional imbalance are non-specific and only a few are pathognomic of a nutritional disorder. Clinical signs of nutritional imbalance are also not very sensitive and only become apparent as an end stage of the imbalance.

Biochemical assessment is generally considered to be most sensitive and specific to detect nutritional inadequacy. However, resources to perform biochemical tests were not available

and group discussions held with the pilot group revealed a ninety- percent refusal rate, to the idea or suggestion of giving venous blood sample as a part of the nutritional assessment. Assessment of body composition is an excellent indicator of a person's nutritional status. Body composition can be assessed by a number of methods and the suitability of a chosen method depends upon the study design. Methods available for assessing body composition include, densitometry (under water weighing) and estimation of lean body mass by deuterium distribution and potassium 40 (^{40} K) levels. Of all of the methods used to assess body composition, densitometry is considered to be the gold standard. Although densitometry is an indirect measurement of body composition it is highly rated because it has been tested against other independent body composition techniques, such as energy-nitrogen balance and cadaver and animal analysis (Buskirk, 1961; Siri, 1961; Garrow *et al.*, 1979; Garrow, 1986). Although densitometry itself is unsuitable and impractical for field studies, it is commonly used to validate indirect methods of assessing body fat percentage using equations and anthropometric measurements. In field studies two methods are most widely chosen to assess the body composition and these are bioelectric impedance (BIA) and anthropometry.

Bioelectric impedance is based on the fact that the impedance of a geometric system depends upon its length, configuration, cross sectional area and frequency of the signal used. Body composition is assessed by using height squared over resistance keeping the frequency constant at 50 KHz. In addition to resistance and reactance bioelectric impedance also uses other subject characteristics such as height, weight, age, sex and activity levels. A study done by O'Diaz *et al.* (1989) demonstrated that although bioelectric impedance is an accurate predictor of body composition, it was the inclusion of weight, height and age and not resistance that was responsible for accuracy of fat free mass (FFM) prediction.

2.4.1 Anthropometry

Anthropometry is the most widely chosen method to estimate body composition and is especially of value in field studies. This is because the equipment is light and portable and as compared to equipment for bioelectric impedance, it is more economical and sturdy. Anthropometry can be a very significant component in the assessment of an elderly person's nutritional status as it is non-invasive and causes minimal discomfort.

Anthropometric measurements estimate body fatness using height and weight, percentage body fat using skinfold thickness', muscle mass using limb circumference and distribution of fat (fat patterning) using waist and hip circumference. As ageing itself leads to significant modifications of body composition that might be unrelated to nutritional status (Steen, 1988; Baumgartner, 1993; Going and Lohman, 1994), for reliable anthropometric evaluation of elderly people, there is a special need for age specific reference values (Ravaglia *et al.*, 1997).

The formulae for the assessment of body composition by anthropometric measurements such as skinfold measurements are generally based on the relationship between skinfold thickness and densitometry (Durnin and Womersley, 1974, Siri, 1961), which is a two compartment model estimate of body composition. Inherent in the use of densitometry is the assumption that density of fat free mass (FFM) and fat is constant. It does not make allowances for:

1. Individual variation in the proportion of fat free mass or lean muscle mass.
2. Variation in proportion of fat.
3. Variation in proportion of bone mass and bone density.

Due to loss in muscle and muscle mass with age, the use of densitometry for obtaining criterion estimates of body composition for the elderly has been questioned (Kuczmarski, 1989; Baumgartner *et al.*, 1991; Deurenberg *et al.*, 1989). Any scientific method remains suspect unless it is shown to be valid, but, "not one method for measuring percentage body fat has been validated in humans" (Martin and Drinkwater, 1991). Although densitometry has been tested against cadaver and animal analysis (Siri, 1961; Garrow, 1986), it is not considered fool proof as human tissue may change composition after death. Duerenberg *et al.* (1989) reported that the use of Siri's equation for the computation of body fat percentage from body density overestimated body fat by 2-3 percent in elderly women. This percentage may be even higher for elderly women who are obese due to increase in amount of water in the FFM (Segal *et al.*, 1987).

Baumgartner *et al.* (1991) looked at the effect of criterion estimates on prediction equations and found significant differences between two and four compartment model estimates of body composition. In their study they advised that equations predicting body composition should be calibrated against estimates from multicompartment models such as hydrodensitometry, $^{3}H_{2}o$ dilution and dual photon absorptiometry. These estimations are

however of a greater importance in studies on energy metabolism and body composition (Deurenberg *et al.*, 1989) but are impractical for field studies. Hence until any of the equations derived from multi-compartment models are cross validated, for many field and community based studies, the techniques derived from two-component approach are the only appropriate means of body composition measurement (Reilley *et al.*, 1994). One of the main functions of anthropometric measurements is to calculate body fatness. Body fat is usually assessed by measurement of skinfold thickness, limb or trunk circumference and body mass index

2.4.1.1 Skinfold thickness

Skinfold thickness, sometimes called 'fat fold' thickness, is actually the thickness of double folds of skin and subcutaneous adipose tissue at specific sites on the body. Skinfolds provide a simple and non-invasive method for estimating general fatness and can help in characterisation of the distribution of sub-cutaneous adipose tissue. It is one of the commonest methods of assessing percentage body fat in humans, especially in field studies. Equations by Durnin and Womersley (1974) and Jackson and Pollock (1978) are most commonly used to calculate percentage of fat from skinfolds. Skinfold thickness is simple to measure and provides a reasonably accurate assessment of body fatness and form an important part of estimation of nutritional status (Durnin *et al.*, 1997). The six most widely used skinfold sites are biceps, triceps, suprailiac, subscapular, thigh and calf. Although individual or combinations of skinfolds may be used to indicate regional distribution of fat (Wit *et al.*, 1984), the most important aspect is to take repeated measurements on the same side. Absolute skinfold thickness can be used directly for comparisons with reference tables (Burr and Phillips, 1984). Durnin and Womersley (1974) found that most of the single skinfolds show the same pattern of body fat and density as sum of four single skinfolds. The limitation of evaluating one skinfold is that a single measurement is a relatively poor predictor of absolute amount and rate of change in body fat. Subscapular, suprailiac and thigh skinfolds however require the subject to partly undress. This could be very important for studies involving the elderly people as undressing may cause discomfort among this age group. It was decided at the outset that only upper arm skin folds would be taken for the present study. The measurement of skinfolds is influenced by variation in the distribution of fat, skin thickness and variability of compressibility with age (Heymsfield and Williams,

1988; Martin *et al.*, 1992). There are no guidelines on the choice of side for bilateral skinfold sites. A study by Womersley and Durnin (1973) showed no statistical difference between measurements on either side of the body.

For the present study biceps (BSF) and triceps (TSF) skinfold thickness was taken on the right side following the method described by Lohman *et al.* (1988). Durnin and Womersley's (1974) equation was used to predict percentage body fat, as their equation shows no bias against under water weighing (Fogelholm *et al.*, 1997).

2.4.1.2 Circumference measurements

Arm circumference provides an index of energy stores and protein mass. Combining limb skinfold thickness with corresponding circumference allows calculation of muscle circumference and areas of muscle and adipose tissue (Gurney and Jelliffe, 1973; Heymsfield *et al.*, 1984). The advantage of doing both the measurements is that the result includes contribution of limb circumference; two limbs with equal skinfolds but unequal circumferences will have different amounts of fat (Heymsfield *et al.*, 1994). Upper arm circumference was measured for the present study and arm muscle circumference and arm fat area were then calculated using the equations:

Arm muscle circumference = arm circumference - (3.142x triceps skinfold thickness)

Arm fat area = [MAC x TSF/ 2]- [3.142 x $(TSF)^2$ / 4]

Waist circumference is an indicator of central adiposity. There are regional differences in the metabolic activity of adipocytes (Rebuff-Scrive, 1988) and various skinfolds and circumferences are used to characterise fat patterning (Freedman *et al.*, 1995). Waist circumference is related to cardiovascular risk factors including serum lipoproteins and blood pressure (Despres *et al.*, 1990; Houmard *et al.*, 1994; Pouliot *et al.*, 1994). Although computerised tomography scans and magnetic resonance imaging provide accurate measurement of abdominal adiposity (Siedell *et al.*, 1988; Leenen *et al.*, 1992), these methods are impractical for use in the field. Waist circumference is a simple measurement, which can be easily and expeditiously done in field studies. It is a useful index of deep adipose tissue (Borkan *et al.*, 1981), which is also highly correlated with body mass index (Kannel and Gordon, 1980). Waist circumference is also more closely related to cardiovascular risk factors than waist hip ratio, making it a much better index of central fat distribution (Houmard *et al.*, 1994; Pouliot *et al.*, 1994).

2.4.1.3 Body mass index

Body weight and height are two simple anthropometric measurements fundamental to the physical description of an individual or population. Both the measures possess the virtues of being precise (highly repeatable), accurate (close to the true value) and valid (representing what they are thought to represent) (Norgan, 1994). Height and weight are used together as body mass index (BMI), which is an excellent indicator of amount of body fat as a percentage of body weight (Roche *et al.*, 1981). BMI is a simple indicator of fat and is calculated:

$$\text{BMI} = \frac{\text{Body weight in kg}}{(\text{Height in metres})^2}$$

The following classification of BMI is used widely

BMI	Body fat classification based on BMI
Less than 20	Underweight
20-25	Ideal range
25-30	Overweight
35+	Obese

The use of BMI in nutritional assessment is subject to error as it is not age or sex specific and it does not distinguish differences due to fat, muscle and bone (Bastow, 1982). A study by Durnin (1989) indicated that fat mass can be different in people with identical BMI. The most obvious drawback of BMI is, it can misclassify large lean individuals as fat (Segal *et al.*, 1987). Loss of height with age (Hallfricsh, 1990) and increase in fat to lean ratio in the elderly people further makes the use of BMI less reliable for elderly people.

BMI still remains the most popular index for predicting fatness and recognising malnutrition among the elderly. This is because it has lower correlation with height and greater correlation with skinfold thickness (Florey, 1970). Although BMI as a single parameter cannot be used to diagnose nutritional imbalance, it is a useful adjunct to other anthropometric measurements in nutritional status assessment. Both BMI and skinfolds have their limitations, but used together they can successfully indicate a specific population group's tendency to fatness and fat distribution.

Measurement of height of elderly people can pose problems because of change in posture or for those who cannot stand without support. For accurate measurement of height, an elderly person should be able to stand erect, without support with heels drawn together. Large amounts of adipose tissue on the buttocks in many elderly persons will sometimes allow only the heels and buttocks to touch the measuring tape of a stadiometer (Chumlea, 1991). Arm span (2x demispan) has been shown to approximate height at maturity (Kwok & Whitelaw, 1991). Demispan is relatively independent of age because the major part of the measurement is dependent on the length of long bones, which do not shrink with age (Brown and Wigzell, 1964). Although osteoarthritis may prevent adequate shoulder abduction and full elbow extension influencing the measurement of arm length, a study by Kwok and Whitelaw (1991) highlights that demispan is reproducible and is a versatile measurement among the elderly adults whose height measurement poses a problem. The COMA report (DoH, 1992) has made recommendations for alternative measures of height such as demispan, to be included as a part of all nutritional surveys of the elderly. Whilst there are other alternative measurements for height such as such as knee height, demispan is less intrusive and has been shown to have a considerably greater correlation with height than knee height (Chumlea, 1985). For the present study, demispan was measured for all respondents.

The indices used to predict body fatness using demispan instead of height are mindex and demiquet, collectively referred to as BMI(ds).

$$\text{Mindex} = \frac{\text{Weight in kg}}{\text{Demispan in m}}$$

$$\text{Demiquet} = \frac{\text{Weight in kg}}{(\text{Demispan in m})^2}$$

2.4.1.4 Technical error of measurement

There is a considerable scope for error in the use of any of the several anthropometric measurements to assess nutritional status. Errors can be introduced due to faulty technique, variation in distribution of fat, variability of skin compressibility and variation in water and potassium content of fat free mass. Replication of measurements is almost routine for researchers who use anthropometry, but data are rarely accompanied by technical error of

measurement (TEM), which can give information on accuracy and replicability of these measurements (Frisancho, 1990). One of the reasons for this seems to be lack of standardised terminology to describe such data (Cameron, 1986). TEM is the standard deviation of error, which is used to assess the repeatability of a measurement by one or more observers. TEM is obtained by repeating a measurement on the same subject, either by same observer (intra-observer) or by two or more observers (inter-observer). Although there are data on interobserver TEM (Chumlea *et al.*, 1984), information regarding intra-observer TEM for the elderly is lacking.

During the pilot study intraobserver TEM for height, weight, skinfold thickness and demispan was calculated for 33 elderly people. Two measurements were recorded for each respondent; the difference between duplicate measurements for each respondent was calculated and entered into an equation by Ulijaszek and Lourie (1994).

$$\text{Intraobserver TEM} = \sqrt{\frac{\Sigma D^2}{2N}}$$

D = difference between measurements, N= number of individuals measured.

Table 2.1 Intraobserver TEM for elderly pilot population†, and reference data for intraobserver and interobserver TEM for comparison.

Measurement	Intraobserver TEM Pilot sample	Intraobserver TEM Reference data	Interobserver TEM Reference data
Height (cm)	0.54	0.7 [a]	Male 0.17 Female 0.24 [b]
Weight (Kg)	0.41	no data	Male 0.03 Female 0.03 [b]
Demispan (cm)	0.63	no data	no data
MAC (cm)	0.04	0.34 [c]	Male 0.15 Female 0.10 [b]
TSF (mm)	0.21	0.80 [c]	Male 0.82 Female 0.90 [b]
BSF (mm)	0.23	0.20-0.60[d]	no data

†For characteristics of study population see Annexe 1 MAC Mid arm circumference, TSF Triceps skinfold thickness, BSF Biceps skinfold thickness

a (Speilman et al., 1973) ; b (Chumlea et al., 1984); c (Frisancho, 1990); d (Meleski, 1980).

Although TEM for standing height was low (0.54 cm), measurement of height was problematic due to increased curvature of the spine, which was common among the pilot sample. Inability to stand without support (n=2), arthritic hip joint (n=1) and prosthetic knee joints (n=2) also caused difficulties. Large amounts of fat on the buttocks and stooping posture, only allowed the heels and buttocks to come in contact with the measuring scale of the stadiometer and did not allow the head plate to be accurately positioned. Due to these difficulties a custom made stadiometer with head plate extended by two inches was designed and produced (CMS Weighing), to measure the standing height of the respondents. The TEM for weight for the pilot was higher than that recorded by Chumlea *et al.*, (1984), this could be due to different conditions for measurement (allowance for clothes, state of undressing etc), but Chumlea *et al.* (1984) gives no details.

Apart from three obese respondents of the pilot study, measurement of skinfold thickness was easy, convenient and quick. Compared to data from other studies the intraobserver TEM for TSF thickness was low (0.21 mm). The calculation of percentage of fat of the

pilot sample using BMI gave a significantly higher value than using SFT. This finding was in agreement with the findings of Reilley *et al.* (1994).

The TEM for demispan at 0.63cm was higher than that for standing height and this was attributed to use of ordinary circumference tape to measure demispan of the pilot sample, which made it very difficult to position the tape correctly. The tape was hence modified to include a hook at one end to fit between the web at the base of middle and ring finger of the respondent to leave the researcher free to position the other end over the sternal notch.

The pilot study thus highlighted that all the anthropometric measurements were highly reliable and could be easily performed on elderly people.

2.4.1.5 Summary of anthropometric measurements used for the study

Table 2.2 summarises measurements and indices that were used to assess nutritional status of elderly respondents of the main study.

Table 2.2 Summary of anthropometric indices for the main survey

Anthropometric Measurement	Indices of Nutritional Status
Height Weight Demispan	(a) Body Mass Index (b) Mindex & Demiquet
Waist Circumference Triceps Biceps Arm circumference	Fat Patterning / Fat Distribution Percent Body Fat Arm Muscle Circumference Arm Fat Area

3.4.1.6 Procedure for taking anthropometric measurements

Height

Height was recorded using a portable stadiometer that was light and compact and had a spirit level attached to the head plate (CMS Weighing, London). The stadiometer was customised by CMS Weighing, London, to overcome the problems encountered with height measurement during the pilot study. For the measurement of height the respondents were asked to remove their shoes and stand as erect as they could with their head in Frankfort Plane. Height was recorded to the nearest 0.1 cm.

Weight

Wearing light indoor clothing, the respondents were weighed without shoes. Soehnle electronic scales (CMS Weighing, London) were used to record weight to the nearest 100 grams. Calibration of the scales against a beam balance using a 10 kg weight was done at the beginning and at the end of the study (nine month interval). The scales were found to be accurate

Demispan

Demispan was measured using a special metallic retractable tape (CMS Weighing, London) with a hook at one end. Special demispan tape was used due to problems faced while recording demispan with an ordinary tape during the pilot study. The same type of tape was used to measure demispan for the Health Survey of England (White *et al.*, 1993). Demispan was measured with the respondent standing with his or her back to a wall, right arm outstretched maximally and laterally at shoulder level, in contact with the wall and palm facing forward. With the hook resting between the middle and the index finger, one reading was taken at the sternal notch.

Waist circumference

Lohman *et al.* (1988) recommended that waist measurement should be recorded with subject wearing little or no clothing. As undressing can cause considerable discomfort among elderly people, waist was measured over the thinnest layer of clothing. The respondents were asked to stand erect with abdomen relaxed, feet together and arms by the

sides. One measurement was taken at the narrowest part of the torso at the end of a normal expiration.

Mid arm circumference

Mid arm circumference (MAC) was measured on the right arm while standing and with the arm hanging freely on the side and palm facing the right thigh. The respondent was then asked to flex his or her arm at 90 at the elbow with the palm facing upwards. A small mark was made half way between the tip of the acromion and the elbow. Three readings of mid arm circumference were taken to the nearest millimetre.

Biceps skinfold

Biceps skinfold thickness was recorded using Harpenden skinfold callipers (CMS Weighing, London) The respondent was asked to stand with arms relaxed on the sides and palms facing anteriorly. A reading was taken to the nearest 0.2mm, on the right side at the level marked for mid arm circumference, approximately 4 seconds after applying the callipers. Three readings were taken and an average was calculated.

Triceps skinfold

Standing behind the respondent three triceps skinfold readings were taken to the nearest 0.2mm. Harpenden callipers were used (CMS Weighing, London) and recording was taken four seconds after applying the callipers at the level marked for measurement of MAC.

2.4.2 Blood pressure

The protocol for measuring blood pressure outlined in the Health Survey of England (White *et al.*, 1993) was followed and respondents were divided into four categories according to their blood pressure and whether they took medication for raised blood pressure.

Normotensive untreated: Systolic blood pressure less than 160 mm Hg and diastolic less than 95 mm Hg, not currently taking drug(s) prescribed for high blood pressure.

Normotensive treated: Systolic less than 160 mm Hg and diastolic less than 95 mm Hg, currently taking drug(s) prescribed for high blood pressure.

Hypertensive treated: Systolic greater than 159 mm Hg and /or diastolic greater than 94 mm Hg, currently taking drug(s) prescribed for high blood pressure.

Hypertensive untreated: Systolic greater than 159 mm Hg and / or diastolic greater than 94 mm Hg not currently taking drug(s) prescribed for high blood pressure.

2.4.2.1 Protocol for measuring blood pressure

Blood pressure was recorded during the first visit, after administering the socio-demographic questionnaire and explanation of procedure for recording food intake in the dietary diary, which took approximately 20-25 minutes. This was done to conform as closely as possible to the "30 minute rule", according to which the respondent should not have eaten, smoked or had an alcoholic drink in the past 30 minutes (White *et al.*, 1993). The respondent was asked to remove jumper or cardigan. If he/she was wearing a long sleeved shirt, this was rolled up, making sure it did not restrict the circulation of blood in the arm. If this was likely the respondent was asked to slip their arm out from the sleeve for the measurement. The respondent was seated relaxed with feet flat on the floor for at least five minutes before the measurement began. During this time the procedure was explained to the respondent and any questions answered. Although taking the mean of three readings gives a better picture of the blood pressure status of a person. Due to the fact that the reading was to be taken in the respondent's home, under relaxed conditions, the decision to take one reading was made to reduce interview time. Studies have shown that although baseline blood pressure (usually three readings taken at interval of one minute between each reading), gives a more reliable blood pressure reading. There is also evidence that screening blood pressure (one reading taken at the beginning of any study) is well correlated with long term blood pressure status of a person (Carroll *et al.*, 1995). The respondent was seated in a chair with his/her arm on an arm rest to bring the antecubital fossa to approximately heart level. Using an automated blood pressure monitor (TM Omron HEM-704C), one measurement was taken on the right side. The cuff was placed on the right upper arm with the lower edge of the cuff 2cm above the elbow crease and the green cuff marker positioned over the brachial artery. The cuff was tight enough to admit two fingers between the cuff and the respondent's arm. The respondent was asked to relax his/her arm with the palm facing upward. The pressure value switch was set and one reading was taken for each person.

2.4.3 Dietary intake

Keeping dietary records requires high degree of skill and co-operation from people. Co-operation rates in excess of eighty percent have been achieved from randomly selected samples that recorded estimated weights of foods over a period of 4-7 days. If a precise measure of an individual's intake is required then records of longer duration are needed which are likely to reduce the compliance (Bingham, 1987; Nelson, 1988). Despite a range of methods available, measuring a person's habitual dietary intake remains a major challenge and a seemingly straightforward task is fraught with difficulties as the list of factors that might introduce an error into the simplest of measurements seems to be endless. If the aim is to measure habitual intake then the Heisenberg's principle of uncertainty must be taken into account; if you stop to measure something, you change its behaviour (Bingham & Nelson, 1991). Although there is a wide range of methods available to assess food intake, it seems that no direct measure of what people eat will provide a true picture of their dietary habits (Bingham & Nelson, 1991). A clear definition of the objectives and respondent profile, study environment and time and resources available are very important factors towards deciding on method of dietary assessment. All methods to assess dietary intake have their strengths and weaknesses and no one method can be universally applied. The validity and reliability of a method also has a major influence on its choice and it cannot be assumed that a proven method will inevitably produce useful results (Hackett *et al.*, 1985). Studies have used one dietary assessment method to validate the other, but if two methods seem to give similar results they may do so because they have common errors.

Dietary intake can be assessed using a number of methods and these can be broadly divided into:

Methods based on past intake (retrospective dietary assessment)

Methods based on present intake (current dietary assessment)

2.4.3.1 Retrospective dietary assessment methods

(i) Twenty four hour recall

(ii) Diet history

(iii) Questionnaires

Retrospective methods are known for their ease of administration but the main criticism for all methods based on recall is that they rely on the accuracy of a subject's memory. Dietary

mis-reporting is also a greater problem with these methods as it is easier to make incorrect statements about food intake and habits during an interview than it is to alter actual consumption during the course of dietary recording (Bingham and Nelson, 1991).

(i) Twenty four hour recall

The subject is asked, through a series of questions, to describe all food and drink consumed 24 hours prior to the interview. This information can be quantified using food models or photographs. Cambell and Dodd, (1967) reported a 25% higher dietary intake with interviewer probing, however ill judged leading questions may introduce bias (Bingham & Nelson, 1991), Twenty four hour recall causes little respondent burden, can be easily and quickly administered, and does not rely on the subjects' literacy or numeracy skills. It is however important to understand how information is stored in the person's memory and how it is retrieved and reported to the investigator (Thompson and Byers, 1994). Considerable probing and detailed enquiry may be needed to retrieve information, leading to increase in respondent and interviewer burden (Marr, 1971). Cognitive influences on dietary reporting have been discussed by Dwyer *et al.* (1987) and Smith *et al.* (1991) and 24 hour recall may not be suitable for the elderly as it relies on short term memory. Cambell and Dodd, (1967) showed that older people can omit as much as 35% of their energy intake and grossly underestimate the intake of ascorbic acid. The major disadvantage of 24-hour recall method is that it does not provide reliable estimate of an individual's intake because of day-to-day variation. Hence information on 'yesterday's' intake reported for 24-hour recall may be not be typical of the subject's habitual diet (Webb & Copeman, 1996).

(ii) Diet history

Typically diet history method of assessing food intake is a combination of 24-hour recall, food frequency questionnaire and a three-day record (Burke, 1947). Diet histories are better suited to clinical settings and are often used when the subjects cannot be interviewed in their own home. This method poses considerable respondent burden and is prone to interviewer bias (Bingham & Nelson, 1991). Subjects are more likely to overestimate how often they consume certain foods (Bingham, 1987) and they are more likely to recall diet that relates to the immediate past and not necessarily to the period of interest (Bingham & Nelson, 1991). The length of the interview may also cause problems. This method is particularly unsuitable

for estimating dietary intake of elderly people because they are prone to digression and may become fatigued or frustrated by a long interview (Kelsey *et al.*, 1989).

(iii) Questionnaires

Questionnaires are the most widely used tool for dietary assessment and are usually food frequency (FFQ) or food frequency and amount type (FAQ). The respondents completing a food frequency questionnaire are asked to report their usual frequency of consumption of each food from a list of foods. FAQ, on the other hand, requires the subjects to say how often they usually consume an item of food or drink and how much they typically have on the days they consume it. Each questionnaire is developed to suit the purpose of the study, which makes rigorous pre-testing imperative (Bingham & Nelson, 1991). Although questionnaires are cheap to administer and can be optically scanned to reduce data entry costs, the amount of time and work that goes in their development and validation, remains their major disadvantage (Bingham & Nelson, 1991)

2.4.3.2 Current dietary assessment methods

(i) Weighed intake

(ii) Estimated intake

Completing food records is time consuming, hard work and can therefore be very inconvenient. The most commonly cited reason for not recording an item of food is being too busy and the recording of food being too much of a hassle (Macdiarmid & Blundell, 1997).

(i) Weighed intake

Weighed food record is often described as the 'gold standard' of dietary assessment because its validity has been tested using a 24-hr. urine collection (Isaksson, 1980; Bingham *et al.*, 1995). Unfortunately in many field studies weighing foods may not be the most appropriate method of dietary assessment. Weighed food records have been described as being invasive and burdensome (Livingston, 1995), making these especially unsuitable for older subjects. Although advent of Petra scales has made weighing food less cumbersome (Bingham, 1991a), elderly people having problems with sight and arthritis in the small bones of hands may find it difficult to operate the scales. It has been suggested in the past that weighing

food alters intake (Ohlson *et al.*, 1950), but it remains debatable whether this is true or is just a case of mis-reporting dietary intake. It has also been known that the chore of weighing foods may cause the subjects to look for alternative meal and snacking pattern and even eat foods which are easy to weigh during the recording period (Macdiarmid & Blundell, 1998). Livingston *et al.* (1992) obtained estimates of energy expenditure by doubly-labelled water and compared them with energy intake recorded by a seven day weighed record and a diet history. They found that on a group basis, results from diet histories were more representative of habitual intake than results from weighed intake. Weighing food also requires the subjects to be highly motivated and the complexity of the procedure can have a serious effect on the response rate. The National Diet and Nutrition Survey, feasibility study tested the use of four or seven day weighed records as a method to assess dietary intake of people over 65 years of age (Hughes *et al.*, 1995). They found that a substantial number of non- respondents cited the task of weighing each item of food and drink as a reason for non-participation. The researchers thus decided that interviewers could use their discretion and offer a semi-quantitive diary to each subject if they were opposed the idea of keeping weighed food records.

(ii) Estimated records

The written diary is a convenient and cheap method to record habitual food intake. The main drawback is that the participants need to be literate and numerate to record their intake by this method. The participants also need to be physically able to write and motivated to keep the diary. Dietary records can be recorded by someone other than the respondent and surrogate recorders have been used for recording dietary intake of children and the institutionalised. Dictaphones have been used and hold special promise for low literacy groups. Todd *et al.* (1983) reported that in their study subjects preferred to tape record their intake as compared to writing it down and both methods gave similar assessment of mean protein and energy intake. Using Dictaphones would be unsuitable for a large survey as it would add to the cost and it may not be suitable for the elderly because if they forget to record a meal or a snack, a written dietary record would be easier to check. Using tape recorder would also be unsuitable for the very old due to reduced dexterity of fingers. Written record is also easier for the investigators to quantify as with taped records it would take longer to verify portion sizes. The tapes would have to be taken away to be

transcribed before quantification of portion sizes, adding a further visit to the respondent's house.

Although dietary diaries are typically open- ended means of recording intake, close-ended forms have also been developed (Johnson *et al.*, 1982). Open ended diaries allow the subjects to record their intake in an open ended format, pose no restrictions upon the subject, do not rely on the memory and allow more direct assessment of portion size. Emphasis by the investigator to record intake as eaten is very important, and recording food consumed at each occasion provides a more accurate estimation of portion size than recalling portion sizes of foods eaten previously. When respondents record the day's food intake once per day (typically at the end of the day), the recording method approaches a 24-hour recall in terms of relying on the memory (Thompson and Byers, 1994). 24-hour urine excretion has been used to validate a three-day dietary diary. Low but significant correlations have been reported on a group basis for adults (Twist *et al.*, 1982) and children (Hackett *et al.*, 1987a). Estimation of food intake by dietary diary like weighed intake can lead to alteration of food intake, but to a lesser extent. Using a food diary is also less burdensome for the subjects and is the more cost- effective choice for a large survey.

2.4.3.3 Variation in dietary intake

The term habitual dietary intake is not only reflective of what a person normally eats but also embraces the fact that habitual diet also is a variable diet. Even if the diet of a group is fairly consistent, any method employed has to principally acknowledge the fact that dietary intake varies between days and from person to person. Thus a population group sharing all other demographic characteristics may have marked within person and between person variations. The extent of daily variation however differs from one individual to another, from 4 to 45% for energy (Wait & Roberts, 1932; Black, 1981) and 14 to 50% for fat (McCance *et al.*, 1938; Baghurst &Baghurst, 1981). To reduce within person variation, it is advised to increase the number of observations (Gardner & Heady, 1973), but this is not always possible as increasing the number of observations can lead to a reduction in compliance, especially in the older age group.

2.4.3.4 Length of dietary recording period

The problem faced during dietary assessment of the elderly people has been discussed by Bransby and Osborne (1953). They found that this age group has relatively high rates of refusal, which may introduce bias into the sample as those who refuse to take part probably are the ones with most disabilities or domestic difficulties. Thus it may well be that least satisfactorily nourished people may be excluded. Durnin *et al.* (1961) highlighted that burden of method is a very important component of a study, as compliance rests heavily on the demands made by the study. The length of recording time is also very important in prospective assessment of dietary intake. A number of studies had to re evaluate and modify the method due to falling compliance as a direct consequence of burden posed by long recording period (Caughey *et al.*, 1994; Hughes *et al.*, 1995). For determination of overall food and nutrient intake a 3-day record has been recommended for measurement of differences between groups of individuals (Bingham, 1987), longer periods are however necessary for vitamins, minerals and cholesterol (Bingham, 1991b). Cellier and Hankin (1963) found that a four day record of dietary intake retained about ninety percent of information of a seven day record. Heady (1961) found significantly high correlation between three and seven day dietary recording indicating that little information is lost using a three day record rather than the whole seven day period. Fidanza and Fidanza (1964) also confirmed that the average nutrient intake for the first three days of dietary records agrees closely with averages for a full seven- day period. Hughes *et al.* (1995) found that mean group daily intakes of energy and selected nutrients were not significantly different for four and seven day records. A study by Gersovitz *et al.* (1978) showed that incomplete records significantly increased with an increase in length of recording period. The validity of collected information thus seems to decrease in the later days of a 7-day record in contrast to information collected in the earlier days of the recording period. A three-day dietary diary has been shown to be a reliable tool to estimate dietary intake (Hackett *et al.*, 1983).

2.4.3.5 Sources of error in dietary records

The choice of dietary method aside, errors in dietary records can also be introduced during collection (error in reporting amount of food eaten) and coding data (coding error and food tables).

Food tables

Nutrient composition database is necessary when dietary intake is required to be converted to nutrient intake. All results from dietary surveys are ultimately dependent on the quality of food tables, unless foods eaten by subjects are analysed independently (Bingham, 1987). The accuracy of the results may also depend upon the method used to estimate the amount of food eaten. Type of nutrient also affects the results and it has been found that fat and fibre content of a food are highly dependent on the method of analysis (Paul & Southgate, 1978). There is a fivefold range in the 'fibre' content of food depending upon the method used to analyse food (Englyst *et al.*, 1983). Systematic error thus may be a serious problem when results of dietary surveys using different food tables are compared and it has been recognised time and again that multi-centre studies should make some provision for centralised analysis (Keys, 1970; de Groot *et al.*, 1991). In the absence of systematic error, using food tables may lead to random errors which can range from 2-20 percent for individual estimates of protein, carbohydrate, iron and calcium, depending upon nutrient studied and number of observations (Bingham, 1991b). Another problem encountered while using food tables is analysing food eaten outside the home; take-away dishes, commercially prepared complete meals and rare recipes. The subject may not know what went into a particular dish and the observer may have to use various quantities of ingredients to make up the recipe/dish. The nutritive value of traditional foods is more likely to be similar to its analysed value and people with stable food habits such as the elderly may thus need shorter periods of observation.

Another source of error in the use of food tables arises during the coding or calculating stage either due to mistakes or coding errors. Data entered by a single observer avoids inter-observer errors. Analysing dietary data is a very time consuming and laborious process and a number of dietary analysis computer packages are available. Computerised nutrient databases improve the speed and accuracy of data entry and analysis (Greenfield & Southgate, 1992).

Estimation of portion size

Errors in estimation of portion size range from underestimation of -43% to overestimation of 156% and this error is greater for some foods than the others (Jonnalgadden *et al.*, 1995). This problem associated with estimation of portion size is a potential source of error

in dietary analysis and a number of aids can be used to help the subject accurately estimate the amount of foods eaten. These include food models, calibrated utensils and food photographs. According to Nelson *et al.* (1994), the assessment of food portion size from photographs includes three main functions:

1. Perception: The ability to relate actual amount of food to an amount shown in a photograph.
2. Conceptualisation: the ability to make a mental construct of an amount of food that is not present and to relate it to a photograph.
3. Memory: this can have a bearing on precision and conceptualisation.

Any form of recall is affected by memory hence for the elderly people using food photographs would require them to rely on their memory for reporting (24-hour recall) and conceptualisation. Nelson *et al.* (1994) concluded that subjects over 65 years of age tend to overestimate portion sizes. Howat and Church (1995) suggested that picture memory could be retained for as long as a week. Thus the length of time elapsed between eating an amount of food and relating it to a photograph is also very important, and may be an important issue to consider for dietary studies of the elderly.

Food photographs are a very popular choice and typically represent small medium or large portion sizes. Alternatively, a single photograph of average portion size is displayed and the subjects are asked to estimate their own portion size as a fraction, multiple or percentage of amount in the photograph. Results from a study by Nelson *et al.* (1994) showed that single photographs are associated with much larger errors in estimation of portion size than the use of multiple photographs. In a later study, Nelson *et al.* (1996) used food photographs and a visual analogue scale to assess portion size and found that actual and estimated portion sizes ranged from - 28.4% to 48.7%, but for majority of nutrients (except for vitamin C which was overestimated by 21%) the calculated nutrient content from estimates was within =/- 7% of the actual content.

Rutihauser (1982) showed that the coefficient of variation of differences between actual and estimated weights using household measures alone was 16-53% and this was reduced to 10-27% using models and photographs. Howat and Church (1995) also compared food models and photographs to estimate portion sizes and concluded that although both methods improved accuracy of results, the improvement was more marked for food photographs. Kelly *et al.* (1995) used 3-day weighed intake to validate food photographs.

Photographs of small, medium and large portions of food were used and they found no discrepancy between the weighed and estimated portions using food photographs. Despite the problems of over- and under-estimation it appears that food photographs are useful and besides speeding up the process of quantification they improve the accuracy of dietary results by reducing the error in estimation of food portion sizes.

2.4.3.6 Dietary mis-reporting

The problem of estimation of portion size can be addressed by the use of aids like food photographs to improve accuracy of results. The fundamental problem of dietary mis-reporting however seems to be inevitable. It has even been commented that "dietary intake cannot be estimated without error and probably never will" (Beaton, 1994) and under-reporting has been referred to as "nutritionists guilty secret" (Garrow, 1995). Studies, using doubly labelled water technique for direct validation of energy intake data under free-living conditions have confirmed that self-reported dietary intake is prone to under-reporting (Black *et al.*, 1996). The use of EI: BMR ratio has been devised (Black *et al.*, 1991; Goldberg *et al.*, 1991) to identify under-reporters. Cut-off values have been formulated and an EI: BMR below 1.2 is deemed incompatible with survival. Goldberg, *et al.* (1991) indicated that a value of 1.35 represented habitual intake. The WHO (1985) has set a value of 1.27 which may be compatible with survival but not with long term health.

Although under-reporting is commoner, dietary mis-reporting or invalid reporting includes both under- and over-reporting (Macdiarmid & Blundell, 1998). Dietary under-reporting has recently attracted a lot of attention (Schoeller, 1990; Goldberg *et al.*, 1991; Litchman *et al.*, 1992; Garrow, 1995; Price *et al.*, 1997; Voss *et al.*, 1998; Macdiarmid & Blundell, 1998). Unlike under-reporting, over-reporting is not as common and is usually associated with foods that are linked with a positive health image (Macdiarmid and Blundell, 1998). Furthermore, for energy over-reporting there are no standard cut-off points. The problem of over-reporting was investigated by Mertz *et al.* (1991). They reported that out of 266 volunteers who recorded their food intake for 7 days only 8% over-estimated their food intake and 81% under-reported their intakes below their maintenance requirements.

A number of studies have also tried to define characteristics of dietary under-reporters. Under-reporting is associated with increasing age (Hirvonen *et al.*, 1997; Briefel *et al.*, 1997), but age is usually associated with other factors such as BMI, social, educational and

economic factors that may have a confounding effect on under-reporting. Under-reporting is also associated with gender, and women are more likely to under-report dietary intake than men (de Vries *et al.*, 1994; Hallfrisch *et al.*, 1982) and lower levels of education (Briefel *et al.*, 1997; Price *et al.*, 1997). When under-reporting is determined from calculations of EI:BMR, its prevalence is higher among obese than lean subjects (Ballard-Barbash *et al.*, 1996; Prentice *et al.*, 1986). Current weight alone may not be indicative of tendency to under-report as in a study of post obese subjects, Black *et al.* (1995) found that ex- slimmers (of normal current BMI) under-reported their energy intake by a mean of 27%. Bingham *et al.* (1995) found that under-reporters record lower intakes of cakes, biscuits, pastries and other high fat foods. Protein is usually accurately reported and may even be over-reported and carbohydrates are under-reported (Summerbell, 1996; Rutishauser, 1995). Klesges *et al.* (1995) reported that 54% of their subjects under-reported their dietary intake using 24-h recall as a method of assessment. In a study by Lafay *et al.* (1997) 16% of the subjects recording their intake by a 3-d diary, under-reported their intake.

All studies of habitual food intake reveal a substantial day-to-day variability and dietary under-reporting may well be due to measurement over a period of low intake (Goldberg *et al.*, 1991), and if random variation is the only form of error, then it should balance out across the population being studied. Under-reporting becomes a serious problem when the error reflects a bias towards recording below habitual intake. Dietary under-reporting can be attributed to different forms of behaviour (Macdiarmid &Blundell, 1998) which include:

1. Food is eaten but deliberately not reported (intentional under-reporting)
2. Food consumption is reduced, or subjects avoid certain foods, during the period of study (intentional alteration of diet)
3. Foods are eaten but genuinely forgotten (unintentional/unknowing under-reporting).

As more and more studies are exploring the problem of under-reporting of dietary intake, the issue is no longer about its existence. The real dilemma facing researchers is that once identified, what should be done with such data? One school of thought is that under-reporters should be excluded, but the problem is that we cannot be sure that the suspected under-reporters identified by one technique are the only ones under-reporting (Macdiarmid and Blundell, 1998). Furthermore, Hirvonen *et al.* (1997) reported that in their study even though the proportion of under-reporters was large (46% for women and 42% for men), excluding them did not change the proportion of fat, protein and carbohydrates of energy

intake. The current consensus thus seems to be that under-reporters should be included and their presence in the sample acknowledged. Under-reporting in micronutrient intake may cause a significant bias, and this should be also taken into consideration (Hirvonen *et al.*, 1997).

2.4.3.7 Dietary assessment method used and procedure followed

The estimation of dietary intake is often a difficult task and can present extra challenges in the elderly people. Declining short term memory makes 24-hour recall unsuitable, weighed intake poses too much burden, diet histories can be lengthy and tiresome and problems of validation and complex summing and averaging to estimate consumption for questionnaires make these tools inappropriate for dietary assessment of the elderly. Food diary method has been found to be valid, and used in conjunction with food photographs gives an accurate assessment of food intake. It does need the subjects to be motivated, but continued observer-subject contact, dedication on the part of the observer and a 3-day recording period not only keeps the subjects motivated but also improves accuracy.

The pilot study highlighted that using a three-day food diary was an effective tool for assessment of nutritional intake of elderly people. It was described as being interesting by the pilot sample. The duration of three days was described as being appropriate as it was stated by the pilot sample that beyond this period the task would have been burdensome. Another view expressed by the pilot sample was that by the third day the respondents started to become aware of how much or how little they were eating. This can be very important in dietary assessment as awareness of diet due to recording can lead to its alteration. The prevalence of under-reporting was determined in the pilot group by calculating EI: BMR. It was found that although men tended to under-report (EI : BMR = 1.1), as a group there was no evidence of under-reporting (EI : BMR = 1.47) among the pilot sample.

A three-day dietary diary using semiweighed technique for pre-packed foods was the method of choice to estimate dietary intake for the main study. Food photographs (Mullan & Luke, 1994) were used to quantify portion sizes. Fruits and vegetables commonly eaten in whole state, cooked or raw, such as apples, oranges, whole potatoes, etc. were designated as small, medium or large and quantified using food portion sizes (Crawley, 1988).

First visit

The subjects were given instruction on how to record food intake in household portions using the dietary diary (Appendix 8). No dietary restrictions were imposed during the study and no dietary counselling was offered. The subjects were instructed to continue eating a diet of choice giving the investigator a 'fly on the wall' view of their usual intake. The need to record all foods and drinks consumed was emphasised and it was also stressed that food intake to be recorded as close to the time of consumption as possible. The instructions were also printed on the inside cover of the dietary diary, in case the subjects needed to confirm something. The first page of the diary was used as an example of how to record food in household measures, left overs, snacks, tinned food and beverages. The inside cover also had the investigator's telephone number for support. The subjects were asked to start recording their intake from the next day (day one after the first visit). An appointment was made to collect the completed dietary record the day after the last day of recording (day four after the first visit). If this did not suit the subject the second visit was scheduled at the subject's convenience, but was left no later than the seventh day after the first visit.

Second visit

During the second visit the observer went through each food item entered in the diary with the respondent and clarified any ambiguities. Portion sizes were quantified using food photographs (Mullan & Luke, 1994). The photographs displayed small medium and large portion sizes of different foods and drinks. Information on packaged foods was recorded in the diary and the amount eaten also recorded (e.g.: 1/2 of 200g tin of baked beans), respondents were also asked to keep food wrappers where possible. They were also asked to fill water in the cups and glasses used for tea, coffee, wine, or other beverages, in the same quantity as usually consumed. The water was then transferred into a measuring jug (carried by the investigator), and the quantity measured. The three- day record was entered into food analysis package, Microdiet (University of Salford). Figures for fibre were derived using Englyst's definition of non-starch polysaccharides (Englyst *et al.*, 1989).

2.4.4 Statistical analysis

The data are presented in tables as mean, SD and 95% confidence intervals unless otherwise stated. Statistical analysis was performed using an SPSS computer software package. A P value of < 0.05 was accepted as the level of statistical significance. One-way ANOVA was used to compute age and gender related differences in nutritional status indicators.

2.4.5 Social class of the respondents

Social class was coded for the respondents according to six groups specified by the Registrar General's Classification of Occupations. Classifications were based on each person's main job before retirement. Table 3.2.5 shows classification of respondents according to the head of the household. All the subsequent comparisons are based on a two-way classification of non-manual (social classes I, II and III non-manual) and manual (social classes III manual, IV and V). This two-way system of classification was similar to that used by the NDNS (Finch *et al.*, 1998).

CHAPTER 3

Findings

3.1 Phase I /Qualitative phase (In-depth interviews)

The tape-recorded interviews were transcribed in verbatim, although questions were not asked in a set pattern, they are grouped together according to the emerging themes.

3.1.1 Theme I (To explore self perception of diet)

Most of the respondents were of the view that their diet was adequate although some were concerned that perhaps they were eating too much or too little. Respondents who said that they probably ate less than they should did so to compensate for low levels of physical activity. Fifty-nine percent (n=19) of the respondents said that they were not concerned about their food intake, ate what they liked and tended not to worry about it. Questions 1 and 2 were asked to explore the respondents' views about their current diet.

Q1. Do you think that you are consuming an adequate diet?

"Yes I think you can say I eat adequately, maybe I ..... well I think I eat more than I should". (F: 83y)

"Yes, I think I am eating properly... I don't do much so I don't need much". (F: 81y)

"I think I eat an adequate diet, my wife won't agree, she'd like to see more greens on my plate". (M: 71y)

"I keep my diet balanced, I try to give my diet a great deal of thought..... well when I get concerned I take my cod liver oil". (M: 67y)

"I don't have an adequate diet. How can I? I don't like fruit and vegetables..... and they say these are good for you. You should see how well my neighbour eats. Well I can't ... I can't eat much anyway. I don't do much moving around so I should not eat much anyway". (F: 72y)

"I think I eat an adequate diet, other people might say I eat less". (F: 83y)
"Probably it is over adequate, I do like fruit and vegetables... I probably eat too much, and there can be too much of a good thing". (F: 68y)

Q2. Are you concerned about what you eat?

"Yes, I am very concerned about what I eat,... always have been". (F: 77y)

"No I am not concerned about what I eat. If you eat good and bad in moderation, it won't harm. I eat what I like and don't worry about it". (F: 78y)

"Well I eat what I like and why not. I can afford it. I won't say I am concerned about what I eat, if I like it, I'll buy it". (F: 67y)

"I am not concerned about what I eat, I don't think I eat enough but that can only be a good thing at my age". (F: 72y)

"Concerned..... well I don't know if concerned. It is consciously in my mind all the time to eat what is good for me". (F: 83y)

"It depends, sometimes I feel health conscious, sometimes I just enjoy myself". (F: 68y)

3.1.2 THEME II (Knowledge of relationship between diet and disease)

Seventy seven percent (n=25) of the respondents were vaguely aware of a link between certain nutrients and incidence of disease. The most commonly quoted nutrient was sugar and its relation to development of diabetes. Being overweight was linked with excess of food, dietary fat and lack of physical activity. Heart disease was only linked to cholesterol by two female respondents, one of whom was awaiting a bypass surgery and the other's husband had died of heart failure. Most of the respondents were aware of the importance of levels of dietary fat, however the ones who said that they had no need to worry about fat content of their diet were the ones who claimed that they did not consume diets high in fat. There was however confusion over use of nutritional terms and some respondents ocassionally referred to calories as fat and vice versa. Questions 3 and 4 were asked to explore this theme.

Q3. Do you know of any diseases that may be linked with what a person eats?

Q4. Are you concerned about the fat in your diet?

"We don't bother with fat because we don't consume too much fat anyway...., so we enjoy the taste of full fat milk and yoghurt". (F: 67y)

"I tend to buy less fat .... I buy Flora and butter and mix the two". (F: 69y)

"I don't bother with all that fat and calorie counting". (M: 84y)

"I am very aware of the fat in my food.... you can do so much by cooking the food the right way. We only buy chips once a month which I cook myself in oil. I don't buy fatty meat, I get all the extra fat trimmed off..... only lean beef always. I cook meat on a trivet and the extra fat is drained off and potatoes are only brushed with oil". (F: 69y)

"I do think about fat and calories. I have been trying to lose weight for the past 20 years. I also went to the hospital where they absolutely starved me, but I did not lose anything so they also gave up.... but I like my food too much and I am over 70 you know... so why worry". (F: 71y)

"I must say I have a weakness for butter but now I am becoming aware of fat in butter because one or two friends of mine have cholesterol problems". (F: 83y)

"I am very aware of the fat in my diet especially for the past three years since I have been to Weight Watchers". (F: 70y)

"I am not concerned about calories and fat and vitamins. If I was having a fry up every morning then I would be concerned and take notice. I don't take vitamins because I wouldn't know what to take. I don't think what my diet is providing for me.... it is just good food". (F: 78y)

3.1.3 THEME III (Nutritional knowledge and information)

Forty-eight percent (n=16) of the respondents said that they were aware of the government guidelines on healthy eating of which 26% (n=9) tried to take them on board. Messages on healthy eating were considered largely ineffective because they were perceived to be ever changing and conflicting. To assess nutritional knowledge the respondents were asked to express their thoughts on foods that were good and foods that were bad for health in their view. The most commonly cited 'good' foods were fruits and vegetables and 'bad' foods were fried and processed foods. Question 5 and 6 was asked to explore the level of nutritional awareness.

Q5. Do you know about the government guidelines on what people should or should not be eating? Do you think these guidelines have an effect on what people eat?

"We are aware of the guidelines but they do not affect us as we are already doing what is being advised". (F: 67y)

"People are ignoring what the government is advising because more and more women are working, hence they use the fish and chip shops. Also messages on TV are very confusing, you'll have one man on one channel saying out, out fat, don't eat fat, cooking without fat is what we should be doing. On another channel a man will be adding butter by the ladle full saying ... you can't have this recipe without it... there is lot of contradiction on TV and magazines and papers". (M: 74y)

"I am aware of some form of guidelines by experts about what we should or should not be eating but I don't care about them. I would say other people are trying to eat healthier, more people seem to be making the right choices because we are feeling healthier..... aren't we, but they are missing out, e.g. you could take this low fat business too far". (F: 69y)

"I am not aware of any such guidelines, I use my own judgement, mind you I did receive some information from my GP when my cholesterol was high".
(F: 82y)

"The advice on the matters of food and eating changes everyday anyway. You have to work out what is good for you, not what is good for everyone.... I myself take it with a rather large pinch of salt. Television has a lot to answer for, so much conflict but again people should think for themselves and not just accept what is fed to them". (F: 82y)

"We are not aware of any such guidelines, but what can the Government do? Lot of ill health is peoples' own fault, they would spend money on cigarettes and alcohol and bingo. People make the wrong choices and then they complain and say we don't have money to buy expensive food. To eat well is your own responsibility". (M: 78y)

"I don't know about any such guidelines and I wouldn't know where to look for such information. I'd certainly like to know more about it. People are not listening to advise because people care very much about taste than what is good, unless you become ill with something". (F: 83y)

"I am aware of such advice, less sugar and less fat seems to be the main thing. But you see all this very confusing, there are mixed messages. Take the example of beef, they are still not coming out and saying_don't eat beef, even when it seems to be clear that younger persons are more vulnerable. They are not doing so because of the beef trade, they don't want to lose the next election. It all comes down to you are what you eat. Basically I think we are just eating too much". (F: 67y)

"I am aware of the guidelines on healthy eating and I do take them on board to some extent as you don't want to be so interested in them that it becomes an obsession. People I would say are not listening to these messages because the Government knew long ago that fat is bad and all but did not tell us, also TV adverts tell us how wonderful chips and chocolate are. I think the food industry has got it right, they do their job well, specially where children are concerned, taste is very important therefore food industry is succeeding in making people eat what they want them to eat. Perhaps the government should employ them to do their job". (F: 68y)

"I do have some idea about the guidelines, one of my friends has quite a few leaflets on healthy eating. I am trying to cut out fried foods and eat more vegetables and bananas, also listening to radio and what people are saying. If I was eating something which was not good for you I'll stop eating it". (M: 67y)

Q6. What are 'good' foods and what are the 'bad' foods?

"Bad foods are the ones that are not good for your health e.g. fried eggs and bacon. Fresh fruits and salads are good foods and are good for you". (M: 67y)

"Bad foods are sugary and fatty and processed foods, good food is like brown bread". (F: 67y)

"Good foods vegetables and salads, bad foods... used to be chips I don't know what it is now". (F: 72y)

"Vegetables and salads are good for you and cream and butter are bad for you". (F: 83y)

"Fried food is bad for you and well cooked food, fruits, chicken and porridge are good for you". (F: 78y)

"Fatty, fried food is bad food and vegetables, fibre and fruit are good for you". (M: 74y)

"Good food is fresh vegetables and bad food is too much sugar". (F: 69y)

"Fruits and vegetables are good food and fatty food is bad". (F: 82y)

"Good quality food, less fat, fruit and brown bread are good and processed food is bad". (F: 77y)

"Wholesome traditional food is good food, and pre-packed food and processed food is bad for you. I see people buying frozen food and I don't know how they do, you never know what's in there could be outdated".
(F: 73y)

"Bad food is convenience food and fatty food. Ordinary food is good food, pasta is good and since I have tried the fresh pasta I have been converted..... never buy the dried stuff again". (F: 82y)

"Meat, vegetables not too much pastry, fibre and brown bread are good food, fried food is bad for you". (M: 74y)

"Traditional food is good for you. I hate trying new things, I like good wholesome British food. I will never try continental food, my grandson is a chef but I never say I'll try pasta, I don't like all these modern spices and sauces". (M: 77y)

3.1.4 THEME IV (Influence of food price and personal budget on food choice)

Price of food seemed to have little influence on food consumption and the consensus was that if the respondents wanted it they bought it, food was on the top of the shopping list for most of the respondents, hence having priority over other expenses. Questions 6 and 7 and 8 were asked to explore the influence of price on food choice.

Q6. What are your views regarding food prices?

"We really don't care about food the price of food. A large percentage of our income goes on food, food is our major expense". (M: 74y)

"The prices of food are quite reasonable, you can buy cheap foods if you want but if you want quality stuff you pay for it". (F: 69y)

"Well prices of food swing in round about. I buy what I like, if I like something I buy it because nobody suffers if I buy what I like. I pay over the odds for food". (F: 70y)

"Well I like good food, I don't go for cheap food so I don't look at prices. I don't spend too much on other things, you know, so I buy what I like". (F: 82y)

"Well we go and eat at the luncheon club everyday. It comes to £2.60 for the two of us per day and we get a hot meal of meat and vegetables, pudding and tea. If I had to go and buy for this we would be spending a lot more and all that cutting and chopping and then washing up... we couldn't be bothered. When we buy food we always budget and buy the cheapest". (M: 72y)

"I used to worry about prices and go running where something was a few pence cheap, but now I can afford to shop wherever I like. Quality is very important price is secondary". (F: 77y)

"I am in such a position if I desperately needed something, I'd be able to afford it, also I buy basic foods which are not expensive. Food is not overpriced but if you buy extravagant food ... it has to be imported, then transported this lead to high prices. Fruits and vegetables are pretty much the same as in the past". (F: 69y)

"Basic foods are not expensive but I buy ready made foods, they are dearer but are convenient". (M: 84y)

"Price of food... well I can't complain, I used to budget for food, all family members used to have half an apple each and saved for everything, I used to compare prices and all that, but not now. I don't need much and there is only me...., being a pensioner has its perks, especially in Liverpool, everything is free especially public transport, but everybody wants more. People say I can't have this or that, but I say they mismanage their money". (F: 83y)

"I don't budget for food, prices seem to be OK. The Government has failed, it doesn't apply to us because Ken (husband) has a good pension and we can go out and buy anything people on small pensions have to do without. My generation went through war and rationing and they were healthier then, now you get so many kinds of food... not that I'd try them but people do. Food is very important, more important than clothes you know. My mother always used to say " good food, fire and a roof over your head ". Food is most important, you've got to stock up on yourself". (F: 72y)

"Although I pretty much buy what I like, I don't spend as much money on food as I used to when I had the family with me. I don't go out eating a lot like young people, people my age don't". (F: 68y)

"I am very aware of food prices. Prices sometimes go up and out of all proportions, I went to buy cider vinegar and they had put the price up by nearly 10%, I don't understand how they can justify something going up by 10-14 % when the cost of living is at two and a half percent. Food for me comes first, and then heat, I usually say if you have food in your stomach you feel warmer and then you need less money to spend on heating". (M: 67y)

3.1.5 THEME V (Effect of age on food choice)

A vast majority of the respondents said that their food choice hadn't changed over the years and they ate and chose similar foods as they did in the past. It was also observed from the comments that in general the respondents claimed that as they had grown older they tended to eat less food, meat and fat. Question 7 was asked to explore the affect of age on food intake.

Q7. Over the years has the food you choose and eat changed in any way?

"I never changed what I eat, my wife likes to try new foods but I like more traditional foods, I tried pasta..... didn't like it". (M: 71y)

"I suffered from gastric ulcer ten years ago, I eat small meals frequently, don't like fried foods anymore". (M: 67y)

"Well I don't eat as much food as I used to, the kind of food I eat has changed as I like experimenting with new foods. Now- a- days I am leaning towards processed foods because I am so busy. I have said to myself that I should try hard to go to fresh fruits and vegetables although it is very tempting to buy all these ready meals". (F: 67y)

"I eat a lot less and much less meat. I don't think there is a lot of goodness in meat. I do eat it when I go out but I think I am leaning towards vegetarianism". (F: 83y)

"Well there is no sugar to start with and we try to eat less fat and avoid frying. I use my pressure cooker a lot and like that sort of cooking. There is no alcohol..... only occasionally". (M: 78y)

"I pretty much eat what I used to, do not like the modern stuff..... curries, pasta, garlic, heavy sauces. I have always enjoyed traditional food. The only thing that has changed since my husband died is that I don't eat as much meat. I am scared of cooking something that is not traditional as I am worried about eating it". (F: 67y)

"The first change came with refrigerators, we don't have to go to the shops for everything. Next change was when the girls left and I didn't have to cook such elaborate meals or so much meat, roast every Sunday, and the next change was health education about fat in diet and health propaganda". (F: 67y)

"I pretty much eat what I used to and as much, people say you don't need as much, you don't eat so much when you grow older that's all cods wallop. It is only because they go and play bingo and spend money otherwise, they don't walk or exercise and they get sick". (M: 81y)

3.1.6 THEME VI (Influence of cooking skills and cooking facilities of food choice)

Most of the respondents said that they made an effort to have at least one cooked meal during the day and this meal could be home cooked or eaten at a luncheon club. Most of the respondents claimed that they did not face any physical difficulties while cooking. All of the respondents had a cooker and a fridge in their kitchen, only 9% (n=3) had no freezer and 27 % (n=9) had a microwave. Questions 8, 9 and10 were asked to explore topics related with cooking and food choice.

Q8. Do you cook? Do you enjoy it?

Q9. Do you face any difficulties while cooking?

Q10. Do you have a fridge, freezer, microwave?

"I am a very simple cook, I try to cook at least one meal. I do not like to turn on my cooker as I pay my own electricity bill, you could also put this down to my mother who was a wonderful cook..... I never bothered to learn". (F: 83y)

"I do not have a microwave but I wouldn't mind one, but will be of no use to me as I only buy small portions because I only have a small freezer". (F: 70y)

"I don't cook, I don't have to... my fish monger cooks my chicken and vegetables everyday. The only time I cook is when I do chips or baked potato. When you get to my age you get used to things and I am happy with what I have". (M: 81y)

"I love cooking, I am very involved with the food we eat, I always have been nothing has changed since I retired, maybe I cook to suit my husbands timing now. I freeze a lot especially fruit, I also freeze bread, chicken and fish. I always make sure there is enough in the freezer". (F: 69y)

"I would say my cooking habits have changed a lot, I don't cook as much as I used to. Cooking was very satisfying, I was the centre of the family and cooking was a joy, I also used to do big roasts... now because of Jack's attitude to food .... he doesn't want large roasts anymore..... (F:67y) (husband interrupts) "I won't say that, I enjoyed my roast but I know you don't much care for it or the cooking..."(laughs) (M: 74y)....."Well it did take a disproportionate amount of time, this arrangement suits me". (F: 67y)

"Preparation of meals never appealed to me, I'd rather settle for some cheese and crackers..... bit lazy about it. As a child I was the same, did not like the idea of dinner. My mother was always trying to fatten me up. When my husband was alive I cooked dinner everyday and of course for my two children. Now I just enjoy not doing it (laughs), I'd rather have some one give me a pill or a prepared meal". (F: 83y)

3.1.7 THEME VII (Role of shopping facilities, access and mobility on food choice)

All of the respondents did their own shopping for food and described it as an activity they enjoyed as it gave them a reason to leave the confines of the house. Most of the respondents shopped at least once a week or more and with a usual pattern of one large shopping trip to the supermarket per week complemented by local shops for daily requirements. The respondents mainly patronised supermarkets and visisted local shops if they needed to buy single item such as bread or milk. Other factors included weather, availability of transportation and the respondent's state of health. The respondents also tended to use the local shops for meat, fish and fruit. Only 11% (n=4) of the subjects were in the favour of an affordable home delivery. Questions 11, 12 and 13 were asked to explore shopping habits of the pilot sample.

Q11. Do you do your own shopping? Do you enjoy it?

Q12. Where do you shop, how do supermarkets compare with local shops?

Q13. Would you like an affordable home delivery service for food?

"I don't have a shopping day which I did when my children were with me. I have a freezer and always have plenty, I usually shop in the morning and I freeze a lot. I usually make two dinners and freeze one for later. Supermarkets are cheaper when you have a family but now I am alone and can afford to use the local shops unless I am entertaining. Local shops are little bit dearer..... but I can afford it and I feel as if I should help the local trade". (F: 68y)

"We go to the supermarket once a week to do the big shop, that is the only time we get the car out, during the week I go to the butcher and fishmonger". (F: 69y)

"I go twice a week to the supermarket and I love it, rest of the time I go to the local shops to buy daily things. I find supermarkets exciting and service is generally good, they don't have any help for old folk who may need help". (F: 77y)

"I don't shop at the supermarket on my own, I go with my daughter, I have no means to go on my own, and my epilepsy doesn't help. I used to walk a lot before my epilepsy, we had lots of shops, a choice of shops. Now we only have one.... a delicatessen who sells everything. The supermarkets are responsible for this, what are old people going to do when there are no local shops. Old people, if they don't have a car they can't go to supermarket and stock up, most of them don't have freezers so they rely on small shops. Small shops are getting smaller and lesser and they are expensive, but you have to pay if you can't go anywhere else". (F: 72y)

"I do once a week shop and I go to the local shops, it is a necessity for me if I don't shop I'll just wonder around. Supermarkets can't beat the little shops, if I want two rashers of bacon I can get it over the road, in a supermarket I'll have to buy a packet". (F: 78y)

3.2 Phase II (Quantitative phase)

3.2.1 Response rates

Of the 320 elderly people contacted for the main survey, 80 (25%) agreed to take part in the study and completed all its aspects (survey sample). Table 3.2.1 shows the total response broken down to indicate response rate per borough. Lowest response rate was recorded for the borough of St Helens & Knowsley.

Table 3.2.1 Number of elderly people recruited from four boroughs of Merseyside

Borough of Merseyside	Number of participants n=80 (100%)
Liverpool	23 (29%)
Southport and Sefton	21 (26%)
The Wirral	22 (27%)
St Helens and Knowsley	14 (17%)

Table 3.2.2 shows that St Helens and Knowsley had the highest number of refusals (42) and had one of the highest number of people (18) who were not available at the address.

Table 3.2.2 Classification of response to the letter of invitation to participate in the study for the four boroughs of Merseyside.

Total letters Posted (80)	Borough			
	Liverpool	Southport&Sefton	The Wirral	St Helens&knowsley
Refusals	39	36	30	42
Unobtainable	12	18	15	18
Doorstep refusals	6	5	13	6
Survey sample	23	21	22	14

3.2.2 Respondent profile

Eighty free living elderly people (65 years and over), 39 men and 41 women, agreed to participate in the study. In accordance with the classification used by the COMA report (DoH, 1992) they were divided into 'younger elderly' respondents (65-74 years) and 'older elderly' respondents (75 years and over). The survey sample was divided by sex and all comparisons were based on these four groups.

3.2.2.1 Age

The mean age of the survey sample was 74.3 years (SD 6.54). The survey sample was evenly distributed for age, mean age of men was 73.9 (SD 6.12) years and mean age of women was 74.6 (SD 6.98) years.

3.2.2.2 Sex

Table 3.2.3 shows that the survey sample had 41 women and 39 men. With 20 younger elderly and 21 older elderly women, women in the two age bands were fairly equally distributed. The survey sample however had a greater number of younger elderly men (24) than older elderly men (15).

Table 3.2.3 The number and proportion of men and women by age in the survey sample.

Age band	Male n (%)	Female n (%)
65-74 years	24 (61)	20 (49)
75 years and over	15 (38)	21 (51)

3.2.2.3 Marital status, literacy and education

Table 3.2.4 shows that thirty-two men (82%) and 16 women (39%) were married. Twenty-five women (61%) and 7 men (18%) were widowed, divorced or single. All 41 women and 39 men of the survey sample were literate.

Table 3.2.4 Marital status and literacy levels by sex of the survey sample

	Status	Men n (%)	Women n (%)
Marital status	Married	32 (82)	16 (39)
	Divorced	2 (5)	5 (12)
	Single	0 (0)	3 (7)
	Widowed	5 (13)	17 (41)
Education	Literate	39 (100)	41 (100)

3.2.2.4 Past-employment and social class of survey sample

Table 3.2.5 shows past-employment status and social class (based on the Registrar General's Classification of Occupations) of the survey sample. All thirty-nine men and 36 women (88%) were in paid employment during their adult years. Only 5 women (12%) were full time house-keepers. Men, 38 (97%), were however more likely to be in full time employment than women, 22 (54%), who were more likely to work part time hours. Ten

men (26%) and 5 women (12%) of the survey sample were still doing voluntary jobs. Ten men (26%) and 3 women (7%) wanted to return to full time paid employment.

Table 3.2.5 Past-employment status and social class of the survey sample by sex

	Classification	Men n (%)	Women n (%)
Past-employment status	Employee	33 (85)	35 (85)
	House- keeper	0 (0)	5 (12)
	Self employed	2 (5)	1 (2)
	Employer	3 (8)	0 (0)
	Unemployed	1 (3)	0 (0)
Working hours	Full time	38 (97)	22 (54)
Social Class	I	3 (8)	3 (7)
	II	3 (8)	2 (5)
	III N	5 (13)	2 (5)
	III M	5 (13)	-
	IV	7 (18)	16 (39)
	V	6 (15)	2 (5)
	VI	9 (23)	16 (39)

Figure 1 and 2 show comparison between socio-economic class distribution by age and sex of the survey sample and that reported by the General Household Survey (Office for National Statistics, 1998).

Figure 1 Socio-economic class distribution of men and women within each age group in the present study.

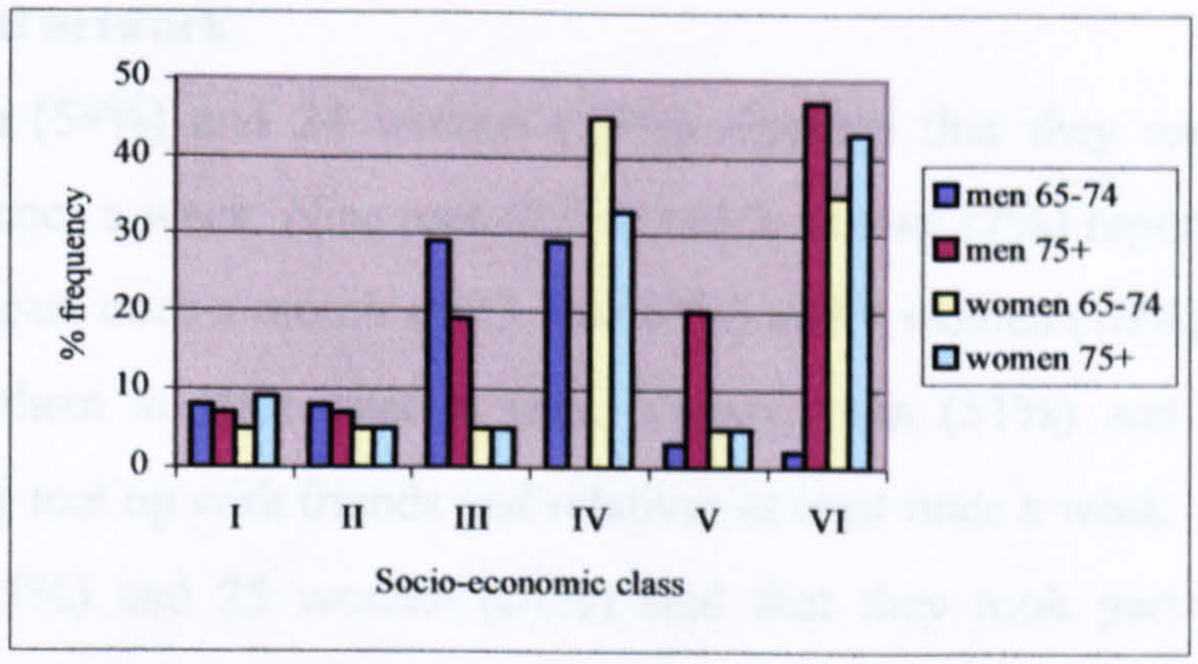
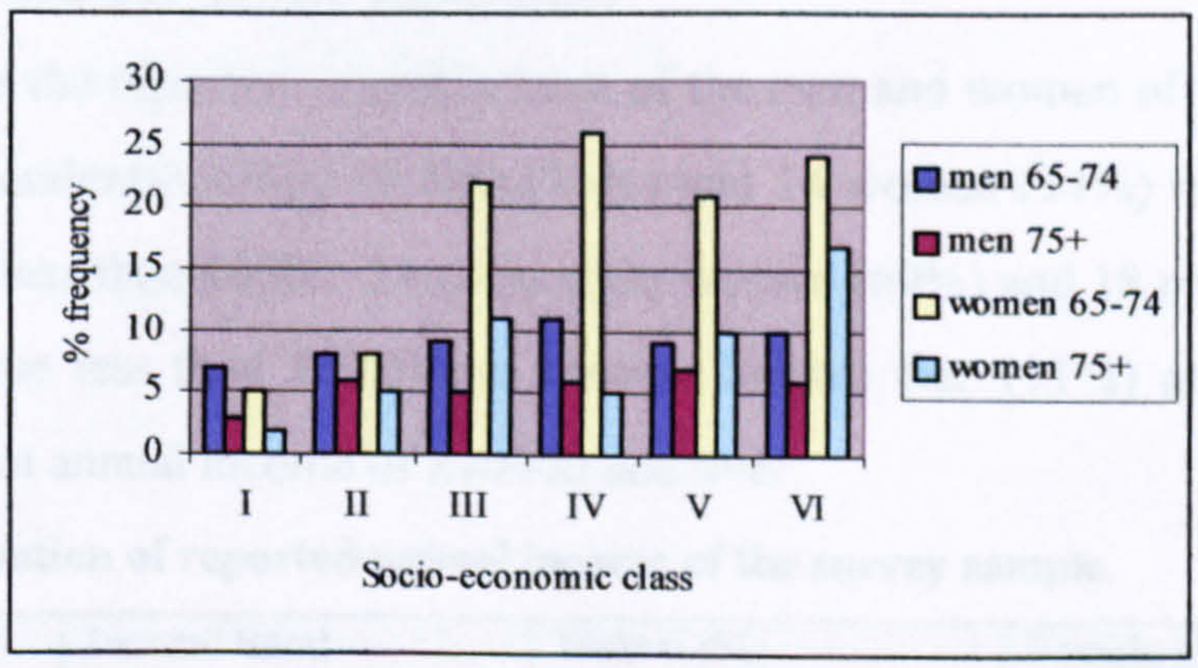


Figure 2 Socio-economic class distribution of men and women within each age group from the General Household Survey (Office for National Statistics, 1998).



3.2.2.5 Living conditions and living facilities

Thirty men (77%) and 29 women (71%) owned the house they lived in, 6 men (15%) and 3 women (7%) lived in rented accommodation, 1 man (3%) and 1 woman (2%) lived in sheltered accommodation. None of the men and 6 of the women (15%) lived in council properties, 4 men (10%) and 2 women (5%) lived with other relatives, children or friends. Seven (18%) men and 23 (56%) women lived alone. Twenty-eight (72%) men and 14 (34%) women lived with a spouse, 4 men (10%) and 2 women (5%) lived with partner and children. Twenty- eight men (72%) and 18 women (44%) owned a car, 38 men (97%) and

40 the women (98%) had a television. Thirty- one men (79%) and 30 women (73%) had central heating. All 39 men and 41 women had running hot water in their houses.

3.2.2.6 Social network

Twenty-one men (54%) and 24 women (59%) reported that they were visited by their children at least once a week. Nine men (23%) and 3 women (7%) reported to be visited by their children at least once a month and 3 men (8%) and 4 women (10%) reported that their children visited them at least once a year. Twenty men (51%) and 27 women (66%) reported that they met up with friends and relatives at least once a week.

Thirteen men (33%) and 25 women (61%) said that they took part in social activities regularly, which included going to pensioners clubs, taking part in outdoor activities such as bowling and rambling and other activities like being involved with the church, dancing, painting, craft etc.

3.2.2.7 Reported net income per annum

Table 3.2.6 shows the reported annual income of the men and women of the survey sample. Twenty-four respondents (30%), 10 men (26%) and 14 women (34%) reported to have an annual income of less than £6000. Twenty- eight women (69%) and 18 men (46%) said that they had an income less than £8000 per annum. Twelve men (31%) and 3 women (7%) reported to have an annual income of £10000 and over.

Table 3.2.6 Distribution of reported annual income of the survey sample.

	Income Band	Male n (%)	Female n (%)
Net income per annum	£2860-£5199	10 (26)	14 (34)
	£5200-£7799	8 (20)	14 (34)
	£7800-£10399	7 (18)	7 (17)
	£10400-£15599	5 (13)	1 (2)
	£15600-£25999	6 (15)	2 (5)
	£26000 & over	1 (3)	0 (0)
	Not answered	2 (5)	3 (7)

3.2.3 KEY POINTS

- The response rate at 25% was low.
- The mean age of the survey sample was 74.3 years (SD 6.54).
- The sample was evenly distributed for sex and age consisting of 41 women, mean age 74.6 and 39 men, mean age 73.9 years.
- Men were more likely to be married and living with a spouse, women were more likely to be widowed, divorced or single and living on their own.
- All respondents were literate.
- The majority (74%) of respondents was owner- occupier and women were more likely to live in council properties.
- Men were more likely to have a car and most of the respondents had a telephone, television, central- heating and running hot water.
- The respondents had regular social contacts with family and friends and women were more socially active than men.

3.3 Reported dietary intake

All comparisons of dietary intake are based on age, sex and social class of the respondents. The survey sample had double the number of married men than women, hence no comparisons were made based on marital status of men and women.

3.3.1 Energy intake

Table 3.3.1 shows that the mean reported energy intake of women (6.1 MJ) was significantly lower than that for men (7.3 MJ) (P= 0.000). For both men and women mean energy intake was close to the values for median intake, suggesting that the distributions were not skewed.

Table 3.3.1 Reported energy intake by sex of the respondents

	Male Mean (SD) Median 95% CI n=39	Female Mean (SD) Median 95% CI n=41
Energy (MJ)	7.3* (1.48) 6.9 6.8 - 7.8	6.1* (1.27) 6.2 5.7 - 6.5

* Mean values were significantly different for men and women (P< 0.05).

3.3.1.1 Reported mean energy intake by age

Table 3.3.2 shows that the mean energy intake of younger elderly respondents (6.5 MJ) was lower than that (6.9 MJ) of older elderly respondents. The difference however was not statistically significant.

Table 3.3.2 Energy intake by age of the respondents of the survey sample

Energy	Age 65-74 years Mean (SD) Median 95% CI n=44	Age 75 years & over Mean (SD) Median 95% CI n=36
Energy (MJ)	6.5 (1.47) 6.7 6.1 - 7.0	6.9 (1.48) 6.7 6.4 - 7.4

3.3.1.2 Energy intake by sex and age

Table 3.3.3 shows that the mean energy intake of younger elderly women (5.9 MJ) was significantly lower the mean energy intake of younger elderly men (P= 0.01). Similarly older elderly women had significantly lower mean energy intake (6.2 MJ) than older elderly men (7.7 MJ) (P=0.01).

Table 3.3.3 Mean energy intake by sex and age

Nutrient	Male 65-74y Mean (SD) Median 95% CI n=24	Female 65-74y Mean (SD) Median 95% CI n=20	Male 75 y &over Mean (SD) Median 95 % CI n=15	Female 75y & over Mean (SD) Median 95% CI n=21
Energy (MJ)	6.9* (1.3) 6.8 6.4 – 7.5	5.9* (1.41) 5.4 5.3 - 6.6	7.7** (1.49) 8.4 6.9 - 8.6	6.2** (1.15) 6.5 5.7 - 6.8

* Mean values were significantly different for men and women of same age cohort (65-74years).
** Mean values were significantly different for men and women of same age cohort (75 years and over).

3.3.1.3 Mean energy intake of survey sample compared with other surveys

Table 3.3.4 compares mean daily energy intake reported by the survey sample (MSSS), National Diet and Nutrition Survey (NDNS) (Finch *et al.*, 1998) and Department of Health and Social Services (DHSS, 1972). The mean daily energy intake for younger elderly men (6.9 MJ) was lower than that (8.21 MJ) recorded for younger elderly men by the NDNS. The mean daily energy intake for younger elderly women (5.9 MJ) was also marginally lower than that (6.07 MJ) recorded for younger elderly women by the NDNS. The average daily energy intake for older elderly men (7.7 MJ) was similar to that (7.6 MJ) recorded for older elderly men by the NDNS. The average daily energy intake (6.2MJ) of older elderly women was slightly higher than that (5.83 MJ) recorded for older elderly women by the NDNS. Apart from energy intake of older elderly men, the intake of the rest of the survey sample was also lower than that reported by DHSS in their 1967/68 survey (DHSS, 1972). The average daily intake for both men and women of the survey sample was lower than that recorded for men (9.96 MJ) and women (6.74 MJ) aged 50- 64 years by the National Diet Survey of British adults (Gregory *et al.*, 1991).

Table 3.3.4 Comparison of mean daily energy intakes with the DHSS (1967/68) (DHSS, 1972), and National Diet and Nutrition Survey (1994/95) (Finch et al, 1998) and the Merseyside survey sample (MSSS) (1996/97).

Department of Health and Social Security (DHSS)(1967/68) National Diet and Nutrition Survey (NDNS) (1994/95 Merseyside Survey Sample (MSSS) (1996/97)				
Energy intake MJ/ day	65-74 years		75 years and over	
	Men	Women	Men	Women
	9.8 8.21 6.9	8.8 6.07 5.9	7.5 7.6 7.7	6.8 5.83 6.2

3.3.1.4 Comparison with recommendations by the Department of Health

The mean daily intake of energy of the survey sample was well below the recommendations made by the panel on dietary reference values (DoH, 1991).

Table 3.3.5 Estimated average requirements in MJ per day (DoH, 1991)

Age	Estimated average requirements in MJ/ day (Average energy intake of the MSSS)	
	Men	Women
65- 74 years	9.71 6.9	7.96 5.9
75 years and over	8.77 7.7	7.61 6.2

3.3.1.5 Variation of energy intake with social class

Table 3.3.6 shows that as a group, energy intake was lower for respondents from manual (6.6MJ) than respondents from non-manual (6.9MJ) social classes, the difference, however was not statistically significant. There was no difference in energy intake between men from non-manual (7.2 MJ) and manual (7.2 MJ) social classes. Women from non-manual social classes had a higher average energy intake (6.5 MJ) than women from manual social classes (6.0 MJ); the difference was not statistically significant.

Table 3.3.6 Energy intake by social class of the survey sample

Energy	Male (NM) Mean (SD) n=11	Male (M) Mean (SD) n=28	Female (NM) Mean (SD) n=7	Female (M) Mean (SD) N=34
Energy (MJ)	7.2 (1.46)	7.2 (1.44)	6.5 (0.91)	6.0 (1.34)

(NM) Non Manual; (M) Manual

3.3.2 Percentage of dietary energy from selected nutrients.

3.3.2.1 By sex

Table 3.3.7 shows that men and women of the survey sample had very similar percentage of total food energy from carbohydrates, sugars, protein, total fat and saturated fatty acid. Men however, had significantly higher percentage of energy from alcohol (3.7%) as compared to women (1.4%) (P=0.000). For both men and women the mean values for percentage energy from the selected nutrients were close to the median values, suggesting that the distributions for majority of nutrients were not skewed. The distribution of intakes was skewed for alcohol (women) with the median being approximately 30% less than the mean intakes.

Table 3.3.7 Percentage of energy from selected nutrients by sex of the respondents

Nutrient	Male Mean% (SD) Median 95% CI n=39	Female Mean% (SD) Median 95% CI n=41
Carbohydrates	45.1 (5.60) 44.9 43.2 – 47.0	46.5 (5.66) 46.8 44.7 - 48.3
Sugars	21.2 (5.15) 20.6 19.5 – 22.9	22.3 (6.03) 22.7 20.4 - 24.2
Fat	34.3 (6.64) 35.6 32.1 – 36.5	34.5 (5.09) 34.8 32.9 - 36.1
SFA	13.3 (3.53) 12.9 12.1 – 14.4	13.1 (4.25) 12.8 11.8 - 14.5
Protein	16.7 (3.15) 16.7 15.6 – 17.7	17.2 (2.91) 17.1 16.3 - 18.1
Alcohol	3.7* (4.18) 3.3 2.4 - 5.1	1.4* (2.03) 0.37 0.8 - 2.0

SFA Saturated Fatty Acid

* Mean values were significantly different for men and women (P< 0.05)

3.3.2.2 By age

Table 3.3.8 shows that as compared to older elderly, younger elderly men and women had similar percentage energy from carbohydrates, sugars, fat, saturated fatty acids, protein and alcohol.

Table 3.3.8 Percentage energy from selected nutrients by age of respondents

Nutrient	Age 65-74 years Mean% (SD) 95% CI *n=44*	Age 74 years &over Mean% (SD) 95% CI *n=36*
Carbohydrates	45.6 (6.13) 43.7 - 47.5	46.1 (4.96) 44.4 – 47.8
Sugars	21.0 (6.18) 19.1 - 22.9	22.3 (5.2) 20.5 – 24.1
Fat	34.4 (6.0) 32.6 - 36.2	34.3 (5.7) 32.4 – 36.3
SFA	12.9 (3.6) 11.8 - 14.0	13.6 (4.16) 12.2 – 15.0
Protein	17.3 (3.38) 16.2 - 18.3	16.5 (2.5) 15.7 – 17.3
Alcohol	2.5 (3.66) 1.4 - 3.6	2.6 (3.2) 1.6 – 3.7

SFA Saturated Fatty Acids

3.3.2.3 By sex and age

Table 3.3.9 shows that the percentage energy from sugars at 24% was significantly higher for older elderly women than that of 17.2% reported by older elderly men (P= 0.02). Percentage energy from alcohol (4.6%) however was significantly higher for older elderly men than that (1.2%) for older elderly women (P= 0.000). Energy contributions from other nutrients, carbohydrates, protein, fat and saturated fatty acids were similar for all age groups and sexes.

Table 3.3.9 Percentage energy from selected nutrients by sex and age

Nutrient	Male 65-74y Mean% (SD) 95% CI n=24	Female 65-74y Mean% (SD) 95% CI n=20	Male 75 y &over Mean% (SD) 95 % CI n=15	Female 75y & over Mean% (SD) 95% CI n=21
Carbohydrates	45.5 (6.30) 42.9 - 48.2	45.7 (6.09) 42.8 - 48.5	44.4 (4.10) 42.1 - 46.6	47.3 (5.25) 44.9 - 49.7
Sugars	21.5 (5.80) 19.0 - 23.9	20.4 (6.72) 17.3 - 23.6	17.2* (5.02) 17.2 - 22.7	24.0* (4.8) 21.8 - 26.2
Fat	34.1 (6.66) 31.3 - 36.9	34.9 (5.18) 32.4 - 37.3	34.6 (6.60) 30.9 - 38.2	34.2 (5.10) 31.8 - 36.5
SFA	12.8 (3.35) 11.4 - 14.2	12.9 (4.06) 11.0 - 14.8	13.8 (3.77) 11.8 - 15.9	13.4 (4.51) 11.3 - 15.4
Protein	17.0 (3.1) 15.7 - 18.3	17.6 (3.75) 15.8 - 19.3	16.0 (3.19) 14.3 - 17.8	16.8 (1.8) 16.0 - 17.7
Alcohol	3.3 (4.3) 1.5 - 5.1	1.6 (2.50) 0.4 - 2.8	4.6* (3.88) 2.5 - 6.8	1.2* (1.50) 0.5 - 1.9

SFA Saturated Fatty Acids

* Mean values are significantly different for men and women of the same age cohort (P<0.05).

3.3.2.4 By social class

Table 3.3.10 shows that the respondents from non-manual social classes had a marginally lower percentage of dietary energy from fat and saturated fatty acids, and a marginally higher percentage of energy from protein and carbohydrates compared to respondents from manual social classes. Respondents from manual social classes however had significantly lower percentage energy from sugar (P=0.04) and alcohol (P= 0.01) than those from non-manual social class. Men from non-manual social classes had a significantly lower percentage of energy from fat (P<0.05) than men from manual social classes. Women of non-manual social classes had significantly higher percentage energy from alcohol than women of manual social classes (P= 0.04).

Table 3.3.10 Variation of percentage energy contribution with social class

	Non Manual			Manual		
Nutrient	Men Mean% (SD) n=11	Women Mean% (SD) n=7	All Mean %(SD) n=18	Men Mean %(SD) N=28	Women Mean %(SD) n=34	All Mean%(SD) n=62
CHO	45.9 (4.38)	45.8 (4.38)	45.9 (4.2)	44.8 (5.96)	46.7 (5.94)	45.8 (5.97)
Sugars	23.5 (4.50)	24.9 (6.09)	24.0† (5.04)	19.8 (5.60)	21.7 (5.97)	20.9† (5.83)
Fat	31.0✤ (7.19)	35.0 (3.61)	32.6 (6.25)	35.5✤ (5.94)	34.4 (5.38)	34.9 (5.62)
SFA	12.2 (3.54)	14.0 (4.51)	12.9 (3.92)	13.6 (3.46)	13.0 (4.24)	13.3 (3.90)
Protein	17.8 (4.37)	16.2 (3.31)	17.2 (3.96)	16.1 (2.42)	17.4 (2.84)	16.8 (2.71)
Alcohol	5.4 (4.71)	2.8* (2.73)	4.4† (4.17)	3.2 (3.82)	1.1* (1.77)	2.1† (3.04)

† Mean values are significantly different for all participants belonging to manual and non-manual social classes (P<0.05).

* Mean values significantly different for women of manual and women of non-manual social classes (P< 0.05).

✤ Mean values significantly different for men of manual and men of non-manual social classes (P< 0.05)

3.3.2.5 Percentage contribution to total dietary energy by selected nutrients compared with NDNS and RNI

Percentage energy from protein

On average, protein provided 16.7% of food energy for men and 17.2% for women of the survey sample, which was similar to that of men (16.1%), and women (16.5%) of NDNS.

Percentage energy from carbohydrates

On average percentage of food energy from carbohydrates for men (45.1%) and women (46.5%) of the survey sample was lower than the 50% recommended by the COMA panel and lower than that (48.2%) for men and (47.5%) recorded for women of the NDNS.

Percentage energy from total fat

The COMA reports on Dietary Reference Values (DoH, 1991) and Nutritional Aspects of Cardiovascular Disease (1994) recommended that the population average for contribution of total fat to food energy should be no more than 35%. On average, men of the survey sample derived (34.3%) and women (34.5%) energy from fat as compared to 35.7% of dietary energy from fat for men and 36.1% for women of NDNS.

Percentage energy from saturated fatty acids

The COMA panel on DRV recommend that saturated fatty acids should not contribute more than 11% towards the total dietary energy. The percentage dietary energy from saturated fatty acids for men (13.3%) and women (13.1%) of the survey sample was higher than the recommended 11% but lower than that of men (14.6%) and women (15.3%) reporting for NDNS.

3.3.4 Ratio of daily energy intake (EI) and calculated Basal Metabolic Rate .

Approximate values for BMR of the respondents were estimated using simple regression equations (Schofield, 1985). Table 3.3.11 shows the distribution of the ratio of energy intake to calculated BMR for men and women of the survey sample. The World Health Organisation (1985) have shown that the ratios of energy intake to BMR below 1.2 are rare

and habitual energy intake below this magnitude is likely to be associated with deficiencies of essential nutrients. In the survey sample values less than 1.2 were recorded for 56% women and 63% men. The EI/ BMR ratio of the survey sample was age and sex dependent, men were more likely to have ratios less than 1.2 than women. A significantly greater number of younger elderly respondents under-reported energy intake than the older elderly (P=0.04). Forty percent of older elderly men and 52% of older elderly women had EI:BMR ratios less than 1.2, 78% of younger elderly men and 60% of younger elderly women had EI: BMR ratios less than 1.2. The COMA reference panel on nutrition of the elderly (DoH, 1992) recommended an EI/ BMR ratio of 1.5 for the elderly to safeguard against non-provision of sufficient dietary energy and adequate intake of all nutrients. Seventy-nine percent of men and 82% of the women of the survey sample had EI/ BMR ratio of less than 1.4.

In the free- living group of the NDNS, EI/ BMR ratios of less than 1.2 were recorded for 41% men and 59% women. It was also calculated that for the NDNS free-living group 71% of the men and 83% of the women had EI/ BMR ratios of less than 1.4. Men (91%) aged 65- 74 years of the survey sample were most likely to have EI/BMR of less than 1.4 than all other groups.

Table 3.3.11 Ratio of energy intake (EI) to calculated basal metabolic rate (BMR)

Men Women			
EI / BMR	65 - 75 years % n=24 n=20	75 years & over % n=15 n=21	All % n=39 n=41
Less than 1.00	26 45	13 19	21 31
Less than 1.20	78 60	40 52	63 56
Less than 1.40	91 80	60 76	79 82
Less than 1.60	100 95	87 -	92 95
Less than 1.80	- 100	100 95	100 98

3.3.5 KEY POINTS

- Women of the survey sample had significantly lower mean reported energy intake (6.1 MJ/day) than men (7.3 MJ/day).
- The mean daily reported energy intake of men was lower than that (8.02 MJ) recorded by the National Diet and Nutrition Survey.
- The mean reported daily energy intake of women was higher than that (5.98 MJ) recorded by the National Diet and Nutrition Survey.
- The lowest reported daily energy intake (5.9 MJ) was recorded for women aged 64- 75 years of age.
- Reported mean energy intake for the survey sample was lower than current estimated average requirements.
- Social class had no significant bearing on the average daily reported energy intake of the survey sample.
- Men aged 75 years and over had significantly higher percentage of dietary energy from alcohol and significantly lower percentage dietary energy from sugars than women aged 75 years and over.
- Marital status of women did not have a significant bearing on energy intake.
- Men from non- manual social classes had significantly higher percentage dietary energy from sugars and significantly lower energy from fat than men from manual social classes.
- Women from non-manual social classes had significantly higher percentage dietary energy from alcohol than women from manual social classes.
- The EI/ BMR ratio less than 1.2 was recorded for 56% of the women and 63% of the men.
- Men and women aged 65-74 years were more likely to have EI/ BMR ratios less than 1.4 than men and women aged 75 years and over.

3.4 Macronutrient intake (Carbohydrates, Protein, Fat and Alcohol)

This section presents daily intakes of protein, carbohydrates, fat and alcohol of the survey sample, separately for sex, age and social class. Absolute intakes are shown in this section. Carbohydrates (CHO) are presented as total CHO (g), starch (g), total sugars (g) and non starch polysaccharides (NSP) (g). Comparisons are made between the intakes recorded for men and women of the survey sample, Reference Nutrient Intake (RNI) (DoH, 1991) and National Diet and Nutrition Survey (NDNS) (Finch *et al.*, 1998).

3.4.3 Macronutrient intakes by sex of the survey sample

Table 3.4.1 shows that women had lower daily intakes of fat, saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), protein, carbohydrates, total sugars, starch, fibre and alcohol than men. The difference was significant for MUFA (P=0.02), protein (P=0.005), starch (P=0.021) and alcohol (P= 0.000). For both men and women the mean value for all the selected nutrients (except alcohol for women) were close to the median values, suggesting that the distributions for the majority of nutrients were not skewed.

Table 3.4.1 Average daily intake of selected nutrients by sex of the respondents

Macronutrient	Male Mean (SD) Median 95% confidence interval n=39	Female Mean (SD) Median 95% confidence interval n=41
Total fat (g)	67.0 (20.30) 66.7 60.3 - 73.7	56.3 (15.81) 52.5 51.3 - 61.3
Total SFA (g)	26.1 (9.57) 24.2 23.0 - 29.3	21.7 (9.40) 19.5 18.7 - 24.7
Total MUFA (g)	21.8* (7.35) 20.0 19.3 - 24.2	17.2* (5.45) 16.6 15.5 - 18.9
Total PUFA (g)	10.4 (4.82) 10.8 8.8 - 12.0	8.8 (3.57) 8.2 7.7 - 9.9
Protein (g)	71.5* (14.45) 68.6 66.8 - 76.3	62.1* (12.17) 62.5 58.3 - 66.0
Carbohydrate (g)	208.8 (49.41) 198.1 192.5 - 225.0	182.0 (43.85) 178.8 168.1 - 195.9
Total Sugars (g)	99.7 (34.00) 93.9 88.6 - 110.9	87.2 (30.00) 78.8 77.8 - 96.7
Starch (g)	105.5* (26.00) 106.0 97.0 - 114.1	91.6* (28.62) 86.6 82.6 - 100.7
NSP (g)	11.8 (4.92) 11.1 10.2 - 13.4	11.3 (4.91) 10.1 9.8 - 12.9
Alcohol (g)	9.5* (10.38) 8.4 6.1 - 12.9	3.1* (4.37) 0.7 1.7 - 4.5

* Mean values were significantly different for men and women ($P < 0.05$)

3.4.4 Macronutrient intakes by age of the survey sample

Table 3.4.2 shows that as compared to younger elderly respondents the intake of fat, SFA, MUFA, protein, CHO, sugars, starch and alcohol was marginally higher among the older elderly respondents. Intake of PUFA and fibre were almost similar for both age groups.

Table 3.4.2 Average daily intake of selected nutrients by age of the respondents

Nutrient	Age 65-74 years Mean (SD) 95% confidence interval *n=44*	Age 75 years & over Mean (SD) 95% confidence interval *n=36*
Total fat (g)	59.5 (17.81) 54.1 - 65.0	63.4 (19.8) 56.7 - 70.1
Total SFA (g)	22.4 (8.4) 19.8 - 24.9	25.4 (10.9) 21.7 - 29.1
Total MUFA (g)	18.8 (6.82) 16.8 - 20.9	20.0 (6.71) 17.8 - 22.3
Total PUFA (g)	9.7 (4.6) 8.3 - 11.1	9.4 (3.8) 8.2 - 10.7
Protein (g)	65.8 (12.84) 61.9 - 69.7	67.2 (15.6) 61.9 - 72.5
Carbohydrate (g)	190.0 (54.70) 173.4 - 206.6	199.9 (38.56) 186.8 - 212.9
Total Sugars (g)	88.7 (35.57) 77.9 - 99.5	97.0 (29.3) 87.1 - 106.9
Starch (g)	98.4 (32.35) 88.5 - 108.2	99.0 (22.1) 91.5 - 106.5
NSP (g)	11.6 (5.13) 10.0 - 13.2	11.5 (4.6) 9.9 - 13.0
Alcohol (g)	5.9 (8.3) 3.4 - 8.4	6.7 (8.67) 3.8 - 9.6

3.4.5 Macronutrient intakes by age and sex of the survey sample

Table 3.4.3 shows the influence of age and sex of the respondents on the macronutrient intake Older elderly women had significantly lower intakes of fat, SFA, MUFA, CHO, starch and alcohol (P< 0.05) than older elderly men. Younger elderly men significantly higher intakes of protein than younger elderly women (P< 0.05). There were no significant differences for intakes of other nutrients.

Table3.4.3 Average daily intake of selected macronutrients by sex and age of the respondents

Nutrient	Male 65-74y Mean (SD) 95% CI n=24	Female 65-74y Mean (SD) 95% CI n=20	Male 75 y &over Mean (SD) 95 % CI n=15	Female 75y & over Mean (SD) 95% CI n=21
Fat (g)	63.2 (19.64) 54.9 - 71.5	55.2 (14.64) 48.3 - 62.0	71.8* (20.74) 60.3 - 83.3	57.4* (17.13) 49.6 - 65.2
SFA (g)	23.9 (8.46) 20.4 - 27.5	20.5 (8.07) 16.7 - 24.3	28.9* (10.67) 23.0 - 34.9	22.9* (10.6) 18.0 - 27.7
MUFA (g)	20.6 (7.73) 17.3 - 27.5	16.7 (4.81) 14.4 - 18.9	23.4* (6.27) 19.9 - 26.8	17.6* (6.08) 14.9 - 20.4
PUFA (g)	10.5 (5.09) 8.3 - 12.6	8.7 (3.87) 6.8 - 10.5	10.2 (4.3) 7.8 - 12.6	8.9 (3.35) 7.4 - 10.4
Protein (g)	69.5 (13.24)† 63.9 - 75.1	61.3† (11.03) 56.1 - 66.4	73.1 (17.08) 63.7 - 82.6	62.9 (13.38) 56.9 - 69.0
Carbohydrate (g)	200.9 (52.46) 178.7 - 223.0	176.9 (55.76) 150.8 -203.0	218.1* (43.62) 194.0 - 242.3	186.8* (29.01) 173.6 - 200.0
Total sugars (g)	96.5 (35.04) 81.8 - 111.3	79.2 (34.67) 63.0 - 95.5	100.1 (37.04) 79.6 - 120.6	94.8 (23.03) 84.4 - 105.3
Starch (g)	101.9 (28.39) 89.9 - 113.9	94.1 (36.84) 76.9 - 111.3	112.5* (20.20) 101.3 - 123.7	89.3* (18.35) 81.0 - 97.7
Fibre (g)	12.4 (5.27) 10.2 - 14.6	10.6 (4.90) 8.3 - 12.9	10.8 (4.07) 8.5 - 13.0	12.0 (4.95) 9.7 - 14.2
Alcohol (g)	8.0 (9.83) 3.8 - 12.1	3.5 (5.26) 1.0 – 5.9	12.3* (10.69) 6.3 - 18.2	2.7* (3.41) 1.2 - 4.3

† Mean intakes significantly different for men and women aged 65 - 74 years (P< 0.05).

- Mean intakes significantly different for men and women aged 75 years and over (P< 0.05)

3.4.5 Macronutrient intake by social class of the survey sample

Table 3.4.4 shows that the respondents from non-manual social classes had lower intakes of fat, MUFA, PUFA and starch than those from manual social classes. None of these differences were statistically significant. Both classes had similar intake of SFA. Intakes of protein, CHO, total sugars, alcohol, and fibre were higher in participants classified as non-manual than those classified as manual and the differences were significant for alcohol ($P=0.000$) and total sugars ($P=0.000$).

Men from non-manual social classes had significantly lower intake of PUFA than men from manual classes ($P<0.05$). Similarly women from non-manual classes had significantly higher intakes of alcohol than women from manual classes ($P<0.05$) (although the intakes were low for participants in both the classes).

Table3.4.4 Average daily intake of selected nutrients by social class of the respondents

	Non-Manual Social Class			manual Social Class		
Nutrient	Men Mean% (SD) N=11	Women Mean% (SD) n=7	All Mean % (SD) n=18	Men Mean % (SD) n=28	Women Mean % (SD) n=34	All Mean% (SD) n=62
Fat (g)	59.6 (16.03)	60.0 (9.27)	59.8 (15.6)	69.2 (20.40)	55.6 (16.85)	61.8 (19.61)
SFA (g)	23.7 (9.49)	24.2 (8.76)	23.9 (8.95)	26.7 (9.62)	21.2 (9.57)	23.7 (22.5)
MUFA (g)	18.9 (6.83)	17.6 (2.74)	18.4 (5.53)	22.8 (7.26)	17.1 (5.88)	19.7 (7.08)
PUFA (g)	7.9✤ (3.48)	9.4 (3.94)	8.5 (3.63)	11.3✤ (4.90)	8.7 (3.5)	9.9 (4.38)
Protein (g)	74.5 (16.36)	61.3 (4.86)	69.4 (14.48)	69.5 (14.10)	62.3 (13.23)	65.5 (14.0)
CHO (g)	209.7 (56.37)	189.9 37.62	202.0 (49.67)	206.6 (47.47)	180.3 (45.36)	192.2 (47.79)
Sugars (g)	109.0 (35.41)	104.7 (34.2)	107.3† (34.0)	93.6 (35.04)	83.6 (28.27)	88.1† (31.6)
Starch (g)	98.3 (24.05)	84.5 (9.91)	93.0 (20.56)	109.0 (26.25)	93.1 (31.01)	100.3 (29.8)
Fibre (g)	13.0 (4.38)	11.3 (2.78)	12.3 (3.84)	11.3 (5.03)	11.3 (5.27)	11.3 (5.12)
Alcohol (g)	13.5 (10.7)	6.7* (6.74)	10.8† (9.75)	8.1 (9.85)	2.3* (3.40)	4.9† (7.58)

† Mean values are significantly different for all participants belonging to manual and non- manual social class ($P<0.05$).

* Mean values significantly different for women of manual and women of non- manual social class ($P< 0.05$).

✤ Mean values significantly different for men of manual and men of non- manual social class ($P< 0.05$)

3.4.6 Comparison of the macronutrient intake of the survey sample with reference nutrient intake (RNI) and that reported by the NDNS.

Protein

The protein intake of the men and women was 134% and 133.5% of the RNI respectively. The average daily intake of protein recorded for the men (71.5g) was the same as that recorded for men (71.5g) of the NDNS. The average daily intake of protein of the women (62.1g) was higher than that of women (56.0g) of the NDNS.

Carbohydrates

The average daily intake of total carbohydrates for men (208.8g) was lower than that recorded for men (232g) of the NDNS. The average daily intake for the women (182.g) was higher than that recorded for women (175g) of the NDNS.

Total sugars

The average daily total sugars intake for men (99.7g) lower than that recorded for men (103g) of NDNS. The daily intake of total sugars for the women (87.2g) however, was higher than recorded for women of the NDNS.

Starch

The average daily starch intake for men (105.5g) and women (91.6g) was lower than that recorded for men (129g) and women (96g) of the NDNS.

Non Starch Polysaccharides (NSP)

The COMA panel on dietary reference values for the UK proposed that the diet of the adult population should contain an average of 18g/day of NSP with range of intake from 12- 24 g (DoH, 1991). The NSP intake of men (11.8g) and women (10.1g) was less than the recommendations made by COMA. The average daily intake of NSP of men and women was lower than 13.5g recorded for men and 11g recorded for women of the NDNS.

Alcohol

The reporting of alcohol intake was different from reporting of other nutrients as there were a considerable number of respondents did not consume any alcohol during the recording period. Thirty-eight percent men and 49% women reported that they did not consume alcohol during the recording period. The average daily intake of alcohol of men (9.5g), was lower than that (11.7g) recorded for men of the NDNS. The mean daily intake of alcohol for women (3.1g) was higher than that reported by women (2.8g) of the NDNS.

Fat

The average daily intake of total fat for men (67.0g) and women (56.3g) was lower than that for men (74.7g) and for women (58.0g) of the NDNS.

Saturated Fatty Acids (SFA)

The average daily intake of SFA of men (26.1g) and women (21.7g) was lower than that 30.6g and 24.7g recorded for the men and women of NDNS.

3.4.7 KEY POINTS

- Men had significantly higher reported intakes of MUFA, protein, starch and alcohol than women.
- Men aged 75 years and over had significantly higher reported intakes of fat, SFA, MUFA, carbohydrates, starch and alcohol than women aged 75 years and over.
- Men aged 65- 74 years had significantly higher reported intakes of protein than women aged 75 years and over.
- Men from non-manual social classes had significantly lower reported intakes of PUFA than men from manual social classes.
- Respondents from non-manual social classes had significantly higher reported intakes of total sugars than respondents from manual social classes.
- Women from non-manual social classes had significantly higher intake of alcohol than women from manual social classes.

3.5 Micronutrient Intake

This section presents daily intakes of selected vitamin and minerals for the respondents based on three-day dietary record. Although information on supplements was provided by the respondents in the food choice questionnaire. The intakes presented in this section are based on vitamins and minerals from food only, bioavailability of vitamins and minerals has also not been taken into account. Thirty-three percent of the men and 41% of the women took dietary supplements, none of which were prescribed by a doctor. The contribution of supplements to vitamin and mineral status was disregarded because of irregularity of intake of supplements. The micronutrient intake of the survey sample is presented by age, sex, social class and compared to RNI (DoH, 1991) and National Diet and Nutrition Survey (NDNS) (Finch *et al.*, 1998).

3.5.1 Micronutrient intake by sex

Table 3.5.1 shows that men of the survey sample had significantly higher intakes of zinc than women (P=0.003) and women had significantly higher intakes of vitamin C (P=0.033). Men also had non-significantly higher intakes of folate, iodine, calcium, vitamin A and calcium. Women had higher intakes of selenium and vitamin D, although not significant. For both men and women the mean value for most of the selected nutrients were close to the median values, suggesting that the distributions for the majority of nutrients were not skewed. The distribution of intakes was skewed for vitamin D, with the median being approximately 25% (for men) and 30% (for women) less than the mean intakes.

Table 3.5.1 Micronutrient and mineral intake by sex of the study respondents (supplements not included).

Vitamins & Minerals	Male Mean (SD) Median 95% CI N=39	Female Mean (SD) Median 95% CI n=41
Retinol equivalent (µg)	567.2 (204.15) 557.6 500.1 - 634.3	537.2 (194.28) 495.3 475.9 - 598.6
Vitamin D (µg)	2.6 (2.20) 2.0 1.8 - 3.3	2.9 (2.46) 2.1 2.2 - 3.7
Vitamin B_1 (mg)	1.2 (0.37) 1.1 1.1 - 1.3	1.2 (0.48) 1.2 1.09 – 1.39
Vitamin B_2 (mg)	1.6 (0.42) 1.6 1.5 - 1.7	1.5 (0.49) 1.5 1.4 - 1.7
Vitamin C (mg)	49.8* (32.60) 42.4 39.1 - 60.5	67.9* (44.4) 56.9 53.9 - 81.9
Vitamin B_{12} (µg)	3.5 (1.8) 3.0 2.9 - 4.1	3.5 (2.40) 3.2 2.8 - 4.3
Vitamin B_6 (mg)	1.6 (0.48) 1.7 1.5 - 1.8	1.5 (0.47) 1.5 1.3 - 1.6
Folate (µg)	199.5 (60.9) 186.8 179.5 - 219.5	198.4 (61.3) 177.4 179.1 - 217.8
Iodine (µg)	104.9 (38.3) 97.2 92.3 - 117.5	94.8 (45.6) 87.5 80.40 - 109.2
Calcium (mg)	749.6 (236.57) 713.9 671.9 - 827.4	687.5 (199.5) 688.9 624.5 - 750.5
Iron (mg)	10.1 (2.8) 9.5 9.2 - 11.0	9.00 (3.35) 8.3 7.9 - 10.1
Zinc (mg)	9.6* (2.7) 8.8 8.7 - 10.5	7.8* (2.34) 7.7 7.0 - 8.5
Selenium (µg)	43.6 (16.37) 44.6 38.2 - 49.0	44.8 (16.52) 41.6 39.6 - 50.0

* Mean values were significantly different for men and women ($P < 0.05$)

3.5.2 Micronutrient intake by age

Table 3.5.2 shows that respondents of both the age groups had similar intakes for calcium, vitamin B12, vitamin B6 and zinc. Older elderly respondents had higher intakes of vitamin A, vitamin D, vitamin C, folate, iron and selenium than younger elderly respondents. None of the recorded differences were statistically significant. Higher intakes (not significant) for iodine were recorded for younger elderly respondents than the older elderly.

Table 3.5.2 Micronutrient intake by age of the study participants

Vitamins & Minerals	Age 65-74 years Mean (SD) 95% confidence interval n=44	Age 75 years & over Mean (SD) 95% confidence interval n=36
Retinol equivalent (μg)	545.0 (215.2) 479.6 - 610.5	549.7 (185.6) 486.9 - 612.5
Vitamin D (μg)	2.6 (2.4) 1.8 - 3.3	3.0 (2.2) 2.2 - 3.7
Vitamin C (mg)	56.0 (35.01) 45.3 - 66.6	61.8 (45.85) 46.3 - 77.3
Vitamin B_1 (mg)	1.03 (0.37) 1.0 – 1.4	1.2 (0.50) 0.99 - 1.47
Vitamin B_2 (mg)	1.5 (0.42) 1.4 - 1.6	1.6 (0.49) 1.5 - 1.8
Vitamin B_{12} (μg)	3.6 (2.52) 2.8 - 4.3	3.5 (1.5) 3.0 - 4.0
Vitamin B_6 (mg)	1.6 (0.49) 1.4 - 1.7	1.5 (0.47) 1.4 - 1.7
Folate (μg)	192.1 (59.74) 174.0 - 210.3	204.6 (63.3) 183.2 - 226.0
Iodine (μg)	101.1 (47.3) 86.7 - 115.5	96.7 (35.76) 84.6 - 108.8
Calcium (mg)	715.7 (250.71) 639.4 - 791.9	714.7 (174.5) 655.7 - 773.8
Iron (mg)	9.1 (2.86) 8.2 - 10.0	10.0 (3.40) 8.8 - 11.1
Zinc (mg)	8.6 (2.82) 7.8 - 9.5	8.6 (2.60) 7.7 - 9.5
Selenium (μg)	41.6 (16.00) 36.8 - 46.5	47.3 (16.2) 41.8 - 52.8

3.5.3 Micronutrient intake by age and sex

Table 3.5.3 shows higher intakes of vitamin A, iodine, calcium, iron and zinc reported by younger elderly men as compared to younger elderly women. Younger elderly women had higher intakes for vitamin D, vitamin B1 and selenium, none of the differences for both the sexes were statistically significant. Both younger elderly men and women had very similar intakes for vitamin B2, vitamin B12, vitamin B6 and folate. Older elderly women had lower intakes of vitamin A, iodine, iron, zinc and selenium than older elderly men. Older elderly men and women had similar intakes of vitamin B12, vitamin B6, folate, vitamin B2 and vitamin D. Non significantly higher intakes for vitamin B1, vitamin C and calcium were recorded for older elderly women as compared to older elderly men.

Compared to older elderly men, younger elderly men had lower intakes of vitamin A, vitamin D, folate, iron, zinc and selenium (not significant). Similar intakes were recorded for vitamin B12, vitamin B6 and folate, and higher (not significant) intakes for iodine and vitamin C for older and younger elderly men.

Younger elderly women had lower intakes of vitamin A, vitamin C, folate, iodine, calcium iron and selenium than older elderly women none of the differences were statistically significant. Similar intakes were recorded for vitamin D, vitamin B12, vitamin B6 and vitamin B2 for younger and older elderly women.

Table3.5.3 Vitamin and mineral intake by age and sex of the respondents

Vitamins& Minerals	Male 65-74y Mean (SD) 95% CI n=24	Female 65-74y Mean (SD) 95% CI n=20	Male 75 y &over Mean (SD) 95 % CI n=15	Female 75y & over Mean (SD) 95% CI n=21
R Equivalent (μg)	554.9 (230.9) 457.4 - 652.4	533.2 (200.1) 439.5 - 626.8	561.7 (180.0) 462.0 - 661.4	541.1 (193.4) 453.0 - 629.1
Vitamin D (μg)	2.3 (2.22) 1.4 - 3.2	2.9 (2.68) 1.6 - 4.2	3.0 (2.11) 1.8 - 4.1	3.0 (2.30) 1.9 - 4.0
Vitamin C (mg)	50.8 (33.12) 36.8 - 64.7	62.2 (37.03) 44.8 - 79.5	45.7 (33.14) 27.3 - 64.1	73.3 (50.76) 50.2 - 96.4
Vitamin B1 (mg)	1.16 (0.28) 1.0 - 1.3	1.23 (0.51) 0.99-1.46	1.3 (0.47) 1.0 - 1.6	1.25 (0.48) 1.04-1.48
Vitamin B2 (mg)	1.6 (0.38) 1.4 - 1.7	1.4 (0.47) 1.2 - 1.7	1.6 (0.50) 1.4 - 1.9	1.6 (0.50) 1.4 - 1.9
Vitamin B_{12} (μg)	3.4 (2.08) 2.5 - 4.3	3.7 (3.00) 2.3 - 5.1	3.6 (1.31) 2.9 - 4.3	3.4 (1.70) 2.6 - 4.1
Vitamin B6 (mg)	1.6 (0.49) 1.4 - 1.9	1.5 (0.48) 1.3 - 1.7	1.6 (0.49) 1.3 -1.8	1.5 (0.47) 1.3 - 1.7
Folate (μg)	192.4 (55.6) 168.9 - 215.9	191.8 (65.79) 161.0 - 222.6	204.4 (72.65) 164.2 - 244.6	204.7 (57.62) 178.5 - 231.0
Iodine (μg)	107.3 (41.88) 89.6 - 124.9	93.7 (53.20) 68.8 - 118.6	97.9 (33.20) 79.5 - 116.3	95.8 (38.27) 78.4 - 113.2
Calcium (mg)	770.5 (261.7) 660.0 - 881.1	649.8 (225.7) 544.1 - 755.4	702.5 (187.78) 598.5 - 806.5	723.4 (168.6) 646.7 - 800.2
Iron (mg)	9.5 (2.98) 8.2 - 10.8	8.6 (2.70) 7.3 - 9.8	10.8 (2.47) 9.5 - 12.2	9.4 (3.91) 7.6 - 11.2
Zinc (mg)	9.3 (2.95) 8.0 - 10.5	7.9 (2.5) 6.7 - 9.0	9.9 (2.56) 8.5 - 11.3	7.7 (2.21) 6.7 - 8.7
Selenium (μg)	40.4 (14.72) 34.1 - 46.6	43.2 (17.77) 34.9 - 51.5	48.7 (17.49) 39.0 - 58.4	46.3 (15.53) 39.2 - 53.3

R Equivalent = retinol equivalents

3.5.4 Micronutrient intake by social class

Table 3.5.4 shows as a group, respondents from non-manual social classes had higher intakes of vitamin A, vitamin C, calcium, iron and zinc than respondents from manual social classes (not significant). Men from non-manual social classes however had significantly higher intakes of iron than men in manual social classes ($P<0.05$) and significantly higher intakes of iron ($P<0.05$) and zinc ($P<0.05$) than women in manual social classes. Respondents from both social classes had similar intakes of vitamin D, vitamin B12, vitamin B6 and Vitamin B2. Higher intakes were recorded for folate, selenium, iodine and vitamin B1 for participants from manual social classes than those in non-manual social classes.

Table3.5.4 Micronutrient and mineral intake by social class of the respondents

	Non Manual			Manual		
Micronutrient & Minerals	Men Mean% (SD) n=11	Women Mean% (SD) n=7	All Mean % (SD) n=18	Men Mean % (SD) n=28	Women Mean % (SD) n=34	All Mean% (SD) n=62
R Equivalent (μg)	525.4 (185.88)	603.1 (191.51)	555.6 (186.5)	570.2 (221.06)	523.7 (194.7)	544.7 (206.68)
Vitamin D (μg)	2.7 (2.34)	3.3 (3.17)	2.9 (3.13)	2.5 (1.66)	2.9 (2.34)	2.7 (2.06)
Vitamin C (mg)	55.2 (31.18)	76.9 (23.48)	63.6 (29.76)	46.3 (33.62)	66.0 (47.63)	57.1 (42.72)
Vitamin B1 (mg)	1.3 (0.43)	1.0 (0.12)	1.2 (0.36)	1.2 (0.35)	1.2 (0.45)	1.2 (0.40)
Vitamin B2 (mg)	1.6 (0.50)	1.3 (0.19)	1.5 (0.43)	1.6 (0.40)	1.6 (0.53)	1.6 (0.47)
Vitamin B_{12} (μg)	3.7 (2.72)	3.5 (1.64)	3.6 (2.31)	3.4 (1.36)	3.6 (2.54)	3.5 (2.08)
Vitamin B6 (mg)	1.8 (0.59)	1.5 (0.24)	1.7 (0.51)	1.5 (0.42)	1.5 (0.51)	1.5 (0.47)
Folate (μg)	196.4 (62.8)	190.2 (43.64)	194.0 (54.79)	197.3 (62.96)	200.1 (64.74)	198.8 (63.44)
Iodine (μg)	94.2 (24.49)	88.1 (27.52)	91.83 (25.10)	107.4 (42.7)	96.2 (48.68)	101.2 (46.05)
Calcium (mg)	708.0 (243.6)	732.2 (131.78)	717.4 (202.93)	758.7 (235.58)	678.3 (211.13)	714.6 (224.28)
Iron (mg)	11.5✤** (2.88)	8.5 (2.03)	10.3 (2.92)	9.5✤ (2.66)	9.1** (3.59)	9.3 (3.18)
Zinc (mg)	10.3** (2.88)	7.0 (1.12)	9.0 (2.83)	9.2 (2.7)	7.9** (2.50)	8.5 (2.6)
Selenium (μg)	40.9 (12.83)	47.1 (14.29)	43.3 (13.37)	44.6 (17.38)	44.3 (17.1)	44.4 (17.09)

✤ Mean values significantly different for men of manual and men of non-manual social classes ($P < 0.05$)

** Mean values significantly different for men of non-manual social classes and women of manual social classes.

3.5.5 Comparison of the macronutrient intake of the survey sample with reference nutrient intake (RNI) and that reported by the NDNS.

Vitamin A

The mean daily intake of vitamin A, 567.2μg for men and 537.2μg for women was lower than 1173μg for men and 969μg for women reporting for NDNS (the distribution for vitamin A intake for NDNS sample was skewed). The mean reported daily intake of vitamin A (retinol equivalents) was 93.6% and 89.5% of the RNI for men and women respectively.

Thiamin (Vitamin B1)

The mean daily intake of thiamin for men (1.2mg) was lower than that recorded for men (1.49mg) reporting for the NDNS. The intake of thiamin for women (1.2mg) was however higher than that recorded for women (1.19mg) of the NDNS. The dietary reference value (DRV) for thiamin is based on estimated average requirements for energy. The average reported daily intake for thiamin was 171% and 362% of the RNI for men and women respectively.

Riboflavin (Vitamin B2)

The average daily intake of riboflavin for men (1.6mg) was marginally lower than that for men (1.7mg) of NDNS. The intake of riboflavin for women (1.5mg) was slightly higher than that of women (1.43g) of NDNS. The mean reported intake of riboflavin was 123% and 136% of the RNI for men and women respectively.

Vitamin B6

The average daily intake of vitamin B6 for men (1.6mg) and women (1.5mg) was lower than 2.1mg and 1.6mg for men and women of the NDNS. The DRV for vitamin B6 is based on protein intake. The average reported intake of vitamin B6 was 149% and 161% of the RNI for men and women respectively.

Vitamin B12

The mean daily intake of vitamin B12 for men (3.5μg) and women (3.5μg) was lower than 6.1μg and 4.5μg recorded respectively for men and women of the NDNS. For the men and women the mean reported daily intake of vitamin B12 was 233% of the RNI.

Folate

The average daily intake of folate for men (199.5μg) and women (198.4μg) was lower than 270μg and 207μg recorded respectively for men and women of NDNS. For men and women, the average intake of folate was 99.7% and 99.2% of the RNI, respectively.

Vitamin C

The average daily intake of vitamin C for men (49.8mg) was lower than that recorded for men (66.9g) of the NDNS. The intake of vitamin C for women (67.9mg) was however higher than that for women (60.7mg) of the NDNS. For the men and women the average intake of vitamin C was 124% and 168% of the RNI, respectively.

Vitamin D

The average daily intake of dietary vitamin D for men (2.6μg) was lower than 4.07μg recorded for men of NDNS. The intake for women (2.9μg) was similar to 2.92μg recorded for women of NDNS. The average reported daily intake of vitamin D was 26% and 29% of the RNI, respectively for men and women.

Calcium

The mean daily intake for calcium for men (749.6mg) and women (687.5mg) was lower than that recorded for men (836mg) and women (690mg) of the NDNS. For the men and women, the average reported intake of calcium was 107% and 98.2% of the RNI, respectively.

Iron

The average daily intake of iron for men (10.1mg) was lower than 11.0mg recorded for men of NDNS. The iron intake of women (9.0mg) was marginally higher than 8.6mg recorded

for women of NDNS. The average reported daily intake of iron was 116% and 103% of the RNI, respectively for the men and women.

Zinc

The mean daily intake of zinc for men (9.6mg) and women (7.8mg) was higher than 8.8mg and 6.9mg recorded for the men and women of NDNS. The average reported daily intake of zinc was 101% and 111% of the RNI, respectively for the men and women.

Iodine

The average daily intake of iodine for men (104.9μg) and women (94.8μg) was lower than 187μg and 149μg recorded respectively for men and women of NDNS. For the men and women, the average intake of iodine was 74.9% and 67.7% of the RNI, respectively.

Selenium

The average reported daily intake of selenium was 58% and 74.6% of the RNI for men and women respectively.

3.2.6 Key Points

- Men and women had very similar reported intakes of vitamins and minerals.
- Men had significantly higher intakes of zinc than women and women had significantly higher intakes of vitamin C than men.
- Age had no significant bearing on the intake of micronutrients.
- Men from non-manual social class had significantly higher intakes of iron than men and women of manual social class
- Men from non- manual social class had significantly higher intakes of zinc than women of manual social class.
- The intakes of vitamin A, folate, dietary vitamin D, calcium (for women only), iodine and selenium were lower than the RNI for these micronutrients.

3.3 Anthropometric measurements

This section presents the anthropometric measurements and calculated indices to assess the nutritional status of the respondents, all comparisons are based on sex, age and social class.

3.3.1 Anthropometric measurements by sex

Table 3.3.1 shows that men were significantly heavier (P=0.001), taller (P=0.000) and had wider demispans (P=0.000) than women. Women, on the other hand had significantly bigger skinfolds biceps (P=0.000) and triceps (P=0.000) than men. The ratio of height to demispan was 2.12 for men and 2.16 for women. The NDNS reported these ratios to be 2.11 and 2.15 respectively for men and women of their free-living sample. Height and demispan were highly correlated (r=0.99). All the findings were very similar to those reported by the NDNS.

Table 3.3.1 Anthropometric Measurements by sex of the respondents

Measurement	Men Mean (SD) Median 95% CI n=39 NDNS	Women Mean (SD) Median 95% CI n=41 NDNS
Weight (Kg)	76.6* (12.70) 74.3 72.3 - 80.9 76.5	67.3* (12.37) 65.2 63.4 - 71.3 64.9
Height (m)	1.7* (0.06) 1.69 1.68 - 1.72 1.698	1.58* (0.06) 1.57 1.56 - 1.6 1.56
Demispan (m)	0.80* (0.03) 0.80 0.79 - 0.81 0.806	0.73* (0.03) 0.73 0.72 - 0.74 0.727
Waist circumference (cm)	93.4 (12.50) 94.6 89.2 - 97.6 -	89.2 (12.22) 90.0 85.3 - 93.1 -
Arm circumference (cm)	27.5 (2.97) 28.5 26.5 - 28.5 30.4	27.5 (3.59) 28.0 26.4 - 28.7 29.7
Triceps skin fold (mm)	9.6* (3.2) 9.7 8.5 - 10.7 -	16.1* (6.92) 16.3 13.9 - 18.3 -
Biceps skin fold (mm)	6.3* (2.08) 6.0 5.6 - 7.0 -	9.8* (4.3) 10.0 8.4 - 11.2 -

- Mean values significantly different for men and women (P< 0.05)

NDNS: National diet and nutrition survey (Finch et al, 1998)

3.3.2 Calculated indices by sex

Table 3.3.2 shows that although men and women had similar values for body mass index, percentage body fat calculated from skin fold thickness was significantly higher (approximately 38% higher) for women than men (P=0.000). Upper arm muscle area was marginally lower for women but upper arm fat area was significantly higher (almost twice) than that of men. Demiquet was calculated for men and mindex was calculated for women. The BMI values for the men and women of the survey sample were similar to those calculated for the men and women participating in the National Diet and Nutrition Survey. Men and women of the survey sample however had higher values for mindex and demiquet than those calculated for the National Diet and Nutrition Survey.

Table 3.3.2 Calculated Indices by sex of the study participants

Index	Men Mean (SD) 95% CI n=39 NDNS	Women Mean (SD) 95% CI n=41 NDNS
BMI	26.4 (3.81) 25.1 - 27.7 26.5	27.0 (4.47) 25.6 - 28.5 26.8
Percentage body fat from SFT	9.0* (4.3) 7.6 - 10.5 -	23.6* (6.6) 21.5 - 25.7 -
Upper arm muscle circumference	27.4 (2.9) 26.4 - 28.4 -	26.9 (3.43) 25.9 - 28.0 -
Arm fat area (cm)2	1.4* (0.54) 1.2 - 1.6	2.5* (1.15) 1.9 - 2.6
Mindex	-	91.8 (15.47) 87.0 - 96.7 89.7
Demiquet	120.4 (17.48) 114.7 - 126.1 117.7	-

* Mean values significantly different for men and women (P< 0.05)

3.3.3 Anthropometric measurements by age

As shown in table 3.3.3 older elderly respondents had lower values for all anthropometric measurements than younger elderly respondents the difference was significant for height ($P < 0.05$).

Table 3.3.3 Anthropometric measurements by age of the respondents

Measurement	Age group 65 -74 y Mean (SD) 95% CI n=44	Age group 75 y & over Mean (SD) 95% CI n=36
Weight (Kg)	74.5 (13.48) 70.3 - 78.7	68.2 (12.35) 63.9 - 72.5
Height (m)	1.65* (0.08) 1.63 - 1.68	1.61* (0.09) 1.58 - 1.65
Demispan (m)	0.77 (0.04) 0.76 - 0.78	0.75 (0.05) 0.74 - 0.77
Waist circumference (cm)	92.6 (11.56) 89.0 - 96.2	89.4 (13.45) 84.7 - 94.1
Arm circumference (cm)	27.9 (3.0) 27.0 - 28.8	27.1 (3.61) 25.8 - 28.3
Triceps skin fold (mm)	13.1 (6.1) 11.2 - 14.9	13.0 (6.75) 10.6 - 15.4
Biceps skin fold (mm)	8.6 (3.9) 7.4 - 9.8	7.5 (3.73) 6.2 - 8.8

* Mean values were significantly different for two age groups ($P < 0.05$)

3.3.4 Calculated indices by age

Table 3.3.4 shows that age did not have a significant bearing on any of the calculated indices. Older and younger elderly respondents had similar values for percentage body fat from skin folds, upper arm muscle area and upper arm fat area. Older elderly respondents had lower BMI, mindex and demiquet values than younger elderly people (non-significant).

Table 3.3.4 Calculated indices by age of the respondents

Indices	Age group 65 -74 y Mean (SD) 95% CI n=44	Age group 75 y & over Mean (SD) 95% CI n=36
BMI	27.1 (3.65) 26.0 - 28.2	26.3 (4.71) 24.6 - 27.9
Percentage body fat from SFT	16.6 (9.33) 13.8 - 19.5	16.5 (9.2) 13.4 - 19.7
Upper arm muscle circumference	27.6 (2.92) 26.7 - 18.5	26.7 (3.44) 25.5 - 27.9
Arm fat area $(cm)^2$	1.8 (0.93) 1.6 - 2.1	1.8 (1.1) 1.4 - 2.2
Mindex	93.0 (14.30) 86.0 - 100.1	90.7 (15.8) 83.3 - 98.1
Demiquet	123.7 (16.76) 117.2 - 130.2	121.6 (21.80) 104.1 - 126.5

3.3.5 Anthropometric measurements by age and sex

Table 3.3.5 shows that younger elderly women significantly lighter in weight (P=0.000), shorter (P=0.009) and had smaller demispans (P=0.000) than younger elderly men. Same trend was observed for older elderly men and women, however the difference was not significant for weight. Younger elderly women were significantly taller and had greater values for demispan than older elderly women (P= 0.000).

Older elderly women had marginally larger waist circumference than older elderly men, however younger elderly men had significantly greater waist circumference than younger elderly women (P= 0.02). Younger elderly women had similar arm circumference as those of older elderly women however younger elderly men had significantly bigger arm circumference than older elderly men (P=0.04). Women of both age groups had significantly

bigger skinfolds than men in the corresponding age groups (P=000). Younger elderly men had significantly larger biceps skinfold than older elderly men (P=0.04).

Table 3.3.5 Anthropometric measurements by age and sex of the respondents

Measurement	Male 65-74y Mean (SD) 95% CI n=24	Female 65-74y Mean (SD) 95% CI n=20	Male 75 y &over Mean (SD) 95 % CI n=15	Female 75y & over Mean (SD) 95% CI n=21
Weight (Kg)	79.6* (12.61) 74.0 - 85.2	69.0* (12.40) 63.2 - 74.8	71.8 (11.72) 65.0 - 78.5	65.7 (12.44) 59.9 - 71.5
Height (m)	1.71* (0.06) 1.68 - 1.73	1.6*$^{\triangle}$ (0.05) 1.57 - 1.62	1.69** (0.05) 1.70 - 1.73	1.56**$^{\triangle}$ (0.07) 1.53 - 1.6
Demispan (m)	0.80* (0.03) 0.79 - 0.81	0.74*$^{\triangle}$ (0.02) 0.73 - 0.75	0.79** (0.03) 0.78 - 0.81	0.72**$^{\triangle}$ (0.03) 0.71 - 0.74
Waist circumference (cm)	96.3* (9.54) 92.1 - 100.5	88.5* (12.4) 82.7 - 94.3	88.8 (15.39) 80.0 - 97.7	89.8 (12.32) 84.1 - 95.6
Arm circumference (cm)	28.4$^{\triangle}$ (2.39) 27.3 - 29.4	27.4 (3.52) 25.7 - 29.0	26.2$^{\triangle}$ (3.63) 24.2 - 28.1	27.7 (3.73) 26.0 - 29.5
Triceps skinfold (mm)	9.7* (2.78) 8.5 - 10.9	16.7* (6.63) 13.6 - 19.8	9.5** (3.80) 7.3 - 11.6	15.5** (7.3) 12.1 - 19.0
Biceps skinfold (mm)	6.8*$^{\triangle}$ (2.11) 5.8 - 7.7	10.6* (4.4) 8.6 - 12.7	5.5**$^{\triangle}$ (3.27) 4.4 - 6.5	9.0** (4.08) 7.0 - 10.9

* Mean values were significantly different for men and women aged 65 - 74 years (P< 0.05).

** Mean values different for men and women aged 75 years and over (p< 0.05).

$^{\triangle}$ Mean values different for subjects of same sex but belonging to different age groups (P< 0.05).

3.3.6 Calculated indices by age and sex

Table 3.3.6 shows that BMI was similar for both the sexes for both the age groups. Younger elderly men had significantly greater arm muscle area as compared to older elderly men (P=0.04).

Table 3.3.6 Calculated indices by age and sex of the study participants

Indices	Male 65-74y Mean (SD) 95% CI n=24	Female 65-74y Mean (SD) 95% CI n=20	Male 75 y &over Mean (SD) 95 % CI n=15	Female 75y & over Mean (SD) 95% CI n=21
BMI	27.2 (3.34) 25.7 - 28.7	27.0 (4.05) 25.1 - 28.9	25.1 (4.2) 22.6 - 27.5	27.1 (4.95) 24.8 - 29.4
% body fat from skinfolds	9.7* (3.7) 8.0 - 11.3	24.7* (7.00) 21.4 - 28.0	8.1** (5.16) 5.2 - 11.0	22.6** (6.18) 19.8 - 25.4
Arm muscle circumference	28.2$^{\triangle}$ (2.3) 27.2 - 29.2	26.8 (3.4) 25.3 - 28.4	26.2$^{\triangle}$ (3.37) 24.3 - 28.1	27.1 (3.54) 25.4 - 28.7
Arm fat area	1.4* (0.47) 1.2 - 1.6	2.3* (1.08) 1.8 - 2.8	1.3** (0.65) 1.0 - 1.7	2.2** (1.2) 1.6 - 2.7
Mindex	-	93.01 (15.0) 86.0 - 100.1	-	90.7 (16.17) 83.3 - 98.1
Demiquet	123.7 (15.03) 117.2 - 130.2	-	115.3 (20.18) 104.2 - 126.5	-

$^{\triangle}$ Mean values different for subjects of same sex but belonging to different age groups (P< 0.05).

* Mean values were significantly different for men and women aged 65 - 74 years (P< 0.05).

** Mean values different for men and women aged 75 years and over (p< 0.05).

3.3.7 Anthropometric measurements and calculated indices by social class

Table 3.3.7 shows association of social class and anthropometric measurements and calculated indices. In common with the findings of the NDNS (Finch *et al.*, 1998) there was no association between most of anthropometric measurements and all of the calculated indices and social classes of the survey sample. Men from non-manual social classes were significantly taller than men from manual social classes (P=0.02).

Table 3.3.7 Anthropometric measurements and calculated indices by social class of the respondents

	Non Manual			Manual		
Measurement & Indices	Men Mean% (SD) n=11	Women Mean% (SD) n=7	All Mean % (SD) n=18	Men Mean % (SD) n=28	Women Mean % (SD) n=34	All Mean% (SD) n=62
Weight (Kg)	76.8* (9.64)	68.9* (10.22)	73.7 (10.37)	77.1** (14.07)	66.8** (12.8)	71.1 (14.08)
Height (m)	1.73✣* (0.386)	1.57* (0.052)	1.67 (0.092)	1.69✣** (0.061)	1.58** (0.066)	1.62 (0.083)
Demispan (m)	0.813* (0.194)	0.730* (0.025)	0.78 (0.047)	0.79** (0.029)	0.73** (0.031)	0.76 (0.042)
W C (cm)	93.5 (5.36)	84.7 (9.46)	90.1 (8.26)	94.1 (14.37)	89.9 (12.52)	91.5 (13.54)
MAC (cm)	27.9 (2.44)	29.0 2.10	28.3 (2.32)	27.6 (3.23)	27.1 (3.76)	27.3 (3.51)
Triceps (mm)	9.6* (3.01)	16.1* (5.22)	12.1 (5.07)	9.8** (3.27)	15.9** (7.29)	13.3 (6.71)
Biceps (mm)	5.4* (1.23)	10.0* (4.36)	7.2 (2.97)	6.7** (2.22)	9.6** (4.37)	8.4 (3.90)
BMI	25.6 (3.22)	27.9 (3.76)	26.5 (2.52)	26.7 (4.05)	26.9 (4.63)	26.8 (4.35)
MAMC	27.6 (2.37)	28.5 (2.00)	27.9 (2.22)	27.3 (3.16)	26.6 (3.59)	26.9 (3.39)
MAFA	1.4 (0.50)	2.3 (0.86)	1.7 (0.81)	1.4 (0.57)	2.2 (1.21)	17.2 (9.28)
Mindex	-	94.3 (12.76)	94.3 (12.76)	-	91.3 (17.00)	91.3 (17.00)
Demiquet	116.5 (15.53)	-	116.5 (15.53)	122.0 (18.25)	-	122.0 (18.25)

✣ Mean values significantly different for men of manual and men of non manual social class ($P< 0.05$)

* Mean values were significantly different for men and women aged 65 - 74 years ($P< 0.05$).

** Mean values different for men and women aged 75 years and over ($p< 0.05$).

3.3.9 KEY POINTS

- Men of the survey sample were significantly heavier and taller than women of the survey sample.
- Men had significantly wider demispan than women.
- Women had significantly bigger skinfolds and upper arm fat area than men.
- Although women had marginally higher values for BMI, they had approximately 38% more fat mass than men.
- Men aged 65-74 were significantly taller than men aged 75 years and over.
- Men aged 65–74 years had significantly bigger biceps skinfolds and greater arm muscle area as compared to men aged 75 years and over.
- Men from non-manual social classes were significantly taller than men from manual social classes.

3.4 Blood pressure

The data on blood pressure status of the study participants comprised, self reported incidence of hypertension provided by the participants in the food choice questionnaire and blood pressure recorded during the first visit. Information from both sources is presented by sex, age and social class of the survey sample, in this section.

3.4.1 Blood pressure by sex

Table 3.4.1 shows that men had marginally higher systolic and diastolic blood pressure than women. Both systolic and diastolic pressures were higher than those recorded for men and women participating in the National Diet and Nutrition Survey.

Table 3.4.1 Blood pressure by sex of the respondents

Blood pressure	Male Mean (SD) Median 95% CI n=39 NDNS	Female Mean (SD) Median 95% CI n=41 NDNS
SBP mmHg	159.6 (24.34) 155.5 151.3 - 167.8 149	156.5 (21.18) 154.0 149.7 - 163.3 155
DBP mmHg	91.4 (14.75) 88.0 86.4 - 96.4 80	89.2 (11.5) 91.0 85.5 - 92.8 78

NDNS: National Diet and Nutrition Survey (Finch *et al*, 1998)

3.4.2 Blood pressure by age

Table 3.4.2 shows that younger elderly had significantly higher mean diastolic blood pressure than older elderly respondents ($P<0.05$).

Table 3.4.2 Blood pressure by age of the respondents

Blood pressure	65-74y Mean (SD) 95% CI n=44	75y& over Mean (SD) 95% CI n=36
SBP mmHg	157.8 (23.4) 150.5 - 165.1	158.2 (21.93) 150.5 - 165.8
DBP mmHg	93.1* (14.0) 88.8 - 97.5	86.7* (11.05) 82.8 - 90.5

* Mean values significantly different for respondents of different age groups.

3.4.3 Blood pressure by sex and age

Table 3.4.3 shows that younger elderly men had significantly higher diastolic blood pressures than older elderly men (P<0.05). There was not much difference in the systolic blood pressures of women of the two age groups.

Table3.4.3 Blood pressure by age and sex of the respondents

Blood pressure	Male 65-74y Mean (SD) 95% CI n=24	Female 65-74y Mean (SD) 95% CI n=20	Male 75 y &+ Mean (SD) 95 % CI n=15	Female75y &+ Mean (SD) 95% CI n=21
SBP mm Hg	163.9 (27.14) 151.9 - 175.9	151.0 (16.76) 143.2 - 158.9	152.8 (17.99) 142.4 - 163.2	161.9 (24.02) 150.7 - 173.2
DBP mm Hg	96.1* (16.34) 88.8 - 103.3	89.9 (10.3) 85.1 - 94.7	84.1* (7.78) 79.6 - 88.6	88.4 (12.7) 82.5 - 94.4

* Mean diastolic blood pressure significantly different (p<0.05)

3.4.4 Self reported incidence of hypertension

Table 3.4.4 shows that based on information provided by the respondents (Food Choice Questionnaire) more younger elderly men were reported to suffer from high blood pressure than women of same age group, and older elderly men and women. All respondents (31% men and 24% women) who reported to be suffering from hypertension also reported to take prescribed medication for it. This was lower than 35% men and 44% women who reported to be taking medication for high blood pressure for the NDNS.

Table 3.4.4 Prevalence of hypertension as reported by the study participants

BP	Male			Female		
	65-74y (n=24)	75y & + (n= 15)	All (n= 39)	65-74y (n=20)	75y & + (n=21)	All (n=41)
SR Ht	9 (37%)	3 (20%)	12 (31%)	4 (20%)	6 (28%)	10 (24%)

SR Ht Self reported hypertension

3.4.5 Distribution of systolic blood pressure by sex

Table 3.4.5a shows that the proportion of men (41%) who had systolic blood pressure of 160 mm Hg and over was higher than women (34%) who had systolic blood pressure of 160 mm Hg or above. Table 3.4.5b shows that a greater proportion of women (56%) had diastolic blood pressure of 90 mm Hg and over than men (46%).

Table 3.4.5a Distribution of systolic blood pressure by sex of the respondents

SBP mm Hg	Male n=39 cum %	Females n=41 cum %	All n=80 cum %
<120	3	5	3
<140	26	12	19
<160	59	66	63
<180	78	83	81
<200	97	98	98

Table 3.4.5b Distribution of diastolic blood pressure by sex of the respondents

DBP mm Hg	Male n=39 cum %	Females n=41 cum %	All n=80 cum %
<70	-	5	3
<80	18	20	19
<90	54	44	49
<100	78	81	79
<110	92	98	95

3.4.6 Distribution of systolic blood pressure by sex and age

Table 3.4.6a shows that a greater proportion of younger elderly men (42%) had a systolic blood pressure of 160 mm Hg and above than 40% of older elderly men aged 75 years and over.

Table3.4.6a Distribution of systolic blood pressure by sex and age of the sample

	Men		Women	
SBP mm Hg	65-74 years n=24 cum%	75 years & over n=15 cum%	65-74 years n=20 cum%	75 years & over n=21 cum%
<120	-	-	5	-
<140	29	20	15	10
<160	58	60	80	52
<180	71	93	90	76
<200	96	100	100	95

Table 3.4.6b on the other hand shows that 48% older elderly women as opposed to 20% younger elderly women had a systolic blood pressure of 160 mm Hg and above. Similar trends were observed for diastolic blood pressure. Younger elderly men had a tendency towards higher systolic and diastolic blood pressures than older elderly men. Conversely older elderly women tended to have a higher systolic blood pressure and a higher diastolic pressure than younger elderly women.

Table 3.4.6b Distribution of diastolic blood pressure by sex and age of the respondents

	Men		Women	
DBP mm Hg	65-74 years n=24 cum%	75 years & over n=15 cum%	65-74 years n=20 cum%	75 years & over n=21 cum%
<70	-	-	-	10
<80	8	33	15	24
<90	42	73	45	43
<100	63	100	80	81
<110	88	-	100	95

3.4.7 Classification of men and women based on their blood pressure

Table 3.4.7 shows that more women were normotensive untreated and more men had controlled blood pressure due to medication (normotensive treated). There was no difference in the number of men and women who were hypertensive treated (raised blood pressure inspite of treatment) and hypertensive untreated (unaware of having raised blood pressure).

Table 3.4.7 Classification of men and women based on blood pressure

Category	Men n (%) n=39	Women n (%) n=41	All n (%) n=80
Normotensive Untreated	13 (33)	17 (42)	30 (38)
Normotensive Treated	3 (8)	1 (2)	4 (5)
Hypertensive Treated	9 (23)	9 (22)	18 (23)
Hypertensive Untreated	14 (36)	14 (34)	28 (35)

3.4.8 Blood pressure by social class

No significant associations were found between blood pressure and social class of the respondents.

3.4.8 KEY POINTS

- Mean blood pressure recorded for men was higher than that recorded for women of the survey sample.
- Mean blood pressures recorded for men and women of the survey sample were higher than those recorded for the participants of the NDNS.
- Mean diastolic blood pressure of men aged 65- 74 years was significantly higher than that recorded for men aged 75 years and over.
- Social class had no significant bearing on the blood pressure of the survey sample.

3.5 Food Choice

The information on factors that influence food choice is divided into subsections and presented under separate headings, below.

3.5.1 Assessment of Health

3.5.1.1 Self perceived health

Table 3.5.1 shows that the majority of the respondents, 61% men and 63% women, had a positive perception of their present health. Five (13%) men and five (12%) women described their present health as being excellent. Twenty three percent of men and 17% women described their health as being very good and 28% men and 34% women described it as being good. More women (15%) than men (5%) perceived their health to be poor and more men (31%) than women (22%) perceived their present health to be fair. There were no apparent age specific trends.

Table 3.5.1 Self perceived health (SPH) by age and sex of respondents

	Male			Female		
SPH	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Excellent	3 (12)	2 (13)	5 (13)	4 (20)	1 (5)	5 (12)
Very good	6 (25)	3 (20)	9 (23)	2 (10)	5 (24)	7 (17)
Good	7 (29)	4 (27)	11 (28)	6 (30)	8 (38)	14 (34)
Fair	6 (25)	6 (40)	12 (31)	5 (25)	4 (19)	9 (22)
Poor	2 (8)	-	2 (5)	3 (15)	3 (15)	6 (15)

[a] How would you describe your present health? (excellent, very good, good, fair, poor, other)

3.5.1.2 Relative self perceived health

Table 3.5.2 shows that more women (61%) than men (54%) considered themselves to be more fit and active compared to another person of similar age. Twenty six percent of the women and (24%) men said they considered themselves to be less fit and active than another person of similar age. Twenty percent of men and 15% women said that they

considered themselves to have the same level of health and fitness as another person of similar age. There were no other apparent sex and age specific trends.

Table3.5.2 Relative self perceived health (RSPH)[a] by age and sex of the respondents

	Male			Female		
RSPH	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
MF&A	13 (54)	8 (53)	21 (54)	13 (65)	12 (57)	25 (61)
Same	6 (25)	2 (13)	8 (20)	2 (10)	4 (19)	6 (15)
LF&A	5 (21)	5 (33)	10 (26)	5 (25)	5 (24)	10 (24)

[a] Comparing yourself to the next person of similar age, do you consider yourself to be: more fit and active, same, less fit and active, don't know, other.

3.5.1.3 Improving present health

Table 3.5.3 shows that the majority of men (54%) and 29% of women said that they did not need to or felt that they couldn't do anything more to improve their present health status. Twenty six percent of men and 34% women said that they would like to take more exercise, 8% men and 27% women said that they would like to lose weight to feel healthier. Younger elderly women (35%) were more likely to be dissatisfied with their present weight than older elderly women (19%). None of the older elderly men expressed a desire to lose weight to feel healthier.

Table 3.5.3 Improving present health status[a] by sex and age of the respondents

	Male			Female		
Health Improve by	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%
Nothing	12 (50)	9 (60)	21 (54)	3 (15)	9 (43)	12 (29)
More exercise	5 (21)	5 (33)	10 (26)	7 (35)	7 (33)	14 (34)
Lose weight	3 (12)	-	3 (8)	7 (35)	4 (19)	11 (27)
Other	4 (17)	1 (7)	5 (13)	-	1 (5)	1 (2)

[a] In your view what could you do to feel healthier? Nothing, take more exercise, lose weight, other.

3.5.1.4 Quality of life

Table 3.5.4 shows that most of men and a majority of women felt that quality of life was mainly determined by companionship and health status. None of the participants said that money alone was enough to improve quality of life, although 8% men and 7% women felt that money, along with health, companionship and social life is important for a better quality of life.

Table 3.5.4 Quality of life[a] by sex and age of study participants

	Male			Female		
Quality of life	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Companionship	9 (37)	9 (60)	18 (46)	5 (25)	8 (38)	13 (32)
Health	12 (50)	6 (40)	18 (46)	14 (70)	10 (48)	24 (58)
Social life	-	-	-	1 (5)	-	1 (2)
All	3 (12)	-	3 (8)	-	3 (14)	3 (7)

[a] According to you, what determines quality of life? Companionship, health, Money, Social life, All of the above.

3.5.1.5 Self reported health (incidence of chronic diseases)

Table 3.5.5 shows that 31 men (79%) and 33 women (81%) of the study sample reported that they suffered from a chronic disease. Fifty- five percent of them (57% women and 52% men) reported suffering from more than one disease. More of the younger elderly respondents (50%) reported suffering from more than one disease than older elderly respondents (36%). The 'other' reported chronic diseases included, breathing disorders (9%), hiatus hernia (10%), osteoporosis (4%), gall stones (1%), diverticulosis (1%), under-active thyroid (6%), migraine (2%), depression (4%), gout (2%) and benign enlargement of prostate (1%). Arthritis was the most commonly reported disease and 49% women and 31% men reported to suffer from it. Older elderly women (52%) and younger elderly men (46%) were more likely to report suffering from arthritis than younger elderly women (45%) and older elderly men (7%).

The next most commonly reported disease was hypertension, 31% men and 24 women reported to suffer from hypertension. Younger elderly men (37%) were more likely to report suffering from hypertension than older elderly men (20%). Conversely older elderly women (29%) were more likely to claim to suffer from hypertension than younger elderly women (20%). Twenty percent of men and 24% of women reported to suffer from heart disease. Older elderly women (29%) were more likely to report suffering from heart disease than younger elderly women (20%). In addition, information on specific conditions was sought. Thirty- six percent of men and 37% of women reported that they had problems with their hearing, but only 5% of men and 20% of women reported to wear a hearing aid. Eighty-five percent of men and 83% of women of the survey sample needed reading glasses. Forty-one percent of men and 56% of women of the study sample reported that they had difficulty walking.

Table 3.5.5 Self reported health (incidence of chronic diseases) by sex and age

	Male			Female		
Disease	65-74y 24(100%	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%
High BP	9 (37)	3 (20)	12 (31)	4 (20)	6 (29)	10 (24)
CAD	4 (17)	4 (27)	8 (20)	4 (20)	6 (29)	10 (24)
Stroke	5 (21)	1 (7)	6 (15)	1 (5)	-	1 (2)
Diabetes	3 (12)	-	3 (8)	2 (10)	-	2 (5)
Cancer	2 (8)	2 (13)	4 (10)	-	1 (5)	1 (2)
Arthritis	11 (46)	1 (7)	12 (31)	9 (45)	11 (52)	20 (49)
Other	4 (17)	4 (27)	8 (20)	11 (55)	8 (38)	19 (46)

CAD Coronary Artery Disease, BP Blood Pressure

3.5.1.6 Self reported intake of drugs

Table 3.5.6 shows that sixty-four percent of the women and 68% of men reported regular use of medication. Women tended to take painkillers in the form of non-steroidal anti-inflammatory drugs (NSAID) and men claimed to take aspirin as a preventative measure against coronary artery disease. 'Other' drugs which were reported included steroids, warfarrin, antidepressants, H2 antagonists, anti emetics, thyroxin and allopurinol.

Table 3.5.6 Medication, self-reported intake of drugs (prescription and over the counter) by sex of the survey sample.

	Male			Female		
Drugs	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Hypertension	9 (37)	3 (20)	12 (31)	4 (20)	6 (29)	10 (24)
CAD	4 (17)	3 (20)	7 (18)	2 (10)	4 (19)	6 (15)
Aspirin	4 (17)	(27)	8 (20)	2 (10)	2 (9)	4 (10)
Diabetes	2 (8)	-	2 (5)	1 (5)	-	1 (2)
NSAID	6 (25)	1 (7)	7 (18)	(35)	6 (29)	13 (32)
Other	7 (29)	2 (13)	9 (23)	4 (20)	6 (28)	10 (24)

NSAID: Non steroidal anti inflammatory drugs

3.5.2 Shopping, cooking and access

3.5.2.1 Shopping for food

Table 3.5.7 shows that seventy- nine percent of men shopped for food whereas 20% had spouses, friends, relatives and neighbours do the shopping for them. A greater proportion of older elderly men (87%) claimed to do their own shopping as compared to 75% of younger elderly men. A greater proportion of younger elderly men (25%) had their shopping done for them as compared to (13%) of the older elderly men. All of the younger elderly men who did not do their own shopping had their food bought by their spouses and for all of them spouses also made choices on their behalf. Older elderly men also relied on other people who shopped for them to make decisions on their behalf.

Eighty-eight percent of women shopped for food and only 12% had someone else do the shopping for them. In contrast to the male respondents, a greater percentage of younger elderly female respondents (95%) did their own shopping as compared (81%) of older elderly women. All the women who did not shop for themselves relied mainly on children, friends and neighbours to do their shopping. The main difference between men and women non shoppers was that men let the people buying food for them also make decisions on what

to buy, women on the other hand said that people who did the shopping for them bought what was stated on the list provided by themselves.

Table 3.5.7 Shopping for food by sex and age of the respondents

	Male			Female		
Shopping	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Shoppers	8 (75)	13 (87)	31 (79)	19 (95)	17 (81)	36 (88)
Non Shopper	6 (25)	2 (13)	8 (20)	1 (5)	4 (19)	5 (12)

3.5.2.2 Reported frequency of shopping

Table 3.5.8 shows that women tended to shop more often than men with 61% shopping more than twice a week as compared to 46% of men shopping more than twice a week. Younger elderly men (46%) were most likely to shop for food once a week. Sixty-three percent of women shoppers described shopping for food as something they enjoyed doing. Twenty-three percent men and 15% of women said that they did not enjoy shopping for food and 8% of men and 15% of women described shopping for food as something that had to be done. Sixty-seven percent of older elderly men as compared to 33% of younger elderly men said that they enjoyed shopping for food. Eight-percent of younger elderly men and 7% of older elderly men perceived shopping for food as something that had to be done. In contrast to men, more of the younger elderly women (70%) claimed to enjoy shopping for food than (57%) older elderly women.

Table:3.5.8 Frequency of shopping for food by age and sex of the respondents

	Male			Female		
Frequency	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Everyday	2 (8)	4 (27)	6 (15)	4 (20)	1 (5)	6 (15)
2-4 times a week	5 (21)	7 (47)	12 (31)	9 (45)	10 (48)	19 (46)
Once a week	11 (46)	2 (13)	13 (33)	6 (30)	6 (29)	12 (29)

3.5.2.3 Transport and accessibility

Table 3.5.9 shows that fifty-six percent of men and 32% of women used their own car to get to and from the shops. Older elderly men (53%) and women (29%) were less likely to have their own transport to get to and from the shops compared with younger elderly men (58%) and women (35%). Older elderly women (29%) were more likely to use public transport to get to and from the shops, than younger elderly women (15%). Younger elderly women (35%) were more likely to walk to the shops to buy food than older elderly women (9%) and men (10%) of both age groups.

Fifty-four percent men and 32% women said that they faced no difficulties while shopping for food. Fifty-four percent of younger elderly men and 65% of younger elderly women said that they faced no difficulties while shopping for food as compared to 53% of older elderly men and 38%of older elderly women. Seventeen-percent and 30% of younger elderly men and women respectively and 33% of older elderly men and women said that they had difficulty carrying their shopping.

Table 3.5.9 Means of getting to and from food outlets, by sex and age of the study sample

	Male			Female		
Access	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Walking	2 (8)	2 (13)	4 (10)	7 (35)	2 (9)	9 (22)
Public transport	2 (8)	1 (7)	3 (8)	3 (15)	6 (29)	9 (22)
Car	14 (58)	8 (53)	22 (56)	7 (35)	6(29)	13 (32)
Taxi	-	1 (7)	1 (2)	1 (5)	2 (9)	3 (7)
Other	-	1 (7)	1 (2)	1 (5)	1 (5)	2 (5)

3.5.2.4 Market segmentation

Table 3.5.10 shows that sixty-two percent of the respondents said they shopped for food at supermarkets. Twenty-percent of the respondents reported that they shopped at supermarkets and local shops. Only one male respondent said that he shopped only at local shops for food. Kwik Save was the most popular food outlet and 31% of the respondents bought their food at Kwik Save. Tesco was the second most frequented food outlet (24%). More women (32%) shopped at Tesco than men (15%) and a greater proportion of men (33%) men shopped at Kwik Save than women (29%). Frozen food outlets such as Kwik

Save and Iceland were more popular among men (44%) than women (34%). It was also observed that older elderly men (73%) were more likely to report buying food from frozen food outlets such as Kwik Save and Iceland. Conversely more of the younger elderly women (55%) shopped at frozen food stores than older elderly women (14%). Men (13%) were more likely to shop at cheaper food outlets such as Aldi than women (5%).

Majority of shoppers (56%) shopped at their chosen supermarkets because of convenience. However additional information was provided by the respondents, which showed that Tesco was preferred because its stores offered greater choice, Kwik Save, better value for money. Respondents, who shopped for food at Asda, did so because it offered greater choice, similarly Marks and Spencers and Sainsbury were chosen because they offered better quality and better lay out, respectively.

Table 3.5.10 Preferred supermarkets by sex and age of the respondents

	Male			Female		
Outlet	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Tesco	5 (21)	1 (7)	6 (15)	6 (30)	7 (33)	13 (32)
Sainsbury	5 (21)	5 (33)	10 (26)	3 (15)	5 (24)	8 (19)
Asda	7 (29)	2 (13)	9 (23)	5 (25)	3 (14)	8 (19)
M &S	2 (8)	1 (7)	3 (8)	1 (5)	2 (9)	3 (7)
Gateway	1 (4)	-	1 (2)	1 (5)	2 (9)	3 (7)
KwikSave	5 (21)	8 (53)	13 (33)	9 (45)	3 (14)	12 (29)
Aldi	3 (12)	2 (13)	5 (13)	2 (10)	-	2 (5)
Iceland	1 (4)	3 (20)	4 (10)	2 (10)	-	2 (5)
Safeway	3(12)	-	3 (8)	-	2 (9)	2 (5)

3.5.2.5 Delivered food

Table 3.5.11 shows that forty-nine percent of men 34% of women had fresh milk delivered to their doorstep. More of the younger elderly men (54%) had milk delivered as opposed to

older elderly men (40%). Thirty five percent of younger elderly women and 33% of older elderly women had milk delivered to their doorstep. Only one older elderly woman had meals on wheels delivered and one woman of the same age group had green grocery delivered to her doorstep.

Only 16% of the respondents said that they'd like to have a home delivery service for food with the majority (84%) stating that they preferred to go out to buy their food and men and women of both age groups held the same view. Thirty-one percent of men and 46% of women said that they were opposed to the idea of a home delivery system for food because they liked to choose their food. Thirty-six percent of men and 29% of women said that shopping for food gave them a reason to go out. Ten-percent of men and 7% of women gave other reasons for wanting to go out to shop for food.

Table 3.5.11 Delivery of food to the doorstep by sex and age of the respondents

	Male			Female		
Food	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Fresh Milk	13 (54)	6 (40)	19 (49)	7 (35)	7 (33)	14 (34)
MOW*	-	-	-	-	1 (5)	1 (2)
Other	-	-	-	-	1 (5)	1 (2)

*Meals on Wheels

3.5.3 Food habits

3.5.3.1 Desired changes in dietary habits

Table 3.5.12 shows that twenty- percent of men and 10% of the women of the respondents claimed that they would like to change an aspect of their current diet. Eight- percent of men and 5% of women wanted to reduce the fat content of their diet, five percent of the respondents wanted to reduce their alcohol intake. Eight- percent of men and 5% of women hoped to eat more greens.

Table3.5.12 Aspects of current diet that the respondents wanted to change, by sex and age.

	Male			Female		
Change	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Less fat	3 (12)	-	3 (8)	1 (5)	1 (5)	2 (5)
Less alcohol	1 (4)	1 (7)	2 (5)	-	-	-
More greens	-	3 (20)	3 (8)	1 (5)	1 (5)	2 (5)
Less food	1 (4)	-	1 (2)	-	-	-

Is there an aspect of your current diet that you would like to change?

3.5.3.2 Attitudes towards dietary change

Table 3.5.13a and 3.5.13b show the attitudes of the respondents towards including or excluding food(s) from their current diet. Fifty-one percent of men and 71% of the women of the survey sample said that they would include food(s) in their diet if it was good for health, only 10% of the men and 7% percent of the women said that they wouldn't. A lesser number of respondents were however ready to exclude something from their diet for health reasons and 44% of men and 66% of the women said they would exclude food(s) from their diet on this basis. Younger elderly men (58%) and women (90%) were more likely to say that they would include new food(s) in their diet for health than older elderly men (40%) and women (52%). Similarly younger elderly men (54%) and women (75%) were more likely to say that they would exclude food from their diet for health than older elderly men (27%) and women (57%).

Five percent of the men and 7% of the women said that their decision to include new food in their diet would depend on the reason for inclusion. Similarly 8% of men and 7% of the women said that they would exclude something from their diet depending on the reason to do so. Twenty-percent of men and 10% of women said that it would depend on the food(s) to be included, similarly 18% of men and 12% of women said that it would depend upon what food(s) they were asked to exclude. Ten percent of men and 5% of women said that they would include food(s) in their diet depending on who was asking them to do so and same reason for excluding food(s) was given by 5% of men and 5% of

women. On the whole, women were more likely to say that they would include (71%) or exclude (66%) food(s) for health reasons than men 51% and 44%, respectively.

Table 3.5.13 The number of respondents who would include food(s) in their diet for health, by age and sex.

	Male			Female		
Change	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Would Include	14 (58)	6 (40)	20 (51)	18 (90)	11 (52)	29 (71)
Wouldn't include	2 (8)	2 (13)	4 (10)	1 (5)	2 (9)	3 (7)
Reason to include	1 (4)	1 (7)	2 (5)	1 (5)	2 (9)	3 (7)
'Who' factor	2 (8)	2 (13)	4 (10)	-	2 (9)	2 (5)
What food	4 (17)	4 (27)	8 (20)	-	4 (19)	4 (10)

Table 3.5.13b The number of respondents who would exclude food(s) from their diet for health, by age and sex .

	Male			Female		
Change	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Would exclude	13 (54)	4 (27)	17 (44)	15 (75)	12 (57)	27 (66)
Wouldn't exclude	4 (17)	5 (33)	9 (23)	3 (15)	1 (5)	4 (10)
Reason to exclude	3 (12)	-	3 (8)	1 (5)	2 (9)	3 (7)
'Who' factor	-	2 (13)	2 (5)	-	2 (9)	2 (5)
What food	3 (12)	4 (27)	7 (18)	1 (5)	4 (19)	5 (12)

3.5.3.3 Vegetarians

The survey sample only had two (2%) vegetarians, one younger elderly man and one older elderly woman.

3.5.3.4 Ready meals

Fifty- nine percent of respondents, 54% men and 63% women consumed ready meals. Older elderly women (76%) were more likely to consume ready meals than younger elderly women (50%). A greater proportion of older elderly men (73%) consumed ready meals as compared to 41% of the younger elderly men.

3.5.3.6 Dentures

Table 3.5.14 shows that sixty percent of the respondents (51% men & 68% women) wore dentures and 2% of the male and 15% of the females who claimed to wear dentures avoided some foods. The NDNS reported that 50% of their sample was dentate and 48% wore partial dentures. They also reported that elderly people from the North were more likely to be edentate than those from the South of England. Older elderly women were most likely to wear dentures (81%). More women (15%) reported to avoid certain foods due to dentures than men (2%). The foods avoided were hard fruits and nuts and preserves and spreads with seeds and meat. Most of the respondents who wore dentures were satisfied with their dentures. The NDNS reported that for their edentate respondents, half faced problems regarding food intake.

Table 3.5.14 The number of denture wearers by age and sex of the respondents.

	Male			Female		
Dentures	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Denture wearers	10 (42)	10 (66)	20 (51)	11 (55)	17 (81)	28 (68)

3.5.3.7 Smoking habits

Table 3.5.15 shows that thirteen percent of men and 5% of women were current smokers. Eighty-two percent of men and 39% women were ex smokers. Seventy- five percent of the men and 50% of the women ex smokers gave up smoking for health reasons.

3.5.15 Smoking habits of the respondents by sex and age

	Male			Female		
Smoking	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Current smokers	3 (12)	2 (13)	5 (13)	1 (5)	1(5)	2 (5)
Ex smokers	19 (79)	13 (87)	32 (82)	8 (40)	8 (38)	16 (39)

3.5.3.8 Special diet

Eight percent of men and 12% women claimed to be on a prescribed diet. Of the male participants, 5% were on low fat diet, and 5% were on low fat and reduced sugar diet. Of the females, 7% were on a low fat diet and 5% were on a low fat and restricted salt diet.

3.5.3.9 Foods avoided

Thirty-three percent of the men and 37% women chose to avoid certain foods from their diet. Twenty percent of the men and 19% of the women claimed that they avoided fatty and fried foods. Five percent of men and 7% of women avoided meat and meat products, 2% of men and women avoided milk and milk products and 5% of men and 7% of women avoided other foods such as foods cooked in heavy sauces and spices, salads and chocolate.

3.5.3.10 Taste and amount of food

Only twenty-six percent of men and 17% of women said that the amount of food they consumed had not changed over the years. Seventy-two percent of men and 80% of women said that as they had grown older, the amount of food they consumed had decreased. Ninety-five percent of men and 76% of the women said that they had experienced no change in taste preference, as they had grown older. Only one woman said that she tended to add more salt and sugar than before.

3.5.4 Cooking abilities

Fifty- six percent of men said that they could cook meals and 44% of men entirely relied on their wives to cook for them. Apart from 9% of older elderly women, none of the respondents faced any difficulties whilst cooking. Ninety- five percent of women cooked

their own food. Ten percent of younger elderly women and 5% of older elderly women, despite cooking their own meals also attended a luncheon club. None of the men attended a luncheon club. The women who attended a luncheon club did so for social reasons than for the benefit of a cooked meal.

3.5.5 Cooking facilities

Table 3.5.16 shows that all of the respondents owned a fridge and 97% of the men and all women also owned a freezer of some description. All respondents had a cooker and electric kettle. Seventy-two percent of the men 63% of the women had a microwave oven and 69% of men and 60% of women owned a mixer or blender. Only 15% of men and 12% of women had a dishwasher.

Table 3.5.16 Cooking facilities and aids by sex and age of the respondents.

	Male			Female		
Cooking facilities	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Fridge	24 (100)	15 (100)	39 (100)	20 (100)	21 (100)	41 (100)
Freezer	23 (96)	15 (100)	38 (97)	20 (100)	21 (100)	41 (100)
Cooker	24 (100)	15 (100)	39 (100)	20(100)	21 (100)	41 (100)
M oven*	18 (75)	10 (67)	28 (72)	15 (75)	11 (52)	26 (63)
Mixer/ Blender	20 (83)	7 (47)	27 (69)	13 (65)	11 (52)	24 (58)
Electric kettle	24 (100)	15 (100)	39 (100)	20 (100)	21 (100)	41 (100)
Dish-Washer	5 (21)	1 (7)	6 (15)	3 (15)	2 (9)	5 (12)

*Microwave oven

3.5.6 Nutritional information

3.5.6.1 Awareness about nutritional information

Table 3.5.17 shows that fifty- six percent of the men and 61% women said that they were aware of guidelines on healthy eating. Women were more likely to say that they followed guidelines on healthy eating and 23% of the men and 32% of the women said that they took

them on board. Thirteen percent of the men and 10% of the women said that they ignored any such guidelines and 20% of men and 19% of women said that they took on board, what suited them.

Table 3.5.17Awareness of nutritional guidelines by age and sex of the respondents.

	Male			Female		
Information	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Aware of guideline	15 (62)	7 (47)	22 (56)	16 (80)	9 (43)	25 (61)
Take on board	7 (29)	2 (13)	9 (23)	8 (40)	5 (24)	13 (32)
Did not take on board	3 (12)	2 (13)	5 (13)	3 (15)	1 (5)	4 (10)
Took on what suited	5 (21)	3 (20)	8 (20)	5 (25)	3 (14)	8 (19)

Are you aware about guidelines on healthy heating?

3.5.6.2 Accessibility of nutritional information

Table 3.5.18 shows that forty-nine percent of men and 56% of women said that information on nutritional guidelines was easily accessible, 26% of men and 22% of women did not find such information easily accessible. Men (33%) and women (14%) aged 75 years and over found guidelines on healthy eating difficult to access than men (21%) and women (30%) aged 65 to 74 years.

Table 3.5.18 Accessibility of nutritional information by age and sex of the respondents.

	Male			Female		
Accessibility	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Easy	12 (50)	7 (47)	19 (49)	13 (65)	10 (48)	23 (56)
Difficult	5 (21)	5 (33)	10 (26)	6 (30)	3 (14)	9 (22)
Don't know	6 (25)	3 (20)	9 (23)	1 (5)	8 (38)	9 (22)

According to you, is the nutritional information easy to get hold of?

3.5.6.3 Perceived effectiveness of nutritional messages

Table 3.5.19 shows that thirty-three percent of men and 27% of women said that information about guidelines on healthy eating was effective, 23% of men and 22% of women said that it wasn't effective. Five percent of men and 7% of women found information on healthy eating too complicated. Ten percent of men and 15% of women said that guidelines on healthy eating kept changing. Five percent of men said that the information was too general and did not apply to all population groups.

Table3.5.19 Perceived effectiveness of nutritional messages by sex and age of the respondents

	Male			Female		
Effectiveness of information	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Effective	8 (33)	5 (33)	13 (33)	8 (40)	3 (14)	11 (27)
Not Effective	6 (25)	3 (20)	9 (23)	4 (20)	5 (24)	9 (22)
Don't know	7 (29)	7 (47)	14 (36)	8 (40)	13 (62)	21 (51)

According to you, is the information on healthy eating effective?

3.5.6.4 Sources of nutritional information

Table 3.5.20 shows that newspapers and magazines were the most popular sources of nutritional information (35%), television (20%) and leaflets in shops (16%) were the second and third sources of nutritional information cited by the respondents. Nine percent of the respondents said that they got their information from friends and relatives, 14% from their doctors or hospital, 6% said that food labels were a good source of nutritional information and only 4% got such information from agencies for elderly people.

Table3.5.20 Sources of nutritional information by sex and age of the respondents

	Male			Female		
Informatio nSource	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
TV	4 (17)	6 (40)	10 (26)	3 (15)	3 (14)	6 (15)
M&P*	9 (37)	6 (40)	15 (38)	8 (40)	5 (24)	13 (32)
Friends & relatives	4 (17)	1 (7)	5 (13)	1 (5)	3 (14)	4 (10)
Doctor/ hospital	3 (12)	1 (7)	4 (10)	4 (20)	3 (14)	7 (17)
Leaflets in shops	1 (4)	3 (20)	4 (10)	6 (30)	3 (14)	9 (22)
Food labels	3 (12)	-	3 (8)	2 (10)	-	2 (5)
Agencies for elderly	-	-	-	3 (15)	-	3 (7)

*magazines and papers

3.5.7 Nutritional knowledge

3.5.7.1 Belief statements reflecting nutritional knowledge

Statement no. 1(Too much fat in the diet is bad for you)

A majority of men (97%) and women (100%) believed that too much fat in the diet to be a bad thing (table 3.5.21).

Table 3.5.21 Belief statement 1

Too much fat in the diet is bad for you						
	Male			Female		
Responses	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	24 (100)	14 (93)	38 (97)	20 (100)	21 (100)	41 (100)
False	-	-	-	-	-	-
Unsure	-	-	-	-	-	-
Don't know	-	1 (7)	1 (3)	-	-	-

Statement 2. (Too much salt in the diet is bad for you)

Ninety- five percent of men and women believed that too much salt in the diet is a not good (table 3.5.22).

Table 3.5.22 Belief statement 2

Too much salt in the diet is bad for you						
	Male			Female		
Responses	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	23 (96)	14 (93)	37 (95)	18 (90)	21 (100)	39 (95)
False	1 (4)	1 (7)	2 (5)	1 (5)	-	1 (2)
Unsure	-	-	-	-	-	-
Don't know	-	-	-	1 (5)	-	1 (2)

Statement 3 (Margarine has less fat than butter)

Seventy- seven percent of the men and 66% of the women believed that margarine has less fat than butter. Eight percent of men and 5% of women believed this statement to be false. Seventeen percent of the women and 3% of the men were unsure and 8% of the men and 12% of the women said they did not know whether margarine had less fat than butter or not (table 3.5.23).

Table 3.5.23 Belief statement 3

Margarine has less fat than butter						
	Male			Female		
Responses	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	17 (71)	13 (87)	30 (77)	13 (65)	14 (67)	27 (66)
False	3 (12)	-	3 (8)	2 (10)	-	2 (5)
Unsure	1 (4)	-	1 (3)	2 (10)	5 (24)	7 (17)
Don't know	1 (4)	2 (13)	3 (8)	3 (15)	2 (9)	5 (12)

Statement 4 (Semi-skimmed milk does not taste as good as full cream milk)

Sixty-nine percent of the men and 76% of the women believed that semi- skimmed milk does not taste as good as full cream milk (table 3.5.24).

Table 3.5.24 Belief statement 4

Semi-skimmed milk does not taste as good as full cream milk						
	Male			Female		
Responses	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	15 (62)	12 (80)	27 (69)	15 (75)	16 (76)	31 (76)
False	7 (29)	2 (13)	9 (23)	3 (15)	1 (5)	4 (10)
Unsure	1 (4)	-	1 (3)	-	1 (5)	1 (2)
Don't know	-	1 (7)	1 (3)	2 (10)	3 (14)	5 (12)

Statement 5 (White bread is a poor source of fibre)

Forty nine percent of men and 73% of women believed white bread to be a poor source of fibre (table 3.5.25).

Table 3.5.25 Belief statement 5

White bread is a poor source of fibre						
	Male			Female		
Responses	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	10 (42)	9 (60)	19 (49)	14 (70)	16 (76)	30 (73)
False	12 (50)	5 (33)	17 (44)	4 (20)	3 (14)	7 (17)
Unsure	1 (4)	-	1 (3)	1 (5)	2 (9)	3 (7)
Don't know	-	1 (7)	1 (3)	1 (5)	-	1 (2)

Statement 6 (meat contains fibre)

Sixty- four percent of the men and 73% of the women believed that meat contained fibre (table 3.5.26).

Table 3.5.26 Beliefs statement 6

Meat contains fibre						
	Male			Female		
Response	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	14 (58)	11 (73)	25 (64)	14 (70)	16 (76)	30 (73)
False	4 (17)	2 (13)	6 (15)	4 (20)	3 (14)	7 (17)
Unsure	2 (8)	-	2 (5)	1 (5)	2 (9)	3 (7)
Don't know	3 (12)	2 (13)	5 (13)	1 (5)	-	1 (2)

Statement 7 (Fish contains fibre)

Forty-nine percent of the men and 56% of the women believed that fish contained fibre (Table 3.5.27).

Table 3.5.27 belief statement 7

Fish contains fibre						
	Male			Female		
Response	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
True	11 (46)	8 (53)	19 (49)	8 (40)	15 (71)	23 (56)
False	6 (25)	3 (20)	9 (23)	6 (30)	2 (9)	8 (19)
Unsure	2 (8)	-	2 (5)	1 (5)	1 (5)	2 (5)
Don't k now	4 (17)	4 (27)	8 (20)	5 (25)	3 (14)	8 (19)

3.5.7.2 Nutritional knowledge score

Nutrient sources (Table 3.5.28)

Respondents were asked to name food sources of saturated fat, fibre, iron and vitamin D. The answer was deemed correct if the respondents named one good source or two average sources of the nutrient in question.

For all nutrients more women, as compared to men, tended to give correct answer and less women were likely to say don't know or give the incorrect answer. Younger elderly men and women were more likely to answer correctly than older elderly men and women. The highest correct responses (92%) were recorded for food sources of fibre. This was followed iron (52%) and saturates (47%). The least correct responses were recorded for vitamin D (12%).

Table 3.5.28 Knowledge of food sources of nutrients by sex and age of the respondents

		Male			Female		
Nutrient	Response	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%
Saturates	Correct	12 (50)	3 (20)	15 (38)	16 (80)	7 (33)	23 (56)
Fibre	Correct	20 (83)	13 (87)	36 (92)	19 (95)	19 (90)	38 (93)
Vitamin D	Correct	3 (12)	3 (20)	6 (15)	4 (20)	-	4 (10)
Iron	Correct	11 (46)	5 (33)	16 (41)	14 (70)	8 (38)	22 (54)

Labels

Table 3.5.29 shows that fifty-six percent of men and 56% of women said that they paid attention to food labels. Younger elderly women (70%) were more likely to say that they paid attention to food labels than older elderly women (43%). Two percent of the respondents said that they read labels out of habit and described it as something they had always done, 7% to see the sell by date and 16% to avoid additives. Seventeen percent of the respondents read labels to avoid fat, 10% to find out about the nutritional value of the food and 6% read labels for other reasons such as country of origin.

Women (19%) were more likely to say that they read labels to avoid fat than men (15%). Younger elderly men (17%) and women (25%) were more likely to read labels to avoid fat than older elderly men (13%) and women (14%).

Table 3.5.29 Reasons for reading food labels by age and sex of the respondents

	Male			Female		
Labels	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Read labels	13 (54)	9 (60)	22 (56)	14 (70)	9 (43)	23 (56)
Habit	1 (4)	-	1(3)	1 (5)	-	1 (2)
Sell by date	2 (8)	2 (13)	4 (10)	1 (5)	1 (5)	2 (5)
Avoid fat	4 (17)	2 (13)	6 (15)	5 (25)	3 (14)	8 (19)
Nutrition value	-	3 (20)	3 (8)	2 (10)	3 (14)	5 (12)
Other	3 (12)	1 (7)	4 (10)	-	1 (5)	1 (2)

Understanding nutritional labels

Twenty-four percent of the respondents, 20% of men and 27% of women said that they found nutritional labels easy to understand, however 67% of the respondents, 67% of the men and 35% of the women found labels difficult to understand. The respondents were given a food label (Weetabix) and questions regarding the print and printed information were asked. Twenty-eight percent of the men 7% of the women said that they could read the print on the label easily. Younger elderly men (29%) were most likely to find the print on labels easy to read, whereas none of the women aged 75 years and over found the print on the label easy to read. Twenty-eight percent of the men and 54% of the women found it difficult to read the print on the label 36% of the men and 37% of the women said that they could not read the print without their glasses. One (2%) woman aged 75 years and over could not read the print even with her glasses.

Understanding nutritional terminology

Table 3.5.30 shows that 26% of men and 32% of women correctly understood the term 'energy'. Ten percent of men and 22% of women had a correct understanding of 'saturates', only 2% of men and women knew what 'kJ' stood for. Thrity eight percent of men and 41% of women understood the term 'kcal' and none of the men and 5% of women knew what 'RDA' stood for.

Table 3.5.30 Understanding of nutritional terminology tested by nutritional label by age and sex of the respondents

		Male			Female		
Nutrient	Respons e	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%
Energy	Correct	6 (25)	4 (27)	10 (26)	7 (35)	6 (29)	13 (32)
Saturates	Correct	2 (8)	2 (13)	4 (10)	8 (40)	1 (5)	9 (22)
KJ	Correct	1 (4)	1 (7)	2 (5)	1 (5)	1 (5)	2 (5)
Kcal	Correct	13 (54)	2 (13)	15 (38)	12 (60)	5 (24)	17 (41)
g	Correct	21 (87)	15 (100)	36 (92)	17 (85)	16 (76)	33 (80)
RDA	Correct	0	0	0	2 (10)	0	2 (5)

Total knowledge score (Table 3.5.31)

Based on their answers to four questions on nutrient sources and six questions on understanding of nutritional terminology, the respondents were given a score out of ten. For each correct answer the respondents were given one point.

Table 3.5.31 shows that younger elderly women scored the highest score of 5 (out of a maximum 10), followed by younger elderly men who had a mean score of 3.71. Older elderly men scored 3.2 as compared to 2.9 scored by older elderly women.

Table 3.5.31 Nutritional knowledge score by age and sex of the respondents

	Male			Female		
	65-74y n=24 Mean (SD) (95%CI)	75y&over n=15 Mean (SD) 95% CI	All n=39 Mean (SD) 95% CI	65-74y n=20 Mean (SD) 95% CI	75y&over n=21 Mean (SD) 95% CI	All n=41 Mean (SD) 95% CI
Knowledge Score (out of 10)	3.71 (203) (2.85- 4.57)	3.20 (2.21) (1.98- 4.42)	3.51 (2.09) (2.84-4.19)	5.00 (2.41) (3.87 -6.13)	2.90 (1.67) (2.14-3.67)	3.93 (2.3) (3.20-4.65)

3.5.8 Food price and choice

Table 3.5.32 shows that twenty-eight percent of men and 29% of women said that price of food was fair, 31% of men and 22% of women considered food prices to be expensive. Thirty- six percent of the men and 44% of women said that better quality food was more expensive. These opinions were quite consistent across both the age cohorts (Table 3.5.31).

Influence of food price on food intake

Eighty- nine percent of the participants said that they had never gone without food due to lack of money. Twelve percent of younger elderly men and 20% of younger elderly women and 9% of older elderly women said that they had gone without food due to lack of money. None of the respondents who reported having gone without food due to lack of money did so after retirement, but during their younger years when they had young children.

Table3.5.32 Perception of current food prices by age and sex of the respondents

	Male			Female		
Food price	65-74y 24(100%)	75y&over 15(100%)	All 39(100%)	65-74y 20(100%)	75y&over 21(100%)	All 41(100%)
Fair	5 (21)	6 (40)	11 (28)	6 (30)	6 (29)	12 (29)
Expensive	8 (33)	4 (27)	12 (31)	4 (20)	5 (24)	9 (22)
Pay for quality	9 (37)	5 (33)	14 (36)	9 (45)	9 (43)	18 (44)

3.5.8.1 Weekly expenditure on food

Fifty-eight percent of younger elderly women and 45% of younger elderly men and 40% and 45% of older elderly men and women, respectively said that food was the most important item on their weekly budget. Younger elderly men reported to spend £50-£59 per

week on food, women of the same age group spent £40-£49 per week. Both older elderly men and women reported to spend, on average £30-£39 per week on food.

3.5.9 Attitudes towards diet and health

Based on a total of thirteen statements, table 3.5.33a and 3.5.33b show the attitudes of the respondents on nutrition, health and disease. The responses of each respondent were converted into a mean numerical score for each statement. A mean score of less than 2.3 was taken as an agreement, 2.3-2.7 as neutral attitude and a score of more than 2.7 was taken as a disagreement.

The responses to the statements showed great congruency. Strongest agreement was shared between statements 10 (health is related to what you eat), 11 (some diseases are related to what you eat) and 12 (being heavy/overweight is bad for you). Statement 7 (advice on nutrition is a waste of time) unanimously evoked the strongest disagreement. Age related differences were seen in responses to statements 1 (if you eat 'good' and 'bad' food in moderation it won't harm you), 8 (lot of ill health among people is their own fault) and 2 (not eating much can only be good for you). Younger elderly women disagreed with statement 8 and although younger elderly men agreed with the statement, they did so less strongly than older elderly men and women. Strongest agreement for statement 8 was seen for older elderly men. Older elderly men and women (men more strongly than women) agreed with statement 1, younger elderly men and women however disagreed with this statement. Only older elderly women agreed (not very strongly) with statement 2, rest of the survey sample disagreed.

Table 3.5.33a Ranked attitude statements

(Statement number)	Ranked attitude statements	Mean Score N=80
	Agree (mean score less than 2.3)	
(10)	Health is related to what you eat	1.27
(12)	Being heavy /overweight is bad for you	1.28
(11)	Some diseases are related to what you eat	1.58
(9)	People care more about taste than what is good for them	1.83
(5)	You are responsible for your own diet	1.84
(6)	People need to be informed about healthy diet	1.87
(13)	People should be shown ways of cooking traditional meals in a healthy way	1.9
(8)	Lot of ill health among people is their own fault	2.2
	Neutral (Mean score between 2.3 and 2.7)	
(3)	As you grow older you don't need as much food	2.6
(1)	If you eat 'good' and 'bad' food in moderation, it won't harm you	2.7
	Disagree (Mean score greater than 2.7)	
(2)	Not eating much can only be good for you	2.8
(4)	Too many fruits and vegetables can be bad for you	3.15
(7)	Advice on nutrition is a waste of time	3.9

Table 3.5.33b Ranked attitude statements by age and sex of the respondents.

Mean Score*	Men		Women	
	65- 74 years n=24 Statement	75 years and over n=15 Statement	65- 74 years n=20 Statement	75 years and over n=21 Statement
0.9				10
1.15			12	
1.19				12
1.2			10	
1.27		10 & 11		
1.3		12		
1.47		9		
1.5	12			
1.52				11
1.6			6	
1.64	10			
Agree 1.67				6
1.7			5	
1.73	11	13		
1.76				9
1.85			11	
1.86	13&9			
1.87		8		
1.9	5			8&5
1.93		6		
2.0				3
2.05			13	13
2.07		3		
2.15			9&3	
2.23	6&3			
2.27		1		
2.32	8			
2.43				1&2
2.5				
2.65			8	
2.67		2		
2.9	1			
disagree 2.93		4		
2.95				4
3.0			2	
3.05			1	
3.15			4	
3.18	2			
3.45	4			
3.47		7		
3.48				7
4.09	7			
4.45			7	

*1=strongly agree, 2=agree, 3=neither agree nor disagree, 4=disagree, 5=strongly disagree

Statements 1 If you eat 'good' and 'bad' food in moderation, it won't harm you. 2 Not eating much can only be good for you. 3 As you grow older you don't need as much food. 4 Too many fruits and vegetables can be bad for you. 5 You are responsible for your own diet. 6 People need to be informed about healthy diet. 7 Advice on nutrition is a waste of time. 8 Lot of ill health among people is their own fault. 9 People care more about taste than what is good for them. 10 Health is related to what you eat. 11 Some diseases are related to what you eat. 12 Being heavy/ overweight is bad for you. 13 People should be shown ways of cooking traditional meals in a healthy way.

3.5.10 Factors influencing food choice

On a scale of one to five (1 being most important and 5 being least important), the respondents were asked to rank factors such as taste, price, appearance, shelf life, packaging, portion size, brand name etc. Mean scores were calculated and the factors were ranked.

Taste was the most important factor influencing food choice across the board, however its importance as a determinant of food choice was higher on the scale for women than for men. Making a healthy choice was very important for younger elderly men and women who ranked it the second most important factor influencing their food choice. This was not observed to be the case for older elderly men and women, however between older elderly men and women, making a healthy choice was relatively more important for women.

Appearance of food was the second most important factor determining food choice for older elderly women and third most important factor for younger elderly women. For men (both age bands) familiarity was more important than the appearance of food. Familiarity however was a more important determinant of food choice for older elderly women than older elderly men and than younger elderly men and women. Price was seen to be a lesser determinant of food choice and between groups it was least important for older elderly men followed by older elderly women. In comparison, younger elderly men and women considered price to be more important factor determining food choice.

Shelf life was more important for younger than older elderly women. Similarly it was more important to younger than older elderly men. Brand name was more important for younger elderly men and women as compared to older elderly men and women. Advertisement was the least important factor determining food choice for all respondents and older elderly women were least influenced by it.

Table 3.5.33 Ranked factors influencing food choice by sex and age of the survey sample
(1= Most important; 5= Least important)

Scale	Men 65-74 y (n=24)	Men 75 y &+ (n=15)	Women 65-74y (n=20)	Women 75y & + (n=21)
1				
1.09				Taste
1.15			Taste	
1.2			Healthy choice	
1.36	Taste			
1.4				
1.43				Appearance
1.5			Appearance	
1.6		Taste		
1.71				Familiar
1.72	Healthy Choice			
1.73		Familiar		
1.8				
1.82	Familiar			
1.86	Appearance			Portion size
1.93		Appearance & portion size		
2				
2.05			Portion size	
2.15			Familiar	
2.18	Portion size			
2.2				
2.22	Price			
2.25			Price	
2.29				Healthy Choice
2.4			Brand name	
2.45	Brand name			
2.5			Shelf life	
2.57				Price
2.67				Shelf life
2.8		Brand name		
2.85	Shelf life			
2.86			Packaging	Packaging
2.93		Price		
2.95				Brand name
3	Packaging			
3.06		Healthy Choice/ shelf life/packaging		
4.2			Advertisement	
4.23	Advertisement			
4.4		Advertisement		
4.47				Advertisement
5				

CHAPTER 4

Discussion

Using qualitative and quantitative tools the main objectives of the study were to investigate factors affecting food choice and to assess nutritional status of elderly people living freely on Merseyside. The findings on food choice were used as a guide to factors that might have been responsible for the current nutritional status of the respondents. Information from in-depth interviews and the FCQ was used to uncover some of the factors influencing the food choice of the survey sample and these factors were then used, where possible, to explain the findings on nutritional status.

4.1 Characteristics of the respondents

The study was designed as a cross-sectional study and the survey sample of 80 (39 men and 41 women) free-living elderly people was recruited at random from the Family Practice Register. The mean age was 73.9 years for men and 74.7 years for women. Based on their age, the respondents were classified as younger elderly (aged 65-74 years) and older elderly (aged 75 years and over). Although the survey sample was fairly evenly distributed for age and sex, fewer older elderly (36) than younger elderly (41) respondents were recruited. This was however expected, as in the elderly population of the UK there are fewer people in the older age groups. Although The Office of National Statistics (2000) recorded 0.5 million younger elderly people and 0.47 million older elderly people in the Northwest, older elderly women outnumber younger elderly women in the Northwest. This could explain why greater number of older elderly (21) than younger elderly women (20) were recruited for the present study. In the older elderly group, more women (21) than men (15) were recruited. This was also as expected because there are fewer men than women in this age category, as despite the fact that although throughout the century more men than women were born, from birth onwards, male mortality exceeds female mortality (Jefferys and Thane, 1989). In the Northwest of England the number of older elderly women is nearly double that of older elderly men (Office of National Statistics, 2000).

The survey sample also had more elderly people who were married than those who were single. Higher response was also reported from elderly people living with a spouse or others than those living on their own by the National Diet and Nutrition Survey (NDNS) (Finch *et al.*, 1998). There were also more widows than widowers in the survey sample and this could be due to the fact that women live longer than men (Office of National Statistics, 1996) and men generally marry women who are younger than them. The majority of the respondents had regular social contacts with children, relatives and friends. This finding supports the theory that people who take part in surveys related to diet and health, are generally socially active and health conscious (Swanson and Ward, 1995; Tennstedt *et al*, 1992; Koval *et al*, 1992).

Most of the respondents lived in their own homes or homes rented privately or from the council. This was important, as the aim of the survey was to study dietary behaviour and nutritional status of elderly people who were living independently and eating self selected diets. All of the respondents were literate, thus tests used to assess nutritional knowledge and understanding were reflective of these and were not confounded by differences in ability to read. The literacy of the subjects was important, as they were required to maintain written dietary records. The literacy rates of subjects recruited for the NDNS were also very high. Although level of education can have a bearing on dietary intake (Davies, 1990), the respondents found it difficult to relate to currently used terms such as primary and secondary education. Similar to the NDNS more men were recruited from non-manual social class than women. The NDNS also reported a preponderance of elderly people recruited from manual social class from the Northwest of England as compared to London and the Southeast where more elderly subjects came from non-manual social class. The majority of respondents had income levels below £10,000 per annum and men were more likely than women to have annual income of over £10,000.

The number of elderly people recruited was less than planned initially, but the subjects who were recruited completed all aspects of the study and there were no dropouts. Comparison with response rates reported by other research projects involving the elderly was however found to be difficult due to differences in criteria for inclusion, aims and objectives, and time and resources available. The response rate was disappointingly low, but it could not however be compared to that reported by the NDNS as they did not report an overall response rate, although they reported response rates for individual aspects of their survey.

The NDNS did report that response rate was better for elderly people living in the South than those living in the North of England.

Kelsey *et al.* (1989) reported that due to general suspicion of studies and concerns about talking to strangers, a letter of introduction might increase the response rate in studies involving the elderly. Although the letter of introduction did not improve response rate, it however promoted understanding of the nature of the study such that among those recruited, participation and completion rates were 100%. Elderly people are also known to be generally very cautious of answering questions on confidential issues regarding diet and health and thus the perceived authority of the body requesting information on such issues can also influence response rate. One of the criteria set out by the ethics committees of the local health authorities and the ethics committee of John Moores University was that the letter of first contact should clearly define that the project was part of a student's higher degree. This might have reduced the perceived authority of the researcher and the importance of findings of the survey in the eyes of the respondents resulting in lower response rate than initially anticipated.

As observed by Herzog *et al.* (1983) the reasons given by the elderly people for not wanting to participate in the survey were less likely to be outright refusals. The primary reasons for non-participation were personal ill health or ill health of spouse. A large number of elderly people also wrote back to say that they enjoyed perfect health and ate very well, hence taking part in the survey would be a waste of time and resources. This highlights a positive perception of diet and health among the elderly also reported by Whichelow (1993).

In contrast to the suggestion by Herzog *et al.* (1983) and Kelsey *et al.* (1989), returning to an elderly persons house on another occasion did not reduce the number of non-responders. Every non-responder was paid a visit. It was found that most of the people who did not respond to the letter of first contact were either not available or refused at the doorstep. If the reason for refusal was ill health or inconvenience, the suggestion of a visit on another occasion was usually seen as a nuisance. However although fewer people than planned were recruited, the survey sample was fairly well balanced in terms of age, sex, level of literacy and income.

4.2 Factors influencing food choice of elderly people on Merseyside

In the present study 78% men and 81% women reported that they suffered from one or more chronic disease. These findings were similar to those reported by SENECA (73%) (de-Groot, 1991). It was also observed that younger elderly respondents were more likely to report that they suffered from more than one chronic condition than older elderly respondents. This finding could be reflective of the fact that people who survive to live to be over 75 years of age would generally be healthier than those who do not live to that age. On the other hand people aged 65-74 years of age reporting to be suffering from more diseases might not be the ones to survive. It is also possible that older elderly people suffering from ill health would not have taken part in the survey. Self-rated health is an important predictor of mortality and positive perception of self-health is associated with increased longevity (Bath, 1999). Perception of health is also a predictor of long-term use of health services and people with a positive perception of health are less likely to rely on health services (Bath, 1999). A vast majority of respondents had a positive perception of their health and the fact that a majority of them reported to suffer from chronic diseases, highlights the fact that as people grow older they expect to have health related problems and accept this as normal. It is also indeed true that it is possible to have a disease and take medication for it, without feeling ill. It is not possible to decipher which factors operate at what level. For the survey sample the importance of positive health and good health during old age for the survey sample was also evident from the finding that health, along with companionship emerged as one of the most important determinants of quality of life. For women health was the most important factor affecting quality of life and for men it was companionship. This perhaps could mean that as more women were widowed and living alone, the importance of being healthy may be synonymous with being self reliant and independent. However as men were more likely to be living with a spouse, losing their partner could be more important to them. Positive perception of self-health may also mean that people, who perceive their health to be positive, may also feel that they do not need to make positive dietary and other lifestyle changes to improve health. This was indeed true for men of the survey sample. Although both men and women had a positive perception of health, men were more likely to say that they did not need, or want, to do anything to improve their present health. Women on the other hand were more likely to want to make

lifestyle changes to improve present health. Only 29% of the women as compared to 54% of men felt that they did not need to do anything to improve their health. A third of the women as opposed to a quarter of men expressed a desire to be more physically active and a third of the women as compared to 8% of the men said that they could improve their present health by losing weight. Losing weight *per se* or increasing physical activity levels to lose weight in order to feel healthier was thus more important for women than men. These findings highlight the fact that women as compared to men were more weight conscious or were more likely to associate being overweight and having a sedentary lifestyle with poor health. These findings also explain why elderly women as compared to elderly men were more likely to make lifestyle changes to improve health.

The majority of the survey sample (57%) considered themselves to be fitter than other persons of similar age. Unlike the findings of SENECA (de Groot *et al.*, 1991) women were more likely to consider themselves to be more fit and active than another person of a similar age. This might be because greater awareness of issues related with health and willingness to incorporate changes to improve health gave women of the survey sample a positive attitude about their present health. 'When 50% or more persons in a population consider their health to be better than that of another person of a similar age, it can usually be put down to unrealistic attitudes towards health of that population' (de Groot *et al.*, 1991). The finding that the majority of men and women felt healthier than their peers indicates presence of a certain degree of 'ageism', which may indeed be due to negative stereotypes associated with health during old age. However when people reach 'old age' they feel healthier than the stereotypical 'unfit and inactive elderly' would feel. Another reason for this finding could be that people who volunteer for studies related with diet and health are often described as being more 'healthy' or 'health conscious' than people who do not. However due to ethical issues it was not possible to build a non-responders' profile.

Cooking ability and cooking facilities can have a huge bearing on what a person eats. Most respondents cooked their own meals and although 44% of the men relied entirely on their wives to cook for them, none of them actually said that they could not cook at all. The finding that 53% of older elderly men could cook was contrary to the findings of the OPCS omnibus study (Nicolaas, 1995) reporting that men aged 75 years and over were the ones most likely to say that they never cooked a meal and least likely to want to learn. Although the FCQ revealed that all men and women, regardless of age reported that they could cook,

the level of their cooking skills could not be established. It may well be that the respondents had very basic cooking skills or made such claims to establish their independence and ability to look after themselves. It was however clearer from the in-depth interviews that men were more likely to say that they mostly relied on other people to cook for them.

"I don't cook, I don't have to... my fish monger cooks my chicken and vegetables everyday. The only time I cook is when I do chips or baked potato. When you get to my age you get used to things and I am happy with what I have". (M: 81y)

There were other indicators of an age and sex related influence on cooking practices. The FCQ revealed that a majority of respondents consumed ready meals. More women (63%) than men (54%) consumed ready meals on a regular basis. This difference could be due to marital status of the respondents as men of the survey sample were more likely to be married and women were more likely to be living alone. Single respondents were more likely to consume ready meals on a regular basis. Although married respondents were less likely to consume ready meals their cooking practices had changed with the changing family structure. The consumption of ready meals was also age dependent and older elderly respondents were more likely to eat ready meals than younger elderly people. From the in-depth interviews it seemed that this difference could be due to the ease of cooking of ready meals.

When my husband was alive I cooked dinner everyday and of course for my two children. Now I just enjoy not doing it (laughs), I'd rather have some one give me a pill or a ready meal". (F: 83y)

In-depth interviews also revealed that cooking practices of married elderly women changed with changing family structure.

"I would say my cooking habits have changed a lot, I don't cook as much as I used to. Cooking was very satisfying, I was the centre of the family and cooking was a joy, I also used to do big roasts... now because of Jack's attitude to food.... he doesn't want large roasts anymore...(F: 67y) (husband interrupts) "I won't say that, I enjoyed my roast but I know you don't much care for it or the cooking..."(laughs) (M: 74y) "Well it did take a disproportionate amount of time, this arrangement suits me". (F: 67y)

The findings on the consumption of ready meals among the respondents differ from the data of the National Food Survey (NFS) on use of convenience foods (MAFF, 1997). The NFS showed that expenditure on convenience foods was low for households where the main

diary keeper (person mainly responsible for food and provision of meals) was over 75 years of age. As most of the elderly people in this study reported that they shopped in supermarkets, availability and variety of ready meals may have led these elderly people to adopt them for their quickness and ease. The fact that many traditional meals are now available as ready meals may also be responsible for their growing popularity among the respondents. The difference between the findings of the current study and the National Food Survey could be due to difference in definition of 'ready meals' and 'convenience foods'. The National Food Survey classified all canned and frozen food as convenience foods. For the present survey the term 'ready meal' was defined as a meal in a packet and frozen foods such as oven bake products were also included. Another reason could be that the expenditure of an elderly person on convenience food may be low due to small amounts of such food bought as compared to amount of food bought and money spent in a household where the main diary keeper is a young adult.

The evidence regarding cooking abilities of the respondents was conflicting. The respondents were cooking their meals, as they did not favour eating out, none of them relied on luncheon clubs for their meals and only one woman relied on meals-on-wheels. The NFS (MAFF, 1997) also reported that pensioner households spent a great deal less than any other group on eating outside the home. To test a person's cooking ability is a major challenge and being a good, bad or average cook is very subjective. The relationship between being able to cook and consuming an adequate diet is even more complicated. The diet of the survey sample fell short of providing them with adequate amounts of energy and a number of micronutrients. Thus the finding that a certain group of people can cook and have all the facilities to cook a meal does not translate itself to mean that they are consuming an adequate diet. Respondents however had well equipped kitchens to aid them and perhaps make cooking more enjoyable. All men and women of the survey sample had a cooker (hob), fridge, freezer (89% small freezer compartment) and electric kettle. A vast majority of respondents also had a microwave oven.

What a person cooks or eats is also intimately related to what barriers he or she faces to get the food. It was observed that a vast majority of the survey sample did their own shopping and some gender differences were observed in their shopping habits. Younger elderly women followed by older elderly men were most likely to do their own shopping. Older elderly women and younger elderly men were more likely to rely on other people to do their

shopping. Men (younger or older) who did not do their shopping relied on the person/persons shopping for them to also make choices for them. Women made decisions about what food items were to be bought, whether they shopped for themselves, shopped for themselves and their partner or whether they had someone else do the shopping. These findings suggest that elderly men living in the community eating a seemingly self-selected diet may have more complicated food choice issues than women. These findings also highlight that even if a large proportion of elderly men report that they are capable of cooking, it does not always translate that they have control over what they eat.

Frequency of shopping for food may be dependent on a number of factors including storage facilities, transport, distance from the shops, and desire or pleasure associated with shopping. Similar to the findings of the NDNS, a large proportion of the survey sample shopped for food 2-3 times a week. There were age and gender related differences as younger elderly men and women were more likely to shop once a week and older elderly men and women were more likely to shop for food up to 4 times a week. Different factors were explored to understand this observation. Having a car could explain the finding of shopping once a week, as it would make access to the shops and transportation of heavy shopping bags from the shops easier. It was observed however that this could not have been the sole explanation for the differences between shopping frequencies, as there were no major differences in car ownership between older and younger elderly men. The majority of both younger elderly men and older elderly men also had their own cars, but unlike the younger elderly men who shopped once a week, older elderly men were more likely to shop 2-3 times a week. It was also observed that a greater proportion of older elderly men (67%) enjoyed shopping for food than younger elderly men (33%). Thus having a car might have made getting to the shops as often as desired easy and at the same time providing an opportunity to go out. Different factors might have been operating behind the observation that older elderly women were more likely to shop for food up to four times a week. This observation seems peculiar as women of this age group were least likely to have access to a car, most likely to use public transport and most likely to report to having difficulty carrying the shopping. But for these same reasons older elderly women might have ended up shopping little and more often. Of all age groups, older elderly women were also most likely to report to be suffering from arthritis, hence carrying heavy shopping bags may have been

particularly difficult for them. Shopping little and often among the older elderly may also have been due to limited freezer space.

The men and women of the survey sample were quite happy to shop at their local supermarket, and the most commonly cited reason for shopping at the chosen supermarket was convenience of proximity. The most commonly faced problem by the respondents was carrying heavy shopping bags. Unlike the findings of Bilderbeck *et al.* (1981), none of the men and women of the survey sample saw price as a problem when shopping at their chosen supermarket. The in-depth interviews also revealed that the respondents were not too worried about food prices and it seems that convenience may have been more important than price.

> *"Basic foods are not expensive but I buy ready made foods, they are dearer but are convenient". (M: 84y)*

Following the observation that most elderly people enjoyed shopping for food and faced no major difficulties while shopping for food, it was not surprising to find that a vast majority (84%) of the men and women were opposed to the idea of home delivery for food even at reasonable cost. This was because most of them saw shopping for food as a reason to be out and about. Nearly half of the men and over a third of the women had fresh milk delivered at their doorstep. Thus it seems that the survey sample saw milk as a necessity and in spite of most supermarkets offering home delivery service, preferred to go out and get the rest of their food shopping.

What people eat and how they regard changing an aspect of their diet also depends on how they view their current diet. The Health and Lifestyle Survey explored British people's beliefs regarding their current diet (Whichelow, 1993). Whichelow reported that optimism about quality of diet increases markedly with age and majority of people aged over 66 years consider their diet to be 'very healthy'. She also observed that the oldest elderly had the highest positive perception of their diet. One of the implications of this finding is that if the perception of current diet is very positive, according to the person whose diet it is, there can be very little room for improvement. For the survey sample, 20% of the women and only 10% of the men said that they wanted to change an aspect of their diet to make it healthier. Thus positive perception of diet was present and was found to be stronger among the men in the survey sample. However when asked if they would include or exclude a food in their diet if it was good or bad for their health, more respondents were willing to include rather

than to exclude food from their diet. The differences in attitudes towards including and excluding food might be due to the fact that including food may be seen as an opportunity to add to improve. To exclude something, however might amount to acceptance on the part of the elderly that their diet contained something that was not good for health. Younger elderly people were more likely to include or exclude food from their diet for health. This could be due to the 'survivor factor' whereby an older elderly person may feel that as he or she has lived this long, he or she must have done the right thing. Hence older elderly people may be less likely to introduce changes in their diet than younger elderly. This attitude of having done the right thing to reach old age was also observed from the in-depth interviews, when respondents were asked about their views on dietary guidelines.

"We are not aware of any such guidelines, but what can the Government do? Lot of ill health is peoples' own fault, they would spend money on cigarettes and alcohol and bingo. People make the wrong choices and then they complain and say we don't have money to buy expensive food. To eat well is your own responsibility". (M: 78y)

McKay and Bolton-Smith (1995) reported in their study of Scottish elderly that older people were most likely to introduce a positive dietary change if advised by their doctor. This was not observed to be true in the present study. Although a minority of the survey sample did say that making a change would depend on who suggested it, the majority said that it would depend on the food in question. This finding perhaps introduces the important role of taste and familiarity of food for the elderly.

Hypothetical questions such as the ones discussed above are well known for posing problems of interpretation and it is not possible to know how people would actually behave if these problems did arise. However such questions also provide opportunities to elucidate the best way of introducing a dietary change to improve health. According to the responses of the men and women of the survey sample it can be deduced that they did have a high perception of their diet but they were not completely averse to the idea of introducing new foods to improve health.

The respondents were asked to grade factors that influence their food choice. Taste emerged as the most important factor of food choice. Between groups it was more important for the older elderly than the younger elderly. It was also observed that along with taste the older elderly were also very likely to be influenced by appearance and familiarity of food. Interestingly, this was not seen to be the case for the younger elderly, whose food choice along with being decidedly influenced by taste, was also most likely to

be affected by need for making a healthy choice. For older elderly men, making a healthy choice along with shelf life and packaging was the second least important factor determining food choice. Healthy choice was also less important to older elderly women, however it was more important a factor of food choice than older elderly men. These findings show that although older and younger elderly are greatly influenced by taste, older elderly people might have a more traditional diet and younger elderly might be more flexible to introducing healthy changes in their diet. These findings are largely in agreement with the findings of Bilderbeck and collegues (1981) who reported that the food choice of elderly people was primarily influenced by taste and habit.

However, contrary to findings Bilderbeck *et al.* (1981) who reported price as the third most important factor of food choice, respondents of the present study did not consider price of food as an important factor of food choice. Price was seen to be less important than taste, appearance, familiarity, healthy choice and portion size. The influence of price on food choice of the survey sample was tested several times during the questionnaire. The responses of the survey sample consistently indicated that price was not an important factor influencing food choice. This was interesting because the majority of the survey sample had annual income of less than £10,000. As compared to the older elderly, price of food was however more important to younger elderly respondents. One explanation of this finding may be that the older elderly are more likely to live alone, hence the amount of food bought may be so little that it is not considered to be expensive. The survey sample may indeed have no problems with food price or these finding may be indicative of elderly people being so used to watching the price to get the best deal that it becomes a habit. This finding may also be reflective of the fact that over the past 10 years there has been a marked decline in food prices (9.3%) relative to retail prices in general (MAFF, 1997). The respondents were asked their views on current food prices and if they had ever gone without food due to shortage of money. A vast majority of the survey sample found food prices to be reasonable and said that they had never gone without food due to shortage of money. The minority of respondents who had gone without food due to lack of money had done so when they were young adults and were bringing up families. The in-depth interviews also revealed that elderly people had greater restrictions and needed to budget for food before retirement and they seemed to have more money to spend on food since their children moved out.

"Price of food... well I can't complain, I used to budget for food, all family members used to have half an apple each and saved for everything, I used to compare prices and all that, but not now. I don't need much and there is only me... being a pensioner has its perks, especially in Liverpool, everything is free especially public transport, but everybody wants more. People say I can't have this or that, but I say they mismanage their money". (F: 83y)

It was also observed that the respondents were more likely to shop in discounted food shops such as Kwik Save and Iceland. The survey sample might have also found price of food reasonable and not a barrier to food choice because food might compete in their budget with other items such as holidays and clothing, which could be sacrificed. The in-depth interviews also revealed that the respondents did not worry about food prices because they saw themselves as not having many of the expenses younger people have.

"Although I pretty much buy what I like, I don't spend as much money on food as I used to when I had the family with me. I don't go out eating a lot like young people, people my age don't". (F: 68y)

Portion size was considered a fairly important factor determining food choice. This is supportive of the earlier finding that most of the survey sample reported to shop for food 2-3 times a week. Small portions may also be preferred due to small freezer size, to avoid wastage, to lighten the weight of shopping bags and to provide a reason to go out to shop more frequently. The preference for small portion sizes is another indication that the respondents were not too concerned about the prices as most special offers are on bulk buys and multi-packs.

Advertisement was quoted as the least important factor influencing food choice. Little information exists on how advertisement affects an elderly person's food choice. Studies in the past have mainly focused on the influence media has on the food habits of the young. Research on advertisement and food choice of the elderly has mainly been conducted in the USA. Clancy (1975) showed that although elderly people in New York tended to consume more calories while watching television, the attitudes of the respondents to television advertising was far from clear. In their study although 70% of the subjects said that advertisement was a major source of information about new products, only 37% said that they would buy a new product advertised on television. Thus similar to the survey sample the respondents of the American study were also quite resistant to the influence of advertising on purchasing behaviour. However there was a contradiction in the findings

regarding the influence of media on food choice, on one hand the respondents were least likely to be influenced by advertising, but on the other hand television and other media sources were quoted as the most important source of nutritional information. This may be because for the repondents familiarity and traditionalism were more important determinants of food choice than advertising. Thus although older people maybe using media as a source of information, they may not be using it to introduce new foods. This also highlights that despite being largely satisfied with their dietary intake, elderly people are interested to learn about food and nutrition and these findings suggest that the media might have a special role as an effective health education medium for the elderly. Another implication of the importance of familiarity for elderly people is that with the advances in food technology, if a dietary change needs to be introduced, instead of advising radical dietary changes, a popular food could be used as a vehicle for introducing such change. The FCQ also revealed that the majority of the respondents were in favour of learning to cook traditional meals in a healthier manner. Thus it seems that elderly people want to make dietary changes to improve health, but they do not want to sacrifice taste and are less willing to introduce new foods.

The flexibility of a population to make changes in their diet to improve health can also be assessed by their attitudes towards other health-related behaviours. The majority of the respondents were ex- smokers and had given up smoking for health reasons. These findings on smoking habits were very similar to those reported by the NDNS. These findings further strengthen the observation that respondents had made lifestyle changes to improve health. Cigarette smoking has received much attention and the health risks associated with cigarette smoking are well publicised. This highlights that increasing awareness through easily accessible information can lead to positive changes.

What elderly people know about nutrition and nutrition related guidelines and how they relate these to health could have an important bearing on their nutrient intake. Men and women of the survey sample generally tended to say that although nutritional information was accessible (widely available), nearly a quarter of them felt that this information was difficult to understand. Younger elderly respondents were more likely to say that such information was easy to come by. There were no age or gender related trends in the understanding of such information. Consistent with the findings of Charlton (1997) and Davies *et al.* (1985) the most common source of information on nutrition related topics was

the media (TV, magazines and newspapers). This was followed by information provided by friends and relatives for men and leaflets in the shops for women of the survey sample. Of the respondents who reported that they were aware of nutritional guidelines, only a minority (more men than women) were likely to ignore them completely. More women were aware of guidelines on healthy eating, and were more likely than men to take them on board, there were however no specific age related trends. It was also observed that the respondents were more likely to incorporate into their normal diet, what suited them about a particular recommendation. Thus availability of advice might also mean that it is quite general and elderly people might take on what suits their lifestyle, but how well they incorporate what is advised will ultimately depend on how well they understand it. Although a majority of the respondents were aware of dietary guidelines, only 33% of men and 27% of women found them to be effective (achieving what they were meant to achieve) and this was mainly because the respondents felt that the information was not consistent. The elderly taking part in the in-depth interviews also perceived such guidelines to be ever changing.

"The advice on the matters of food and eating changes everyday anyway. You have to work out what is good for you, not what is good for everyone.... I myself take it with a rather large pinch of salt. Television has a lot to answer for, so much conflict but again people should think for themselves and not just accept what is fed to them". (F: 82y)

Thus although the media was the most popular vehicle for dissemination of information on matters regarding diet and health, it was also quoted as the main reason for the public's confusion over such advice.

Research has shown that beliefs, attitudes and knowledge may not lead to appropriate changes in dietary behaviour (Shepherd, 1987), but they can go some way to explain dietary and health related behaviour. Most of the respondents believed that excessive use of fat and salt could be detrimental to health. Although it was not possible to analyse the diet of the elderly for its salt content, it was found that the diet had desirable levels of total fat. The respondents also believed that margarine had less fat than butter and that semi-skimmed milk did not taste as good as whole milk. Lilley & Johnson (1996) found that in their sample of rural elderly in Nottingham, two thirds consumed semi- skimmed milk and 50% chose it despite taste preference for whole milk. The present study was designed to assess the nutrient intake hence it was not possible to ascertain whether the survey sample did choose to use semi-skimmed milk or margarine over full fat milk and butter. A vast majority of the

respondents believed that meat contained fibre and nearly half of the men and majority of the women believed that fish contained fibre. More men than women believed white bread to be a poor source of fibre. The knowledge test (sources of nutrients) revealed that the highest number of correct responses was given for food sources of fibre. Contrary to the belief that fish and meat contain fibre, these were not cited as sources of fibre in the knowledge test. This could be reflective of the fact that although the respondents believed meat and fish to contain fibre, they may not have regarded them as good sources of fibre. However it was found that the respondents had a lower than desirable intake of fibre. Thus despite having a sound knowledge about dietary sources of fibre, the fibre intake was low, this could be reflective of the fact that dietary knowledge does not always predict behaviour. This finding may also highlight the problems faced by the elderly to increase their fibre intake (Davies *et al.*, 1986).

The major studies of nutritional labelling conducted in the UK (MAFF, 1990; The Associations for Consumer Report, 1990), have revealed that people do read food labels but are confused by the information on labels. Food labels can be an important source of nutritional information, provided that they are free of technical jargon. It was found that a majority of men and women paid attention to nutritional labels. However different people did so for different reasons. One of the major reasons cited by men and women was that they read labels to avoid fat. It was also found that majority of men and women found food labels difficult to understand and this was compounded by the fact that the majority of them found it very difficult to read the print on labels. Knowledge of the survey sample was tested further by giving them a food label. Surprisingly a high percentage of women (17%) did not know the meaning of 'g' and perhaps this had implications beyond nutrition. Technical words seemed to confuse people, and the poorest scores were recorded for RDA and KJ, women performed better than men with regard to the meaning of terms such as saturates, Kcal and energy. It was again observed that the younger elderly had better understanding of nutritional terminology than the older elderly. Although none of the groups achieved a score higher than five out of ten, younger elderly women at five had the highest score for nutritional knowledge and older elderly women had the lowest scores. This confirms the earlier finding that although the respondents held strong views on nutritional issues they found nutritional advice difficult to understand and the older elderly had poorer knowledge about nutrition and related issues than the younger elderly. This

difference between level of nutritional knowledge of older and younger elderly respondents could be because nutritional advice is generally not targeted towards the older elderly. The main reasons for older elderly people being largely excluded from public health campaigns is that older elderly people are seen to be too old and too set in their ways to benefit from or want to introduce dietary changes.

Beliefs held by the respondents on diet, health and disease revealed that elderly people on the whole acknowledged that nutrition had a bearing on health. They linked dietary intake with state of health, they also believed that what people eat could lead to certain diseases and that being over weight is bad for health. The group however also felt that people perhaps care more for taste than what is good for health. This also might imply that generally healthy food is associated with being bland and tasteless. The respondents believed that teaching people to cook traditional meals in a healthier manner was a good way of introducing a change. This finding strengthens the earlier finding that foods that are familiar and referred to as 'favourite' foods might be targeted to introduce the required change. Although the respondents were usually in agreement over most of the statements, gender and age differences were however observed over certain statements. Older elderly believed in 'everything in moderation' as they agreed that if someone eats 'good' and 'bad' food in moderation, they balanced each other out, young elderly did not support this. The older elderly, similar to the younger elderly believed that the ultimate responsibility of a person's diet lies with the person, but unlike the younger elderly, older elderly respondents also believed that most people suffer ill health as a direct consequence of their behaviours. This attitude was also evident from the in-depth interviews.

"I pretty much eat what I used to and as much, people say you don't need as much, you don't eat so much when you grow older that's all cods wallop. It is only because they go and play bingo and spend money otherwise, they don't walk or exercise and they get sick". (M: 81y)

Although the responses were amalgamated to indicate agreement, neutrality and disagreement, the original options given to the respondents to choose from were, strongly agree, agree, neither agree nor disagree, disagree and strongly disagree. This meant that there was also certain grading according to the strength of the response. Strongest disagreement was evoked by the statement that advice on nutrition was a waste of time, indicating that the survey sample believed strongly that nutritional advice was valuable.

How much of that advice they took on, from earlier findings seems to depend on how much they understood and how far removed it was from their usual diet. Strongest agreement was shared between the belief that being overweight was bad for health and what people eat is related to health and disease. This is a very important association as most of the studies have commented that one of the reasons that elderly people do not make appropriate dietary changes is that they do not associate dietary intake with health status. (Griffiths *et al.*, 1994; McKay and Bolton-Smith, 1995).

The findings of the survey did show that for the older elderly taste and familiarity were more important than healthy choice but they were not opposed to receiving nutritional advice. Similar to younger elderly respondents, they acknowledged the link between diet, health and disease; in addition they also displayed an 'internal locus of control'. The internal locus of control emerged from the FCQ and the in-depth interviews, which showed that older elderly were more likely to believe that the control over state of health lies with the person and ill health is largely brought on by engaging in ill-advised behaviour.

It was also apparent that men had poorer nutritional knowledge than women and were less likely to introduce positive dietary changes. This finding could be reflective of the fact that men did not feel the need to improve nutritional knowledge as women emerged as the main decision-makers and it may well be that positive dietary changes had been introduced into the diets of male respondents without them being aware.

4.3 Factors influencing nutritional status of elderly people on Merseyside

4.3.1 Energy intake

The mean reported dietary energy intake was 7.3 MJ for men and 6.1 MJ for women. This finding is supportive of results of major dietary surveys and other cross-sectional studies of the elderly (Finch *et al.*, 1998; de Groot *et al.*, 1991; Wright *et al.*, 1995) that have shown that men report to consume more dietary energy than women. At these levels the energy intake of both men and women fell well below the EAR set for elderly people (DoH, 1992). The energy intakes for women were similar to those reported by women (5.98 MJ) for the NDNS and lower for men as compared to those reported by men (8.02 MJ) for the NDNS. Similar to the findings of NDNS, the reported daily energy intakes were significantly lower ($p<0.001$) than those reported by DHSS in 1972. These findings highlight a trend towards

declining energy intakes that have also been observed for energy intakes of pre-school children (DHSS, 1975; Gregory *et al.*, 1995) over the past 25-30 years. It seems that a fall in reported dietary energy intake over the past 3 decades has been accompanied by an increase in life expectancy. Animal studies show that restriction of dietary energy leads to a reduction in mortality and morbidity (Harrison *et al.*, 1984). It is difficult to ascertain whether the increase in life expectancy can be attributed, wholly or partially, to the recorded fall in reported dietary energy. This is because dietary studies inevitably rely on energy intakes reported by people. Due to many known influences such as sex, age, BMI, level of education, reported energy intake does not always reflect habitual intake. If however the reported energy intake is reflective of actual intake, the applicability of the findings of animal studies carried out on rats in controlled environment to humans remains questionable. This is mainly due to the fact that in humans the increase in life expectancy has not been accompanied by a concomitant reduction in morbidity reported by studies on animals.

The estimated average requirements for energy ideally takes into account the healthy range for body weight, provision of essential nutrients as well as level of physical activity associated with long term health. Low reported energy intake could be due to a number of reasons (Schoeller, 1990; Goldberg *et al.*, 1991; Litchman *et al.*, 1992; Price *et al.*, 1997, Garrow, 1995, Voss *et al.*, 1998; Macdiarmid & Blundell, 1998). The energy intakes although low, may be real and reflect habitual diet, the respondents may have had low intakes during the recording period and lastly low reported energy intakes could have been due to conscious or unconscious under-reporting. Although it is possible to ascertain the number of people reporting low intakes, it is not possible to know which factors operate at what level. The problems related with the energy intakes of the elderly and their adequacy to maintain health are compounded by problems associated with setting the recommendations for energy intakes for this group. Due to fall in BMR and physical activity with age, the energy requirements of elderly people may be less than those of younger people (Dupont *et al.*, 1996). The problems faced by the COMA panel to set reference values for energy requirements of the elderly were largely due to difference in activity levels, some elderly people might be so inactive that an average intake of 1.2X BMR would be sufficient to maintain weight. However we cannot assume that all elderly people are inactive. Moreover setting the energy requirements at 1.2X BMR is associated with

increased risk of diet being inadequate to provide vital nutrients needed to maintain health. For this reason the COMA panel (DoH, 1992) set the requirements for energy intake at 1.5X BMR. These values are also used as cut off points to ascertain the level of dietary misreporting in nutritional studies. For studies involving the elderly, the applicability of these cut off points is questionable if information regarding physical activity levels is lacking. Determining accurate physical activity levels of a population relies on suitable measurement tool. Voorrips *et al.* (1991) showed that a questionnaire could provide a reliable and valid method to classify elderly subjects into categories of high, medium and low physical activity. Sims *et al.* (1999) on the other hand reported that elderly people tend to overestimate their physical activity levels and proposed ambulatory heart monitoring as a useful adjunct to a physical activity questionnaire. In the present study, due to length of the FCQ and time spent with each subject there was no scope for an in-depth estimation of physical activity levels. The brief information collected to assess physical activity levels was insufficient to give an accurate level of physical activity levels of the subjects and was hence disregarded.

In order to assess level of dietary under-reporting cut off points were applied and it was found that 56% of women and 63% of men had EI: BMR values less than 1.2. These findings were comparable to 59% women but higher than men (41%) reporting for the NDNS who had EI: BMR values less than 1.2. Dietary under-reporting was found to be sex and age dependent. Similar to the findings of the main survey the findings of the pilot study revealed that men of the pilot sample were more likely to under-report (EI/BMR=1.1) as compared to women (EI/BMR=1.4). These findings were different from the findings of the NDNS and other studies that report that women are more likely to under-report than men (Finch et al, 1998; de Vries *et al.*, 1994; Hallfrisch *et al.*, 1982). This could be due to the fact that most of the men taking part in the survey were married or lived with someone. Having being cared for by a partner for a long period of time, they could have found it more difficult to correctly record matters regarding food and cooking methods. Level of under-reporting was also age dependent, older elderly men (40%) and women (52%) were less likely to under-report dietary energy intake as compared to younger elderly men (78%) and women (60%). The higher incidence of under-reporting was accompanied by the finding that older elderly men and women had higher reported intakes of dietary energy than younger elderly men and women. More accurate dietary reporting among older elderly men

and women could be due to the fact that older elderly respondents may have had more time to spend on completing their diet diaries. It could also be that due to the fact that having survived to live that long, older elderly respondents were quite proud of their diet and hence were less likely to change their diet or under-report. Whether the reported energy intake was low due to low intakes or due to under-reporting, these findings highlight that elderly people may have been influenced by present day ethos of the increased importance body image and stigma attached with being overweight. Although the statement 'being overweight or heavy is bad for you' evoked one of the strongest agreements from all the subjects, it was also found that younger elderly had greater awareness of issues associated with diet and health. Thus the younger elderly may have been more concerned about body image and slimness than older elderly. If dietary under-reporting was attributable to problems related with body image, older elderly men and women seemed less influenced by it and this could be due to lower levels of awareness of such issues or a greater pride in their health. Low reported intake of dietary energy was also accompanied by the belief that requirements for food decrease with advancing age. The majority of the respondents also reported in the food choice questionnaire that the amount of food they ate had reduced with age. Although the reason for this was not explored, however, during the in-depth interviews when asked to comment on the adequacy of their diet the answers of the respondents were suggestive that this reduction could in part be due to the belief that dietary requirements reduce with age due to fall in physical activity.

"Yes, I think I am eating properly... I don't do much so I don't need much". (F: 81y)

This reduction was probably not due to sensory changes as a majority of men and women of the survey sample reported in the FCQ that they had not observed any changes in their sensory perception over the years. This finding could however highlight the fact that changes in sensory perception related to ageing develop gradually, hence may not have been appreciated by the respondents.

The implications of these findings are that elderly people could be consuming diets that are low in energy and hence may be at risk of micronutrient deficiencies. The finding that the diets fell short for a number of micronutrients complemented these findings. The EI: BMR ratios calculated for the survey sample did imply dietary under-reporting, but this is not

unusual being similar to that reported by other studies (Finch *et al.*, 1998; Mertz *et al.*, 1991).

4.3.2 Macronutrient intake

Bearing in mind the likely errors associated with dietary assessment methods (Bingham & Nelson, 1991; Bingham, 1987) the macronutrient intake of the survey sample was largely adequate in comparison with the current recommendations.

The mean fat intake was 67g and 53g, providing 34.3% and 34.5% of total energy for men and women respectively. The dietary survey of British elderly carried out in 1967/68 (DoH, 1972) reported 42.1% and 43.5% of energy from fat for men and women respectively. This sample was followed up in 1972/73 (DoH, 1979) and 40.7% and 42.7% of dietary energy was recorded to be contributed by total fat for men and women respectively. The National Diet Survey (Gregory *et al.*, 1991) recorded 37.6% and 39.5% of dietary energy for men and women (50-64 years) respectively. The NDNS recorded 35.7% and 36.1% of energy from fat for elderly men and women. The findings are thus consistent with a trend towards a fall in total energy from total fat recorded over past 30 years.

The reported total fat intake as a percentage of dietary energy was within desirable levels according to the recommended 35% by the Department of health (DoH, 1991). The in-depth interviews showed that majority of subjects were aware of importance of levels of total fat in their diet.

> *"I am very aware of the fat in my food.... you can do so much by cooking the food the right way. We only buy chips once a month which I cook myself in oil. I don't buy fatty meat, I get all the extra fat trimmed off... only lean beef always. I cook meat on a trivet and the extra fat is drained off and potatoes are only brushed with oil". (F: 69y)*

The desirable levels of total fat intake of the survey sample could be due the fact that reduction in total fat intake has been the main focus of most public health campaigns and high intakes have been linked with major illnesses such as heart disease and cancer. From the findings it is apparent that the elderly reporting for this study had successfully achieved a desirable amount of total fat in their diet. There were many other indications that this reported reduction in total fat intake was indeed due to successful assimilation of advice on the benefits of a reduction of dietary fat. Ninety-seven percent of the men and 100% of the women believed that too much fat in the diet was bad for health. Eight percent of men and 5% of women reported in the FCQ that they would like to reduce the amount of fat in their

diet. The finding that more men than women wanted to reduce fat in their diet but the women had achieved lower intakes of total dietary fat could be due to greater nutritional knowledge, willingness and the ability to incorporate dietary change among women than men. It was also reported that 15% men and 17% women read food labels in order to avoid eating products that are high in fat. The importance of reduction in dietary fat was also revealed when 20% of men and 19% of women reported that, as they had grown older, they had started to avoid dietary fat. The interviews also revealed that a majority of the respondents named high fat foods as 'bad' foods.

"Fruits and vegetables are good food and fatty food is bad". (F: 82y)

The respondents may also have been influenced by the importance of fat as a cause of major illness and the low fat intakes could be due to that fact that 20% of the men and 24% of the women reported to suffer from coronary artery disease. The in-depth interviews also highlighted the perceived importance of reduction of dietary fat in prevention of such diseases.

"I must say I have a weakness for butter but now I am becoming aware of fat in butter because one or two friends of mine have cholesterol problems". (F: 83y)

The above statement also highlights that the reduction in total fat was achieved despite a preference for taste for high fat foods, this indeed became apparent when majority of subjects reported in the FCQ that they preferred the taste of full fat milk to semi-skimmed milk. Lilley and Johnson (1996) also reported their study of elderly people living in rural Nottinghamshire that the subjects had made dietary changes to incorporate reduced fat milks and spreads in their diet despite their taste preferences for full fat milk and butter.
Although it would seem that elderly people have been successful in reducing their total fat intake, this was not seen to be the case for saturated fat intake. Similar to the findings of NDNS, saturated fats accounted for more than 13% of the dietary energy for men and women of the survey sample. An increase or decrease in the contribution of saturated fatty acids in the diet precedes similar patterns of increase or decrease of plasma total cholesterol and low-density lipoproteins (DoH, 1994). Due to age related changes in blood lipids, previous studies looking at the association between age, plasma cholesterol levels and

incidence of coronary heart disease have concluded that elderly people would be unlikely to benefit from reduction in cholesterol levels (Gofman *et al.*, 1966). This attitude has led to exclusion of elderly people from advice on importance of type of dietary fat consumed. This attitude is changing as British (Shipley *et al.*, 1991) and American researchers (Gordon and Rifkind 1989) have shown the benefits of lowering plasma cholesterol on the heart health of older people up to the age of 70 years and beyond. The findings of successful reduction in total fat intake and not saturated fat intake highlight the fact that elderly people perhaps have not assimilated the advice to reduce saturated fats due fact that until recently such advice has not been targeted towards the elderly people. The lack of knowledge about saturated fat became apparent from the FCQ, only 38% of the men could correctly name one good or two average sources of saturated fatty acids. Women had better knowledge and 56% of the women could correctly name its sources. It was also found that only 10% men and 22% women knew what saturated fat meant. The in-depth interviews also supported that elderly people did not have clear idea about different types of dietary fats.

"I tend to buy less fat...I buy Flora and butter and mix the two." (F: 69y)

Although elderly men had higher intakes for total fat, saturated fat and monounsaturated fat (MUFA) and polyunsaturated fatty acids (PUFA), the difference was only significant for MUFA. It was also found that compared with older elderly women, older elderly men had significantly higher intakes of total fat, saturated fat and MUFA. In the absence of food sources of nutrients, it is difficult to explain the finding of significantly higher intakes of MUFA. Older elderly men were more likely to be living with partner or family and significantly higher intakes of MUFA could be due to a more traditional diet of meat and two vegetables.

"Traditional food is good for you. I hate trying new things, I like good wholesome British food. I will never try continental food, my grandson is a chef but I never say I'll try pasta, I don't like all these modern spices and sauces". (M: 77y)

The FCQ and in-depth interviews revealed that compared to men, women in general were more likely to say that they avoided meat than men, however there were no age related trends.

"I eat a lot less and much less meat. I don't think there is a lot of goodness in meat. I do eat it when I go out but I think I am leaning towards vegetarianism". (F: 83y)

Although the lower intakes of saturated fat in women could to some extent be due to better level of nutritional knowledge, more awareness and greater willingness to change, significantly higher intakes of saturates among older elderly men as compared to older elderly women more difficult to understand. This was mainly because when older men and older women were compared, older men had better level of nutritional knowledge. On one hand this finding highlights the complex interaction between knowledge and behaviour. On the other hand despite greater knowledge, traditionalism and resistance to change might have been stronger in older elderly men than women. Older elderly women were also more likely to be widows and the death of husband may have led to changes in dietary intake due to increased awareness of a link between diet and disease.

The importance of an increase in dietary n-3 PUFA is also emerging as cardio protective because of its role in reducing plasma triglycerides and blood pressure, both of which are risk factors for coronary artery disease. It is also known that plasma triglycerides and blood pressure increase with age. Due to confounding affect of age on these risk factors and lack of research on benefits of increasing the intake of n-3 PUFA, the COMA panel (DoH, 1992) found insufficient grounds to recommend dietary manipulation to lower plasma triglycerides in elderly people.

Protein intake of men of the survey sample was significantly higher than that of the women. The average protein intake recorded in the 1986/87 surveys of British adults (Gregory *et al.*, 1991) indicated that there is a trend towards increasing protein intake with age. Studies on protein intake and of body protein show that in the elderly population, protein is not an at risk nutrient (Horwarth, 1989). It has been postulated that healthy elderly people living at home and consuming self-selected diets are in metabolic equilibrium for protein on a mean daily intake of 69 grams for men and 60 grams for women. The level of protein in the diet was (71.5g) 134% of RNI for men and (62.1g) 133% of RNI for women. The findings of the survey thus show that the diet of the respondents provided adequate amounts of protein and the intakes of dietary protein were very similar to those reported by the NDNS.

The survey sample did not achieve the recommended 50% of total dietary energy from carbohydrates and fell short by approximately 5%. The NDNS and other large surveys reported similar findings (Finch *et al.*, 1998; Wright *et al.*, 1995). As expected starches

provided approximately half of the total carbohydrates but the diet was high in sugars and low in NSP. High intake of sugars has been recognised as one of the problems associated with dietary intake of elderly people (DoH, 1992). The intake of total sugars was high at 21.2% of energy for men and 22.3% energy for women. This may have implications on the dental health of the elderly and may also cause abnormal metabolic responses (DoH, 1989). Although the diets of the survey sample did not achieve 50% recommended energy from carbohydrates, the dietary contribution to energy from total fat was at desirable levels. The high levels of sugars and desirable levels of dietary fat seem to conform to a phenomenon referred to as the 'see-saw' effects which has been in the past recognised in children (Rugg-Gunn *et al.*, 1991; Hackett *et al.*, 1987b; Gibson, 1997) and adults (Lewis *et al.*, 1992). Thus it would seem that elderly people might also exhibit the 'seesaw effect' whereby a reduction in dietary fat may be accompanied by an increase in dietary sugars and vice-versa. Such a diet (high in sugars) is also usually of low nutrient density or insufficient to provide vital micronutrients. As recognised by the COMA panel, a high level of sugar intake may be detrimental to health but recommending diets that are low in sugar may not be appropriate for all elderly people. A low sugar diet may indeed lead to an increase in intake of dietary fat or a reduction in food intake as sugar might be used to improve palatability. For the present study the high intake of sugar was a concern, as a nutrient diluting effect of sugar intake on both micronutrient and fibre intake was observed. The effect of dietary sugar on the dental health of an individual is not only associated with amount of total dietary sugars, but also to other factors such as time and frequency of consumption and type of food. Investigation of these factors was outside the scope of the study. The questionnaire on diet and health revealed that although 51% men and 68% women of the survey sample wore dentures, only a minority of them complained of any oral problems associated with wearing dentures, being edentulous or partially dentate. Although Palmqvist *et al.* (1991) found that reporting better dental status than the actual one is more common than reporting of poor dental status, Douglas *et al.* (1991) reported that in elderly people self reported oral health status is a valid representation of actual status. Thus it can be safely assumed that the subjects enjoyed good dental health and wearing dentures was not detrimental to their nutritional status.

The COMA panel (DoH, 1992) also recommended that of all population groups, the elderly would most benefit from an increased NSP intake due to a greater prevalence of

constipation in this group. Low intakes of fibre were recorded for men and women of the survey sample, women had lower intakes of NSP than men although not significantly so. Age and social class had no significant effect on the dietary fibre intake. The COMA panel on DRV (DoH, 1991) recommended that the elderly should aim to increase their NSP intake by approximately 50% from the current average of 12g to 18g per day. The survey sample recorded an intake of approximately 11g of NSP per day. Increasing this intake to the desired 18g per day would mean major changes in diet. Of all the nutrients on which the knowledge of the survey sample was tested, the subjects achieved the highest score for fibre. Ninety-two percent of men and 93% of women correctly named two average or one good dietary source of fibre. The in-depth interviews also revealed that a majority of the subjects named fibre and fibre rich foods as being 'good' foods.

"Fatty, fried food is bad and vegetables, fibre and fruit are good for you". (M: 74y)

The implications of this finding are twofold. Firstly, these findings highlight that nutritional knowledge and awareness of the health benefits of a nutrient or food does not always lead to appropriate dietary behaviour. Secondly, these findings may be indicative of the difficulties faced by elderly people in increasing their dietary fibre intake. These difficulties have been discussed by Davies *et al.* (1986) and include chewing difficulties and problems with gaseous distension caused by NSP. Davies and colleagues concluded that elderly people may turn to high fibre products like bran or bran enriched products which would need to be consumed only once a day to provide the required amount. These products may reduce the availability of certain minerals such as zinc, copper, calcium and iron, which may already be compromised due to reduced energy intake. Due to low intakes of fibre reported by the respondents of the survey sample (also reported by the NDNS), achieving the target of 18g per day might prove difficult and hence a more moderate increase would perhaps be more realistic and appropriate for this age group.

4.3.3 Micronutrient intake

For micronutrients, requirements and methods to assess levels of intake (dietary or through supplementation) are far from being well established, the need for improved methodology and more research into influence of age on requirements is well recognised (Saini *et al.*, 2000; Bates *et al.*, 1998; DoH, 1992). In comparison with the DRVs (DoH, 1991) the reported micronutrient intake of the respondents was inadequate to provide the required

amounts of vitamin D, retinol equivalents, folate, iodine, selenium for both men and women and calcium for women. Due to the problem of low energy reporters, assessment of biochemical indices, may have presented a more informed picture. Bates *et al.* (1999b) found that in their institutionalised sample biochemical indices of micronutrient status revealed a more prevalent inadequacy than intake estimates. This finding highlights the fact that elderly people living in institutions may have greater requirements for micronutrients or it may be indicative of the fact that the process of ageing and ill health itself (unrelated to intake) may influence the micronutrient status. Bates *et al.* (1999b) also reported that for all the status indices measured, there was a stronger correlation between vitamin status indices and their intakes, than between mineral status indices and their intakes. Due to resources available the present study focussed on other indices of nutritional status rather than biochemical indices. The importance of the findings of Bates and colleagues for the present survey was that of the six micronutrients of concern, three were vitamins indicating that their reported dietary levels were fairly robust indicators of their status. Thirty-three percent of the men and 41% of the women took non-prescribed dietary supplements. The contribution of supplements to vitamin and mineral status was however disregarded because of the irregularity of intake of supplements and also because the study was mainly designed to focus on dietary intake. From the irregularity of intake it became clear that most of the survey sample and the elderly who took part in the in-depth interviews regarded supplements as 'pep-up' pills to be taken when they were feeling a bit low.

"I keep my diet balanced, I try to give my diet a great deal of thought... well when I get concerned I take my cod liver oil". (M: 67y)

Hirvonen *et al.* (1997) reported that low dietary reporting could lead to significant under estimation of total vitamin and mineral intake. However low reported energy intake may or may not be wholly or partly responsible for the diet failing to provide all the essential micronutrients in elderly people. SENECA investigators (deGroot *et al.*, 1999) reported a high prevalence of inadequate intake of micronutrients at all levels of energy intakes among European elderly people. The problems related to inclusion of supplements should also be carefully considered, especially in the elderly as this may give falsely high mean intakes for the group. One of the reasons for this is that not all the respondents take supplements and the second problem, as recognised by Bates *et al.*, 1998 is that elderly people who report

taking supplements are usually those who have adequate dietary intakes of micronutrients. This would increase the risk that people who are at a greater risk of micronutrient deficiencies might go unrecognised.

Similar to the findings of the NDNS the intakes of vitamin B1, B2, B6 and B12, vitamin C, iron, zinc for all subjects and calcium for men were adequate as compared to the recommendations (DoH, 1991). Women however had significantly higher intakes of vitamin C than men, this was similar to the finding of significantly high intakes of vitamin C (when expressed per 1000 Kcal), among women reporting for the NDNS. The findings of higher intakes of vitamin C in women were also recorded in a study investigating consumption of fruits and vegetables among elderly men and women of Nottingham (Donkin *et al.*, 1998). They found that elderly women consumed significantly more fruit (oranges, grapefruit, mandarins, apples and pears) and drank more juice than elderly men. The NDNS also reported that women consumed more fruit and men consumed more meat, eggs, sugar and alcohol. Although women had significantly higher intakes of vitamin C, the intake of vitamin C for both men and women was well over the RNI. Both men and women of the survey sample had adequate intakes of zinc, men however had significantly higher intakes of zinc than women. This difference could be due to higher intake of meat and meat products among men than women. Consistent with the findings of the iron intake of the survey sample, other studies have found that iron deficiency does not seem to be a problem in elderly people (Johnson *et al.*, 1994). Men and women also displayed good knowledge on dietary iron and 41% men and 54% women correctly named one good source or two average sources of iron. Intakes of iron were adequate for all age, sex and social class groups, however men from non-manual social classes had significantly higher intakes of iron than men and women from manual social classes. The NDNS also reported significantly higher intakes of iron expressed per unit of energy intake for men from non-manual social classes. This difference could be due to higher consumption of meat among the non-manual social classes. The NDNS also reported that elderly people from non-manual social classes had significantly higher intakes of liver, turkey and chicken than those from manual social classes.

Intakes of folate, 99.7% of RNI for men and 99.2% of RNI for women, were marginally lower than the levels recommended by the panel on DRVs. The NDNS did not report any short fall in the dietary intake of folate. Age and social class did not have any significant

effect on the folate intake. The metabolism of folate and its role in the prevention of cardiovascular disease (Clarke *et al.*, 1998; Ubbink, 1998) have increased the importance of dietary levels of folate in elderly people. These levels reported by the respondents are indicative of a marginal folate deficiency making it a nutrient of special interest and the one whose levels perhaps need to be monitored. These findings on folate intake are supportive of the well-recognised 'tea and toast' type of diet, which is common among the elderly (DoH, 1992). This finding of borderline inadequacy highlights that elderly people perhaps might benefit from a daily folate supplement and need to be more aware of dangers of over cooking foods, which would further compromise the folate content in their diet.

The dietary intake for vitamin A (retinol equivalents) was low and provided 93.6% of RNI for men and 89.5% of RNI for women. No such shortfalls were observed by the NDNS. There was no significant influence of age or social class on the vitamin A intake of the survey sample. Low intakes of vitamin A seemed to go hand in hand with low intakes of vitamin D. Although fortification of all yellow fats (except butter), with vitamins A and D is endorsed by the COMA panel (DoH, 1992), the diet of the survey sample fell short of providing the required amounts. The finding of high intake of saturated fat imply that the survey sample might have had higher intakes of butter as opposed to use of spreads and fats enriched with vitamins A and D. One of the rich sources of vitamin A is also egg yolk, association of eggs with high levels of cholesterol and well-publicised scares like salmonella might have led to a reduction in intake. Another source of vitamin A is liver, and as reported by the NDNS, is quite popular among the elderly. Liver and liver products however are one of those products, which are generally consumed on certain days and it might well be that men and women of the survey sample did not have these during the recording period.

The predominant source of vitamin D is from skin through exposure to sunlight. Dietary intake usually makes a smaller contribution mainly because only few a foods can be called good sources of vitamin D. However dietary levels of below 5 μg have been associated with an increased incidence of osteomalacia (Krall *et al.*, 1989). Dietary intake of vitamin D was of some concern at 2.6μg for men and 2.9μg for women. It was also observed that the distribution for the intake of vitamin D was skewed, as the median intake was 25% and 30% less than the mean intake for men and women. A similar observation was made by the NDNS who also reported a wide range of intakes for vitamin D. Social class and age did

not have any significant bearing on the vitamin D intake of the survey sample. The mean intakes for dietary vitamin D were low and were only 26% of RNI for men and 29% of RNI for women. Although it was found by the information on dietary supplements that cod liver oil was a popular choice among the survey sample, its contribution was disregarded because of its irregularity of use. NDNS reported similar findings, they also found that including dietary supplements marginally increased the proportion of people who met the RNI, with 95% participants still below RNI when supplements were included. The intake of vitamin D of the survey sample was similar to that reported by DHSS, 1967/68 (DoH, 1972) and DHSS 1972/73 (DoH, 1979). The intake of vitamin D for women of the survey sample was similar to that reported by the NDNS, but intake for men was lower than that reported for the men of NDNS. The men and women of the survey sample had the lowest scores on knowledge for vitamin D. Only 15% of the men and 10% of the women were able to name one good source or two average dietary sources of vitamin D. The intakes for vitamin D reported for the survey sample are of particular concern because these were even lower than those recorded for the institutionalised respondents reporting for the NDNS.

These low intakes of vitamin D could have a detrimental effect on the bone health of the survey sample. From these findings it seems that men and women would benefit from advice on importance of vitamin D for bone health and information regarding sources of vitamin D. Regular consumption of foods rich in vitamin D, such as fortified margarine, eggs, liver and oily fish should be encouraged in this group and supplementation should perhaps be considered.

The significance of the low intake of vitamin D acquires even greater importance due to low intakes of calcium reported for women of the survey sample. Although dietary calcium was only marginally lower than the RNI, the implications of this finding become more important in the presence of low intakes of vitamin D. In conjunction, both low intakes of vitamin D and calcium can have detrimental effect on the bone health of post-menopausal women. There is however conflicting evidence regarding the role of dietary calcium in replacing the bone loss associated with age and after the menopause in women (Riggs *et al.*, 1987; Stevenson *et al.*, 1988). Calcium status may be further compromised due to increased excretion of calcium due to high intakes of dietary protein. The COMA panel (DoH, 1992) recommend that calcium supplementation should only be advised if vitamin D status is

inadequate as well. Women of the survey sample would benefit from supplementation with calcium.

The finding of low intakes of selenium (58% RNI for men and 74.6% RNI for women) and iodine (74.9% RNI for men and 67.7% RNI for women) was unique to the survey sample. Comparison with other surveys was however found to be difficult as most of the surveys, including the NDNS did not report on the dietary levels of selenium. They however reported normal dietary levels of iodine. Although selenium occurs in fish, meat and cereals, selenium levels of food largely depends on the soil content. The selenium status of a population correlates positively with the amount and availability of selenium in the diet (Levander, 1987). Low selenium levels are associated with a number of cancers (Salonen *et al.*, 1985). More recently the selenium status of the elderly has received attention due to its possible role in preventing oxidative damage and slowing the process of ageing (Richard and Roussel, 1999). The implications of low dietary selenium levels are not clear, selenium supplements should however be prescribed with caution as high intakes can be toxic (DoH, 1992). There is even less data on low levels of iodine in the diet of elderly, hence the importance of finding of low reported intake of iodine is not clear. The daily intake of 104.9μg for men and 94.8 μg for women fell short of 150 μg per day, which is sufficient to prevent goitre under normal circumstances (Passmore and Eastwood, 1986). As most soils contain little iodine, most foodstuffs remain poor sources. The richest source of iodine is seafood and eating sea fish once or twice a week is sufficient to provide more than 150μg of iodine per day. Another way of optimising iodine intake is by food fortification. Table and cooking salt is the most suitable vehicle for iodine fortification for the general population. Although in the UK fortification of salt with iodine is not mandatory, there are brands of iodised salts fortified up to 25-30ppm. During the dietary recording no information was collected on prevalence of use of iodised salt. From the findings of such low intakes of iodine it would be prudent to advice the elderly to replace their regular salt with iodised salt or aim to eat sea fish such as haddock, whiting and herring at least twice a week. Eating oily fish such as herring twice a week is also recommended for optimising cardiovascular health. Due to association of high intakes of salt with hypertension (Rose, 1981), the advice on replacing salt with iodised salt should be accompanied by advice on importance of maintaining low intakes of salt.

The survey sample thus had adequate intakes of macronutrients but fell short for a number of micronutrients. As other researchers have shown that dietary intake of most micronutrients is positively correlated with their biochemical status (Finch *et al.*, 1998; Wright *et al.*, 1995), it can be deduced that the micronutrient status of the survey sample might be compromised due to low dietary intakes of certain micronutrients. More research is however needed to assess whether the dietary shortfall of important micronutrients is accompanied by low blood levels and poor body stores. Although information on dietary supplements is very important as it has an important bearing on the micronutrient status, better methodology is needed to successfully code and incorporate this information.

4.3.4 Anthropometric indices

Due to ease of administration, low cost and effectiveness as a tool of measurement of nutritional status, appropriate anthropometric measurements were used as the second tool to assess nutritional status of the survey sample. As recommended by the Department of Health (1992), demispan along with height was also measured for all the respondents of the survey sample.

Body mass index was 26.4 for men and 27.0 for women and was similar to 26.5 and 26.8 reported for the free living men and women of the NDNS and 26.6 and 26.8 reported by the Health Survey of England (Prescot- Clarke & Primatesta, 1997). Ninety- five percent of the survey sample had a BMI between 25.1 and 28.5, thus although a vast majority of respondents could be classified as being slightly overweight, contrary to the findings of the NDNS the incidence of obesity was low. Although the BMI fell with age, the decline was not statistically significant and the reduction in BMI with age was more pronounced (not significant) for men than women. Although BMI correlates well with the percentage of body weight that is fat (Knight, 1984), some underestimation is to be expected due to loss of muscle mass with age. BMI as such remains a good predictor of fatness. Obesity is a major concern for health care providers of present times as it is linked with increased morbidity and mortality. Being overweight or indeed obese in later years might not be so undesirable as it may not have the same adverse consequences for health of the elderly as it does for the young (Burr *et al.*, 1982). On the contrary thinness in the elderly has been linked with increased mortality (Taybeck *et al.*, 1990; Mattila *et al.*, 1986). Lehman and Bassey (1996) reported that weight *per se* does not predict mortality or morbidity and as long as an elderly

person is not severely physically dependent, thinness may also not be an ominous sign. Launer *et al.* (1994) reported that weight stability as opposed to absolute weight is a better indicator of mortality. Only 4% of the survey sample had a BMI less than 20, no information was collected to ascertain weight lost or gained during the recent past.

Similar to the findings of NDNS and findings of Knight (1984), the men from non- manual social classes were significantly taller than men from manual social classes, no such differences were recorded between women of the two social classes. As a group, younger elderly respondents were significantly taller than the older elderly, however the demispans of the two age groups were very similar. This could be indicative of the fact that older elderly respondents may have been measured smaller due to increased problems of stooping, inability to stand up tall, and problems with weight bearing joints. It was also observed that older elderly women were not only significantly shorter than younger elderly women; they also had significantly shorter demispans. This finding confirms a secular trend towards tallness in women of later generations (Backwin and McLaughlen, 1964). Similar conclusions could not be drawn from the data on height and demispan of men of the survey sample as there was no significant difference between the demispans of younger and older elderly men. These results probably reflect both secular trends towards increased height, especially among women and age-related loss of height, especially among men. These findings also highlight the importance of using alternative measurements such as demispan to give a true picture of height of elderly people. Common with the findings of other studies (Finch *et al.*, 1998; Kwok & Whitelaw, 1991) demispan highly correlated with measured height and was found to be approximately half of the height of an elderly person.

Compared to population norms, women had large biceps and triceps skinfolds, which were also significantly bigger than those of men of the survey sample. Comparison with NDNS was not possible, as they did not measure skinfolds. Upper arm circumference and upper arm muscle area were similar for men and women of the survey sample, however women had double the upper arm fat area than men. This could be due to greater tendency of women to store fat at peripheral sites. Skinfolds and arm circumference reduced with age, however not significantly so, younger elderly men had significantly greater upper arm circumference than older elderly men. Older elderly men had significantly lower arm muscle area and biceps skinfold thickness than younger elderly men. No significant differences or specific trends were observed for women of the two age groups. In a longitudinal study,

such findings would have clearly indicated a reduction in fat and muscle mass with age, however in a cross-sectional study such a reduction may be age associated, however it may also be confounded by a number of factors.

As expected from the findings of the skinfolds, body fat percentage calculated by predicting equation using skinfold thickness, showed that women had significantly higher percentage of weight as fat than men. Although the percentage of body fat by this method at 23.6% for women of the survey sample was not extraordinarily high, the percentage body fat for men at 9.0% was low. The percentage fat for men could have been an under estimation of body fat percentage as skinfold thickness are better estimates of fat percentage for women than for men (Mitchell & Lipschitz, 1982).

Another predictor of nutritional status, which is acquiring great importance, is waist circumference, as central adiposity is related to higher morbidity and mortality (Despres *et al.*, 1990; Houmard *et al.*, 1994; Pouliot *et al.*, 1994). In the present study, waist circumference as opposed to waist-hip ratio was recorded, as it has been shown to be a more sensitive index of health and nutritional status (Houmard *et al.*, 1994; Pouliot *et al.*, 1994). As a group men had greater (93.4 cm) and women had smaller (89.4 cm) waist circumference measurement than that (90 cm) generally associated with increased health risks (Lemieux *et al.*, 1997). Younger elderly women had significantly smaller waist girth than younger elderly men. Older elderly men and women had very similar waist circumference. Older elderly men had smaller waist circumference than younger elderly men, however older elderly women had greater waist circumference than younger elderly women. In addition to these findings, younger elderly men and women had larger peripheral skinfolds than older elderly women. These findings imply that with age, women may be prone to a shift of peripheral fat to central fat stores and men may be prone to lose fat from central and peripheral sites. Thus implying that with advancing age women may be more at risk of suffering from diseases such as coronary artery disease, associated with central deposition of fat. This theory was supported by the findings of the FCQ, which revealed that older elderly women were more likely to suffer from coronary artery disease than younger elderly women.

4.3.5 Blood pressure

Hypertension has been long recognised as a major risk factor for development of coronary heart disease (DoH, 1994). However its role in the predicting the health status of the elderly is far from clear. Certain nutrients have been implicated in the development or prevention and treatment of blood pressure. The COMA panel on nutrition of the elderly (DoH, 1992), stressed the role of blood pressure in heart health of the elderly. The panel however also acknowledged that there were a few problems related with the available evidence regarding nutrient intake and blood pressure. The panel went on to say that the evidence available is mainly based on either inter-population studies or intervention studies conducted under strictly controlled conditions. The applicability of these on the dietary intake and its effect on blood pressure of elderly people in the community remains questionable. Advising major dietary changes needs justification, and the COMA panel felt that at present the available evidence does not justify such changes. The panel however did recommend that salt intake, in line with other population groups needs to be reduced from the present intake of 9 grams and over to 6 grams per day. Change in salt intake is perhaps one of the more difficult dietary changes to introduce and maintain, especially for the elderly. Moreover long-term salt reduction is needed to maintain the beneficial effects on blood pressure. Studies, which have attempted to reduce salt intake, have found that people usually revert to their original consumption pattern after a period of time and when they do, the changes in blood pressure are no longer detectable (Geleijnse *et al.*, 1994). Assessing the precise salt intake of a population is usually very difficult. In the present study, salt intake from the analysis of dietary diary was disregarded as no information was recorded regarding salt added during cooking and at the table and the intake from analysis of diet diaries would undoubtedly be an under estimate. The NDNS also did not find any significant associations between salt intake and systolic and diastolic blood pressures and they acknowledged that due to similar reasons outlined above, the salt intake of their sample may have been under estimated. Mean blood pressure recorded for men and women of the survey sample was higher than that recorded by the NDNS. This was in keeping with the findings of the NDNS and British Regional Heart Study (Bruce *et al.*, 1993), which recorded higher blood pressures for men and women of Scotland and North of England. Men generally had higher blood pressure than women but this was of no statistical significance. As a group men aged 65-74 years of age were mildly hypertensive (blood pressure > 159/64 mm Hg). Social class and BMI did

not have any significant bearing on blood pressure. Age however significantly influenced blood pressure, and men age 65-74 years had significantly higher diastolic blood pressure than men aged 75 years and over. No such differences were observed for women or systolic blood pressure. The importance of these findings is not clear as there is controversial evidence regarding the relative importance of the two blood pressures (systolic and diastolic) as predictors of cardiovascular disease (Boshuizen *et al.*, 1998; Lindstorm *et al.*, 1995). Men aged 65-74 years were also more likely to report to be suffering form high blood pressure. Although all respondents who reported to suffer from high blood pressure (27%), were also on medication for it, a high proportion (23%) of sufferers had raised blood pressure at the time of recording. This observation is of consequence as not only prevalence of hypertension but also quality of control is important and moderately and poorly controlled blood pressure is associated with an increased risk of stroke (Du *et al.*, 1997). Du *et al.* (1997) reported a high incidence of poorly controlled blood pressure among elderly people in the Northwest and recommended that blood pressure in hypertensive elderly should be maintained at or below 150/90 mm Hg. The findings of the present study also revealed that more than a third of the survey sample (equal number of men and women), had blood pressure > 160/ 95, without them being aware of it. This finding may represent a dilemma facing modern day health care providers. In the elderly there is conflicting evidence regarding implications of mild to moderate hypertension. The association of blood pressure with diet is far from established and pharmacological treatment, especially for mild hypertension is linked with an increase in ischaemic cardiac events (Merlo *et al.*, 1996).

The findings on blood pressure are indicative of uncontrolled and unidentified or untreated high blood pressure in the elderly living in the community. Due to detrimental effects of antihypertensives on the cardiovascular status of the elderly, more research is needed to explore the role of nutrients in prevention and treatment of hypertension (especially mild) in the elderly. Central adiposity and raised blood pressure are independent risk factors for cardiovascular diseases, the greatest waist circumference (96.3cm) and prevalence of mild hypertension young elderly men may be particularly at risk of cardiovascular diseases.

5.0 Conclusion

This study demonstrated that elderly people living freely on Merseyside were selecting diets that were inadequate to provide the required amounts of total dietary energy and several essential nutrients.

The findings indicate that the respondents recognized dietary factors to be important in determining optimal health status and identified elderly people as a group who would be willing to incorporate changes in their diets to optimize health. However due to the fact that this group has been largely excluded from advice on the importance of nutrition, targeting this group for nutrition education however would be a major challenge.

The findings of the survey highlight that a concerted action by a multidisciplinary team consisting of dieticians, policy makers, community health professionals, care providers, the media and the food industry would be needed to address the nutritional issues of elderly people. Additional to the recommendation made by the COMA Panel (DoH, 1992) for the need to educate and inform health professionals about the role of good nutrition for elderly people, it is important that views and beliefs of the elderly people need to be taken into account for an effective nutritional policy for elderly people. The Nutrition Advisory Group for Elderly People's (NAGE) gold standard for hospital practice (Health Advisory Service, 1998), clearly defines the role of dietitians in optimal nutrition for elderly people in hospitals, similar guidelines on nutrition are needed for health care professionals working with elderly people living in the community.

As recognized by Shepherd and Towler (1992) the findings highlight a complex link between nutritional knowledge and dietary behaviour and although beliefs on importance of nutrition in maintaining health was one of the determinants of food choice, sensory attributes of food were most important. This heightened importance of taste and familiarity of food with age needs to be addressed in the development of nutrition education and information programmes for elderly people. As identified by Charlton (1997) and Goldberg et al. (1989), the findings of the survey acknowledge that the media may have a special role in making such messages widely available. The need for such messages to be simple and targeted to all ages above the age of retirement is of paramount importance as one of the reasons for the older elderly respondents' poor knowledge and perceived resistance to incorporating change in dietary behaviour could be due to their general exclusion from public health messages on diet and health.

The desirable level of intake of total fat reported by the respondents are indicative of the fact that public health messages on importance of reducing total fat have been successful because of their wide availability. It may well be that the importance of achieving low levels of total fat are known to, and acknowledged by, the health professionals, who are hence equipped to give advice that is easy to understand by the lay person and the media. The fact that the food industry has also been involved in the campaign to achieve a reduction in total dietary fat is evident from the huge selection of low fat traditional and novel foods readily available in the supermarkets. The findings of the survey highlight that the health professionals need to be educated in the role of all nutrients in maintaining health and achieving optimal ageing. Bearing in mind the importance of taste and tradition for the elderly, the food industry may have a special role in developing products incorporating the required changes that do not compromise taste or require introduction of new foods in the diets of elderly people. Along with the ready availability of such products the importance of incorporating these as a normal part of dietary intake should be clearly outlined and made available for the elderly people.

One of the unfortunate consequences of lower-fat diet message is that often the replacement for fat calories are calories from simple sugars which can elevate serum triacylglcerols that can increase the risk of coronary artery disease. The finding of reduced calories from fat was accompanied by increase in calories from sugars. As acknowledged by the COMA panel (DoH, 1992) the advice of reduction in total sugars is not straightforward. Due to importance of taste as a determinant of food choice and role of sugar to improve palatability, the advice on repatterning dietary choices regarding total sugar may result in a reduction in food intake resulting in increased nutritional risk. Although elderly people should be made aware of the importance of high levels of dietary intake of sugars, advice on restricting sugars should be carefully evaluated. Although importance of high levels of dietary sugars *per se* for elderly people may or may not warrant their reduction, however the nutrient diluting effect observed for the respondents clearly indicates that such high levels of sugars were reducing the overall quality of diet. One solution to the problem could be to inform elderly people about the role of miconutrients and dietary supplements in achieving optimal nutrition.

Another reason for the low intakes of essential micronutrients could have been due to poor knowledge about their importance in maintaining health. The poor nutritional knowledge of

elderly people about dietary sources of vitamin D certainly indicates that it could have been one of the reasons for poor vitamin D status. One reason for low levels of knowledge on micronutrients and their role in optimising health could be the fact that the role of micronutrients in healthy ageing has only recently been recognized (Richard and Rousell, 1999). Low levels of vitamin D however have been recorded for the past 30 years, and the role of vitamin D in maintainece of bone health have been long established. The low levels of intake of vitamin D could be due the fact that most of the foods that are fortified with vitamin D, such as yellow fats, are also associated with high levels of fat. This highlights the confusion and conflict in nutrition information and advice perceived by the respondents. Thus in case of micronutrients such as vitamin D, folate, calcium and vitamin A, there is a great need for information in simple accessible format clearly defining the role of these nutrients and their food sources. Health professionals should also be better informed about the role of micronutrients such as folate, selenium, vitamin D and calcium. As recommended by the COMA panel the role of dietary supplements may have a special role in optimizing their nutritional status. Similar to other studies (Bates *et al.,* 1998), the survey identified a need to develop methods for assessing the role of dietary supplements on nutritional status of elderly people.

As recommended by the COMA panel (DoH, 1992) demispan was recorded for all respondents and provided a reliable and useful alternative to height for elderly people. The findings on waist measurement and its importance as a predictor of coronary artery disease indicated that elderly people would benefit from easy to understand information on the importance of central adiposity in causation of coronary artery disease. Lastly as recommended by Du *et al.* (1997) the findings on blood pressure indicate that blood pressure of elderly people on Merseyside need to be monitored regularly to reduce incidence of coronary artery disease and stroke.

The changes in age structure of population of the UK are unprecedented and continuing. On one hand these changes represent the great successes and accomplishments in health and social care system. On the other hand such changes have huge implications for these support systems. Nutrition is fast becoming one of the most important lifestyle factors determining health status of all age groups. The present survey gave a snap shot view of nutritional status and the factors that influence food choices made by elderly people living freely on the Merseyside. The survey also identified future needs and highlighted areas

where interventions and training are likely to have maximum impact on the nutritional status of elderly people.

The survey identified:

- The need for education and training of health care professionals in various aspects of nutrition of elderly people and the importance of dissemination of advice on importance of optimal nutrition.
- The need for information on important aspects of diet and disease such as coronary artery disease, osteoporosis and hypertension in simple and non-scientific format.
- The need for information on nutrition in optimal health to be widely available in outlets such as supermarkets and GP surgeries.
- The need for information on issues of healthy ageing and diet to be targeted towards all ages over the age of retirement.
- All information on nutrition to be available as nutrients and foods, clearly indicating the food sources of nutrients.
- Role of television in informing elderly people on issues of diet and health.

The survey also identified the need for further research into:

- The development of methods for assessing contribution of dietary supplements to nutritional status of elderly people.
- A longitudinal survey investigating the food habits and nutritional status of elderly people at two points in time to understand the impact of ageing on these.

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ANNEXE 1

Summary of recommendations of the COMA report on The Nutrition of the Elderly People (DoH, 1992)

I. Recommendations to maintain good nutritional status in elderly people.

1. The Panel endorsed the recommendations for people aged over 50 years in COMA report on dietary reference values for food energy and nutrients for the UK (DoH, 1991)
2. Recommendations for dietary energy intakes of elderly people should be generous, except for those who are obese.
3. Elderly people should derive their dietary intake from nutrient dense foods.
4. An active lifestyle, with prompt resumption after episodes of intercurrent illness is recommended as contributing in several ways to good health.
5. Steps should be taken to increase awareness of health professionals of the importance of both overweight and underweight in the elderly.
6. For the majority of elderly people, the same recommendations concerning the dietary intake of non-milk extrinsic sugars apply as for younger adult population.
7. Intake of NSP comparable to those recommended for the general population is advised for most elderly people. Foods with high phytate content, especially raw bran, should be avoided or used sparingly.
8. The statutory fortification of yellow fats other than butter with vitamin A and D should continue, and manufacturers are encouraged to fortify other fat spreads voluntarily.
9. Elderly people should be encouraged to increase their dietary intakes of vitamin C.
10. Adequate intakes of vitamin C need to be ensured for elderly people who are dependent on institutional catering.
11. Elderly people, in common with those of all ages, should be advised to eat more fresh vegetables, fruit and whole grain cereal.
12. Elderly people should be encouraged to adopt diets which moderate plasma cholesterol levels.
13. There should be encouragement of elderly people to consume oily fish and to maintain physical activity in order to reduce the risk of thrombosis.
14. The Working Group endorsed the WHO recommendation that 6 g per day sodium chloride should be a reasonable average intake for the elderly population in the UK, and recommends that the present average dietary salt intake needs to be reduced to meet this level.
15. The calcium intakes of elderly people should be monitored.
16. Doorstep deliveries of milk for the elderly should be maintained.
17. All elderly people should be encouraged to expose some skin to sunlight during the months of May to September.
18. If adequate exposure to sunlight is not possible; vitamin D supplementation should be considered especially during the winter and early spring.
19. Health professionals should be made aware of the impact of nutritional status on the development of and recovery from illness.
20. Health professionals should be aware of the often-inadequate food intake of elderly people in institutions.
21. Assessment of nutritional status should be a routine aspect of history taking and clinical examination when an elderly person is admitted to hospital.

Annex I ctd.

Summary of recommendations of the COMA report on The Nutrition of the Elderly People (DoH, 1992)

II Recommendations for further research.

1. Further studies are needed to quantify energy requirements of elderly people, which take individual health status into account with particular emphasis on those who are thin.
2. Techniques to measure energy expenditure including the doubly labeled water method should be evaluated further in elderly people.
3. Further research should validate the best anthropometric methods for fieldwork with the elderly people.
4. Demispan measurements should be extended to all nutritional surveys of elderly people and some of the younger adults to assess its relationship to other measures of skeletal size and to parameters of health.
5. The prognostic significance of BMI and other anthropometric measures in a British population of elderly people should be clarified.
6. Further research should be done to determine with more precision the protein requirements of elderly people.
7. Th e micronutrient intakes of elderly people in the UK need to be determined.
8. The micronutrient requirements of the elderly population need to be determined more accurately.
9. The clinical features of deficiency of vitamins from B group especially thiamin, vitamin B12 and folate need to be investigated.
10. Better biochemical indices of vitamin C status need to be developed.
11. There should be further research to assess magnesium status in ill elderly people, particularly those with cardiac failure.
12. The iron status of elderly people in this country needs to be determined.
13. Clinical and biochemical markers of both zinc and copper status need to be defined more precisely.
14. Research is needed into the nutritional component of the attainment of peak bone mass.
15. Further studies are needed to determine optimal intakes of calcium for the elderly population.
16. Research is needed on the clinical features of vitamin D deficiency.
17. The relationship between the development of cancer and dietary energy and nutrients should continue to be investigated.
18. Methodologies should be developed for the determination of antioxidant status.
19. The impact of acute and chronic illness on the nutritional requirements of the elderly needs comprehensive study.
20. Parameters of nutritional status with prognostic significance in ill elderly patients should be determined.
21. Effective methods of ensuring adequate nutrition need to be developed and evaluated, especially for elderly people in hospitals or institutions.

ANNEXE II

The Pilot Study, Phase 1

Introduction

A pilot study was carried out from April 1996 to June 1996, to test and refine the methods and techniques to be used in the main survey. The subjects were recruited using the following agencies:

1. University of the Third Age.
2. Graduate Women's Club.
3. Age Concern, Liverpool.
4. Christian Council on Age and Ageing.
5. Liverpool Housing Association.
6. Department of Social Services.
7. Luncheon Clubs: Woolton and Old Swan.

These agencies were contacted in order to recruit elderly people of 65 years and over living freely in the community in different settings and eating self selected diets.

Overview of the Method Followed to Collect Data for Phase I

First Visit

After an introduction and a brief outline of the project the following sequence was followed:

1. Giving and explaining the dietary diary
2. Questionnaire on general health and socio-economic status

First set of measurements for nutritional status assessment, in the following order:

a). Blood pressure
b). Weight measurement
c). Height measurement
d). Measurement of skinfold thickness
e). Measurement of demispan.

Second Visit

Usually made on the fourth day adhering to the following sequence:

1. Collection of dietary diary.
2. In depth one to one interview
3. Repeat measurements in the same order.

33 elderly people were recruited for the pilot study

Table 1 Demographic Profile

Gender	Women	22 (67%)
	Men	11 (33%)
Age Groups (years)	65-69	7 (21%)
	70-74	13 (40%)
	75-79	6 (18%)
	80-84	6 (18%)
	85 & +	1 (3%)
Marital Status	Married	17 (52%)
	Single	5 (15%)
	Divorced	11 (33%)
Housing	Owned	21 (64%)
	Rented	6 (18%)
	Sheltered	5 (15%)
	Council	1 (3%)
Income (per annum)	Mean	£8200
	Minimum	£3400
	Maximum	£18,000

Health Status

The prevalence of diseases is summarized in the following table.

Table 2: Self reported health of the pilot sample

Disease	Prevalence % (n)
Hypertension	24 (8)
Arthritis	24 (8)
Heart disease	12 (4)
Diabetes	6 (2)
Stroke	6 (2)
Vision	12 (4)
Thyroid	12 (4)
None	18 (6)
Other	18 (6)

Drugs taken

The drugs taken by the respondents prescribed or non prescribed are listed in the following table.

Table 3: Drug intake of the pilot sample

Drug	Intake %	(n)
Antihypertensives	21	(7)
NSAID	18	(6)
Antidiabetics	6	(2)
Aspirin	21	(7)
Heart disease	12	(4)
Thyroxin	12	(4)
None	24	(8)
Other	21	(7)

NSAID: Non Steroidal Anti Inflammatory Drugs

Dietary supplements

Ten subjects took dietary supplements of some description.

Table 4: Supplements taken by the pilot sample

Supplement	Taken by % (n)
Fish Liver Oil	21 (7)
Vit B Complex	9 (3)
Calcium	3 (1)
Cider vinegar	6 (2)

Aims of Piloting the Method to Assess the Nutritional Intake

* To test whether the method for assessment of the nutritional intake is quick to administer, easy to understand and minimises respondent burden.

* To test the process of using food photographs and calibrated household utensils in the quantification of the estimated portion sizes.

* Subjective appraisal of various aspects of the method and evaluation of scope for refinement.

Method

The method chosen to assess the dietary intake of the target population was therefore the three day diary using household measures to estimate the portion size; semi-weighed technique was used for all tinned and packaged foods. The portion sizes were quantified using food photographs and an array of calibrated household utensils.

Analysis of data

The food diaries were analysed using the Microdiet programme (University of Salford) and statistical analysis was completed using Statistical Package for the Social Sciences (SPSS).

FINDINGS

Nutrient intake

Table 5 Calculated average daily intakes of energy, macronutrients, vitamins and minerals for the sample. Values are means with their standard deviation [SD] and range in parenthesis

Nutrient	Total *n*=33 Mean SD (Range)	Female (F) *n*=22 Mean SD (Range)	Male (M) *n*=11 Mean SD (Range)	p
Energy (MJ)	6.4 .87 (4.9 - 8.6)	6.2 .75 (4.9 - 7.7)	6.9 .95 (5.4 -8.6)	0.03
Carbohydrate (g)	192.6 41.85 (138.6 -330.4)	183.3 27.07 (138.6 -224.9)	213 60.39 (47.0 -330.4)	0.06
Total sugars (g)	81.7 31.96 (25.7-158.3)	83.4 23.61 (31.8 -125.7)	78 46.85 (25.6 -158.3)	0.66
Starch(g)	103.6 28.45 (42.3-185.4)	94.7 21.3 (42.3 -138.0)	123.2 33.2 (4.6 - 85.4)	0.006
Sucrose (g)	38.4 30.33 (5.0 -149.2)	35.5 20.18 (11.9 - 86.8)	44.9 46.36 (5.0-149.2)	0.42
Fibre (g)	9.9 3.37 (5.3 -19.1)	9.5 3.2 (5.3 -17.1)	10.6 3.9 (6.9 -9.1)	0.43
Fat (g)	61.3 17.39 (30.2-113.2)	59.9 15.65 (30.2 - 93.3)	64.3 21.35 (35.80 -113.2)	0.51
Protein (g)	59.8 10.24 (33.4 -73.6)	57.8 10.69 (33.4 - 73.6)	64.1 8.00 (42.9 -73.6)	0.1
Calcium (mg)	653.8 173.27 (272.1 - 987.3)	653.9 157.41 (458.3 -976.0)	653.5 213.53 (272.1- 987.3)	0.99
Iron (mg)	11.0 6.89 (5.7-44.5)	9.4 3.24 (5.7-16.7)	14.4 10.94 (6.4 -44.5)	0.05
Zinc (mg)	7.4 1.9 (3.9 -10.9)	7.1 1.74 (4.2-10.9)	7.9 2.08 (3.8 -10.9)	0.26
Vitamin D (μg)	6.7 8.91 (0.0 - 32.2)	6.5 9.13 (0.1 - 32.1)	7.8 8.86 (00.0 - 24.0)	0.8
Vitamin C (mg)	60.0 35.25 (6.8 -150.9)	63.7 35.05 (6.8 -150.9)	51.7 36.83 (7.3 -122.9)	0.37

Nutrients as a percentage of energy are represented in the following table:

Table 6 Percent of total energy from selected nutrients

Nutrient	Total n=33 Mean%	SD	Female n=22 Mean%	SD	Male n=11 Mean%	SD
Protein	15.7	2.43	15.7	2.74	15.7	1.66
Carbohydrate	47.1	7.68	46.8	7.17	47.7	9.09
Fat	35.9	7.95	36.4	7.3	34.9	9.5
Saturates	12.8	3.73	13.3	3.55	11.9	4.13
Sugar	20.5	7.87	21.6	7.15	18.0	9.21

Anthropometric measurements

Aims

* To test all the equipment and fieldwork procedures to be used in the main study.
* To test the reliability of the anthropometric measurements.

Method

Measurements taken

Measure:	**Instrument**
Height:	Portable Stadiometer model 1 A25
Weight:	Soehnle scales
Skin fold thickness:	Holtain skinfold callipers
Blood Pressure:	A & DUA - 701 digital apparatus.

All the anthropometric measurements were taken twice by the same observer. The first measurements were taken during the first visit and the second was taken three days later during the second visit. The triceps & biceps skinfold, and midarm circumference were taken in triplicate. All measurements were taken from the right side of the body, and were based on the method described by Lohman et al (1988). The protocol for the measurement of blood pressure and demispan was the same as that followed in the Health Survey for England (1991) (White et al, 1991).

Analysis (Anthropometric Data)

Data were analysed using SPSS and total and sex - specific descriptives calculated. Differences between measurements of males and females were compared using one way ANOVA.

Table 7: Anthropometric measurements of the pilot sample

Measurement	Total SD (Range)	Male (M) SD (Range)	Female (F) SD (Range)	P
Triceps mm	21.6 8.33 (11.1 - 32.8)	16.2 9.66 (6.2 - 33.7)	24.0 6.59 (11.1 - 32.8)	.02
Biceps mm	12.7 6.82 (3.2 - 27.8)	8.8 5.62 (3.23- 22.0)	14.4 6.7 (4.9 - 27.8)	.04
MAC cm	30.0 3.81 (22.4 - 39.8)	28.3 4.35 (22.4 - 37.3)	30.7 3.44 (24..9 - 39.8)	.14
Height cm	62.6 9.05 (148.5-181.1)	173.1 6.19 (160.1-181.1)	158.2 5.85 (148.5-170.4)	.001
Demispan cm	75.7 4.66 (67.2-84.2)	81.1 2.92 (75.1-84.2)	73.3 2.92 (67.2-79.2)	.001
Weight kg	74.7 15.73 (52.9-121.00)	78.8 18.65 (55.7-121)	73.0 14.55 (52.9-115.8)	.39

MAC = Mid arm circumference

Relationship between height and demispan:

Overall height was approximately twice the length of Demispan. The height / demispan ratio for men was **2.13** and **2.16** for women

Blood Pressure:

Table 8: Blood pressure of the pilot sample

Subjects	Mean Systolic (mmHg) SD (Range)	Mean diastolic (mmHg) SD (Range)
Total n=33	159 28.24 (113-231)	83 9.29 (67-95)
Male n=11	163 32.40 (130-211)	80 10.93 (67-95)
Female n=22	158 27.04 (113-231)	83 8.63 (70-95)

The mean systolic pressure for men was moderately raised and higher than that for women, although the mean diastolic pressure was higher in women than men but was within the normal range for the age group.

Body Mass Index: (Weight in Kg / Height in m^2) was used to assess the level of body fatness or obesity and the categories used were those adopted by the Royal College of Physicians:

Level of body mass index(BMI)	Description
20 or less	Underweight
Over 20 - 25	Desirable
Over 25 - 30	Overweight
Over 30	Obese

Table 9: BMI of the pilot sample

Subjects	Mean	SD	Range
Total	28.63	6.35	(22.29 - 47.45)
Male	26.74	5.17	(24.49 - 38.4)
Female	29.32	6.73	(22.29 - 47.45)

The mean BMI for men and women was suggestive of the sample being overweight with the mean BMI for women higher than that of men although not significantly so ($p > .05$)

APPENDIX 1

Schedule for in-depth interviews (Phase I)

Q. Do you think that you are consuming an adequate diet?

Q. Are you concerned about what you eat?

Q. Do you know of any diseases that may be linked with what a person eats?

Q. Are you concerned about the fat in your diet?

Q. Do you know about the government guidelines on what people should or should not be eating? Do you these guidelines have an effect on what people eat?

Q. What are good and bad foods?

Q. What are your views regarding food prices?

Q. What percentage of your income is spent on food?

Q. When you are paying bills or paying for essentials what is on the top of you list?

Q. Over the years has the food you choose and eat changed in any way?

Q. Do you cook? (Probe) Do you enjoy it?

Q. Do you face any difficulties while cooking?

Q. Do you have a fridge, freezer, microwave?

Q. Do you do your own shopping ? (Probe) Do you enjoy it.

Q. Where do you shop, how do supermarkets compare with local shops?

Q. Would you like an affordable home delivery service for food?

Liverpool John Moores University

School of Education and Consumer Studies

APPENDIX 2

Food Habits Questionnaire of Elderly People on Merseyside [Part II]

(To be completed during the second visit)

(General Health and Dietary Habits Questionnaire)

All sections to be completed by the interviewer, the respondent does not have to answer all questions

ID Code ☐☐☐☐ **Date** _____

Post Code ☐☐☐☐.☐☐☐ **Day** _____

Section I Health

Now that you have completed your diary I would like to ask you a few questions about the food you eat ano your health. This should take about half an hour of your time. You have the right to refuse to answer any questions you are not comfortable with.

Section Ia : Self percieved health

Q1

How would you describe your present health ?

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor
- ○ Very poor
- ○ Other

Q2

Comparing yourself to the next person of similar age

Do you consider yourself to be:

- ○ More fit and active
- ○ Same
- ○ Less fit and active
- ○ Don't know
- ○ Other

Q3

In your view what could you do to feel healthier?

- ○ Nothing, satisfied with health
- ○ Take more exercise
- ○ Lose weight
- ○ Stop smoking
- ○ Be more socially active
- ○ Give up alcohol
- ○ Other

Q4

According to you what determines quality of life?

- ○ Companionship
- ○ Money
- ○ Health
- ○ Social life
- ○ All of the above
- ○ Other

Section Ib General health

Q5

Do you suffer from any chronic diseases?

- ○ Yes
- ○ No

If yes go to Q 5a, if no go to Q6

Q5a

Please specify

Q6

Do you have any hearing problems?

- ○ Yes
- ○ No

If yes go to Q6a, if no Q7

Q6a

Do you wear a hearing aid?

- ○ Yes
- ○ No

Q7

Do you have any problems with your eyesight?

- ○ Yes
- ○ No

Q8

Do you have any difficulty walking?

- ○ Yes
- ○ No

Q9

Do you take any prescribed medicine?

- ○ Yes
- ○ No

If yes go to Q9a and record name, dose and directions

Q9a

Name	Dose	Directions

Additional information Q9a

Q10

Do you take any supplements, vitamins, tonics etc?

- ◯ Yes
- ◯ No

If yes go to Q10a and record name, composition and strength and dose

Q10a

Name	Composition and strength	Dose

Additional information Q10a

Section II Physical activity

Q11

Do you take any physical activity?

- ◯ Yes
- ◯ No

If yes Q11a and Q11b

if no Q11c

Q11a

Please specify what you do?

- ◯ Walking
- ◯ Jogging
- ◯ Swimming
- ◯ Playing sport
- ◯ Gardening
- ◯ Other, specify

Q11b

How long do you exercise for ? [running prompt]

- ◯ Less than 30 minutes per day
- ◯ 30 minutes to one hour per day
- ◯ 1-2 hours per day
- ◯ More than 2 hours per day
- ◯ Once a week
- ◯ 2-3 times aweek
- ◯ Occasionally
- ◯ Other

Q11c

Why don't you take exercise?

- ◯ Painful joints
- ◯ Breathlessness
- ◯ Can't be bothered
- ◯ Neverdone any physical activity
- ◯ No company
- ◯ Doctor's advise
- ◯ Don't know what is available
- ◯ Don't know what to do
- ◯ Don't need to exercise
- ◯ Other, specify

Section III Smoking

Q12

Do you smoke?

- ◯ Yes
- ◯ No

If yes go to Q12a, if no Q13

Q12a

How many cigarettes do you smoke per day?

- ◯ 1-4
- ◯ 5-14
- ◯ 15-26
- ◯ 26 or more
- ◯ Other, specify

Q13

Did you smoke in the past?

- ◯ Yes
- ◯ No

If yes go to Q13a and Q13b

Q13a

Record year

☐

Q13b

What was your reason for giving up?

- ◯ Health reasons
- ◯ Doctor's advice
- ◯ Social reason
- ◯ Death of spouse
- ◯ Illness in the family
- ◯ Pregnancy
- ◯ Other, specify

Section IV Food and diet habits

Q14

Are you on any prescribed diet?

- ○ Yes
- ○ No

If yes go to Q14a

Q14a

Please specify what it is

For the interviewer only

- ○ Low salt
- ○ Low fat diet
- ○ Sugar restricted
- ○ Low protein diet
- ○ High fibre diet
- ○ Other

Q15

Do you avoid any foods?

- ○ Yes
- ○ No

If yes go to Q15a and Q15b

Q15a

Which foods are these?
For interviewer only

- ○ Milk and milk products
- ○ Cereals
- ○ Citrus fruit
- ○ Green salads
- ○ Meat and meat products
- ○ Fish
- ○ Other

Q15b

Why do you avoid these foods?
For interviewer only

- ○ Don't agree with me
- ○ Make me feel sick
- ○ Don't have a taste for them
- ○ Religious grounds
- ○ Moral/Ethical reasons
- ○ Other

Hand the respondent showcard 1

Q16

Please look at the card and tell me

Which of the following do you have in your home?

- Fridge
- Freezer including freezer compartment
- Cooker { gas/electric or hot plates}
- Microwave
- Mixer or blender
- Electric kettle
- Toaster
- Dishwasher

Q16a

If no cooker, fridge, freezer or microwav record reason

Cooker

Fridge

Freezer

Microwave

Q17

Do you cook your meals?

- ◯ Yes
- ◯ No

If no go to Q17a

Q17a

Why don't you cook?

Running prompt

- ◯ Find it too much trouble
- ◯ Find it difficult to cook
- ◯ Cannot cook
- ◯ Too expensive
- ◯ Don't have the facilities
- ◯ Other

Q18

Do you go to a luncheon club?

- ◯ Yes
- ◯ No

If yes go to Q18a and Q18b

Q18a

How often do you go?

- ◯ Everyday
- ◯ 2-4 times a week
- ◯ Once a week
- ◯ Occasionally
- ◯ Other

Q18b

Why do you go?

- ◯ For the benefit of cooked meal
- ◯ To avoid cooking a meal at home
- ◯ Cheaper than cooking at home
- ◯ For the company
- ◯ Other

Q19

Do you wear removable dentures?

- ◯ Yes
- ◯ No

If yes go to Q19a

Q19a

Do you avoid any foods due to these dentures/ sensitive teeth or any mouth problems?

- ◯ Yes
- ◯ No

If yes go to Q19a i

Q19a i

If yes record which foods

Q20

Over the years has your taste preference changed?

- ◯ No change
- ◯ Like more sweet
- ◯ Add more salt
- ◯ Food does not taste as it used to
- ◯ Other

Q21

Over the years has the amount of food you eat changed?

- ◯ Remained same
- ◯ Decreased
- ◯ Increased

Q22

Are you a vegetarian?

- ◯ Yes
- ◯ No

Q23

Do you eat conveniance foods /ready made meals?

- ◯ Yes
- ◯ No

Section IVa Shopping and Access

Q24

Can you shop for food?

- ◯ Yes
- ◯ No, someone else does the shopping
- ◯ Not without help
- ◯ Other

If someone else does the shopping go to Q24a

Q24a

If someone else shops for you, please specify who it is?

- ◯ Spouse
- ◯ Children
- ◯ Relatives
- ◯ Friends
- ◯ Neighbours
- ◯ Organisation to help the elderly
- ◯ Other

Go to Q24a i

Q24a i

When they shop for you do they:

Running prompt

- ◯ Buy what you tell them
- ◯ Make choices for you
- ◯ Make additions to your
- ◯ Exclude things that the think are not good for y
- ◯ Other

Q25

How often do you shop for food?

- ◯ Do not shop
- ◯ Everyday
- ◯ 2-4 times aweek
- ◯ Once a week
- ◯ Once every two weeks
- ◯ Other

Q26

Do you like to shop for food?

- ◯ No
- ◯ Yes
- ◯ Something that has to be done
- ◯ A reason to go out
- ◯ Other

Q27

How do you get to the shops?

- ◯ Walking
- ◯ Cycling
- ◯ Public transport
- ◯ Car
- ◯ Taxi/cab
- ◯ Ride with afriend or relative

Q28

Where do you shop for food?

- Local supermarkets
- Local shops
- Both
- Other, specify

Q29

Do you face any difficulties while shopping?

- ◯ Travelling to and from shops
- ◯ Carrying the shopping
- ◯ Help available in the shops
- ◯ Other
- ◯ No difficulty

Q30

What can supermarkets do to make them more helpful towards an older person?

- ◯ Have smaller portion sizes in prepackaged foods
- ◯ Structural change
- ◯ Changes at shopping aids, trolleys etc
- ◯ Separate checkouts
- ◯ More assisstance
- ◯ Other
- ◯ No changes needed

Q32

Running prompt

What makes it (the chosen) better than the others?

- ◯ Convenient
- ◯ Better value for money
- ◯ More brand names
- ◯ More healthy options
- ◯ Helpful staff
- ◯ More older person friendly
- ◯ Greater choice
- ◯ Better layout
- ◯ Better shopping aids
- ◯ Other

If yes hand the respondent showcard 3
From the list please indicate

Q34

Which of the following do you have delivered?

- ◯ Complete meals
- ◯ Fresh milk
- ◯ Eggs
- ◯ Bread
- ◯ Vegetables
- ◯ Meat
- ◯ Fish
- ◯ Fruit
- ◯ Other

Hand the subject showcard 2 and ask:
Q31 *From the list please indicate:*

Which supermarket do you enjoy shopping at most?

- ◯ Tesco
- ◯ Sainsbury
- ◯ Asda
- ◯ Marks and Spencer
- ◯ Gateway
- ◯ Somerfield
- ◯ Netto
- ◯ Aldi
- ◯ Other
- ◯ Don't shop in supermarkets
- ◯ Kwik save
- ◯ Safeway

Q33

Do you have any food delivered to your house?

- ◯ Yes
- ◯ No

Q35

Would you like to have an affordable home delivery which you could use to have all your food delivered to your doorstep?

- ◯ Yes
- ◯ No

If no go to Q35a

Q35a

Record reason

Section IV b Eating out

Q36

Do you go out to eat or have a snack?

- ◯ Yes
- ◯ No

If yes ask Q36a, if no ask Q36b

Q36a

How often do you eat out (apart from lunch clubs)

- ◯ Occasionally
- ◯ Daily
- ◯ 4-6 times aweek
- ◯ 2-3 times aweek
- ◯ once aweek
- ◯ Once a fortnight
- ◯ Once a month
- ◯ Other

Q36b

If no ask why and record (open)

Section V Nutritional information and Knowledge

Q37

Do you know about the guidelines on healthy eating?

- ◯ Yes
- ◯ No

If yes go to Q37a

Q37a

Do you:

- ◯ Take them on board
- ◯ Take no notice of them
- ◯ Other

Q38

According to you is nutritional information easy to get hold of?

- ◯ Yes
- ◯ No
- ◯ Don't know
- ◯ Not applicable

Hand the respondent showcard 4

Q39

Where do you get information on food and nutrition based topics?

- ◯ Television
- ◯ Radio
- ◯ Magazines
- ◯ Age concern associations
- ◯ Friends and relatives
- ◯ Doctor or hospital
- ◯ Dietician
- ◯ Leaflets in shops
- ◯ Government agencies
- ◯ Weight loss groups
- ◯ Food lables
- ◯ Don't know
- ◯ Other

Q40

According to you is the nutritional information available effective?

- ◯ Yes
- ◯ No
- ◯ Not applicable
- ◯ Don't know

If no go to Q40a →

Q40a

Why do you think it is not effective?

Running prompt

- ◯ Not widely available
- ◯ Too complicated
- ◯ Too general
- ◯ Too radicle
- ◯ The messages keep changing
- ◯ Other
- ◯ Don't know

Q41 *Hand the subject options card 1*

Now I am going to read a number of statements and I would like you to listen to each statement and then tell me which of the options on the card apply to you. The options you can choose from are true , if you think that the statement I read is true,; false if according to you it is not true; unsure if you cannot decide and don't know if you don't know the answer to that statement.

Options card 1

1 True 2 False 3 Unsure 4 Don't know

- ◯ Too much fat in your diet is bad for you.
- ◯ Too much salt is bad for you
- ◯ Mixing margarine with butter reduces the fat
- ◯ Butter has more fat than margarine
- ◯ Semiskimmed milk does not taste as good as full cream milk
- ◯ White bread is a poor source of fibre
- ◯ Meat contains fibre
- ◯ Fish contains fibre

Q42

Now I would like you to tell me which foods give you :

Saturated fat _____

Protein _____

Fibre _____

Vitamin D _____

Vitamin A _____

Iron _____

Q43 **What do you understand by the term 'a balanced diet'**

Food Labelling

Now I am going to ask you a few questions about labels on foods:

Q44

Do you pay any attention to food labels?

- ○ Yes
- ○ No

If yes go to Q 44a if no go to Q44b

Q44a

Why do you read food labels?

- ○ Something you have always done
- ○ Something you enjoy
- ○ To make sure you are getting enough of a particular ingredient
- ○ To avoid a particular ingredient
- ○ To find out about the nutritional value of a particular food
- ○ To see if there are any additives.
- ○ For the sell by date

Q44 b Why don't you pay attention to labels?

OPEN

If visually impaired go to Q54

Q45

Do you find labels on food:

- Easy to understand
- Difficult to understand
- Not sure
- Not asked, don't read lebels

Now I am going to show you a food label and ask y a few questions about the information on the label

Hand over the label

Q46

Can you read the print on the label?

- Yes, quite easily
- Yes, but with some difficulty
- ○ No, not without my glasses
- ○ No, cannot read even with my glasses

I would now like you to look at the list of ingredients

Q47

The first line of the ingredient list says 'energy', could you tell me what it means?

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

Q48

The 5th line of the label mentions 'saturates' could you tell me what saturates are?

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

There are also some symbols on the label, could you tell me what they stand for?

Q49

KJ

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

Q50

Kcal

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

Q51

g

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

Q52

Mg

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

Q53

On the 12th line underneath the heading for vitamins, the label says Thiamin 1.2 mg/85% RDA .

Could you tell me what you think RDA stands for?

- ○ Correct answer
- ○ Incorrect answer
- ○ Don't know
- ○ Not sure

Section VI Food Choice

Q54

Is there any aspect of your diet that you would like to change?

- ◯ Yes
- ◯ No

If yes go to Q54a

Q54a

If yes please specify what it is:

Q55

Would you include any foods in your diet if it was good for your health?

- ◯ Yes
- ◯ No
- ◯ Depends on the food
- ◯ Depends on reason to include the food
- ◯ Other

Q56

Would you exclude any food from your diet if it was bad for your health?

- ◯ Yes
- ◯ No
- ◯ Depends upon the food
- ◯ Depends on the reason to exclude
- ◯ Other

Q57

For what reason would you consider making a change in your diet?

- ◯ Will not make a change
- ◯ Life threatening illness
- ◯ Any illness related to the way you eat
- ◯ Reduce weight
- ◯ For general sense of well being
- ◯ To prolong life
- ◯ Other

Q58 Now I am going to ask you a question which you ne to answer by rating every option I give you by giving score of 1-5, 1 being most and 5 being least importar

When you are buying food how important are these factors to you?
Running prompt 1 being most important ant 5 being least important

	1	2	3	4	5
Price					
Taste					
Appearance					
Healthy choice					
Familiar					
Brand name					
Packaging					
Long shelf life					
Portion size					
Advertisement					

Section VII Diet and Health

Q59 Hand the respondent options card 2

I am going to read you some statements and for each statement that I read I would like you to indicate which option stated on the card applies to how you feel about that statement

1Strongly agree 2 agree 3 Neither agree or disagree 4 Disagree 5 Strongly disagree 6 Not sure/ no ansv

- ☐ If you eat good and bad food in moderation it won't harm you
- ☐ Not eating much can only be good for you
- ☐ As you grow older you don't need as much food
- ☐ Too much fruits and vegetables can be bad for you
- ☐ You are responsible for your own diet
- ☐ People need to be informed about healthy diet
- ☐ Advice on nutrition is a waste of time
- ☐ Lot of ill health among people is their own fault
- ☐ People care more about taste than what is good for health
- ☐ Health is related to what you eat
- ☐ Some diseases are related to what you eat
- ☐ Being overweight / heavy is bad for you
- ☐ People shoul be shown ways of cooking traditional foods in a healthy way

Section VIII Food price

Q60

What would you say about food price in general?

- ○ Fair
- ○ Expensive
- ○ You pay for quality
- ○ Other

Q61

Have you ever gone without food due to shortage of money?

- ○ Yes
- ○ No

Q62

How much money do you spend on food each week (approx)

Hand the respondent showcard 5

Q63

Which of the following are the 3 most important items in your budget? 1 being most and 3 being least important.

- Rent / Mortgage
- Food
- Fuel bills
- Television
- Going out
- Clothes
- Alcohol
- Cigarettes
- Transport
- Other

APPENDIX 3

Date .....

Dear

My name is Nicky Saini, I am a research student at Liverpool John Moores University and I am studying what the older people living on Merseyside are eating. Your name has been selected randomly from the family practice patient list, which is held by the Local Health Authority. Your GP was not involved in selecting subjects for the research project. This study has been funded by the Liverpool John Moores University, and the procedure mentioned above will cause you no discomfort. You will not be paid for your time but your help will be *invaluable* to add to the knowledge in the neglected field of diet of the elderly people. This study has the approval of the Local Health Authority.

You are invited to participate in this study and you would be requested to give information about your diet and have some physical measurements taken (height, weight, blood pressure etc.). You will also be invited to answer a questionnaire on diet and health. You of course can refuse to participate in any part of the study or leave any questionnaire items unanswered, which you find intrusive and don't feel comfortable with.

May I visit you personally in your home on ..... at.....
to talk about the study in detail and answer any questions you might have for me. I will be carrying official John Moores University *identity card* bearing my name and photograph. This visit will take about an hour of your time. If this appointment is not convenient or you do not wish to participate please call me at 0151 231 5239 or return the **options sheet** for which I am including a stamped addressed envelope.

I guarantee that all your answers will remain confidential and although your name will not appear anywhere, the results of the survey may be published in statistical form. You of course have the right to refuse to take part in the study or withdraw from the study at any time.

Thank you very much for your time, looking forward to seeing you.
Yours sincerely

Nicky Saini

Tel : 0151 231 5239

Nicky Saini Liverpool John Moores University IM Marsh Campus Barkhill Road Liverpool L17 6BD

APPENDIX 4

JMU
Liverpool John Moores University

Response Sheet

Please return this sheet using the stamped addressed envelope.

Mr/Mrs.....

Address.....

.....

Please tick as appropriate

- ☐ I would like to talk to the researcher ..... To find out more about the study.
- ☐ I would like to take part in the study.
- ☐ I would not like to take part in the study.
- ☐ I would like to rearrange my appointment to.....

Nicky Saini Liverpool John Moores University, IM Marsh Campus, Barkhill Road, Liverpool L17 6BD

Liverpool John Moores University

APPENDIX 5

Subject Consent Form

I, the under signed hereby agree to ;

Take part in the study which aims to investigate what the older people are eating. I have received a satisfactory explanation of the study and the procedures involved.

1. Keep a dietary diary for three continuous days.

2. Answer a general questionnaire and take part in a discussion.

3. Have my height , weight, skinfold thickness measured arm and waist measured

4. Have my blood pressure recorded.

I understand that I can refuse to take part at any time.

I understand that my answers will remain confidential and will be anonymous, although the results of the study may be published.

Subject
Signature.....

Print name .....

Researcher
Signature .....

Print name.....

Dated .....

Nicky Saini Liverpool John Moores University IM Marsh Campus Barkhill Road Liverpool L17 6BD

Liverpool John Moores University
School of Education and Consumer Studies

APPENDIX 6

Food Habits Questionnaire of Elderly People on Merseyside [Part I]
(To be completed during the first visit)

All sections to be completed by the interviewer, the respondent does not have to answer all questions

Date ☐☐☐☐☐☐☐☐☐

ID Code ☐☐☐☐

Post Code ☐☐☐☐.☐☐☐

Day ☐

Thank you for helping me with this project. I would like to ask you a few general questions which are fairly routine survey questions. As you see your name does not appear anywhere on the questionnaire (show), hence you remain annonymous and anything you say is confidential.If you feel uncomfortable answering any questions we can leave them out.

Section I General information and marital status

Q1 Sex

- Male ○
- Female ○

Q2 What is your date of birth? _____ or How old are you? ☐

Q3

What is your marital status?

- ○ Married
- ○ Divorced / Separated
- ○ Living with a partner
- ○ Single
- ○ Widowed

If Widowed ask 3a. If divorced ask 3b

Q3a

How long have you been a widow / widower

- ○ Less than a year ago
- ○ over 10 years ago
- ○ Over 2 but under 5 years ago
- ○ Over5 but under 10 years ago
- ○ 1-2 years ago

Q3b

How long have you been divorced for?

- ○ Over 2 and under 5 years ago
- ○ More than 10 years ago
- ○ Less than a year ago
- ○ Over 5 and under 10 years ago
- ○ 1-2 years ago

Section II · Education and Occupation

Q4

Did you attend school?

- ○ Yes
- ○ No

If yes go to Q4a if no go to Q5

Q4a

What kind of education do you have?

- ○ Primary
- ○ Secondary
- ○ Higher
- ○ Technical training
- ○ Apprenticeship
- ○ Other, specify

Q5

What was your working condition, were you :

- ○ Employee
- ○ Housekeeper
- ○ Self employed
- ○ Employer
- ○ Unemployed

Q6

What was your last job? (Open)

Q7

Was it full time or part time?

- ○ Full time
- ○ Part time

Q8

Do you still work?

- ○ Yes
- ○ No

If yes go to 8a, if no go to 8b

Q8a

If yes, mention:

- ○ In full time employment
- ○ In part time employment
- ○ Voluntary work
- ○ Occasional work

Q8b

If no, would you like to return to work?

- ○ Yes
- ○ No

Partner's occupation (if applicable)

Q9

What was your partner's working condition?

- ○ Employer
- ○ Employee
- ○ Unemployed
- ○ Housekeeper
- ○ Self employed

Q10

What was your partner's last job?

Q11

Was it full time or part time?

- ○ Full time
- ○ Part time

If yes go to Q12a, If no go to Q 12b

Q12

Does you partner still work?

- ○ Yes
- ○ No

Q12a

If yes, mention:

- ○ In full time employment
- ○ In part time employment
- ○ Voluntary work
- ○ Occasional work

Q12b

If no, would he like to return to work?

- ○ Yes
- ○ No

Section III Housing

Living Facilities

Q13

Is this house:

- ○ Private
- ○ Rented
- ○ Sheltered
- ○ Council
- ○ Other

Specify

Q14

Who else lives with you?

- ○ Nobody
- ○ Spouse/ partner only
- ○ Spouse/ partner and children
- ○ Spouse/ partner and grandchildren
- ○ Other relative/relatives
- ○ Friend/friends
- ○ Other, specify

Q15 *Hand the subject showcard A. Please look at the card and say which of the following do you have:*

Which of the following do you have?

- ○ Car
- ○ Telephone
- ○ Television
- ○ Central heating
- ○ Running hot water

Section IV Social Network

Q16

Do you have children?

- ○ Yes
- ○ No

If yes go to Q16a, if no go to Q17

Q16a

How often do they visit you? [running prompt]

- ○ More than 3 times a week
- ○ Once a week
- ○ Once a fortnight
- ○ Once a month
- ○ Rarely
- ○ Other, specify

Q17

Do you have a social network/ friends, neighbours etc?

- ○ Yes
- ○ No

If yes go to Q19a, if no go to Q18

Q17a

How often do you see them?

- ○ Nearly everyday
- ○ Once a week
- ○ Once a fortnight
- ○ Once a month
- ○ Rarely
- ○ Other, specify

Q18

Which of the following statements best describes your relationship with them

- ○ Very familiar, we help each other when needed
- ○ Good to go out with but seldom call them when I have problem
- ○ Other, specify

Q19

If you have problem who do you call for help?

- ○ Manage on my own
- ○ Health services
- ○ Social services
- ○ Friends
- ○ Neighbours
- ○ Children
- ○ Relatives
- ○ Other, specify

Q20

Do you participate in any social activity?

- ○ Yes
- ○ No

If yes go to Q20a if no go to Q21

Q20a

What are these?

- ○ Pensioners clubs
- ○ Outdoor activities
- ○ Social clubs
- ○ Other, specify

Section V Finances

Now I am going to ask you few questions about your financial situation. This is important because money can have a bearing on what foods people buy. Like the other information provided by you this information will also remain strictly confidential and your name will not appear anywhere.

Q21

How would you describe your economic sitation?

- ○ Good
- ○ Bad
- ○ Satisfactory
- ○ Could be better
- ○ Other, specify

Q22

What is your basic source of income?

- ○ Professional work
- ○ Work related pension
- ○ State pension
- ○ Family including spouse
- ○ Income suppert
- ○ State pension
- ○ Other, specify

Q23 *Hand the subjects showcard Aa for single and Ab for couples or families*

Please look at the card and indicate:

How much money do you have coming in each week?

For single Aa

Income per week

- ○ Upto £55
- ○ £55 - £64.99
- ○ £65 -£74.99
- ○ £75 - £99.99
- ○ £100 - £149.99
- ○ £150 - £199.99
- ○ £200 - £299.99
- ○ £300 - £499.99
- ○ £500 and over

For couples and families Ab

Income per week

- ○ Upto £85
- ○ £85 - 99.99
- ○ £100 - £129.99
- ○ £130 - £149.99
- ○ £150 - £199.99
- ○ £200 - £299.99
- ○ £300 - £499.99
- ○ £500 - £599.99
- ○ £600 and over

Notes

24 Weetabix®

2

WEETABIX TOKENS

WXAR97

(Tokens not part of Argos Offer)

NUTRITION INFORMATION

	per 100g	per 37.5g serving
Energy	1439kJ	540kJ
	339kcal	127kcal
Protein	11.5g	4.3g
Carbohydrate	67.3g	25.2g
(of which sugars)	(4.7g)	(1.8g)
Fat	2.7g	1.0g
(of which saturates)	(0.7g)	(0.3g)
Fibre	10.9g	4.1g
Soluble	3.2g	1.2g
Insoluble	7.7g	2.9g
Sodium	0.3g	0.1g

Vitamins	per 100g	per 37.5g serving
Thiamin (B_1)	1.2mg/85%RDA	0.4mg/32%RDA
Riboflavin (B_2)	1.4mg/85%RDA	0.5mg/33%RDA
Niacin	15.3mg/85%RDA	5.7mg/32%RDA
Folacin (Folic Acid)	170.0µg/85%RDA	63.8µg/32%RDA
Iron	11.9mg/85%RDA	4.5mg/32%RDA

An average serving of two Weetabix (37.5g) will provide at least 32% of the recommended daily allowance (RDA) for the average adult of the vitamins and iron listed. This pack contains twelve 2-biscuit servings.

Made in England by Weetabix Limited.

W

Whole Wheat Cereal with Added Vitamins & Iron

Were you unwell for any of the survey days?
If YES please give details

Day 1 _____

_____

_____

_____

Day 2 _____

_____

_____

_____

Day 3 _____

_____

_____

_____

Thankyou for your co-operation

Liverpool
John Moores
University

I.M.Marsh Campus

Confidential

Code [ ]

Post Code [ ]

APPENDIX 8

Survey Days 1. .....

2. .....

3. .....

For office use only .....

Please remember to;

1. Carry this booklet with you everywhere for the three days of the study

2. Write down the time, amount and description of all food and drink consumed, including snacks etc. taken outside the home

   Give as much detail as possible, including brand names and recipes. Also, record any leftovers.

3. Record any illness, however mild.

4. If you take any vitamin supplements etc. please write these down the brand name, and the number you take.

IF YOU HAVE ANY QUESTIONS OR PROBLEMS PLEASE CONTACT...

Nicky Saini

Time	Food and Drink with Amount	Office Use
		How many - Food Model

Day and Date.....

Time	Food and Drink with Amount	Office Use
		How many - Food Model

Example Day Monday

Time	Food and Drink with Amount	Office Use
8-30	2 Weetabix	
	Teaspoon of sugar	
	¼ pint skimmed milk	
10-15	Cup of instant coffee	
	Fun size Mars Bar	
12-30	Hollands cheese and onion pie	
	1 large banana - left half	
	1 can R.Whites lemonade	
3-15	Cup of tea with milk	
5-00	Cup of tea with milk (UHT)	
	1 large slice thick wholemeal bread	
	¼ teaspoon Marmite	
	½ teaspoon butter	
7-00	1 cup of boiled rice	
	½ 350g tin Tesco veg curry	
9-00	1 Sherry	

Time	Food and Drink with Amount	Office Use
		How many - Food Model

Time	Food and Drink with Amount	Office Use
		How many - Food Model

Measurement of nutritional intake and nutritional status of free living elderly : a pilot study. By N. SAINI, A.M. MILLER, S.M. MAXWELL, L. DUGDILL and A.F. HACKETT, *Centre for Education and Consumer Research, Liverpool John Moores University, IM Marsh Campus, Barkhill Road, Liverpool L17 6BD*

There is very little information concerning the eating habits of elderly people. A pilot study was undertaken to assess the respondent burden, ease of administration and participation, and feasibility of all the methods and procedures proposed to determine the nutritional intake and status of the subjects. The pilot study group consisted of twenty two women, mean age 73.6 (SD 6.04) years and eleven men, mean age 75.6 (SD 4.56) years. Food intake was estimated using a three day dietary diary quantified by food photographs and various calibrated utensils and analysed using Microdiet (Salford University).

Nutrient	Female (n 22)			Male (n 11)			Significance
	Mean	SD	(Range)	Mean	SD	(Range)	P =
Energy (MJ)	6.2	0.75	(4.9 - 7.7)	6.9	0.95	(5.4 - 8.6)	0.03
Carbohydrate (g)	183.3	27.07	(138.6 - 224.9)	213.0	60.39	(147 - 330.4)	0.06
(% energy)	46.8	7.17	(32.2 - 63.7)	47.7	9.09	(36.9 - 63.2)	0.76
Protein (g)	57.8	10.69	(33.4 - 73.6)	64.1	8.00	(42.9 - 73.6)	0.1
(% energy)	15.7	2.74	(10.2 - 19.3)	15.7	1.66	(13.4 - 18.2)	0.99
Fat (g)	59.9	15.65	(30.2 - 93.3)	64.3	21.35	(35.8 - 113.2)	0.51
(% energy)	36.4	7.3	(22.2 - 51.6)	34.9	9.5	(17.6 - 49.4)	0.62
(% energy, saturates)	13.3	3.55	(6.36 - 18.7)	11.9	4.13	(5.2 - 17.7)	0.36
Total sugars (g)	83.4	23.61	(31.8 - 125.7)	78.0	46.85	(25.6 - 158.3)	0.66
(% energy)	21.6	7.15	(7.2 - 38.9)	18.0	9.21	(4.8 - 32.9)	0.24
NSP (g)	9.5	3.2	(5.3 - 17.1)	10.6	3.9	(6.9 - 9.1)	0.43
Calcium (mg)	653.9	157.41	(458.3 - 976.0)	653.5	213.53	(272.1 - 937.3)	0.99
Iron (mg)	9.4	3.24	(5.7 - 16.7)	14.4	10.94	(6.4 - 44.4)	0.05
Vitamin D (µg)	6.5	9.13	(0.1 - 32.1)	7.8	8.86	(00.0 - 24.0)	0.8

Nutritional status was assessed using blood pressure (BP) and anthropometric measurements which comprised duplicate measurements of height, weight, demispan, mid arm circumference, triceps and biceps skinfold thickness (in triplicate).

Measurement	Female			Male			Significance
	Mean	SD	(Range)	Mean	SD	(Range)	P =
Height (m)	1.582	0.059	(1.485 - 1.704)	1.731	0.062	(1.601 - 1.811)	0.001
Weight (kg)	73.0	14.55	(52.9 - 156.6*)	78.8	15.73	(55.7 - 121)	0.39
Demispan (m)	0.733	0.029	(0.672 - 0.792)	0.811	0.029	(0.751 - 0.842)	0.001
Triceps (mm)	24.6	6.69	(11.1 - 35.33)	15.6	8.15	(6.2 - 33.3)	0.002
Biceps(mm)	15.2	7.04	(4.9 - 28.7)	8.3	4.74	(3.2 - 21.7)	0.006
BMI	31.1	9.84	(22.4 - 64.0*)	26.1	4.53	(21.8 - 38.5)	0.06
% Body fat	29.2	4.0	(21.4 - 35.3)	14.7	6.0	(4.1 - 26.0)	0.000
Systolic BP (mmHg)	158	27.04	(113 - 231)	163	32.40	(130 - 211)	0.67
Diastolic BP (mmHg)	83	8.63	(70 - 95)	80	10.93	(67 - 95)	0.44

The results showed that the mean energy intake for both men and women was low but the prevalence of overweight and obesity was high. As a group there was no evidence of under-reporting of dietary intake (energy intake / BMR = 1.47) (Macdiarmid & Blundell, 1997). Technical error for all measurements was recorded and showed no systematic bias with a reliability of 0.95 and above, although difficulties were encountered whilst measuring height. The pilot study demonstrated feasibility of methods and was invaluable not only for its practical and instructional role but also towards highlighting areas for concern regarding the diet and nutritional status of elderly people for the main survey.

* Extreme values, obtained from one respondent.

Macdiarmid, J.I. & Blundell, J.E. (1997). *European Journal of Clinical Nutrition* 51, 199-200.

Micronutrient intake of free living elderly people. By N.Saini[1], S.M. Maxwell[2], L.Dugdill[2] and A.M. Miller[2], [1]*The Hugh Sinclair Unit of Human Nutrition, The University of Reading, RG6 6AP.* [2]*Liverpool John Moores University, Barkhill Road, L17 6BD.*

Vitamin and mineral status of the elderly can be compromised by reduced food intake, impaired state of repletion of vitamins, presence of diseases and increased intake of drugs. Combined supplementation could be the best way of preventing accelerated ageing and reducing the risk of age related diseases (Richard and Roussel, 1999). A survey to assess nutritional status of elderly people was carried out in the four boroughs of Merseyside. Eighty elderly subjects forty-one women (mean age 74.6 years, SD 6.98) and 39 men (mean age 73.9 years, SD 6.12), living freely in the community were selected at random from the Family Practice Register. Three- day diet diaries quantified by a food photographic atlas (Luke and Mullan, 1994) were used to estimate nutrient intake. Information on frequency and type of dietary supplements taken was also recorded. Dietary diaries were analyzed using Microdiet (Salford University) and micronutrient intakes were compared to those recommended by The Department of Health (1991).

	Men n=39				Women n=41			
Micronutrient per day	Mean (SD)	%below RNI	%below EAR	%below LRNI	Mean (SD)	% below RNI	% below EAR	% below LRNI
Ret Eq† (µg)	567.2 (204.15)	72	41	15	537.2 (194.28)	66	24	5
Vitamin D (µg)	2.6 (2.20)	97	-	-	2.9 (2.46)	98	-	-
Thiamin (mg)	1.2 (0.37)	3	0	0	1.2 (0.48)	0	0	0
Riboflavin (mg)	1.6 (0.42)	23	5	3	1.5 (0.49)	12	5	2
Vitamin B_{12} (µg)	3.5 (1.8)	8	3	0	3.5 (2.4)	15	12	12
Vitamin B_6 (mg)	1.6 (0.48)	10	5	3	1.5 (0.47)	12	2	0
Folate (µg)	199.5 (60.9)	59	20	0	198.4 (61.3)	54	29	0
Vitamin C (mg)	49.8* (32.6)	46	28	5	67.9* (44.4)	32	15	2
Calcium (mg)	749.6 (236.57)	46	15	5	687.5 (199.5)	51	22	7
Iron (mg)	10.1 (2.8)	38	10	3	9.0 (3.35)	58	19	2
Zinc (mg)	9.6* (2.7)	61	20	5	7.8* (2.34)	44	15	0
Selenium (µg)	43.6 (16.37)	95	-	36	44.8 (16.52)	83	-	44
Iodine (µg)	104.9 (38.3)	82	-	36	94.8 (45.6)	88	-	34

† Retinol Equivalents

*Significantly different for men and women $p < 0.05$

Although 33% men and 41% women took dietary supplements, their contribution towards micronutrient status of the elderly was disregarded due to irregularity of intake. Men had significantly higher intakes of zinc and lower intakes of vitamin C than women. Compared with dietary reference values, major shortfalls from reference nutrient intake were observed for retinol equivalents, vitamin D, iodine, selenium and folate. Women in addition had low intakes of calcium.

These findings highlight that elderly people living in the community, eating self selected diets may be vulnerable to vitamin and mineral deficiencies. Although non-prescribed dietary supplements may have a sizeable contribution towards the micronutrient intake of the elderly people; irregularity of intake makes it difficult to ascertain their impact on the overall micronutrient status of the elderly.

Department of Health (1991) Report on Health and Social Subjects 41. *Dietary Reference Values for Food Energy and Nutrients for the United Kingdom.* HMSO: London.

Mullan, A. and Luke, V. (1994) *Photographic Atlas of Average Portions.* Liverpool University Department of Medicine: Liverpool

Richard, M. J. and Roussel, A.M. (1999) Micronutrients and ageing: intakes and requirements. *Proceedings of the Nutrition Society* 58, 573-578

NUTRITION IN OLDER PEOPLE

Lynne Kennedy, Clare Taylor, Niki Saini,

This section addresses the health and nutritional needs of older persons living in the community. Possible links between the health of the older population and dietary or nutritional factors are explored. Examples of existing service provision have been used to help identify recommendations for improvements in services and also elements of good practice. The role of sectors outside health will also be considered when making recommendations aimed at improving health and the quality of life for older residents in the North West.

Under nutrition is the major nutritional issue in the care of older people. Studies demonstrate that older persons, both living in their own home and institutional care, are at risk from nutritional deficiencies. Eating however is not only a physiological requirement but also has important social and cultural significance. For some, food delivered by services such as Meals on Wheels might be their only contact with their community.

Lifestyle factors such as diet have a profound impact on public health. Approximately 30% of deaths from coronary heart disease and cancer are attributable to a poor diet[1]. Previous health policy has focused on prevention of premature deaths amongst adults below 64 years of age[2]. Between 1991 and 1993 in the North West there were 5,985 deaths from coronary heart disease. Progress in the Region has been lower than expected; with an annual average fall of 134 deaths per year during the years 1984-1993, compared with the target of an average annual decrease of 316[3]. Improvements in diet at any age can help to reduce disease and death rates and to improve quality of life. Certain conditions are however typically associated with nutritional intake in older age. Nutrition therefore has an important role in promoting and maintaining the health and the independence of older people[4].

Dietary needs

Age-related deterioration varies greatly between individuals. Older people are a heterogeneous population making it difficult to develop common messages for dietary advice. There are no specific recommendations for older people, except to highlight that energy requirements tend to decrease with age. As food intake is reduced, care is needed to ensure nutrient intakes, particularly essential vitamins and minerals, are not compromised. Older people are currently advised to adopt dietary patterns similar to those recommended for maintaining health in younger adults[5]. The Committee on Medical Aspects of Food Policy[2] (COMA) recommendations relating to the elderly have been summarised in Table 5:1.

Table 5.1
Dietary Recommendations for Older People*

COMA recommendations	Special requirements
Energy (EAR)** Age Men Women 65-74 2,300 kcal/day 1900 kcal/day 75+ 2100 kcal/day 1810 kcal/day	Increase intake in institutionalised, disabled, bed ridden elderly with low physical activity levels Increase intake in sufferers of Parkinson's disease[1], dementia[7], chest infections and rheumatoid arthritis[1]
Protein (RNI)*** Women 46.5g/day Men 53.3g/day	decrease intake in those with a comprised kidney function Increase intake for those with conditions of ill health, infection and immobilisation[9,10]
Fat (% of energy derived from fat) 35% of total dietary energy from total fat No more than 10% from saturates	decrease intake in the overweight, or those suffering from heart disease, raised serum cholesterol, colon and prostatic cancer[11,12,13,14] Increase intake as a flavour and taste enhancer for the frail with poor appetites and low energy intakes
Carbohydrate Non Milk Extrinsic Sugars/Simple sugars - 10% total dietary energy Starch and Intrinsic Milk Sugars - 37% total dietary energy	decrease intake in those with conditions such as obesity or diabetes
3. Dietary Fibre (Non-Starch Polysaccharides) Dietary Reference Values 18g/day	Increase intake for conditions such as constipation, obesity, bowel cancer, diverticular disease, diabetes and raised cholesterol levels
Vitamins Vitamin D (RNI) 10ug/day	Increase intake in those housebound and institutionalised supplements may be needed
Vitamin C (RNI) 40mg/day	Increase intake in the institutionalised elderly or those receiving 'meals on wheels'. May need supplements due to loss during prolonged cooking, storing period
Vitamin A (RNI 600ug/day	No Special Requirements
Vitamin B (RNI) Thiamin 0.4mg / 100kcal/day Riboflavin 1.3mg/day (men) 1.1mg/day (women) Niacin 6.6mg / 1000kcal/day Vit B12 1.5u/day Folate 200u/day	Increase intake of B12 for those suffering from disorders such as gastric atrophy
Minerals Calcium (RNI) 700mg/day	No Special Requirements
Sodium (RNI) 1600mg/day	decrease intake in sufferers of high blood pressure
Iron (RNI) 8.7mg/day	No Special Requirements

* Based on recommendations by COMA panel on Dietary Reference Values[15] and COMA panel on Nutrition of the Elderly[2].
** EAR - Estimated Average Requirement
*** RNI - Reference Nutrient Intake

Current Dietary Trends

To date there has been relatively little research into the nutrition status of the older population. The information which is available is outdated making it difficult to make effective policy decisions aimed at improvements in diet and health. Despite this, there are features of the dietary habits of the older population which have been determined[5]. The differences between food habits of older people and younger adults, are highlighted in Table 5.2.

The Diet and Nutritional Survey of the Elderly[7], is due to be published in late 1998, providing up to date information on dietary intakes and to help set nutritional requirements for this age group. This will replace the existing data collected more than 25 years ago[8]. A separate study undertaken in the North West is expected to highlight dietary intake and habits, nutritional status, and nutritional knowledge of older people in the North West region and will be useful for setting local priorities[9].

Effects of Ageing on food intake

The ageing process triggers changes at both cellular and organ level. Physiological, psychological and socio-economic factors associated with old age can also influence nutritional status[10].

Physiological factors

Sensory and physical changes including taste[11] and smell[12] have a profound influence on food and nutrient intake, e.g. dentures can make the chewing process more difficult which in turn affects consumption of certain foods such as fruits, vegetables and meats, leading to avoidance and increased risk of an imbalanced diet[13]. Certain complications can lead to a reduction in the flow of saliva or difficulties in swallowing. This is particularly seen amongst stroke patients. Of all new stroke cases today, 30% of sufferers will not survive, 35% make a complete recovery and 35% will be left with some remaining disability (See Chapter 2. Heart Disease and Stroke in Older People)[14].

The use of medication can also have a major impact on diet. Prescribed drugs can influence dietary intake, result in reduced physical activity and also the development of a poor appetite[22].

Table 5.2
A Summary of Food Habits of the Elderly
(65+ years compared with 16-64 years)

Foods	Trends In Dietary Habits of Older People
Type of fat spread	hard margarine or butter use is more prevalent with increasing age people over 55 years are more likely to use butter or hard margarine compared to younger adults significantly higher proportion of elderly women in central, south and south west regions are more likely to use low fat or reduced fat spread
Cooking fat	elderly people are least likely to (say that they) eat fried food the elderly who do report eating fried foods are more likely to use solid fats similarly, older people living in the north or in manual social groups are more likely to fry using solid fats not cooking oils
Milk	slightly higher proportion of elderly women use skimmed or semi-skimmed milk those over 75 are more likely to report using full fat milk
Biscuits, cakes, confectionery	elderly people are most likely to report consuming biscuits, cakes and confectionery every day
Sugar in tea and coffee	significantly higher propertion of elderly men, than women, report adding sugar to tea or coffee elderly people in non manual social classes are less likley to take sugar in tea and coffee
Fruits	elderly people are more likely to report eating fruit daily elderly men rend to report eating fruit less frequently than elderly women elderly in non manual social classes are more likely to eat fruit daily men and women living in the north report eating fruit no more than once a week or even less
Vegetables or salads	a higher proportion of elderly people are likely to eat vegetables or salads every day compared to 16-44 year olds older elderly women are least likely to eat vegetables or salads daily those in the north consume less vegetables and salads than those in the south
Bread and bread rolls	elderly people are more likely to eat bread (men more frequently than women and men in the north more so than the south) elderly people are more likely to eat wholemeal bread than other ages elderly people in non manual social classes more likely to consume wholemeal bread than those in manual classes
Breakfast cereals	elderly people are more likely to eat breakfast cereals (than those aged 16-44) and more men than women higher numbers of older women aged 65-74 choose a high fibre variety
Salt added during cooking	elderly men and women reported adding the most salt during cooking the practice of adding salt increases with age women aged 65-74 in social classes I and II are less likely to add salt during cooking than other elderly women
Adding salt to food at the table	men and women in social classes I and II and those in the south of England are least likely to add salt at the table

Source: Office of Population Census and Surveys; Health Survey for England 1993.

Physical Activity and Older People

Activity is often restricted for a high number of the older population. A high prevalence of arthritis in older people can lead to reduced dexterity of movement and to pain in weight bearing joints. Conditions which affect mobility can restrict a persons ability to prepare food, thereby affecting nutritional intake and consequently their personal independence. Social or economic factors also have an impact and can influence practicalities such as access to local shops. Car ownership, for example, in households containing one retired person on state pension, is currently 8%[15].

Psycho-Social Factors

Social changes which accompany ageing have an impact on the food older people consume. Living arrangements, the loss of a spouse and social isolation can all lead to adverse changes in dietary intake[16]. Bereavement, which increases with life stage, leads to loss of appetite brought on by loneliness and depression. This can effect dietary intake due to the loss of motivation for day to day activities such as cooking or food shopping. The impact has been shown to be greatest with the loss of a former meal time companion[17]. Some sources have suggested that psychological factors are a main cause of under-nutrition in older people and initiatives which help them to maintain an interest in food can be helpful.

Socio-economic factors

Financial and housing circumstances greatly influence foods purchased and consumed. Owning a freezer means that older people can stock up on products when special offers are made and can store small portions of ready-made meals[18]. In the United Kingdom, 91% of households own a freezer[24]. Households comprising one adult, in particular an older lone adult are the least likely to have a freezer or other consumer durable.

A number of separate database were accessed in order to find details of initiatives in the North West aimed at promoting healthy food and nutrition to the older population. These included various Health Education Authority databases such as the Food and Low Income Projects database. A small number of initiatives were identified, many of which were based around the idea of a food co-operative. The following two examples (Table 5:3 and 5:4) illustrate how local action takes into consideration factors such as social isolation, loss of motivation and problems of access and availability.

Table 5.3
Age Concern 'Get cooking' Project in Cumbria

AGE CONCERN	GET COOKING, CUMBRIA (Target Audience - Older People)
Project Summary	A cookery club aimed at encouraging motivation in older people to cook meals and maintain a balanced diet
Activities	Cookery Classes; planning, shopping, cooking and eating lunch in peer groups; Nutrition/health education; support; door to door transport
Outcomes/ Achievements	Increasing self-confidence, sustaining interest in food, providing coping skills

Table 5.4
Food Cooperatives in Bolton

FOOD CO-OPs IN BOLTON (Older People, single parents, disadvantaged)	
Project Summary	A network of 9 fruit and vegetable co-ops run by local volunteers
Activities	Provides fruit and vegetables at cost price to it's members; provides a home delivery service for older members
Outcomes/ Achievements	Helping overcome problems around access and affordability for older people; delivers fresh fruit and vegetables to the household

Identifying services provided to help meet the nutritional needs of older people

Nutrition and dietetic provision for older people in the North West is divided between hospital and community services. A letter was circulated from the Department of Public Health, University of Liverpool to a non-random selection of district dietetic managers and to personnel in relevant sectors across the region, in order to obtain information on current practice. They were asked to identify and describe existing arrangements regarding older people in relation to food and nutrition. The valuable role of community nurses and health visitor managers in the community was also recognised.

Nutrition and Dietetic Provision for Older People (hospital and community based)

Feedback was obtained from 8 of the 12 dietetic departments contacted. The information provided was variable. The data was not intended to assess whether the nutrition services provided were adequate to meet local need but instead to summarise dietetic provision for older people and to identify areas which might benefit from policy guidelines.

Differences were shown both in the type and level of service provided by dietetic departments across the Region. Population characteristics such as demographics provide one explanation. Nevertheless there appeared to be no region-wide guidelines or strategy in relation to nutrition and older people.

Examples of Dietetic Service Provision in the North West

From the information received it is clear that, with few exceptions, dieticians are generally not employed in a role specifically to cater for older people. In response to the nutritional needs of the older population, most services have adopted a variable mix of prevention, health promotion, treatment and care. The time and resources allocated to older people varied between districts, as did the perceived importance compared with that of the general population. A Region wide policy or guidelines on how to determine the minimum level of service provision would be beneficial.

Variation across the Region was shown in the level of dietetic care provided in hospital settings. Manchester Royal Infirmary employs a full time dietitian to work specifically with older people (although in reality time was also being spent on general cases), other trusts demonstrate no specific post for this purpose. The type of dietetic care offered within the hospitals across the Region is broadly similar, with the core responsibilities ranging from nutritional assessments, providing dietary supplements, tube feeding, providing advice on healthy eating, cardiac rehabilitation programmes and working with sufferers of conditions such as Parkinson's disease, or strokes. In some cases other responsibilities included liasing closely with patients, their families, carers and residential and nursing homes (often via social services).

The level of dietetic service provision within the community also varied throughout the Region. Only some trusts regarded older people as one of their priorities, with many services available to them such as clinics, home visits, and various examples of multi-disciplinary working.

Current gaps or difficulties relating to health service provision

Dietetic departments were asked to identify gaps or problems relating to service provision for the elderly. These are summarised overleaf.

- Elderly groups of the population are not seen as a high priority. This is a problem when competing for limited resources
- The increased numbers of the elderly staying in residential and nursing homes has reduced the percentages routinely in contact with community health services
- There is no legislation or policy on nutritional standards for meal provision in residential and nursing homes.
- There is a lack of education on nutritional problems among the elderly, especially in nursing homes, residential homes, and within the patient's own home. A misleading attitude also exists that healthy eating is for disease prevention amongst young, not older adults
- Elderly patients have difficulty in accessibility to clinics. Home appointments are restricted, with support only being provided in exceptional circumstances
- The limited co-ordination of the dietetic service makes it difficult to contribute effectively to multi-disciplinary working

Provision of Nutritional Care Outside the National Health Service

A high proportion of those living in institutional care experience "institutional starvation"; that is they have a low body weight due to inadequate energy intake[2]. Loss of appetite and depression in the individual are common causes of this. Wider factors relating to food provision and food consumption are however equally important. The absence of practical guidelines or nutritional standards for the provision of food in institutions clearly has an influence and warrants further research. The effect can also be compounded by the lack of training or awareness of staff employed in this sector.

Whilst guidelines prepared by the voluntary body, 'The Caroline Walker Trust', for nutritional standards in nursing homes do exist, these are not part of present legislation. With the number of residents in institutional care set to rise, new legislative guidelines would help to improve dietary quality and have a health impact for as much as a third of the elderly population and therefore could have considerable implications. The following is a summary of the guidelines from the Caroline Walker Trust.

Residential Accommodation

An average day's food, over a one week period should meet the Committee on Medical Aspects of Food Policy's recommendation of estimated average requirement for energy and reference nutrition intake for selected nutrients. Fruit and vegetables should not be cooked or stored for long periods to avoid nutrient loss.

Residential and nursing homes applying for registration should be required to meet nutritional guidelines for food served to older people and the nutritional standards of meals should be monitored regularly.

Community Meals

Daily meal packages should provide at least 33% of reference nutrition intake for most essential nutrients, 40% of estimated average requirement for energy and 50% of reference nutrition intake for vitamin C. Food should be cooked, stored and transported correctly to avoid cross contamination and nutrient loss.

Without routine monitoring or research, it is not possible to assess the extent of "institutional starvation" and wider nutrition in homes across the North West. In one local study, researchers reported specific micro-nutrient deficiency amongst residents, particularly for vitamins C and D, folic acid and calcium. An increase in the intake of fresh fruit, vegetables and milk was recommended[19].

The provision of food to dependent older people, both in residential homes and in the community is a vital component of community care and adequate nutrition standards for meals is crucial to the physical well-being of residents and patients. Food also provides a social function, particularly for those living in care where mealtimes are their main opportunity for social interaction.

Community Meals Service (e.g. meals on wheels)

This term encompasses all meals delivered to older people in their own home, provided by luncheon clubs and meals provided in sheltered accommodation. These are currently mainly organised by social services. However, in some parts of the country, especially rural areas, the meals service still largely depends on help from volunteer bodies, such as the Womens Royal Voluntary Service (See Chapter 4, Women's Royal Voluntary Service in the North West)[20]. Many older people are reliant on such services; in 1992 alone 32.9 million meals were to delivered to their homes[21].

One of the main aims of the community meals service is to enable older people to continue living in the community, rather than be admitted into residential care. In the Liverpool District the average number of meals served each week is almost 2,800. This is a valuable service to older people who are often vulnerable to nutritional health problems. Eligibility criteria are listed below.

- those suffering from a handicap (physical / mental);
- the elderly and frail;
- those at risk from malnutrition without a mid-day meal;
- people without relatives or friends to cook a meal for them;
- those unable to attend a lunch club or day centre;
- those in temporary need of meals, following illness or convalescence.

There are, at present, no formal policies on the nutritional standards of these meals and research has raised doubts about their nutritional value[22]. For example evidence has shown foods such as vegetables may lose up to 90% of their vitamin C content by the time they arrive at their destination[23].

There are some who question not only the nutritional value of such meals, but also address the question of the provision of meals leading to an increased dependency[28] and others suggesting alternatives such as help with shopping, advice with cooking and help with the provision of equipment would be preferable to the meals service.[30]

Summary

Health Promotion in older people is particularly important in trying to achieve lifestyle changes. relating to diet and health. Under-nutrition remains an issue in this group due to the many lifestyle changes occurring and sometimes deteriorating health.

There remains much room for improvement in the application of guidelines and recommendations regarding meals served in nursing and residential homes and in the community. There is a clear need for more intensive research to combat the problem of lack of knowledge in the area of food and nutrition amongst older people.

Recommendations

National

Older people should be considered as important as the rest of the population with regard to the formulation of dietary guidelines and the targeting of health promotion initiatives. This is particularly important when competing for funding.

Regional

A minimum level of service provision required by older people should be established

Local

Residential and nursing homes applying for registration should be required to meet nutritional guidelines for food served to older people and the nutritional standards of meals should be monitored regularly. Legislative guidelines should be drawn up to establish and control the nutritional standards of all meals served to older people, in institutionalised care and in the community.

Specific initiatives should be further developed, which encourage practical ways for older people to improve their nutritional intake (e.g. cooking sessions, advice and

assistance with grocery shopping) and to avoid dependency on services like meals on wheels where possible.

Acknowledgement:
We would also like to acknowledge dietetic managers and dietitians within the North West for their assistance; Age Concern Get Cooking- Cumbria; Food-Co-op's Project in Bolton; and the Meals service in Liverpool.

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