

CHAPTER 2

LITERATURE REVIEW

CONTENTS

2.0	INTRODUCTION	21
2.1	HEALTH STATUS	
2.1.1	AUSTRALIA	21
2.1.2	GREEK-BORN AUSTRALIANS	
2.1.2.1	Mortality data	23
2.1.2.2	Morbidity, Disability, Well-being	26
2.1.3	GREEKS IN GREECE	
2.1.3.1	Mortality data	34
2.1.3.2	Morbidity data	38
2.2	FOOD AND NUTRIENT INTAKE	41
2.2.1	GREEK-BORN AUSTRALIANS	
2.2.1.1	National data	42
2.2.1.2	Samples	45
2.2.2	GREEKS IN GREECE	
2.2.2.1	National data	48
2.2.2.2	Samples	51
2.2.3	OTHER ELDERLY STUDIES	57
2.3	LIFESTYLE	
2.3.1	DEFINITION OF LIFESTYLE	58
2.3.2	LIFESTYLE, HEALTH & WELL-BEING	58
2.3.3	LIFESTYLE & FOOD INTAKE	
2.3.3.1	Living arrangements	60
2.3.3.2	Social networks and support	61
2.3.3.3	Social and leisure activity	62
2.3.3.4	Exercise	62
2.3.4	FOOD AND HEALTH BELIEFS	63
2.4	INTER-RELATIONSHIPS OF HEALTH, FOOD AND LIFESTYLE	64
2.4.1	FACTORS AFFECTING HEALTH & QUALITY OF LIFE	65
2.4.2	FACTORS AFFECTING DIETARY INTAKE	67
2.5	CONCLUSIONS	70

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter will review existing literature on elderly Greeks in Greece and Australia, their health, lifestyle and food intake as well as other relevant elderly studies.

2.1 HEALTH STATUS

The World Health Organisation's definition of 'health and quality of life' is not simply the absence of disease but includes something positive as well, that moves beyond the body to include personal and social well-being (WHO, 1984).

Therefore, total health assessments of the elderly should not only include physical health, but also functional health (e.g ability to carry out activities of daily living, disability), mental health (e.g well-being, depression), social health (e.g social activity, social networks and living arrangements) and economic functioning (Fillenbaum, 1984). Where available, all these aspects of health will be addressed in the literature review.

2.1.1 AUSTRALIA

Between 1968 and 1988 death rates for Australian-born males and females decreased by 34% and 37% and at age 85 by 30% and 32% respectively. This is in marked contrast to earlier decades of the 20th century, when death rates at younger ages declined at a substantially greater rate than those at older ages. This has resulted in increasing average life expectancies, at older ages as well as birth. Relative increases in life expectancy at age 60 are now outpacing increases in life expectancy at birth (D'Espaignet et al 1991).

In the Australian Bureau of Statistics (ABS) surveys, *impairments* are defined as 'the loss or abnormality of psychological, physiological or anatomical function', *disabilities* are defined as the incapacity to perform basic self-care functions' and *handicaps* 'as the restrictions that impairments and disabilities place on the performance of basic social roles and on interaction with one's environment'. The ABS classified persons as not disabled, disabled or handicapped on the basis of self-reported answers to a standard

survey instrument. The 1988 survey estimated that 15.5 % of Australians (2.5 million) are disabled and that, of this group, 83 % (2.1 million) are handicapped - this is a 50% increase in the number of handicapped since the 1981 survey.

The prevalence of handicap rose in all groups, but most of the increase occurred in the mild or moderate handicap groups. Most of the increase in the prevalence of severe handicap occurred in the 85 years and over age group. The major causes of disability and handicap in older life are non-fatal conditions closely related to age. They include arthritis, hearing loss, blindness, circulatory diseases, musculoskeletal diseases and Alzheimer's disease.

The percentage change in prevalence rate of disabling conditions from 1981 to 1988 for the 75+ age group were as follows for males and females respectively: circulatory diseases +23.6, +14.8%; respiratory diseases +8.3%, +84.9%; musculoskeletal diseases +14.5%, +19.6%; nervous system diseases +23.7%, +23.9%; sight loss -1.3%,-2.2%; hearing loss +29.4%,+6.4%; mental disorders +6.6%,+15.4%.

At age 65, life expectancy in 1988 was 14.8 for males and 18.7 for females. This is an increase of 0.9 years for men and 0.6 years for women since 1981. Disability-free life expectancy at age 65 was 6.7 years for men and 8.6 years for women, compared with 8.1 and 10.1 years of disability respectively. Disability-free life expectancy had decreased by 15% for both men and women.

The increasing reported prevalence of disability and handicap is not due to populations ageing, sampling variability or measurement error, but possibly due to some or all of the following factors (Mathers 1991):

1) higher incidence of chronic disease; 2) improved survival leading to increased prevalence of chronic disease 3) earlier diagnosis or treatment of chronic diseases; 4) earlier adjustment of activities to cope with disease 5) community is more aware of disabling conditions or are more willing to report such conditions; 6) rising expectations of what is 'good health'.

Mathers (1991) concludes '*What we can say is that all the gains in increased years of life are increased years of perceived disability and handicap, with a consequent demand for social and health services. People may be living longer but sicker, they may have higher expectations of good health, or they may be adjusting behaviour more by restricting activity. In any case they have increased their use of health care in order to monitor their condition*'. The surprisingly high transition rates from dependence to independence at

older ages found by Rogers et al (1989) suggest considerable potential for reducing disability among older people through treatment, appropriate management and social and environmental support (Manton 1989).

2.1.2 GREEK-BORN AUSTRALIANS

2.1.2.1 Mortality data

A. *National death registrations*

Mortality data on elderly migrants is limited. For example, the main source on migrant mortality (Young 1986) only provides data on elderly aged 65-74 years. An analysis of deaths occurring in 1980-82 by birthplace region for ages 15-74 has been performed by Young (1986,1987). Mortality is reported as standard mortality ratios (SMRs). This ratio is adjusted for differences in age structure and takes a value of 100 when the mortality level is equal to that of the total Australian population.

i. Mortality profile of Greek Australians, 1980-82

Overseas-born Australians generally have lower mortality than those born in Australia, except immigrants from Oceania. Those born in North, West, Eastern Europe, North America and South and East Asia have only slightly lower mortality. Whereas those born in southern Europe (mainly Greece and Italy), the Middle East, South East Asia, Central and South America have substantially lower mortality levels.

The most striking feature is the consistently low mortality levels for Australians born in southern Europe, especially Greece. Italians, have slightly higher mortality levels than Greeks due to substantially higher death rates caused by diseases of the respiratory system, digestive system and liver as well as higher death rates from stroke in women, and cancer of the lungs in men (Young 1986; Powles 1990b).

Between ages 45 and 64, Southern European death rates are only half those of the Australian-born. Mortality levels for this group are lower than in their countries of origin and show little tendency to converge, with increasing residence, towards those of the Australian-born (Powles 1991). Data for 1986 show that the mortality advantage of southern Europeans is holding constant, implying that absolute mortality rates are declining at a comparable rate to those of the Australian-born (ABS 1989a). At the age of

20, their estimated life-expectancy advantage over the Australian-born, on 1980-82 mortality rates, was 5.6 years for males and 3.5 years for females. The minority Asian population of Hawaii is the longest-lived population in the world, followed by southern European born Australians (Powles 1990a).

ii. Causes of Death (standard mortality ratios) of Greek Australians aged 15-74 years, 1980-82

The mortality advantage of southern Europeans is spread over the major cause of death categories in which diet plays a major causal role - cancer followed by cardiovascular disease, accounting for 80% of all deaths. For Australian-born, the biggest killer is cardiovascular disease followed by cancer. The majority of deaths occur from cancer in Greek-born (GB) Australians (SMR M 77, F 75); but the rates are lower than rates in Greece (mainly for stomach cancer) and much lower than rates for the Australian-born (AB) (SMR M 101, F 102) (Young 1986; Powles 1990a).

Death rates from a number of sites are generally low including colon, breast, ovary, cervix (one of the lowest rates of all ethnic groups), prostate and skin. With increasing length of stay, incidence rates of colonic and breast cancer tend to converge towards those of the AB, but with offsetting declines at other sites - namely stomach and cervix (Armstrong et al. 1983; McMichael et al. 1980).

The next most common cause of death for the GB include ischaemic heart disease (SMR M 68, F 48) and stroke (SMR M 69, F 56). Death rates in Greece are lower for ischaemic heart disease for both men and women but much higher for stroke. Compared to the AB, (ischaemic heart disease SMR M 105, F 105; stroke M 108, F 108) the GB are at a distinct advantage.

As with cancer death rates, with increasing length of stay ischaemic heart disease death rates increase, with offsetting declines of fatal stroke (Young 1986). These data suggest that if the rate of death from circulatory diseases is increasing in persons of Greek ethnicity, it is doing so no more rapidly among those in Australia than among those in Greece.

Deaths from diabetes are well above expectation for the GB (SMR M 123, F 123) compared to AB (SMR M 97, F 99) (Powles 1990a).

iii. Causes of Death (Age specific mortality rates) of Elderly Greek Australians aged 65-74, 1980-82

The picture for elderly Greek Australians does not appear as favourable when compared to the younger age groups, as well as to other ethnic groups and the Australian-born. In contrast to their younger counterparts, where cancer is the main cause of death, circulatory diseases were the most common cause of death in Greek-born elderly, followed by cancer.

Age-specific mortality rates (AMR) from circulatory diseases more than triple from the age group 55-64 to 65-74 for most ethnic groups. When compared to AB (M 230, F 113) and IB (M 129, F 82), death rates from circulatory diseases for elderly GB (M 166, F 75) are significantly lower (except for Italian men). This advantage of elderly Greeks is mainly due to much lower death rates from ischaemic heart disease (AB M 156, F 67; GB M 109, F 35; IB M 87, F 47) as opposed to stroke (AB M 41, F 29; GB M 37, F 23; IB M 25, F 23) (Young 1986).

Age-specific mortality rates (AMR) from cancer more than double from the age group 55-64 to 65-74 for most ethnic groups. For GB, the rate almost quadruples, thus catching-up and even surpassing rates for AB. When compared to AB (AMR M 110, F 56) and Italian-born (IB) (AMR M 96, F 33), cancer death rates for elderly GB (AMR M 112, F 50) are equally as high - particularly for cancer of the digestive and respiratory system in men and breast in women (Young 1986).

McCallum (1992) states " *Most immigrants live longer than people born in Australia. There is evidence to suggest that long-term residence in Australia is associated with a slightly higher risk of death. Thus, in terms of survival, immigrant groups have the advantage, while the Australian-born have the worst life chances. Successful ageing, however, depends on how well these extra years are lived, not merely upon the relative length of life.*"

Morbidity data may help reveal whether these longer years of Greek Australians are in fact spent in better health (see section 2.1.2.2 and figure 2.1.2.2a).

B. Population-based national cancer registrations

Using data from the Australian Bureau of Statistics, age-sex-standardized cancer death rates in migrants, by country of origin (United Kingdom, Scotland, Ireland, Poland, Yugoslavia, Greece, Italy) and duration of residence (<16 years and >16 years), were calculated for 1962-1976 and compared with Australian-born, to determine dietary factors in cancer aetiology (McMichael et al., 1980, 1983).

All seven migrant source countries, in 1970, had higher rates of stomach cancer than Australia, and the corresponding migrant groups which initially reflected those higher rates, experienced an approximately 25% risk reduction with increased duration of residence. The four European migrant groups, whose native risk of colon cancer was about half that of the Australian population, showed a doubling in risk with increasing duration of stay, converging to Australian-born rates.

The increase was greater in men (particularly Greek men) than in women, perhaps reflecting their greater dietary acculturation. Rectal cancer showed even larger increases than colon cancer risk with increased residence. Estimated per capita consumption of various major food stuffs was obtained for the 1950s from food balance sheets. Consumption was expressed relative to an arbitrarily assigned figure of 10 for Australia.

Greece had the following per capita consumption relative to Australia: cereals 16; potatoes 9; pulses and nuts 42; sugar 2; vegetables 14; fruits 13; meat 2; eggs 4; milk and cheese 4; total animal fats 2; vegetable oils 26. McMichael (1980, 1983) indicates that the large increase in intestinal cancer risk among Greek migrants is consistent with an increased intake of animal fats and meat and a decreased intake of dietary fibre.

2.1.2.2 Morbidity, Disability and Well-being

The mortality experience of individual ethnic groups varies widely. However, mortality data is limited because it does not provide an accurate picture of health and morbidity in the community. Indeed, 'health' is made up of at least three dimensions: measures of disability, symptoms and subjective well-being.

A. National morbidity data

i) National Health Survey, Australian Bureau of Statistics, 1989-90

The large scale household surveys conducted by the Australian Bureau of Statistics are the main source of representative data on self reported states of health in immigrants. The National Health Survey was conducted by the Australian Bureau of Statistics (ABS, 1991b) in 1989-90 on Australians, of all ages, including non-English speaking persons.

Subjects were interviewed about the illness/injuries they experienced, actions they had taken in regard to their health, and about aspects of their lifestyle and other characteristics which may affect their health. The published data classifies specific ethnic groups into broader groups, such as southern Europeans, but not by age strata. However, unpublished data by age strata is available from the ABS on request (ABS 1991b).

This service was used to obtain information on the health status of southern European-born (SEB) and Australian-born (AB) by age strata; the standard error of 25-50 on the numbers of Greek Australians was too high to reliably use non-aggregated ethnic group data (see Appendix 1). The total population of SEB in Australia was 722,200 (M 385 800, F 336 400) with those aged 70 plus numbering at 51,700 (M 25 800, F 25 900); the total population of AB was 13,253,000 (M 6 564 000, F 6 689 000) with those aged 70 plus numbering 907,600 (M 353 900, F 553 700). A greater proportion of SEB were aged 70+ (14%) compared with AB (7%).

A total of 73% of the SEB (M 70%, F 77%) reported an illness compared to 65% of the AB (M 63%, F 67%). Of the SEB aged 70+, 91% (M 90%, F 93%) reported an illness compared to 96% of the AB (M 96%, F 96%). The health status of SEB Australians does not appear as favourable when morbidity data is examined, especially for those aged over 70 (see figure 2.1.2.2b).

Diabetes was three times more prevalent in the SEB population (3-4%) compared to the AB (1-2%), and its prevalence increased five-fold in those aged over 70 (SEB M 13%, F 12%; AB M 5%, F 3%). There appears to be little gender specific differences in prevalence.

Although death rates from heart disease in 1982 were about 40% lower for SEB compared to the AB, the proportion of SEB suffering from heart disease was slightly

higher in 1989, especially for the men (M 2.7%, F 1.8%) compared to the AB (M 1.8%, F 1.6%). However, its prevalence increased only three-fold in those aged over 70 for the SEB (M 11%, F 7%) compared to six-fold in the AB (M 11%, F 10%).

Additionally, the prevalence of hypercholesterolaemia was about three times higher in SEB, (M 5%, F 6%) compared with AB (M 2%, F 2%). For those aged 70+, the prevalence of hypercholesterolaemia increased four-fold for SEB men (19%) and 1.5 times for women (10%); for AB it increased only slightly (M 2%, F 3%).

Death rates from stroke for SEB were also about 40% lower than that of the AB (but about the same in the 70+ age group), even though the prevalence of hypertension in SEB (M 10%, F 14%) was nearly twice that of AB (M 6%, F 7%). Similarly, death rates from stroke were significantly higher for SEB men in all age groups, yet more SEB women had hypertension compared with the men. The prevalence of hypertension doubled for SEB men aged 70+ (22%) but quadrupled for AB men (23%). Hypertension tripled for SEB women (42%) and quadrupled for AB women (32%) aged 70+.

Death rates from cancer in 1982 were about 30% lower for SEB compared to AB, but in the older age groups death rates from cancer for SEB surpassed the AB rates. This was also reflected in the morbidity data; SEB had about half the prevalence of cancer (M 0.6%, F 1%) compared with the AB (M 1.7%, F 1.6%). In the 70+ group however, the prevalence of cancer increased dramatically by nine-fold for SEB men (5.5%) and six-fold for SEB women (6%) compared to only four-fold for AB men (8%) and three-fold for AB women (5%).

Nerve problems (included tension, nervousness and emotional problems) were reported at least three times more often by SEB (M 2%, F 4%) compared to AB (M 0.7%, F 1%). In the 70+ group, nerve problems increased more than three-fold in the SEB (8%) and more than two-fold in the AB (2%). Depression was also three times more common in the SEB (M 0.7%, F 1%) compared with AB (M 0.2%, F 0.3%). Insomnia was reported two times more often by the SEB (M 0.9%, F 0.6%) compared with AB (M 0.2%, F 0.5%) which doubled in the 70 plus age group (SEB 6%; AB 2%).

Ulcers were more than two times more prevalent in SEB (M 3%, F 2%) compared with AB (M 1.5%, F 1%) which rose more than two-fold in the 70 plus age group for both SEB (M 8.5%, F 8%) and AB (M 4%, F 2%). The proportion of respondents reporting arthritis were similar for both SEB (M 12%, F 23%) and AB (M 8%, F 12%). The prevalence more

than doubled in the 70 plus age group for SEB (M 23%, F 55%) and quadrupled in the AB (M 35%, F 46%). More women appeared to report having arthritis.

ii) Risk Factor Prevalence Surveys of 1980 and 1983 (National Heart Foundation 1985)

These surveys indicate that rates of both smoking and obesity are higher among males born in southern Europe compared with Australian-born males. Increases in the prevalence of obesity between surveys were marked (about 5% and mostly among those aged 25-44), compared with only small increases for the Australian-born population over this period. These differences were found to be statistically significant. Nevertheless, these data suggest only tentatively that obesity may be more common, and on the increase, among southern Europeans because the samples were small, and a greater proportion were of lower socioeconomic status, a factor likely to increase the prevalence of obesity independently of ethnicity.

In general, the relatively small differences observed in risk factor prevalence (including smoking) are insufficient to explain the considerably lower mortality (1982 data) from heart disease among immigrants from southern Europe (Powles and Gifford, 1990).

B. Morbidity data from samples

i. Ulman and Abernethy 1975; Lovell and Prineas 1974

The classic risk factors for heart disease provide an incomplete explanation for its relative low incidence among southern Europeans. Two random household surveys of inner urban samples in Melbourne in the early 1970s compared blood pressures in Australian- and Italian-born subjects. Both studies showed substantially lower pressures in Italian-born males; for females this pattern was repeated in one study, while in the other there were only modest differences. However, Italian respondents had higher body mass indices than Australian-born, and these were higher for women than for men (Ulman and Abernethy 1975; Lovell and Prineas 1974).

ii. Armstrong et al. 1983b

A study of immigrants from Italy (and a reference group of British ancestry) in Perth in 1977 found systolic and diastolic blood pressures to be lower when compared with an

age-matched Australian-born sample, even though higher levels of body fat, smoking and drinking were noted in the Italian group. Differences were not observed in total serum cholesterol levels. Italian males and females had higher body mass indices (28 and 29) than the age-matched Australian-born sample (24 and 25) (Armstrong et al. 1983b). Risk factor levels varied little by duration of residence.

iii. Powles et al (1988a,b,1990a)

In a study of immigrants from the Greek island of Levkada, risk factor levels in migrating and non-migrating siblings were compared (Powles et al. 1988a,b). Blood pressures were found to be substantially lower in those who had remained on the island and to have risen roughly half way towards Australian levels in the immigrants.

The most significant predictor of blood pressure in this study was body mass index, which was also higher for immigrants than for their siblings in Greece (Powles et al. unpub.). Blood total cholesterol concentrations differed little between the non-immigrants and immigrants and both were similar to published Australian values. Mean body mass index values of Greek immigrants were higher (for males) than those of their siblings and other family who had remained on the Greek island of Levkada (M 26, versus 24; F 26 versus 25) suggesting a tendency for male immigrants to increase weight (Powles et al. 1988a, 1990).

iv. Australian Family Project survey (AFP), 1983

The family project was a social survey comprising a two stage probability sample, conducted in Sydney. Respondents were aged 60 and over and living at home. It did not deal with ethnic aged as a major topic because of relatively small numbers of subjects from non-English speaking countries (NES) (n=133) as opposed to the numbers of Australian-born (n=755) and migrants from English speaking countries (ES) (n=163). All respondents from NES speaking countries were fluent in English and consequently atypical of elderly migrants from this group. Additionally, the sample contained older respondents, and those more likely to be handicapped. Mainly the data on migrants from English-speaking countries have been used by other researchers for comparative purposes.

v. Australian Institute of Multicultural Affairs (AIMA) survey, 1984

A large survey of 1110 elderly aged 60 and over and living at home. The sample was comprised of the following ethnic groups: Italy 26.7%, Poland 25.5%, Greece 13.3% (n=148, M 48%, F 52%), Yugoslavia 14.4%, China 11.3%, Germany 8.7%. Questions in the survey matched the questions in the AFP survey which was used for comparative data on Australian-born. This survey has serious limitations because it was conducted in areas of Sydney and Melbourne which had large ethnic communities. Such areas are likely to contain relatively larger numbers of disadvantaged respondents, because successful immigrants move out of such areas. Similarly a survey of the elderly cared for at home will reveal more sick elderly of ethnic origin than Australian-born, because the ethnic elderly are less likely to have been institutionalised than the Australian-born (McCallum 1990; AIMA 1986; Colson 1986).

Even though this study has serious limitations, many researchers have used this survey to provide evidence regarding health status and well-being. A favourable impression of health status among immigrants may appear to be challenged, at least for the elderly, by the AIMA survey. Nearly 10% of the sample claimed to be in excellent health, 64% assessed their health as good or fair and 26% as poor. The Greek-born reported the 'poorest' health with 5% claiming excellent health, and 40% poor health. The order in self reported health status of the 6 groups was: German-, Italian-, Polish-, Yugoslav and Greek-born.

This order was essentially the same for the age groups (60-4,65-9,70-74,75-79,80-84,85+) and for males and females. Regardless of age, males claimed to be healthier than females. Increased age presented only a slight decline in reported health to the age of 74. However, between the ages 75 and 80, health status dropped sharply. Generally the decline in health with greater age was more pronounced among males. Decline in health over the past 5 years was considerably greater for the ethnic aged than for either the Australian-born aged or those from ES countries.

Reported deterioration in health was greatest among the Greek-born (75%) and least among the German-born (35%). The only specific health problems addressed in the interview were: hearing, eye, mouth and feet problems as well as mental problems. There were only minor variations among birthplace groups in the incidence of hearing problems, with the Greek-born reporting the poorest hearing. As a group, the aged from NES countries (especially the men) reported many more problems with hearing than did the Australian-born. The situation for eyesight problems was very similar except that men

reported better eyesight than women and eyesight did not decline as markedly with increased age compared with hearing problems. Similarly, foot problems were more common with the NES subjects (especially Greeks) which significantly increased with age and were more common among females.

The order of birthplace groups, reporting 'no problems' with oral health was: Germany (81%), Poland (69%), Yugoslavia (68%), Italy (62%), Greece (43%) and China (41%). Oral health declined only slightly with age and there was no significant difference between males and females. Depression was most common among the Greek- (38.5%) and Italian-born (22.6%), and least common among the Chinese- (12.8%) and German-born (10.35). It did not increase significantly with increasing age but was significantly higher among females in the sample. Boredom and loneliness were also commonplace for the NES respondents - the highest being for Greeks (43%), then Chinese (23%), Italian (21%), Polish (16%), Yugoslav (16%), and German (7%).

Colson (1986) concludes : " *the AIMA and AFP surveys, without a major exception, indicate that the ethnic aged consistently reported poorer health than the Australian-born aged in terms of both self rated health status and the use of services, the Greek-born aged appear to have the poorest health*".

Dollis (1989) states: " *The picture which emerges from this survey is one of limited mobility, high levels of ill-health and, as a consequence, higher dependence on others for support*". McCallum and Shadbolt (1989) using new analyses to control confounding variables confirmed the association of low well-being scores with non-English speaking background, especially when English proficiency was poor. Nevertheless, McCallum (1990) after extensive review of this survey, concludes that it has too many limitations and that the ACOTA/DCS survey is best used to identify differences between immigrants and the Australian-born on a range of health-related variables.

**vi. Australian Council on the Ageing & Department of Community Services
ACOTA/DCS) survey, 1985**

This survey conducted in 1981 has fewer limitations than the AIMA survey. It contains representative groups of immigrants and Australian-born from a random sample of 3016 respondents living at home in Melbourne and Adelaide - thus some biases inherent in the AIMA methodology were avoided.

Of the total sample, 65.5% were born in Australia, 17.7% in other ES countries, and 16.8% (n=512) in NES countries (7% southern Europe n=211, 4.7% eastern Europe, 2.7% north-west Europe, other 2.2%). The majority of the respondents in the southern European group were born in Italy (4.7%) - only 0.9% were born in Greece (n=27).

A limitation of this study is with respect to the conduct of the interview. Of the 369 migrants from NES backgrounds, only 88 interviews were conducted (fully or partially) in a language other than English, with the Italian-born being the only group to have a significant number interviewed. Data on country of birth is presented as 4 major groups due to limited numbers: 1. Australia-born 2. non-English speaking (NES) countries 3. English-speaking (ES) and 4. total.

This study did not find the immigrant elderly to be generally disadvantaged in health terms, although it did confirm lower rates of subjective well-being in immigrants from SEB and eastern Europe and NES countries outside Europe than respondents born in Australia.

NES immigrants were most likely to feel that their health was poor, with similar proportions of SEB (14%), eastern Europeans (14%) and persons from NES countries outside Europe (13%). Only 2.5% of north-west Europeans and 4% of Australian-born thought their health was poor, a proportion similar to the survey norm of 5%. Of those persons who considered they were in poor health, 95% reported at least one chronic condition and were also more likely to have multiple chronic conditions. Overall, the most prevalent chronic illnesses reported for all groups were musculoskeletal diseases (38%), followed by nervous, mental disorders (17%), ear disorders (17%), eye disorders (14%) and circulatory system diseases (10%). These conditions increased significantly with age.

There was little difference in the overall prevalence of chronic conditions reported by women or men (62%), even across age groups. However, women were more likely to suffer from chronic musculoskeletal diseases and men from ear disorders and diseases of the respiratory system. Only small differences were observed between the groups in self-reported chronic illnesses and disabling conditions. Persons born in NESB countries, especially those aged 65-74, appeared somewhat more likely to report diseases of the circulatory system (12%) compared to Australian-born (10%) and other-English born (8%). The prevalence of circulatory diseases increased almost 3-fold in those aged over 75 for the NES compared to less than 1.5-fold in the English immigrants and Australian-

born. Also, NES were less likely to report ear disorders (12%) compared to Australian-born (18%) and other-English born (18%).

Nervous or mental disorders were high among SEB (22.5%) with proportionately more indicating treatment for nervous or mental disorders (7%) than the average (4.5%). The consistent finding of psychological distress is further supported by their lower levels of well-being. They were over-represented among those who received needed assistance with domestic tasks, meals, shopping, linen/laundry, light and heavy housework.

They were also more likely than all others to have met their needs with other household tasks (gardening, home maintenance and repairs, transport). However, the source of support was more likely to be from the informal support network than for the mainstream elderly - mainly from a spouse followed by a relative or friend living outside their household. It is not possible to draw conclusions about the health and well-being of Greek elderly in this survey due to the small numbers studied (less than 30 subjects). This highlights the need for further studies.

2.1.3 GREEKS IN GREECE

2.1.3.1 Mortality data

Age adjusted mortality from all causes in Greece is among the lowest in the world and, accordingly, life expectancy at birth of this population is one of the longest. This is particularly true with respect to men, and is accounted for by very low cause-specific mortality rates from coronary heart disease and several cancers, notably those of the large bowel, the prostate and (among women) the breast (WHO, 1992; Trichopoulos et al., 1989). The latest World Health Organization report (1992) showed Greece as ranking second in the world (after Japan) in average life expectancy at birth (M 74.3, F 79.4); Australia ranking 12th (M 73.2, F 79.8).

i. National data

Data on disease incidence have not been deemed reliable in Greece, whereas mortality data are considered to be of relatively good quality (Trichopoulou and Efstathiadis, et al., 1989). The age standardised death rates per 1000 in 1989 for ischaemic heart disease was almost half (M 91.5, F 36) that of 1988 Australian rates (M 170.5, F 82) but stroke rates were almost double (M 78, F 79) that of Australian rates (M 47, F 42). Death rates for cancer were only slightly lower for Greece (M 603, F 393) compared to Australia (M

649, F 378), with rates being slightly higher for stomach cancer (M 9, F 5) and lower for breast cancer (15.5) compared to Australia (M 8, F 4; 21) (WHO 1992).

The main causes of death (rate/1000) for Greek elderly aged 65 to 74 were circulatory diseases (M 1404, F 959) followed by cancer (M 971, F 457). Australian elderly, however, have higher death rates for circulatory diseases (M 1639, F 826) as well as cancer (M 1097, F 586). In the 75 and over age group in Greece, death rates for circulatory diseases increased four times for the men, and the women catch-up with a six-fold increase (M 5489, F 5569). In contrast there was only a two-fold increase in cancer death rates with twice as many men dying from this disease (M 1746, F 824). In contrast to Greece, death rates in Australia for circulatory diseases in this age group were lower for both men (5146) and women (4582), but not for cancer (M 2179, F 1088).

Death rates for specific circulatory diseases differ between the countries. Death rates for stroke were higher in Greece (M 391, F 375) than Australia (M 257, F 181) in the 65-74 age group. In the 75+ group there was a five-fold increase in death rates for the men and a seven-fold increase for the women in both countries resulting in higher death rates from stroke in elderly women. In contrast, Greece had only half the death rates from ischaemic heart disease in the 65-74 age group (M 431, F 178.5) compared to Australia (M 802.5, F 377.5). In the 75+ there was a two fold increase in death rates from heart disease in both countries, except for Australian women death rates increased four times in this age group.

Similarly, death rates for specific cancers differed between countries. In the 65-74 age group death rates for stomach cancer in Greece (M 54, F 32) were similar to rates in Australia (M 56, F 22) with rates being slightly higher for the Greek women. In the 75+ group, death rates for stomach cancer doubled in both Greece (M 130, F 81) and Australia (M 136, F 66). In contrast, the death rates for colonic cancer in Greece (M 37, F 31) were only half that of Australian rates (M 93, F 71) in the 65-74 age group, with rates doubling in both countries in the 75+ group. Breast cancer death rates in Greece (63) were about half that of Australian rates (92) in the 65-74 age group, with rates doubling in the 75+ group (see figure 2.1.2.2c,d).

Even though Greece appears to have certain health advantages compared to Australia (namely less heart disease, colonic cancer and breast cancer but not less stroke or stomach cancer), Greek epidemiologists and researchers have shown grave concern for the changing health profile of Greeks.

Trichopoulou and Efstathiadis (1989) analyse the time trend of coronary heart disease mortality in Greece between 1969 and 1980. They indicate, that even though it is very low, mortality has been increasing and that perhaps this increase reflects even more marked increases in incidence because its better contemporary treatment has improved the case fatality ratio (Papaevangelou and Tsibos, 1982).

They contrast the alarming upward trend in heart disease mortality in Greece with the decreasing trends in the United States and other European countries. Similarly, age adjusted mortality rates from diabetes, colon and breast cancer have also been shown to be steadily increasing (Trichopoulos et al., 1982; Velonakis et al., 1983). When compared to other southern European countries, Greece has the lowest death rates of colonic cancer but not the lowest for heart disease (Trichopoulou 1991). Comparison of morbidity data of elderly Greeks (from a semi-rural town) to other European countries, showed that they had the highest self-reported rates of heart disease and hypertension (de Groot et al., 1991).

Table 2.1.3.1 shows mortality rates per hundred thousand (age standardized to the world population) for coronary heart disease (CHD) and selected cancers in Greece, Italy, Portugal and Spain, by sex, and their ranks among the corresponding rates of 26 European countries (rank 1 indicates the lowest rate) (Trichopoulou 1991).

Table 2.1.3.1**Age standardized (World) mortality rates '100 000, 1980**

Heart disease and selected cancers, by sex

Greece, Italy, Portugal, Spain

ranked according to corresponding rates of 26 European countries

		GREECE		ITALY		PORTUGAL		SPAIN	
		rate	rank	rate	rank	rate	rank	rate	rank
CHD	M	81.4	4	94.3	5	72.3	2	73.6	3
	F	30.0	3	38.8	6	32.5	4	29.1	2
Oesophagus cancer	M	1.9	3	4.8	17	5.8	20	5.3	19
	F	0.6	6	0.8	11	1.6	21	0.8	14
Stomach cancer	M	12.1	1	22.7	20	29.7	24	19.8	15
	F	6.7	3	10.7	19	14.5	26	9.8	16
Large bowel cancer	M	7.7	1	18.2	12	16.9	9	11.8	5
	F	6.9	1	13.3	11	12.9	10	9.5	6
Breast cancer	M	-	-	-	-	-	-	-	-
	F	14.6	5	19.2	14	15.0	7	13.5	4
Ovary cancer	M	-	-	-	-	-	-	-	-
	F	2.6	3	4.2	6	2.4	2	2.3	1
Prostate cancer	M	7.3	3	10.8	7	13.8	13	12.8	11
	F	-	-	-	-	-	-	-	-

Source: Trichopoulou 1991; Rank 1 indicates the lowest rate.

These changes to the health profile of Greeks have been attributed to the progressive 'northernisation' of the Greek diet with increased consumption of meat, eggs, milk products and animal fats and decreased consumption of plant foods, especially legumes and grains. Food balance sheets reveal marked changes in food consumption over the past 20 years, mainly reflected in an increase of consumption of protein and fats of animal origin whereas the consumption of vegetables, fruits and cereals has remained relatively stable or has declined. These changes have been correlated in time and place with changes in mortality rates of major chronic disease, but a causal link needs further investigation (Doll and Peto, 1981; Manousos et al., 1985).

ii. Mortality data from samples

See section 2.2.2.2 for results from the 7-country study (Keys et al., 1980).

2.1.3.2 Morbidity data

A) National data on morbidity

Limited reliable data are available for morbidity prevalence in Greece.

B) Morbidity data from samples

Studies among adults in Greece have shown that during the last 20 years there have been marked increases in the level of plasma cholesterol and weight (Kafatos et al., 1980; Trichopoulos et al., 1983; Georgiades et al., 1969 and unpublished data 1988). Studies in children have also shown that blood pressure and obesity indices are higher in Greece than in other European countries (Kafatos et al., 1981).

i) The elderly in 11 countries (Heikkinen et al., 1983).

In 1979-80 the Regional Office for Europe of the World Health Organization initiated an international population-based study of the elderly in fifteen centres (rural and urban) in ten European countries, including rural Greece (Heikkinen et al., 1983). The principal aim of this cross-sectional study was to produce standardized and comparable data from representative population samples on the health and functional ability of elderly people and their use of health and social services. Unfortunately, dietary data and blood samples were not collected.

At each site, about 1200 elderly subjects were interviewed aged 60-89 years. The samples were obtained from electoral rolls. The questionnaire covered health and functional ability, living conditions, way of life and use of services. Most questionnaire items were from previous studies and were thus of known reliability and validity. However, some were developed especially for this survey. In Greece, the areas surveyed were largely rural, principally on the mainland of Greece but also including some islands. The areas were widely spread in the north, south, east and west and included 21 Greek villages and small towns, one of which was 30km from Athens. A total of 1508 (aged 60+ M 704, F 804) subjects were studied, of which 50% of the sample were aged 70+.

One of the most striking findings was the assessment by women of their health and well-being. Compared with the men, women were more likely to report poor health status, well-being and feelings of loneliness. Women reported more health problems (except hearing problems), more difficulty in coping with activities of daily living and less social

activity. They also used medical services more than the men. A greater proportion of the Greek elderly aged 70-79 reported good health (M 80%, F 63%) compared with other centres. Self rated health dropped in the 80+ age group in Greece (M 54%, F 50% reported good health). Most of the other variables measured have not been tabulated by centre but in 'general' graphs thus making extrapolations for Greece almost impossible.

ii) *The Euronut-Seneca study: Nutrition and Health in the elderly European community (de Groot et al., 1991)*

The major source of morbidity data on elderly Greeks in Greece is from the Euronut Seneca study conducted in 1988-89 on 2600 elderly people aged 70-75 years, living in 19 small towns in 12 European countries (de Groot et al., 1991).

This study explored dietary patterns in the elderly in relation to both social and economic conditions and to health and performance. The data comprise demographic, social, diet, mobility, health and performance aspects, which were all collected by questionnaire. Many questionnaire items were taken from the instrument used in the WHO 11 country elderly study (Heikkinen et al., 1983). Anthropometry and blood analyses were also carried out.

The study has both a first stage cross-sectional design (1988-1989) and a second stage mixed longitudinal design (for centres able to take part). The cross-sectional study included a randomly selected sample of 30 men and 30 women born in 1913-1914 giving a total sample of 60. The longitudinal design included a randomly selected sample of 30 men and 30 women born in 1913-1914, 35 men and 35 women born in 1915-1916, 45 men and 45 women born in 1917-1918 giving a final sample of 110 men and 110 women. Elderly living in psycho-geriatric homes were excluded as were elderly not fluent in the country's language or unable to answer questions independently.

The following countries took part in the study: Norway, Italy, Greece, Switzerland, Poland, Hungary, Belgium, Denmark, Netherlands, France, Portugal and Spain - the first 6 countries only took part in the cross-sectional study. It was specified that the size of the town(s) should be 10,000-20,000 and 'traditional' in nature. The majority of the towns selected were semi-rural, ranging from lowlands to mountainous with a range of temperate climates. In most countries, towns were selected with a population and socio-economic structure comparable to the average country structure. The results however, are not representative for the country as a whole. Additionally, results of the non-

responders' questionnaire indicate a somewhat selective participation; responders tended to be male, non-smokers, healthy and better educated.

In Greece, a rural town on the mainland and two rural towns on an island were selected: 33 men and 27 women aged 75 were studied in Markopoulo (M/GR) located 20km from Athens; 36 men and 49 women, aged 75 were also studied in Anogia and Archanes (AA/GR) located near Iraklion, Crete. Both places were essentially devoted to traditional and manual agriculture, with 75% of the elderly engaged in farming e.g vineyards, olive-groves, sheep farming. Results have been reported separately for the two towns since there appears to be differing morbidity profiles - elderly Cretans being slightly healthier with a lower prevalence of heart disease. The average participation rate was around 50% with Greece and Crete having two of the highest response rates (61%, 81% respectively). The results therefore are not truly representative of all 70-75-year-old people living in the towns studied. In all centres, self-perceived global health was better in men than in women. The greatest proportion of elderly men and women, respectively, reporting good health were in Northern Switzerland (86%, 82%), Netherlands (79%, 71%), Denmark (72%, 71%) and mainland Greece (73%, 56%). The greatest proportion reporting poor health were in Central Italy (28%,31%), Portugal (23%, 41%), Crete (17%, 22%) and Hungary (14%, 23%).

Overall, few persons in any country considered their health poor (about 1 in 10), or very poor (about 1 in 100) and a greater proportion of subjects in north-western industrialised towns tended to answer that their health was good compared with Mediterranean/rural centres. Despite the fact that most of the subjects judged their health as good (20-82%), a large proportion of elderly (59-92%) answered 'yes' to the question: 'Are you suffering from a chronic disease?'. On average most subjects (especially women) suffered from at least one chronic disease. The lowest percentage of elderly men and women respectively reporting a chronic disease were the Swiss from the north (58%, 59%) and the highest percentage were the Norwegians (91%, 89%) and Portuguese (93%, 92%) - the remaining countries averaged around 70%, including Greece (M/GR 70%, 85%; AA/GR 72%, 86%).

The most common chronic diseases mentioned were arthritis, hypertension and ischaemic heart disease. The highest percentage of arthritis was reported in Greece (M/GR 53%; AA/GR 41%), central France (54%) and central Italy (44%) and the lowest in the Netherlands (5%) and Norway (10%). The highest percentage of hypertension was reported in Greece (M/GR 33%, AA/GR 29%), Hungary (26%) and Portugal (30%) and the lowest in Switzerland (10%), Netherlands (15%) and Norway (15%). The highest

percentage of diabetes was reported in central Italy (17%) and Norway (15%) and the lowest in Denmark (2%) and central France (4%) - other countries averaged about 10% (M/GR 8%, AA/GR 6%). The highest percentage of ischaemic heart disease was reported in Portugal (30%), Greece (28%) (but not Crete (18%) and Norway (27%) and the lowest in central Italy (5%) and Spain (4%). The highest mean cholesterol levels (mmol/l) for men and women respectively were found in Norway (6.2, 7.8) and the Netherlands (6.1, 6.7) and the lowest in Portugal (5.2, 6.2) and Crete (5.8, 5.9) - the remaining countries had similar levels, including mainland Greece (6.1, 6.1). The highest mean high density lipoprotein cholesterol levels (mmol/l) for men and women respectively were found in Denmark (1.2, 1.5), France (1.4, 1.6), Hungary (1.4, 1.4), Spain (1.2, 1.5), Italy (1.4, 1.6) and Portugal (1.3, 1.4) and the lowest in Norway (1.0, 1.3). The remaining countries had in between values e.g Greece (M/GR 1.1, 1.5; AA/G 1.2, 1.2). The highest mean triglyceride levels (mmol/l) for men and women respectively were found in Hungary (1.8, 1.9), Norway (1.6, 1.9) and mainland Greece (1.5, 1.1), and the lowest in Portugal (1.3, 1.4) and Crete (1.3, 1.5).

This data suggests that the morbidity profile of elderly Greeks may have changed in an unfavourable direction with a greater prevalence of heart disease and hypertension comparable or greater than other European centres.

2.2 FOOD AND NUTRIENT INTAKE

The low mortality rates in the Greek population in Greece and Australia are not adequately understood, but speculations have focused on the Greek diet (Keys, 1980; Helsing & Trichopoulou, 1989). The Greek diet represents an important variant of the Mediterranean diet, which is currently attracting the interest of nutritionists and epidemiologists (Sacks & Willett, 1991) as a time-tested health promoting nutritional pattern (Trichopoulou et al., 1993b).

There have been several attempts to identify the components and the composition of the Greek diet in ad hoc studies (Keys, 1980; Aravanis et al., 1988a,b; Kafatos et al., 1991; Trichopoulou, 1992) and in case control studies (Trichopoulou et al., 1993a). It is concluded that low total fat intake is not a characteristic of the Greek diet and cannot explain the apparently health-promoting consequences of this diet.

There is strong evidence to suggest that the adoption of a mainstream Australian diet by Greek Australians leads to poorer health and that maintenance of a more traditional diet

can be protective of health (Powles 1990). Even though there has been increasing interest in the Mediterranean diet, there are relatively few studies on the food habits of Greeks in Greece and Australia, with little data on the elderly.

2.2.1 GREEK-BORN AUSTRALIANS

Research concerning the nutritional status of immigrants has been narrowly defined and measured. The lack of the similarity of the methods between studies limits the comparability of results, and the methodological difficulties in studying the diets of immigrants may discourage relevant research. There are limited studies comparing food and nutrient intake of Greeks in Australia with Greeks in Greece.

The study of immigrants' eating habits provides clues to reasons for observed changes in health status, both beneficial and harmful, and may provide information for use in planning strategies to maintain or improve traditional dietary habits. While the lower mortality rates of many immigrant groups can be attributed partly to selection (self or system) of healthy immigrants, and partly to genetic differences, they must also be the result of the protective elements of the diets that immigrants bring with them, and retain to some degree (Webb and Manderson, 1990).

2.2.1.1 Food and nutrient intake from national data

A. *Australian Bureau of Statistics - Apparent consumption of foodstuffs & Household Expenditure Surveys*

National food production statistics (adjusted for processing losses and stocks) have been used to assess food consumption differences by country of birth; such as food balance sheets and Household Expenditure Surveys. These sources of information have their limitations in estimating food consumed, because they do not take into account food waste, non-human use, household produce (e.g dairy products, home-grown vegetables and home-made wine), price differences within food groups, or the relative distribution of foods among household members (English 1986, Powles et al., 1990). Even though these data are for expenditure, not for quantity actually consumed, they still prove useful in comparisons with dietary intake assessments of individuals.

i) McMichael (1983)

The average 'apparent' consumption of foodstuffs in Australia were compared, with that of six countries of origin of various immigrant groups, over the period 1958 to 1966. Apparent consumption of vegetables and cereals was higher (especially southern Europeans) in all source countries except Yugoslavia, where it was lower than in Australia. 'Apparent' consumption of pulses and nuts was considerably higher in all Southern European countries than in Australia. The quantity of fruit consumed was lower than Australia in all the source countries, except in Greece, where it was higher. Vegetable oil consumption in Greece and Italy was double the Australian level, but meat, eggs, milk, cheese and sugar consumption was substantially lower in southern European countries and Poland than in Australia.

ii) Powles et al. (1990)

Household expenditure on food between six immigrant groups and native-born Anglo-Australians were compared using data from the 1984 Household Expenditure Survey. There was a statistically significant greater household expenditure on fruit, vegetables, bread and cereal by southern Europeans and South-East and East Asians, with the highest expenditure reported for Greeks. The types of fruit and vegetables consumed differed between ethnic groups; Greeks consumed more leafy greens, tomatoes and more seasonal fruits such as grapes, watermelon and cantaloup and less root vegetables.

In contrast to 1958-1966 apparent consumption, there was greater expenditure on red meat by southern Europeans (statistically significant for Greeks which had the highest expenditure) than by the Australian-born or northern Europeans. Greeks also had a significantly higher expenditure on fish/seafood, eggs and oils and significantly lower expenditure on margarine, wine and beer than Australian-born. Expenditure on wine was low probably because of access to home produced wine.

B. The National Dietary Survey of Adults, Dept. of Health, 1983

The National Dietary Survey of Adults was undertaken in 1983 (Cashel et al. 1986; English et al. 1987). It was the first population-based, Australia-wide survey of dietary intakes since 1944. Other population-based dietary surveys have been conducted in Australia since the 1983 survey (Baghurst et al. 1988 a,b,c), but data concerning country of birth differences have not been analysed or published thus far.

In the 1983 survey, of the 6225 respondents aged from 25 to 64 years, 4597 were Australian-born (AB), 743 from United Kingdom, 282 from northern Europe, 375 from southern Europe (mainly Italian) and 186 from Asia. Information was based on 24-hour recall of all foods and beverages. The descriptive survey results suggest marked differences in food consumption between ethnic groups, which have been found to be statistically significant (Nichols unpublished data).

Southern Europeans and Asians ate substantially more bread and cereals, particularly white bread, pasta and rice, but substantially less breakfast cereals than the Australian-born or northern European respondents. Wholemeal bread consumption was more common among the latter groups.

In contrast to the household expenditure survey, total vegetable consumption was lower among Asians and southern Europeans. They consumed substantially more selected fruits and vegetables, including citrus fruits and juices, leafy greens, tomatoes and tomato products, than did the Australian-born sample. Respondents born in Australia ate more potatoes and other root vegetables than southern European and Asian immigrants (Webb and Manderson 1990).

Actual plant food consumption by Greeks is probably even higher than suggested by the expenditure and national surveys given that vegetable gardens are commonplace in Greek households and their consumption under-reported. The discrepancy in vegetable intake between the two surveys may be due partly to the differences in ethnic composition: Italian immigrants (who spend similar amounts to the Australian-born population on vegetables) were in the majority in the National Dietary Survey sample. Under-reporting of cooked vegetables, more common than over-reporting (Karvetti and Knuts 1985), may have occurred more frequently among immigrants with limited fluency in English.

Meat consumption was high for all groups (and differed to AB by only about 10%), although the types of meats varied between groups. The Southern European-born (SEB) ate more beef, pork and fish and less lamb, meat products and takeaways. SEB used less dairy products, notably milk, but cheese consumption was higher than AB. Also, their per capita consumption of butter and margarine was only half that of the AB, as was their consumption of sugars, jams and alcoholic beverages (Webb and Manderson 1990). Immigrant women have adapted their diets somewhat more than males towards the mainstream Australian diet. This finding is in conflict to other studies (Rutishauser & Wahlqvist, 1983; McMichael et al., 1983).

Differences were also observed in total energy intake and the composition of the diets between the AB and immigrant respondents (English et al. 1987). Reported average energy intakes were lower for all immigrant groups than for the AB (M 11340 kJ F 7490 kJ) - especially for SEB (M 9730 kJ , F 7040 kJ).

While all diets were high in protein (about 18%), in contrast to other studies, the contribution of fat (about 36%) to total energy intake was comparatively low amongst SEB compared to AB (about 40%). This finding is interesting in view of the higher intakes of beef, veal and cheese by SEB, offset by their considerably lower consumption of fat spreads and milk. However, the quantification of olive oil consumption by SEB is notoriously difficult given habits such as dipping bread in oil. If oil intake is carefully measured then total energy and fat intake may have been higher.

Thiamin and magnesium tended to be lower in the diets of SEB, perhaps associated with their higher reported intakes of white bread relative to wholemeal and their lower consumption of enriched breakfast cereals than the AB (Webb and Manderson 1990). The minor differences reported in nutrient intakes between the ethnic groups and AB suggests that foods per se may be more important in explaining the large differences in patterns of diet-related disease between immigrant groups (Hankin et al. 1983; Powles unpub.). In comparison with apparent food consumption in countries of origin (Food balance sheets), the few immigrant groups that have been studied in Australia appear to increase their intakes of meats, dairy products and fat spreads, at the expense of cereals and vegetables. These changes are generally consistent with self reported, post migratory changes in diet. After migration there also tends to be an increase in the quantity of food and their energy intake (Webb and Manderson, 1990).

2.2.1.2 Food and nutrient intake from samples

i) Armstrong et al. (1983b)

About 170 Italian-born and 170 Australian-born were surveyed in Perth in 1977. Only 2% of the Italian-born had been resident less than 10 years. Although the study population is not representative, and the recall and self assessment of the dietary change are not necessarily accurate, the findings are instructive. Surprisingly, fewer immigrants (58%) than Australian-born (77%) reported that their diets had changed. Among the 111 Italian-born who reported that their diet had changed since migration, the most notable reported changes were an increase in meat (68 %), fish and animal fats (39%) and a decrease in

starchy foods, vegetables, fruit, sugar, salt and dairy products, with little change in egg consumption. Most 'changers' said their diet had changed more than 10 years ago and the commonest reason given was 'migration'.

ii) Loftus Hills (1968)

In the study by Loftus Hills (1968), diet histories of 24 female patients with cholelithiasis who had migrated from Italy and Greece were taken for an 'average' week in their country of origin and in Australia, prior to symptoms of gall bladder disease. Although the subjects adhered to traditional ways of food preparation and cooking in Australia, they had increased their meat intake (especially beef) from once or twice a week to once or twice a day, and decreased their intake of vegetables, bread and pasta. An increased intake of biscuits, soft drinks, canned fruit and beer were described, as well as decreased consumption of milk, cheese and eggs.

iii) Kosmidis et al. (1980) and Rutishauser & Wahlqvist (1983)

One-day recorded diets of 472 randomly selected Greek immigrants in Melbourne of shorter stay (less than 16 years) and longer stay (more than 16 years) were compared in 1979/80. Relatively small differences in the diets of these groups were observed: only the consumption of several types of meats (including pork, lamb, ham and bacon) and tea drinking increased with duration of residence, particularly for men. Cheese consumption increased for women, but decreased in men, and the reverse trend was noted for pasta. The observed differences in diet were similar when two subsamples of comparable age and differing lengths of residence were compared. Greater changes in food consumption were made by Greek men than women. Adherence to religious fasting practices was maintained by only a small proportion of immigrants, regardless of duration of residence. Such religious practices involved the omission of meat, fish and eggs from the diet on Wednesdays and Fridays. However, older migrants tended to observe this custom somewhat more frequently. The conclusion of the study is tentative: there are apparently small changes in the diets of immigrants (mainly men), towards the mainstream Australian diet with increasing duration of stay, although major changes may have occurred immediately following migration (Webb and Manderson 1990).

iv) Powles et al., 1988a,b

Differences in food consumption among adult Greek siblings were studied, where at least one sibling had migrated to Melbourne from the Greek Island of Levkada 15 to 29 years ago (spouses of Greek ethnicity were also included). A total 694 siblings were studied, plus 274 Levkadian spouses, 423 offspring and 79 spouses born elsewhere in rural Greece. The effective study population was 1474 - 488 were seen in Levkada in 1983 and at least one migrant sibling in Melbourne in the following summer.

Median duration of residence for migrants was around 20 years. The diets of all study subjects were assessed with food-frequency questions. Portion sizes were obtained using a 2 day photographic and written record from 44 non-immigrants and 59 immigrants (unpublished data). The differences were noteworthy for the following food groups: compared with the immigrants, the non-immigrants consumed nearly double the amount of olive oil, vegetables (especially leafy greens), legumes, fruit, fish, cheese, eggs and wine but only half the amount of meat, less cow's milk (as opposed to goats milk), yoghurt, ice-cream, beer, and margarine on bread (Powles, pers. comm.). About 50% of the immigrants reported that their diets had changed, largely during the first year after migration. This is supported by the observation that there was little difference in the dietary patterns of the shorter and longer stay migrants.

Total energy intakes were lower among the immigrants, as were intakes of fat, carbohydrate and alcohol. The percentage of energy contributed by protein was higher among immigrants, consistent with their higher consumption of meats. Despite higher intakes of milk and yoghurt, margarine and meats, however, the percentage of energy contributed by fat was no higher for immigrants than for non-immigrants (around 40% per cent for both groups). This was largely attributable to lower oil consumption by immigrants (Powles,pers.comm).

These studies point to the fact that migrants have been changing their dietary exposures in an 'adverse' direction - with consumption of red meat and animal products rising to high levels and an apparent downward trend in cereal consumption. However, this increase in meat consumption has occurred against a background of continuing high fruit intake, vegetables (especially wild greens), legumes, cereals, olive oil and fish, in a cuisine that is still identifiably Greek.

The 1982 mortality statistics indicates that there has been little convergence towards the rates of the host population. However, more recent morbidity data (National Health

Survey, ABS 1989-1990) suggests the reverse. Whatever the nature of the protective effects of Greek culture on mortality, the capacity of Greeks to retain their cultural identity in a new environment becomes an important underlying cause of their longevity. Acculturation of the Greek diet towards greater intakes of animal foods and less plant foods may be associated with the increasing morbidity levels. Further studies are required.

2.2.2 GREEKS IN GREECE

2.2.2.1 Food and nutrient intake from national data

A. *Food Balance Sheets*

The major source of food consumption data is the Food Balance Sheets. The data are mostly generated nationally, but collated, prepared and published in a standardised manner by the Food and Agricultural Organisation (FAO). Although there are serious limitations to this data source, it represents practically the only standardized and consistent data base available for cross-country comparisons (Ferro-Luzzi and Sette, 1989; Trichopoulou, 1989). Food balance sheets reflect commercial transactions, but not necessarily actual consumption - since spoilage, wastage, storage and home production are not accounted for. They also ignore distributional characteristics within the population; different subgroups (including emigrants) may have distinctive diets. Nevertheless, for descriptive epidemiological purposes they are useful.

During the post War II period and, in particular, during the last 25 years, there have been substantial changes in the food consumption patterns of the Greek population. Table 2.2.2.1a shows food availability patterns in Greece and Australia during three, '3-year periods', spanning a 25 year range (1964-1988). During this period, there appears to have been an increase in availability of the following foods in Greece by: 100% for meat, 65% for milk, 30% for eggs, 70% for vegetables, 80% for starchy roots, 30% for nuts, 100% for sugar products, 40% for vegetable fats, 35% for animal fats and 55% for alcoholic beverages - and a decrease in availability of pulses by 30% and cereals by 16%. Availability of fruit and fish has remained stable over this period. Overall, there has been an increase in availability of plant foods by 20% and animal foods by 65%.

In contrast, in Australia over this period, the availability of meat, milk, cereals and vegetables remained stable (<10% increase), with the following foods increasing by: 20%

for fish, 100% for pulses, 30% for nuts, 36% for starchy roots, 12% for fruit, 400% for vegetable fats and 18% for alcohol. The availability of eggs decreased by 11%, sugar products by 6%, and animal fats by 40%; there has been an increase in availability of plant foods by 13% and animal foods by only 5%.

Table 2.2.2.1a

**Average food consumption in Greece (GR) & Australia (AUS)
kg per year per capita 1964-1988, Food Balance Sheets, FAO 1988**

	1964-1966		1976-1978		1986-1988		
	GR	AUS	GR	AUS	GR	AUS	
Animal foods	200	370	286	370	330	388	
meat & offal	37.2	104.3	67.2	118.9	78.4	104.3	
fish & seafood	17.9	13.3	15.7	13.1	18	15.8	
milk	136.3	240.2	192.2	226.2	224.1	256.8	
eggs	8.5	12.0	11.1	12.6	10.9	10.7	
Plant foods	524	307	587	313	624	348	
cereals	170.7	106.4	153.1	107.8	142.2	112.2	
pulses	8.1	0.9	6.1	0.8	5.6	1.9	
nuts	12.4	4.0	14.9	5.3	16.1	6.0	
starchy roots	40.0	42.0	66.3	44.8	72.7	57.3	
vegetables	118.2	69.7	188.7	67.8	201.1	77.5	
fruit	174.7	83.6	158.0	86.3	186.1	93.5	
Sugar products	18.5	51.3	32.1	52.4	35.5	48.3	
Vegetable fats	17.4	2.5	22.5	11.8	24.6	14.6	
Animal fats	2.0	13.4	1.9	10.4	2.7	8.3	
Alcohol		39.2	116.4	44.0	154.8	60.9	137.2

Source: FAO, 1988

In 1988, Greece had a similar availability of animal foods to Australia (but meat availability was 25% lower in Greece), but had 80% more available plant foods (pulses 200% more, nuts 160%, vegetables 160%, fruit 100%, and cereals 30% more). Vegetable fats were more available in Greece by 70%, whereas animal fats were less available by 70%, alcohol by 130% and sugar products by 30%.

Within and between country differences over the past 25 years is also reflected in Table 2.2.2.1b where food availability is expressed as a percentage of total calories per day. In Greece, energy 'intake' increased by 23%; this increase has been accounted for, mainly by increases in animal foods (42%), protein (24%) and fat (67%) (Trichopoulou and

Efstathiadis, 1989; FAO, 1985). Whereas cereals and carbohydrate intake decreased. In contrast, energy intake in Australia has only increased by 10%, mainly due to an increase in plant food intake (6%) and carbohydrate.

This apparent decrease in consumption of pulses, and to a lesser extent, cereals and an increase in consumption of eggs, milk products, animal fats and meat in Greece implies a progressive 'northernisation or westernisation' of the Greek diet (Trichopoulou 1991). Further supportive evidence comes from household budget surveys (Trichopoulou, 1989) and from *ad hoc* studies in several Mediterranean countries (Ferro Luzzi and Sette, 1989).

Table 2.2.2.1b

**Total daily energy intake from various foods (%)
Greece & Australia, 1964-1988.**

	1964-1966		1976-1978		1986-1988	
	GR	AUS	GR	AUS	GR	AUS
Total kcal/day	3021	3042	3469	3317	3700	3330
Animal foods	16.0	34.0	21.9	32.0	25.0	30.5
meat & offal	6.8	20.5	10.9	19.9	14.0	18.5
fish & seafood	1.0	0.6	0.8	0.7	0.9	0.8
milk&cheese	7.2	11.4	8.9	9.5	9.1	10.4
eggs	1.0	1.5	1.2	1.5	1.1	1.3
Plant foods	59.7	31.6	49.8	30.5	45.0	33.5
cereals	43.3	23.7	34.5	22.7	29.5	23.5
pulses	2.5	0.3	1.7	0.2	1.4	0.5
nuts	2.0	0.7	2.2	0.9	2.2	1.0
starchy roots	2.4	2.6	3.5	2.2	3.6	2.7
vegetables	2.6	1.5	3.3	1.4	3.3	1.7
fruit	6.9	3.7	4.9	3.5	5.3	3.5
sugar products	5.9	17.4	8.9	16.7	9.3	15.0
vegetable fats	14.3	2.5	15.7	8.7	16.0	10.6
animal fats	1.4	9.1	1.0	6.7	1.0	4.9
alcohol	2.5	4.4	2.5	5.4	3.3	5.6

Source: FAO, 1988

2.2.2.2 Food and nutrient intake from samples

i. Keys et al. (1968 and 1980)

It is now 40 years since Keys and his colleagues (Hartog et al, 1968; Keys et al, 1980) initiated their seven-country study which triggered the whole issue of the Mediterranean diet and its protective effects against heart disease. At the end of the 1950s, this study was designed to investigate relations between diet and cardiovascular diseases. Sixteen cohorts were selected in Finland, Italy, Greece (Crete and Corfu), Japan, Netherlands, United States and Yugoslavia. In Greece, five dietary surveys were carried out between 1960 and 1965 during the summer months (March-September); three in Crete and two in Corfu. A total of 68 men were studied.

The base-line survey was followed-up after 5 and 10 years by repeat surveys. Since then, only mortality data were collected, which are now almost complete for a subsequent 25 year period (James et al., 1989). The 15-year age-standardized death rates per 10,000 for coronary heart disease (CHD) have been reported. Cohorts from the Mediterranean had one third of the deaths from CHD (284) compared to the non-Mediterranean cohorts (655) (Fidanza, 1988).

The death rate from heart disease was found to be significantly related to the ratio of monounsaturated to saturated fatty acids in the diet (Keys et al., 1986). During the base-line survey 13000 men aged 40-59 years, were medically examined. Food intake was collected in random samples for each cohort by use of the weighed 7 day food record method. Scanty published information exists up to this date on the composition of the diets in terms of food items and nutrients. Fatty acid composition of the diets have been reported by Hartog et al., (1968). Four countries were reported as follows for percentage energy intake from fat, P/S ratio, M/S ratio respectively: Greece 34.6%, 0.45, 3.34; Italy 24.7%, 0.39, 1.63; Yugoslavia 27.8%, 0.42, 1.15; and Finland 37.3%, 0.15, 0.58.

Recently, Kromhout et al. (1989) analysed the food intake data and reported food consumption patterns; nutrient intake was not reported because local food tables were not available for each cohort. The original food records were no longer available therefore the diets were reconstructed on the basis of results of the dietary surveys mentioned in a publication by Keys et al. (1966). When information was not available on the consumption of certain foods (e.g fruits and vegetables), food balance sheet data from Greece in 1961-65 were used as a substitute (FAO, 1980).

To compare the different cohorts, all the quantities of foods were converted in a standardized way into quantities of raw products (see table 2.2.2.2). Most cohorts consumed between 240 and 450g bread/day. The Americans and Japanese, however, consumed far less bread. The quantity in Japan was <10g/day, but consumption of cereal products (mainly rice) was very high (500g/day). The consumption of cereal products in Italy was also high (145g) but here it was mainly pastas that were eaten. In Finland, Netherlands and Yugoslavia potato consumption was high (200-300g/day). Few potatoes were consumed in Italy (40g) and Japan (65g).

Table 2.2.2.2

**Average intake of plant and animal foods (uncooked)
g/day (% total food intake)**

7 country study, Greek men aged 40-59, 1960-65

	CRETE		CORFU	
	g/day	(% total food intake)	g/day	(% total food intake)
N	31		37	
Bread	380	(22)	450	(28)
Cereal	30	(2)	45	(3)
Potatoes	190	(11)	150	(9)
Legumes	30	(2)	30	(2)
Vegetables	191	(11)	191	(12)
Fruit	464	(27)	462	(28)
Meat	35	(35)	35	(2)
Fish	18	(1)	60	(4)
Eggs	25	(1.5)	5	(0.3)
Cheese	13	(1)	14	(1)
Milk	235	(14)	70	(4)
Other	107	(6)	109	(7)
Pastries	0	(0)	0	(0)
Total foods	1720		1620	
Animal foods	433	(25)	293	(18)
Plant foods	1285	(75)	1328	(82)
Edible fats	95		75	
Sugar products	20		13	
Alcoholic beverages	15		31	

Source: Kromhout et al., 1989

Japan was the only country with a high consumption of legumes (90g/day). This is because soy products were classified as legumes. Vegetable consumption varied between 100-200g/day among most cohorts. About 200g of vegetables per day were consumed by subjects in Greece, Italy, Japan, Netherlands and Yugoslavia. Very little fruit was eaten by subjects in Yugoslavia (<10g/day) and Japan (30g). The most fruit was eaten by Greek men (460g/day). Little meat was eaten in Japan and Greece (<35g/day) and the most was eaten in America, Yugoslavia and Italy (>150g/day). Fish consumption was high in Japan (150g/day), moderate in Greece (40g/day) and very low in America (3g/day).

Egg consumption was significantly greater in Italy (40g/day) and Yugoslavia (35g/day) compared with Greece (15g/day). Cheese intake varied between 10-35g/day in most cohorts; cheese was not eaten in Japan and the greatest intake was found in Yugoslavia. Milk was rarely consumed in Japan, low to moderate amounts (70-300g) were consumed in the Mediterranean cohorts and the Finnish subjects had the highest intake (>1 litre/day).

The Japanese cohorts consumed the least fat (<10g/day) and in the other cohorts use of fats varied between 25-100g/day. The cohorts in Finland, Netherlands and United States had the highest intake of saturated fats. Cohorts in Greece and Italy had the highest intake of monounsaturated fats from olive oil and the Yugoslavian subjects consumed mainly polyunsaturated fat from sunflower oil. Consumption of sugar products and pastries was high in Finland, Netherlands and United States and low in Greece. The lowest alcohol intake (<6g/day) was in Finland, Netherlands and United States and the highest was in Italy (70g/day). Yugoslavia, Greece and Japan averaged about 25g/day.

In summary Greece was characterised by a high intake of olive oil and fruit. However, in the last 20 years olive oil, fruit, cereal and pulse intake has decreased and alcohol and meat intake has increased (Aravanis and Ioannidis, 1984). Cretans have been reported to have low CHD mortality rates compared with other European countries, as well as Greece. This health advantage has been associated with the traditional Cretan diet (Greek National Statistical Service, 1986; Keys, 1970; Kafatos et al., 1991).

ii. Kafatos et al., 1991

A study in Crete (Kafatos et al., 1991) compared the prevalence of CHD risk factors among 387 (256 males, 131 females) Cretan bank employees aged between 20-65 years with the cohort of the 7 country study. Mean cholesterol concentration had risen by 36%

over 26 years (from 4.7 to 6.4 mmol/l for men aged 40-60 y). Total food intake was about 1250g/day of which 72% was contributed by plant food and 28% by animal food. The following changes to dietary intake (assessed with 24 hour recall) had occurred: bread consumption decreased by 70% (115g/d), potatoes by 53% (88g/d), fruits by 31% (322g/d), and eggs by 48% (13g/d).

Meat consumption had increased by 160% (91g/d), fish by 88% (34g/d), and cheese by 366% (60g/d). The consumption of cereals (29g/d), pulses (40g/d) and sugar products (20g/d) had not changed significantly whereas alcohol consumption decreased by 33% (10g/d). There had been a reduction in monounsaturated fatty acid consumption and an increase in the consumption of saturated fats, whereas the consumption of polyunsaturates and total fats (36% energy intake) had not been altered. The ratio of polyunsaturates to saturated fats decreased from 0.37 in the 1960s to 0.28 in the 1980s; the ratio of monounsaturates to saturates decreased from 3.6 to 1.66. Energy intake also decreased from 2685kcal/day to 2488 kcal/day. With the exception of diminished physical activity, the prevalence of other risk factors (smoking, blood pressure, body mass index) remained relatively stable over this period. These changes in the CHD risk-factor status of the Cretan urban population occurred over a period in which CHD mortality rates are reported to have increased.

iii. Euronut SENECA study (de Groot et al., 1991)

The Euronut-Seneca study was conducted in 1988-89 on 2600 people aged 75 years, living in 19 small towns in 12 European countries - including Greece. Dietary data was collected from subjects using the interviewer administered quantitative diet history for the previous month (see also section 2.1.3.2). In Greece, a rural town on the mainland and two rural towns on an island were selected: 33 men and 27 women aged 75 were studied in Markopoulo located 20km from Athens; 36 men and 49 women, aged 75 were studied in Anogia and Archanes located near Iraklion, Crete.

Mean energy intake of Markopoulo men (2452 kcal/day) was greater than Cretan men (2738 kcal/day). In contrast, Cretan women (1738 kcal/day) had lower energy intakes than Markopoulo women (2095 kcal/day). Men in 11 European centres had lower energy intakes than Greek men. Compared with the other 18 centres, Markopoulo women had one of the highest mean energy intakes where as Cretan women had intakes similar to the majority of the centres. Percentage energy intake from carbohydrate was about 43% for the Greek men and women, of which 29% was complex carbohydrate and 14% simple carbohydrate. The majority of the elderly in the Euronut study had carbohydrate

intakes around 40%. Mean fibre intakes were slightly greater for the men (18g/day) than the women (14g/day). Percentage energy from protein was about 15% for the majority of the elderly in the Euronut study. Fat intake was high in Greek men (42%) and women (45%), of which only 10% was saturated, 20% was monounsaturated and 5% polyunsaturated, with a high P+M/S ratio of 2.5. Only 5 other centres in the Euronut study had mean fat intakes around 40% - the remaining centres had intakes of about 35%. Furthermore, the Greek elderly boasted the most favourable fatty acid ratios (due to their low saturated fat intakes) with only one other centre in the Euronut study having a PMS ratio above 2. Similarly, Greek subjects had the lowest mean cholesterol intakes (M 244mg/day, F 175mg/day) compared with elderly in other centres.

Percentage energy from alcohol was greater for men (4.2%) than for the women (0.3%). The majority of the men and women in the Euronut study had alcohol intakes greater than the Greek elderly. Calcium intakes were higher in Markopoulo (M 1323mg/day, F 1213mg/day) than in Crete (M 942mg/day, F 521mg/day). Only 11% of the Greek men did not meet the lowest European RDI compared with 4% of the Markopoulo women and 47% of the Cretan women.

Most of the elderly in this study appeared to be getting adequate amounts of calcium in their diets. Markopoulo elderly also had higher mean iron intakes (M 16mg/day, F 11mg/day) than Cretan elderly (M 13mg/day, F 7mg/day). Less than 12% of the Greek elderly had iron intakes below two thirds of the lowest European RDI (except Cretan women 58%). The majority of the subjects in other centres were consuming adequate amounts of iron.

Vitamin A intakes in Greek elderly were low (M 876 RE/day, F 629 RE/day), with a high proportion consuming less than two thirds of the lowest European RDI (M 32%, F 44%). Large proportions of subjects (>30%) in the other centres were also not achieving the RDI for vitamin A. Mean thiamin intakes appeared adequate (M 1.4 mg/day, F 0.83 mg/day) with only 10% of Greek men and 30% of women not achieving two thirds of the lowest European RDI. Similarly in the other centres, thiamin intake appeared adequate with only 6 centres having >20% of their subjects not achieving the RDI.

In contrast, mean riboflavin intakes did not appear adequate (M 1.4mg/day, F 0.9mg/day) with 30% of the Greek men and 56% of the women not achieving two thirds of the lowest European RDI. About 10 centres in the Euronut study had >20% of subjects (mainly men) not achieving the RDI. Mean vitamin C intakes were high in the Greek subjects (M 175 mg/day, F 123mg/day); none of the men and only 9% of the women did not achieve

two thirds of the lowest European RDI. High vitamin C intakes were also found in the other centres. Mean pyridoxine intake appeared inadequate (M 1.1mg/day, F 0.75mg/day) with more than 30% of the Cretan men not achieving two thirds of the lowest European RDI; only 2% of the Cretan women had intakes below the RDI. Blood tests confirmed a high prevalence of vitamin B6 deficiency in both men and women (54%). Pyridoxine intakes appeared adequate in the majority of the other centres. Blood tests indicated that less than 20% of these subjects had deficiency.

In the Euronut study, elderly Greeks had total food intakes of about 1220g/day, of which 73% was contributed by plant foods and 27% by animal foods (Trichopoulou et al., 1989 unpublished data see Appendix 13). This is in contrast to studies on Angloceltic Australians where plant food intakes are lower (50-60%) and animal foods greater (40-50%) (Wahlqvist et al., in press). Compared with the other European centres in the Euronut study, meat intakes of elderly Greeks were low (M 104g/day, F 73g/day), fish intakes were high (M 30g/day, F 25g/day), milk and milk products were moderate (M 220g/day, F 180g/day), egg intake was low (M 10g/day, F 7g/day), vegetable intake was moderate (M 296g/day, F 220g/day), fruit intake was high (M 354g/day, F 268g/day), legume intake was high (M 53g/day, F 43g/day), cereal intake moderate to low (M 284g/day, F 245/day), fat intake high (mainly as olive oil, M 34g/day, F 28g/day), sugar products were low (17g/day), and alcoholic beverages were low to moderate (100g/day).

iv. Case control studies from Greece (Trichopoulou et al., 1993a, 1993b)

Nutritional data concerning the comparison (control) series of six case-control studies undertaken in the 1980s in urban parts of Athens (Skalkidis et al., 1989; Katsouyanni et al., 1991; Manousos et al., 1985; Papadimitriou et al., 1984; Trichopoulou et al., 1992; Katsouyanni et al., 1986,1988; Kalandidi et al, 1990; Trichopoulos et al., 1985) have been used to estimate the percent energy intake from major macronutrients in the contemporary Greek diet (Trichopoulou et al., 1993a). Food intake data were generated by interviewer-administered semi-quantitative food frequency questionnaires. The analyses were based on 228 men and 610 women aged 40-79 years.

The main results were as follows:

- 1) Mean energy intakes from carbohydrate were between 35%-43%, with mean values for men aged 70+ (38%) being similar to women (36%).
- 2) Mean energy intake from protein were between 17%-20%, with mean values for men aged 70+ being similar to women (19.5%).
- 3) Mean energy intakes from fat were between 40%-50%, with mean values for men (42%) being significantly lower than for women (46%) and subjects aged 70+ tended to have the highest fat intakes (M 43%, F 46%).
- 4) Energy intake from saturated fats (M 17%, F 20%) and monounsaturated fats was high (M 16.3%, F 18.4%) and low from polyunsaturated fat (M 4.5%, F 3.5%).

2.2.3 OTHER ELDERLY STUDIES

Recently Horwath (1989a) reviewed the existing international literature concerning the food and nutrient intake of representative groups of elderly people.

Australian studies based on true random population samples of Anglo-Celtic Australians included in this review:

- 1) *Baghurst and Record, 1983* - M 162, F 105, age 50-70, response rate 85%, semiquantitative food frequency questionnaire.
- 2) *Baghurst and Record, 1987* - M 195, F 136, age 65-75, response rate 82%, quantitative food frequency questionnaire.
- 3) *Horwath, 1987* - M 981 F 1213, age 65+, response rate 77%, semiquantitative food frequency questionnaire.
- 4) *Victorian Nutrition Survey, 1987* - M 160, F 158, age 60+, response rate 65%, semiquantitative food frequency questionnaire.

Other large studies reviewed include:

- 1) *NHANES I and II (National Health and Nutrition Examination Survey), 10 State Nutrition Survey 1971-74 (Young, 1983)* - USA, M 887, F 1209, age 65-74, response rate 64%, semiquantitative food frequency questionnaire and 24-hour recall, random sample.
- 2) *NFCS Nationwide Food Consumption Survey, 1980* - USA, M 1654, F 2730, age 65+, 24-hour recall and 2 days diet record, response rate not defined, random sample.
- 3) *Steen et al., 1977* - Sweden, M 182 F 188, age 70, response rate 95%, diet history, random sample.

- 4) DHSS Department of Health and Social Security - UK, age 65+, 7 days food record, response rate 65%; 1972 M 425, F 454; follow-up in 1979, convenience random sample.

The published studies suggest that inadequate intakes of fruit and vegetables may be common; that calcium, zinc, potassium, magnesium, vitamin B6 and folate are likely to be the nutrients least adequately supplied in the diets of elderly people; and that total fat, saturated fat, refined carbohydrate and sodium are generally above the recommended levels while complex carbohydrate and fibre intakes are generally below the recommended levels. To quote Horwath (1989a): "*As such dietary inadequacies may have important health implications for the the elderly population, it is vitally important to collect more data on the eating habits of representative groups of elderly people*".

2.3 LIFESTYLE

2.3.1 DEFINITION OF LIFESTYLE

In epidemiology, the term lifestyle is frequently used to mean behaviour thereby causing misconceptions. Lifestyles refer to *ways of life* rather than to a single kind of *behaviour* such as smoking, sleep pattern, exercise or drinking alcohol. Lifestyle includes workplace, place of residence, culture and tradition of her/his social background, marital status, age, neighbours, living environment and social factors (living arrangements, social activity, leisure activity/time use and social networks/support) (Erben, 1992)

The basic concept underlying the lifestyles approach is one of socialization of individuals and social groups in the frame of social interaction. The health-related behaviours of individuals are viewed as being embedded in the lifestyle; i.e smoking, for example is seen as a behaviour which is a component of certain lifestyles of an individual or social group; thus smoking is not seen as a lifestyle as such.

2.3.2 LIFESTYLE, HEALTH & WELL-BEING

2.3.2.1 Mortality

Since 1976, when Cassel first examined the contribution of the social environment to host resistance, numerous studies have shown a positive effect of social factors to morbidity and mortality (Cassel et al., 1976; Blazer 1982; House et al., 1982; Schoenbach et al., 1986; Seeman et al., 1987; Welin et al., 1985; Zuckerman et al., 1984; Broadhead et al., 1983). Welin et al (1985) followed two cohorts of men born in

1913 and 1923 in western Sweden. They showed that mortality rate decreases as social activity increases. Evidence from a Finnish study suggests a graded association between the extent of *social relations* and mortality (Kaplan et al., 1988). For men there is a graded connection between the extent of social connections and mortality (Hanson et al., 1989). Prospective studies, which control for base line health status, consistently show increased risk of death among persons with a low quantity and sometimes low quality, of social relationships (House et al., 1988).

Prospective studies showed that increased *social activity* and/or wider social network were associated with lower mortality rate in the elderly (Olsen et al., 1991; Silverstein and Bengtson, 1991). Of the four components in the social network indices used in the Alameda County Study, contacts with close friends and relatives showed the strongest association with mortality for men aged 60-69 (Berkman and Syme, 1979). To quote Eisenbergh (1975): "*A friend, not an apple, a day will keep the doctor away*". In investigating psychosocial predictors of mortality among elderly poor, it was found that 'religiousness' and 'happiness' (as rated by the interviewers) reduced the risk of mortality primarily among the elderly who were in poor health (Zuckerman, 1984). The importance of animals and pets in the social and emotional life of older men and women, especially the isolated elderly, has been suggested (Goldmeir, 1986). In each of these situations, food and nutrition is one of the vehicles for health benefit.

Regular exercise can have important benefits in later life. From the Harvard Alumni study (Paffenbarger et al., 1986). An increase in level of physical activity by calorie expenditure per week from about 500 to 2000, has been associated with a progressive decline in death rate in subjects aged up to 84. A Finnish study of Pekkanen et al. (1987) compared those with high physical activity against those with low physical activity in a twenty years prospective study. More survived who belonged to the high physical activity category.

2.3.2.2 Well-being

Being a migrant can pose an independent risk to health, especially mental health and well being. Migrants surrounded by family who love and value them will, on the whole, enjoy better mental health than others who lack such support. The presence of at least some family members, a like-ethnic community and involvement in it, has been found to be important in preserving mental health and well-being (Beiser, 1990).

Exercise has other benefits in later life. A recent study from Australia shows that a three month, very modest exercise program in elderly people improved measures of mood state (Millar, 1988).

2.3.2.3 Health

There is now a rapidly growing literature on the negative effects of bereavement, social isolation and loneliness on immune function reviewed by Berkman (1988). Diminished lymphocyte function has been found. In particular, lower T and B lymphocyte responses to various mitogens, lower levels of natural-killer cell activity, higher Epstein-Barr virus antibody titre and higher urinary cortisol levels. These studies cumulatively are provocative and indicate a mechanism by which such experiences as bereavement, social isolation and loneliness might influence disease risks. Furthermore, much laboratory work relates adrenocortical hormones to immune response. It has frequently been hypothesized that environmental stressors, including psychosocial ones, have these effects by influencing neuroendocrine responses, which in turn influence a number of physiological functions ranging from immune function to carbohydrate metabolism and cardiac function (Monjan, 1981).

Chronic poor sleep can have a detrimental impact on both psychological and physical well-being (Webb and Levy, 1982) but yet too much sleep may be a sign of deteriorating health. Napping has been associated with reduced coronary mortality in Greek men (Trichopoulos et al. 1987). Several groups have suggested that even light alcohol intake produces significant and permanent impairments in cognitive function (Parker et al., 1983). However, these conclusions have been disputed (Hill, 1983; Goodwin, 1987,1988). In contrast, a moderate intake of alcohol (1-2 glasses per day) has been associated with reduced rates of heart disease (US National Research Council, 1989).

2.3.3 LIFESTYLE AND FOOD INTAKE

Social isolation frequently is considered to be a contributing factor to the development of a lack of interest in food and to dietary inadequacy (Ryan and Bower, 1989).

2.3.3.1 Living arrangements

In most developing countries, social and cultural patterns continue to protect their elderly from isolation in society. Drastic changes in lifestyle, such as the death of a spouse or a change in living situation, may cause alterations in food-related behaviour that are

resistant to successful adaptation. Elderly people living alone (mainly men) have been found to eat less of foods requiring preparation, eat less regularly scheduled meals, used convenience foods more often and reduced the amounts and types of foods eaten (Horwath, 1987; Davies, 1990). Companionship was found to serve as a buffer against the negative effects of poor appetite on dietary intake (Walker and Beauchene, 1991; McIntosh et al., 1989). A study of marriage and diet in elderly Australians (Horwath, 1989) concluded that companionship at mealtimes may not be as important as marital roles, convenience, cooking skills and preparation time in influencing dietary intake by elderly people.

It was further reported that elderly men living with a spouse generally had more favourable dietary patterns (more fruit and vegetables) than those living alone. Women living alone, on the other hand, had similar dietary patterns and nutrient intakes equal to or better than those of women living with a spouse. Loss of spouse and bereavement also have significant effects on nutritional status and the immune system in the elderly (Davies, 1990; Chandra, 1990). Walker and Beauchene (1991) studied 61 subjects aged 60-94. Loneliness was related to dietary adequacy, particularly to energy, protein and phosphorus intake, but the magnitude was not great.

Similarly, Davis et al., (1990) reported that more men living alone consumed a poor quality diet not because they made poorer food choices, but rather that they consumed fewer calories. In general, more women than men had poor-quality diets as did subjects with low incomes, low food expenditures, poor health and unemployment (men only).

The United States Select Committee on Nutrition and Human Needs (Todhunter, 1971) proposed that apathy and social isolation contribute to reduced food intake in the elderly especially for those who live alone. This assumption is based on the premise that the social life of many elderly adults is built around food; therefore eating is a social and psychological event as well as a biological need.

2.3.3.2 Social networks and support

For the prevention of sudden, recurrent or long-standing malnutrition, the support of family, friends and neighbours can be vital (Davies and Knutson, 1991). Researchers have found that the number of reported dietary problems diminished when the frequency of visits with relatives and friends was perceived as adequate (Walker and Beauchene, 1991). In a study of 782 elderly New Zealanders (Horwath et al., 1992), 10% of the women were defined as having poor social support. These women were found to have

significantly lower intakes of fibre, vitamin B6, ascorbic acid, iron, copper, potassium and magnesium.

2.3.3.3 Social and leisure activity

Much social activity takes place around food, which thereby assumes an important health-promoting function, aside from the provision of nutrients. The availability of social support increases with both the number of organisations or clubs an elderly person belongs to and with his or her frequency of religious service attendance (Stephens et al., 1978). In a study by Walker and Beauchene (1991), elderly subjects who were more socially active reported less loneliness, and this appeared to be related to increased nutrient intake.

In an Australian study of more than 2000 elderly (Horwath, 1987), social/leisure activity alone accounted for 15% of variance in dietary variety score, and 11% of the variance in the variety of vegetable intake; however it was not associated with energy intake. Participation in a greater variety of social/leisure activities was associated with use of a greater variety of foods, which in turn is linked with higher micronutrient intakes.

To borrow a phrase from Baird and Schutz (1980) who reported similar relationships between social/leisure and nutritional status (both dietary and biochemical measures), perhaps *"positive attitudes and behaviour suggestive of physical, emotional, intellectual and economic wholeness - in other words, an entire lifestyle - ... have a positive relationship to both dietary intake and serum nutrient levels"*.

2.3.3.4 Exercise

At increased ages, there is a gradual reduction in the basal metabolic rate, but no proportional reduction of the demand for essential nutrients. The reasons for this decline are inadequately understood. Changes in lifestyle and family structure, the effect of the disease processes, and a reduction in the physiological capacity for exercise are among the possible explanations (Astrand, 1992). Buskirk's (1985) review of data on health maintenance and exercise supports the assumption that regular exercise blunts many of the physiological declines associated with ageing, improves sense of well-being and quality of life. Physical activity has been associated with greater energy intakes and subsequently nutrient intakes in the aged (Astrand, 1992; Smiciklas-Wright, 1990). Voorrips et al. (1991) showed that physically active women aged 60-79 years tended to have a food pattern more in line with dietary allowances and a significantly lower body

weight and percentage body fat than the sedentary group. For these reasons, it is recommended that older people try to stay physically active (Astrand, 1992).

2.3.4 FOOD AND HEALTH BELIEFS

The term food habits generally refers to ways in which a distinct group selects, prepares, consumes and otherwise reacts to and uses portions of the available food supply. Food habits are influenced by *food beliefs* which are predicated on history and experience. The cultural history of ancestors and geographical location shape food beliefs, as do religious and social customs, as well as physiological and psychological factors (Suitor and Hunter, 1986). Sound nutritional practices abound in different socio-cultural groups. Cultural groups having a stable history of many generations have food habits, beliefs and traditions compatible with survival of the group in a particular setting. Traditional food cultures have developed over thousands of years and have been tested, refined and distilled producing a repertory of foods and processes for preparing them, capable of sustaining human life in specific environments - usually in good health. However, the food beliefs are not always compatible with survival of weaker members of the group or with achievement of optimal health because foods were usually chosen from the array that was available (Suitor and Hunter, 1986; Farb and Armelagos, 1980).

Culture has numerous effects on food beliefs and habits. In the traditional sense, culture is a design for living within a society that is transmitted from generation to generation. Through the influence of culture an individual learns how people 'should' behave in various situations. Particular foods and eating behaviours are an integral part of the mosaic of culture. Culture influences what is considered to be acceptable food and attitudes about relationships of food and health. Cultural practices such as traditional food behaviours promote a sense of stability, security, and belongingness. These feelings provide motivation for maintaining traditional ways (Suitor and Hunter, 1986).

Many traditional diets, such as the Mediterranean diet, have historically been linked with good health and long life (mainly absence of chronic diseases) (Trichopoulou et al., 1993b). There are many lessons to be learnt from these time-tested traditional diets. The wisdom of such 'old' cultures can be captured in the food beliefs, which tend to be steeped in tradition, experience and religion. Industrialized countries, like Australia, which in most cases have 'young cultures', lack this wisdom.

This fact has been eloquently stated by Michael Symons (Symons, 1982). "*So far great cuisines have arisen from peasant societies, even if recognized by elites and refined by*

professionals. The rigours of survival have given the peasant a proper respect for cultivation and cooking, have demonstrated the advantages of tradition, have aroused the joys of the seasons...But, Australians have put down peasants as ignorant, superstitious, inefficient and dirty..Yet the lack of peasant experience - or, conversely, our total history of industrialization - explains why we have traditionally cared less about food than any other people in history".

A major difference between a food belief and a prudent health practice is the degree of backing by sound scientific knowledge. Indeed, some beliefs evolve to be prudent practices. For example, the popularity of olive oil among some groups predicated the latest scientific emphasis on monounsaturated fats and heart disease. In some cases however, knowledge and scientific evidence is simply not available and thus many resort to tradition, practical experience, and beliefs passed down from generation to generation to maintain health (Wahlqvist et al., 1991). Food beliefs based upon tradition must be distinguished from contemporary food beliefs which are often ill-conceived and become popular because of the willingness of an interested person or group to trust information uncritically in order to cure illness e.g the belief that megadoses of vitamin C cure cancer (Reed, 1985).

The food and health beliefs of Greeks may shed some light on the reasons for their health advantages (Powles and Gifford, 1991). The elderly (as opposed to their younger counterparts) may provide further information about the importance of traditional food and lifestyle practices in later life, as they tend to maintain and uphold such practices. The elderly are not only custodians of tradition, but they are also wiser from a lifetime of experience, and thus form one of the best resource for food and health beliefs. Such information may prove particularly useful in the prevention of morbidity in today's rapidly ageing populations.

2.4 INTER-RELATIONSHIPS OF HEALTH, FOOD AND LIFESTYLE

There is general agreement in the literature on the five areas that should be included in a *total health assessment* of the elderly. This has been defined as *multidimensional assessment of health status*, which has become synonymous with quality of life. These include not only physical health, but also activities of daily living, mental health, social and economic functioning - all of which contribute to quality of life in this age group. Information on physical health alone is inadequate when considering well-being and quality of life of elderly folk (Fillenbaum, 1984). Health promotion programs directed at

senior populations were neglected until recently, upon the general belief that changes in food and lifestyle habits late in life were difficult to achieve and in any event would be "too little and too late". However, Fries (1992) argues that because the magnitude of health expenditures in the senior population is so much greater than at younger ages and the proximity of the intervention and the events to be prevented so much closer, health preservation programs which encouraged good nutrition and exercise may be even more effective in seniors than in younger individuals. This was shown recently in a study of 6000 Bank of America retirees (Leigh et al., 1993).

In contrast, Schlettwein-Gsell (1992) argues that the preventive effect of nutrition on improving quality of life is greatest in early childhood and gradually diminishes with age. She suggests that the psychological effects of nutrition, such as the pleasure and enjoyment offered by food, social contacts and daily routine, as well as the impact of eating for self-esteem continually assume greater importance with advancing years. However, we do not know at what age psychological effects become more important than preventive effects; or indeed whether in some individuals they are equally important in determining quality of life.

It is widely accepted, that inappropriate food intake in old age can lead not only to marginal or suboptimal intakes of micronutrients, but also contribute to the development and enhanced progression of many degenerative diseases and disorders associated with ageing. Inappropriate food intake may further promote various age-related changes in body composition, physiological function and mobility. For these reasons, many investigators examine the potential influences on dietary intake, which in turn affects health and quality of life. Only a few studies have examined the factors directly affecting health and quality life in the elderly.

2.4.1 FACTORS AFFECTING HEALTH AND QUALITY OF LIFE

The most important factors identified as determining quality of life and well-being in the elderly include social relations or networks, mobility, independence, cognitive function, psychological state. Last in importance in determining quality of life are surrounding circumstances such as finances, health and housing. Therefore, being free of illness did not necessarily ensure quality of life (Heikkinen, 1987; Butler, 1992; Schlettwein-Gsell, 1992; Dwyer et al., 1991; Saltman et al., 1989).

In a study by Saltman et al (1989), 29 subjects aged 50-94 were interviewed to determine what makes elderly people 'feel healthy'. Five main areas were mentioned consistently: social contacts, social and physical activity, interests, mental state and independence. Respondents considered the most important way to feel healthy was to have company, especially the company of grandchildren. The importance of an adequate amount of sleep was also mentioned often. Independence (e.g looking after yourself, control over own life) and a healthy mental-state were also considered as imperative. The important findings from this study is that the elderly did not associate absence or control of illness with 'health'. In fact, good health was defined consistently in non-medical terms.

Another important factor determining quality of life is the ability to remain mobile and independent, with little or no disability. Impairments exert negative influences not only on morbidity and mortality, but also on social and psychological function. They limit an individual's quality of life and ability to live independently, to maintain or begin relationships, and to pursue recreational activities and other goals (Dwyer et al., 1991).

Rosenberg and Miller (1992) point to the growing evidence supporting the view that good nutritional status is an important determinant of health and quality of life in the elderly. Namely by maintaining physical mobility, cognitive and visual function via its effect on the nervous system. Visual function has been shown to be affected by antioxidants such as vitamins C and E (Jacques et al. 1988), physical mobility and cognitive function by vitamins B6, B12, folate, vitamin C, riboflavin, thiamin and iron (Goodwin et al. 1983). The authors also suggest that *"It is more likely that mild or subclinical vitamin deficiencies play a role in the pathogenesis of declining neurocognitive function in ageing....without the appearance of any of the diagnostic features or symptoms of true deficiency.....in this situation, some organs may be able to compensate and function normally, whereas others may not. Effects of such a chronic deficiency state may exist particularly in the nervous system"*. Evidence supporting this notion is beginning to accumulate (Lindenbaum et al. 1983, Goodwin et al. 1988).

It has been argued that energy restriction is a likely advantage in terms of ageing but this is by no means certain. We may not be able to extrapolate from rodents in cages to free-living homo sapiens (Wahlqvist, 1990). The evidence is in favour of a greater energy intake than that prevailing in sedentary homo sapiens, leading to greater life expectancy and not the reverse, whatever the rodent studies appear to show (Kromhout et al., 1982; Kushi et al., 1985; Lapidus et al., 1986).

It has been suggested that polyunsaturated fatty acids, mainly n-6 linoleic acid, may pose special problems, particularly in the elderly. For instance, immune responses are enhanced when tissue linoleate levels fall. Most of the evidence derives from experimental animals in which high intakes of linoleic acid (and low intakes of n-3 fatty acids α -linolenic, eicosapentanoic EPA and docosahexanoic DHA) suppress immunological competence and hence interfere with the control of tumour growth. Polyunsaturated fatty acids appear to negatively influence the outcome of another common cause of death in the elderly: sudden cardiac arrest. Another postulated adverse consequence of eating polyunsaturated fatty acids is the generation of oxidized LDL; whether ageing predisposes to oxidation is uncertain. It has frequently been suggested that linoleic acid may promote cancer. This has only been shown in animals and not in humans (Nestel, 1992).

2.4.2 FACTORS AFFECTING DIETARY INTAKE

Davies (1991) outlines risk factors and warning signals for malnutrition in the elderly (see Figure 2.4.2). A risk factor has been defined as a major identifiable biological or environmental circumstance or event that increases the risk of malnutrition and therefore suggests the need for special care and attention. Warning signals have been defined as single or groups of observable circumstances that, if left unchecked, might cause an 'at risk' individual to become malnourished (Davies, 1981; Davies 1991; Davies and Knutson, 1991).

Horwath (1987) looked in a formal way at risk factors for indices of poor dietary intake in elderly subjects. What was important was living alone for men; poor health for a variety of reasons; low participation in physical and social activities; shopping difficulties; poor appetite; diminished enjoyment of eating; individual life difficulties; reports that some foods are too acid; pension as only source of income; lower education attainment; lower occupational status; feelings of extreme inertia; missed meals and cooked meals eaten on less than 5 days a week. Living alone had the greatest negative impact on dietary habits and nutrient intakes in elderly Australian men. These men had a poor fruit and vegetable intake and a greater preference for convenience foods. Estimated intakes of protein, carbohydrate, vitamin C, vitamin B6, zinc and potassium were also lower in this group. Elderly Australian women living alone had, on the other hand nutrient intakes equal to or greater than those of women living with a spouse.

A number of studies have shown the importance of social well-being in determining nutritional status (Ryan and Bower, 1989; Hanson, 1978). An increase in social

interaction and social enhancement at mealtimes may improve dietary adequacy for older persons whether they live independently, in special housing or in an institution (Hanson, 1978). The number of reported dietary problems diminished when the frequency of visits with relatives and friends was perceived as adequate (Learner and Kivett, 1981). The literature implies that an increase in social interaction and activity will improve dietary adequacy, although evidence to substantiate this theory is limited.

Figure 2.4.2

Risk factors and Warning signals of malnutrition in the elderly

(Davies, 1991; Goodwin, 1989)

Factors affecting nutritional status - risk factors

- Medical health status (chronic illness, acute illness)
- Poor dentition and/or difficulty in swallowing
- Depression
- Effect of major life events
- Housebound/living alone/isolation/social support
- Institutionalization
- Cognitive status
- Level of activity
- Medication
- Low socio-economic status
- Ethnic status
- Effect of prescribed therapeutic diets
- Nourishing food unavailable/expensive
- Lack of community food programs
- Insanitary water supplies/pollution
- Disaster: eg floods

Warning Signals

- Recent unintended weight change + or - 3kg (7 lb)
- Physical disability affecting food procurement, preparation or intake
- Lack of sunlight
- Bereavement and/or observed depression/loneliness
- Mental confusion affecting eating
- Multiple medications/long term medication
- Missed meals/snacks/fluids (e.g fewer than 7 hot or main meals in one week; less than 300ml of fluids daily)
- Food wastage/rejection
- Insufficient food stores at home - should buy or get 12 or more nutrient dense foods per week
- Lack of fruits, juices, vegetables
- Low budget for food
- Poor nutrition knowledge
- Lack of appropriate medicines
- High alcohol consumption/ heavy smoker
- Lack of work capacity
- Poor food hygiene

Davis et al (1985) also reported that type of living arrangement was significantly associated with food and nutrient intake and dietary variety in men only, using the data of 3477 65-74 year olds from NHANES 1. The majority of studies also show a positive relationship between lower income and poor dietary intake (Horwath, 1987; Yearick et al., 1980; Slesinger et al., 1980). Socio-economic status can affect dietary intake via a range of factors from nutritional knowledge, food preferences and perception of the social prestige of foods, to life-style and the ability to purchase foods. The low income groups have been characterised by a lower consumption of high-fibre and vitamin C-rich foods and a higher intake of saturated fat, cholesterol and salt (Horwath, 1989a).

Once life expectancy increases, age-related diseases also tend to increase. These diseases can have their own impact on nutritional status. It is possible that poor health may impair dietary intake through an effect on appetite or by limiting a person's ability to shop for or cook food or to actually feed himself. For example, the advent of diabetes, whose prevalence increases with advancing years, can alter nutritional needs and require dietary modifications which may include restriction. Wasting disease like cardiac cachexia, or cerebrovascular disease with disability that impairs food preparation and ability to eat, present unique sets of food needs.

However, results concerning the relationship between health or disability and dietary intake are conflicting. In a study by Walker and Beauchene (1991) on 61 elderly aged 60-94 years, physical health was measured using the Guttman Health scale. The physical health index consisted of an inventory of diseases categorized as major or minor and a measure of degree of confinement resulting from each disease (Rosecrans and Philblad, 1970). Physical health was related to intakes of vitamin A, ascorbic acid, and fibre; individuals in poor physical health ate less of these nutrients. The management of disease and disability in the aged can also contribute its own set of nutritional problems. This is particularly evident with pharmacotherapy with adverse effects of drugs on appetite and taste, nutrient absorption and handling (Roe, 1984).

Medication use is a measure of morbidity and thus an important contributor to quality of life. Some medications taken by the elderly are known to effect appetite, nutrient absorption, metabolism and excretion - causing fatigue, weakness or depression, all of which may further compromise food intake and nutritional status (Roe, 1987). The loss of teeth and of mechanical chewing efficiency, and the reduction in taste and smell acuity associated with aging, have been suggested as important factors impairing nutritional status in the elderly. However, food selection is not necessarily altered in those wearing dentures, so the influence on dietary intake is unclear (Horwath, 1989a).

With ageing there is a decreased acuity of taste, especially for salty and bitter tastes, but not for sweet or sour. In association with a significant atrophy of the taste buds, is a reduction in the ability to detect odours and to identify the foods eaten (Schiffman and Covey, 1984). The reductions in taste sensitivity with ageing, however, appear to be small. The sense of smell appears to decline more with ageing than the sense of taste. Elderly have lessened ability to differentiate between food odours (Glick, 1990; Murphy, 1992). In elderly Australians, the overall frequency of reporting that food no longer tasted or smelt as good was considerably lower than that in other studies: 5% and 2%, respectively (Horwath, 1987). Nevertheless, both perceived loss of taste and smell appeared to be important reasons for diminished enjoyment in eating, particularly for men.

2.5 CONCLUSIONS

There has been a great deal of interest in the Mediterranean diet ever since the Seven Countries study in the 1950's and 60's (Keys et al, 1966) which showed that coronary artery disease was lower in Southern European countries. Nevertheless, there have been few attempts to define the food and nutrient composition of the Greek diet. Most of these attempts have not relied on actual food intake but on indirect measures, such as food balance sheets. Recently, intake of selected foods and nutrients by elderly Greeks were described (Trichopoulou et al., unpublished data; de Groot et al., 1991). More data is clearly needed on the composition of the Greek diet.

Similarly, in Australia, Greeks have been reported to have the lowest mortality rates (1982 data) from heart disease and cancer compared with Australian-born and other ethnic groups. Yet there is a limited data on lifestyle habits and dietary intake of Greek Australians and changes to such habits on migration. Furthermore, some studies have reported a greater prevalence of morbidity, disability and poor sense of well-being in elderly Greek Australians compared with Australian-born (1989-90 data). This requires further investigation, particularly since they will experience the most rapid ageing of their community in years to come.

The literature review highlights the need for more descriptive information on the food and lifestyle habits of Greeks in Greece and Australia. It also indicates that the morbidity profile of ageing Greeks is of particular concern since they appear to be losing their protection against certain non-communicable diseases and report poor sense of health and well-being. By identifying dietary factors affecting the health and quality of life of elderly Greeks, this may provide invaluable information which could be included in public health messages, not only for this community, but for the public at large.