

# **Quality of Life among Older People in the UK and Taiwan**

By

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## ABSTRACT

This research is a cross-national comparison of longitudinal studies, designed to compare the quality of life, to identify the physical, mental, social, environmental factors contributing to quality of life, and predict the relationship between quality of life and mortality in old age. Although previous research has suggested that health, functional ability, psychological well-being, social relationships, socioeconomic status, and environmental conditions can affect quality of life among older people, little research has compared quality of life in old age across Asia-Western countries. The overall aim of this study was to compare the factors affecting quality of life among older people in the UK and Taiwan. Data were derived from the 1989 and 1993 waves of two nationally-representative samples of older people: the *Nottingham Longitudinal Study of Activity and Ageing* (NLSAA) in the UK, and the *Survey of Health and Living Status of the Elderly* in Taiwan. Data from the two studies were harmonised to ensure their comparability for the statistical analyses, and life satisfaction was used as a measure of quality of life.

Secondary analysis was performed on the harmonised data sets containing data from 690 (1989) and 410 (1993) NLSAA participants and 1,438 (1989) and 1,003 (1993) SHLSET participants. Factors related to physical (e.g., self-rated health, perceived health relative to peers, specific diseases) and mental health (e.g., loneliness, depression), social factors (e.g., attending religious groups, having a TV or radio, having friends), demographic characteristics (e.g., age, gender, marital status, income), and life satisfaction (as a measure of quality of life) were examined using Mann-Whitney tests, chi-square tests, stepwise multiple regression, and logistic regression. The association between quality of life and mortality was assessed using Cox proportional hazards regression models. Cluster analysis was used to examine the patterns among older people in terms of life satisfaction, and the relationship of these clusters with mortality was assessed.

The results of this research suggested that the sample of older people from the UK had higher life satisfaction scores than their peers in Taiwan; however, this difference did not remain in the multivariate analyses. The analyses also identified that self-rated health, mental health (loneliness and depression), income satisfaction, and using a walking aid were common predictors affecting quality of life in the two countries. The

results from Chapter 5 showed that the study location variable had an interactional effect with particular variables on life satisfaction between the two countries, i.e., people in the UK who were married, had excellent self-rated health, smoked, had heart, stomach, dizziness, high blood pressure or walking problems, used a walking aid, and those with high level of depression. People in these groups in the UK tended to report a high level of life satisfaction compared with their counterparts in Taiwan. Older people in Taiwan without friends had lower life satisfaction than their counterparts who had no friends in the UK.

Survival analyses showed that life satisfaction is associated with mortality in the two countries, especially older people who reported positive feelings in life satisfaction tended to have a decreased risk of mortality. Life satisfaction had a less persistent effect on mortality for the sample of older people in Taiwan, suggesting that other factors explain the relationship with mortality in older people in Taiwan, or that they are more resilient. However, in the UK people who had higher life satisfaction scores had improved survival, independent of demographic, physical and mental health, and social engagement. There was no relationship between change in life satisfaction (1989-1993) and mortality. Finally, patterns of life satisfaction were related to mortality – older people with patterns of higher life satisfaction within cluster were more likely to live longer.

Statistically significant differences were found between most of the factors of life satisfaction in the two countries. For instance, older people in Taiwan tended to live with someone, suggesting that the extended families are more in Taiwan than the UK. While some of the differences found, such as depression and loneliness, may be due to cultural variations, further research is required to identify further predictors of life satisfaction.

Finally, the term ‘life satisfaction’ is one component of quality of life, and life satisfaction was used as a measure of quality of life in the research. This comparative research described and explained the differences and similarities in quality of life among older people living in two different cultures and societies. To conclude, a common data set is a unique opportunity to identify the factors affecting quality of life and to compare quality of life between the UK and Taiwan for increasing our understanding of older people.

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for all the pains and dark  
you have borne for me;  
for all the benefits and blessings  
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Merciful friends, brothers and sisters  
may I know you more clearly,  
lover more dearly,  
and follow you more nearly,  
day by day.*

– Prayer of Saint Richard of Chichester

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## LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
AHEAD	The Asset and Health Dynamics Among the Oldest Old
ASPs	Alternatively Secured Pensions
BASE	The Berlin Aging Study
BASE	The Brief Assessment of Social Engagement
BMLSOA	Beijing Multidimensional Longitudinal Study On Aging
CAPE	The Clifton Assessment Procedures for the Elderly
CES-D	The Centre for Epidemiological Studies-Depress
CI	Confidence Interval
CLESA	Comparison of Longitudinal European Studies on Aging
dB	Decibel
df	Degree of Freedom
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders-IV
ELSA	The English Longitudinal Study of Ageing
EMRO	Eastern Mediterranean Regional Office
ENABLE-AGE	The Study Enabling, Autonomy, Participation, and Well-being in Old Age: The Home Environment as a Determinant for Healthy Ageing
ESAW	European Study on Adult Well-being
EURODEP	The European Depression Study for the Elderly
EuroQoL	The European Quality of Life Scale
FAS	The Financial Assistance Scheme
FAMSUP	The Family Support for Older People: Determinants and Consequences
FSCS	Financial Service Compensation Scheme
GAD	Generalized Anxiety Disorder
GDS	The Geriatric Depression Scale
GHQ	General Health Questionnaire
HALE	Health Ageing: a Longitudinal Study in Europe
HMO	Health Maintenance Organization
HR	Hazard Ratio
HRQOL	Health-Related Quality Of Life
IADL	The Instrumental Activities of Daily Living
ICD-10	The International Classification of Diseases-10
IHQl	The Index of Health-related Quality of Life
K-S Test	Kolmogorov-Smirnov Test
LASA	The Longitudinal Aging Study of Amsterdam
LSI	The Life Satisfaction Index
LSIA	The Life Satisfaction Index A
LSIB	The Life Satisfaction Index B
LSIW	The Life Satisfaction Index W
LSIZ	The Life Satisfaction Index Z
LSR	The Life Satisfaction Rating
MIG	Minimum Income Guarantee
MMSE	Mini Mental State Examination
MOBILATE	The European project: MOBILATE – Enhancing outdoor mobility in later life

M-W U Test	Mann-Whitney U Test
NHI	The National Health Insurance
NHS	The National Health Service
NIA	The US National Institute on Aging
NLSAA	The Nottingham Longitudinal Study of Activity and Ageing
OASIS	Old Age and Autonomy: the Role of Service Systems and Intergenerational Family Solidarity
OHIP	The Oral Health Impact Profile
OLS	Ordinary Least Squares
ONS	The Office for National Statistics
OPAS	Occupational Pensions Advisory Service
OR	Odds Ratio
PACE	The Program of All-inclusive Care for the Elderly
PGC	The Philadelphia Geriatric Center
PSC	The Population Studies Centre
QOL	Quality of Life
QOLI	The Quality Of Life Inventory
R <sup>2</sup>	R squared value
RACs	Retirement Annuity Contracts
S2P	State Second Pension
SAD	The 14-item Anxiety and Depression Scale
SAS	Statistical Analysis System
SD	Standard Deviation
SEARO	South East Asian Regional Office
SEBAS	Social Environment and Biomarkers of Aging Study
SERPS	State Earnings Related Pension Scheme
SF-12	The Short Form-12 health survey
SF-20	The Short Form-20 health survey
SF-36	The Short Form-36 health survey
SHARE	The Survey of Health, Aging and Retirement in Europe
SHLSET	Survey of Health and Living Status of the Elderly in Taiwan
SIP	The sickness Impact Profile
SIPPs	Self Invested Personal Pensions
SOC	Selection, Optimization, and Compensation
SPSS	Statistical Package for the Social Sciences
TPAS	The Pensions Advisory Service
UCLA-LS	The UCLA Loneliness Scale
UK	The United Kingdom
VAS	Visual Analogue Scales
WDQ	The Worry Domains Questionnaire
WHO	The World Health Organization
WHO-DAS-II	The World Health Organization-Disability Assessment Schedule
WHOQOL-100	The 100-Item Quality Of Life Instrument developed by the World Health Organization
WHOQOL-Brief	The Brief Quality Of Life Instrument developed by the World Health Organization
$\chi^2$	Chi-square test

## Chapter 1 Introduction

### 1.1 Introduction

This research is a comparative study of quality of life among older people in the United Kingdom (UK) and Taiwan. It is based upon issues associated with an increasingly ageing population, and a growing proportion of older people living in the UK and Taiwan. It seeks to clarify the importance of quality of life in older people, and this chapter identifies the purpose of the research, the research questions, and the significance of this research.

Older people can be described as those who are 65 years old and older. According to Lassey and Lassey (2001, p.9), “age 65 is approximately the time when one begins to notice that bodily functions do not work as well as they formerly did.” As far as the exact definition of ageing population is concerned, there is not adequate literature that can provide a fine universal definition which can be used worldwide. However, most literature has provided a practical definition of ageing population by using an age limit of 65. In other words, ageing population can be practically defined as those of age 65 and over, which will be adopted as the criterion of ageing population in this research. It is predicted that the total population of older people in the whole world will exceed one billion by 2030 (2001). Two major factors, i.e., increasing life expectancy and declining fertility rates are influencing the process of population ageing, and are part of a trend in developed countries worldwide.

Quality of life among older people is an important issue worldwide in the 21<sup>st</sup> century, because the proportion of people aged 65 and older is increasing so rapidly. The increasing numbers of the ageing population is due to people living longer; life expectancy is one reason affecting quality of life for an ageing population. However, as well as increased life span, quality of life in the additional years is important for older people experiencing changes in health status and frailty.

The last two decades have seen growing importance placed on research into quality of life among older people (Walker, 2004; Walker, 2005; Walker, 2006). Research on quality of life in old age has been undertaken in many studies in the UK (Bowling, 1999; Grundy and Bowling, 1999; Bowling and Windsor, 2001; Gabriel and Bowling, 2004; Kellaher et al., 2004; Walker, 2004; Bowling, 2005), but there is a general lack

of applied research on improving quality of life among older people in Taiwan. Moreover, at present, comparative studies focusing on quality of life in old age – that is, international comparisons – remain very scarce. In fact, on the whole, there has been relatively little research comparing quality of life among older people between two or more countries, until recently.

This chapter gives a brief overview of recent developments in the demographics of the ageing population, the importance of quality of life in old age, and the questions that will be addressed in the current study. Finally, the dissertation structure is presented.

### 1.2 Ageing population in the world

The older population is increasing throughout the world, and will continue to do so until at least 2050. It can be seen from Table 1.1 that the total population of people 65 years and older was 507 million (male: 223 million and female: 284 million) in 2008; this compares with 389 million (male: 168 million and female: 221 million) in 1997 (U.S. Census Bureau, 2008). Approximately 53.5% of these older people live in Asia (China, Taiwan, Japan, Korea, Saudi Arabia, Iran, Iraq, Israel, Jordan, Pakistan, Philippines, India, etc.), while about 23.4% live in Europe. The proportion of the population aged 65 and over is estimated to increase to 50% or more by 2030 (U.S. Census Bureau, 2008). This growth in the older population is caused by reduced mortality rates and by a decline in fertility (Lowenstein, 2005).

**Table 1.1: Estimates of population and percentage by gender for age 65+ of the world in 2008.**

Areas	Total N (%)	Male N (%)	Female N (%)
World (Total)	507.4	222.8 (43.9)	284.6 (56.1)
Continent of Africa	32.3 (6.4)	14.3 (44.3)	18.0 (55.7)
Continent of Northern America	55.2 (10.9)	23.6 (42.7)	31.6 (57.3)
Continent of South America	25.6 (5.1)	10.9 (42.6)	14.7 (57.4)
Continent of Asia	271.6 (53.5)	125.7 (46.2)	145.9 (53.8)
Continent of Europe	119.0 (23.4)	46.5 (39.1)	72.5 (60.9)
Continent of Oceania	3.7 (0.7)	1.7 (44.7)	2.0 (55.3)

Source: U.S. Census Bureau, International Data Base, data updated 13 December 2008 (population in millions).

Figure 1.1 shows countries with high life expectancy at birth tend to be located in Europe, North America, and Latin America (<http://www.worldlifeexpectancy.com/>). Older people in these regions are now living longer than in the past. For example, for the year 2020, the estimated life expectancy in Europe ranges from 81.7 to 85.1 years for women and from 75.3 to 80.2 years for men (Lowenstein, 2005). As the

population of older people increases throughout the developed world, the quality of life of this group will become increasingly important.

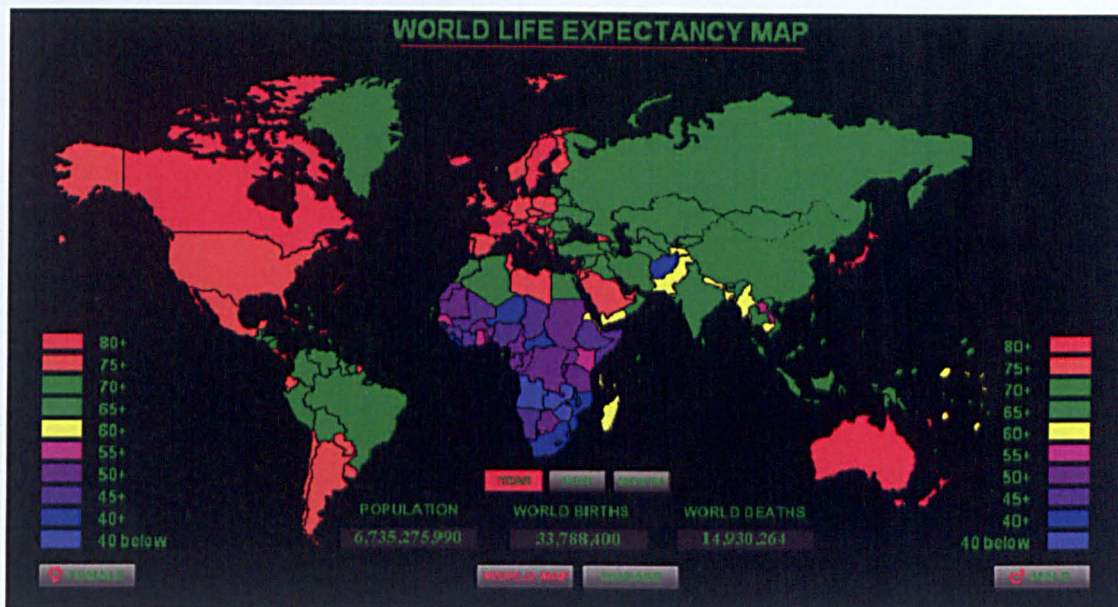


Figure 1.1: The World life expectancy (<http://www.worldlifeexpectancy.com/>) accessed on 31<sup>st</sup> March 2009.

### 1.3 Comparative research: developed versus developing countries

Numerous studies have been conducted in the highly-developed countries of Western Europe, such as the CLESA (Comparison of Longitudinal European Studies on Aging) (Bardage et al., 2005; Zunzunegui et al., 2005), the HALE (Healthy Ageing: a Longitudinal study in Europe) (Äijänseppä et al., 2005), and the ESAW (European Study on Adult Well-being) (Ferring et al., 2004) in Europe. Two additional studies examined the relationship between socioeconomic status inequalities and mortality in Western Europe (Huisman et al., 2004; Huisman et al., 2005). However, relevant research in developing countries has not yet gained adequate attention, and this phenomenon has been noted. For example, Walker (2006, p. 8) emphasized the importance of environmental factors in ageing research in Europe and suggested that it is important to realize “the need to understand the experience of interior and exterior space in later life across different European countries and regions (urban/rural, developed/less developed).” Hence, international comparative research should be conducted not only in developed countries, but also in developing countries, whenever and wherever possible.

With respect to ageing research in developing countries, many studies have been undertaken. However, limitations in most of these studies include their inadequate research scope and limited samples. For example, Wada et al. (2005) compared quality of life among older people in developed versus developing countries, but did not examine what factors influence the prevalence of depression. Ofstedal et al. (2004) examined economic well-being among older people in eight developing countries in Southern and Eastern Asia, but did not actually compare developed and developing countries, and they also did not include the biggest developing country (China) or the two most-developed countries (Japan and Korea).

With respect to comparative studies between developed and developing countries, there are many important issues to consider, including the various political, social, economical, cultural, and demographic differences. Developed countries, by definition, are better off economically than developing countries; they also tend to be more politically stable. Both political factors and the economic environment influence social welfare and social security for older people. Indeed, older people tend to have increased longevity and better quality of life in developed countries. Longevity may equate with good health and physical function; while, as discussed already, health is one of the strongest predictors of quality of life in older people. Therefore, international comparisons between developed and developing countries must be concerned with economic conditions, the social environment, and culture.

### **1.4 Comparison of the UK and Taiwan**

Studying historical perspectives, societal changes, and cultures may help to understand the life course of the ageing populations across countries. Thus, this section presents a historical perspective, ageing population, health services, social support systems, and lifestyles of older people in the two countries.

#### **1.4.1 Historical perspective**

##### ***The UK***

The United Kingdom (UK) is located in Western Europe between the North Atlantic Ocean and the North Sea, northwest of France. Its total area is 244,820 sq km, including Rockall and the Shetland Islands, and the majority of people live in England,

Scotland, and Wales. It is one of the most important post-industrialized countries in the world (The Central Intelligence Agency, 2006).

The UK is one of the world's leading trading powers and financial centres, and its Gross Domestic Product (GDP) in purchasing power parity was \$1.29 trillion in 1999 and \$2.231 trillion in 2008. The UK economy saw a long period of expansion and growth after the economic recession of 1992. People in the UK who have completed five or more years of schooling have accounted for 99% of the total population since 1978. 1.1% of the population worked in agriculture, 17.5% in manufacturing and construction, 11.3% in government, and 1.2% in energy in 1996, and 1.4% of the population worked in agriculture, 18.2% in industry, and 80.4% in services in 2006 (The Central Intelligence Agency, 2006).

### *Taiwan*

Taiwan is a small group of islands with a total area of 35,980 sq km, including the islands of Pescadores, Matsu, and Quemoy. It is located in Eastern Asia, its islands bordering the East China Sea, Philippine Sea, South China Sea, and Taiwan Strait, north of the Philippines, off the south eastern coast of China (The Central Intelligence Agency, 2006).

Taiwan was discovered by both the Chinese and Japanese prior to 1600. A large number of immigrants were led by the famous Chinese general, Cheng Ch'eng-Kung, in 1662 and, after some years, it succumbed to the control of the new Manchu regime in mainland China. These events were followed by a continuous migration of Chinese which raised the population from a few thousand in 1600 to more than two million by 1895, when Taiwan was ceded to Japan.

Japan evolved a system of managing affairs in Taiwan, and developed a colonial program. The colonial government set out to halt the further migration of people from mainland China, but Taiwan's population grew rapidly from about three million in 1905 to 6 million in 1943 (Chen, 2001). Taiwan reverted to Chinese control after World War II and, following the Communist victory on the mainland in 1949, two million Nationalists fled to Taiwan and established a government (The Central Intelligence Agency, 2006). These two million Nationalists were mainly young male soldiers and officers of the military, who tended to work in government when they came to Taiwan (Ofstedal et al., 2004). However, the Taiwanese government Taiwan

implemented martial law between 1949 and 1987, and the Taiwanese people had insufficient individual freedoms and human rights during this long time.

Before the year 2000, Taiwan was a developing country, and manufacturing occupied the main industrial sector since the mid-1960s. Taiwan was ranked the third computer hardware supplier in the world between 1995 and 1999. However, laptop computers, monitors, personal desktop computers, and motherboards, accounted for approximately 80% of the production value of the information technology industry in 2000 (Government Information Office in Taiwan, 2007).

The GDP in purchasing power parity was \$357 billion in 1999 and \$738 billion in 2008. Taiwanese people who could read and write formed 86% of the total population in 1980, and 96.1% of the total population in 2003. In 1988, there were more people in the service sector than the industrial sector for the first time. 8% of the population worked in agriculture, 37% in industry, and 55% in services in 1999, and 5.1% of the population worked in agriculture, 36.8% in industry, and 58% in services in 2008 (The Central Intelligence Agency, 2006).

In summary, the objective of economic development is to allow a country's people to enjoy a higher quality of life, and developed countries, such as the UK, have a better record than most other countries in education, health, culture, leisure activities, and social involvement. These non-economic areas need support from a good economical environment and, although there has been an economic transformation in Taiwan, the welfare system is still grossly inadequate, inequitable, and inefficient.

### **1.4.2 Ageing population in the UK and Taiwan**

#### ***Ageing population in the UK***

The UK's ageing population began to increase rapidly in 2008. Life expectancy has increased as a consequence of improved health, housing, and lifestyle. There are less than 9 million people over 65 but it is estimated that they may be approximately 13 million by 2025.

Table 1.2 shows the estimated change in population for the UK between 2008 and 2025. In mid 2008, the total UK population was approximately 60,943,912 and the proportion of people aged 65 years and over was 16% (4,186,561males/5,549,195 females). In 2025, it is estimated that the total population of the UK will be



63,818,586, and the proportion of older people will increase to 20.4% (5,775,207males/ 7,220,995 females) (U.S. Census Bureau, 2008).

**Table 1.2: Midyear population, by age and gender: 2008 and 2025 in the UK.**

AGE	2008			2025		
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
TOTAL	60,943	30,172	30,771	63,818	31,650	32,168
65-69	2,730	1,310	1,420	3,675	1,792	1,882
70-74	2,333	1,087	1,246	3,000	1,410	1,589
75-79	1,915	832	1,082	2,764	1,238	1,526
80+	2,755	956	1,799	3,556	1,333	2,223

Source: U.S. Census Bureau, International Data Base, data updated 16 July 2007 (population in thousands).

In the UK, life expectancy at birth of the overall population is 78.8 years (76.4 years for males, and 81.5 years for females, 2008 estimate) (U.S. Census Bureau, 2008). By 2025, the life expectancy will be 81.1 years for the total population (78.4 years for males and 83.8 years for females, 2025 est.) (U.S. Census Bureau, 2008)

### *Ageing population in Taiwan*

A major demographic transition has been observed over the past 40 years. In 1993, for the first time in Taiwan, the proportion of people aged 65 years or over accounted for more than 7% of the total population (Chen, 2001). By 2008, the total population was 22,920,946 and the proportion of the population aged 65 years and over was 10.5% (1,167,476 males/1,228,691 females).

Table 1.3 shows the numbers of people aged 65 and over by age and gender, both for 2008 and the prediction for 2025. It is estimated, that the total population will rise to 23,213,741 and the proportion of the older population will rise to 19.1% (2,010,725 males, 2,429,177 females) by 2025 (U.S. Census Bureau, 2008).

**Table 1.3: Midyear population, by age and gender: 2008 and 2025 in Taiwan.**

AGE	2008			2025		
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
TOTAL	22,920	11,586	11,333	23,213	11,507	11,706
65-69	760	361	399	1,546	736	809
70-74	610	286	324	1,252	581	761
75-79	498	254	243	715	321	394
80+	525	265	260	924	371	553

Source: U.S. Census Bureau, International Data Base, data updated 16 July 2007 (population in thousands).

In 2008, life expectancy at birth was 77.8 years ( 74.9 years for males, and 80.9 years for females) (U.S. Census Bureau, 2008). It is estimated that, in 2025, life expectancy

will be 80.3 years for the total population (77.5 for males, and 83.4 for females, est.) (U.S. Census Bureau, 2008).

In summary, the proportion of older people in the UK is more than in Taiwan, and life expectancy at birth for men and women was very close in 2008 between the two countries.

### 1.4.3 Health services

#### *Health care in the UK*

##### The National Health Service

Health care is important to older people and, in the UK, the *National Health Service* (NHS) was established in 1948 to improve health care and create widespread care for each person (Lassey and Lassey, 2001). The NHS provides health care, long-term care, and general care. Furthermore, the NHS supports acute care in hospitals and chronic care in nursing homes (Lassey and Lassey, 2001). Initially, health services were free for all persons in this program. However, some services, such as prescriptions, dental treatment, and eye care, were dropped from state-funded coverage after 1977. Older people are the biggest beneficiaries of free services from the NHS, which endeavours to provide a continuum of health care for older people. The intent is to enable older people to maintain their health and decrease using long-stay hospital and nursing home care. However, the provision of these health care services by the NHS could restore older people's health, decrease the risk of mortality, and maintain their quality of life.

The NIIS is an organisational structure controlled by the national government, and both hospitals and nursing homes are part of this national system. Hospitals provide health care for most of the population, including acute care, and have an extensive system of geriatric care, whereas nursing homes support chronic care. However, according to the 'Better Government for Older People' programme, social care, housing management, education, transportation, and health are provided by multi-level networked governance (Hayden and Benington, 2000). For instance, home care services are the accountability of local government, including local branches or regional agencies of national government. On the other hand, citizen and community centres are forms of older people's participation in various activities. Therefore, local

government plays an important role in integrating, developing, and implementing strategies for improving the quality of life for older people.

### **Geriatric medicine and hospices**

Two essential concepts, namely geriatric medicine and hospices, have been founded and developed in the UK. *Geriatric medicine* is a medical speciality which deals with the health care management of older people (Lassey and Lassey, 2001) and, according to Lassey and Lassey (2001, p. 323), geriatricians “are trained to focus not only on accurate assessment and medical treatment, but also on rehabilitation and long-term care. Their goal is to optimize functional capacity and independence insofar as is possible.” This is the area of medicine concerned with the problems of ageing, for example, non-specific symptoms in assessing older people, like confusion, falls or deteriorating functional ability.

Another innovation is the *hospice* concept of end-of-life care for people who are dying (Lassey and Lassey, 2001). Hospices exist in different forms, including hospital in-patient suites, home care services, and nursing homes. These two developments were aimed at improving health care, and the quality of life, of terminally ill people, including older people.

### ***Health care in Taiwan***

#### **National Health Insurance**

In Taiwan, older people are encouraged to live with, or near, their adult children, although the government provides basic life assistance and health care for poor and vulnerable older people (Government Information Office in Taiwan, 2007). In 1980, the government introduced the *Welfare Law for the Aged* to provide services for older people (Bartlett and Wu, 2000). In terms of health care, in 1995, the government implemented the *National Health Insurance* (NHI) program under the *National Health Insurance Act* to replace 13 different public health insurance plans (e.g., the Labour Insurance program, the Government Employee and School Staff Insurance program, the Retired Government Employees’ Insurance program, and the Comprehensive Farmers’ Health Insurance program).

The NHI program provides medical services, including inpatient care, ambulatory care, laboratory tests, X-ray examinations, pharmaceuticals, dental services,

traditional Chinese medicine, day care for people with mental health problems, adult health examinations, pre-natal examinations, well-baby checkups, smear tests, limited home health care, and certain other services. The NHI program covered 99% of the total population by the end of 2008 (Government Information Office in Taiwan, 2007).

### **Day care**

Day care is an important component of current care for older Taiwanese people. The first day-care centre for older people was established in 1988 in the Neihu District by the Taipei City government. Most of the day care centres, and residential and nursing homes are located in Taipei and Kaohsiung City, with far fewer available for older people living in the countryside or rural townships. There were 748 retirement and nursing homes caring for 34,724 older people in 2002, but this is not adequate to house older people. The Ministry of the Interior provides financial backing for county governments and rural township administrative offices to support an in-home care program (Government Information Office in Taiwan, 2007), which provides nursing-skill training to family members and professional caregivers, to improve the quality of services for older people still living at home.

### **Long-term care**

Because of the increasing need for the long-term care of older people, the government corroborated a proposal for a ten-year long-term care system in 2007 (Government Information Office in Taiwan, 2008), and this (Government Information Office in Taiwan, 2007) long-term care system will be completed within ten years with funding of NT\$81.736 billion (US\$2.5 billion) provided by the government for services for older people (aged 65 and over), indigenous people (aged 55 and over), disabled people (aged 50 and over), and older people living alone or unable to perform the activities of daily living. However, a variety of levels of services or grants will be provided to older people according to their health and economic situation (Government Information Office in Taiwan, 2008).

In summary, the system of health care for older people has a long and progressive history in the UK compared with Taiwan. However, health care services and life expectancy have improved in Taiwan since the government implemented the National Health Insurance program in 1995.

### 1.4.4 Social support systems

#### *Social services in the UK*

##### **Community Care**

In the UK, the function of the family to provide support for older people has weakened for several reasons, one of which is that an increasing proportion of women work outside the home, and younger people move away from home for employment purposes, and do not live close to their parents. Informal helpers such as spouses, adult children, sisters, brothers, friends, neighbours, grandchildren, nieces, nephews, and cousins, become important for older people. However, the government enforces community responsibility for resolving older people's long-term care problems and, in 1990, the *Community Care Act* was passed, providing new funding for research into older people (Lassey and Lassey, 2001). According to the *Community Care Act*, local governments need to plan health care to meet the social care needs of older people. The *Community Care Act* also proposed that private enterprises should help to provide residential care and nursing homes for older people. Later, the '*Better Government for Older People*' project was launched to improve the lives of older people, including health care, social services, employment, housing, transport, and health education in the early years of the 21st century (Bernard and Phillips, 2000).

##### **Personal Pensions**

The UK has a long history of social security policies for older people, and the main strategies are shown in Table 1.4. *Pension Credit*, introduced in 2003, is a plan to provide income for people aged 60 and older, consisting of at least 114.05 pounds sterling (£) per week for a single person and £174.05 per week for two people living together. This income increases by £17.88 per week for a single person and £23.58 each week for two people living together if they are aged over 65 (The Pensions Advisory Service, 2006). This is an important benefit offered to older people by the present system.

**Table 1.4: Significant pension events in the UK.**

Year	Policy
1948	Basic State Pension
1956	Retirement Annuity Contracts (RACs)
1975	Occupational Pensions Board established
1978	State Earnings Related Pension Scheme (SERPS)
1983	Occupational Pensions Advisory Service (OPAS)
1988	Personal Pensions
1989	Self Invested Personal Pension (SIPPs)
1999	Minimum Income Guarantee (MIG)
2001	Stakeholder Pensions / Financial Service Compensation Scheme (FSCS)
2002	State Second Pension (S2P)
2003	Pensions Credit replaces MIG
2004	OPAS changes its name to The Pensions Advisory Service (TPAS)
2005	The Financial Assistance Scheme (FAS)
2006	Alternatively Secured Pensions (ASPs)

Source: The Pensions Advisory Service in the UK.

### *Social services in Taiwan*

#### **Family role**

The family provides basic care and financial support for its older parents in Taiwan, since the traditional Confucian values emphasize family responsibility for the financial support and care of older parents in Chinese populations. Before industrialisation and societal change, people lived in large extended families. Today, however, the traditional concept of the extended family has been replaced by the newer concept of the nuclear family. Most families are smaller and consist of parents and one or two children, especially in large towns and cities such as Taipei, Taichung, and Kaohsiung, although there are still extended families in rural areas in Taiwan (Government Information Office in Taiwan, 2007). Thus, before 2008, older people may have worried about financial problems relating to increasing healthcare expenditure on account of decreasing family support and a lack of social security support from the Taiwanese government in Taiwan. Today, the government encourages moderate growth for increasing the birth rate.

#### **National Pension Insurance**

In response to the ageing population, the government initiated a pension system for older people in 2002 (Government Information Office in Taiwan, 2007), which provided a monthly pension of NT\$3000 (US\$91) to senior citizens aged 65 years or more, who were below the poverty line and did not receive other pensions or stipends. According to the criteria of the pension system, approximately 440,000 older people

were eligible for this pension. However, this program was replaced by the National Pension Insurance in 2008. On the other hand, a plan for a national pension program was submitted by the Executive Yuan for approval by the legislature. The National Pension Insurance program suggests a monthly pension of US\$218 for those aged 65 years or more, and it also offers financial assistance to physically and mentally disabled people (Government Information Office in Taiwan, 2007). The *National Pension Act* has now been passed, and took effect from October 2008.

In summary, the government in the UK takes responsibility for the care of older people, and pension changes are implemented to increase equality and adequacy. Conversely, in Taiwan, the family is expected to provide personal care. However, the Taiwanese government implemented a new pension system in 2008 for income support for older people.

### 1.4.5 Lifestyle of older people

#### *Older people in the UK*

The lifestyle of older people in the UK can be considered from various aspects. For example, people tend to have a higher alcohol intake and smoke more (Soule et al., 2005). According to the General Household Survey, Office for National Statistics, the prevalence of cigarette smoking among older people of 60 and over was 16% for men during the period between 1998 and 2003, and 16% for women in 1998 and 14% in 2003. 30% of older men aged 75 or more drank alcohol on five or more days every week in 2003 (Soule, 2005).

Generally, the majority of older people live in private homes, and are married or cohabiting with their families. Most older people visit a relative or friend at least once a week, and 78% of older people aged 65 and over have contact with neighbours at least once a week. However, 14% of them had no contact at all in 2001 (Soule, 2005). According to the UK Time Use Survey 2000, the main leisure activities were watching TV and video, social life, entertainment and culture, reading and listening to the radio/music, resting, food preparation, cleaning and house repairs, and gardening or pets (Soule, 2005).

Some older people travel, but this may depend upon their health and financial situation. In addition, some older people continue to work, which may be due to

income difficulties. The majority of older people use public transport and other lesser groups use a car (Lassey and Lassey, 2001) (Lassey and Lassey, 2001). Older people do a minimum amount of physical activities, for example, walking and gardening. However, they participate in volunteering, and cultural and sporting activities if they do not have health or mobility problems (Soule, 2005).

### *Older people in Taiwan*

In terms of older people in Taiwan, the one basic trait of people is that they are extremely warm and friendly, and their form of hospitality is more likely to prepare a raucous dinner party with lots of friends and good food. For this reason, eating habits have their effect on the health of older people in Taiwan, causing common diseases such as diabetes, cancer, and heart disorders.

Studies of the lifestyle of older people in Taiwan are quite limited, but according to research on a sample of the *Survey of Health and Living Status of the Elderly in Taiwan* (SHLSET) aged 60 and over, the majority of leisure activities included attending religious activities, taking walks at least once a week, participating in social clubs and community organisations, watching TV and listening to radio. Older people participate in social activities including chess, cards, singing groups, dancing, tai-chi, and karaoke, and they also attend concerts or take local tours or day trips at least once a week (Hermalin and Yang, 2004). However, it is worth noting that 60% of older people like to chat with relatives, friends or neighbours, and to drink tea socially. These activities have a significant influence on the quality of life of older people in Taiwan (Hermalin et al., 2004).

Older people use public transport much more or walk in Taiwan. However, in the 1990s, older people tended to report 'fear of movement', which affected their lifestyle, because they recognised weakened muscles, arthritic joints, occasional dizziness, or other health problems. Furthermore, the environment was not user-friendly, with more traffic problems and un-manoeuvrable pavements, increasing the danger for older people in Taiwan (Vuylsteke, 1995). However, these situations may have only a small impact on the quality of life among older Taiwanese people.



### **1.4.6 Overview of changes experienced by older people in the UK and Taiwan**

Section 1.4 discusses the changes experienced by old people in the UK and Taiwan. Central to the concept of 'quality of life' in old age in both countries is the value attached to health. The UK government generated a new and improved system of health care in 1946, and physical health care for older people has received more attention in Taiwan, although some challenges remain. However, health care for older people has improved in Taiwan since 1995, and great progress has been made in improving the life expectancy of older people during the last 10 years.

Threats to the quality of life among older people include not only health care, but economic problems and the level of participation in communities and the wider society. A personal pension system has probably helped to achieve a good quality of life for older people in the UK. Conversely, the welfare of older people in Taiwan has developed slowly. The essence of lifestyle for older people reflects the ability to maintain their lives and relationships with other people, and older people in the UK attempt to perform individual and interesting activities, whereas older Taiwanese people desire to keep their family, friends, and social relationships.

### **1.5 Importance of quality of life in older people**

Quality of life is a central issue for older people. The ageing population and life expectancy are increasing, but a variety of factors may affect overall quality of life during the extra years of later life (Hellström et al., 2004).

In essence, older people tend to experience general health problems, difficult financial situations, limited social relationships, disruptive changes in their roles in society, losses of basic functional ability, and anxiety as they age and approach the end of life. Consequently, such problems have become a major concern of the study of gerontology and health authorities in many countries. As discussed in Section 1.4, both the UK and Taiwan have also paid much attention to such issues by providing health care and social service programmes for older people. These programmes aim to solve main problems for the elderly people and improve their overall quality of life, and hopefully to increase survival, and to enable continued physical, psychological, and social functioning associated with performing normal activities of older people's

daily life. The British have the most advanced system compared with Taiwan. The Taiwan government is progressive to take the amount of responsibility for caring older people now.

Older people frequently perceive certain factors as being of greater importance to their overall quality of life. As will be discussed in the literature review in Chapter 2, a variety of factors (e.g., morale, loneliness, physical and mental health, social engagement, etc.) may contribute to, and affect, quality of life, but a key question is which factors are the most important. The current study seeks to provide a better understanding of what factors affect quality of life among older people.

### **1.6 Objectives and research questions**

The main objectives of the research in this thesis are (1) to examine quality of life among older people; (2) to examine the factors that may affect this, such as physical health, psychological well-being, demographic characteristics, and social engagement; and (3) to compare quality of life among older people in the UK and Taiwan. In this thesis, life satisfaction will be used as a measure of quality of life. A rationale for this approach is discussed in Chapter 2. In view of these objectives, the seven specific research questions to be addressed in this study are:

1. How might datasets from independent studies on older people be combined to undertake cross-national comparisons?

This question is a methodological issue that will be examined by utilising two data sets, one from the UK and one from Taiwan. To date, few investigators have examined how data from separate international studies can be used for comparative purposes. The details of this process are described in Chapter 4. A further methodological question arises from this.

2. How does attrition affect the samples of older people in longitudinal studies?

The following research questions are addressed by the empirical research conducted for this thesis.

3. What are the differences in quality of life among older people in the UK and Taiwan?
4. What factors are associated with quality of life among older people?
5. Which factors are associated with a change in quality of life among older people?

6. What is the relationship between quality of life and mortality in old age in the UK and Taiwan?
7. Are there observable patterns of quality of life among older people and do any such patterns have a relationship with mortality among older people?

These seven research questions will be addressed through secondary analyses of data drawn from the *Nottingham Longitudinal Study of Activity and Ageing* (NLSAA) in the UK and the *Survey of Health and Living Status of the Elderly in Taiwan* (SHLSET), which contain data from similar nationally-representative cohorts of older people age 65 and over, who were interviewed in 1989 and 1993. Descriptive, bivariate, and multivariate analyses will be used for this study, with further testing to detect relationships between variables, as necessary.

It is hoped that answering these questions will contribute to our understanding of the relationship between various factors and quality of life among older people. This study may be critically important, laying the groundwork for understanding how datasets from independent studies on older people can be merged to undertake cross-national comparisons.

### **1.7 Structure of the thesis**

For these objectives to be achieved, the overall structure of the thesis takes the form of eight chapters, including this introductory chapter. Chapter 1 of this thesis has provided a background and research questions for the research, i.e., the major factors that contribute to quality of life and its importance for older people across countries.

Chapter 2 presents the literature review for the thesis, and begins by examining various definitions of quality of life, before presenting the definition used in this thesis. It then looks at ways by which to measure quality of life, explores certain aspects of quality of life, examines the relationship between quality of life and mortality, discusses successful ageing and theories of ageing, explains cross-national comparisons of quality of life, and identifies gaps in the literature. This is followed by further background information on the ongoing research that the present study has carried out and a statement regarding the specific research objectives. Related domains and factors that exert an influence on quality of life – such as physical health, psychological well-being, social situation, environment, and demographic status – are presented and described in the literature review. The research methodology is

presented in Chapter 3, with details of the data resources, research instrument, and data analysis plans used.

The detailed analyses in pursuit of research questions are presented in Chapter 4-7. Chapter 4 presents the set of findings of the research, focusing on the data harmonisation and comparison the UK and Taiwan research questions discussed in the analysis. Chapter 5 identifies, and compares, the factors that influence both quality of life and changes in quality of life between the two countries. The following Chapter 6 discusses the relationship between quality of life and changes in quality of life and mortality. Chapter 7 is divided into two main parts. The first section describes the use of cluster analysis to identify patterns of quality of life. The second section presents the relationship between patterns of quality of life and mortality. This research finding will be interpreted with reference to the methodological choices made, and then are discussed these results.

Finally, Chapter 8 concludes the thesis, with a brief summary of the findings and discusses the limitations of the study. It also discusses the implications of the findings, and makes suggestions for future research in this area.

### **1.8 Conclusion**

Chapter 1 has provided a brief overview of how both the population of older people and life expectancy are increasing worldwide. Although people are living longer, older people may suffer from poor health, disability, a decline in function, and so on in their later years. These factors may adversely affect overall quality of life in these additional years of old age. Consequently, a number of studies have been conducted to identify the most important factors affecting quality of life in older people. The chapter has also presented the background for the research, and revealed the importance of quality of life as an issue for this large, and growing, population of older people.

Although numerous other investigators worldwide have studied, and reported on, the importance of quality of life for older people, in this chapter, the use of already existing datasets is proposed to compare quality of life and the factors affecting quality of life between two geographically-distant and culturally-distinct countries: the UK and Taiwan.

While this chapter has introduced profile of older people, regarding health care, and social support program context in the two countries, it is important to note that quality of life among older people will have common and dissimilar contributing factors to quality of life. Thus, Chapter 2 will expound the knowledge of quality of life and attempt to bring a multicultural perspective to older people.

## Chapter 2 Literature review

### 2.1 Introduction

Chapter 1 introduced the thesis and presented the main research questions for the study. This chapter reviews the current literature on quality of life in older people.

For the quality of life to be understood in-depth among older people, the literature review is structured as follows. The first section gives a brief overview of the concept of quality of life and the second section defines 'quality of life' for this research. The third section shows the measure of quality of life and how studies have measured quality of life, following which aspects of quality of life are presented, with full details of the factors affecting, or related to, quality of life, including physical health, mental health, social factors, the environmental situation, and demographic characteristics. The relationship between quality of life and mortality is described in the next section. Successful ageing and theories of ageing are then presented, outlining the relationship between successful ageing and theories of ageing and quality of life. Finally, the last two sections discuss the value of comparative research and the importance of such research to the life quality of ageing population, with a synthesis to identify the shortcomings of the reviewed literature.

In order to investigate the current literature surrounding this research, a search strategy was developed to review the literature, firstly to identify the key concepts of this research, such as quality of life, life satisfaction, older people, etc. The primary search strategy was to conduct a search of the following bibliographic databases using the key concepts listed on the following page.

- ASSIA via CSA: covers the applied social sciences
- CINAHL via EBSCO: covers the nursing and allied health literature
- Dissertation Abstracts: include US and European dissertations and theses
- MEDLINE via OvidSP: covers medical literature
- PsycARTICLES via OvidSP: full text literature covering psychology and related disciplines
- PsycINFO via OvidSP: covers psychology and related disciplines

- Google Scholar: sets scholar preferences linking to the University of Sheffield Library and the National Central Library of Taiwan

These databases were chosen to reflect the widest range of literature available, and because they were held in electronic format by the University of Sheffield Library and the National Central Library of Taiwan.

The key terms used for the search were as follows:

Key terms	Alternative terms
Quality of life Life satisfaction Psychological well-being Morale Happiness	Older people Elderly people The elderly
	<p><b>Physical health</b>, e.g., chronic diseases, functional status, disability, frailty etc.</p> <p><b>Mental health</b>, e.g., grief, worry, loneliness, anxiety, depression, etc.</p> <p><b>Social factors</b>, e.g., social relationships, social networks, social engagement, etc.</p> <p><b>Environment</b>, e.g., living arrangements, living alone, built environment, etc.</p> <p><b>Demographics</b>, e.g., age, gender, marital status, finance, socioeconomic class, etc.</p> <p><b>Mortality</b></p> <p><b>Successful ageing</b></p> <p><b>Theories of ageing</b>, e.g., disengagement theory, activity theory, continuity theory, and subculture theory.</p> <p><b>Comparative research</b></p>

From the total number of hits per search, a number of records were tagged, or marked according to criteria, and references specifically related to the quality of life of older people were examined.

Official or governmental data, which was available on-line, was also reviewed to support this research. This included the Republic of China (Taiwan) Yearbook (published by the Government Information Office), the Population Studies Centre in the University of Michigan, the World Health Organisation, the Office for National Statistics, the Pensions Advisory Service (grant-aided by the Department for Work and Pensions), and the World Factbook (US Central Intelligence Agency).

Finally, a search was made of academic research, such as the Growing Older programme (the Economic & Social Research Council research programme on extending quality of life) and European Forum on Population Ageing Research, made for the literature review relating to quality of life among older people.

### **2.2 Overview of the concept of quality of life**

Quality of life is a widely used term in gerontological research, as well in other areas of health and medical research. Much has been written about what constitutes quality of life, and this is discussed in Section 2.5. In old age, the factors that affect quality of life, as well as interventions that improve quality of life in older people have been examined (Kligman, 1989; Staats et al., 1993; Baxter et al., 1998; Liao et al., 2000; Odom, 2001; Schechtman et al., 2001; 2002; Wrosch and Scheire, 2003; Kennedy and Hamilton, 2005). According to Sullivan, et al., (2000) and Bowling et al. (2003), quality of life in old age is influenced by physical, psychological, social, and environmental factors, though other researchers have argued that culture and social structures also are influential factors in quality of life. These two factors (culture and social structure) include ethnicity, gender, education, income, and socioeconomic class, the last being an especially important factor in quality of life among older people. These factors can be determined by older people's life experiences, meanings, perceptions, and expectations (Walker, 2005).

Physical health is an important factor influencing quality of life in old age (Huppert et al., 2000; Hendry and Mcvittie, 2004). If people are healthy, they are more likely to have a higher-level quality of life than if they are suffering from health problems. Health status is described as depending upon an individual's relative level of wellness, or conversely of illness, which is the presence of biological or physiological dysfunction, symptoms, and/or functional impairment (Miller, 2003b). Walker (2005) described possible physical health problems in old age as heart disease, diabetes, stroke, joint disorders, and impaired vision and hearing. For example, older people with impaired vision may have reduced mobility and can undertake fewer activities of daily living; this may result in reduced contact and communication with the external environment, and social isolation may result. Moreover, reduced social contact or being alone, or feeling lonely, may lead to social isolation, and psychological problems such as depression (Barron et al., 1994). Psychological health is another essential aspect of quality of life to consider; it is related to negative experiences in later life, for instance, the loss of a partner, loss of family, having poorer health, and loss of social relationships, and these affect a large proportion of older people. As Walker (2005) mentioned, the main psychological conditions include loneliness, anxiety, depression, and dementia.



It is generally accepted that physical and mental health domains contribute to quality of life. However, there is growing evidence that social relationships and the life course have an impact on a person's quality of life in old age (Blane et al., 2004; Wiggins et al., 2004; Wilhelmsen et al., 2005). According to Bajekal (2004), quality of life is influenced by four dimensions: the quality of neighbourhood, social networks and community participation, material conditions, and health. For instance, among 624 participants aged 65 or over surveyed in a two-year longitudinal study, Saito et al. (2005) found that positive support from the neighbourhood affected the activities of daily living of older women living alone. Bowling et al. (2003) reported that older people define 'good' quality of life as "having good social relationships with family, friends, and neighbours." (p. 233) Older people like to continue their life within their own homes and their own neighbourhoods (East, 1992). Thus, social support from the neighbourhood is an important element in the health status of older people; also, older people may establish relationships between social support and/or engagement and feeling of contentment if the relationships are a positive interaction that contributes to the quality of life of older people.

### **2.3 Definition of quality of life**

Quality of life is important for all older individuals; but the first thing to consider is what constitutes 'quality of life'. Previous investigators have studied quality of life in older people from several different perspectives such as physical and psychological health-oriented studies, socioeconomic studies, among others. Despite an increasing number of studies trying to define the term 'quality of life' in older people, its definition remains broad (Bowling et al., 2002). Gabriel and Bowling (2004) argued that a broader definition of quality of life is more useful and accurate. In a previous study, Bowling et al. (2002) emphasized the importance of self-evaluations in quality of life, and how they are usually influenced by physical, psychological, socio-demographic, social capital, and socioeconomic factors. The last definitions of quality of life also include social and emotional well-being, happiness, and life satisfaction. However, financial status appears to be important (Bowling and Gabriel, 2004).

The fundamental domains of quality of life include physiological, psychological, social, behavioural, and intellectual functions. However, other factors, such as ethnicity, gender, socioeconomic status, and culture, are influential (Tsang et al., 2004;

Lee, 2005). Deck et al. (2002) and Kerschner and Pegues (1998) studied various aspects of quality of life. For instance, they found that, among older individuals, men rate their quality of life more positively than women. Studies on the ageing population have found strong associations between socioeconomic inequality and quality of life in old age (Breeze et al., 2004; Breeze et al., 2005). Therefore, demographic characters may indirectly influence quality of life when older people are more likely to have a lower income, have a lower level of education, or be widowed and live alone.

A distinction has been made by Farquhar (1995) between two areas of research into quality of life in older people: (1) social gerontology and social indicators research, and (2) health services research. Farquhar (1995) addressed four dimensions related to the concept of quality of life, as seen from a social gerontology and social indicators perspective. The dimensions are general health and functional status, socioeconomic status, life satisfaction, and self-esteem. However, the author also emphasized that there are a variety of important components of quality of life in health services research, such as physical well-being, psychological well-being, and functional status (Farquhar, 1995).

Several researchers have addressed two different dimensions of quality of life: the subjective and the objective (Brooks, 1996; Lundh and Nolan, 1996; Lawton et al., 1999; Hagberg et al., 2002; Carr et al., 2003). Theoretical analysis by Kane (2003) supports the concept of quality of life as a multidimensional structure with both subjective and objective elements. Such analysis has identified fourteen domains: physical functioning; self-maintenance; usual activities; social functioning; sexual functioning and intimacy; psychological well-being and distress; cognitive functioning; pain and discomfort; energy/fatigue; sleep; self-esteem; sense of mastery; perceived health; and life satisfaction (Kane, 2003).

Changes in quality of life may also depend upon individual perceptions, responses to the external environment, and the ability to sustain quality of life. Research has examined such factors as health status (Livingston et al., 1998; Lawton et al., 1999; Knurowski et al., 2004), functional ability (Li et al., 2003), perceptions of subjective well-being (Sarvimäki and Stenbock-Hult, 2000; Efklides et al., 2003), dependence in activities of daily living, housing accessibility (Iwarsson and Isacson, 1997), friendship support (Ferraro et al., 1984), neighbourhoods (Smith et al., 2004), release

from life experiences (Hendry and Mcvittie, 2004), living at home (Farquhar, 1995; Hellstrom and Hallberg, 2004), social production (Ormel et al., 1997), nutrition (Amarantos et al., 2001; Drewnowski and Evans, 2001), life course (Blane et al., 2004; Wiggins et al., 2004), and personality (Hagberg et al., 2002). These studies demonstrate that quality of life is multidimensional in older people, and complicated both to understand and to measure.

Ranzijn (2002) claimed that quality of life research tends to look at external influences rather than internal activities in old age; but many studies do examine from the inside out. One study in Greece, for example, assessed subjective quality of life in terms of an individual's life satisfaction, subjective well-being, happiness, and morale (Efklides et al., 2003). Subjective quality of life includes an affective component (e.g., positive affect and happiness) and a cognitive component (e.g., level of life satisfaction, and various other domains of life) (Brooks, 1996). Some research has pointed to a significant relationship between various personality characteristics (e.g., dominance, responsibility, emotional stability, sociability, cautiousness, original thinking, personal relations, and energy in physical and mental health) and various dimensions of quality of life (satisfaction with finances and housing, relations with neighbours and social relationships and activities, outlook on life, psychological well-being, and psychosomatic symptoms). Quality of life is influenced by these personality traits (Hagberg et al., 2002).

The term 'subjective quality of life' also deals with the concept of psychologically-oriented well-being, analysing self satisfaction and psychological well-being as indicators of successful ageing (Baltes and Baltes, 1990). Based on Lundh and Nolan's (1996) research, older people sustain their quality of life, maintain their self-esteem, and adjust their psychological processes to achieve what they want or hope for in their own ageing process. Lundh and Nolan (1996) used qualitative methods to reveal relevant factors affecting ageing and quality of life. In addition, they tried to answer why some older people adjust well to ageing. The main finding of their study was that the process of assimilation (maintaining current activities) is more difficult to maintain in older people than the processes of accommodation (flexible goal adjustment) and immunization (selective filtering). However, there is a need for research on subjective health, and on how subjective health interacts with other

quality of life components. An important element of this necessary endeavour will be the inclusion of older people's definitions of quality of life.

The term 'objective quality of life' obviously utilizes criteria that are more objective. Objective factors relate to health status, functional status, and impairment (Brooks, 1996). Bordres et al. (2004) examined factors related to health-related quality of life in 5,000 community-dwelling older people, 65 years and older, in a southwestern region of the United States. The study found that older people who live in rural and urban areas need social services, medical care, and supportive services to sustain their physical, social, and psychological health (Bordres et al., 2004). Lawton et al. (1999) assessed 602 older people from senior centres and several housing developments in Philadelphia. They analyzed both objective and subjective quality of life in terms of positive and negative indicators of mental health. They demonstrated that objective activity participation, subjective time use, and quality of friendships are associated with positive effects; otherwise, time use is associated with depression. Another study examined the oldest old, 85 and over, living in East London. Three major domains were identified: well-being and autonomy; health and activity; and the environment. The finding was that only 3% of respondents had 'good' scores on all nine items across the three domains (Grundy and Bowling, 1999).

Assessing both subjective and objective variables, Smith et al. (2004) noted that several factors were associated with quality of life, including socio-demographic factors, health, economic circumstances, social support, participating in social activities, fear of crime, housing issues, and neighbourhood satisfaction. Iwarsson and Isacson (1997) assessed objective quality of life via external judgements such as physical health, functional ability, cognitive capacity, and environmental aspects; and subjective quality of life based upon internal judgements such as self-perceptions of quality of life, self-rated health, life satisfaction, self-esteem, and well-being.

Generally, it can be shown that quality of life has meaning beyond an individual's health, and is influenced by one's perception of his or her physical, psychological, social, economic, and political environment. In particular, quality of life represents a broad range of psychological characteristics and is represented by hope, sense of purpose, competence, fidelity, love, care and wisdom, all of which relate to one's sense of subjective well-being (Philp, 1996). This implies that value is based upon subjective functioning in comparison with personal expectations. Quality of life is

subject to an individual's subjective evaluation of their behaviour, objective environment, and psychological well-being (Gerritsen et al., 2004). Quality of life has various interactive components (such as personal autonomy, expressed satisfaction, physical and mental well-being, social-economic status, quality of the environment, purposeful activity, social integration, and cultural factors) and one's life experiences in space and time (Gerritsen et al., 2004).

According to Social Production Function Theory, every person's goal is subjective well-being, but this represents both physical and social well-being (Gerritsen et al., 2004). Quality of life is a combination of one's animate and inanimate environment, , and one's function or power (Gerritsen et al., 2004).

Bowling (2003, p3) provided the following definition of quality of life for people of older age: 'quality of life is a collection of interacting objective and subjective dimensions. Quality of life is also a dynamic concept; it is the values and self-evaluations of life that may change over time in response to life and health events and experiences.' Based on a literature review, Tsang and colleagues (2004, p. 54) concluded: "The quality of life of older people should contain domains beyond health-related issues, including aspects of social, emotional, and physical functioning, as well as life satisfaction."

In an empirical study, Sarvimäki and Stenbock-Hult (2000, p. 1025) defined quality of life as "a sense of well-being, meaning, and value." Quality of life was felt to encompass thirteen domains: distress, discomfort, the loss of role, self-control and will to live, loss of gratification, continuing stress, indignities, service dissatisfaction, discontinuity in lifestyle, relative poverty, narrowing of the social repertoire, and perceived shortening of life span (Warner, 1998). Furthermore, Lawton (1999, p. 182) defined quality of life "as the multidimensional evaluation, by both intrapersonal and social-normative criteria, of the person-environment system of an individual with specially four sectors: behavioural competence, environmental quality, perceived quality of life, and psychological well-being." However, the World Health Organization (WHIO) defined quality of life as:

"An individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, and standards and concerns. It is a broad-ranging concept affected in a complex way by the person's physical health, psychological

state, level of independence, social relationships, and their relationships to salient features in the environment.” (World Health Organization, 2002, p. 13)

One of the problems associated with defining quality of life is that one needs to integrate both objective and subjective aspects in a multidimensional concept. Hendry and McVittie (2004), in their research, addressed the problem in older people, and found that quality of life is an active concept that is difficult to measure. They further suggested that the 100-Item Quality of life Instrument developed by the World Health Organization could not draw out the exact subjective experience of quality of life in older people.

Cheung et al. (2005) believed that quality of life in older people consists of cultural activities, work, finances, accommodations, friendship, health, self, family, and community, with facets in every domain. In general, most authors agree that the concept of quality of life should be concentrated on a person’s subjective interpretation of the quality of their life, and that, at the very least, certain elements should be included, such as physical functional, disease and treatment-related physical symptoms, psychological function, and social function. In addition, demographic and cultural factors, sexual function, body image, and sleep quality should be considered as part of quality of life (Mendlowicz and Stein, 2000).

Finally, according to Skevington (2002), quality of life is understood in connection with the social security of the national welfare system, health care settings, and policy makers. Policy decisions on social resources in health care and health services are considered to affect quality of life in older people. This should be among the major issues among older people (O’Boyle, 1997). Based upon income-related quality of life research, older people with poorer functional capability, lower physical activity and poorer psychological well-being tend to be in lower income levels, but there does not appear to be a relationship between income and social contact or social activities (Arendt, 2005). Shifts of policy and health services cannot be predicted; thus, economic resources are important to quality of life in older people (Arendt, 2005; Cheung et al., 2005). Therefore, quality of life should be considered in terms of the perspective of the individual, and it is important to know their opportunities in the perspectives of society.

In the field of gerontology, various definitions of quality of life are found. A generally accepted definition of quality of life is lacking. By examining the research literature

on quality of life, it may be concluded that quality of life in older people can be understood from different perspectives, according to different needs and purposes. In this thesis, the term of 'quality of life' is used in its broadest sense to refer to the multiple dimensions. It encompasses physical health, psychological status, social relationships in society, environmental influence, and the value, experiences, meanings, and expectation from older people's perception. The broad use of the term quality of life is also used to refer to objective dimensions as well as subject dimensions. These factors may change and affect quality of life in different time, place, situation, culture, and society. Therefore, quality of life is a concept difficult to define precisely. Attempts to measure quality of life are presented in the following section and Section 2.9 presents a way to conceptualise quality of life for the purpose of this thesis.

### **2.4 *The measurement of quality of life***

As discussed in the previous section, quality of life is difficult to measure due to the lack of a clear concept, precise definition, and identifiable factors affecting it (Bowling, 2003). For developing knowledge about quality of life in old age, the measurement of quality of life is clearly vital. Many approaches have been adopted by researchers in their studies of measurement of quality of life. According to Robinson (2003 , p. 96), there are three ways to measure the quality of life, which are "discriminative measures are used to distinguish between individuals or groups, typically in cross-section studies to quantify or compare the burden of illness; evaluative measures assess change over time; predictive measures are used to classify individuals into categories pre-defined by existing criteria."

Quality of life is related to health and is used widely in the evaluation of physical and mental health services. However, there is a lack of clarity between generalized quality of life and health-related quality of life (Lawton, 1999). Borglin et al. (2005) concluded that health-rated quality of life was a more inclusive concept than quality of life based on a multidimensional perspective of physical health, psychological health, social functioning, and well-being. Health-related quality of life requires that one meet the requirements of daily living, and accounts for how one feels. Lawton (1999, p. 182) defined health-related quality of life as "people's subjective evaluations of the influences of their current health status, health care, and health-

promoting activities on their ability to achieve and maintain a level of overall function that allows them to pursue valued life goals and that is reflected in their general well-being.”

With respect to instruments of quality of life, the most generic instruments assess physical, psychological, and social well-being. Some examples include: the Short Form-36 (SF-36) (Pit et al., 1996; Murray et al., 1998; Andresen, 1999; Cooper and Kohlmann, 2001; Walters et al., 2001; Yip et al., 2001; Osborne et al., 2003), the Medical Outcomes Study Short Form-20 (SF-20) (Carver et al., 1999), the Short Form-12 (SF-12) (Rubenach et al., 2000), the Health Status Questionnaire-12, the European Quality of Life Scale (EuroQoL) (Rubenach et al., 2000; Hulme et al., 2004), the WHOQOL-Brief (Hwang et al., 2003), and the Index of Health-related Quality of Life (IHQL) (Livingston et al., 1998). Nilsson et al (2004) reviewed and described 16 health-related quality of life instruments, and found that only the WHOQOL-100 included the six domains of physical, psychological, social, spiritual, economic, and environmental dimensions.

Generic instruments, as opposed to disease-specific instruments, are often considered to be appropriate health-related quality of life (HRQOL) measures. There is no consensus in the literature about this, however, Walters (2004) used four statistical methods (assuming a normal distribution and comparing two means; non-parametric analysis; Whitehead's proportional odds model; and bootstrapping) to assess the SF-36 as a generic measure of health-related quality of life. He found that the SF-36 shared many characteristics with HRQOL measures, and concluded, therefore, that the SF-36 is an appropriate instrument for HRQOL measurements. Similarly, Murray et al. (1998) examined institutionalized older people and found that the SF-36 was useful. In contrast, Pit et al. (1996) used the SF-36 to assess quality of life among hostel residents in Australia, and concluded that the questionnaire probably is not suitable for older people living in hostels. For further similar studies, they recommended modifying the SF-36.

Older people construct their quality of life in old age by evaluating their past and present experiences. Therefore, quality of life reflects the view of the older people concerned. Quality of life measurements are usually based on older people's subjective sense of well-being and are commonly used as an important fact in gerontological research. A Life Satisfaction Index (LSI) was constructed so the



persons rated their life satisfaction in terms of their perceived quality of life. The original scale was Life Satisfaction Rating (LSR) was described by Neugarten et al. (1961) that was a part of the Kansas City Study of Adult Life<sup>1</sup>.

In the research of Neugarten et al. (1961), they undertook a five-year study, in urban Kansa City by using data on 177 men and women aged 50 to 90 and developed an operational definition for the LSI with five factors assessing psychological well-being: “Zest (vs. apathy) takes pleasure from the round of activities that constitutes his everyday life; Resolution and fortitude regards his life as meaningful and accepts resolutely that which life has been; Congruence between desired and achieved goals feels he has succeeded in achieving his major goals; Positive self concept holds a positive image of self; and Mood tone maintains happy and optimistic attitudes and mood” (p. 137). The Life satisfaction Index A (LSIA) with 20 statements and the Life Satisfaction Index B (LSIB) with 12 open-ended and checklist items were two short, easy-administered, and self-report instruments based on LSR that were developed (Neugarten et al., 1961).

The LSIA is self-report measure and contained 20 items with the three response categories: “agree”, “disagree”, or “I do not know”. Each response is scored 1 point. The score range is from zero to twenty and higher scores indicate higher life satisfaction. Their study confirmed the LSIA is a successful measurement for assessing well-being in old age over 65 (Neugarten et al., 1961). The LSIA was found to have moderately high reliability. Wallace and Wheeler (2002) reviewed 157 journal articles for reliability information resulting in a review of 34 samples and demonstrated a higher reliability of 0.79 (SD=0.10, median=0.79).

The LSIA was further evaluated using factor analysis to confirm the five theoretical components of life satisfaction (Adams, 1969). He found that the first factor explained 34% of the variance and suggested that one main factor related to LSIA was associated with life satisfaction (Adams, 1969). After factor rotation analyses, only three apparent factors were presented in mood tone, zest for life, and congruence between desired and achieved goals. The factors of resolution and fortitude were not expected to evaluate life satisfaction; moreover, there was no item to support the fifth

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<sup>1</sup> The Kansas City Study of adult Life, conducted by the Committee on Human Development of the University of Chicago in the years from 1951-1964, was focused on a representative sample of men and women between the ages of 40 and 75.

factor of self-concept after factor rotation (Adams, 1969). However, his study suggested that the two items (i.e., “Compared to other people my age, I have made a lot of foolish decisions in my life” and “I feel my age, but it does not bother me”) did not correlate with life satisfaction.

The original Life Satisfaction Index has been modified and shortened to a 13-item scale called the Life Satisfaction Index Z (LSIZ) and its use was proposed among older people in rural areas, for the most part of older males (Wood et al., 1969). Wood and colleagues (1969) used item analysis and derived seven items from LSIA. They also argued that participants found it difficult to decide whether to agree or disagree, so they changed the scoring method so that “wrong” was scored “0”, “right “ was scored “2”, and “question mark” or no response was scored “1” (Wood et al., 1969). They undertook a study to explore life satisfaction among 100 rural older people in Kansa City and examined the reliability between LSIZ and LSR (Life Satisfaction Rating scale). Their results found that the validity and reliability coefficients of correlation between the two measures of life satisfaction were 0.57 and 0.79 (Wood et al., 1969). Morgan et al. (1987) conducted a research in the Nottingham Longitudinal Study of activity and Ageing to examine mental health and psychological well-being among the old and the very old people living at home by using LSIZ. Although they did not use factor analysis to analyze the LSI, they made minor changes to suit their British sample. For instance, statement 2 in the LSIZ was ‘I have gotten more of the breaks in life than most of the people I know’ which was modified to ‘I have had more chances in life than most of the people I know’. Their findings supported the idea that the LSIZ is a useful scale to assess psychological well-being in the old and the very old people living at home. In addition, Baiyewu and Jegede (1992) used the LSIZ to examine 945 older Nigerian and produced two factors on Varimax rotation of factor analysis, and the internal consistency value was 0.72. Compared to the study in Nottingham by Morgan and his colleagues (1987), Baiyewu and Jegede (1992) suggested that the LSIZ was not affected by differences in cultural background in old age. Therefore, the LSIZ seems a useful brief assessment scale to evaluate quality of life in old age among different groups and different cultures.

A further study by Hoyt and Creech (1983), showed that the data did not support the original theoretical structure of the Life Satisfaction Index. Hoyt and Creech (1983) argued that Neugarten and her colleagues did not use a heterogeneous and suitable

sample and this might influence their research's findings related to the LSIA. Thus, Hoyt and Creech (1983) undertook a study using data derived from the 1974 Myth and Reality of Aging Survey based on a large national sample including black and white people aged 65 years and over to examine LSIA (18 items with four-factor model) (Adams, 1969) and LSIZ (13 items with four-factor model) (Wood et al., 1969). Factor analysis revealed that the three factors in the eight-item model<sup>2</sup> were better at explaining life satisfaction with past, present, and future confidence in different gender and racial groups (Hoyt and Creech, 1983). This result was confirmed by Wilson and his colleagues' research with their 791 participants aged 55-95 in the University of Missouri, but the eight-item LSIA was suitable to examine older people and/or higher-income persons (Wilson et al., 1985).

In addition, Liang (1984) conducted a study to clarify the components of LSIA by using data from the 1974 National Council on Aging/Harries survey, Myths and Realities of Aging in America. In his research, 11-item<sup>3</sup> was analysed, instead of the 18-item LSIA proposed by Adams (1969), loading on three first-order factors (i.e., mood tone, zest, and congruence) and the second order factor was subjective well-being in terms of life satisfaction (Liang, 1984). The factor loading range was from 0.669 to 0.998 in mood tone, zest, and congruence and the variance was between 45% and close to 100% to explain subjective well-being in the three components (Liang, 1984). Therefore, Liang (1984) recommended that the modified LSIA be considered a good formulation for all four sub-samples (the sample size ranged from 666 to 705, the total number of participants was 2,797). Compared with the Philadelphia Geriatric Center (PGC) Morale Scale, they suggested that the PGC scale and the LSIA are reliable instruments to examine ethnic groups (white and black American) (Liang et al., 1987).

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<sup>2</sup> The eight-item model was "I am just as happy as when I was younger", "These are the best years of my life", "I have made plans for things I'll be doing a month or a year from now", "As I look back on my life, I am fairly well satisfied", "I've gotten pretty much what I expect out of life", "My life could be happier than it is now", "I expect some interesting and pleasant things to happen to me in the future", "I would not change the past even if I could".

<sup>3</sup> The 11-item of LSIA was developed from the original items: "I have gotten more of the breaks in life than most of the people I know", "I am just as happy as when I was younger", "My life could be happier than it is now", "These are the best years of my life", "Most of the things I do are boring or monotonous", "I expect some interesting and pleasant things to happen to me in the future", "The things I do are as interesting to me as they ever were", "I feel old and sometimes tired", "As I look on my life, I am fairly well satisfied", "I would not change my past life even if I could", "I have gotten pretty much what I expected out of life".

Liang et al. (1988) also used a structural equation model that was the same as the structural formulation in this previous study (Liang, 1984), changing to 7 items from the 11-item LSIA (4 items were excluded because of factor loadings below 0.5 in the earlier study) to examine three generations of Mexican Americans in San Antonio, Texas. Their results suggested that the LSIA with three factors was suitable to be applied to all three generations (Liang et al., 1988). Moreover, Lawrence and Liang (1988) provided further evidence for the stability of the structure formulation by using factorial invariance to measure across age and gender. The four factors (i.e., congruence, happiness, positive affect, and negative affect) were found in the integration of the Affect Balance Scale and the LSIA, but it was differences were found in the factorial structure between the Black and White sub-samples and they concluded that the meaning of subjective well-being might be different for these two samples (Lawrence and Liang, 1988).

Finally, factor-analytic studies of the LSIW reveal that the two components originally proposed by Bigot (1974) – Acceptance-Contentment and Achievement-Fulfilment. The LSIW with 8 items shortened from the 20-item LSIA for examining well-being has been standardised for use with 150 retired males aged 55-79 in the British population in different socioeconomic classes and age groups (Bigot, 1974). However, James et al. (1986) measured 155 British older people living in a rural community and proposed to reject item 6 “compared with other people of my age, I’ve made a lot of foolish decisions in my life”. They presented that “The LSI-W would appear to be a more adequate measure of current satisfaction than past achievement, and should be scored and interpreted as a single scale, rather than as two sub-scales” (James et al., 1986, p. 649).

As discussed above, quality of life instruments are designed to assess quality of life in different situations, populations, or in illness (Robinson et al., 2003). Thus, broader issues that may affect quality of life (e.g., physical and psychological health, functioning, social function, environmental conditions, different cultures, and an individual’s situation) should be taken into consideration in any studies’ instruments of quality of life for most populations. The following section discusses studies that have examined these factors.

## **2.5 Factors affecting quality of life**

This section has been divided into five parts: physical health, mental health, social factors, environmental circumstances, and demographic characteristics. Each part gives a brief overview of the relevant research and then goes on to explore the association with quality of life.

### **2.5.1 Physical health**

Physical conditions may have the strongest influence on quality of life in old age (Knurowski et al., 2004), and include chronic diseases, reduced function, disability, sensory impairments, alcohol abuse, frailty, and falls.

#### **2.5.1.1 Chronic diseases**

The prevalence of chronic disease and disability tends to increase with age (Arnold et al., 2004), and especially people in advanced old age more frequently suffer from health problems, and older people experience a decline in their health. Studies on the impact of chronic disease in Taiwan are quite limited. Goldman and colleagues (2004) examined older Taiwanese people's diseases to compare their self-rated health. They selected participants from two studies, namely the Survey of Health and Living Status of the Elderly in Taiwan (SHLSET) and the Social Environment and Biomarkers of Aging Study (SEBAS). The findings suggest that older people present serious chronic illnesses, such as high blood pressure, diabetes, heart disease, cancer or malignant tumours, lower respiratory tract disease, arthritis or rheumatism, gastric ulcers and other stomach ailments, liver or gall bladder disease, cataracts, kidney disease, gout, and spinal or vertebral spurs tend to impact their quality of life.

The list of common chronic diseases is consistent worldwide, especially in industrialized countries. In Europe, the most prevalent chronic diseases in older people are lung disease, heart and cardiovascular disease, diabetes, stroke, joint disorders, and impaired vision and hearing (Walker, 2005). General physical health problems among older people within the developing countries include heart disease and stroke (e.g., congestive heart disease, high blood pressure, and coronary vascular disease), cancer (e.g., breast, bowel, cervical, prostate, and lung), musculoskeletal (e.g., General damage, osteoarthritis, and osteoporosis), sensory (e.g., cataracts, glaucoma, macular degeneration, hearing loss, and Parkinson's disease), diabetes,

urinary incontinence, and chronic obstructive pulmonary disease (World Health Organization, 2003a). The World Health Organization (1999, online) concluded, “common diseases among older people are cardiovascular disease, arthritis, osteoporosis, and hypertension.” The World Health Organization also stressed that significant contributors to chronic disease and disability include smoking, excessive alcohol consumption, lack of exercise, inadequate nutrition, and obesity (World Health Organization, 1999).

The association between age and physical health in old age is complex. Obviously, chronic diseases can result in functional decline and outright disability; but decreased physical activity also contributes to chronic disease. For instance, decreased physical activity contributes to decreased cardiopulmonary function, poorer vascular tone, and less fitness of voluntary muscles (Manton et al., 1997). Some chronic diseases are associated with pain, but other symptoms, such as dizziness or weakness, can be very problematic for older people. These symptoms may be very important in affecting a person’s perceived well-being (Smith et al., 2002). Disease affects physical, psychological, and social functioning, and perhaps no symptom has a greater impact than chronic pain (Scudds and Østbye, 2001; Scherder et al., 2002). In the United States, Bayliss et al (2005) examined 156 older people of a Health Maintenance Organization (HMO) who reported an average of 5.9 chronic medical conditions. From these studies, chronic disease can be understood to be associated with disability, physical discomfort, and emotional distress. These physical problems may make older people more dependent and this may reduce lower quality of life.

An epidemiological study was conducted to examine factors related to perceived health among older people. Of 706 participants, aged 75 years and older in Uppsala, Sweden, mobility and sleeping problems exhibited a greater impact than vision and hearing problems on perceived health, and people with these conditions tended to have lower level of quality of life (Lindgren et al., 1994).

### **2.5.1.2 Functional status**

Functional status is the measure of an individual’s performance in daily life activities (Knurowski et al., 2004), and functional decline is a normal part of the ageing process (Schroll et al., 2002; Avlund et al., 2003), although physical exercise may delay this functional decline and increase life expectancy. Functional status is important among

older Taiwanese people, and has an effect on their life expectancy. Zimmer et al. (2002) conducted a study to examine the relationship between changes in functional limitation and survival among older people in Taiwan, and used the SHLSET datasets for 1993, 1996, and 1999. They found that the functional limitations of older Taiwanese people had increased, and that their climbing and walking difficulties between 1993 and 1999 were associated with a decreased mortality risks. They suggested that the National Health Insurance program, started in 1995, had improved the health of older people and increased their survival time.

Mor et al. (1989) examined well older people, aged 70-74 years old, and compared those who exercised and those who did not, those who could versus those who could not carry 25 lb, walk 1/4 mile, climb 10 steps and do heavy housework without help or difficulty. They found that participants who did not do regular exercising or walk were 1.5 times more likely to be affected by functional decline than participants who did. Similarly, in another study examining functional capacity and well-being, 8,805 older people aged 80-105 years old in 22 provinces of China were assessed (Zeng, 2002). In this study, the oldest-old living in rural areas were significantly more active than the urban oldest-old and they were more likely to have higher well-being. Zeng (2002) reported that the female oldest-old had more serious health problems and worse functioning than the male oldest-old. He suggested that being active in daily living, having good physical performance and normal cognitive function tended to affect well-being in the oldest-old people and having positive feelings in life is one way that can help longevity.

In other studies assessing functional status in old age by gender, women have reported higher levels of physical function and more positive health behaviours than men (Strawbridge et al., 1993; Beland and Zunzunegui, 1999). In Spain, Beland and Zunzunegui (1999) assessed 1,273 community-dwelling older people aged 65 and older and found that men especially covered the full range of functional abilities, from no limitations to severe limitations. They also found that certain chronic diseases, cognitive problems, and depressive symptoms predicted functional change. Therefore, high-functioning older people exercised more and were more independent. As Nusselder and Pecters (2006) suggested that survival and functioning status are the possible outcomes for measuring successful ageing. Thus, functioning is an important indicator predicting high or low quality of life.

### 2.5.1.3 Disability

Disability is not the same as functional limitation. Disability refers to specific limitations in societal performance roles and tasks within a particular socio-cultural and physical environment (Tung and Mutran, 2005). For instance, one group of investigators used the World Health Organization-Disability Assessment Schedule (WHO-DAS-II) to examine 840 participants, aged 60 and older, in Turkey. The study found that disability affected certain activities (e.g., joining in community events) more than others (e.g., household responsibilities). According to Jang et al. (2003, p. 163), disability is “the levels of difficulty in performing activities evaluation of one’s own functional status rather than an objective indicator; therefore, there are potentials for psychosocial attributes to contribute.”

Disability is highly prevalent among older people. For instance, in a longitudinal population study of older people aged 65 and older in six areas of England and Wales, disability was measured by activities of daily living scale including washing all over, cutting toenails, getting on a bus, going up and down stairs, doing heavy housework, going shopping and carrying heavy bags, preparing, and cooking hot meals, reaching an overhead shelf, and tying a good knot in a piece of string, 11% of men and 19% of women (N=1.3 million) were disabled (Melzer et al., 1999). Li et al. (2000) identified the annual incidence of disability (assessing six items including bathing, dressing, moving between bed and chair, using the toilet, eating, and walking inside the house) to be 3.7% in Taiwanese older people. Another cross-sectional multi-stage random sample survey of 4,048 older people, aged 60 and older, in Thailand found that long-term disability affected a quarter of the sample. Long-term disability (prevalence rate 19%, 95% CI = 17.8-20.2) and dependency in self-care (prevalence rate 6.9%, 95% CI = 6.1-7.7) were also common.

Disability is more common among older women (Melzer et al., 1999; Jagger et al., 2001; Winblad et al., 2001; Jitapunkul et al., 2003). In the Charleston Heart Study Cohort in the United States, the prevalence of disability was highest in older black females and in older people with a history of cardiovascular disease (Keil et al., 1989). Keil et al. (1989) also identified elevated systolic blood pressure in white females, elevated cholesterol in black females, obesity in black females, and low educational level in white females to be predictors of disability. In a longitudinal study, Li et al.



(2000) identified a significant relationship between activities of daily living and social class, with unskilled blue-collar workers having a 1.8 times higher risk of limitations in activities of daily of living than white-collar workers in Taiwan. In another cross-national study examining patterns of disability, the author found that disability rates in older people increase as countries become more developed (Lamb, 1996).

Psychological factors and personality characteristics also affect disability (Femia et al., 2001; Jang et al., 2003). Disability also commonly affected the quality of life (Donmez et al., 2005). Donmez and colleagues (2005) examined the two factors – disability and its effects on living conditions to determine the quality of life of older people (age 65 and older). They found that the most severe disability is shown in ‘life activities’ such as getting around, participation in society, and self care affecting older people’s quality of life.

### **2.5.1.4 Sensory impairment**

Sensory impairment and poor oral health affect physical and psychological function and social well-being among older people (Moscicki et al., 1985; Mulrow et al., 1990; Fook and Morgan, 2000; Heydecke et al., 2003; Raina et al., 2004; Gerdin et al., 2005). Vision and hearing impairments tend to be major health problems that increase with age, potentially reducing functional independence in activities of daily living, mobility and communication with others. For instance, in people aged 61-80 years old, the prevalence of hearing loss of 45 decibels (dB) or greater was 3.1% in the UK (Fook and Morgan, 2000). In a study of 935 men and 1,358 women aged 57 to 89, Moscicki et al. (1985) found that increasing age was the most critical risk factor for hearing loss, and that women who had better hearing than men tended to live longer. Mulrow et al. (1990) demonstrated that hearing aids improve the quality of life among older people; 82% of 188 participants reported that hearing impairment might have lower levels of quality of life. Moreover, hearing aids improved social and emotional function, communication function, cognitive function, and depression linking to good quality of life.

Visual impairment tends to be an important cause of activity limitation and disability in old age, causing difficulties with activities such as dressing, bathing, cooking, walking, going out, and taking part in leisure activities. It also increases the risk of falls and fractures (Desai et al., 2001). In a cross-sectional Canadian study of 11,507

individuals 55-64 years old and 5,106 older people 65 years and older, Raina et al. (2004) found that vision and hearing loss were the factors that most affect instrumental activities of daily living (IADL). Older people also reported less decision-making control and were less happy with their lives. Similarly, Foxall et al. (1994) found that loneliness did not have a significant association with poor vision among older people who were living alone. Older people with poor vision tended to have more support from friends and adult children, thus, this might improve their quality of life. For instance, Tsai et al. (2004) examined the effect of impaired vision on quality of life among older Taiwanese and found that impaired vision was associated with physical and social function; while, improving vision was related to general health perceptions and mental health.

Oral health can be important for quality of life (McGrath and Bedi, 2002). The Oral Health Impact Profile (OHIP) describes seven domains of oral health dysfunction, including functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap (Heydecke et al., 2003). In old age, toothaches or facial pain affects eating, communication, social relationships, and daily life. Oral health may also be linked to other diseases. For instance, poor oral health and tooth loss decrease chewing ability; toothache causes poor eating habits and poor sleep; and periodontal disease is associated with heart disease, stroke, and respiratory disease (Locker and Matear, 2005). Recent studies have revealed that both dry mouth (Gerdin et al., 2005) and oral disease (Heydecke et al., 2003) significantly affect oral health-related quality of life. Finally, it can be concluded that sensory impairment and oral health have a significant impact on physical health, daily activities, psychological problems, social relationship and subjective well-being.

### **2.5.1.5 Alcohol abuse**

Alcohol abuse is relatively common among older people and is associated with numerous health problems (Fingerhood, 2000; O'Connell et al., 2003). Alcohol abuse may develop to alcohol dependence which is a kind of mental disorder and associated with depression, strokes, high blood pressure, urinary incontinence, and coronary heart disease, etc. (World Health Organization, 2003a). Alcohol abuse may be long-lasting in later life because of disease, pain, grief, loneliness, or depression. Excess

alcohol consumption may also create some physical health problems; moreover, those health problems may affect quality of life among older people. In old age, alcohol consumption occurs in men more than women (Office of National Statistics, 2005), but women suffer more health problems because of alcohol (Moos et al., 2005). For example, more older males, aged 75 and older, drink excessive alcohol than younger people, aged 16-24 (30% versus 14%). One in twenty women aged 65-74, exceed standard alcohol consumption (Office of National Statistics, 2005).

Moos et al. (2005) examined older adults' health and changes in later-life drinking patterns among 1,291 community residents, aged 55-65. The research was a survey of health and alcohol consumption, with follow-ups of one, four, and ten years. Alcohol consumption was found to be an important predictor of poor health and poor quality of life, especially in those with more than one chronic condition, more than one physical symptom, taking more than two prescription medications, or at having least one acute health event annually. Alcohol abuse may be a latent risk factor for falls, fractures, hypertension, congestive heart failure, depression, myopathies, adverse drug reactions, and stroke. Furthermore, some researchers have demonstrated that cognitive impairment can be caused by alcohol abuse (Fingerhood, 2000; Thomas and Rockwood, 2001; O'Connell et al., 2003). However, alcohol abuse can result in impairments in physical, social, psychological, and cognitive health, which are linking to poor quality of life among older people.

### **2.5.1.6 Frailty**

Ostir et al. (2004) described frailty as a clinical condition, common in very old people, which may impact on quality of life. Frailty is associated with impaired strength, endurance, and balance; vulnerability to trauma and other stressors; and a high risk of morbidity, disability, and mortality. In Canada, Kaethler et al. (2003) surveyed 675 registered attendees of the 1999 annual meeting of the Canadian Association of Gerontology, and 52% (n=356) responded. Of these, 50% reported that the concept of frailty was related to function and independence among older persons; 50% reported that medical and physical conditions were important domains of frailty; and 69% reported that the concept of frailty was clinically useful. The syndrome of frailty may include instability, increased rates of falling, decreased muscle mass/strength, reduced/slow mobility, unintentional weight loss, exhaustion, vulnerability to stress

with decreased ability to maintain health, poor ability to carry out important practical and social activities, and sensory loss (vision/auditory/taste/smell). Frailty progresses through functional decline, to failure to thrive, to death. Therefore, frail older people are an especially vulnerable group. They may suffer complicated chronic and acute diseases or functional disability in later life (Bergman and Beland, 2000).

There are more concrete and precise definitions of the frailty of older people, which include the presence of functional disability, comorbid physical or psychological conditions, and vulnerability to future functional, medical or psychological decline (Kaethler et al., 2003). Psychological conditions (e.g., morale or spirit) can influence frailty in old age; good psychological health plays an important role in protecting against functional and physical decline related to frailty (Ostir et al., 2004). Keciour and D'epinay (2004) examined well-being (the affective or emotional component and the cognitive component) among 340 older people, aged 80-84 years old. They found that frailty had a significant impact upon poor well-being among older people, and was associated with depressive symptoms and worse self-assessed health. Exercise might be an important factor in improving functional, physical and psychological health, and well-being in those who otherwise are deemed to be 'frail' (Rockwood et al., 2004; Purscher et al., 2005).

Frailty older people may have quality of life. Frieswijk and colleagues (2004) examined social comparison<sup>4</sup> and its effect on life satisfaction (using the Dutch version of the Satisfaction with Life Scale) among 444 community-dwelling older people with different levels of frailty. They found that older people with higher levels of frailty were more negative in their attitude (upward contrast and downward identification) to life satisfaction, but these frail people still had some positive feeling to life satisfaction (upward identification). Older people who are frail may still have a relatively good quality of life, for example, if they can maintain their well-being and have a positive attitude and outlook (Frieswijk et al., 2004; Steverink et al., 2005).

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<sup>4</sup> Social comparison is to measure the different social comparison strategies. There are four strategies: **upward identification**, an example item 'When I see others who are better off than I am, I have good hope that my situation will improve.' **downward contrast**, an example item 'When I meet others who are worse off than I am, I realize how well I am doing.' **upward contrast**, an example item 'When I see others who are better off than I am, it is threatening to notice that I am not doing so well' **downward identification**, an example item 'When I see others who are worse off than I am, I experience fear that I will decline.'

### 2.5.1.7 Falls

Falls are a common problem among older people (Lord et al., 2001; Parry et al., 2001). Most falls happen in men aged 45 and older, and in women aged 60 and older. Older people 75-79 represented the largest proportion of fallers in both genders; 6.4% and 7.3% for men and women, respectively (Office of National Statistics, 2005). Falls may be associated with chronic disease among older people. Lawlor et al. (2003) examined falls and chronic disease and drug use in older women, and found that at least one chronic disease was found among older people who had fallen. There was an increased risk of falls associated with circulatory disease, chronic obstructive pulmonary disease, depression, and arthritis leading to poor quality of life. Moreover, according to Close et al. (2003), a history of falls in the previous year (Kron et al., 2003), falling indoors, and inability to get up after a fall have all been shown to be predictive of poor prognosis.

Falls may also lead to psychological health problems. Fear of falling restricts older people's activity (Fletcher and Hirdes, 2004), decreases their mobility, decreases their function, increases their falls, and thus may decrease their quality of life. Li et al. (2003) found that a high fear of falling causes people to perform poorly in balance and lower-extremity functional mobility tasks. Such people also exhibited poor instrumental activities daily of life and a low quality of life. In another study, Gagnon et al. (2005) examined psychological factors associated with the fear of falling and found that depressive disorders and depression severity were most strongly related to fear of falling. All these factors impact on physical, psychological, social functioning, and subjective well-being among older people who fall (Zijlstra et al., 2005).

### 2.5.1.8 Summary

Physical health has an important effect on both objective and subjective quality of life. As discussed previous studies and current evidence show, physical health in terms of chronic illnesses, functioning, disability, sensory impairment, alcohol abuse, frailty, and falls are absent from older people who may experience a better quality of life. In contrast, older people with worse physical health may have a poor quality of life. Therefore, improving and maintaining physical health, may play a major role in maintaining quality of life in old age.

### 2.5.2 Mental Health

In this section, current mental health and its influence on the quality of life will be discussed. As the World Health Organization (2001, p. 5) pointed out: “Mental health has been defined variously by scholars from different cultures. Concepts of mental health include subjective well-being, perceived self-efficacy, autonomy, competence, intergenerational dependence, and self-actualization of one’s intellectual and emotional potential, among others.” According to this definition, mental health can be described as a concept entailing an individual’s emotional and psychological well-being; but there can be other, more explicit, definitions.

Mental health conditions can have a considerable effect on a person’s quality of life and it can include a number of symptoms: namely, grief, anxiety, depression, and cognitive dysfunction (e.g., dementia, schizophrenia) (Walker 2005). Therefore, in this section, mental health is a complicated condition and can be considered under the following headings: (1) bereavement; (2) grief; (3) worry; (4) anxiety; (5) loneliness; and (6) depression.

#### 2.5.2.1 Bereavement

The death of a loved one can cause profound grief, especially during the bereavement process. Bonanno and Kaltman (1999) explored various grief experiences and their relationship to the definition of bereavement in the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders), where it is defined as follows: “bereavement is a stressor that produces relatively normal and expected distress” (p. 706). Rodgers (2004) used a storytelling approach to assess the bereavement experience among older African American widows. Six main themes were identified: awareness of death; care giving; getting through; moving on; changing feelings; and financial security. Meanwhile, the process of bereavement is accompanied by many psychologically distressing symptoms including isolation, loneliness, and depression that these may impact on an individual’s quality of life (Costello, 2000).

Much research has shown that bereavement is related to depression. For instance, in the first year of a loss, many individuals show a moderate disruption in functioning, and chronic grief can be accompanied by major depression (Caserta et al., 1990; Norris and Murrell, 1990; Parkes, 1997; Zisook et al., 1997; Bonanno and Kaltman, 2001). Similarly, in the bereavement process, survivors of older spouses can have

significant clinical depression (Gilewski et al., 1991; Turvey et al., 1999). Byrne and Raphael (1997) pointed out that widowers are not depressed or lonely, but they often suffer from more sleep problems and thoughts of death and suicide. However, older persons with significant clinical depression sometimes do commit suicide during the bereavement process (Gilewski et al., 1991). Therefore, bereavement is related to depression and may lead to mental retardation or functional impairment; furthermore, it may lead to poor quality of life when older people cannot cope with it.

### **2.5.2.2 Grief**

Grief is common among those who are older (Harwood, 2001). Often, this results from the loss of a partner, the loss of family contact, the loss of friends, or the loss of health. Grief is the experience and feeling of the loss (Costello, 2000). Although grief is considered to be a fundamental emotional response to loss (The Northwest Geriatric Education Center at the University of Washington, 2000), it also is accompanied by many other factors, that include physical, psychological, and social factors, which can also affect quality of life. Kim et al. (2000) described the meaning of grief among older women in Korea. Grief was associated with physical and psychological decline; unpleasant memories of one's spouse; pity for children; unfortunate consequences of fate; anxiety about the future, and even fear of imminent death. Furthermore, grief affects social functioning, mental health, and energy levels; and importantly, it can also decrease one's overall quality of life (Silverman et al., 2000).

Grief is associated with feelings of emptiness, uselessness, lack of sensation, disbelief, extreme sadness, hopelessness, anger, and depression or feel any other emotions (Fiske and Jones, 2005). There is often an intense desire to be with the lost person, but this strong desire is usually impossible to realise, as the person may well no longer be alive. When individuals undergo a long process of despair, there seems to be no clear indication of when the grief will end. It may also intensify, especially at the time of anniversaries (Parkes, 1997).

Bonanno and Kaltman (1999) identified four essential components of the grieving process: context; meaning; representations of the lost relationship; and coping and emotion-regulation processes. All of these elements interact with the bereavement process. Grief can result in a decline in health, especially among older people (Grief, 2002). It also can cause decreased function; bereavement often is associated with

difficulty managing daily activities, stopping work, leading to poor physical health, and then lower quality of life (Harwood, 2001; Oakley et al., 2002).

### 2.5.2.3 Worry

Graham (2003) claimed that “worry is a cardinal feature of anxiety disorder and of generalized anxiety disorder in particular” (p. 323). Neikrug (2003, p. 326) have provided perhaps the conceptual definition of worry as “in relation to the respondents sense of coherence in order to evaluate the relationship between a person’s ability to cope and to find meaning in life and their image of future old age.” Thus, worry can be described as a state of thinking about things that might happen and making a person anxious.

Tallis et al. (1992) developed the Worry Domains Questionnaire (WDQ), in which they summarized five domains of worry: relationships, lack of confidence, aimless future, work incompetence, and financial. Among the older people, patterns of worry involve health (Watari and Brodbeck, 2000; Diefenbach et al., 2001; Montorio et al., 2003; Neikrug, 2003); family/interpersonal relationships (Watari and Brodbeck, 2000; Diefenbach et al., 2001); finances (Watari and Brodbeck, 2000; Neikrug, 2003); and other miscellaneous concerns (e.g., social-environmental concerns, accomplishing things) (Diefenbach et al., 2001). In terms of demographics, women and unmarried older people (including those who live alone) tend to be particularly worried about their finances (Neikrug, 2003). In Neikrug’s (2003) study, the degree of worry sharply decreased among older people aged 65-74 years old, but returned to high levels in those 75 years and over; the result also found that more blue-collar workers (40.6%) reported worry than professionals or senior administrators (15%). Worry can be the result of anxiety and can seriously interfere with daily life and its various activities. In other words, worry may adversely decrease overall well-being and quality of life (Montorio et al., 2003).

### 2.5.2.4 Anxiety

Anxiety is excessive worry and its symptoms are common in later life (Flint, 1994; Mehta et al., 2003). Anxiety is defined by Generalized Anxiety Disorder (GAD) as “in part by excessive and uncontrollable worry, and remains one of the most frequently diagnosed anxiety disorders among older adults.” (Diefenbach et al., 2001, p. 269) GAD also included physical symptoms and impairment in adaptive



functioning (Bourland et al., 2000); and it is usually assessed by phobic disorders, panic disorder, generalized anxiety disorder and obsessive compulsive disorder (De Beurs et al., 1999).

The research evidence reveals that anxiety disorder tends to have a significant adverse effect on quality of life (Bourland et al., 2000; Mendlowicz and Stein, 2000). Bourland et al., (2000) compared quality of life and life satisfaction between 59 older American with anxiety disorder and 19 older people (mean age 66.19) without anxiety disorder (mean age 65.79). They found that older people with severity of anxiety had lower quality of life as measured by the Quality Of Life Inventory (QOLI); and suggested optimism predicted a better life satisfaction as measured by LSIZ. Similarly, in a large community-based sample (n=659) of participants aged 55-85 years in the Netherlands, De Beurs and colleagues (1999) compared older people with and without anxiety and other potentially confounding factors such as chronic physical diseases, disability, functional limitations, social network, and well-being (including self-reported loneliness, self-perceived health, and a rating of general satisfaction with life). They suggested that anxiety has a negative effect on the functioning and well-being among older people and better management of anxiety can increase quality of life in old age.

### 2.5.2.5 Loneliness

Loneliness is another aspect of mental health affecting quality of life in old age. According to De Jong Gierveld and Van Tilburg's (1999, p. 3) definition, "loneliness is a situation experienced by the individual as an unpleasant, or unacceptable discrepancy between the number and quality of social relationships realized, and the social relationships desired." Furthermore, Andersson (1998, p. 265) characterized loneliness as "the generalized lack of satisfying personal, social, or community relationships." Thus, the term 'loneliness' can be described a feeling sad from being alone including intensity/quantity of loneliness, inner loneliness and positive loneliness (Routasalo and Pitkala, 2003).

Loneliness may be caused by physical health problems, and living arrangements among older Taiwanese people. For instance, Jones at al. (1985) examined the factors relating to loneliness, and found that older people who were widowed, lived alone, had a disability (e.g., had difficulty in hearing, seeing, or decreased mobility), and had

lost physical capabilities were much more likely to experience loneliness. Older parents in Taiwan usually live with their adult children, and obtain care and financial support from them. However, if older people with those conditions or diseases live alone, this may reduce their quality of life, as they may have less support.

Studies suggest loneliness has its effect on quality of life. For example, Holmén et al. (1999) conducted a study including 315 older people aged 75-98 who were living in their own apartments. They compared two groups: participants with slightly impaired cognition and participants with intact cognition. Loneliness was measured by the question, 'Do you experience loneliness?' and the present state of mood in terms of quality of life was measured by the Geriatric Depression Scale (GDS). They found that older people who were cognitively intact reported basic satisfaction with their lives. Conversely, the majority older people with cognitive impairment also experienced loneliness and a sad mood because they seemed to feel that life was empty, leading to a lower quality of life. However, people still can achieve a higher quality of life if they can find trusting and meaningful relationships (Holmén et al., 1999).

Liu and Guo (2007) examined the relationship between loneliness and quality of life for two groups: 275 empty nest (children departure from home) and 315 not empty nest rural older people aged 60 years and older in a county, China. The UCLA Loneliness Scale (UCLA-LS) was used to measure loneliness and the 36-Item Short-Form Health Survey (SF-36) was used to measure quality of life. They found that loneliness has an impact on quality of life in both groups, and social support and income are important factors associated with loneliness. Thus, they suggested that reducing the level of loneliness might help to improve quality of life among older people.

### 2.5.2.6 Depression

Depression is a common mental illness that can affect the life of older people (Badger, 2001). The term 'depression' is defined by the World Health Organization (2003b, online) as follows:

"Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration. These problems can become chronic or recurrent and lead to substantial impairments in an individual's

ability to take care of his or her everyday responsibilities. At its worst, depression can lead to suicide, a tragic fatality associated with the loss of about 850,000 thousand lives every year.”

According to the Diagnostic and Statistical Manual (DSM-IV) and the International Classification of Diseases (ICD-10), the criteria for diagnosing major depression include exhibiting a depressed mood and loss of interest and pleasure. Depressive symptoms include feelings of sadness, fear, fatigue, guilt, anxiety, changing appetite, changing activity levels, losing weight, decreasing self-esteem, and ruminating about death or suicide (Alexopoulos, 2005).

Some studies have emphasised that depression is linked to illnesses such as stroke, heart disease, cancer, diabetes, dementia, Parkinson’s disease, and Alzheimer’s disease (Mulsant and Ganguli, 1999; Gottfries, 2001; National Institute of Mental Health, 2003). For instance, Dent et al. (1999) examined the association between depression and eight chronic physical conditions, neurodegenerative conditions, and functional disability. They found that cardiovascular, cerebrovascular disease, gait ataxia, gait slowing, cognitive impairment, and Parkinsonism were associated with depressive symptoms. Older people can feel low and helpless when they are sick and disabled. Patten (2000) demonstrated that depression often is a response to declining health and functional impairment in older people. In addition, depressive symptoms are often associated with poor function (e.g., cognitive functioning and activities of daily living), poor health perception, and a low sense of well-being in old age (Ormel et al., 1998; Chi and Chou, 2000).

A number of studies have been conducted examining the effects of age and gender on the prevalence of depression. The prevalence of depression rises between 65 and 85 years old (Blazer, 1989). Women, in particular, experience increased depression rates between the ages of 80 and 85 (Heikkinen and Kauppinen, 2004). Gender tendencies appear to differ concerning depression. For example, Takkinen et al. (2004) found that older twin sisters had more depressive symptoms and diagnosed depression than their twin brothers. On the other hand, Zarit et al. (1999) analysed a population-based sample of older people between 84 and 90 years in Sweden and found that gender had no direct or indirect relationship with depressive symptoms. However, most studies showed that older women tended to have depression and this leads to lower

well-being or quality of life (Ryff, 1995; Prince et al., 1997; Prince et al., 1999; Kobau et al., 2004).

Age-related losses – such as loss of professional identity, physical mobility and the unavoidable loss of family and friends – can affect a person's ability to maintain relationships and independence; and these, in turn, may lead to a higher incidence of depressive symptoms (Alpass and Neville, 2003). In Brilman and Ormels' research (2001), it was shown that life stress is a potent risk factor for the onset of a depressive episode in later life; meanwhile, major and minor depression were equally strongly connected to severe life events. Similarly, depression in later life was especially associated with negative life events during adulthood and late adulthood (Kraaij and De Wilde, 2001). Major depression is associated with the loss of a partner, chronic mood disturbance, and longstanding vulnerability factors, such as a positive family or personal history (Beekman et al., 1995; Beekman et al., 1997b). This evidence supports the idea that older people with depression are usually having poor subjective well-being.

Depression can seriously impact on quality of life because of the resultant impairment in social functioning (Warner, 1998). In their study, Hays et al. (1997) studied 3,240 community-dwelling older adults (mean age 72.8) in the Piedmont area of North Carolina over one year, and found that depression affected functional ability, including basic activities of daily living, strength, and stamina/mobility. Functional disabilities limit older people's social activities and they may in turn affect quality of life. Thus, depression may cause social isolation, but the inadequacy of social support can be higher among depressed older persons. Prince et al.'s (1997) community survey involving all residents over the age of 65 in London, UK, found that frequent experiences of loneliness and social support deficits were strongly associated with depression. Furthermore, Vanderhorst and McLaren (2005) also addressed the serious outcomes associated with ignoring social support among depressed older people. They found that having fewer social supports was associated with higher levels of depression, leading to a poor quality of life. Therefore, the impairment in social functioning has a greater effect on poor quality of life in old age, as it often involves social isolation and a lack of social support.

### 2.5.2.7 Summary

In conclusion, quality of life may be influenced by mental health. As discussed above, older people may experience grief, bereavement, worry, depression, loneliness, and anxiety because these mental problems can be caused by other losses (e.g., functioning loss, loss of family members or friends), lack of emotional engagement (e.g., living alone, lack social support), and being less engaged with others or society (e.g., lack social activities) which may lead to a lower quality of life. Therefore, enhancing and/or maintaining mental health can have considerable benefits for improving quality of life in old age.

### 2.5.3 Social factors

Social factors also are important determinants of quality of life among older people (Smith and Goodnow, 1999; Kim et al., 2000; Fernández-Ballesteros, 2002; Silverstein and Parker, 2002; Wong, 2003). In the present section, social relationships, social networks, and social engagement will be discussed as they relate to quality of life in old age. Next, leisure activities will be covered. Finally, social support will be examined to see how social support influences quality of life in older people, an area of particular relevance to this thesis.

#### 2.5.3.1 Social relationships

Social relationships will be defined as the complex social connection that exists between people living in a certain social environment. Avlund et al. (2004) state:

“The structure of social relations is defined as the individuals with whom one has an interpersonal relationship and the linkage between these individuals. This is generally study in terms of the number of social relations that people have the frequency of seeing other people, the diversity of social relations, and the reciprocity of social relations. The function of social relations is defined as the interpersonal interactions within the structure of the social relations. The function covers the qualitative and behavioural aspects of the social relations and comprises social support, social anchorage, and relational strain, typically measured as the relational content of social interactions (e.g., emotional or instrumental support).” (p. S44)

Social relationships in Taiwan are emphasised on the ‘self’ in relation to others, which is influenced by a Confucian stress on interrelatedness (Seeman, et al., 2004). However, older people may experience more increase health risks if they are do not have their own close social relationships. For instance, Liang et al. (1999) examined

the relationship between stress (assessed by spouse or adult children dying and financial strain) and social relations and mortality among older people in Taiwan based on the SHLSET study in 1989 and 1993, and they suggested that stress and social relationships not only affect physical health and psychological well-being, but also increase the risk of mortality.

Social relationships may affect quality of life in terms of psychological well-being (Takahashi et al., 1997; McAuley et al., 2000; Antonucci et al., 2002). Takahashi et al. (1997), for instance, examined patterns of social relationships (family versus friend dominant<sup>5</sup>) and psychological well-being (subjective well-being) among Japanese older people (n=174) aged 65 and over, living in communities and institutions. They found that there were no differences between family-dominant and friend-dominant in terms of psychological well-being. Avlund et al.'s cohort study (2004), in which data from 835 randomly selected Finns, all born in 1914, were examined as part of the Nordic Research on Ageing Study, yielded a similar result. They found that having weekly telephone contact had a beneficial effect, reducing functional decline at 5-year follow-up; and women had stronger social relationships than men in this respect; however, poor social participation (i.e., no membership in a retirement club) was especially related to functional decline among older women. All the evidence so far has demonstrated the importance of social relationships to promote health and in relation to good quality of life among older people.

Another important point is worth mentioning. Older people tend to like to continue to live within their own homes and neighbourhoods (East, 1992). It is easier for them to continue communication and coordination with friends, and to continue being mobile within their own community (Mollenkopf et al., 1997), even though social relationships may decline with increasing age. Advanced age may be an important predictor of decline in social relationships due to their adult children leaving and friends dying, and having to move into other accommodation. Little is known about how changes in social relationships affect quality of life in old age. However, older

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<sup>5</sup> Family and friend dominant are dominant figures which is a kind of self-report type method to assess the pattern of social relationships of individuals. The Picture Affective Relationships test (PART) for Elderly People was constructed by Takahashi (1987, 1990). The term "Affective Relationships" refers to the central and relatively stable social relationships that are essential for survival and well-being (Takahashi, 1990).

people may obtain social support (e.g., emotional support or material resources) from their social relations; this may have some benefits for their quality of life.

### 2.5.3.2 Social networks

Social networks refer to the connections with frequent and/or close contacts, such as close friends, relatives, and neighbours (Pagel et al., 1987). As Brown et al. (2004) pointed out: “Social networks are the identified social relationships that surround an individual, their characteristics and individuals’ perceptions and valuations of them. Network characteristics include their size, density (connectedness between members), boundedness (e.g., by neighbourhood), homogeneity, frequency of contact of members, their multiplexed (number of types of transactions within them), duration and reciprocity” (p. 37). In a society, through social networks, people can obtain necessary social services, information, material aid, and emotional support and maintain their social status. It is important for older people to keep their social networks because they need more support in terms of both emotional and material aid than younger or middle-aged people for improving quality of life (Achat et al., 1998; Pinquart and Sörensen, 2000).

During the last few years, numerous studies have been carried out and their results have shown that social networks are associated with health, well-being, and survival in old age (Rennemark and Hagberg, 1997; Wenger, 1997; Rennemark and Hagberg, 1999a; Rennemark and Hagberg, 1999b; Cattell, 2001; Zunzunegui et al., 2003). Van Tilburg and Van Groenou (2002) assessed the relationship between social networks and health in 2,302 older Dutch adults, from aged 60 to 85, in four waves of a seven-year longitudinal study (the Living Arrangements and Social Networks of Older Adults and the Longitudinal Aging Study Amsterdam). They identified seven domains in the network: household members; children and their partners; other relatives; neighbours; colleagues from work or school; fellow members of organizations; and others. They noted a decline in health over the seven years of follow-up; decreases in ADL (activities of daily living) and in self-rated health were linked to increases in the support that was received from network members. Moreover, a decrease in ADL capacity and in an individual’s MMSE (Mini

Mental State Examination) score predicted a decrease in network size. A decrease in ADL capacity, an increase in health limitations, and a decrease in self-rated health resulted in a decrease in the instrumental support given to network members and subjective well-being.

Rennemark and Hagberg (1999b) found that social networks (structures and functions) had strong correlations with symptoms of illness and symptoms from muscles, bones, and joints in a small Swedish community (n=249) of older people aged 71 and over. These Swedish older people indicated that greater life satisfaction was associated with better social networks and fewer symptoms of illness. Phillipson and colleagues (1998) examined older people's social networks in Bethnal Green and Woodford in London, and Wolverhampton in the West Midlands. They found that social network size did not seem to decrease with age and friends played an important role in older people's social networks. However, Phillipson et al., (1998, p. 286) suggested that "networks may vary in the resources which they provide for their members." There is a reciprocal relationship between older people and their friends.

With regards to the relationship between social networks and well-being, Pinquart and Sörensen (2000) used meta-analysis to combine findings from 286 empirical studies on the association between socioeconomic status and social network and subjective well-being (three aspects of quality of life: life satisfaction, happiness, and self-esteem) in later life. They concluded that the quality of social contacts had a stronger association with subjective well-being than the quantity of social contacts. In addition, having contact with friends was more strongly associated with subjective well-being than having contact with adult children. Moreover, their studies showed that social networks were influenced by subjective well-being among older people who lived in a relatively stable environment. Older people had tight social networks tended to have better quality of life. Giles et al. (2005) examined the effect of social networks (such as children, relatives, and confidants) on 10-year survival in 1,477 older Australians living in the community and in residential care facilities. They found that larger social networks with friends were protective against mortality over the 10-year period, and a smaller effect of networks with confidants (hazard ratio=0.84, 95% CI=0.71-0.98), although there was no



significant difference between the effect of social networks with children and relatives on survival.

The results of these studies suggest that strong social networks may improve survival, and quality of life among older people, but social networks are affected by other factors, e.g., physical health and psychological well-being, can be considered extremely important for older people. Consequently, being able to maintain relationships with other people and give support to others is important for maintaining good social networks.

### **2.5.3.3 Social engagement**

Social engagement is a broad concept that addresses the complex circumstances involving people's social behaviour and interaction with society. Various researchers have provided various definitions of social engagement. For example, Zunzunegui et al. (2005) concluded that "social engagement is defined as community involvement, e.g., membership in neighbourhood associations, religious groups or nongovernmental organizations (p. 40)." Bassuk et al. (1999) examined the relationship between social disengagement and the incidence of cognitive decline. They defined social engagement as "the maintenance of many social connections and a high level of participation in social activities" and felt that this prevented cognitive decline (p. 165). Therefore, social engagement may improve cognitive function and also improve people's quality of life.

It has been suggested that social engagement and health are closely associated in older life. Bath and Deeg (2005), in a discussion of the literature on the relationship between social engagement and health, emphasized the role played by social engagement on health outcomes, including disability, cognitive function and the risk of dementia. Bath and Gardiner (2005) used both cross-sectional and longitudinal analysis to examine data collected in the Nottingham Longitudinal Study of Activity and Ageing (NLSAA) in 1985 (n=1,042), 1989 (n=781), and 1993 (n=540). They found that older people with high social engagement in 1989 had decreased contact with community nurses and home-assistance support. In 1993, older people with higher levels of social engagement had increased contact with community nurses and home-assistance support. They also concluded that there is a relationship between older people's level of social engagement and several other factors (for example,

physical health, physical activities, and mobility). These factors might have influenced their use of health care services, social care services, and medications.

Furthermore, social engagement was shown to be a predictor of mortality among older people. Bennett (2002) also examined the data from the NLSAA, and demonstrated that a low degree of social engagement predicted mortality; meanwhile, social engagement also predicts intermediate declines in physical health and morale. In another study, Bennett (2006) suggested that social engagement is a good predictor of subjective physical health and is associated with quality of life, in that people with higher levels of social engagement have better quality of life.

### **2.5.3.4 Social support**

Social support can be defined as a kind of social assistance by which people can receive help from formal support agencies (such as visiting nurses and home assistance) (Bury and Holme, 1990) and interpersonal relationships. Other authors present the view that social support has three dimensions: structural, functional, and appraisal (Chen and Silverstein, 2000). Chen and Silverstein (2000, p. 47) explained: “the structural component of support describes the composition of the social network and the availability of people in the network who may help the individual. The functional aspect of social support includes the amount of instrumental, emotional, and financial help. Appraisal of social support represents the subjective evaluation of the adequacy of support or the degree of satisfaction with support.” Moreover, Brown et al. (2004, p. 37) defined social support as “the interactive process in which emotional, instrumental or financial aid is obtained from network members.” Therefore, social support can be formal or informal, and can come from multiple varied sources, such as welfare services, relatives, friends, and partners.

Previous research suggests that older people in poor health attempt to contact children and friends less because children provide the main support for their older parents (Hermalin and Yang, 2004). Moreover, based upon the four waves (1989, 1993, 1996, and 1999) of the SHLSET study, Cornman et al. (2003) found that older Taiwanese people’s perceived support and social ties (including marital status, number co-residing with children, number of friends, and social involvement) were associated with health. However, older people receiving support were less likely to have a low level of depression at follow-up.

There is considerable evidence supporting the relationship between social support and physical health, psychological well-being, and mortality (Silverstein et al., 1996; Hays et al., 1997; Prince et al., 1997; Gurung et al., 2003; Iecovich et al., 2004). Saito et al. (2005) reported on a longitudinal study of health status, social support and using data on health care and welfare service use among older people. Their results showed that social support is an important factor that predicts health status among older people living alone. They also reported that receiving social support from the neighbourhood had benefits on activities of daily living and on well-being among older women or older people 75 years and older.

With regards to psychological well-being, VanDerHorst and McLaren (2005) addressed the serious consequences of ignoring social support among the depressed older people, when they studied 110 Australians, aged 65 and over. They found that fewer social resources were associated with higher levels of depression. In one study on social support and psychological well-being, Chen and Silverstein (2000) reported on data from a random sample of 3,039 adults, aged 55 and older, recruited in the 1992 Beijing Multidimensional Longitudinal Study on Aging (BMLSOA). They suggested that the benefits of social support relate to older parents' well-being, especially providing instrumental support to children and the benefits of receiving support from children.

Temkin-Greener et al. (2004) analyzed the relationship between social support and mortality between 1998 and 1999 in 3,138 American older people who participated in the Program of All-Inclusive Care for the Elderly (PACE). Their study revealed that several social support variables, such as caregiver as a spouse (hazard ratio=0.63) and caregivers' assistance with meals (hazard ratio=0.66), significantly reduced mortality, and aspects of informal care giving as additional important factors that enhance survival in a very frail population. Thus, low social support may result in poorer health and increased mortality risk.

Several studies have focused on the relationships between social support and life satisfaction among older people (McGhee, 1985; Barrett, 1999; Lazar, 2000; Wang et al., 2002). For example, Wang et al. (2002) found that 57.1% of the variance in life satisfaction among older male was explained by social support from others. Another study also found that social support (providing and receiving support) was associated with increased quality of life in most situations among Korean older people (Kim et

al., 2000). Moreover, Fernández-Ballesteros (2002) emphasized that the relationships with family and friends are the most important influences on good quality of life in old age because older people need more help and care from those people when they are frail or have health problems.

Older people receive social support when they have problems associated with functional disability, illness, or psychological stress. On the other hand, older people also provide support to others, which improves their own quality of life because helping others makes them feel valued. These studies demonstrate the importance of social support in later life, particularly in relation to high quality of life.

### **2.5.3.5 Leisure activities**

Leisure activities can be defined as those activities that people enjoy doing in their free time. There are many benefits to participation in leisure activities including health promoting, engaging with others, and so forth, and these can enhance well-being and life satisfaction (Nilsson et al., 2006). Zimmer and Lin (1996) noted that “leisure activities tend to promote feelings of competency, accomplishment, self-efficacy and mastery over one’s environment is thought to be particularly useful for positive psychological development in older adults” (p. 169). Furthermore, participating in leisure activities often involves physical activity and social interactions (Silverstein and Parker, 2002), both of which are beneficial to a good quality of life.

Leisure activities are a critical component of quality of life. According to a study by Everard et al (2000), leisure activity has a positive impact upon the mental and physical health of older people. Zimmer and Lin (1996) also found that leisure activities, especially physical activities, were significantly associated with emotional well-being, based on a sample of 4,049 people aged 60 and over in SHLSET. They used factor analysis to generate four patterns of leisure activity items, namely physical activities (sport, walking, and gardening), creative activities (games, reading hobbies, and handicrafts), contemplative activities (thinking and worshipping), and social activities (socializing). These results suggest that contemplative activities tend to present an impediment to successful ageing in Taiwan, particularly among women. Their explanation relied upon the Activity Theory, which “assumes that activities which are solitary in nature add less to well-being than others since, in acting alone,

there is little opportunity for the role support necessary to establish a positive self-concept” (p. 182).

Previous studies have found that socio-demographic variables are significantly associated with leisure activities in later life (Nilsson et al., 2006). The frequency of participating in leisure activities, in general, decreases with increasing age. For instance, Gauthier and Smeeding (2003) analysed cross-national differences in leisure time of older people in nine countries: Canada, Finland, Germany, Italy, Japan, Netherlands, Sweden, the United Kingdom, and the United States. They found that time spent on paid work decreases with age, while time spent on passive leisure activities (e.g., watching TV, relaxing), personal activities (e.g., sleep, eating, bathing, dressing, medical care), and to a lesser amount, active leisure activities (e.g., travel for pleasure, visiting friends) increases with age. One American study found that older people with high socioeconomic status, education levels and income had a high level of participation in leisure activities and had good well-being (Satariano et al., 2002). Agahi and Parker (2005) conducted a study on a nationally-representative sample of the Swedish population, aged 77 and over, in 1992 and 2002. Compared to men, older women were more likely to participate in physical and intellectual activities improving their quality of life.

Wong (2003) examined the quality of life of older people in Singapore in terms of life satisfaction. Both leisure and recreation domains (e.g., sports, entertainment, hobbies, relaxation) as well as the arts and culture, were a part of quality of life. Older Singaporeans generally were satisfied with their life, but they tended to be satisfied with their personal health, family ties and public safety, and were less satisfied with leisure and recreation as well as arts and culture. Silverstein and Parker (2002) examined 324 older Swedes living in the community, surveyed in 1981 and 1992. These participants were more likely to perceive improvements in their life; changes in functional health had little direct effect on quality of life; and adding and dropping activities had equal and opposite effects on perceived changes in quality of life. In summary, they suggested that older people increase their activities across six domains (fifteen leisure activities), and that such increases tend to be perceived as improvements in quality of life.

### **2.5.3.6 Summary**

The relationships between social relationships, social networks, social engagement, social support and leisure activities and quality of life have been reviewed in this section. Social networks tend to be divided into kinship and friendship (Pin et al., 2005). The family remains the main source of support for many older people. Perceived social support is an important component of quality of life. The studies reviewed suggest that social relationships and social support can have a favourable influence on quality of life.

Social relationships, networks, engagement and support are influenced by various factors, including age, gender, living situation, marital status, friend status, and culture. Although some longitudinal studies have shown that social factors are linked to well-being among older people, little is known about cross-national differences in older people's quality of life. In particular, we know little about cross-culture differences in older people's quality of life especially comparing the UK and Taiwan. The relationship between participation and quality of life will be explored in this thesis, including comparative analysis and studies based upon different cultural beliefs, values, and norms.

### **2.5.4 Environment**

This section examines the environmental problems facing older people and discusses these in relation to quality of life. It examines the issue of living arrangements; then looks at problems associated with living status. After this, it examines the problems of external influences (e.g., environment, neighbourhood, and community crime) on quality of life among older people. Finally, there will be a discussion of the problems of living environment related to quality of life.

#### **2.5.4.1 Living arrangements**

The term 'living arrangements' largely refers to those with whom a person lives e.g., one's spouse, immediate family, other relatives, friends, or oneself alone. Palloni (2001, p. 1) explained that "the term 'living arrangements' is used interchangeably to refer to the household structure of the elderly." Demography, socioeconomic status and cultural factors may affect living arrangements, for example, marital status, family size and structure, financial support, and health status. Bongaarts and Zimmer

(2002) examined living arrangements among older people in 43 developing countries and found that older people were more likely to live with adults children in Asia and least in Africa.

Living arrangements may provide an important indication of support to a person. Living with a spouse or family can be beneficial to older people in terms of receiving assistance, including physical and emotional help. For example, Liang et al. (2005) analysed the relationship between health and living arrangements using data from the Asset and Health Dynamics among the Oldest Old (AHEAD) survey of Americans, aged 72 years and over, in 1993, 1995 and 1998. They found that older people with poor health (e.g. functional limitations and cognitive impairment) are more likely to live with their children or live with other people. Research also has demonstrated that older people with disabilities tended to live with relatives and received informal family care, thereby having a relatively good life (Audenaert, 2003).

In addition, living arrangements may be closely associated with older people's daily life satisfaction. Generally, living arrangements can be broadly linked with life satisfaction, well-being, and quality of life. For example, in a study of ageing and life satisfaction (SHLSET), Chen (2001) examined the relationship between major life events (i.e., retirement, deterioration of health, and loss of spouse) and life satisfaction and found that living arrangements had a significant influence on life satisfaction in a longitudinal survey involving 4,412 participants (response rate 91.8%) 60 and over in Taiwan in 1989 and 1993. In other words, older people had lower life satisfaction when they did not obtain support from their families. Conversely, older people gain resources and support when they live with their adult children or other relatives. These resources and sources of support are very important for the majority of older people, and have a positive effect on their quality of life.

### **2.5.4.2 Living alone**

Living alone may be defined as a one-person household (Tomassini et al., 2004). The most recent estimates of older people (aged 65 and over) living alone are 46% for Great Britain (2001), 48% for the Netherlands (2000), 51% for Sweden (2002), 40% for the USA (2002), 41% for Austria (2001), 51% for Germany (1994), 36% for Italy (2000), and 25% for Portugal (1994) (Tomassini et al., 2004).

Another important fact is that living alone has become more common among older people, especially among older women aged 65 and older from 1970 to 2000 (Tomassini et al., 2004). In longitudinal studies, living alone exhibits mixed effects. For instance, older women living alone can be protected against functional decline by contact with friends and relatives and they tend to have better mental health and vitality compared with older women living with a spouse (Michael et al., 2001). However, women living alone also are at increased risk of poverty, leading to poor quality of life (Johnson and Smeeding, 2000).

Three recent studies examined the relationship between living alone and social support, and health and quality of life. In one study, based upon 2 years of longitudinal observation in a rural area of Japan, Saito et al. (2005) analyzed 340 participants who lived alone. They suggested that social support predicts the health status of older people living alone, especially the neighbourhood environment. Finally, Lee (2005) explored quality of life among Chinese older people (n=109), aged 60 and over, living alone in two public housing estates located in an urban area of Hong Kong. He defined life satisfaction as quality of life and used the LSIZ to measure quality of life. The results were that mental health, the number of days in hospital, life satisfaction, age, and self-esteem accounted for 56.4% of the variance in quality of life.

### 2.5.4.3 Community-dwelling older people

'Community-dwelling older adults' refers to "those who are not in assisted living or nursing homes" (Ganz et al., 2006, online). Hellström et al. (2004) examined quality of life and symptoms among older people at home with and without help. They sent a postal questionnaire to 1,866 participants aged 75 years and over (448 persons received help and 793 persons did not). The items in the questionnaire included asking if the person needed help with instrumental activities daily livings (ADLs) (e.g., shopping, meal preparation and housekeeping) and personal ADLs (e.g., bathing, dressing and feeding). Eight quality of life questions were selected from the Life Quality Gerontological Center Scale (LGC)<sup>6</sup>. They found that older people with loneliness, depression, and abdominal pain had a low quality of life in both groups

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<sup>6</sup> The LGC is 49-item scale and is derived from the analysis of the item from the Life Satisfaction Index A, the Philadelphia Geriatric Centre Morale Scale, and the Life Quality Scale (Hellström et al., 2004).



(participants with and without help). Older people receiving help with daily living were more likely to have an associated lower quality of life.

In addition, for older people self-care at home may also be important for quality of life. For example, Backman and Hentinen (2001) examined older peoples' self-care behaviour related to life satisfaction. Forty participants aged 75 and older living at home in northern Finland were interviewed on the subject of their functional capacity, life satisfaction (5-item Satisfaction with Life Scale), and self-esteem. They found that older people having appropriate self-care behaviour (e.g., responsible, formally guided or independent behaviours) could manage their daily activities without help from others and tended to have a high quality of life. On the contrary, older people who are not able or willing or may not be able to carry out their daily activities without assistance from others may have low life satisfaction. Quality of life among older people in a living community may be affected by many issues, e.g., physical health, functional capacity, and self-care ability.

### **2.5.4.4 Built environment**

The built environment, particularly housing, may influence quality of life in old age. Older people are more likely to live their own home when they can control their lives and be independent. However, environmental hazards can be a risk and may be linked to poor quality of life among older people living in their own home, especially frail older people. Research has shown that the absence of handrails, non-slip step stripping, and rugs increase risks in unsafe indoor locations. Steps, unsafe floor rugs, rooms with trailing cords, and unsafe chairs were other hazards identified by Stevens et al. (2001). This means that falls are strongly related to these places of residence. As previously discussed in Section 2.5.1.7, falls may cause physical health problems and influence quality of life in later life. On the other hand, the home may also generate some dangers to health and safety because older people may not be able to clean and maintain their own home due to their poor physical condition (Lassey and Lassey, 2001). For example, a dirty environment may affect a person's health; electrical wiring and out-of-date plumbing, or an out-of-order heating can cause risks that could influence quality of life.

A number of surveys have shown that good living conditions are linked with a higher degree of subjective well-being (Iwarsson and Isacson, 1997; Yamashita et al., 1999).

For example, Gitlin et al. (2001) examined the factors that influence older people living at home and their problems relating to psychosocial well-being. 296 participants were community-living frail older people living in the western region of New York. They used a tool to assess the environmental problems including nine areas (e.g., bathroom, kitchen bedrooms, entry to home, stairs etc.) and seven conditions (e.g., lighting during day, temperature control, appliances etc.). Surrounding the home was observed with over 106 specific items evaluated. The specific items included persistent situation (e.g., lack of needed handrails, doors too heavy, thresholds too high etc.) and variables (e.g., lack of appropriate heat or air conditioning). Three measures were used for testing psychosocial well-being including the 10-item Rosenberg Self-Esteem scale, the 20-item centre for Epidemiological studies Depression Scale (CES-D), and the 8-item Social Resources Scale. They found that older people with home environmental problems were younger, female, of minority status, experiencing pain, and greater physical disability; however, less social contact was a predictor of poor quality of life, morbidity, and mortality, but environmental problems were not.

Another study examined the relationship between housing quality and psychological well-being among 497 American older people (mean age 72.5) living independently in the community (Evans et al., 2002). They identified 45 items relating to housing quality including infrastructure (e.g., home in good repair), amenities (e.g., presence of customised cabinets), support for mobility impairment (e.g., handrails in the main hallway), and spatial requirements (e.g., kitchen space adequate for meal preparation) and used a standardized instrument which was developed by Mroczek and Kolarz (1998) to assess psychological well-being. They suggested that housing quality was associated with psychological well-being, especially a person's feelings of belongingness, sense of ownership, and ability to personalize among older people living in the community.

### **2.5.4.5 Neighbourhood**

Even though research has shown that particular neighbourhood environments may not be ideal for many older people, and older people may feel limited in terms of using community facilities, partially because of excessive noise, inadequate lighting, and heavy neighbourhood traffic (Balfour and Kaplan, 2002), but neighbours can still be

very important. Older people benefit from their neighbours from a social point of view. Neighbours can also provide necessary support (Perren et al., 2004). Neighbourhood satisfaction is an indicator of social relationships; meanwhile, neighbours are an important source of support, especially among rural older people (McGhee, 1984). Most neighbours are willing to help or provide support to older people without asking for reimbursement, these help have benefit for older people's quality of life (Nocon and Pearson, 2000). The issue of social relationships is important for maintaining quality of life and was discussed in Section 2.5.3.1.

In addition to the neighbours, the neighbourhood itself also can play a vital role in terms of quality of life. Kahana et al. (2003) showed that one's neighbourhood can not only be a predictor of residential satisfaction for older people but also a major contributor to their quality of life. Based on their evaluation, the relationship between a person and the environment (focus on neighbourhood) predicts residential satisfaction and affects psychological well-being among community-dwelling older people. This conclusion was supported by another survey of representative participants 65 and over in Madrid (Rojo Perez et al., 2001). For example, 94% of participants living in Madrid reported that they were very satisfied with their neighbourhood; moreover, the neighbourhood contributed 23% of the variance in the level of residential satisfaction. In addition, Smith et al. (2004) examined the relationship between neighbour and quality of life among 600 older people aged 60 and over, in three English cities (Liverpool, Manchester, and the London borough of Newham). They found that satisfaction with the neighbourhood was a significant determinant of quality of life; although they concluded that total environmental factors have less of a relationship with quality of life among older people. Other recent research has demonstrated that the relationship between older people and their neighbours contributes to their good quality of life (Gabriel and Bowling, 2004).

### **2.5.4.6 Crime**

Crime may create a higher risk to those who are vulnerable, especially older people. Older people usually are aware of the potential for crimes; however, they often lack the ability to prevent crime, largely because of their own physical limitations. An American study (Acierno et al., 2004) determined that older people, especially females and non-whites with low income, were especially at risk of becoming the

victims of crimes. Additionally, the fear of crime was significantly associated with depression and social isolation ( $R^2=16\%$ , including demographic variables). In another study of older people in England, Mawby (2004) investigated 341 participants in the Help the Aged and Homesafe Initiative who were living in Plymouth (Mawby, 1999). It was found that older people who were part of this program reported lower levels of fear of crime; in addition, they expressed the view that the Senior Link/Homesafe had improved their quality of life. A safe environment can reduce older people's fear of crime and improve their psychological well-being and physical health.

With regard to the fear of crime, older people are most afraid of personal and property crimes (Yin, 1980). Yin (1980), in a review of the literature, described the severe repercussions of crime-related physical injury and property loss in older people. McKee and Milner (2000) assessed 60 community-dwelling older people, aged 65 and over, in Sheffield, and found that older people had more fear of personal crime (e.g., mugging, assault, rape and murder) than property crime (e.g., burglary, car theft, vandalism and shoplifting). They also had more fear of crime than the reality of crime, such that fear of crime may be a causal factor in reduced activity leading to poor quality of life among older people.

Previous research has demonstrated that fear of crime is associated with lower morale, lower subjective well-being, and reduced neighbourhood satisfaction (Ward et al., 1986). Adams and Serpe (2000) also argued that fear of crime leads to lower quality of life in older people. Smith et al. (2004) concluded that being a victim of crime directly, and adversely, affects older people's quality of life.

### **2.5.4.7 Summary**

The environment is concerned with living arrangements, living status, the built environment, the neighbourhood, and fear of crime in old age. Home environment factors tend to affect quality of life among older people, both directly and indirectly. Satisfaction with residential location, neighbourhood, and external environment depend upon an older person's subjective perception of the environment. Older people would like to live in their own home; however, many problems that older people must face in everyday life have been identified, especially in terms of safety, from factors both inside and outside the home. This especially is true for those older people living

alone. Older people are not always fully aware of the dangers in their own home; others merely neglect to rectify problems, for a variety of reasons that may include their own physical limitations. Thus, it can be concluded that the quality of the home environment is an important determinant of quality of life among older people living in a home.

Another important issue to study is a wide gap between the actual danger and the apparent of such danger by older people themselves. Most older people usually estimate their homes are very safe, a belief that is not reflected by available evidence (Carter et al., 1997). In addition, fear of crime may be more of a problem than risk of crime. Consequently, all these environment problems indicate that both the inside and outside environments moderate the relationship between perceived safety and physical health that can be associated with quality of life among older people.

### **2.5.5 Demographic characteristics**

In this section, demographic characteristics will be discussed to see how they relate to quality of life among older people. Generally, demographic aspects refer to characteristics such as age, gender, education, income, marital status, and socioeconomic class, and according to Mroczek and Kolarz (1998), these variables usually are taken into consideration in any study of well-being and quality of life among older people.

#### **2.5.5.1 Age**

It is generally recognized that the health of older people deteriorates with age; and, as quality of life is very closely related to health, age may have an impact on quality of life as well. Fernández-Ballesteros (1998, p. 61) claimed that “age ... seems to determine great differences in the majority of the objective health indicators. As age increases, and although perceived health does not change significantly, subjects report more chronic problems, more pains, more mental disorders, they have spent more days confined to bed in the previous month, and they have more hearing problems.” One Swedish study demonstrated that, with increasing age, the most prevalent symptoms are depression and anxiety among older people (Al-Windi et al., 1999). Other studies have reported that health is the most important life domain among older people, due to age-related changes in physical health, which in turn affect well-being

and quality of life (Martin et al., 2001; Hsieh, 2005). This phenomenon is especially true for the oldest old.

In viewing the relationship between quality of life and old age, frailty is another factor that has drawn much attention from researchers. With increasing age, frail older people tend to experience more and more chronic illness, disability, and dependency. Frieswijk et al. (2004, p. 250) noted that “With age, many changes occur at the physical and the psychosocial level. In general, there is an increase in physical and cognitive limitations, which in turn affect daily activities and social contacts. When older people suffer from beginning problems in multiple life domains, the interaction of these problems can cause a gerontological condition called frailty.” These health problems not only limit daily activities among frail older people, but also affect their quality of life. Furthermore, recent research has demonstrated that frailty is related to mortality, which is affected by chronic disease and disability (Puts et al., 2005).

Meanwhile, it has been noted that frail older people tend to experience lower levels of morale, life satisfaction, and well-being. According to Pinquart’s meta-analysis (2001) of 125 studies, both age-associated losses and financial strain are associated with decreased subjective well-being among the oldest old. The Berlin Aging Study (BASE) revealed that, compared with young-old participants (70-84 years), the oldest-old (85-103 years) expressed less positive well-being (Smith, 2001). One study in Greece examined the relationship between demographic factors and subjective quality of life in old age, and found that older people had lower morale due to their physical frailty (Efklides et al., 2003). Frieswijk et al. (2004) conducted a study on 444 community-dwelling older people, aged 65 and older, in the Netherlands. They found that older people with higher levels of frailty rated life satisfaction lower on a 5-point agreement scale ( $B=-0.25$ ,  $p<0.001$ ). These results demonstrate that age contributes to lower quality of life among older people, mediated, at least in part, through health problems; it is not surprising that failing physical health is associated with more dissatisfaction in quality of life.

### **2.5.5.2 Gender**

Gender differences in quality of life among very old people have been demonstrated in different empirical studies. Most research has identified a general trend that older men rate their quality of life higher than do older women. Grundy and Bowling (1999)

explored quality of life among the very old (85+) in East London. They designed a scale measuring quality of life, which included items on life satisfaction, control, activities of daily living, health problems, general health (measured via the General Health Questionnaire, GHQ), activities, likes, warmth, and security. They found that 58% of older men rated their quality of life as 'good' on at least five of the items, versus only 41% of women; consistent with this, only 9% of men but 18% of women rated their quality of life as 'poor' on at least five items. It has been suggested that, historically at least, older men have a higher quality of life than older women, because older men are more likely to receive ongoing reimbursement from their previous work. In contrast, women usually work at home, take care of the children earlier in life, and have very few financial resources in old age. Older women's economic resources tend to stem from their husband or adult children. Similarly, other studies have shown that older women have lower levels of life satisfaction than men (Fernández-Ballesteros, 1998; Smith, 2001). Another survey compared health status and quality of life in Poland and Croatia, where older men again reported having better health status and quality of life than older women (Knurowski et al., 2004).

In general, older women tend to report lower subjective well-being and life satisfaction. Pinqart and Sörensen (2001) carried out a meta-analysis and synthesized the findings of 300 empirical studies. They found that older women, compared to men, had lower subjective well-being, more loneliness, and a more negative self-concept.<sup>7</sup> Pinqart and Sörensen (2001) also suggested that one explanation for women's lower level of satisfaction in life quality could be older women's health problems. Older women may have worse health, including chronic diseases and functional limitations more than their male counterparts. Another explanation is that there are more widows than widowers, so more older women live alone. On the other hand, in a marital relationship, men spend longer hours in paid employment and women spend longer hours in childcare, housework, and spousal care. Even in societies in which both husbands and wives contribute income, men generally are recognised as the head of the family (Heaton and Blake, 1999). Lastly, compared with older men, older women tend to have lower income, less education, and fewer benefits from former retirement

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<sup>7</sup> Aspects of self-concept include self-esteem and subjective age, for example, women usually describe themselves as dependent, sociable, less dominant, and less financially-oriented than men (Pinqart and Sörensen, 2001).

(Sobieszczyk et al., 2003), thus, it is not surprisingly quality of life is lower in older women.

### **2.5.5.3 Marital status**

There is considerable research on marital status (Chipperfield and Havens, 2001; Dykstra and de Jong Gierveld, 2004; Peek et al., 2006). It has been shown that for older people, being married, single, or widowed, marital status has some influence on quality of life. For example, Smith (2001) found that married older people report higher levels of subjective well-being than older people who were single, widowed, separated, or divorced. In a seven-year longitudinal study, Chipperfield and Havens (2001) examined the relationship between marital status and life satisfaction among 2,180 older people in Canada. Over the seven-year follow-up period, stability of marital status accompanied a decline in life satisfaction among older women, but not among men. On the other hand, older people had a decline in life satisfaction when they lost a spouse; this effect was especially significant in older men. Again, perhaps are less so in women because of women looking after men.

The effect of marriage tends to have more influence on older men; for example, widowers tend to experience higher rates of mortality (Goldman et al., 1995). In Dykstra and de Jong Gierveld's study (2004), older men reported higher emotional well-being than women as a result of their marriage. In Antonucci and Akiyama's study (1987), older men were more satisfied with marriage than women. A recent study demonstrated that well-being (e.g., depressive symptoms, life satisfaction, and self-rated health) is associated with the relationship between husband and wife in old age (Peck et al., 2006). In a marital relationship, both the older husband and wife depend upon each other to survive physically, financially and emotionally. Thus, it can be concluded that marriage tends to produce advantages with respect to longevity and quality of life, especially for older men.

### **2.5.5.4 Education**

Some evidence has shown that level of education is directly related to life satisfaction, well-being, and quality of life, but that it is indirectly linked with quality of life through health and functional status. For example, Zimmer et al. (1998) used secondary data from the Survey Health and Living Status of the Elderly in Taiwan



study (SHLSET), collected in 1989 and 1993, and found that education is related to physical functioning.

Furthermore, higher education plays a significant role in preventing morbidity and in delaying the onset of disability. In a seven-year longitudinal study of 8,871 adults, aged 65-84 years, Melzer et al. (2001) found that both older men and women with higher education had lower incidence of disability. This result is consistent with results from Huisman et al.'s study (2005), which identified decreased risks of functional limitation and mortality among older people with better education. A higher level of education may be associated with more enjoyable work, greater income, higher social class, more health information/health-related resources, and better quality of life.

A recent study demonstrated that certain demographic factors, such as lower educational level and lifestyle, can explain certain adverse health-related quality of life occurrences (e.g., obesity, less physical activity) among older women in Spain (Guallar-Castillón et al., 2005). In contrast, older men tend to have high life satisfaction, high self-esteem, and high subjective health because they have high level of education and income (Pinquart and Sörensen, 2001). On the other hand, compared with young adults, older people have higher psychological well-being associated with their education and previous work (Ryff and Heidrich, 1997). Finally, the relationship between higher levels of education and quality of life may be mediated through physical and psychological health in old age.

### **2.5.5.5 Finance**

Finances include economic status and income. In old age, most income tends to come from work earnings, retirement pensions, pension interest, and state pensions. Older people may have more economic strain in later life because the value of their income or pensions tends to decrease over time, due to inflation. On the other hand, older people often have difficulty gaining re-employment in the labour market. One important source of income for older people is a state pension. In most countries, state pensions tend to be based on the assumption that old age begins at age 65. Thus, economic problems sometimes arise among young-old people. For example, a Canadian survey found that Canadian older people had higher levels of poverty and

were more financially dependent than younger old people, especially among those between the aged of 54 and 63 years (Cheal and Kampen, 1998).

In general, income inequality exists among older people, especially between older men and women. Older women tend to experience financial strain that increases with age, lack of independence, and loss of a spouse. For example, in Italy, Aureli and Baldazzi (2002) found that older women, aged 75-79 years, were more dissatisfied with their economic status than men. Women also reported more employment interruptions and lower rates of pay when they were younger (Cheng and Chan, 2006). Consequently, older women tended to have smaller pensions in retirement. This made many dependent upon their spouse and family, and this was linked to poor quality of life.

Income plays an important role in quality of life. Arendt (2005) found that Danish older people with low levels of income were more likely to report poor functional status, fewer physical activities, and poorer psychological well-being. Gabriel and Bowling (2004) conjectured that finances affect quality of life because having a low income makes it more difficult to maintain a higher quality of life. La Grange and Lock (2002) investigated Chinese older people who were 60 years old and living alone in Hong Kong; they found that older people with low incomes had greater difficulty in maintaining certain living standards, especially with respect to housing and health care. Walker (1993, p. 287) claimed: "Differences based on class, age, gender, race and marital status are reflected in income inequalities and, at the extremes are younger (60-74) middle-class males and married couples, and older (75+) women and working-class families." Diener and Biswas-Diener (2002) suggested that insufficient income could be an important determinant of unhappiness in later life, and that there is a direct relationship between income and subjective well-being.

### **2.5.5.6 Ethnicity**

Research findings suggest that there are important ethnic differences in quality of life in older age, although, again, it is likely that these differences are mediated by other factors. Bajekal et al. (2004), found that factors determining quality of life were health, social networks, material conditions, and the quality of the physical environment among different racial groups (Caucasian, Indian, Caribbean, and Pakistani) in England. Another study of ethnic differences among older people in England revealed

that four racial groups (Jamaican Caribbean, Gujarati Indian Hindu, Punjabi Pakistani, and Caucasian English) recognized six factors that were associated with their life quality. These six factors were independence; income and wealth; health; having a role; support networks; and having time (Grewal et al., 2004). Similar to other demographic factors, health has an important influence on quality of life among different ethnic groups.

Moriarty and Butt (2004) found that lower household income is the most important factor affecting poor quality of life in Black Caribbean older people, when compared with Caucasians, Asians, Black Africans, and Chinese in England and Scotland. Thus, low quality of life among different ethnic groups may be mediated by poor health and low income. In Taiwan, there are four ethnic groups: Fukien (Mingnan dialect), Hakka (Hakka dialect), Mainlander (Mandarin), and Indigenous people (having different dialects) (Knodel et al., 2002). Ethnicity has significant differences in age, gender, education, and self-rated health, in particular Indigenous people have low level of education and poor health which are associated with poor quality of life (Zimmer et al., 1998).

### **2.5.5.7 Socioeconomic class**

Socioeconomic class refers to one's social and economic grouping. It is highly related to one's previous occupation. Older people may feel satisfied with their life due to a direct link with their past or present work or their position in society because of the reputation, self-esteem, and admiration from others that certain employment generates. Upper class older people, especially men, also have larger pensions and/or incomes. Empirical studies have demonstrated that older people from the lower socioeconomic classes tend to have poorer health and resultant reduced quality of life. For example, Breeze et al. (2005) examined the effect of socioeconomic class on health-related quality of life among older people in a rural area in Britain. They found that poorer functioning older people (defined as quality of life) tended to be socio-economically poorer.

Another British study explored the effect of socioeconomic class on quality of life among 9,547 older people, aged 75 years and over (Breeze et al., 2004). They found that, compared with non-manual labourers, older people from lower socioeconomic classes who had been manual labourers reported poorer health, as measured by the

Sickness Impact Profile (SIP)<sup>8</sup>, lower morale, and worse quality of life<sup>9</sup>. Bowling et al. (2002) tested a model of quality of life on 999 older people participants using data from the Office for National Statistics (ONS) Omnibus Survey in Great Britain. Not surprisingly, those older people reporting that they had a very good life belonged to higher social classes, had higher incomes, and were better educated. Therefore, quality of life among older people is related to their socioeconomic class, and this is mediated through health and other variables.

### 2.5.5.8 Summary

It is important to understand that age, gender, marital status, education, income, ethnicity, and socioeconomic class are inter-related factors, and that their effect on quality of life in older people may be mediated through health and other related variables. Nonetheless, they all are important factors to consider, and their effects can be quite prominent. As older people age, they tend to experience more health problems and both the occurrence of these and their impact on quality of life may be influenced by demographic factors.

Older people tend to report higher levels of life satisfaction when they are married, are better educated, have better employment, have a higher income, and belong to a higher socioeconomic class. Older people in different racial groups may perceive a shift in social support and economic resources due to changes in societal values and the economic environment. In other words, a lack of social resources and financial support may cause individuals to feel more dissatisfied with their lives, especially within certain racial groups. Meanwhile, as for quality of life viewed by different racial ethnicities, complicated social inequalities exist, a phenomenon that is especially true for those who Indigenous people live in rural areas or the hills in Taiwan. Clearly, this problem warrants further study.

In conclusion, the literature suggests that older people who are married, younger, and male, who have higher levels of education and better incomes, and who come from higher socioeconomic classes tend to report higher levels of quality of life.

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<sup>8</sup> According to Breeze et al.'s study (2004), SIP includes home management, mobility, self-care, and social interaction.

<sup>9</sup> Breeze et al. (2004) defined quality of life in terms of five domains: home management, mobility, self care, social interaction, and morale.

### 2.6 *Quality of life and mortality*

This section discusses the relationship between quality of life and mortality. Quality of life may have an effect on mortality in old age. A large number of studies have shown that physical health, mental factors, marital status, family, and economic roles, and social engagement are associated with quality of life (Michalos et al., 2000; Sprangers et al., 2000; Breeze et al., 2004; Wada et al., 2005). What seems to be lacking, there is shortage of studies exploring the correlation between quality of life and mortality among older people.

The question that has been touched from time to time but not explored is the relationship between quality of life and mortality among older people. Certain factors associated with mortality in later life (e.g., age, frailty, illness, self-rated health) increase mortality in the ageing population. It is conceivable that an older person is likely to have a higher risk of mortality if she or he has a low quality of life. Data from 1192 non-institutionalized people aged 70-75 years old living in a North Italian town were analyzed with multiple logistic regression and the results indicated the effects of sensory aids on quality of life and six-year mortality (Appollonio et al., 1996). They found that sensory deprivation associated with ageing, was correlated with reduced quality of life in social relationships, cognitive performance, worse mood level, and performance in instrumental activities of daily living, and these people tended to have a higher mortality rate.

Iwasa et al. (2006) examined the relationship between subjective well-being and mortality among older people aged 52-77 years in an urban Japanese community. They used Cox proportional hazard regression to analyze a seven-year mortality using subjective well-being (the 17-item Philadelphia Geriatric Center Morale Scale) as a baseline predictor. Their findings showed that subjective well-being is a reliable predictor for mortality in old age. The relationship between life satisfaction and mortality was explained by Lyyra and colleagues (2006). They examined the relationship between life satisfaction (using the LSI-Z) and mortality over 10 years among 320 same-sex older twins over 80 years in Sweden. Their results demonstrated that older people with lower life satisfaction had double the increased risk of death in comparison to those people who had higher life satisfaction. They also suggested that

there was not a significant relationship between older people with past life satisfaction and mortality.

Although quality of life does not have a precise definition, quality of life may be defined, or at least affected by objective (e.g., income, education, health status) and subjective (e.g., life satisfaction, happiness, well-being) factors in general, as discussed in Section 2.3. These factors may affect quality of life, and if quality of life decreases or increases, this may increase or decrease the risk of mortality. For example, Maier and Smith (1999) in the Berlin Aging Study (516 participants aged 70-103 years) found that dissatisfaction with life was associated with an increased risk of mortality. They examined the relationship between psychological factors and mortality (1990-1993), and measured subjective well-being using five constructs including Positive and Negative Affect (the Positive Affect Negative Affect Schedule), agitation, dissatisfaction with ageing, and dissatisfaction with life (15-item the Philadelphia Geriatric Center Morale Scale). Zuckerman and colleagues (1984) examined the relationship between psychosocial factors and mortality. Of 400 participants aged 62 years and older lived in New Haven, Hartford, and West Haven, Connecticut. They measured life satisfaction and well-being using five constructs including LSI, the Multiple Affect Adjective Checklist, a five-item index of anomie<sup>10</sup> (Srole, 1956), a two-item insomnia, and a five-item depression scale. The result showed that religiousness, happiness, and presence of living offspring tended to reduce the risk of mortality.

In the Austrian Longitudinal Study of Ageing, Anstey et al. (2002) examined psychosocial factors of longevity in very old people over a 9-year period. 2,087 participants aged 65 and older were assessed on measures of perceived control, morale, self-rated health, social participation, life satisfaction, self-rated life expectancy and self reported physical function. They found that for older men, perceived control was related to a reduced risk of mortality; for women, social participation, morale, and physical function reduced the mortality risk. They suggested social participation and well-being tended to have a positive effect on longevity. Another HRQOL-mortality relationship was explored by Tsai et al. (2007). Participants were 4,424 community-dwelling older Taiwanese aged 65 and over who

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<sup>10</sup> Srole (1956) defined anomie as "the breakdown of the individual's sense of attachment to society" (p. 712).

participated a door-to-door interview with a 36-item questionnaire (SF-36). They found that lower Physical Component summary (PCS) and Mental Component Summary (MCS) score were independently associated with increasing the risk of 3-year-mortality.

Quality of life has therefore a relationship with mortality; although this may be mediated through different health, independency, and social factors that may interact over time, and affect the impact on long-term survival.

## **2.7 Theories of ageing**

### **2.7.1 Introduction**

The use of theory is not only an intellectual pursuit for its own sake, but it also plays an essential part in research on gerontology. Although gerontology includes the consideration of psychology, sociology, biology etc., for the most part it is concerned with the study of older people, and of the processes of ageing.

There are different views of the phenomenon of ageing, and biological theories of ageing are supported hypothetically by different ageing and physiologic theories that are variably centred on Genetics theories, Wear-and-Tear theories, Immunity theories, the Cross-Linkage Theory, the Free Radicals Theory, the Neuro-endocrine Theory, and the Apoptosis<sup>11</sup> Theory. Psychological theories of ageing address the issues of behaviour and development, such as the Human Needs Theory, Life-Course and Personality Development theories, and the Theory of Gerotranscendence. Sociological theories of ageing include the Disengagement Theory, the Activity Theory, the Continuity Theory, the Subculture Theory, Age Stratification and Age Integration theories (Miller, 2003a). Street (2007) noted that ageing means individuals getting older over period of time, mainly playing roles in society, so that it is important to understand the processes and relationships between ageing and society. Therefore, sociological theories are described and discussed as part of the literature review in this research.

Research on ageing well, and on life satisfaction, has been part of gerontology for more than 50 years (Lawton, 1946; Havighurst, 1961), and Havighurst (1968)

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<sup>11</sup> Apoptosis is a mechanism of cell death, first described in 1970s, that is distinct from necrosis. Apoptosis is considered a normal developmental process that occurs continuously throughout life. The apoptosis theory might explain the increased incidence of cancer, autoimmune disease, and cardiovascular and neurodegenerative disorders in older adults (Miller, 2003a).

suggested that life satisfaction is far more complex than is postulated by either the Activity Theory or the Disengagement Theory. However, Chapman (2005) proposed that the concept of ageing well in gerontology includes six frameworks, namely the Activity Theory, the Disengagement Theory, and the Continuity Theory, the Selective Optimisation with Compensation model, and the Successful Ageing model. Furthermore, Street (2007) indicated that the Activity Theory, the Disengagement Theory and the Continuity Theory emphasise individual actors in society, while the Subculture Theory examines the connection between individuals and society, and the Age Stratification and Age Integration theories present the structural relationships between people and society in the context of the changing age structures of national populations.

Understanding the quality of life needs an appreciation of the ageing theories because the theories of ageing may both explain the ageing phenomenon and the results found in this research, and also help to understand older people's situation in society from their life experiences, continuity, and adjustments. This research combines Street (2003) and Chapman's (2005) suggestion of using the Activity Theory, the Disengagement Theory, the Continuity Theory, and the Subculture Theory. However, the Age Stratification and Age Integration theories are not subjects of interest for this research, and are, therefore, not presented here. Finally, the Selective Optimisation with Compensation model, and the Successful Ageing model are presented in the next section (Section 2.8), and these theories may serve as a basis to explain the ultimate ageing process, and ageing well, for guiding the current research.

### **2.7.2 Disengagement theory**

Disengagement theory was proposed by Cumming and Henry in 1961 (Bearon, 1996; Powell, 2001b). This theory suggests that older people with good health and finances tend to withdraw from society. In other words, later in life, people not only retire from their work, but also from their family and friends. The theory states that it is a normal social phenomenon for older people to gradually withdraw or disengage from their social roles. The withdrawal process is a mutual decision: older people withdraw from society, and society withdraws from them. This withdrawal process is widespread, unavoidable, and beneficial to older people and society.



One group of investigators used disengagement theory to examine Taiwanese older people's life satisfaction (Chen, 2003). Those 60 and over who perceived that drastic social changes had occurred in Taiwan over the preceding 30 years, reported considerable life satisfaction. One explanation for this is that many had withdrawn from their previous social roles, so change had affected them minimally. Financial status was a predictor of degree of withdrawal from prior roles. Hence, financial limitations may be an important reason that older individuals disengage from society. As discussed in Section 2.5.3.3, older people who have more social engagements tend to have higher quality of life. However, this theory has been criticized; and is not now widely accepted because it ignores important aspect of an older person's response to ageing and society (Powell, 2001b).

### **2.7.3 Activity theory**

The view of activity theory holds that a senior's level of activity influences his or her level of life satisfaction (Powell, 2001a). In other words, if older people increase their activities, their life satisfaction also will increase. Although older people suffer changes in health and function, their need for social participation, social support, and social relationships does not change. Older people can replace lost roles with new roles, and replace old activities with new. Activity theory also emphasizes that informal social activities may be more intimate, popular, and frequent for many older people (Maier and Klumb, 2005).

According to activity theory, informal social activities influence the relationship between life satisfaction and more formal social activities. Zimmer and Lin (1996) analysed the relationship between leisure activities and well-being in 4,049 Taiwanese older people over the age of 60. Leisure activities were divided into four types: physical activities, creative activities, contemplative activities (more sedentary activities), and social activities. Their results supported the activity theory that most leisure activities, especially physical activities, had a strong positive influence on well-being and life satisfaction.

In a recent study, Litwin and Shiovitz-Ezra (2006) examined the relationship between activities and well-being among older people in Israel. They used data from a 1997 national survey of older people aged 60 and over. Based upon activity theory, they categorized activities as solitary, formal, or informal. They determined that all three

categories of activity and social relationship were significantly related to well-being. Additionally, they argued that the quality of social ties is more important than activity participation. Although activity theory has been tested in many studies (Silverstein and Parker, 2002; Föbker and Grotz, 2006), however, as discussed in Section 2.5.3, evidences show that social activities are associated with social relationships and more social activities are likely to improve quality of life in old age.

### **2.7.4 Continuity theory**

A third theory of ageing is continuity theory. Continuity theory claims that people are able to carry forward their habits, preferences, lifestyle, and social relationships from their midlife to old age. Moreover, they can continue their interest or careers within their life course to achieve the goal of successful ageing (Bearon, 1996). According to this viewpoint, everyone with their personal characteristics has the ability to deal with life events from midlife to later life. This process of compromise is individual, dynamic and continually evolving in their life. Finchum and Weber (2000) argued that friendships can be continued from midlife to old age. They tried to apply continuity theory to explain friendships among older people. In their article, they identified friendship as an important component of older people's social networks; especially given the fewer social relationships, and less participation in social activities that tend to result in later life.

One study examined social participation among widowed older people, from the perspective of activity, disengagement, and continuity theories (Utz et al., 2002). Social participation increased among older people after they had lost a spouse; meanwhile, widowed older people needed more social support from their friends and kin. The authors suggested that continuity theory was best at explaining how older people maintain their social participation when they lose a spouse; adults more easily accept themselves and their friends when they become old or single. For older people, maintaining friendships has two vital requirements. Finchum and Weber (2000) argue that "internal continuity is an important part of individual mastery and competence. It is essential in establishing a sense of ego integrity and in meeting the need for self-esteem. External continuity is motivated by desire of predictable social support and in later years provides a basis for security in social relationships" (p.163). Thus, older people may examine themselves to see what is lacking in their lives; then they adjust

so that they can continue with life and this may be good for older people's quality of life.

### **2.7.5 Subculture theory**

The fourth theory is Subculture Theory, which was proposed by Arnold Rose in the early 1960s (Bond et al., 1993). This theory emphasises the role changes in later life, in order to understand the relationships between older people and society (Street, 2007). Subculture is different from mainstream culture, since it originates within a fraction of society, as opposed to the whole. According to this theory, older people share circumstances such as having their own norms, expectations, beliefs, problems, concerns, friendships and so on, versus other age groups. They also interact more with other older people than other age groups, becoming less well integrated in wider society. In this aging subculture, older people focus on their health and mobility rather than on education, work, social class, and achievements and, in this way; they obtain support from members of the same age group. However, Caserta (1995) suggested that older people can adjust to their evolving life circumstances, achieve successful ageing, and maintain a satisfactory quality of life.

### **2.7.6 Summary**

Many researchers of ageing consider social factors to be key theoretical considerations for their research. These factors include various roles, dynamic processes, and activities in society, and the different theories appear to address the implications and consequences of different social settings. Each theory attempts to explain how older people successfully adapt to changes in their daily lives, and interact with society in order to maintain their quality of life. The Disengagement, Activity, Continuity, and Subculture theories are based upon the adjustments of older people to losses within the context of their roles and reference groups in society. The Disengagement, Activity, and Continuity theories explore the psychosocial and sociological attributes which improve the understanding of variations in outcomes for older people. The Subculture theory describes the pattern of sub-cultural groups of older people which can arise through positive social processes (e.g., similar habits, friends) and negative ones (e.g., exclusion from social engagement). These theories may be complementary to each other and explain the concept of ageing when considered together, compared to being considered in isolation.

### 2.8 *Successful ageing*

This section presents a general overview of definitions, models of successful ageing, and, studies of successful ageing. Finally, the relationships between successful ageing and quality of life are discussed in this part.

#### 2.8.1 **Definitions of successful ageing**

Defining 'successful ageing' has drawn much attention from researchers in social gerontology. Rowe and Kahn (1997, p. 433) defined successful ageing as having "three main components: low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life." A variety of characteristics have been taken into consideration by researchers in their definitions; for example, physical health, psychological well-being, social environment, and quality of life (Von Faber et al., 2001; Andrews et al., 2002; Li et al., 2006; Nusselder and Peeters, 2006). According to a definition provided by Strawbridge et al (1996), successful ageing can be conceptualized along with the dimensions of everyday activities and mental health. Thus, it seems that a generally objective concept of successful ageing is related to health (e.g. physical and mental health).

In addition, it is important to understand successful ageing from the perspective of older people and to see how successful ageing might be defined by older people themselves, rather than by academics. Some have studied older people's views of successful ageing. Strawbridge et al. (2002) compared older people's self-rated successful ageing with three criteria from Rowe and Kahn's model of successful ageing (e.g., absence of disease, disability, and risk factors; maintenance of physical and mental functioning; and active engagement in life). Half of the participants (50.3%) defined their own successful ageing in terms of the absence of chronic disease and functional difficulties; only 18.8% matched the three criteria proposed by Rowe and Kahn. Many with chronic illness or functional difficulties still assessed themselves as having aged successfully.

Similarly, Phelan et al. (2004) examined how older people perceive they have aged. The investigators analysed data from both the Kame Project<sup>12</sup> and the Adult Changes

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<sup>12</sup> The term 'kame' means 'turtle', a Japanese symbol of longevity.

in Thought (Huang and Acton) study. The investigators used mailed surveys to ask participants whether they had ever thought about ageing and successful ageing; whether these thoughts had changed over the last 20 years; and what specific attributes<sup>13</sup> they felt were important to successful ageing. Ninety percent of participants (N=1,890) reported they had experienced successful ageing over the past 20 years, and approximately 60% expressed that their thoughts had changed over that time. They concluded, “Older adults’ definition of successful ageing is multi-dimensional, encompassing physical, functional, psychological, and social health (p. 211).”

Other researchers have proposed further criteria; for example, in one study, the majority of participants met research criteria “for independent living, master/growth, positive adaptation, life satisfaction/emotional well-being, and active engagement with life and experienced a high health-related quality of life despite having common age-associated illnesses and physical disability” (Montross et al., 2006, p.50). Among the various concepts, there is one in particular for the oldest old, who defined successful ageing “as a process of adaptation” (Von Faber et al., 2001, p. 2694). Concisely, when older people themselves assess the meaning of successful ageing, they tend to think of a successful life in terms of specifics, such as the absence of chronic diseases, the absence of functional difficulties, and a positive sense of well-being.

Therefore, this evidence suggests that successful ageing is linked to good health (e.g., physical, functional, and psychological) and social resources. However, the impact of other factors and the environment, per se, has been examined inadequately, leaving room for considerable improvement in models of successful ageing. However, it is still not exactly clear what is meant by successful ageing. While a variety of definitions of the term ‘successful ageing’ have been suggested, the term ‘successful

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<sup>13</sup> According to Phelan et al.’s study (2004), attributes contain 20 items: living a very long time; remaining in good health until close to death; feeling satisfied with life the majority of the time; having the kind of genes (heredity) that help me age well; having friends and family members who are there for me; staying involved with the world and people around me; being able to make choices about things that affect how I age, like my diet, exercise, and smoking; being able to meet all of my needs and some of my wants; not feeling lonely or isolated; adjusting to changes that are related to ageing; being able to take care of myself until close to the time of my death; having a sense of peace when thinking about the fact that I will not live forever; feeling that I have been able to influence others’ lives in positive ways; having no regrets about how I have lived my life; being able to work in paid or volunteer activities after usual retirement age (65); feeling good about myself; being able to cope with the challenges of my later years; remaining free of chronic disease; continuing to learn new things; and being able to act according to my own inner standards and values.

ageing' is positive conceptualisation of ageing to keep healthy (including physical and psychological health), being productive in society, financial security, free from dependence, staying in engaging with other people, and having control, and finally to maintain a good quality of life in later life.

### **2.8.2 Models of successful ageing**

Three major models of successful ageing have been proposed to describe that older people experience in their life and how they go through life. The aim of these models was to achieve a better view of the quality of life among older people. Firstly, Rowe and Kahn (1987) outlined the difference between successful ageing and usual ageing. In their view, physical health, cognitive function, and psychosocial factors are essential among older people as they gradually age. They suggested that older people's autonomy decreases for various reasons, which include physical impairments, financial limitations, their residential environment, and their living arrangements. This means that autonomy is important for older people. As Rowe and Kahn (1987, p.145) explain: older people want to be "able to make decisions regarding choice of activity, method and manner of engagement, timing, pace, and the like."

Another important aspect is social support, which is also associated with the concepts of autonomy and dependence. As Rowe and Kahn (1987) explain: "The interpersonal behaviours that are called supportive include, among others, the providing of material assistance, information, sick care, and expressions of respect and love. Support so defined, in our view, can either increase or decrease the autonomy and control of the recipient. Teaching, encouraging, enabling are autonomy-increasing nodes of support (p.147)." Consequently, all these factors relating to physical health, psychological factors, cognitive function, control, and social support are potential predictors of successful ageing.

Models of successful ageing may link with various complicated concepts and may be comprised of many dimensions. Rowe and Kahn's model of successful ageing explore the relationships among the avoidance of disease and disability, high cognitive and physical function, and engagement with life. They suggest that, in order to age successfully, older people must stay healthy, avoid age-related risks, and continue to have regular contact with others. They emphasize that active engagement includes interpersonal relationships and productive activity. Those who age successfully have

the ability to sustain their interpersonal relationships, which includes contacting and transacting with others; exchanging information; and receiving emotional support and, when needed, direct assistance. Furthermore, successful older people also participate in creative activities of societal value (Rowe and Kahn, 1997). Therefore, in this model of successful ageing, it is most important for older people to maintain good health, higher-level function, and more active engagement with others. However, in Strawbridge et al.'s (2002) study, only 18.8 % of participants reached the criteria of Rowe and Kahn. The result showed that Rowe and Kahn's successful ageing definition is not related to older people's well-being. They suggested that any successful ageing definition must reflect well-being to be valid.

Predating Rowe and Kahn's model (1997), Baltes and Baltes (1993) introduced a psychological model of SOC<sup>14</sup> (selection, optimization, and compensation) to explain successful ageing. These elements of selection, optimization, and compensation are central to an elder's life processes. In other words, although older people have losses in some aspects of their life as they age, they must have the ability to adapt to different situations (gains and losses) through selection (choosing from limited functions), optimization (taking advantage of opportunities for life), and compensation (performing retained functions instead of attempting those already lost). According to this view, older people age successfully when they integrate the three elements. Baltes and Baltes (1993) also suggested that successful ageing includes other characteristics, such as longevity, biological health, mental health, cognitive efficiency, social competence and productivity, personal control, and life satisfaction.

The MacArthur Successful Aging Model was proposed by Berkman et al (Berkman et al., 1993). The MacArthur Successful Aging Study was a longitudinal study of 1,189 older people between the ages of 70 and 79, conducted in Durham (North Carolina), East Boston (Massachusetts), and New Haven (Connecticut), which assessed physical, psychological, social, and biomedical characteristics as predictors of function. A model of successful ageing was developed that identified subgroups with higher, intermediate, and lower levels of biomedical, physiological, psychological, and social

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<sup>14</sup> Baltes and Baltes (1993) defined SOC as "selection, which refers to an increasing restriction of one's life world fewer domains of functioning because of an aging loss in the range of adaptive potential.....The second element, optimization, reflects the view that people engage in behaviours to enrich and augment their general reserves and to maximize their chosen life courses (and associated forms of behaviour) with regard to quantity and quality...The third element, compensation, results also (like selection) from restrictions in the range of plasticity or adaptive potential."

function. This study provided important insight into how a successful ageing model could be established and studied from different angles. The significance of their research can be further demonstrated by the fact that the model became a frame of reference for an Australian longitudinal study conducted by Andrews et al. (2002). Andrews and his colleagues applied the criteria of successful ageing developed by the MacArthur Model, to examine a sample of 1,947 older people, aged 70 and over. Their results were consistent with those of the MacArthur study; for example, subjects had different levels of success at different ages; and those who experienced successful ageing often enjoyed both longevity and a better quality of life. What is apparent from these models of successful ageing is that the concept of successful ageing has been examined from different perspectives. Most importantly, physical independence generally is perceived to be the most important factor in successful ageing. However, the importance of quality of life in old age must not be overlooked.

### 2.8.3 Successful ageing and quality of life

A number of researchers have reported that successful ageing is an important characteristic in old age, and it contains some dimensions (e.g. function, ability, health) in daily life among older people. For example, a study was conducted by Baltes and Lang (1997) on 516 community-dwelling and institutionalized older people between the ages of 70 and 103 years who lived in West Berlin. In their study, successful ageing was defined operationally as a high level of function. This level of function, in turn, required the following resource capacities: sensorimotor (e.g., visual acuity, auditory acuity, and balance-gait); cognitive (e.g., figural analogies, letter series, and practical problems); personality (e.g., the personality dimension of extraversion and goal strength); and social integration (e.g., perceived social support and role variety in the social networks). They found that older people who participate in more activities<sup>15</sup> had relatively more resource capacities; meanwhile, resource-rich older people were more likely to experience successful ageing.

Additionally, in a 6-year longitudinal study in Canada, Menec (2003) emphasized that everyday activities (such as engaging in social activities, reading, and volunteering) have an important effect on successful ageing, and successful ageing could be defined

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<sup>15</sup> In accordance with Balte and Lang's study (1997), activities included self-care, household chores/housekeeping, physical leisure, intellectual-cultural leisure, television viewing, social engagement, resting, and sleeping.



as well-being, good functioning, and lower mortality. Their study showed that higher levels of everyday activities predicted better function and reduced mortality 6 years later.

Phelan and Larson (2002) conducted a systematic literature review that found successful ageing is strongly related to life satisfaction, longevity, freedom from disability, mastery/growth, active engagement with life, high/independent functioning, and positive adaptation. High educational level, self-efficacy, regular physical activity, social contacts/supports, and freedom from chronic diseases are important factors to predict successful ageing. A review of literature by Bowling and Dieppe (2005) showed that the main constituents of successful ageing include life expectancy, life satisfaction and wellbeing, mental and psychological health, cognitive function, personal growth, physical health, functioning, psychological characteristics, social participation, and leisure activities.

So far, however, there has been little discussion of the relationship between successful ageing and quality of life. As Dieppe (2005) suggested the main components of successful ageing are the same as for quality of life (discussed in Section 2.3) i.e., physical and psychological health, functioning, social participation, and leisure activities. Both successful ageing and quality of life can be seen as similar terms that have the same dimensions and encompass the prevention of disease and disability, the maintenance of high function and psychological well-being, and continued participation in society, and productive activities. Alternatively, quality of life can be characterized as successful ageing that older people seek not only live longer but also better lives to achieve the goal of successful ageing.

### **2.8.4 Summary**

This section examined several definitions and models of ageing and the relationship between successful ageing and quality of life. The lack of consistency in operational definitions makes it somewhat difficult to compare findings between studies. Defining and modelling successful ageing generally requires consideration of physical health, psychological well-being, and social factors. These characteristics practically are the same as the dimensions of quality of life.

Three major models were discussed. The model proposed by Rowe and Kahn (1997) emphasizes the importance of independence/autonomy. The second model,

developed by Baltes and Baltes (1993), is a psychologically-based model via the processes of selection, optimization, and compensation, older people are able to adapt to the losses that occur as a natural result of the ageing process. The third model, the MacArthur Successful Aging Model, categorizes older people into higher, intermediate, and lower levels of function in four realms: biomedical, physiological, psychological, and social.

In summary, all the reviewed research models and studies suggest that we should not assume that one older people's successful ageing is equal to another's. Even though trends exist, successful ageing may depend upon various complex socioeconomic and cultural factors. Life conditions and events may be more critical to an older person's quality of life when trying to sustain independent and autonomy. Further research is warranted to understand this better.

### **2.9 The conceptualization of quality of life**

One issue addressed in this research is related to the conceptualization of quality of life. According to the above discussion, quality of life could be expressed in several ways, such as life satisfaction, happiness, morale, and well-being; some specific concepts of 'quality of life', 'life satisfaction', 'happiness', 'morale', and 'well-being' are used interchangeably. However, it is important to clarify these concepts and understand the concept of quality of life. Thus, the aim of this section is to discuss the concepts of life satisfaction, happiness, morale, and well-being; and to develop the framework for this research.

#### **2.9.1 Life satisfaction**

According to George's (1979) definition, "life satisfaction is essentially a cognitive assessment of one's progress toward desired goals. Further, as 'life in general' or 'life as a whole' is the referent, a long-range time perspective and non-specific life conditions are implied" (p. 210). On the other hand, Neugarten and colleagues (1961) developed the Life Satisfaction Index and defined life satisfaction constituted by five domains: zest, fortitude, success in achieving desired goals, self-concept, and mood. Such a definition, however, is not completely supported by Adams (1969). In Adams' research (1969), life satisfaction constructs mood tone, zest for life, and congruence between achieved and desired goals.

Life satisfaction is at the centre of much research on ageing due to its relationship to such important outcomes as health, morbidity, mortality, and successful ageing (Fernández-Ballesteros et al., 2001). It also is reported to reflect a person's quality of life with their environment and social relationship such as happiness, optimism, well-being, and morale, all of which help to prevent physical decline in old age. In terms of confounding factors affecting life satisfaction, poor health status and difficult life courses may lead to low life satisfaction, while a good marital relationship may have positive effects on life satisfaction.

Recently, life satisfaction has been developed as a kind of subjective well-being for quality of life, and has been used as a dependent variable to measure quality of life in gerontological research. As discussed in Section 2.4, many instruments are available for measuring quality of life; however, there is no single and clear concept for measuring quality of life. The Life Satisfaction Index is one of the popular instruments for measuring quality of life in gerontological research. For example, Liang et al. (1988) used it to examine the three generations of Mexican Americans; Lawrence et al., (1988) examined race, sex, and age differences in life satisfaction; Lyyra et al., (2006) used it to predict survival in Octogenarians. Thus, the Life Satisfaction Index is a reliable and valid measure of life satisfaction.

### 2.9.2 Happiness

'Happiness' is "transitory moods of gaiety or euphoria, reflecting the affect that people feel toward their current state of affairs" (George, 1979, pp. 210-211). Diener et al. (1999, p. 295) explain: "The happy person is blessed with a positive temperament, tends to look on the bright side of things, and does not ruminate excessively about bad events, and is living in an economically developed society, has social confidants, and possesses adequate resources for making progress toward valued goals." Thus, happiness can be described as a state of having a pleasurable feeling or demonstrating satisfaction with a specific situation.

In Subramanian et al. (2005), happiness refers to people's overall evaluation of their own life and/or it could capture momentary feelings of pleasure" (p. 666). Subramanian and colleagues (2005) used "the question 'In general, are you very happy, happy, not very happy and not happy at all?'" (p. 666) as a construct to investigate 24,118 adults (age 18-89) in the USA communities, and found that older

people were less unhappy and participants who were healthier tended to be happier. Contrary to this study, Lacey et al. (2006) reported that happiness declines although well-being improved with age in their comparative self-reported happiness research of a sample of 273 participants (younger adults, mean age=31; older people, mean age=68) in the U.S. census population-based study. Thus, happiness is not consistent across different ages of older people. However, what are older people's experiences and/or views? Efklides et al., (2003, p. 178) defined subjective quality of life "in terms of life satisfaction (LS), subjective well-being (SWB), happiness, and morale." They examined subjective quality of life among 160 (age range 63-100) older people in a Greek city and nearby small town and found that the sources of happiness may not be only from personal factors, but also from the situation of having children in a family that contributed to older people's social support network and close relationships.

Happiness can be a pleasure feeling or emotion and is affected by internal factors (e.g., health) or external factors (e.g., having children). So, happiness has different meanings in various researches on quality of life.

### **2.9.3 Morale**

The term 'morale' can be defined as a generalized feeling of well-being and as a basic sense of satisfaction (Von Heideken Wågert et al., 2005). It is often viewed as equivalent to subjective or psychological well-being. The Philadelphia Geriatric Center Morale Scale (PGCMS) was developed by Lawton in 1972 and it is often used to measure morale in older people. In the PGCMS initial stage, it identified three main components in high morale, e.g., active, sociable, and optimistic in attitude (Von Heideken Wågert et al., 2005).

Morale is related to health, psychological well-being, social factors, and quality of life (Woo et al., 2005). It is also associated with positive/negative thinking which may affect one's health. An interesting study was conducted by Von Heideken Wågert et al. (2005). They found that a large proportion of the oldest old (aged 85 and over) had high morale scores. The most important predictors of their high morale were living in ordinary housing, previous stroke, not feeling lonely, and not being depressed. This is especially true in old age, as physical limitations often result in increasing restrictions on mobility, and thus relate to social activities. This, in turn, can result in further

isolation and a lowering of morale. Low morale usually is associated with lower levels of activity (Maddox and Eisdorfer, 1962), and then this may be considered to be most important to older people and impact on their quality of life. Litwin (2001) examined the association between social networks and morale and found that older respondents with networks of friends exhibited higher levels of morale. Demura et al. (2002) found that participating as a volunteer and having a best friend are associated with high morale. Furthermore, Mancini and Orthner (1980) found that leisure satisfaction and socioeconomic status were the most important factors predicting morale. Therefore, reducing physical health risks and enhancing social participation might improve quality of life.

### 2.9.4 Psychological well-being

Psychological well-being is a well-known construct in social gerontology. Lawton et al. (1984) argued that there is desperate need for greater conceptual clarity regarding life satisfaction, happiness, morale, and psychological well-being because all recognize the large overlap among the constructs in these terms. Previous sections (Section 2.9.1–2.9.3) have discussed life satisfaction, happiness, and morale. In this section, psychological well-being is described in terms of its definition and related research.

In Ryff's (1989) study, the term 'psychological well-being' is defined as its operationalized dimensions: self-acceptance<sup>16</sup>, positive relations with others, autonomy<sup>17</sup>, environmental mastery, purpose in life, and personal growth. Lawton et al. (1984) suggested that psychological well-being is a part of 'the good life' and other factors include behavioural competence, perceived quality of life, and objective environment.

However, what is psychological well-being in old age? Lawton and colleagues (1984) examined the factorial and conceptual dimensions of psychological well-being among 284 USA-born older people. The pool of subjective indicators of well-being including "the Gurin et al. happiness item (1960), the Campbell et al. (1969) satisfaction with life as a whole rating, the Bradburn (1969) Affect Balance Scale, the Rosenberg (1965)

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<sup>16</sup> Self-acceptance is defined as a central feature of mental health as well as a characteristic of self-actualization, optimal functioning, and maturity (Ryff, 1989, p. 1071).

<sup>17</sup> Autonomy is as self-determination, independence, and the regulation of behaviour from within (Ryff, 1989, p. 1071).

Self-Esteem Scale, the psychological distress items from the Health Interview Survey (National Center for Health Statistics, 1970), and the self-rated health, personal adjustment, and residential satisfaction domain indices of the Philadelphia Geriatric Center Multilevel Assessment Instrument (MAI; Lawton, et al. 1982).” were measured in Lawton et al.’s (1984, pp. 68-69) study. The result showed that the components of psychological well-being include twelve factors accounting for 41% of the total variance. These twelve factors, containing 144 items, include happiness, negative affect, residential satisfaction, self-rated health, expression versus denial of negative affect (somewhat more difficult to interpret than others), self-concept I (having suicidal ideation), social ease, time use, self-concept II (having generalized anxiety), congruence between expectation and attainment (contains the LSI item congruence), positive affect, and desire to move (Lawton et al., 1984). From this finding, psychological well-being can be used to describe a person with happiness either because they have a higher physical well-being and assess themselves in a state of positive sentiment or because their external pleasures are many; if both are granted, then a person may have a higher quality of life.

### **2.9.5 Framework in this research**

This section tries to draw distinctions between life satisfaction, psychological well-being, happiness, and morale. As Diener (2000, p. 34) has remarked, “there are a number of separable components of subjective well-being: life satisfaction (global judgments of one’s life), satisfaction with important domains (e.g., work satisfaction), positive affect (experiencing many pleasant emotions and moods), and low levels of negative affect (experiencing few unpleasant emotions and moods).” He described subjective well-being as involving life satisfaction and sentiment and lacking spirit. Stones and Kozma (1980, p. 270) defined “life satisfaction as gratification of an appropriate proportion of the major desires of life, happiness as an activity or state in the sphere of feelings, and morale as moral condition as regards discipline and confidence.” Without a doubt, these terms allow for some commonality. Any one of them, however, is not sufficient description of quality of life because quality of life refers to an overall condition of an individual’s life and complex conceptualization.

When considering the concept of ‘quality of life’ in older people, based on the previous discussion (Section 2.9.1-2.9.4) important components of quality of life

appear to be life satisfaction, psychological well-being, happiness, and morale. However, life satisfaction, psychological well-being, happiness, and morale can be considered as a part of quality of life. Therefore, it may be assumed that life satisfaction, psychological well-being, happiness, and morale are subjective measure of quality of life. Other factors may affect quality of life (e.g., physical and mental health, social factors, environment, and demographic characteristics) but are not part of quality of life per se.

According to Nusselder and Peeters (2006), survival is a possible consequence of achieving successful ageing. Therefore, older people with a good quality of life may live longer and age successfully. On the other hand, quality of life may either directly or indirectly, affect mortality (Iwasa et al., 2006). According to these assumptions, the theoretical concept of quality of life is shown Figure 2.1. For this research, the term 'life satisfaction' will be used as an operational definition to assess quality of life because of its conceptual value, and because it may be influenced by physical and mental health, social factors, and demographic characteristics.

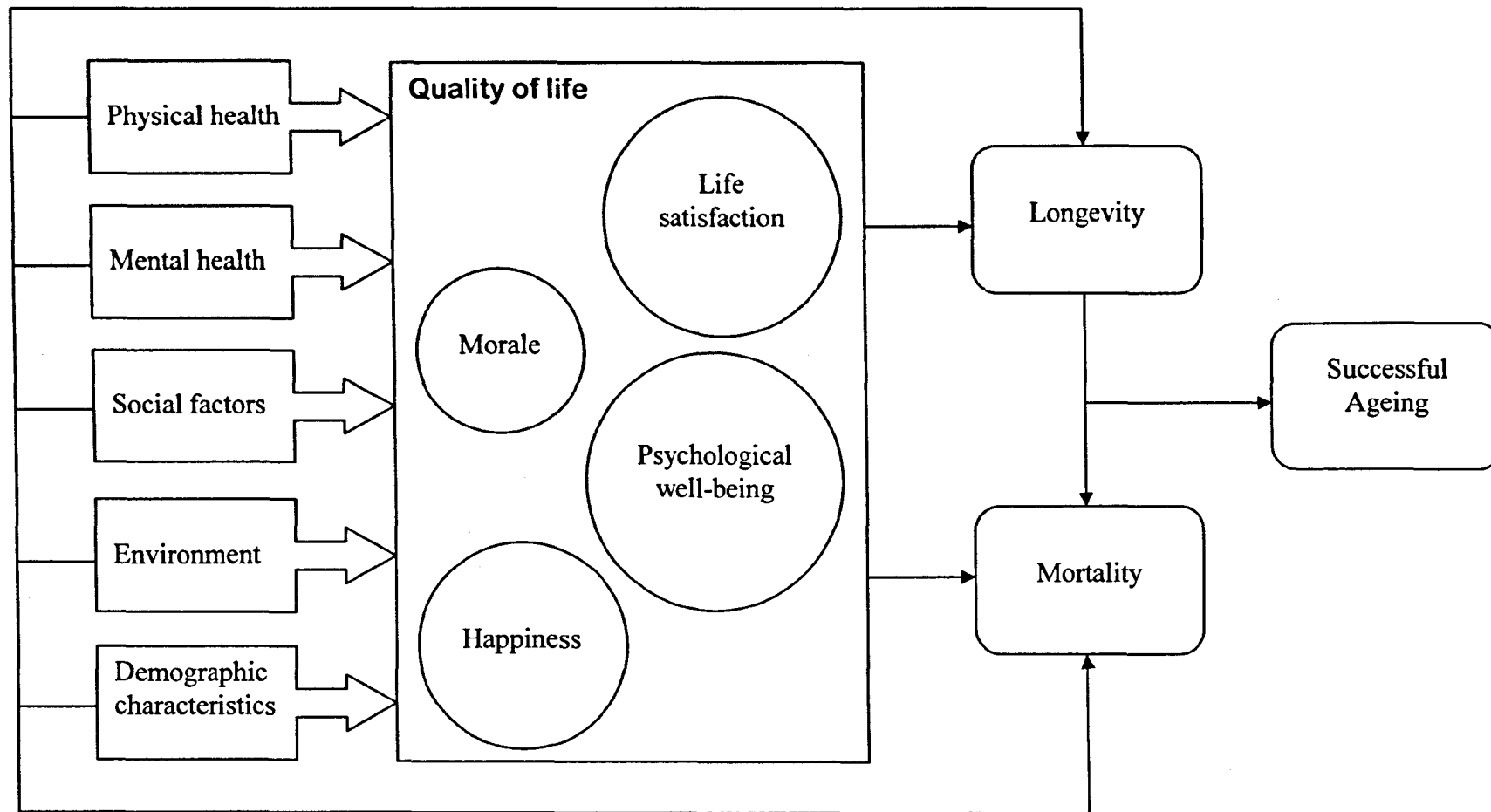


Figure 2.1: Conceptualisation of quality of life for this study arising from the literature review.



## **2.10 International comparisons of quality of life**

While the definition of quality of life varies among researchers, it is also understood and studied differently by researchers in different countries. Comparative ageing research is a successful development in the European (e.g., CLESA, OASIS, ENABLE AGE, ESAW, EURODEP, SHARE, FAMSUP, and MOBILATE); and these researches seek for societal and cultural specificity and distinctiveness (Tesch-Römer and Von Kondratowitz, 2006). Therefore, comparative ageing research can help in understanding quality of life in across different countries.

In order to do comparative ageing research, some equivalent problems are very important; especially important is the language translation problem. Two methodological problems are also very important. One is data equivalence for analyzing data. Another one is conceptual equivalence (Tesch-Römer and Von Kondratowitz, 2006). Conceptual equivalence means that an interesting concept is comparable or identical in the research. For example, the concept of 'quality of life' has to have a similar meaning across cultures. Its operational definition equivalence and similar concepts that can be used across countries such as 'life satisfaction', 'psychological well-being' or 'happiness', should be used in different languages to measure the concept 'quality of life'. This section discusses international comparisons quality of life to inform this current research.

Comparative quality of life research can not only help to understand older people's experiences of quality of life in different countries as well as societies, but also can help in identifying culture-specific differences for improving quality of life among older people. In this section, comparative research into indicators of quality of life, intercontinental research, and methodological issues are discussed.

### **2.10.1 Comparative research into indicators of quality of life**

Most studies have examined specific aspects of quality of life in older people, such as longevity, health, well-being, successful ageing, and life satisfaction (Lamb and Myers, 1999; Ferring et al., 2004; Iwarsson et al., 2004; Bardage et al., 2005; Wahrendorf et al., 2006). Lamb (1996) examined socio-demographic and quality of life factors associated with older disability. Data from 10,416 older adults aged 60 and over were drawn from two components of the World Health Organization's Health

and Social Aspects of Aging project: EMRO (Eastern Mediterranean Regional Office- Bahrain, Egypt, Jordan and Tunisia) and SEARO (South East Asian Regional Office- Burma, the Democratic People's Republic of Korea, Indonesia, Sri Lanka and Thailand). In this study, quality of life measures included the revised Philadelphia Geriatric Centre morale scale (PGCMS) and social support. Categories of disability included being functionally and emotionally healthy, functionally healthy with depressive symptoms, strength problems, severely depressed, mobility problems, and functional frailty. Compared with older men, women were found to be more depressed, have more physical strength limitations, and more mobility problems. In general, both functional and emotional problems were correlated with a lower quality of life across all surveyed countries. However, disability in older people tended to be greater in countries in the Eastern Mediterranean and South-East Asian regions.

Motel-Klingebiel et al. (2004) explored the relationship between social inequality and quality of life among older people in five countries. Data were derived from the OASIS Study – Old Age and Autonomy: the Role of Service Systems and Intergenerational Family Solidarity. The sample population consisted of 6,105 older people from Norway, England, Germany, Spain, and Israel. In their study, quality of life was measured using the WHOQOL-Brief<sup>18</sup>; it was analyzed using Ordinary Least-Squares (OLS) regression models, with overall quality of life as the dependent variable. Older people reported that feeling physically healthy was the most important component of overall quality of life. However, the investigators did not examine to what extent changes in health status affect quality of life in these countries because of limitations with the data.

Knurowski et al. (2004) examined whether health status was associated with quality of life. They chose a random sample of 528 and 286 older people, aged 65-85 years old, in Poland and Croatia, respectively. Quality of life was measured in terms of health (self-rated health, physical functioning, mental health, perceived bodily pain, hearing and vision ability, morbidity, functional status, loneliness and depression) and general quality of life. Results from the two countries were similar, but respondents in

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<sup>18</sup> The World Health Organization has developed a brief generic questionnaire to assess quality of life, the WHOQOL-Bref. The WHOQOL-Bref is an abbreviated 26-item version of the WHOQOL-100 and it contains one general QOL item, one general health item, and 24 specific items – one item from each of the 24 QOL facets of the WHOQOL-100. The 24 specific items cover four broad domains: physical, psychological, social, and environmental, to be answered on five-point scales, which assess the intensity, capacity, frequency, and evaluation of QOL facets (von Steinbüchel et al., 2006).

both countries reported poorer quality of life than any other countries in Western Europe.

Lastly, Wada (2005) examined depression, activities of daily living (ADL) and quality of life in three Asian countries; 2,695 older people, aged 60 years and over, were recruited from community-dwellings in Indonesia, Vietnam, and Japan in 2002-2003. Quality of life was assessed by means of five 100 mm visual analogue scales (VAS), measuring subjective sense of health, relationships with family, relationships with friend, financial status, and subjective happiness. Depression was associated with fewer activities of daily living and lower quality of life. Depression was most prevalent in Indonesia (33.8%), followed by Japan (30.3%) and Vietnam (17.2%).

As can be seen, a strong positive association between level of health and quality of life was observed in international comparisons. Quality of life is also influenced by psychological well-being, and by social and environmental factors. However, previous international comparisons did not address social, environment, and cultural factors that might influence quality of life in older people. Therefore, quality of life may need a broader, international definition.

### **2.10.2 Intercontinental comparisons of quality of life**

In terms of international comparisons, most research has focused on Europe, North America, and Asia (Lamb and Myers, 1999; Antonucci et al., 2001; Iecovich et al., 2004; Ofstedal et al., 2004; Van Tilburg et al., 2004; Äijänseppä et al., 2005; Davey et al., 2005). For instance, comparing Western and Eastern Europe, Iwarsson et al. (2004) conducted the study *Enabling Autonomy, Participation, and Well-being in Old Age: The Home Environment as a Determinant for Healthy Ageing (ENABLE-AGE)*. Wahrendorf et al. (2006) surveyed older people after retirement in the Survey of Health, Aging and Retirement in Europe (SHARE) across ten countries in Europe.

With respect to intercontinental comparisons, Knesebeck et al. (2003) investigated socioeconomic status and its effect on older people's health in Germany and the United States. The results showed that older Americans' health tended to be less affected by socio-economic status; socio-economic status had more influence on older people in Germany. In a more recent study, Davey et al. (2005) undertook a longitudinal study on how both service and support can affect older people in the United States and Sweden. They found that formal services were utilized less

frequently in the United States than in Sweden; informal service use was low in both countries.

It has been discussed in Section 2.10.1. Lamb (1996) compared quality of life among a representative sample of older people living in the Eastern Mediterranean region and Southeast Asia. In the nine countries surveyed, both functional and emotional limitations were associated with lower quality of life. Again, there were no regional differences.

Social scientists have tended to neglect South America, Oceania, and Africa, where quality of life in older people is also an important issue. Older people in different regions may differ significantly from each other in terms of their quality of life. Therefore, it is very important to expand comparative analyses to include these neglected areas if we are to develop a truly international understanding of ageing.

### **2.10.3 Comparative research: methodological issues**

Walker (2006, p. 8) attended the European Forum on Population Ageing Research and proposed that “European comparative research is greatly inhibited by the wide variations in the type and quality of data available on this topic in different countries. There is an urgent need for comparable approaches and measures to be adopted, if the full potential of European research is to be realised.” Indeed, the same research conducted in different countries may require different methodologies for sample recruitment and data collection procedures, and different inclusion and exclusion criteria, depending upon cultural, language and other differences that exist between countries. Data are obtained from different countries and interpreted in different languages in different way, and this can affect the outcome of research. Thus, for the broad and various data from different countries, there is an urgent need to develop a method for harmonization and integration of data.

First challenging issue relates to the accuracy of self-reported data. International differences in language, culture, life situation, and environment may affect how older people assess and report their own health and quality of life. Political and economic circumstances also may influence an older people’s perception of quality of life (Lamb and Myers, 1999). Ofstedal et al. (2004) suggested that differences in economic status comprise a barrier against comparative research between countries.

Another issue is how to interpret data and understand quality of life in different countries. Asis et al.(1995) analyzed focus group discussions in four Asian countries. Different styles and procedures were used for these discussions, possibly influencing their findings. Antonucci et al. (2001) used cross-sectional data to examine the social network among older people between 70 and 79 and 80 and 90 years old across four countries. They demonstrated an association between resource deficits and social network characteristics in the different age groups. However, their study was limited in terms of its ability to determine direction of effects; longitudinal, rather than cross-sectional, data would have been more appropriate to determine cause and effect relationships.

Lastly, different operational definitions of quality of life have been used in different countries and different comparative studies. A challenge to current comparative research is that there has a universal measure of quality of life in old age. As Walker (2006, p. 9) suggested: “there is a need for further theoretical work on the models of quality of life and the instruments used to measure it. In particular, the implicit theories held by older people concerning the quality of their lives must be incorporated into a basic definition of quality of life.” The use of a wide variety of definitions and different instruments of quality of life may produce disparate results, which makes it very difficult to compare between studies, countries and continents. Walker (2006) expressed the need to establish a broader model of quality of life to use for all comparative studies on ageing.

### **2.10.4 Summary**

Several studies have been undertaken comparing the ageing process between different countries and continents, and between developed and developing countries. These studies are limited in their usefulness, however, because of restricted scope, inadequate samples, and a variety of other methodological limitations. Differences in language, culture, race, living environment, and economic and political circumstances limit interpretations of comparative data.

Clearly, designing operant definitions and methodologies that span significantly different cultures and languages is a challenge. Firstly, among the various methodological necessities is selecting a representative sample in each selected country. Secondly, data collection must be standardized in a way that is both

consistent but feasible for use in all sampled populations. Thirdly, all survey instruments must be standardized, yet translated into each appropriate language and culturally appropriate (Walker, 2006). In addition, data fusion and sorting data into consistent categories are important. Although most investigators use existing national datasets to compare quality of life between countries, Walker (2006, p. 10) suggests establishing “a virtual quality of life database library on the web.” Therefore, new methodologies and technologies may be necessary to solve existing methodological problems for comparative studies in ageing research.

### **2.11 Conclusion**

This chapter started by reviewing the definition of quality of life and components of quality of life in old age. It assessed physical, psychological, social, environmental, and demographic factors affecting quality of life in older people, followed by a review of definitions, models and theories of successful ageing, a brief analysis of international and intercontinental comparisons, and finally, a review of methodological barriers to comparative studies. This concluding section will briefly summarize the conclusions drawn from this detailed review of the literature.

#### **2.11.1 Summary of the literature review**

Quality of life is a broader concept that encompasses many concepts including health (Arnold et al., 2004; Knurowski et al., 2004), happiness, well-being, and life satisfaction. There is general agreement that factors such as health, psychological well-being, social networks, and material circumstances considerably contribute to the quality of life of older people. As far as the meaning of ‘quality of life’ is concerned, the World Health Organization (WHO) has suggested six domains: psychological, level of independence, social relationships, environment, and spirituality/religion /personal beliefs (The WHOQOL Group, 1995). The WHO also defined quality of life as “individuals’ perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns” (The WHOQOL Group, 1995; p. 1405). Thus, quality of life can be understood to be a subjective, dynamic process based on older people’s life philosophy, experience, life satisfaction, morale, happiness, and psychological well-being according to an individual’s life situation. Quality of life in older people is also affected by objective indicators, such as physical health and functioning, cognitive

and control ability, social networks and personal resources, environment and neighbourhood, ethnic culture, and social security of their country.

In general, researchers measure quality of life among older people using objective and subjective indicators. Objective indicators of quality of life have been measured against the criteria of physical health, functional ability, longevity, morbidity, mortality, income, socioeconomic status, housing, living arrangement, social engagement, and neighbourhood. However, these objective factors may not fully capture an individual's subjective judgment, experience, expectations, and perceptions. These limitations may have been caused by researchers' restricted theoretical framework and limited representative samples. Because the concept of quality of life may have many different meanings among different older people, it is important for older people to provide their own perspectives.

When older people assess their quality of life as good, it most often is associated with better health, social conditions, and environment. Demographic factors also influence quality of life in old age. Therefore, quality of life should be evaluated, according to both objective factors and the subjective perceptions of older people themselves.

In the discussion of psychological factors, studies have shown that psychological or mental health problems – such as anxiety, worry, grief, bereavement, loneliness, and depression – have a large impact on old age. Older people are relatively more likely to suffer to a greater degree when they experience certain crucial life events, like losing a spouse, families, and friends. These life events often cause anxiety, worry or grief. Furthermore, older people may live alone, have limited social engagement, participate in few social activities, feel lonely, and have no sense of hope for the future. Psychological problems tend to affect mental health adversely, and this may influence quality of life.

Social factors include social networks, relationships, engagement, support, resources, and activity participation. Social networks tend to be an important source of social support for older people; and social networks also affect older people's level of engagement and activity participation.

An older person's living environment is another important factor that must be considered when assessing quality of life. Two important aspects of 'environment' are the individual's perception of his or her environment, and the actual external

circumstances. Some older people tend to prefer to live with others, but some prefer living alone. In general, older people have more satisfaction living with others, because they have more physical, emotional and financial support. Some older people favour living in institutions. The safety of the living environment is especially important for older people living alone in their own homes. Both the fear of falling and actual falls adversely affect quality of life. Crime is another issue in which fear plays a major part.

Demographic factors – such as age, gender, marital status, income, education, and socio-economic factors – have been found to be associated with quality of life in various kinds of research. Ageing itself is associated with increasing health problems and ‘frailty’. For a variety of reasons that include past and present income, older men tend to be more likely to have good quality of life than older women. Being married also generally is associated with better quality of life, though female widows tend to do better than their male peers. Improved finances and higher levels of education also are predictors of better quality of life. Lower socioeconomic status, less education, and minority and immigrant status have adverse effects.

In conclusion, quality of life may have different components, e.g., loneliness, morale, etc. and there may be other factors that affect quality of life, e.g., disability, health, illness, finance, etc.

### **2.11.2 Gaps in the present literature**

Perhaps the biggest gap in our current understanding of ageing and quality of life is how different countries and continents compare. Although several international and intercontinental studies exist, they have been limited by a number of factors that include restricted scope, and a lack of attention to cultural, language and other social differences between samples. There is a particular lack of information about the causes of differences, especially as they pertain to developed and developing countries. Social and economic inequalities may explain much of the variation between countries. However, many older people assess their life as good or excellent even when they have health problems, more financial stress, or worse living environments. Thus, international comparative ageing research needs to consider a complex array of factors: economic, political, and others.



Ageing studies have been conducted in Europe for many years; there is an especially rich tradition of longitudinal research in the United Kingdom. All this research has contributed important findings to our present understanding of ageing. It now would be invaluable to conduct a comparative study of quality of life involving older people in Asia and other countries, especially from the West, to see how the East and West differ. Through this research, researchers may glean even more information from Western countries already studied, in addition to gaining an understanding of ageing in the East. Comparatively speaking, ageing research in Asia still is lacking in terms of methodological competence and investigator experience. For longitudinal studies, Asian countries require a systemic perspective and consciousness to develop and integrate the existing data on ageing. Accordingly, through the continuation of pre-existing studies, researchers may use existing data to answer new questions.

### **2.11.3 Bridging the gaps in current knowledge**

The main goal of this research is to examine quality of life among older people, to examine the factors affecting quality of life, and to compare quality of life between the UK and Taiwan. Quality of life is a multiple-dimensional concept and it is used in terms of 'life satisfaction', 'psychological well-being', 'morale', or 'happiness' according to researchers' definition and methodology for using different indicators to compare quality of life among older people between countries. Therefore, this chapter presented quality of life definitions, measurable instruments, factors affecting quality of life, quality of life relating to mortality, theories of gerontology, and successful ageing models to demonstrate the concept of quality of life and operational equivalence applying for this research. These discussions provide help for this research to answer research questions 2-6 in Chapter 1.

According to the framework in Section 2.9, the term 'quality of life' was used in this study because of its conceptual value in many aspects of relationships, including life satisfaction, happiness, psychological well-being, morale, and successful ageing. A thorough literature review has been conducted of factors affecting quality of life. However, in this research, the measure of 'life satisfaction' will be used as an operational equivalent to quality of life, although it may be only one component of it. The assumption is that variables such as physical and mental health, social factors, environment, and demographic characteristics all influence life satisfaction as well as

quality of life. One study used a single item to assess older people's quality of life (Berglund and Ericsson, 2003). However, one question probably could not express older people's whole life experience or life situation. Thus, in this research, life satisfaction will be measured by means of two multi-item questionnaires (13 items in the UK, 10 items in Taiwan).

Second, comparative ageing research relating to the indicators of quality of life and methodological problems for international comparisons of quality of life are described. To bridge the gap, data harmonisation will be used to answer the first research question: how might datasets from independent studies on older people be combined to undertake cross-national comparisons in this research.

This research will use data from both longitudinal and cross-sectional studies to assess quality of life. Longitudinal studies are an important way to examine the cumulative effects of physical and mental health and other factors on quality of life. Demographic characteristics such as age, gender, marital status, and socioeconomic class will be examined in this research. The intended global purpose of this comparative study is to expand the current body of knowledge regarding quality of life in older people, thereby bridging current gaps in knowledge, especially in terms of problems of equivalence for comparative ageing research.

So far, in this thesis, a detailed literature review has been presented, in which various important issues related to this research were identified. The findings from the review will be used as a foundation for the research in this thesis. The next chapter, Chapter 3, describes the methodology including datasets from the two surveys (the NLSAA and SHLSET) and explains the data analysis plan in this research.

# Chapter 3 Methodology

Chapter 2 discussed definitions of quality of life, measurements, and the factors that may influence it, and developed the theoretical framework for guiding the data analyses in this chapter. The purpose of this chapter is to provide an overview of the data and a data analysis plan to assist the research, and understand quality of life among older people in the two countries: the UK and Taiwan.

### 3.1 Introduction

The overall purpose of this thesis is to examine quality of life in old age and compare quality of life among older people in the UK and Taiwan. As discussed in the literature review, the term 'quality of life' will be used in this research to examine one particular aspect, life satisfaction, which was measured using the Life Satisfaction Index. The factors that will be used to test the relationship with quality of life are physical and mental health, social factors, environment, and demographic characteristics to be used for measurement purposes. This longitudinal research may be able to determine a relationship between these factors and older people's quality of life, and the relationship between quality of life and mortality. In addition, comparing quality of life of older people in two countries needs to take account of differences in the methodological approaches.

The methodological decisions made here are based on the validity, comparability, and suitability of the research. The validity of a measure must be given serious consideration. For example, research comparing the quality of life of older people in study design, methodology, and instruments used may result in observed differences that are not substantive differences in reality (Bowling, 2003). Therefore, first, data from two studies were harmonised to obtain comparable data in this research. Second, many of the statistical method of choice (e.g., Chi-square test, Stepwise regression, Cox regression, and cluster analysis) to be used are determined first of all by the actual research question or hypothesis, followed by the nature of the data, e.g., whether the data are continuous or categorical, whether they are normally distributed or not. Finally, the suitability of a comparative measure is a crucial issue. Thus, selected variables from the two studies (NLSAA and SHLSET) have to have the same

or at least similar, meaning for comparative purposes to ensure increase the validity of this research.

Chapter 4 begins by providing a detailed description of the data harmonisation process and a statistical description of the two studies. Chapter 5 identifies the predictors of life satisfaction using Mann-Whitney U tests, chi-square analysis, and binary logistic regression analysis. With regard to life satisfaction as a predictor of mortality, Cox regression was used in Chapter 6. Chapter 7 present patterns of quality of life among older people using cluster analysis. Therefore, the methodological issues in this chapter are: (1) to describe the research design; (2) to introduce the data sources from two countries – the UK and Taiwan; (3) to describe the variable harmonization process; and finally, (4) to outline the data analyses undertaken.

### **3.2 Research design**

For this thesis, the investigator adopted a quantitative research design. The reason for selecting a quantitative approach is that this method is suitable for describing, exploring and interpreting large quantities of data. In a quantitative study, the hypotheses are directional and state a relationship or comparison. They may specify a multivariate relationship between independent and dependent variables, and relate this to a conceptual perspective (Creswell, 1994). In this research, datasets were analyzed using secondary analysis of data from the *Nottingham Longitudinal Study of Activity and Ageing* (NLSAA) conducted in the UK, and the *Survey of Health and Living Status of the Elderly in Taiwan* (SHLSET). The samples of older people are reported to be representative of the populations of older people in the two countries (Morgan, 1998; Taiwan Provincial Institute of Family Planning, 1989).

In this study, exploratory and descriptive data analyses, as their names suggest, were employed to explore, clarify, describe, and interpret quality of life data (Fayers and Machin, 2000). The main reason for this is that exploratory analyses often consist of a large number of individual comparisons employing significance tests, and some apparently strong effects may, in fact, arise out of chance fluctuations in the data (Type I errors). Exploratory and descriptive data analyses are suitable for doing comparative research in large datasets. Furthermore, the study identifies various factors influencing change in quality of life in older people, and uses survival analyses

to examine all the variables to identify factors predicting fourteen-year (1989-2003) and ten-year (1993-2003) mortality.

For the cross-sectional analyses conducted in this study, the assessment of quality of life was measured at two particular time points. They analyze the quality of life data of participants in the two countries at common time points, i.e., in 1989 and 1993. A number of potential predictors of quality of life were assessed, i.e., physical and mental health, social factors, demographic variables, and environment which were used for the analyses described here.

A longitudinal comparative method was used. Reasons for selecting a longitudinal research approach are (1) that this method is suitable for looking into historical changes caused by different factors and assessing their influences over time; and (2) it allows for an investigation of causality which is not possible with cross-sectional analyses. The longitudinal analyzes in this study entails comparisons between 1989 and 1993 in the two countries. Thus, the study examines quality of life profiles among older people over time, ultimately comparing both point-in-time levels and changes over time between the UK and Taiwan.

Finally, as the facets of quality of life are measured, it would be helpful to know whether there are groups or clusters of older people with similar patterns of life satisfaction. Conversely, grouping together individuals that are similar to each other, but different from individuals in other groups, may allow for the identification of clusters of older people who have similar patterns of quality of life. It can then use these clusters to try to understand better the patterns of quality of life and whether these clusters are similar in other ways.

### **3.3 Data sources**

For this research, data were extracted from two existing datasets. One was derived from the Nottingham Longitudinal Study of Activity and Aging (NLSAA), conducted in the United Kingdom (UK); and the other was from the Survey of Health and Living Status of the Elderly in Taiwan (SHLSET). In both databases, all participants were 65 years or over in age. The databases included representative samples of older people in both the UK and Taiwan in 1989 and 1993. A description of sample collection methods, the survey process, and the survey instruments is presented here.

### 3.3.1 The NLSAA dataset

The data for this research were derived from the Nottingham Longitudinal Study of Activity and Ageing (NLSAA), a study of the relationship between physical activity and ageing among older people. The survey was funded by the Grand Charity, with additional support from the Trent Regional Health Authority (Morgan, 1993).

The main purpose of NLSAA was to assess the role of customary physical activity in promoting and maintaining psychological well-being in older people. The NLSAA was enriched by psychological and sociological variables, and surveys were carried out three times, in 1985, 1989 and 1993, by a survey team led by Professor Kevin Morgan.

#### 3.3.1.1 The NLSAA sample

The original sample was composed of subjects from three areas of greater Nottingham which were the Meadows, Beeston, and Clifton districts (Morgan, 1993; Morgan, 1998). These areas included 48,733 persons, served by 25 general practitioners. With the permission and assistance of these general practitioners, National Health Service age-sex lists were used to identify all non-institutionalised persons, age 65 years and over, living within each survey area (Morgan and Clarke, 1997; Morgan, 1998; Bath and Morgan, 1999).

Of 8,409 older people identified, 1,599 were randomly selected from the Nottinghamshire Family Practitioner Committee's records, 1,299 eligible older people were randomly selected for interview, and 1,042 agreed to participate in the survey (Morgan, 1993; Morgan and Clarke, 1997; Morgan, 1998; Morgan and Bath, 1998). Therefore, the first interviews were conducted between May and September 1985; 1,042 individuals ( $n=507$  age 65-74, 535 age 75+; 636 women, 606 men) were interviewed, reflecting a response rate of 80.2% (Morgan, 1993; Morgan, 1998; Bath and Morgan, 1999).

There were 690 correspondents in the first follow-up survey in 1989, all selected from among the original survey 1,042 respondents from 1985; 352 were not re-interviewed for the following reasons: 261 were deceased, 63 people refused to participate in the follow-up interview, 25 were untraceable, and 3 had emigrated (Bath and Morgan,

1999). Of those still alive, 690 older people agreed to be re-interviewed (a response rate of 88.3%) in 1989.

The second follow-up survey for NLSAA was conducted in 1993, with data collection starting in May and finishing in September. Of the original 1,042, 540 remained for re-interview. Of these, 426 were contacted, and 410 were interviewed satisfactorily (a response rate among those contacted of 96.2%).

### **3.3.1.2 Survey assessments**

The data collection instrument for the Nottingham Longitudinal Study of Activity and Ageing (NLSAA) was a structured interview/questionnaire. The original questionnaire was composed of 161 questions (including 314 items of data) that addressed issues of subject demographics, mobility, physical health, psychological health (cognitive status, depression, and morale), social functioning, use of health and personal social services, customary physical activity, and physical measurements (Morgan, 1993; Morgan and Bath, 1998).

The interview questionnaire was revised from 161 questions to 150 questions in the second and third waves of the study, conducted in 1989 and 1993 (Morgan, 1993). The data from the NLSAA were coded and entered into SPSS (Statistical Package for the Social Sciences). Factors in this structured questionnaire are described as follows: according to the NLSAA data catalogue (Morgan, 1993).

#### ***Demographic data***

Demographic data included age, gender, date of birth, and age in years at the time of recorded death. To identify each individual set of data, a 4-digit number was assigned to each person as a contact code. The relevant part of section one recorded participants' contact conditions; for example, outcome of the interview, reason for abandoning the interview, interview language, date, duration, and place (Morgan, 1993). The demographic data were coded as nominal variables or as dates.

#### ***Cognitive impairment***

The questionnaire for evaluating cognitive impairment entailed information/orientation cognitive screening. The following screening classifications of the 12-item information/orientation subscale of the Clifton Assessment Procedures for the Elderly (CAPE) (Pattie and Gilleard, 1979) were recommended: 0-7=impaired, 8-9=

borderline, and 10-12=unimpaired (Morgan, 1993; Morgan, 1998). The interview was discontinued immediately if any respondents scored fewer than 6 (Bath and Morgan, 1999). If the respondent scored between 6 and 9, this was deemed related primarily to evident anxiety, agitation or protracted response latencies (Morgan, 1993; Bath and Gardiner, 2005). It must be noted that all respondents who scored under 9 subsequently were assessed by a psychogeriatrician (Morgan, 1993). The CAPE score was coded as both a continuous, and a categorical, variable.

### *Household circumstances*

Household circumstance questions included items on marital status (including period of separation/bereavement), working life (including participant's, husband's, and father's occupation), social class, living arrangements, and the head of the household. These questions were coded as nominal data.

Additionally, this section also identified the number of the participant's living siblings, children, grandchildren, and great-grandchildren, excluding in-laws. Recording of the number of living relatives and the frequency of contact with them was done for the purpose of establishing the overall network of social and family support (Morgan, 1993). Data were collected and coded as continuous data.

### *Health and mobility*

This section covered ten health topics, including sight, hearing, heart troubles, stomach troubles, headaches, dizziness, high blood pressure, arthritis, foot trouble, and urinary incontinence. This section defined the respondents' mobility status. Responses to the questions on physical condition were used in the compilation of a 14-item physical health index (Morgan, 1993). The individual items were coded as categorical data, and the scale was continuous, '0' indicating no health problem and a higher score indicating a greater number of problems.

### *Physical activities*

This section included questions regarding pain, arthritis, and daily activities. Items dealt with the degree to which joint pain and stiffness interfered with daily activities, including buttoning/unbuttoning clothes, holding a spoon, carrying bags, walking, scratching one's back, brushing or combing hair, turning over in bed, getting in/out of



bed, putting on shoes, and putting on socks/stockings (Morgan, 1993). The information was recorded as categorical data.

### *Falls and accidents*

This section was intended to explore the occurrence, number, place, reason, and frequency of falls and accidents among older participants, in order to understand reasons for femoral and neck fractures and the development of osteoporosis in later life (Morgan, 1993). The data were coded as nominal data.

### *Chest pain and dyspnoea*

Inquiries regarding both chest pain and dyspnoea were shortened considerably in the follow-up waves in 1989 and 1993, for the longitudinal study. Chest pain might be associated with congestive heart conditions, and subsequent limiting of physical activity. Dyspnoea is a sign of serious disease of the airway, lungs, or heart. Therefore, dyspnoea (difficult or laboured breathing) was followed throughout the course of the study (Morgan, 1993). The information associated with this subject was coded as categorical data.

### *Smoking behaviour*

In order to determine levels of customary or former tobacco consumption, smoking and related behaviour were examined among the participants. Follow-up waves of the study explored whether or not smoking habits had changed. This was to enable the comparison of different levels of smoking behaviour with consequent health outcomes (Morgan, 1993). The data were coded as categorical variables.

### *Sleep*

Questions regarding sleep, sleeping problems, and the use of hypnotics and other medication were incorporated. In old age, sleeping problems may cause considerable distress. Hypnotic drugs or similar medication are often used among older people with sleeping difficulties. Thus, if participants used any such drugs, this was recorded in the survey. Data related to sleep were coded as either continuous or categorical data, as appropriate (Morgan, 1993).

### *Self-assessed health*

This section consisted of self-assessment ratings of health, activity level and memory, and attitudes regarding health and ageing. In this section, participants were asked

about their view of their own health, because the perception of their own health and general health conditions might be thought of as an important indicator of awareness of relative decline or fitness, and might well indicate conditions that are more general.

In addition, participants were requested to assess their own health both, temporally (relative to 5 years ago) and generally (relative to others of the same age), so as to examine whether or not participants perceived any decline or improvement or whether there was any change over time (Morgan, 1993). All information was coded as ordinal variables.

### *Social engagement*

The Brief Assessment of Social Engagement (BASE) scale provided a measure of social participation (Bedford et al., 1976). The BASE was from a 20-item additive scale which examined the degree to which an older person personally engaged in social interactions, with an overall reliability alpha of 0.7 (Morgan et al., 1985). Social engagement is closely associated with customary physical activity, and may be useful as an indicator of the role of such factors in promoting and maintaining health in old age (Morgan, 1993). The data for the total 20-item were coded as continuous variables.

### *Household duties*

Household duties were comprised of internal domestic networks and the use of stairs. Participants were asked who assumes responsibility for tasks associated with the maintenance and upkeep of the household, and whether there was any paid/unpaid help from others or voluntary/statutory worker(s) outside the household. The data were coded as nominal variables (Morgan, 1993).

### *Customary physical activity*

This section assessed customary physical activity among participants. The term customary physical activity refers to activities performed regularly over several weeks (weekly for at least eight weeks). It also measured how much time per week was spent in various activities (if described as a range of time, such as 10-15 minutes, then the rounded-up midpoint was recorded).

This was done only for those activities in which the respondent participated. Although designed for all individuals 65 years old and over, some sections were inappropriate

for certain individuals (Morgan, 1993). Customary physical activity encompassed a wide range of physical activities, including work-related activities, walking and related activities, outdoor activities, indoor productive activities, leisure activities, and specific physical activities (which require strength, mobility, and flexibility) (Morgan, 1993; Morgan and Bath, 1998). The information was coded either as continuous data (ratio variable; e.g., time in minutes per week) or as categorical data (ordinal variable; e.g., 1-2 times per weeks, never done this type of activity) (Morgan, 1993).

### *Psychological well-being*

The psychological well-being assessment included questions regarding life satisfaction, levels of anxiety and depression (SAD – Symptoms of Anxiety and Depression Subscale), and morale. Within this section, a modified version of the 13-item Life Satisfaction Index was used (Morgan et al., 1987). The Life Satisfaction Index-Z (LSIZ), with 13 items, is a shorter version of the original Life Satisfaction Index-A, and has been applied to measure life satisfaction among older individuals in numerous studies; its average reliability is 0.79 (SD=0.10, median=0.79) (Wallace and Wheeler, 2002). The total LSIZ score was derived from the 13 questions and coded as a continuous variable, scoring from 0 to 26 (Morgan, 1993).

The 14-item Anxiety and Depression (SAD) scale was adopted to assess anxiety and depression, derived from the Delusions, Symptoms and States Inventory (Bedford et al., 1976). The SAD underwent a clinical validation exercise at baseline, and the total scores for 6 subjects exhibited high levels of concordance with clinical diagnostic ratings of depression performed by experienced psychiatrists (Bedford et al., 1976). The total SAD score from seven questions was coded as a continuous variable, from 0 to 21 (Morgan, 1993).

### *Social support*

Social support included the number and frequency of contacts with formal social and medical support organizations or individuals. Contact with formal social and medical support organizations or individuals was assessed in terms of contacts with the person's general practitioner (family doctor), community (district) nurses, health visitor, and home help services over the preceding six months (Morgan, 1993; Morgan, 1998; Bath and Gardiner, 2005). The data were coded as ordinal data (Morgan, 1993).

### *Financial assessment*

In this section, the purpose was to determine the degree to which economic problems might affect or inhibit participants' activities. Thus, the participant's income and capital assets were assessed. However, income and capital obviously are sensitive and private issues for many. Therefore, interviewers carefully assessed the willingness of participants, and each interviewer was allowed to drop this section if a participant clearly was unhappy or embarrassed, or continually questioned the motives of the interviewer (Morgan, 1993; Morgan, 1998). The data were coded as either nominal or ordinal variables.

### *Physiological measures*

Physiological measures consisted of handgrip strength, half body span, body weight, and shoulder flexibility. A handgrip dynamometer was used for measurement of handgrip strength; scales for body weight; a tape measure for half body span; and a goniometer for shoulder flexibility. Data for handgrip strength and weight were measured in kg, half body span was measured to the nearest mm, and shoulder flexibility was measured in Centigrade degrees (°C) (Morgan, 1998). All data associated with the unit scale were coded as continuous variables.

### **3.3.2 The SHLSET dataset**

Data were extracted from the longitudinal survey of the Survey of Health and Living Status of the Elderly in Taiwan (SHLSET) provided by the Bureau of Health Promotion, Department of Health, Taiwan. This project was conducted jointly by the Taiwan Provincial Institute of Family Planning, in Taichung, and the Population Studies Centre (PSC) and Institute of Gerontology at the University of Michigan, and funded by the US National Institute on Aging (NIA), in 1989, 1993, 1996, and 1999 (Taiwan Provincial Institute of Family Planning, 1989; Chen, 2001).

The aim of the SHLSET survey is described as follows:

- To describe the state of health of older people (including functional limitations, chronic conditions, and self-assessed health status);
- To investigate the effects of socioeconomic status, family network characteristics, social supports, and health behaviours on health status among older people;

- To address relevant policy issues concerning older people, such as medical care and financial status (Taiwan Provincial Institute of Family Planning, 1989).

### 3.3.2.1 The SHLSET Sample

The first SHLSET survey was conducted in 1989; the sample was chosen to be nationally representative. The sampling frame consisted of older people, age 60 years and over, residing in Taiwan. At the same time, most of the sample was drawn from the non-institutionalised population (Taiwan Provincial Institute of Family Planning, 1989).

Table 3.1 shows the representativeness of the complete sample, by sex and age, including response rates relative to the total population age 60 and over in Taiwan.

**Table 3.1: Sample size, responses, and response rates by gender and age.**

	Gender			Age				
	Total	Male	Female	60-64	65-69	70-74	75-79	80+
Sample size	4,412	2,546	1,866	1,720	1,214	764	451	263
Responses	4,049	2,319	1,730	1,562	1,129	711	417	230
Response rate	91.9%	91.1%	92.7%	90.8%	93.0%	93.1%	92.5%	87.5%

Source: 1989 Survey of Health and Living Status of the Elderly in Taiwan.

The first wave survey entailed a three-stage equal probability sample intended to represent all older people 60 and over at the end of 1988 in Taiwan. It is worth noting that Taiwan maintained a Household Register for each resident, and this register was used to select the random sample (Zimmer et al., 2002).

The first stage sample was selected from the 331 administrative units (known generically as townships) of Taiwan (excluding 30 mountainous areas with largely aboriginal populations) (Taiwan Provincial Institute of Family Planning, 1989). For the second stage, a block (line) sample was selected from townships, with probabilities proportional to their size by accumulation of the line population across the townships, using systematic random sampling (Taiwan Provincial Institute of Family Planning, 1989). Finally, two eligible individuals were chosen from each selected block (line), selected by systematic random sampling during the third stage (Taiwan Provincial Institute of Family Planning, 1989).

The sample size was 4,412, and the response rate was 91.8%, with 4,049 participants interviewed by the end of October 1989 (Taiwan Provincial Institute of Family Planning, 1989).

The initial sampling procedures were also used in the second, third, and fourth rounds of the survey to select the sample (Zimmer et al., 2002). To permit longitudinal research, a nationally-representative survey of older people above the age of 60 in 1989, was conducted in 1989, 1993, 1996, and 1999. Taiwan’s government also provided information on health, income, wealth, and family demographics for a large group of older people (Kan et al., 2001). The second follow-up survey was conducted in 1993 and the 1989 participants were re-interviewed. Of 3,155 participants (77.9%) 64 years and over re-interviewed; 74.6% of the attrition was caused by death and the other 25.4% were lost from the survey in 1989 (Chen, 2001). It is important to note that no age weighting was undertaken to make the sample nationally representative during the first and second surveys in 1989 and 1993.

The 1989 participants were re-interviewed in 1996 (the third wave survey) and 1999 (the fourth wave survey), however, the new participants age between 50 and 66 years old were recruited in 1996, and these new participants also re-interviewed in 1999 (Zimmer et al., 2002). Detailed data from the four waves of the survey conducted in 1989, 1993, 1996, and 1999 are shown in Table 3.2.

**Table 3.2: The respondent’s data in 1989, 1993, 1996, and 1999.**

Year	Respondents	Age	The death of respondents	Non- respondents	Response rate (excluding the death of respondents)
1989	4,049	60+	-	363	91.8%
1993	3,155	64+	582	312	91.0%
1996	2,669	67+	1047	333	88.9%
	2,462 (new sample)	50-66	9	570	81.2%
1999	2,310	70+	1486	253	90.1%
	2,130 (new sample)	53-69	110	222	90.6%

Source: A Longitudinal Study on Health and Living Status of the Elderly in Taiwan since 1989 (Bureau of Health Promotion Department of Health, Taiwan, R.O.C.).

### **3.3.2.2 Survey assessments**

The original data from the SHLSET were coded and entered in SAS (Statistical Analysis System) (Barr and Service, 1976) and then converted to SPSS format. The questionnaire was composed of eight sections including marital history and other background characteristics; household schedule, social and economic exchanges; health, health care utilization and behaviours; occupational history; activities and general attitudes; residence history; economics/financial well-being; and emotional and instrumental support (Taiwan Provincial Institute of Family Planning, 1989).

### *Marital history and other background characteristics*

The first section contained questions to obtain individual background information, such as age, gender, education, ethnicity, and marital status. In 1993, questions on living arrangements were added to this section (Taiwan Provincial Institute of Family Planning, 1989). The data were coded as nominal variables or as dates.

### *Household schedule, social and economic exchanges*

In this section, household structure, social network, and social exchanges were recorded in detail, to assess how older people satisfied their needs through the exchange of material and emotional support between older people and others.

An important Chinese characteristic is that older people are more likely to live together or live close to family members or relatives. Thus, older people have regular contact with family members, relatives, and friends and have a close social network; furthermore, the social network may be an important resource for their provision and receipt of materials and care. In the 1993 survey, questions regarding instrumental support were added to this section. The information was coded as nominal variables (e.g., children's gender and marital status) or as ordinal variables (e.g., children's education) (Taiwan Provincial Institute of Family Planning, 1989).

### *Health, health care utilization and behaviours*

This section consisted of inquiries regarding various health conditions, the use of physical aids, measures of daily activities, hygiene habits, health self-assessment, the use of medical services, measures of melancholia, ailments, and measures of life satisfaction. All these questions were related to disability, diseases, health care utilization, health behaviour, emotional health, and satisfaction with personal health status from several perspectives. The Centre for Epidemiological Studies Depression (CES-D) scale was used for measuring melancholia, because it has been widely used in studies of late-life depression (Radloff, 1977; Radloff and Teri, 1986). Moreover, the criterion validity of the CES-D for major depression was shown to be highly satisfactory among older people in the Netherlands community (Beekman et al., 1997a). From the CES-D scale, 17 items were adopted in 1989 and 11 items in 1993. Another measure the 10-item Life Satisfaction Index (LSI) was used in 1989, but only a 4-item LSI was used in 1993. Finally, considering cognition as an important factor affecting older people, nine questions to measure cognition were added in 1993. Data

collected on health conditions were recorded as categorical variables. The total CES-D and life satisfaction scores were coded as continuous variables.

### *Occupational history*

In 1989, this section addressed employment history. The proportion of primary industry workers (e.g., labour-intensive industries, farm produce, agricultural products) decreased and the proportion of secondary industry workers (e.g., technology-intensive industries, skill-intensive products) and tertiary industry works (e.g., electronic products, computer products) increased from 1952 to 1994 in Taiwan (Chen, 1998). Meanwhile, many people still work on farms as part of their family business. Older people in Taiwan have experienced drastic socio-economic changes. Therefore, questions about employment history help one to understand the sources of income and economic conditions in their later life. All data were collected and coded as categorical variables.

### *Activities and general attitudes*

This section assessed social and leisure activities, and religious faith; state of mind and attitudes of the older were added in 1989 (Taiwan Provincial Institute of Family Planning, 1989). In 1993, the questionnaire was changed by the Taiwan Provincial Institute of Family Planning, and a section on emotional support was added. With this section, there was an attempt to examine changes in life style among older people; for example, they became members of clubs and organizations (Taiwan Provincial Institute of Family Planning, 1989). The information was coded as nominal variables.

### *Residence history*

The section contained questions on residence history, household history, and moving between residences/locations. The survey questions in this section were intended to consider and understand different living situations among older people, like living alone, reasons for moving, and satisfaction with living arrangements (Taiwan Provincial Institute of Family Planning, 1989). The data were coded as either a nominal or a categorical variable, as appropriate.

### *Economics/financial well-being*

This section was composed of questions on the economic status and financial well-being of the subject. Questions included items on family or household income sources,



property, asset structure, financial management, and daily life expenses (Taiwan Provincial Institute of Family Planning, 1989). In the 1993 survey, questions were added about the older person's satisfaction with welfare services provided by the government. The information was collected and coded as nominal variables (e.g., the main breadwinner of the household, the major source of income) and ordinal variables (e.g., the total income, satisfied with your current economic status).

### *Emotional and instrumental support*

To measure participants' emotions, the last section concerned emotional and care support. Questions included items on the situation of older people receiving help and care from family members, relatives, friends, and neighbours (Taiwan Provincial Institute of Family Planning, 1989). This section was not included in the questionnaire in 1993 because all questions in the eighth section were dispersed to other sections. The data were coded as categorical variables.

### **3.3.3 Differences between the NLSAA and SHLSET**

A number of important differences exist between the UK and Taiwanese datasets. The NLSAA included a baseline survey conducted in 1985, whereas the SHLSET initially was conducted in 1989. Compared with 1,042 original subjects in the NLSAA, the SHLSET had 4,049 original subjects. Both datasets involved longitudinal investigations; the NLSAA entailed follow-up surveys in 1989 and 1993, whereas the SHLSET included follow-up surveys in 1993, 1995, 1996, 1999, 2000, and 2003.

There also were certain differences in interviewer selection and the content of training. For example, in the NLSAA study, before the first wave of the study in 1985, a two-week training programme was arranged for the ten selected interviewers. Within the training programme, there was extensive discussion regarding the content of the questionnaire, as well as role-playing sessions, and video-assisted practice in questionnaire administration. In the second and third waves of the study, fewer interviewers were needed, due to the shrinking sample from natural depletion. The previous training programme and procedures were adopted in the administration of the study. During each wave of the study, the main interview was carried out during the period from May to October.

A total of 86 female interviewers aged 20 years or older were recruited for the SHLSET study. These interviewers accepted six days training at the Institute of

Family Planning in late March, 1989. Content of the training included lectures on the significance and objectives of the survey, social and psychological adjustment of older people, chronic diseases. Moreover, interviewers were also to understand interviewing skills, an in-depth review of the questionnaire, explanations of the work procedures, and pay schedule. Finally, interviewing practice including role-playing and field practice was conducted during the training period. The main interview began 2<sup>nd</sup> April 1989.

Regarding the instruments, two major measurements were used in the two studies: one is depression and another one is life satisfaction. As mentioned above, the SAD was used to measure depression in the NLSAA study; while, the CES-D was used in SHLSET. The LSI-Z was used for measuring life satisfaction in the NLSAA study, while the LSI-A was used in SHLSET. However, these instruments are different in questions and items although they have some questions that are similar. For comparing the two datasets, the standardised score of the Life Satisfaction Index were used in this research.

### ***3.4 Variables in the study and data harmonisation***

The most straightforward way to compare quality of life among older people internationally is to set up joint studies across two or more countries using similar designs, methodologies, survey tools, etc. However, most studies on older people have been set up with local funding, using country-specific funding sources. An alternative approach is to use data harmonization to combine data from existing studies of older people, so as to develop an international data set (Bath et al., Submitted for publication). One of the aims of this study was to develop a data set from two longitudinal studies, one of older people in the UK and the other of older people in Taiwan, and to compare quality of life between these two geographically and culturally-distinct samples.

Data harmonisation requires consideration of both of the datasets simultaneously, though this is not straightforward, given that the datasets gather information on a variety of topical issues such as health, household structure, and residential history from each sample in isolation of the other. Obviously, not all variable harmonisation is perfect, due to variations in the wording of questions, the classifications conducted by each study, and the cultural meaning of the survey concepts. In this research, there

were three components to the process of data harmonisation: (1) translating the existing documentation (SHLSET); (2) determining the availability of variables; and (3) designing harmonised variable names and response options.

### 3.4.1 Existing documentation

The study documentation, such as a questionnaire or the codebook, plays an essential role in the data harmonisation process, particularly in determining the variables and categories that are available. To complicate matters, the quality and quantity of documentation varies considerably across studies. The original survey questionnaires reveal the survey wording in the forms and the pre-defined categories for responses. Then, the questionnaire directs attention to differing meanings of questions and responses between the two countries; therefore, the questionnaire is an essential document with which to create harmonised variables.

In addition to questionnaires, codebooks supply the basic information needed to read a dataset and provide variable names and a label for all possible values of each variable. However, existing codebooks are sometimes incomplete. For example, the labels of variables were not shown in the 1993 codebook of Taiwan data set. The researcher completed all labels of these variables according to the in 1993 Taiwanese questionnaire.

In brief, both the questionnaire and codebook can provide insights into important differences between variable categories across samples; and this should to help make the best use of the data.

### 3.4.2 Harmonisation process

Data harmonisation is a relatively new approach which other studies have used before this e.g., CLESA (Noale et al., 2005; Pluijm et al., 2005). There are three main steps for the data of harmonisation process.

The first step that was undertaken was to translate the SHLSET questionnaires from the Chinese version to an English version; this is because the Taiwanese questionnaire and related materials were all in Chinese. Compared to the UK, there is a very different cultural and social environment, because Taiwan is an Eastern country and uses the Chinese language. Even though the researcher was familiar with the social environment and the culture that exists in Taiwan, it was important to pay careful

attention to the different meanings for each question to ensure that the Chinese and English versions matched each other. Thus, there had to be an English translation of the original Chinese questionnaire of the Survey of Health and Living Status of the Elderly in Taiwan, both for 1989 and for 1993.

The next steps were to review the questions and to compare response categories, for example, marital status had four response categories in the NLSAA and six response categories in SHLSET, so it was necessary to merge some categories and create a new proper response category. The final step was to create new variables and response categories for each dataset. The primary source used to interpret the meanings of the variable categories was the original questionnaire. The questionnaire provided information for creating response appropriate categories.

### **3.5 Merge data sets analysis plan**

Data management and analysis were performed using the Statistical Package for the Social Sciences (SPSS, version 14.0 for windows). As discussed in the literature review Chapter 2, quality of life was operationally defined as life satisfaction and was the main dependent variable in the study. The factors were important to affect quality of life and were identified including physical conditions, psychological health, social factors, environment, and demographics.

Most potential factors, as indicated in the literature review were used in this research. However, the major predictors of quality of life include demographic (i.e., age, gender, marital status, living status), socioeconomic (i.e., social class, financial circumstances), and physical health status (i.e., diseases, smoking, physical health, mobility, self-rated health, perceived health relative to peers), psychological well-being (i.e., loneliness, depression), and social engagement (i.e., attending religious groups, clubs or organisations, raising a pet, watching TV or listening to radio, having friends) and were set as independent variables for use in this research.

#### **3.5.1 Sample description**

This study compared the quality of life among older people in 1989 and 1993 of the same birth cohort who shared common characteristics or experiences within a time period (e.g., are born, leave school, experience social and economic change, etc.).

Thus, the samples were from two countries (the UK and Taiwan) born during the same time period, up till approximately 1920.

The sample derived from the Nottingham Longitudinal Study of Activity and Ageing (NLSAA) was based on a 1985 survey that had 1,042 participants aged 65 years and over (i.e., born before 30<sup>th</sup> September, 1920). Follow-up surveys were conducted on those who still were alive and living in Nottingham in 1989 and 1993. In 1989, 690 subjects were re-interviewed (response rate = 88%). In 1993, 410 took part in the interviews, to yield a response rate of 72% (Morgan, 1998).

Data in the Taiwan-based sample were derived from the Survey of Health and Living Status of the Elderly in Taiwan (SHLSET). SHLSET involved a nationally representative cohort of 4,049 older people, initially 60 years old and older (i.e., born before 31<sup>st</sup> December 1928) during a baseline survey conducted in 1989. Of this number, 3,155 subjects were re-interviewed in 1993 with a response rate of 91% (Taiwan Provincial Institute of Family Planning, 1989).

In order to undertake a valid comparison, it was important to obtain equivalent and unbiased samples of older people. Thus, this research identified individuals born in the same years to avoid any cohort effects, and selected the same interview year to reduce any age or period effects that may occur when comparing samples in both studies. The participants in the NLSAA were born in or before 1920, and the subjects in SHLSET born in or before 1928. Therefore, the sample for comparative study contained all participants born before 1920 who were interviewed in 1989/1993.

To identify individuals born in the same year, an algorithm was used to calculate and create an accurate age and selection sample born before 30<sup>th</sup> April 1920 for the Taiwan-based sample in 1989 and 1993 using the “transform→compute→compute variable” command in SPSS. The final sample contained 1,438 subjects (35.5%, n=4,049) in 1989 and 1,003 (31.8%, n=3,155) in 1993. An additional 410 participants (10.1%, n=4,049) in 1989 and 299 participants (9.5%, n=3,155) in 1993 were dropped due to missing data relating to date of birth and reported age.

Table 3.3 presents the samples used for analysis from the NLSAA and SHLSET in 1989 and 1993.

**Table 3.3: The sample in the NLSAA and SHLSET in 1989 and 1993.**

		SHLSET	NLSAA
1989	Original sample	4,049	1,042
	Sample used in this research	1,438	690
	Number of survivors		781
	Losses 1985-1989		
	Died		261
	Refused interview		63
	Untraceable		25
	Emigrated		3
	Number of survivors interviewed		690
	Re-interview rate		88%
1993	Sample used in this research	1,003	410
	Number of survivors		564
	Losses 1989-1983		
	Died	582	217
	Refused interview	312	50
	Untraceable		11
	Emigrated		2
	Number of survivors interviewed	3,155	410
	Re-interview rate	91%	72%

**3.5.2 Statistical methods**

At the beginning, data were harmonised to organise all difference types of data, and then SPSS statistical software used to analyse the harmonised data sets.

First, descriptive statistics were computed for the continuous variables (e.g., age, standardised LSI score, standardised SAD score, number of people living in the household). Two-sample Kolmogorov-Smirnov tests were used to rest the null hypothesis that the variables in the harmonised data sets from 1989 and 1993 were normally distributed.

Non-parametric tests for two independent samples are useful for determining whether or not the values of a particular variable differ between two groups, when the assumptions required for use of the Student’s t test are not met (Daly and Bourke, 2000). The t test assumes that the sample mean is a valid measure of the centre, while the mean is valid when the distance between all scale values is equal. This is a problem when the test variable is ordinal, because in ordinal scales the distances between values often are arbitrary. Moreover, parametric tests are invalid if those distances are arbitrary because variance is calculated using squared distances from the mean. Even if the mean is a valid measure of the centre, the distribution of the test variable may be non-normal, and parametric tests assume data normality (Altman and Bland, 1999).

For those reasons, it was decided that the best statistical methods to adopt for this study were nonparametric procedures designed to test the significance of differences between two groups. Non-parametric tests make no assumptions about normality and can be used to test ordinal variables.

The one-sample Kolmogorov-Smirnov (K-S) Test evaluates whether the sample variables are significantly different from the assumption of a normal distribution. It is a more powerful alternative to the Chi-square test when its assumptions are met because the Chi-square test tests whether in general the observed distribution is not significantly different from the hypothesized one. Thus, the K-S test is a more stringent test. Continuous interval or ratio data are required for the K-S test for exact results and ordinal data or grouped interval data may be used. In this research, however, the one-sample Kolmogorov-Smirnov test determines whether the distribution of harmonised continuous variables differs significantly from a normal distribution (in the two countries). For instance, the variable for the standardized life satisfaction score was tested against a hypothetical normal distribution.

Secondly, for all two-country comparisons, different statistical methods were adopted. The Mann-Whitney U test was used to determine whether there were any significant differences in harmonised continuous variables existing between the two studies (i.e., NLSAA and SHLSET). It would be expected that there are a similar number of high and low ranks in each group, if the groups are equal.

Also for international comparisons, Pearson chi-square tests were performed on categorical data that cannot be normally distributed, because they are not continuous. Chi-square analysis compares the observed and expected frequencies in each category to test that all categories contain the same proportion of values or that each category contains a user-specified proportion of values (Bland, 2000). This method uses ordered or unordered numeric categorical variables (i.e., ordinal or nominal variables). For this research, chi-square tests were used to determine whether a significant association existed between study location (i.e., the UK or Taiwan) and each of the harmonised categorical variables.

In order to clarify differences in variables between the two studies, logistic regression models were created and tested. Logistic regression is a multivariate means by which to deal with predictor variables that are continuous or categorical, and a dependent

variable that is dichotomous (Field, 2005). This technique was used to predict study location as a function of all independent variables, but also predicts whether a certain category of a variable is more or less likely to be represented in the NLSAA or SHLSET dataset.

Thirdly, further analyses were undertaken to test the effects of selective attrition on the participants used in the comparisons between the NLSAA and SHLSET variables. For this aim, data were compared between all participants interviewed at the time of the baseline surveys (both the NLSAA, 1985 and SHLSET, 1989), and those born in 1920 who were re-interviewed at the time of the follow-up surveys. Mann-Whitney U test, chi-square analysis, and logistic regression were used to test the NLSAA and SHLSET data separately to determine whether there were significant differences in baseline survey data between those who were alive and re-interviewed in follow-up surveys and those who were alive but not re-interviewed in follow-up surveys. For both datasets, the null hypothesis was that there was no difference between follow-up participants and non-participants.

The fourth statistical objective was to determine whether life satisfaction (as quality of life) could be predicted by any of the independent variables (e.g., age, gender, marital status, living arrangements, social class, financial circumstances, self-rated health and so on) for both two studies in 1989 and 1993. To address this issue, life satisfaction was set as a continuous dependent variable in a linear regression model. Linear regression is useful for modelling the relationship between a dependent variable and one or more independent variables, and assumes that there is a linear relationship between the dependent variable and each predictor (Kleinbaum et al., 1987; Bland, 2000). The backward stepwise method employs a combination of the procedures used in the forward entry and backward removal methods. Either critical F values or critical p values can be specified to be used to control entry and removal of effects from the regression model. In this research, the entry and removal criteria was probability-of-F-to-enter  $\leq 0.05$  and probability-of-F-to-remove  $\geq 0.1$ .

The backward stepwise method was deemed the best way to identify the model that best predicts life satisfaction because of the number of independent variables. In this research, twenty six factors are large number to be used for testing influence on the life satisfaction. However, the *backward removal* is the first procedure to perform for reducing most factors if possible, and then the forward entry is procedure to identify



the 'best' and the less comprehensive factors that adequately account for the life satisfaction. Therefore, stepwise multiple regression analysis was used to clarify the relative contribution of independent variables to life satisfaction.

Additional analyses were undertaken incorporating life satisfaction as a categorical variable. In order to compare predictor differences between high and low life satisfaction, first, the standardized life satisfaction score was recoded to high and low life satisfaction according to the median life satisfaction score, and then the dichotomous dependent variable and all independent variables were examined using Mann-Whitney U tests, chi-square analysis, and binary logistic regression analysis.

As mentioned above, logistic regression is suited to models wherein the dependent variable is dichotomous and independent variables can be either continuous or categorical. Categorical independent variables need to be made into dummy variables or indicator coded. For this analysis, life satisfaction was taken as the dependent variable, based upon values of a categorical variable. Thus, when binary logistic regression was used, the dependent variable had to be dichotomous, created using the 'Transform' and 'Recode into Different variables' commands in SPSS; for example, high life satisfaction versus low life satisfaction.

Logistic regression coefficients can be used to estimate odds ratios for each of the independent variables in the model (Kleinbaum et al., 1987; Bland, 2000). Therefore, it was suitable to construct a model using a range of potential factors to predict high versus low life satisfaction in both samples (NLSAA and SHLSET). Then the model could be used to derive estimates of the odds ratios for each factor.

Fifth, change in quality of life may reflect many factors. To measure and assess relationships between life satisfaction change and other predictors, statistical methods such as stepwise multiple regression (dependent variable = continuous), Mann-Whitney U tests, chi-square analysis, and binary logistic regression analysis (dependent variable = dichotomous) were undertaken.

Sixth, in order to understand the relationship between study location and quality of life, logistic regression was again utilised. Logistic regression allows for the identification of interactions between independent variables that influence the dependent variable. Thus, logistic regression was used to determine whether study location exerted any interactive effects on other predictors of quality of life.

Seventh, a Kaplan-Meier curve was created to estimate survival over time, when participants had been dead for different lengths of time (Kaplan and Meier, 1958; SPSS Inc., 2005). The goal was to test the population survival curves from two samples (NLSAA versus SHLSET). Kaplan-Meier curves are easy to calculate, require few assumptions (because they are totally nonparametric), and are useful when predictor variables are categorical (e.g., dead vs. alive).

An eighth objective here was to determine whether life satisfaction affects mortality in old age. For this purpose, Cox regression analysis was used to determine the relationship between quality of life and mortality, and whether other variables influence this relationship. Cox proportional hazards regression is a method, as are proportional hazards models, by which to model the time to a specified event (e.g., death) (Cox, 1972; Bland, 2000). This regression method is used to investigate several variables at a time, and assumes that the effects of the different variables on survival are constant over time. The calculations take into account censored observations. Participants whose data are censored – either because they had not died, or because they were lost to follow-up, moved away, etc. – are incorporated.

Therefore, in the construction of Cox regression model, life satisfaction was used as the baseline variable, and other predictors (e.g., life satisfaction, age, gender, marital status, and self-rated health) were entered into the model as covariates. The model was then tested to see if life satisfaction has a statistically significant, i.e., an independent, relationship with mortality.

Finally, this research hoped to identify groups of individuals that were similar to each other, to understand the different profiles of each group, and to examine the relationships between these groups and mortality. Hierarchical clustering adopts stepwise reduction of the number of individuals by placing them into groups (Speece, 1994; Chan, 2005). The clustering approach starts with all individuals, to group similar individuals into a single cluster, and then sequentially joins other clusters based, upon similarities, to form new clusters. This process continues until one big cluster is obtained that contains all individuals. The end result of this process is a dendrogram, which is a tree diagram frequently used to illustrate the arrangement of the clusters produced by a clustering algorithm. This helps to identify differential profiles between the groups. Furthermore, Cox regression was used to test the relationship between clusters and mortality, to see whether those clusters with patterns

of a higher life satisfaction experience a different rate of mortality than clusters reporting lower life satisfaction.

### **3.6 Ethics of using datasets for a new purpose**

This study included two datasets: the *Nottingham Longitudinal Study of Activity and Ageing* (NLSAA) in the UK, and the *Survey of Health and Living Status of the Elderly in Taiwan* (SHLSET). Usage of both datasets was approved by the Department of Information Studies, in accordance with the University of Sheffield research ethics policies. The research project was carried out in accordance with the University of Sheffield's policy and procedures, which include the University's 'Financial Regulations'; 'Good Research Practice Standards'; and the 'Ethics Policy for Research Involving Human Participants, Data and Tissue' (Research Ethics Policy).

The Taiwanese dataset for this study was derived from the Survey of Health and Living Status of the Elderly in Taiwan, and was provided by the Bureau of Health Promotion, Department of Health, Taiwan. A Data Usage Application Form (Appendix A-D, pp. 406-409) was submitted to the Bureau of Health Promotion, and the research project was carried out in accordance with the Bureau of Health Promotion's policies and procedures, which included the Bureau's 'Act of Computer Process Personal Data Protection' and 'Act of Proven and Used Data', published by the Bureau of Health Promotion, Department of Health, Executive Yuan. For undertaking survival research in old age, furthermore, the application form for the change of use plan of databank reference materials was submitted to apply for the survival data 2003 for identifying the predictors of mortality among older people.

In brief, the study involved secondary analysis of data already collected from existing studies. All the data were anonymous and the researcher had no access to contact details. No further contact with subjects was needed to complete the study. Actual data were reviewed only by the researcher and supervisor, and were entered into a computer using only the identification number.

### **3.7 Conclusion**

The main aim of this study is to examine quality of life amongst older people living in two geographically, and culturally, distinct countries, namely the UK and Taiwan. The research included data from sufficiently large sample sizes to allow for the

detection of differences in quality of life, according to age, gender, socio-economic class, health, social engagement, and other factors.

Another major purpose of this study is to determine which aspects of an older person's life are most important, in terms of quality of life, in both the UK and Taiwan, and the study was conducted using appropriate statistical methods to ascertain the differences which exist in the quality of life among older people in the two countries, and which factors have the greatest influence upon it. The results of these analyses will be presented in subsequent chapters.

This chapter addressed the research design, details of the two studies, from which the data were derived, and the creation and analysis of the harmonised data set, which will provide a suitable resource for the analyses which follow in chapters 4-7. Chapter 4 will discuss the harmonisation process and compares the quality of life among older people in the UK and Taiwan.

## Chapter 4 Data harmonization and comparison of the UK and Taiwan

Chapter 3 provides an overview of the data sets used in the two surveys and the analytic strategy for identifying participants in the two countries. This chapter illustrates the data harmonisation process and examines differences in life satisfaction among older people in the UK and Taiwan.

### 4.1 Introduction

Many Western countries have set up longitudinal studies involving large representative samples of older people such as the English Longitudinal Study of Ageing (ELSA), the Longitudinal Aging Study of Amsterdam (LASA), and The Comparison of Longitudinal European Study on Aging (CLESA). As mentioned in Section 2.10.4, most of the studies that have been conducted in different countries and they have used different methods or data collection tools, making it difficult to undertake cross-national comparative studies. However, the principal consideration is using a method to create compatible and integrated datasets which have been collected for different purposes under different collection administrations, and using different standards and methodologies. One method for this, data harmonisation has been a focus of this research.

Data harmonisation is the process of organising different types, levels, and sources of data in such a way that they can be made compatible, comparable, and useful for analysis and decision-making, through the application of common definitions, attributes, and values. This is essential so that large data sets from multiple sources can be exploited to their full potential. Furthermore, the two datasets must be harmonised as much as possible to allow for the integration of more variables in the datasets.

A great deal of effort has been exerted in attempts to improve quality of life in old age (Grundy and Bowling, 1999), but this requires a good understanding of the factors that affect life satisfaction. What seems to be lacking, however, is comparative research on life satisfaction among older people. In this thesis, life satisfaction is compared between older people in the UK and Taiwan, using a framework and harmonised data that includes demographic, economic, physical, psychological, and

social parameters to determine how these factors affect life satisfaction and what are the differences between the two populations.

Therefore, the aim of this chapter is to answer three research questions as follow.

- ❖ How might datasets from independent studies on older people be combined to undertake cross-national comparisons?
- ❖ How does attrition affect the samples of older people in longitudinal studies?
- ❖ What are the differences in quality of life among older people in the UK and Taiwan?

In this chapter, the first section presents an overview of the concepts of data harmonization; describes the methodological approach to the standardisation of variables; and provides a list of the comparable variables and response options that were created, including continuous and categorical variables. The following sections present descriptive analyses for these datasets, including examination for the differences between the NLSAA (UK) and SHLSET (Taiwan), and further analyses performed to examine the effects of selective attrition among older people in the two studies and countries. Finally, the limitations and conclusions for data harmonization and testing will be discussed.

### **4.2 Attrition in longitudinal studies**

Attrition refers to the loss of respondents from a survey (Deeg, 2002). According to Matthews et al. (2004, p. 2), “Attrition can be defined as the loss of relevant individuals occurring after definition of the population to be included in a study.”

Subject attrition is an important issue in longitudinal studies, because altering the composition of the initial randomly selected sample may introduce biases and adversely affect how representative the sample is of the population of interest. This is particularly a problem in gerontology, as older people may die, or become unable to participate in ongoing surveys due to a variety of age-related diseases and disabilities, e.g., Alzheimer’s disease or cardiovascular disease or cerebralvascular disease.

There are two major types of subject attrition. One is selective attrition, which is described as the tendency of certain individuals in a study to be more likely to drop out of a study than others, because of some inherent characteristic; e.g., they choose no longer to participate because they do not have the disease of interest, and therefore are less interested in the study; or they move, because they are among the healthy

people in the study and are still employed. The other major form of attrition is non-selective attrition, which is when people cannot participate because of some relatively random event, or some event deemed unrelated to the study outcomes of interest, like death in a car accident.

In general, selective attrition is non-random and introduces statistical bias because the sample is no longer representative of the population. Non-selective attrition occurs randomly in a sample and in the population. Among the two types of attrition, mortality is considered to be non-selective attrition, and is unavoidable among older participants in longitudinal studies (Deeg, 2002).

Factors associated with attrition in longitudinal surveys have been investigated in a number of studies (Slymen et al., 1996; Chatfield et al., 2005). Attrition may be related to certain demographic characteristics of respondents, but also to other factors. For example, Slymen et al. (1996) showed that attrition is associated with older age, lower income, and poorer health. However, much less attention has been paid to examining the impact of attrition on specific research outcomes (Deeg et al., 2002). It raises the question as to whether the results from responses gathered from participants who are re-interviewed in follow-up surveys, after a certain amount of attrition, can be generalized to the initial population of older people from which the study sample originally was drawn (in this instance, in the UK and Taiwan), and how serious a problem this is. The present chapter examines the effect of selective attrition from baseline to follow-up on the outcomes among the older people' studies, and provides a comprehensive review of the literature on how the occurrence and characteristics of attrition may affect life satisfaction assessments in older people.

### **4.3 Methods**

To start, the key question in data harmonization is what data have been collected in two or more studies that can be compared. Data harmonization, therefore, must begin by defining comparable concepts and indicators. The principal purpose of this thesis is to compare life satisfaction among older people in two distinct countries and cultures. As mentioned in the literature review, life satisfaction in old age can be affected by numerous factors, such as physical condition, mental health, economic circumstances, and different social parameters. Therefore, these factors will be sought for use as comparable variables in this research.

Before initiating data harmonization, it was necessary to examine the instruments, used in the two studies (the NLSAA and SHLSET) to identify equivalent variables and data for the two samples, so that they could be merged into a single combined dataset. The Population Studies Center at the University of Michigan provides the questionnaire with both a Chinese and an English version which used in the SHLSET study, the 1989 Survey of Health and Living Status of the Elderly in Taiwan: Questionnaire and Survey Design. In this way, the NLSAA and SHLSET questionnaires could be harmonized without having to worry about cumbersome translation procedures, rendering the data more reliable and valid.

Some seemingly similar variables could not always be harmonized, due to differences in concepts and different ways of considering variables and the scales of measurement. For this reason, it is important to remove any obvious differences between variables and options across samples, and to make the variables compatible and suitable for use in the datasets. However, there were some variables which were selected to be harmonised and compared in this research.

After data harmonisation, it was important to identify whether each of the continuous variables had a normal distribution or not. Parametric statistical tests assume that certain variables are distributed normally, or at least approximate to a normal distribution. The one-sample Kolmogorov-Smirnov Test was used to assess whether variables were normally distributed or not.

Following this, Mann-Whitney U tests were used to analyze the null hypotheses that there were no significant differences in the harmonised continuous variables between the two studies; chi-squared tests were used to test the null hypotheses that there was no significant association between categorical variables in the NLSAA and the SHLSET data sets. Logistic regression models were then used to identify which variables were the best predictors of location for the two studies in 1989 and 1993, in order to identify any differences between the two studies. Finally, the effects of selective attrition on the samples in the two studies were evaluated using Mann-Whitney U tests, chi-squared tests, and logistic regression.

Finally, to understand as clearly as possible the differences between participants who continued to accept being interviewed and those who did not, it was imperative to distinguish between the different types of attrition. To assess attrition effects,



Goodman and Blum (1996) suggested using multiple logistic regression to determine whether attrition influences the sample based upon one or more variables. This is because logistic regression models generally deal with binomial dependent variables, assigning a value of '0' to one outcome (e.g., not re-interviewed) and a value of '1' to the other (e.g., re-interviewed). In this section, Mann-Whitney U tests and chi-square analysis was used as a first step to compare those who were re-interviewed versus those who were not re-interviewed with respect to a variety of continuous and categorical variables. Then, as a second step, logistic regression analysis was performed to assess the relative contributions of, and hence the likelihood of bias caused by, variables deemed different between the two groups (re-interviewed vs. not) on selective attrition as it existed at four-year and eight-year follow-up for the NLSAA study (1989 versus 1985; and 1993 versus 1985), and four-year follow-up for the SHLSET study (1993 versus 1989).

### **4.4 Results**

#### **4.4.1 Data harmonization**

This section describes the demographic, socioeconomic, health related, perceived health and mobility, psychological, social engagement, and life satisfaction-related variables, corrected following data harmonisation. More information on the process of data harmonization is described in the follow pages.

##### **4.4.1.1 Demographic variables**

Table 4.1 shows the demographic variables that were used in the NLSAA and SHLSET studies and the harmonised variables and response options that were developed from these. In the questionnaires used in the NLSAA study, British participants were asked to provide their exact date of birth i.e., the day, month, and year, so that it was possible to calculate participants' precise age at the time the interview was conducted. Older people in the Taiwanese SHLSET, however, provided only the month and year of the birth. Communication with Professor Liang indicated that older people in Taiwan were more illiterate and they could not remember the exact birth date (Liang, personal communication), therefore, the 15th day of the month was used to report the birth date. Finally, a single variable, 'age at interview', was created, by subtracting the date of birth from the interview date.

To identify individuals born before 30 April 1920, an algorithm was used to calculate and create an exact age, and those participants born before 15<sup>th</sup> April 1920 for the Taiwan-based sample who were interviewed in 1989 and 1993 using the “Transform, compute variable” command in SPSS. The 15<sup>th</sup> April date was used because the exact date of birth was not recorded in SHLSET. SPSS needs the actual day of birth to calculate accurate age, so the 15<sup>th</sup> was used as the midpoint of the month, assuming that errors would balance each other out. The final SHLSET study contained 1,438 individuals (35.5% of n=4,049) who were interviewed in 1989 and 1,003 (31.8% of n=3,155) who were re-interviewed in 1993.

Concerning the respondent’s marital status, the wordings for the questions and response options from the NLSAA study were used. It was assumed that these questions and response options had the same meaning for the purposes of data harmonization. For example, the response options in SHLSET – ‘Currently married, spouse living in household’ and ‘currently married, spouse not living in household’<sup>19</sup> (see blue-coloured words in Table 4.1) were merged to the variable ‘Married’ (blue-coloured words), in accordance with the response options used in NLSAA. As can be seen in Table 4.1, the harmonised variables for living arrangements were created as ‘living status’ and ‘number of people living in the household’. In the NLSAA study, for instance, there were six response options pertaining to different people who lived in a household. Thus, these options were merged into a single variable ‘living with someone in the household’, as opposed to ‘living alone’.

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<sup>19</sup> This response option ‘currently married, spouse not living in household’ was a phenomenon in 19<sup>th</sup> century in Taiwan, especially indicating soldiers who are married but do not live with wives and children.

Table 4.1: Demographic factors in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised Response options
		Questions	Response options	Questions	Response options		
Demographic factor	Age	Exact date of birth	Continuous variable	When were you born?	Continuous variable	Age	Continuous number
	Gender	Gender	1. Male 2. Female	Respondent's sex	1. Male 2. Female	Gender	Male Female
	Marital status	Marital status	1. Married 2. Single 3. Widowed 4. Separated /Divorced	What is your marital status?	1. Currently married, spouse living in household 2. Currently married, spouse not living in household 3. Separated 4. Divorced 5. Widowed 6. Never married	Marital status	1. Married 2. Single 3. Widowed 4. Separated /Divorced
	Living arrangements	Who else lives here?	1. Number of males under age 18 2. Number of males 19-64 years old 3. Number of males over 65 years 4. Number of females under age 18 5. Number of females 19-64 years old 6. Number of females over 65 years	How many people are usually living in this household?	Number of people usually living in household	Living status	No / live alone Yes / live with someone in household
						No. of people living in the household	No. of people living in the household

**4.4.1.2 Socioeconomic variables**

Table 4.2 presents the socioeconomic variables in NLSAA and SHLSET, and the harmonised variables and response options that were developed.

With regard to the question of socioeconomic class, there was a variable with three separate options in the NLSAA, which were ‘Professional/II Intermediate’, ‘IIN Skilled-Non Manual/IIIM Skilled-Manual’, and ‘Semiskilled/Unskilled’. In SHLSET, data from the type of occupation question had a range of positive responses covering Professional/technician, Owner of business and manager, Clerk and officer, Sales, Manual skilled, Semiskilled, Service, Unskilled, Farmer/fisherman, and Not employed. However, the question of socioeconomic class had a large number of different response options in the two studies. For the purpose of data harmonization, it was narrowed and assumed that the questions had the same broad meaning. The harmonised response options in SHLSET were created to simulate the options in the NLSAA. In the SHLSET study, ‘Professional/technician’ and ‘Owner of business and manager’ (see blue-coloured words in Table 4.2) were deemed equivalent to ‘Professional/intermediate’; ‘Clerk and office’, ‘Sales’, and ‘Manual skilled’ (green-coloured words) were considered the same as ‘Skilled (non-manual and manual)’; and ‘Semi-skilled’, ‘Service’, ‘Unskilled’, ‘Farmer/fisherman’, ‘Not employed’, and ‘others’ (purple-coloured words) were deemed equivalent to ‘semiskilled/unskilled/others’.

The questions on financial circumstances were different in the two studies: respondents in the NLSAA were asked whether they were satisfied or dissatisfied with their present financial position, whereas respondents in the SHLSET study were asked whether they were satisfied with their current economic condition. In the NLSAA, the response options included completely satisfied, fairly satisfied, fairly dissatisfied, and completely dissatisfied, whereas there were five response options in SHLSET: very satisfied, satisfied, average, not satisfied, and very unhappy with it. In other words, there was a neutral response option in SHLSET, but not in the NLSAA.

For data harmonization, a question and response options were created, along with a new variable: expressed satisfaction with income (No/Yes). For example, concerning the ‘expressed satisfaction with income’ variable in the NLSAA study, ‘completely satisfied’ and ‘fairly satisfied’ were deemed equivalent to ‘Yes’ (satisfied) and ‘fairly

dissatisfied' and 'completely dissatisfied' were deemed equivalent to 'No' (dissatisfied). Meanwhile, for the SHLSET study, 'very satisfied' and 'satisfied' were considered equivalent to 'Yes' (satisfied) and 'average', 'not satisfied', and 'very unhappy with it' were deemed equivalent to 'No' (dissatisfied).

Table 4.2: Socioeconomic variables in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised Response options
		Questions	Response options	Questions	Response options		
Social factors		Socioeconomic class	<ol style="list-style-type: none"> <li>1. Professional / II Intermediate</li> <li>2. IIIN Skilled – Non Manual / IIIM Skilled – Manual</li> <li>3. Semiskilled / Unskilled</li> </ol>	What was your (last) job (occupation)?	<ol style="list-style-type: none"> <li>1. Professional / technician</li> <li>2. Owner of business and manager</li> <li>3. Clerk and officer</li> <li>4. Sales</li> <li>5. Manual skilled</li> <li>6. Semiskilled</li> <li>7. Service</li> <li>8. Unskilled</li> <li>9. Farmer/fisher</li> <li>10. Not employed</li> <li>11. Others</li> </ol>	Socioeconomic class	<ol style="list-style-type: none"> <li>1. Professional / intermediate</li> <li>2. Skilled (non manual and manual)</li> <li>3. Semiskilled / unskilled /other</li> </ol>
	Financial circumstances	On the whole, do you feel satisfied or dissatisfied with your present financial position?	<ol style="list-style-type: none"> <li>1. Completely satisfied</li> <li>2. Fairly satisfied</li> <li>3. Fairly dissatisfied</li> <li>4. Completely dissatisfies</li> </ol>	In general, are you (or your family) satisfied with current economic condition?	<ol style="list-style-type: none"> <li>1. Very satisfied</li> <li>2. Satisfied</li> <li>3. Neither satisfied nor unsatisfied</li> <li>4. Unsatisfied</li> <li>5. Very unsatisfied</li> </ol>	Expressed satisfaction with income/ present financial position?	<ol style="list-style-type: none"> <li>Yes/ satisfied</li> <li>No/ dissatisfied</li> </ol>

### 4.4.1.3 Health-related variables

Table 4.3 shows the health-related harmonised variables and response options that were similar in NLSAA and SHLSET.

Questions in the NLSAA and SHLSET related to the smoking habits of respondents had a dichotomous response option (No/Yes), so the new variable included these two response options in Table 4.3.

There were several variables associated with diseases and health conditions in participants that were similar in the NLSAA and SHLSET studies. In NLSAA, participants were asked whether they suffered from stomach trouble, while, in SHLSET, participants were asked whether they had gastrointestinal problems. A harmonised variable (has stomach ulcer, gastrointestinal or other digestive tract disorders) was created. Another question in the NLSAA questionnaire asked whether participants suffered from giddiness, whereas, in SHLSET, participants were asked whether they had dizziness and/or vertigo. A harmonised variable (has giddiness/dizziness/vertigo) was created. In addition, a question pertaining to urinary problems was different in the two studies; participants were asked whether they suffered from leakage of urine in the NLSAA; however, in SHLSET, participants were asked whether they had lost any amount of urine beyond their control over the last twelve months; accordingly, a harmonised variable (has incontinence) was created. Variables relating to heart disease and high blood pressure were similar in the NLSAA and SHLSET; therefore, new harmonised variables (has heart trouble, has high blood pressure) were created.

For all of these variables, both studies had no/yes response options; therefore, to harmonise the data, the new variables had the same options and it was assumed that these two response options were equivalent across all the questions. However, it is acknowledged that subtle differences in the meaning may have had a small effect on the numbers in each category across the two studies. For instance, participants in SHLSET were asked whether they have stomach ulcer, gastrointestinal or other digestive tract disorders. This effect might increase the number of participants with stomach problems more than their counterparts in the NLSAA and affect the consequence of tests.

Table 4.3: Health-related variables in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised Response options
		Questions	Response options	Questions	Response options		
Physical health	Smoking	Do you smoke?	0. No 1. Yes	Do you currently smoke cigarettes?	0. No 1. Yes	Smokes?	0. No 1. Yes
	Diseases	Arthritis or rheumatism?	0. No 1. Yes	Do you have arthritis or rheumatism?	0. No 1. Yes	Has arthritis or rheumatism?	0. No 1. Yes
		Heart trouble?	0. No 1. Yes	Do you have heart trouble?	0. No 1. Yes	Has heart trouble?	0. No 1. Yes
		Stomach trouble?	0. No 1. Yes	Do you have ulcer, gastrointestinal or other digestive tract disorders?	0. No 1. Yes	Has stomach/gastrointestinal trouble?	0. No 1. Yes
		Giddiness?	0. No 1. Yes	Do you have dizziness, vertigo?	0. No 1. Yes	Has any giddiness, dizziness or vertigo?	0. No 1. Yes
		High blood pressure?	0. No 1. Yes	Do you have high blood pressure?	0. No 1. Yes	Has high blood pressure?	0. No 1. Yes
		Leakage of urine?	0. No 1. Yes	Have you lost any amount of urine beyond your control during the last 12 months?	0. No 1. Yes	Has leakage of urine or incontinence?	0. No 1. Yes



### 4.4.1.4 Perceived health and mobility variables

Participants were asked two similar questions in the NLSAA and SHLSET, about how they rated their current health and how they thought their health was compared to their peers. Table 4.4 shows these variables, as well as the harmonised mobility variables and options that were used from the NLSAA and SHLSET data sets.

The first question, on self-rated health, was very similar in both studies, but the response options were slightly different and in a different order. The order of the response options in the NLSAA was poor, fair, average, followed by good and then excellent, whereas in SHLSET, the order of the response options was excellent, very good, good, fair, and then poor. The new variable was created with the following categories: Poor/ Fair/ Average (good)/ Good (very good)/ Excellent, it being assumed that 'Average' and 'Good', and 'Good' and 'Very good' were equivalent options, as they were between fair and excellent on a five-point scale.

Regarding the question about how the older people thought their health was compared with their peers, the questions were similar in the two studies, but the question was less concise (e.g., Would you say that your health is better, about the same or worse than most people your age?) in the SHLSET study. It was assumed that the two questions had the same meaning.

However, the response category order in the NLSAA was 'much more healthy', followed by 'more healthy', 'about as healthy', 'less healthy', and 'much less healthy'. There were only three response options (e.g., better, about the same, and worse) in SHLSET. Therefore, the new harmonised response options were created as follows: '(much) less healthy/worse' (see purple-coloured words in Table 4.4), 'about as healthy/ about the same' (green-coloured words), and '(much) more healthy/ better' (blue-coloured words). The response categories in SHLSET were the same as the new response options in their overall meaning, but it was necessary to reverse the order. Data in the NLSAA were merged into three options: 'Much more healthy' and 'More healthy' were merged into the new category (much more healthy/ better), and 'Less healthy' and 'Much less healthy' were merged into the first category of the new variable (much less healthy/ worse).

In the NLSAA study, participants were asked whether they had problems with walking, with two response options (Yes/No); whereas, in SHLSET, people were

asked if they had a walking problem and supplied with six response options (No problem/ Some/ A lot/ Unable to do/ Don't know/ Never did it before). A harmonised variable (have walking problem) was created with two response categories. The 'No problem' response in SHLSET was considered to be equivalent to the response 'No', and all other responses (Some difficulty/ Very difficult/ Cannot do it/ Do not know/ Never do it) were regarded as equivalent to the response 'Yes' in the new variable.

Participants in the NLSAA study were asked whether they had any walking problems that required the use of an aid, and supplied with 12 response options (No limiting problem/ Other unspecified/ Single stick/ Hip replacement and no aid/ Zimmer, shopping trolley/ Arthritis/ Other persons/ Muscular weakness/ Two walking sticks/ Two crutches/ Varicose veins/ Knee replacement). In contrast, people in SHLSET were asked whether they had to use a walking stick, crutch or aid, with two response options (Yes/ No). A new harmonised variable (have use of walking stick, crutch or aid, (Yes/ No) was created. For data harmonization, the following response options (No limiting problem/ Other unspecified/ Hip replacement and no aid/ Arthritis/ Other persons/ Muscular/ Varicose/ Knee replacement) were equivalent to 'No' and the remaining responses (Single stick/ Zimmer and shopping trolley/ Two walking sticks/ Two crutches) were regarded as being equivalent to 'Yes' in the NLSAA.

Table 4.4: Self-rated health and mobility variables in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised Response options	
		Questions	Response options	Questions	Response options			
Physical health	Self-rated health	How would you rate your present health?	<ol style="list-style-type: none"> <li>1. Poor</li> <li>2. Fair</li> <li>3. Average</li> <li>4. Good</li> <li>5. Excellent</li> </ol>	How would you rate your health at the present time?	<ol style="list-style-type: none"> <li>1. Excellent</li> <li>2. Very Good</li> <li>3. Good</li> <li>4. Fair</li> <li>5. Poor</li> </ol>	Self-rated health	<ol style="list-style-type: none"> <li>1. Poor</li> <li>2. Fair</li> <li>3. Average / Good</li> <li>4. Good / Very good</li> <li>5. Excellent</li> </ol>	
		Compared with other men/women of your own age, do you think you are:	<ol style="list-style-type: none"> <li>1. Much more healthy</li> <li>2. More healthy</li> <li>3. About as healthy</li> <li>4. Less healthy</li> <li>5. Much less healthy</li> </ol>	Would you say that your health is better, about the same or worse than most people of your age?	<ol style="list-style-type: none"> <li>1. Better</li> <li>2. About the same</li> <li>3. Worse</li> </ol>	Perceived health relative to peers	<ol style="list-style-type: none"> <li>1. Much less healthy / Worse</li> <li>2. About as healthy / About the same</li> <li>3. Much more healthy / Better</li> </ol>	
	Mobility	Have problem walking?	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>		Do you have any difficulty in walking about 200-300 meters?	<ol style="list-style-type: none"> <li>0. no problem</li> <li>1. some</li> <li>2. a lot</li> <li>3. unable to do</li> <li>4. don't know</li> <li>5. never did it before</li> </ol>	Have problem walking?	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>
		Any walking problem that requires use of aids	<ol style="list-style-type: none"> <li>1. No limiting problem</li> <li>2. Other unspecified</li> <li>3. Single stick</li> <li>4. Hip replacement (no aid)</li> <li>5. Zimmer/shopping trolley</li> <li>6. Arthritis</li> <li>7. Other persons</li> <li>8. Muscular weakness</li> <li>9. Two walking sticks</li> <li>10. Two crutches</li> <li>11. Varicose</li> <li>12. Knee replacement</li> </ol>		Do you use a walking stick or crutch?	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>	Use of walking stick/crutch/aid	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Yes</li> </ol>

### 4.4.1.5 Mental health variables

Table 4.6 presents the variables measuring well-being in the NLSAA and SHLSET, and the harmonised variables and response options that were developed.

The mental health variables can be seen in Table 4.6. Loneliness was addressed in a single question and in part of the social engagement scale in the NLSAA. In SHLSET, the question on loneliness was part of the Centre for Epidemiological Studies of Depression (CES-D) scale (Radloff, 1977). Both the NLSAA and SHLSET studies had a similar question and four response options, although the wording of the questions was slightly different. It was assumed that the questions in the two studies had a similar meaning, but the response options were regarded as being different.

The new harmonised variable assessed whether a person experienced loneliness, using a dichotomous response (Not lonely/ Lonely). People in the NLSAA study were asked how often they felt lonely, and provided with the response options 'Often', 'Sometimes', 'Seldom', and 'Never'; so that 'Never' was equal to 'Not lonely', and 'Often', 'Sometimes', and 'Seldom' were equivalent to 'Lonely'. In SHLSET, participants were asked if they had felt lonely (isolated, with no companion) with response options 'Not lonely', 'Rarely (one day)', 'Sometimes (2-3 days)', and 'Often or chronically (over 4 days)'. To create the new variable, the response option 'No' was equated with 'Not lonely' and the response options 'Rarely (one day)', 'Sometimes (2-3 days)', and 'Often or chronically (over 4 days)' equated with 'Lonely'.

Depression was assessed in the NLSAA using the 14-item Anxiety and Depression (SAD) scale drawn from the Delusions, Symptoms and States Inventory (Morgan, 1998). Each item had four response options (with a value of 0 = No, 1 = A little, 2 = A lot, 3 = Unbearable). To standardize these scales, the total score in the NLSAA was divided by 42 and multiplied by 100 (a maximum possible score = 14 x 3).

In SHLSET, depression was measured using the Centre Epidemiological Studies of Depression (CES-D) scale (17-point scale), but the single question on loneliness extracted to be its own variable, so that the CES-D scale comprised 16 items in this study. Each item had four response options (with a value of 0 = Never; 1 = Rarely; 2 = Some of the time, 1-4 days; 3 = Most or all of the time, 5-7 days). The total depression score was divided by 48 (a maximum possible score = 16 x 3) in 1989.

The item in the CES-D scale was reduced to 11 items (blue-coloured words) minus one loneliness item (red-coloured words) divided by 30 and multiplied by 100 (a maximum possible score =  $10 \times 3$ ) in 1993 for standardisation. However, the standardised total score to assess participant depression was presumed to be equivalent in the two studies.

The two depression scales cover a depression continuum although they have distinct states of depression. However, the two depression scales may be interpreted the conceptualisation of mood that of general psychological distress (Bedford and Deary, 1997). There may not have cultural difference for older people to express their mood in the UK and Taiwan.

Table 4.5: Mental health variables in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised Response options
		Questions	Response options	Questions	Response options		
Mental health	Loneliness	How often do you feel lonely?	<ol style="list-style-type: none"> <li>1. Often</li> <li>2. Sometimes</li> <li>3. Seldom</li> <li>4. Never</li> </ol>	Feel lonely (isolated, with no companion).	<ol style="list-style-type: none"> <li>0. No</li> <li>1. Rarely (one day)</li> <li>2. Sometimes (2-3 days)</li> <li>3. Often or chronically (over 4 days)</li> </ol>	Loneliness	<ol style="list-style-type: none"> <li>0. Not lonely</li> <li>1. Lonely</li> </ol>
	Depression	<ol style="list-style-type: none"> <li>1. Recently, have you been worried about every little thing?</li> <li>2. Recently, have you been so miserable that you have had difficulty with your sleep?</li> <li>3. Recently, have you been breathless OR had a pounding in your heart?</li> <li>4. Recently, have you been so 'worked up' that you couldn't keep still?</li> <li>5. Recently, have been depressed without knowing why?</li> <li>6. Recently, have you gone to bed not caring if you never woke up?</li> <li>7. Recently, for no good reason, have you had feelings of panic?</li> <li>8. Recently, have you been so low in spirits that you have sat for ages doing absolutely nothing?</li> <li>9. Recently, have you had a pain OR tense feeling in the back of your neck?</li> <li>10. Recently, has the future seemed hopeless?</li> <li>11. Recently, has worrying kept you awake at night?</li> <li>12. Recently, have you lost interest in just about everything?</li> <li>13. Recently, have you been so anxious that you couldn't make your mind up about the simplest thing?</li> <li>14. Have you been so depressed that you thought of doing away with yourself?</li> </ol>	<ol style="list-style-type: none"> <li>0. No</li> <li>1. A little</li> <li>2. A lot</li> <li>3. Unbearable</li> </ol>	<ol style="list-style-type: none"> <li>1. I worried about some little things.</li> <li>2. I did not feel like eating; my appetite was poor.</li> <li>3. I felt that I could not shake off the blues even with help from my family or friends.</li> <li>4. I had trouble keeping my mind on what I was doing.</li> <li>5. I felt depressed.</li> <li>6. I felt that everything I did was an effort.</li> <li>7. I thought my life had been a failure.</li> <li>8. I felt fearful.</li> <li>9. My sleep was restless.</li> <li>10. I feel very happy.</li> <li>11. I talked less than usual.</li> <li>12. I felt lonely.</li> <li>13. People were unfriendly.</li> <li>14. I enjoyed life.</li> <li>15. I felt sad.</li> <li>16. I felt that people disliked me.</li> <li>17. I could not get 'going'.</li> </ol>	<ol style="list-style-type: none"> <li>0. Never</li> <li>1. Rarely</li> <li>2. Some of the time (1-4 days)</li> <li>3. Most or all of the time (5-7 days)</li> </ol>	Depression	The standardized score

### 4.4.1.6 Social engagement variables

Table 4.7 shows the original questions in the NLSAA and SHLSET and the new social engagement harmonised variables and response options.

The questions were more verbose in the NLSAA questionnaire; only one question was identified that was the same in the two studies; i.e., having a pet. Other variables were derived using different questions in the two studies. People in the NLSAA were asked if they took a weekly or monthly magazine or journal (including television journals) as an example, and provided with dichotomous response options (No/Yes). Meanwhile, in SHLSET, participants were asked if they had read a newspaper or journal and provided with five response options (No/Less than once a week/1-2 a week/everyday/Yes, no number). An assumption was made that the questions all assessed the same basic concept.

There were also questions relating to 'access to a TV or radio', 'attending religious services, or religious gatherings or meetings', and 'attending a meeting or gathering of any club, organisation, society or group in the past month' in the NLSAA, which were slightly different in SHLSET: 'had watched TV or listened radio', 'had participated in a religious group', and 'had joined a club or group'. These questions also were assumed to have equivalent meaning in both studies for data harmonization purposes. Thus, new variables 'had read a newspaper or journal', 'have a TV or radio', 'had attended religious groups', 'had attended any clubs or groups', and 'had a pet' with two response options (No/Yes) were created.

In the NLSAA study, all of these questions had two response options (No/Yes), except for 'had attended religious groups' that had three response options: never, sometimes, and often. The 'never' category was equated with 'No'; 'sometimes' and 'often' were merged to 'Yes'. In contrast, in SHLSET, the response options for these questions were No/Less than once a week/1-2 a week/everyday/Yes, no number for these questions. Consequently, the option 'No' was equated with 'No' and all other response options were regarded as equal to 'Yes'.

Similarly, the questions about friends were asked differently in the NLSAA and SHLSET. Participants in the NLSAA study were asked how many friends they had living in, or near, the district where they lived; whereas people in SHLSET were

asked how many close neighbours and friends lived in their area and provided an open-ended numerical response. For the purpose of data harmonisation, it was believed that the wording of the two variables was equivalent in the two studies.

In the NLSAA, the three response options for this question were 'None', '1-3', and 'more than 3'. The two options in the harmonised variable were 'No friends' and 'Some friends'. Therefore, the NLSAA response 'None' was equivalent to 'No friends', and both '1-3' and 'more than 3' equivalent to 'Some friends'. The response option 'zero friends' in the SHLSET study was equated with 'No friends', and other numbers were equated with 'Some friends'.



Table 4.6: Social engagement variables in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised response options
		Questions	Response options	Questions	Response options		
Social factors	Social engagement	Do you take a weekly or monthly magazine or journal (including television journals)?	0. No 1. Yes	Do you read newspaper, books?	0. No 1. Less than once a week 2. 1-2 a week 3. Almost everyday	Does read newspaper or journal?	0. No 1. Yes
		Do you have access to a TV or radio	0. No 1. Yes	Do you watch TV or listen to radio?	0. No 1. Less than once a week 2. 1-2 a week 3. Almost everyday	Have a TV radio?	0. No 1. Yes
		Do you attend religious services, or religious gatherings or meeting?	0. Never 1. Sometimes 2. Often	Do you participate in religious groups?	0. No 1. Less than once a week 2. 1-2 a week 3. Almost everyday	Does attend religious services?	0. No 1. Yes
		In the past month, have you attended a meeting or gathering of any club, organisation, society or group?	0. No 1. Yes	Do you participate in clan associations?	0. No 1. Less than once a week 2. 1-2 a week 3. Almost everyday	Does attend any clubs or groups?	0. No 1. Yes
		Do you have a pet?	0. No 1. Yes	Do you rear pets?	0. No 1. Less than once a week 2. 1-2 a week 3. Almost everyday	Has a pet?	0. No 1. Yes
		How many friends do you have living in, or near, this district	1. None 2. 1-3 3. More than 3	How many close neighbours and friends do you have?	No. of neighbours and friends	Neighbours or friends	0. No friend 1. Some friends

### 4.4.1.7 Life-satisfaction score

Table 4.7 presents the life satisfaction-related variable in the NLSAA and SHLSET, and the harmonised variable and response options created.

As mentioned in Section 3.4, life satisfaction was used as a measure of quality of life. However, the two studies (the NLSAA and SHLSET) used the same life satisfaction scale, but extracted different questions from this instrument. For example, the items – “As I grow older, things seem better than I thought they would be.” and “In spite of what people say, the life of the average person is getting worse, not better,” were included in the life satisfaction scale in the NLSAA study, but were not present in the SHLSET study.

Table 4.7 shows the Life Satisfaction Index-Z containing thirteen items, making it a shorter version of the original Life Satisfaction Index-A (Wallace and Wheeler, 2002), used in the NLSAA. Each item had three response options (with a value of 0 = No, disagree; 1 = don't know; 2 = Yes, agree). To standardise this scale, the total score in the NLSAA was divided by 26 and multiplied by 100 (a maximum possible score =  $13 \times 2$ ).

In SHLSET, the life satisfaction scale was a ten-item scale in 1989 and a four-item (blue-coloured word) scale in 1993; and each item had two response options (with a value of 2 = No, disagree; 1 = Yes, agree; 3=do not know or other answer). For the purpose of data harmonisation, the response options 0 = No, disagree; 1 = don't know; and 2 = Yes, agree were changed to be consistent with the response options used in the NLSAA study. To standardize these scales, the total score was divided by 20 and multiplied by 100 (a maximum possible score =  $10 \times 2$ ) in 1989 and was divided by 8 and multiplied by 100 (a maximum possible score =  $4 \times 2$ ) in 1993. It was assumed that these LSI scales both measured life satisfaction in an equivalent way.

Without standardised scores, it is difficult to make comparisons; in particular, there have different items in the two scales. In order for the score to be meaningful, it needs to know whether the score is above or below the mean and how many standard deviations each score is above or below the mean that it can compare the two scales. Thus, standardised scores allow this research to make comparisons of raw scores that come from very different sources.

Table 4.7: Life satisfaction-related variable in the NLSAA and SHLSET and new variables created following data harmonization.

Life satisfaction dimensions	Variables name	NLSAA		SHLSET		Harmonised variable name	Harmonised response options
		Questions	Response options	Questions	Response options		
Life satisfaction	Life satisfaction	<ol style="list-style-type: none"> <li>1. As I grow older, things seem better than I thought they would be.</li> <li>2. I have had more chances in life than most of the people I know.</li> <li>3. This is the dreariest time of my life.</li> <li>4. I am just as happy as when I was younger.</li> <li>5. These are the best yours of my life.</li> <li>6. Most of the things I do are boring or monotonous.</li> <li>7. The things I do are as interesting to me as they ever were.</li> <li>8. As I look back on my life, I am fairly well satisfies.</li> <li>9. I have made plans for things I will be doing in a month or a year from now.</li> <li>10. When I think back over my life, I did not get most of the important things I wanted.</li> <li>11. Compared with other people, I get down in the dumps too often.</li> <li>12. I have pretty much what I expected out of life.</li> <li>13. In spite of what people say, the life of the average person is getting worse, not better.</li> </ol>	<ol style="list-style-type: none"> <li>0. No, disagree</li> <li>1. Don't know</li> <li>2. Yes, agree</li> </ol>	<ol style="list-style-type: none"> <li>1. I have had more breaks in life than most of the people I know (compared to elderly neighbors and relatives).</li> <li>2. As I look back on my life, I am fairly well satisfied.</li> <li>3. My life could be happier than it is now.</li> <li>4. I would not change my past even if I could.</li> <li>5. These are the best years of my life.</li> <li>6. Most of the things I do are boring or monotonous.</li> <li>7. I have always felt interested in the things I have done.</li> <li>8. I expect some interesting and pleasant things to happen to me in the future.</li> <li>9. I feel old and somewhat tired.</li> <li>10. I've become pretty much what I expected out of life.</li> </ol>	<ol style="list-style-type: none"> <li>1. Agree</li> <li>2. Disagree</li> <li>3. Don't know or other answer</li> </ol>	Life satisfaction	<ol style="list-style-type: none"> <li>0. No, disagree</li> <li>1. Don't know</li> <li>2. Yes, agree</li> </ol> Standardised score

## 4.4.2 Differences between the UK and Taiwan

This section includes descriptive statistics of the harmonised data and tests for differences the two samples.

### 4.4.2.1 Descriptive statistics

Table 4.8 shows the results of the descriptive analyses of continuous variables used in 1989 for the two studies. In 1989, there was the same age range in both countries, but participants in the NLSAA study were older than participants in SHLSET. The older people in SHLSET had a lower level of life satisfaction, and higher levels of depression, and were living with more people relative to older people in the NLSAA study. The results of one-sample Kolmogorov-Smirnov Tests, lead to the rejection of the null hypothesis, that the continuous variables in the NLSAA and SHLSET from 1989 were normally distributed.

**Table 4.8: Descriptive statistics of continuous variables in the NLSAA and SHLSET in 1989.**

Variable	N	Mean	Median	SD	Range	K-S Z*	p value
<b>NLSAA (n=690)</b>							
Age (years)	690	78.34	77.40	5.78	69–98	2.080	<0.001
Standardised LSI score	650	64.08	69.23	20.61	0–100	2.675	<0.001
Standardised SAD score	649	7.47	2.38	11.11	0–62	6.384	<0.001
Number of people living in household	667	0.62	1.00	0.73	0–7	7.287	<0.001
<b>SHLSET (n=1,438)</b>							
Age (years)	1438	75.67	74.34	5.42	69–98	4.163	<0.001
Standardised LSI score	1343	61.15	70.00	24.38	0–100	5.998	<0.001
Standardised SAD score	1330	17.02	12.50	15.15	0–85	6.046	<0.001
Number of people living in household	1437	5.26	5.00	3.25	0–25	3.996	<0.001

\* K-S Z = the One-Sample Kolmogorov-Smirnov Test.

Table 4.9 presents the descriptive analyses for the continuous variables derived from both studies in 1993. The older people in the SHLSET study again were younger than their NLSAA counterparts. In addition, older people in SHLSET had lower levels of life satisfaction, and higher levels of depression, and lived with more other people than older people in the NLSAA study. The results of one-sample Kolmogorov-Smirnov Tests, to the rejection of the null hypothesis, that the continuous variables in the NLSAA and SHLSET from 1993 were normally distributed.

**Table 4.9: Descriptive statistics of continuous variables in the NLSAA and SHLSET in 1993.**

Variable	N	Mean	Median	SD	Range	K-S Z*	p value
<b>NLSAA (n=410)</b>							
Age (years)	399	81.38	80.30	5.17	73-101	1.712	0.006
Standardised LSI score	382	65.10	69.23	20.34	0-100	2.186	<0.001
Standardised SAD score	382	6.21	2.38	10.44	0-71	5.390	<0.001
Number of people living in household	406	0.64	1.00	0.68	0-4	5.513	<0.001
<b>SHLSET (n=1,003)</b>							
Age (years)	1,003	78.91	77.73	4.96	73-99	3.679	<0.001
Standardised LSI score	1003	57.20	50.00	33.18	0-100	4.617	<0.001
Standardised SAD score	898	23.63	20.00	17.01	0-87	3.667	<0.001
Number of people living in household	999	3.93	4.00	3.17	0-20	4.006	<0.001

\* K-S Z = the One-Sample Kolmogorov-Smirnov Test.

Table 4.10 shows the results of the descriptive analyses of continuous variables used in the combined data sets from 1989 and 1993.

In 1993, it is clear that, in addition to participants being older, they had lower levels of life satisfaction and higher levels of depression, and the mean number of people living in the household decreased from 1989 to 1993. The results of one-sample Kolmogorov-Smirnov Tests, lead to the rejection of the null hypothesis, that the continuous variables in the combined data sets from 1989 and 1993 were normally distributed.

**Table 4.10: Descriptive statistics of continuous variables in the combined data sets.**

Variable	N	Mean	Median	SD	Range	K-S Z*	p value
<b>Combined data set in 1989 (n=2,128)</b>							
Age (years)	2128	76.54	75.19	5.68	69-98	4.501	<0.001
Standardised LSI score	1993	62.10	69.23	23.25	0-100	6.124	<0.001
Standardised SAD score	1979	13.89	10.42	14.65	0-85	7.633	<0.001
Number of people living in household	2104	3.79	3.00	3.47	0-25	8.664	<0.001
<b>Combined data set in 1993 (n=1,413)</b>							
Age (years)	1402	79.61	78.48	5.14	73-101	3.724	<0.001
Standardised LSI score	1385	59.38	61.54	30.39	0-100	4.423	<0.001
Standardised SAD score	1280	18.43	16.67	17.29	0-87	5.122	<0.001
Number of people living in household	1405	2.98	2.00	3.08	0-20	8.468	<0.001

\* K-S Z = the One-Sample Kolmogorov-Smirnov Test.

Figure 4.1 shows the difference in life satisfaction mean scores between 1989 and 1993 in the three datasets. A large decrease in the life satisfaction score is shown between 1989 and 1993 in the SHLSET study. Conversely, the life satisfaction score increased in 1993 in the NLSAA study.

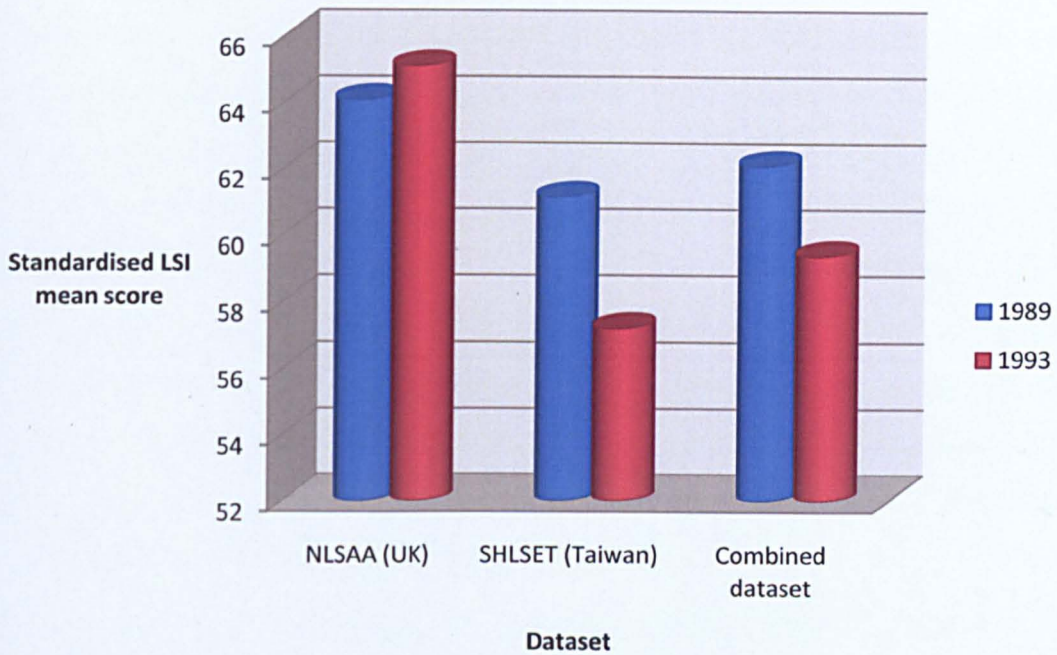


Figure 4.1: The mean standardised life satisfaction score in 1989 and 1993.

#### 4.4.2.2 Differences between the NLSAA and SHLSET

As mentioned above, none of the continuous variables had a normal distribution. In order to compare the two studies (i.e., NLSAA and SHLSET) and each of the harmonised data set variables in 1989 and 1993, Mann-Whitney U tests were used to test continuous variables.

##### 4.4.2.2.1 Mann-Whitney U tests for continuous variables

###### 1989

Table 4.11 shows the results of the Mann-Whitney U tests for continuous variables. The tests reveal a significant difference in the mean rank for age among the older people in the two studies ( $Z$  statistic=-10.795;  $p<0.001$ ). The mean rank for the older people in the NLSAA study was 1272.08, and for the people in the SHLSET dataset 964.90; i.e., the people in the NLSAA study were older than those in the SHLSET.

Table 4.11: Results of Mann-Whitney U tests for continuous variables in 1989.

Variable	NLSAA	SHLSET	Z statistic	p value
	Mean Rank (N)	Mean Rank (N)		
Age (years)	1272.08 (690)	964.90 (1438)	-10.795	<0.001
Standardised LSI score	1027.07 (650)	982.45 (1343)	-1.627	0.104
Standardised SAD score	668.98 (649)	1146.65 (1330)	-17.539	<0.001
Number of people living in household	392.02 (667)	1359.07 (1437)	-34.290	<0.001

There was no significant difference in the mean rank for the standardised life satisfaction scores ( $Z$  statistic=-1.627;  $p=0.104$ ) for the older people in the two samples. The mean rank for the older people in the NLSAA sample was 1027.07 and for those in SHLSET the mean rank was 982.45, i.e., the older people in the NLSAA study had a higher standardised LSI score than those in SHLSET, although this difference was not significant.

There was a significant difference in the mean rank of the standardised depression scores between the two studies ( $Z$  statistic=-17.539;  $p<0.001$ ). The mean rank for older people in the NLSAA was 668.98 and for those in SHLSET the mean rank was 1146.65. In other words, the older people in SHLSET had higher levels of depression than their counterparts in the NLSAA study.

There was a significant difference in the mean rank of the number of people living in the household ( $Z$  statistic=-34.290;  $p<0.001$ ) for the older people in the two samples. The mean rank for those in the NLSAA sample was 392.02 and for those in SHLSET 1359.07, meaning that the SHLSET older people lived with more other people.

In summary, older people in the SHLSET study sample in 1989 tended to be younger, had higher levels of depression, had lower levels of life satisfaction, and lived with more people relative to the older people in the NLSAA study.

**1993**

Table 4.12 presents the data for the continuous variables of participants in the NLSAA and SHLSET 1993 studies. There was a significant difference in the mean rank for age among older people in the two studies ( $Z$  statistic=-9.036;  $p<0.001$ ). The mean rank for age in the NLSAA study was 856.40 and for the SHLSET study 639.88; i.e., participants in SHLSET were younger.

**Table 4.12: Results of Mann-Whitney U tests for continuous variables in 1993.**

Variable	NLSAA	SHLSET	Z statistic	p value
	Mean Rank (N)	Mean Rank (N)		
Age (years)	856.40 (399)	639.88 (1003)	-9.036	<0.001
Standardised LSI score	752.69 (382)	670.27 (1003)	-3.457	0.001
Standardised SAD score	347.16 (382)	765.28 (898)	-18.637	<0.001
Number of people living in household	357.89 (406)	843.25 (999)	-20.673	<0.001

There was a significant difference in the mean rank for standardised life satisfaction scores ( $Z$  statistic=-3.457;  $p=0.001$ ) between the two samples. The mean rank for the NLSAA study older people was 752.69 and for the SHLSET older people 670.27; i.e.,

older people in the NLSAA study had higher levels of life satisfaction than their counterparts in SHLSET.

There was a significant difference in the mean rank for standardised depression scores (Z statistic=-18.637;  $p=0.001$ ) between the two studies, with the mean rank for the NLSAA sample being 347.16 and for the SHLSET sample being 765.28, meaning that the SHLSET sample had higher levels of depression. There was a significant difference in the mean rank for the number of people living in the household (Z statistic=-20.673;  $p<0.001$ ) between the two samples. The mean rank for the NLSAA study was 357.89 and for the SHLSET study 843.25, meaning that older people in the SHLSET sample lived with more people than those in the NLSAA sample.

In summary, in 1993 older people in the SHLSET sample tended to be younger, had higher levels of depression, had lower levels of life satisfaction, and lived with more people than their counterparts in the NLSAA sample.

#### ***4.4.2.2 Chi-Square tests for categorical variables***

Separate Chi-square tests were used to test each null hypothesis that there was no association between categorical variables and the location of study, i.e., whether it was the NLSAA or the SHLSET data set. The number and percentage of 23 categorical variables was shown in tables.

#### **1989**

Table 4.13 shows the descriptive statistics for categorical variables in the 1989 NLSAA and SHLSET samples, as well as the results of Chi-square tests for differences between the two samples.

It can be seen that there are differences between the participants in the NLSAA and SHLSET. For example, of the 690 people in NLSAA, 260 (37.7%) were male and 430 (62.3%) were female, compared with the SHLSET study, in which 53.4% ( $n=768$ ) were male and 46.6% ( $n=670$ ) female ( $\chi^2=45.552$ ;  $p<0.001$ ). Of the 690 NLSAA participants, 47.4% ( $n=323$ ) were widowed, 42.7% ( $n=291$ ) were married, 6.0% ( $n=41$ ) were single, and 4.0% ( $n=27$ ) were separated/divorced. In comparison, 51.3% ( $n=736$ ) of the SHLSET sample was married, 3.1% ( $n=45$ ) were separated/divorced, 3.0% ( $n=43$ ) were single, and 42.6% ( $n=612$ ) were widowed ( $\chi^2=9.765$ ;  $p=0.002$ ). The majority of participants (60.1%,  $n=412$ ) were in the skilled-non manual/skilled-manual category in the NLSAA study; in contrast, a large majority of the sample



(71.8%, n=859) in the SHLSET sample was semiskilled/non-skilled/other ( $\chi^2=199.691$ ;  $p<0.001$ ).

Furthermore, there was a significant association between study location (UK vs. Taiwan) and living status ( $\chi^2=803.233$ ;  $p<0.001$ ), satisfaction with income ( $\chi^2=217.713$ ;  $p<0.001$ ), self-rated health ( $\chi^2=13.328$ ;  $p<0.001$ ), comparison with peer group health ( $\chi^2=53.456$ ;  $p<0.001$ ), smoking ( $\chi^2=13.376$ ;  $p<0.001$ ), arthritis or rheumatism ( $\chi^2=153.868$ ;  $p<0.001$ ), stomach problems ( $\chi^2=14.173$ ;  $p<0.001$ ), dizziness ( $\chi^2=42.369$ ;  $p<0.001$ ), high blood pressure ( $\chi^2=5.575$ ;  $p<0.018$ ), urinary incontinence ( $\chi^2=167.442$ ;  $p<0.001$ ), use of a walking aid ( $\chi^2=30.305$ ;  $p<0.001$ ), loneliness ( $\chi^2=284.290$ ;  $p<0.001$ ), friends ( $\chi^2=94.779$ ;  $p<0.001$ ), reading of newspapers or journals ( $\chi^2=587.059$ ;  $p<0.001$ ), religious group participation ( $\chi^2=101.226$ ;  $p<0.001$ ), participation in a club or organization ( $\chi^2=291.787$ ;  $p<0.001$ ), and pets ( $\chi^2=31.402$ ;  $p<0.001$ ).

**Table 4.13: Descriptive statistics of categorical variables and results of Chi<sup>2</sup> tests for differences between the NLSAA and SHLSET samples in 1989.**

Variable	NLSAA N (%)		SHLSET N (%)		Total (%)		$\chi^2$	p value
Gender								
Male	260	(37.7)	768	(53.4)	1028	(48.3)	45.552	<0.001
Female	430	(62.3)	670	(46.6)	110	(51.7)		
Marital status							9.765	0.002
Married	291	(42.7)	736	(51.3)	1027	(48.5)		
Single	41	(6.0)	43	(3.0)	84	(4.0)		
Widowed	323	(47.4)	612	(42.6)	935	(44.1)		
Separated/Divorced	27	(4.0)	45	(3.1)	72	(3.4)		
Socioeconomic class							199.691	<0.001
Professional/Intermediate	103	(15.0)	158	(13.2)	261	(13.9)		
Skilled-non manual/skilled-manual	412	(60.1)	180	(15.0)	592	(31.5)		
Semiskilled/unskilled/others	170	(24.8)	859	(71.8)	1029	(54.7)		
Living status							803.233	<0.001
Live with someone	347	(52.1)	1436	(99.9)	1783	(84.8)		
Live alone	319	(47.9)	1	(0.1)	320	(15.2)		
Satisfaction with income							217.713	<0.001
Dissatisfied	143	(22.0)	771	(57.3)	914	(45.8)		
Satisfied	506	(78.0)	575	(42.7)	1081	(54.2)		
Self-rated health							13.328	<0.001
Poor	50	(7.6)	65	(4.8)	115	(5.7)		
Fair	115	(17.4)	272	(20.1)	387	(19.2)		
Average	128	(19.4)	551	(40.7)	679	(33.7)		
Good	274	(41.5)	280	(20.7)	554	(27.5)		
Excellent	94	(14.2)	186	(13.7)	280	(13.9)		
Comparison with peer group health							53.456	<0.001
Less healthy	69	(10.7)	291	(21.5)	360	(18.0)		
About as healthy	288	(44.9)	653	(48.2)	941	(47.1)		
More healthy	285	(44.4)	411	(30.3)	696	(34.9)		
Smoking							13.376	<0.001
Yes	141	(21.4)	419	(29.2)	560	(26.7)		
No	517	(78.6)	1018	(70.8)	1535	(73.3)		
Arthritis or rheumatism							153.868	<0.001
Yes	400	(58.8)	438	(30.5)	838	(39.6)		
No	280	(41.2)	999	(69.5)	1279	(60.4)		
Heart disease								

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Yes	140	(20.6)	312	(21.8)	452	(21.4)	0.309	0.578
No	540	(79.4)	1122	(78.2)	1662	(78.6)		
Stomach problems								
Yes	200	(29.5)	313	(21.8)	513	(24.3)	14.173	<0.001
No	479	(70.5)	1121	(78.2)	1600	(75.7)		
Dizziness								
Yes	270	(39.8)	59	(4.2)	329	(15.7)	438.341	<0.001
No	409	(60.2)	1362	(95.8)	1771	(84.3)		
High blood pressure								
Yes	148	(21.8)	382	(26.7)	530	(25.1)	5.575	0.018
No	531	(78.2)	1050	(73.3)	1581	(74.9)		
Urinary problem								
Yes	169	(25.0)	187	(13.4)	356	(17.1)	42.369	<0.001
No	508	(75.0)	1212	(86.6)	1720	(82.9)		
Walking problem								
Difficulty	196	(29.4)	429	(29.9)	625	(29.7)	0.031	0.859
No difficulty	471	(70.6)	1007	(70.1)	1478	(70.3)		
Walking aid use								
Yes	136	(22.3)	180	(12.5)	316	(15.4)	30.305	<0.001
No	475	(77.7)	1256	(87.5)	1731	(84.6)		
Loneliness								
Lonely	415	(63.7)	332	(24.6)	747	(37.4)	284.290	<0.001
Not lonely	237	(36.3)	1016	(75.4)	1253	(62.7)		
Friends								
Some friends	526	(78.5)	1020	(94.1)	1546	(88.1)	94.779	<0.001
No friend	144	(21.5)	64	(5.9)	208	(11.9)		
Newspaper or journal reading								
Yes	584	(86.6)	431	(30.0)	1015	(48.1)	587.059	<0.001
No	90	(13.4)	1005	(70.0)	1095	(51.9)		
Religious group participation								
Yes	176	(26.2)	135	(9.4)	311	(14.7)	101.226	<0.001
No	497	(73.8)	1303	(90.6)	1800	(85.3)		
TV or radio								
Yes	625	(92.9)	1300	(90.5)	1925	(91.3)	2.860	0.091
No	48	(7.1)	136	(9.5)	184	(8.7)		
Club/organization participation								
Yes	241	(35.8)	94	(6.5)	335	(15.9)	291.787	<0.001
No	432	(64.2)	1343	(93.5)	1775	(84.1)		
Pets								
Yes	156	(23.1)	191	(13.3)	347	(16.5)	31.402	<0.001
No	518	(76.9)	1242	(86.7)	1760	(83.5)		

Older people in the SHLSET study in 1989 were more likely to be male, more likely to be married, more likely to be semiskilled/unskilled/other, more likely to live with someone, more likely to be dissatisfied with their income, more likely to have average self-rated health, more likely to feel that their health was about as good as their peers, more likely to be smoking, less likely to feel lonely, more likely to have friends, less likely to read newspapers or journals, less likely to attend a religious group, club, or organization, less likely to have arthritis or rheumatism, stomach problems, dizziness, and urinary incontinence, more likely to have high blood pressure, less likely to use a walking aid, and less likely to have a pet than their counterparts in the NLSAA sample.

1993

Table 4.14 compares the samples of older people in the NLSAA and SHLSET 1993 databases, according to the categorical variables.

There are differences between the participants in the NLSAA and SHLSET datasets, e.g., gender, marital status, living status, socioeconomic class, satisfaction with income, comparison with peer group health, feeling lonely, having friends, according to the categorical variables.

Table 4.14 reveals a significant association between the location of the study in 1993 and gender ( $\chi^2=41.550$ ;  $p<0.001$ ), marital status ( $\chi^2=24.031$ ;  $p<0.001$ ), socioeconomic class ( $\chi^2=146.019$ ;  $p<0.001$ ), living status ( $\chi^2=183.029$ ;  $p<0.001$ ), satisfaction with income ( $\chi^2=111.635$ ;  $p<0.001$ ), comparison with peer group health ( $\chi^2=45.579$ ;  $p<0.001$ ), smoking ( $\chi^2=5.526$ ;  $p=0.019$ ), arthritis or rheumatism ( $\chi^2=195.348$ ;  $p<0.001$ ), stomach problems ( $\chi^2=43.725$ ;  $p<0.001$ ), dizziness ( $\chi^2=322.222$ ;  $p<0.001$ ), high blood pressure ( $\chi^2=7.149$ ;  $p=0.008$ ), urinary incontinence ( $\chi^2=35.714$ ;  $p<0.001$ ), walking aid use ( $\chi^2=58.718$ ;  $p<0.001$ ), loneliness ( $\chi^2=85.570$ ;  $p<0.001$ ), friends ( $\chi^2=34.422$ ;  $p<0.001$ ), newspaper or journal reading ( $\chi^2=397.059$ ;  $p<0.001$ ), religious group participation ( $\chi^2=80.818$ ;  $p<0.001$ ), having a TV or radio ( $\chi^2=46.052$ ;  $p<0.001$ ), and participation in a club or organization ( $\chi^2=286.024$ ;  $p<0.001$ ).

**Table 4.14: Descriptive statistics of categorical variables and results of Chi<sup>2</sup> tests differences between the NLSAA and SHLSET samples in 1993.**

Variable	NLSAA N (%)	SHLSET N (%)	Total (%)	$\chi^2$	p value
Gender					
Male	139 (33.8)	531 (52.9)	670 (47.4)	41.550	<0.001
Female	271 (66.1)	472 (47.1)	744 (52.6)		
Marital status				24.031	<0.001
Married	153 (39.8)	562 (56.1)	715 (51.6)		
Single	22 (5.7)	22 (2.2)	44 (3.2)		
Widowed	195 (50.6)	390 (38.9)	585 (42.2)		
Separated/Divorced	15 (3.9)	28 (2.8)	43 (3.1)		
Socioeconomic class				146.019	<0.001
Professional/Intermediate	68 (16.6)	102 (12.6)	170 (13.9)		
Skilled-non manual/ skilled-manual	244 (59.5)	119 (14.7)	363 (29.8)		
Semiskilled/unskilled/others	97 (23.7)	589 (72.7)	686 (56.3)		
Living status				183.029	<0.001
Live with someone	225 (55.3)	880 (88.1)	1105 (78.6)		
Live alone	182 (44.7)	119 (11.9)	301 (21.4)		
Satisfaction with income				111.635	<0.001
Dissatisfied	55 (14.4)	413 (45.6)	468 (36.3)		
Satisfied	327 (85.6)	493 (54.4)	820 (63.7)		
Self-rated health				0.081	0.776
Poor	28 (7.3)	39 (4.2)	67 (5.1)		
Fair	78 (20.4)	194 (21.1)	272 (20.9)		
Average	83 (21.7)	331 (36.0)	414 (31.8)		
Good	148 (38.6)	203 (22.1)	351 (26.9)		
Excellent	46 (12.0)	153 (16.6)	199 (15.3)		

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Comparison with peer group health								
Less healthy	35	(9.1)	170	(18.9)	205	(16.0)	45.579	<0.001
About as healthy	173	(45.2)	481	(53.6)	654	(51.1)		
More healthy	175	(45.7)	247	(27.5)	422	(32.9)		
Smoking								
Yes	65	(17.0)	230	(22.9)	295	(21.3)	5.526	0.019
No	318	(83.0)	773	(77.1)	1091	(78.7)		
Arthritis or rheumatism								
Yes	242	(63.2)	225	(23.0)	467	(34.3)	195.348	<0.001
No	141	(36.8)	753	(77.0)	894	(65.7)		
Heart disease								
Yes	84	(21.9)	192	(19.7)	276	(20.3)	0.696	0.404
No	300	(78.1)	784	(80.3)	1084	(79.7)		
Stomach problems								
Yes	87	(22.7)	92	(9.2)	179	(12.9)	43.725	<0.001
No	297	(77.3)	911	(90.8)	1208	(87.1)		
Dizziness								
Yes	119	(31.0)	3	(0.3)	122	(8.8)	322.222	<0.001
No	265	(69.0)	1000	(99.7)	1265	(91.2)		
High blood pressure								
Yes	91	(23.8)	305	(31.3)	396	(29.2)	7.149	0.008
No	291	(76.2)	668	(68.7)	959	(70.8)		
Urinary problems								
Yes	99	(25.8)	122	(12.4)	221	(16.2)	35.714	<0.001
No	284	(74.2)	861	(87.6)	1145	(83.8)		
Walking problems								
Difficulty	117	(31.2)	269	(26.8)	386	(28.0)	2.385	0.123
No difficulty	258	(68.8)	734	(73.2)	992	(72.0)		
Walking aid use								
Yes	133	(35.8)	165	(16.5)	298	(21.7)	58.718	<0.001
No	238	(64.2)	837	(83.5)	1075	(78.3)		
Loneliness								
Lonely	199	(52.1)	230	(25.3)	429	(33.3)	85.570	<0.001
Not lonely	183	(47.9)	678	(74.7)	861	(66.7)		
Friends								
Some friends	333	(87.4)	652	(72.0)	985	(76.6)	34.422	<0.001
No friend	48	(12.6)	253	(28.0)	301	(23.4)		
Newspaper or journal reading								
Yes	339	(88.7)	290	(28.9)	629	(45.4)	397.059	<0.001
No	43	(11.3)	713	(71.1)	756	(54.6)		
Religious group participation								
Yes	102	(26.7)	82	(8.2)	184	(13.3)	80.818	<0.001
No	280	(73.3)	921	(91.8)	1201	(86.7)		
TV & radio								
Yes	381	(99.5)	878	(87.5)	1259	(90.8)	46.052	<0.001
No	2	(0.5)	125	(12.5)	127	(9.2)		
Club/organization participation								
Yes	164	(42.9)	56	(5.6)	220	(15.9)	286.024	<0.001
No	218	(57.1)	947	(94.4)	1165	(84.1)		
Pet(s)								
Yes	74	(19.4)	153	(15.3)	227	(16.4)	3.129	0.077
No	308	(80.6)	850	(84.7)	1158	(83.6)		

The SHLSET study sample had a higher proportion of males, more people who were married, higher proportions of semiskilled/unskilled/others, a higher proportion of living with someone, lower levels of satisfaction with income, a higher proportion who feel that their health was about as good as their peers, of smokers, not feeling lonely, with friends, who not read newspapers or journals, who not attend a religious group, club, or organization, who not have a TV or radio, who not have arthritis or rheumatism, stomach problems, dizziness, high blood pressure, urinary incontinence

problems, and a higher proportion who did not use a walking aid relative to their counterparts in the NLSAA.

#### ***4.4.2.2.3 Logistic Regression analyses for selected variables***

Logistic regression analyses were carried out to examine the selected significant variables (including continuous and categorical variables) from Mann-Whitney U tests and Chi-Square tests to see which variables were significant in multivariate analysis.

#### **1989**

Table 4.15 presents the factors that predicted study location (UK versus Taiwan) by logistic regression. When all the selected variables were considered together, they significantly predicted differences between the NLSAA and SHLSET samples ( $\chi^2=1712.656$ ;  $df=30$ ;  $p<0.001$ ). It can be seen from Table 4.15 that there was a significant difference in age ( $p=0.002$ ), gender ( $p<0.001$ ), marital status ( $p=0.003$ ), living status ( $p<0.001$ ), socioeconomic class ( $p<0.001$ ), self-rated health ( $p<0.001$ ), arthritis problems ( $p=0.002$ ), dizziness ( $p<0.001$ ), high blood pressure ( $p=0.014$ ), loneliness ( $p<0.001$ ), standardised SAD score ( $p<0.001$ ), newspaper or journal reading ( $p<0.001$ ), club or organization ( $p=0.028$ ), pets ( $p=0.001$ ), and friends ( $p<0.001$ ).

People with the following attributes were less likely to be in SHLSET: females (OR=0.092; 95% CI=0.038–0.221;  $p<0.001$ ), being skilled/manual and non-manual (OR=0.133; 95% CI=0.053–0.336;  $p<0.001$ ), having poor self-rated health (OR=0.011; 95% CI=0.001–0.123;  $p<0.001$ ), reporting good health (OR=0.349; 95% CI=0.125–0.975;  $p=0.045$ ), having an arthritis problem (OR=0.298; 95% CI=0.138–0.643;  $p=0.002$ ), having dizziness as a problem (OR=0.024; 95% CI=0.008–0.073;  $p<0.001$ ), feeling lonely (OR=0.025; 95% CI=0.011–0.059;  $p<0.001$ ), reading newspapers or journals (OR=0.003; 95% CI=0.001–0.013;  $p<0.001$ ), attending club or organisation (OR=0.369; 95% CI=0.152–0.866;  $p=0.028$ ), and having a pet (OR=0.215; 95% CI=0.089–0.518;  $p=0.001$ ) in comparison to people in the NLSAA.

The following factors were associated with location. People in the SHLSET sample were more likely to be young (OR=0.885; 95% CI=0.818–0.958;  $p=0.002$ ), single (OR=9.45; 95% CI=1.154–77.381;  $p=0.036$ ), widowed (OR=3.845; 95%

CI=1.609–9.188;  $p=0.002$ ), living with someone (OR=16572.147; 95% CI=1053.677–260645.308;  $p<0.001$ ), to have high blood pressure (OR=2.760; 95% CI=1.226–6.212;  $p=0.014$ ), to report higher levels of depression (OR=1.120; 95% CI=1.079–1.162;  $p<0.001$ ), and to have friends (OR=19.882; 95% CI=5.636–70.141;  $p<0.001$ ) compared with people in the NLSAA.

**Table 4.15: Selected significant variables differences between the NLSAA and SHLSET in 1989.**

Variable (reference category)	Category	Odds ratio	95% CI	<i>p</i> value
Age		0.885	0.818–0.958	0.002
Gender (Male)	Female	0.092	0.038–0.221	<0.001
Marital status (Married)	Single	9.450	1.154–77.381	0.036
	Widowed	3.845	1.609–9.188	0.002
	Separated/Divorced	0.285	0.026–3.140	0.305
Living status (Live alone)	Live with someone	16572.147	1053.677–260645.308	<0.001
Satisfied with income (Dissatisfied)	Satisfied	0.476	0.220–1.028	0.059
Socioeconomic class (Professional/intermediate)	Skilled/manual & non-manual	0.133	0.053–0.336	<0.001
	Semiskilled/unskilled/others	0.822	0.302–2.239	0.702
Self-rated health (Excellent)	Poor	0.011	0.001–0.123	<0.001
	Fair	0.437	0.116–1.638	0.219
	Average	1.505	0.477–4.750	0.485
	Good	0.349	0.125–0.975	0.045
Comparison with peer group health (More healthy)	Less healthy	2.206	0.512–9.509	0.289
	About as healthy	0.587	0.257–1.341	0.206
Smoking (No)	Yes	0.967	0.415–2.254	0.938
Arthritis (No)	Yes	0.298	0.138–0.643	0.002
Stomach problems (No)	Yes	2.106	0.835–5.311	0.114
Dizziness (No)	Yes	0.024	0.008–0.073	<0.001
High blood pressure (No)	Yes	2.760	1.226–6.212	0.014
Urinary incontinence (No)	Yes	0.611	0.203–1.838	0.381
Walking aid use (No)	Yes	2.359	0.848–6.558	0.100
Loneliness (No)	Yes	0.025	0.011–0.059	<0.001
Standardised SAD score		1.120	1.079–1.162	<0.001
Newspaper/journal reading (No)	Yes	0.003	0.001–0.013	<0.001
Religious group (No)	Yes	0.603	0.231–1.576	0.302
Club or organization (No)	Yes	0.369	0.152–0.866	0.028
Pets (No)	Yes	0.215	0.089–0.518	0.001
Friends (No)	Yes	19.882	5.636–70.141	<0.001

**1993**

For the 1993 data, a regression model consisting of all the selected variables together significantly predicted differences between the NLSAA and SHLSET datasets ( $\chi^2=1159.545$ ;  $df=27$ ;  $p<0.001$ ).

Table 4.16 presents the factors that predicted differences between the two studies. There was a significant difference in age ( $p<0.001$ ), gender ( $p<0.001$ ), socioeconomic class ( $p<0.001$ ), comparison with peer group health ( $p=0.023$ ), arthritis ( $p<0.001$ ), dizziness ( $p<0.001$ ), urinary incontinence ( $p=0.002$ ), walking aid use ( $p=0.019$ ), loneliness ( $p<0.001$ ), standardised SAD score ( $p<0.001$ ), newspaper or journal reading ( $p<0.001$ ), and attending a club or organization ( $p=0.005$ ).

In contrast to older people in the NLSAA study, people in SHLSET were less likely to: be female (OR=0.089; 95% CI=0.034–0.229;  $p<0.001$ ), be a skilled/manual or non-manual worker (OR=0.246; 95% CI=0.096–0.634;  $p=0.004$ ), have an arthritis problem (OR=0.087; 95% CI=0.037–0.204;  $p<0.001$ ), have a dizziness problem (OR=0.001; 95% CI=0.000–0.017;  $p<0.001$ ), have urinary incontinence (OR=0.161; 95% CI=0.052–0.497;  $p=0.002$ ), use a walking aid (OR=0.286; 95% CI=0.100–0.813;  $p=0.019$ ), feel lonely (OR=0.068; 95% CI=0.024–0.190;  $p<0.001$ ), read newspapers or journals (OR=0.012; 95% CI=0.004–0.041;  $p<0.001$ ), and attend a club or organization (OR=0.291; 95% CI=0.124–0.687;  $p=0.005$ ).

The following factors were related to location (UK vs. Taiwan). People in the SHLSET sample were more likely to be young (OR=0.842; 95% CI=0.767–0.925;  $p<0.001$ ), rate themselves about as healthy as their peers (OR=3.308; 95% CI=1.455–7.521;  $p=0.004$ ), and have higher levels of depression (OR=1.195; 95% CI=1.143–1.250;  $p<0.001$ ).

**Table 4.16: Selected significant variables differences between the NLSAA and SHLSET in 1993.**

Variable (reference category)	Category	Odds ratio	95% CI	p value
Age		0.842	0.767–0.925	<0.001
Gender (Male)	Female	0.089	0.034–0.229	<0.001
Marital status (Married)	Single	0.681	0.096–4.846	0.608
	Widowed	1.188	0.460–3.067	0.701
	Separated/Divorced	0.277	0.029–2.652	0.721
Living status (Live alone)	Live with someone	1.596	0.488–5.214	0.265
Satisfaction with income (Dissatisfied)	Satisfied	0.419	0.167–1.052	0.439
Socioeconomic class				<0.001

(Professional/intermediate)	Skilled/manual & non-manual	0.246	0.096–0.634	0.004
	Semiskilled/unskilled/others	1.409	0.490–1.050	0.524
Comparison with peer group health (More healthy)				0.014
	Less healthy	4.434	0.949–20.712	0.058
	About as healthy	3.308	1.455–7.521	0.004
Smoking (No)	Yes	2.280	0.929–5.596	0.072
Arthritis (No)	Yes	0.087	0.037–0.204	<0.001
Stomach problem (No)	Yes	0.624	0.196–1.992	0.426
Dizziness (No)	Yes	0.001	0.000–0.017	<0.001
High blood pressure (No)	Yes	1.129	0.478–2.668	0.782
Urinary incontinence (No)	Yes	0.161	0.052–0.497	0.002
Walking aid use (No)	Yes	0.286	0.100–0.813	0.019
Loneliness (No)	Yes	0.068	0.024–0.190	<0.001
Standardised SAD score		1.195	1.143–1.250	<0.001
Standardised LSI score		1.002	0.987–1.018	0.787
Newspapers/journals (No)	Yes	0.012	0.004–0.041	<0.001
Religious groups (No)	Yes	0.921	0.302–2.810	0.885
Club/organization (No)	Yes	0.291	0.124–0.687	0.005
TV or radio (No)	Yes	0.043	0.001–1.605	0.088
Friends (No)	Yes	0.397	0.151–1.043	0.061

#### 4.4.3 Attrition in the NLSAA and SHLSET samples

The purpose of this section was to examine whether attrition due to non-response and death led to bias in the longitudinal studies. In this section, therefore, Mann-Whitney U test, Chi-Square test, and logistic regression analyses were used to examine the effect of attrition from baseline to follow-up surveys on the outcomes in longitudinal studies.

##### 4.4.3.1 Mann-Whitney U tests for continuous variables

###### NLSAA 1985-1989

Table 4.17 shows the results of Mann-Whitney U tests to determine whether there were significant differences in 1985 between those who were alive and re-interviewed in 1989 and those who were alive but not re-interviewed in 1989 in the NLSAA study.

**Table 4.17: Correlations of attrition among continuous variables in the NLSAA, 1985-1989.**

Variable	Alive not interviewed Mean Rank (N)	Alive interviewed Mean Rank (N)	Z statistic	p value
Age	364.78 (65)	379.25 (690)	-0.511	0.609
Standardised SAD score	406.01 (62)	363.40 (671)	-1.585	0.113
Standardised LSI score	345.65 (62)	371.15 (675)	-0.905	0.366
Number of people living in household	359.04 (65)	377.61 (686)	-0.737	0.461



Table 4.17 reveals no significant difference in the mean rank for age ( $Z$  statistic=-0.511;  $p=0.609$ ), standardised SAD score ( $Z$  statistic=-1.58;  $p=0.113$ ), standardised LSI score ( $Z$  statistic=-0.905;  $p=0.366$ ), or number of people living in the household ( $Z$  statistic=-0.737;  $p=0.461$ ) in 1985 between survivors interviewed versus survivors not re-interviewed in 1989.

### NLSAA 1985-1993

Table 4.18 shows the results of Mann-Whitney U tests to determine whether there were significant differences in 1985 between those who were alive and re-interviewed in 1993 and those who were alive but not re-interviewed in 1993 in the NLSAA study.

**Table 4.18: Correlations of attrition in continuous variables in the NLSAA, 1985-1993.**

Variable	Alive not interviewed Mean Rank (N)	Alive interviewed Mean Rank (N)	Z statistic	p value
Age	306.29 (139)	264.39 (410)	-2.692	0.007
Standardised SAD score	278.35 (129)	264.04 (405)	-0.962	0.336
Standardised LSI score	240.04 (130)	278.89 (408)	-2.488	0.013
Number of people living in household	253.96 (137)	280.70 (410)	-1.934	0.053

There was an association between whether 1993 survivors were interviewed or not and age ( $Z$  statistic=-2.692;  $p=0.007$ ) and standardised LSI score ( $Z$  statistic=-2.488;  $p=0.013$ ) in 1985. Older survivors were less likely to be re-interviewed, as were those with a lower baseline standardised LSI score. Those with fewer others living in the household in 1985 tended to be less likely to be interviewed, but the comparison just failed to achieve statistical significance.

In summary, survivors in 1993 who were re-interviewed were younger and had a higher level of life satisfaction in 1985 than those survivors who were not re-interviewed in 1993.

### SHLSET 1989-1993

Table 4.19 presents the mean rank for the continuous variables and the results of the Mann-Whitney U tests for the SHLSET data in 1989.

**Table 4.19: Correlations of attrition in continuous variables in SHLSET, 1989-1993.**

Variable	Alive not interviewed Mean Rank (N)	Alive interviewed Mean Rank (N)	Z statistic	p value
Age	516.23 (99)	553.89 (1001)	-1.125	0.260
Standardised SAD score	538.37 (92)	526.46 (962)	-0.360	0.719
Standardised LSI score	486.02 (93)	536.41 (970)	-1.526	0.127
Number of people living in household	367.72 (99)	568.05 (1000)	-6.033	<0.001

The only statistically significant difference between 1993 survivors interviewed and those not interviewed related to the number of people living in the household in 1989 (Z statistic=-6.033;  $p < 0.001$ ) in 1989. People in 1989 who had more people living in the household were more likely to be re-interviewed in 1993.

#### 4.4.3.2 Chi-Square tests for categorical variables

Separate Chi-square tests were used to test each null hypothesis that there was no association between participants who were alive and not interviewed and participants who were alive and interviewed from the baseline interviewing date.

##### NLSAA 1985-1989

Table 4.20 shows the results of chi-square tests comparing baseline (1985) categorical variables between people alive and re-interviewed in 1989 versus those alive but not re-interviewed in the NLSAA study. There was an association between whether 1989 survivors were re-interviewed or not and self-rated health ( $\chi^2=4.967$ ;  $p=0.026$ ) in 1985. Survivors in 1989 who were re-interviewed were more likely than their non-re-interviewed counterparts to have reported good (49.6%,  $n=335$ ) or excellent (16.7%,  $n=113$ ) health in 1985, and less likely to have rated their health as poor (11.1%,  $n=7$ ), fair (12.7%,  $n=8$ ), or average (22.2%,  $n=14$ ).

**Table 4.20: Correlations of attrition in categorical variables in the NLSAA, 1985-1989.**

Variable	Alive not interviewed N (%)	Alive interviewed N (%)	Total (%)	$\chi^2$	$p$ value
Gender					
Male	21 (32.3)	260 (37.7)	281 (37.2)	0.522	0.470
Female	44 (67.7)	430 (62.3)	474 (62.8)		
Marital status				0.722	0.396
Married	29 (44.6)	354 (51.5)	383 (50.9)		
Single	3 (4.6)	38 (5.5)	41 (5.5)		
Widowed	33 (50.8)	271 (39.4)	304 (40.4)		
Separated/Divorced	0 (.0)	24 (3.5)	24 (3.2)		
Socioeconomic class				0.050	0.822
Professional/intermediate	10 (15.9)	103 (15.0)	113 (15.1)		
Skilled-non manual/ skilled-manual	38 (60.3)	412 (60.1)	450 (60.2)		
Semiskilled/unskilled/others	15 (23.8)	170 (24.8)	185 (24.7)		
Living status				0.528	0.467
Live with someone	35 (53.8)	407 (59.3)	442 (58.9)		
Live alone	30 (46.2)	279 (40.7)	309 (41.1)		
Satisfaction with income				0.770	0.380
Dissatisfied	10 (21.8)	147 (21.8)	157 (21.3)		
Satisfied	52 (83.9)	528 (78.2)	580 (78.7)		
Self-rated health				4.967	0.026
Poor	7 (11.1)	25 (3.7)	32 (4.3)		
Fair	8 (12.7)	98 (14.5)	106 (14.4)		
Average	14 (22.2)	104 (15.4)	118 (16.0)		
Good	27 (42.9)	335 (49.6)	362 (49.1)		
Excellent	7 (11.1)	113 (16.7)	120 (16.3)		

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Comparison with peer group health								
Less healthy	24	(38.1)	215	(31.8)	239	(32.3)	2.030	0.154
About as healthy	35	(55.6)	381	(56.4)	416	(56.3)		
More healthy	4	(6.3)	80	(11.8)	84	(11.4)		
Smoking								
Yes	16	(25.0)	164	(24.0)	180	(24.1)	0.001	0.981
No	48	(75.0)	519	(76.0)	567	(75.9)		
Arthritis or rheumatism								
Yes	42	(64.4)	405	(58.9)	447	(59.4)	0.593	0.441
No	23	(35.4)	283	(41.1)	306	(40.6)		
Heart disease								
Yes	17	(26.2)	129	(18.8)	146	(19.5)	1.590	0.207
No	48	(73.8)	556	(81.2)	604	(80.5)		
Stomach problems								
Yes	21	(32.3)	181	(26.3)	202	(26.9)	0.792	0.373
No	44	(67.7)	506	(73.7)	550	(73.1)		
Dizziness								
Yes	27	(41.5)	236	(34.4)	263	(35.0)	1.051	0.305
No	38	(58.5)	451	(65.6)	489	(65.0)		
High blood pressure								
Yes	13	(20.3)	151	(22.0)	164	(21.9)	0.024	0.876
No	51	(79.7)	535	(78.0)	586	(78.1)		
Urinary problem								
Yes	11	(16.9)	111	(16.2)	122	(16.3)	0.000	1.000
No	54	(83.1)	574	(83.8)	628	(83.7)		
Walking problem								
Difficulty	24	(39.3)	186	(27.6)	210	(28.5)	3.257	0.071
No difficulty	37	(60.7)	489	(72.4)	526	(71.5)		
Walking aid use								
Yes	14	(22.6)	114	(16.8)	128	(17.3)	0.970	0.325
No	48	(77.4)	566	(83.2)	614	(82.7)		
Loneliness								
Lonely	51	(82.3)	566	(83.9)	617	(83.7)	0.021	0.884
Not lonely	11	(17.7)	109	(16.1)	120	(16.3)		
Friends								
Some friends	49	(77.8)	573	(84.1)	622	(83.6)	1.271	0.260
No friend	14	(22.2)	108	(15.9)	122	(16.4)		
Newspaper or journal								
Yes	56	(88.9)	642	(94.3)	698	(93.8)	2.029	0.154
No	7	(11.1)	39	(5.7)	46	(6.2)		
Religious group								
Yes	12	(19.0)	190	(27.9)	202	(27.2)	1.859	0.173
No	51	(81.0)	491	(72.1)	542	(72.8)		
TV or radio								
Yes	59	(95.2)	640	(94.0)	699	(94.1)	0.009	0.923
No	3	(4.8)	41	(6.0)	44	(5.9)		
Club/organization								
Yes	21	(33.3)	278	(40.8)	299	(40.1)	1.034	0.309
No	42	(66.7)	404	(59.2)	446	(59.9)		
Pets								
Yes	15	(23.8)	188	(27.6)	203	(27.3)	0.249	0.617
No	48	(76.2)	493	(72.4)	541	(72.7)		

### NLSAA 1985-1993

Table 4.21 presents the results of Chi-square tests comparing baseline categorical variables between people who were alive and re-interviewed in 1993 and people who were alive but not re-interviewed in 1993 in the NLSAA study.

There was a statistical association between being re-interviewed among 1993 survivors, versus not, and the following 1985 variables: marital status ( $\chi^2=5.040$ ;

$p=0.025$ ), living status ( $\chi^2=4.070$ ;  $p=0.044$ ), comparison with peer group health ( $\chi^2=5.842$ ;  $p=0.016$ ), read newspapers or journals ( $\chi^2=4.980$ ;  $p=0.026$ ), attending religious group ( $\chi^2=4.618$ ;  $p=0.032$ ), and participation in a club or organization ( $\chi^2=3.975$ ;  $p=0.046$ ) in the NLSAA study, although one or more of these differences may have been the result of Type I error (detecting a difference that does not truly exist) because of the large number of tests done. However, to err on the side of caution all these variables were included in the regression model in Section 4.4.3.3.

Survivors in 1993 who were re-interviewed were more likely to have been married in 1985 than those not re-interviewed. Those living with someone else in 1985 were more likely to be interviewed in 1993 than those living alone in 1985. Those who reported being about as healthy as their peers in 1985 were more likely to be interviewed in 1993 than people who felt more or less healthy than their peers in 1985. Participants who were reading newspapers and/or journals, and attending a religious group, and/or other club or organization were more likely to be re-interviewed in 1993 than those not re-interviewed.

**Table 4.21: Correlations of attrition in categorical variables in the NLSAA, 1985-1993.**

Variable	Alive not interviewed N (%)		Alive interviewed N (%)		Total (%)		$\chi^2$	$p$ value
Gender								
Male	53	(38.1)	138	(33.7)	191	(34.8)	0.728	0.393
Female	86	(61.9)	272	(66.3)	358	(65.2)		
Marital status								
Married	62	(44.9)	234	(57.1)	296	(54.0)	5.040	0.025
Single	11	(8.0)	23	(5.6)	34	(6.2)		
Widowed	60	(43.5)	140	(34.1)	200	(36.5)		
Separated/Divorced	5	(3.6)	13	(3.2)	18	(3.3)		
Socioeconomic class								
Professional/intermediate	21	(15.4)	68	(16.6)	89	(16.3)	0.738	0.390
Skilled-non manual/skilled-manual	77	(56.6)	244	(59.7)	321	(58.9)		
Semiskilled/unskilled	38	(27.9)	97	(23.7)	135	(24.8)		
Living status								
Live with someone	75	(54.7)	266	(64.9)	341	(62.3)	4.070	0.044
Live alone	62	(45.3)	144	(35.1)	206	(37.7)		
Satisfaction with income								
Dissatisfied	29	(22.3)	81	(19.9)	110	(20.5)	0.218	0.641
Satisfied	101	(77.7)	326	(80.1)	427	(79.5)		
Self-rated health								
Poor	9	(6.9)	9	(2.2)	18	(3.3)	2.585	0.108
Fair	16	(12.2)	54	(13.3)	70	(13.0)		
Average	24	(18.3)	65	(16.0)	89	(16.5)		
Good	62	(47.3)	208	(51.1)	270	(50.2)		
Excellent	20	(15.3)	71	(17.4)	91	(16.9)		
Comparison with peer group health								
Less healthy	48	(36.6)	105	(25.7)	153	(28.4)	5.842	0.016
About as healthy	71	(54.2)	249	(61.0)	320	(59.4)		
More healthy	12	(9.2)	54	(13.2)	66	(12.2)		
Smoking								
Yes	34	(25.2)	95	(23.2)	129	(23.7)	0.130	0.718

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No	101	(74.8)	315	(76.8)	416	(76.3)		
Arthritis or rheumatism								
Yes	85	(61.6)	249	(60.7)	334	(60.9)	0.006	0.937
No	53	(38.4)	161	(39.3)	214	(39.1)		
Heart disease								
Yes	23	(16.9)	67	(16.4)	90	(16.5)	0.000	0.991
No	113	(83.1)	342	(83.6)	455	(83.5)		
Stomach problem								
Yes	39	(28.3)	109	(26.6)	148	(27.0)	0.074	0.785
No	99	(71.7)	301	(73.4)	400	(73.0)		
Dizziness								
Yes	50	(36.2)	135	(32.9)	185	(33.8)	0.367	0.544
No	88	(63.8)	275	(67.1)	363	(66.2)		
High blood pressure								
Yes	28	(20.6)	93	(22.7)	121	(22.2)	0.153	0.696
No	108	(79.4)	317	(77.3)	425	(77.8)		
Urinary problem								
Yes	19	(14.0)	50	(12.2)	69	(12.6)	0.153	0.696
No	117	(86.0)	360	(87.8)	477	(87.4)		
Walking problem								
Difficulty	38	(28.8)	112	(27.4)	150	(27.7)	0.041	0.840
No difficulty	94	(71.2)	297	(72.6)	391	(72.3)		
Walking aid use								
Yes	24	(17.9)	57	(13.9)	81	(14.9)	0.962	0.327
No	110	(82.1)	352	(86.1)	462	(85.1)		
Loneliness								
Lonely	105	(80.8)	350	(86.0)	455	(84.7)	1.695	0.193
Not lonely	25	(19.2)	57	(14.0)	82	(15.3)		
Friends								
Some friends	107	(79.9)	351	(85.8)	458	(84.3)	2.290	0.130
No friend	27	(20.1)	58	(14.2)	85	(15.7)		
Newspaper or journal								
Yes	120	(89.6)	390	(95.4)	510	(93.9)	4.980	0.026
No	14	(10.4)	19	(4.6)	33	(6.1)		
Religious group								
Yes	28	(20.9)	127	(31.1)	155	(28.5)	4.618	0.032
No	106	(79.1)	282	(68.9)	388	(71.5)		
TV or radio								
Yes	124	(93.2)	394	(96.3)	518	(95.6)	1.605	0.205
No	9	(6.8)	15	(3.7)	24	(4.4)		
Club/organization								
Yes	43	(32.1)	173	(42.3)	216	(39.8)	3.975	0.046
No	91	(67.9)	236	(57.7)	327	(60.2)		
Pets								
Yes	33	(24.6)	119	(29.1)	152	(28.0)	0.790	0.374
No	101	(75.4)	290	(70.9)	391	(72.0)		

### SHLSET 1989-1993

Table 4.22 presents the results of chi-square tests comparing baseline (1989) categorical variables between people who were alive and re-interviewed in 1993 and those who were alive but not re-interviewed in the SHLSET study. Significant differences were apparent for marital status ( $\chi^2=7.542$ ;  $p=0.006$ ), socioeconomic class ( $\chi^2=6.884$ ;  $p=0.009$ ), comparison with peer group health ( $\chi^2=4.791$ ;  $p=0.029$ ), and reading a newspaper or journal ( $\chi^2=9.796$ ;  $p=0.002$ ).

Those re-interviewed in 1993 were more likely to have been married, be semiskilled/unskilled /others, and read newspapers or journals than survivors who

were not re-interviewed in 1993. People who reported in 1989 that they felt about as healthy as their peers were more likely to participate in the 1993 re-interview than those who felt they were more and less healthy. Those who read a newspaper or journal in 1989 were more likely to be re-interviewed in 1993 than people who were not reading newspaper or journals.

**Table 4.22: Correlations of attrition in categorical variables in SHLSET, 1989-1993.**

Variable	Alive not interviewed N (%)		Alive interviewed N (%)		Total (%)		$\chi^2$	<i>p</i> value
<b>Gender</b>								
Male	53	(53.5)	531	(53.0)	584	(53.1)	0.000	1.000
Female	46	(46.5)	470	(47.0)	516	(46.9)		
<b>Marital status</b>							7.542	0.006
Married	40	(40.4)	561	(56.1)	601	(54.7)		
Single	7	(7.1)	22	(2.2)	29	(2.6)		
Widowed	46	(46.5)	389	(38.9)	435	(39.6)		
Separated/Divorced	6	(6.1)	28	(2.8)	34	(3.1)		
<b>Socioeconomic class</b>							6.884	0.009
Professional/intermediate	16	(20.8)	102	(12.6)	118	(13.3)		
Skilled-non manual/ skilled-manual	16	(20.8)	119	(14.7)	135	(15.3)		
Semiskilled/unskilled/others	45	(58.4)	587	(72.6)	632	(71.4)		
<b>Living status</b>							0.000	1.000
Live with someone	99	(100)	999	(99.9)	1098	(99.9)		
Live alone	0	(.0)	1	(.10)	1	(.10)		
<b>Satisfied with income</b>							2.789	0.095
Dissatisfied	61	(65.6)	544	(56.0)	605	(56.9)		
Satisfied	32	(34.4)	427	(44.0)	459	(43.1)		
<b>Self-rated health</b>							2.917	0.088
Poor	2	(2.2)	23	(2.4)	25	(2.3)		
Fair	9	(9.7)	183	(18.8)	192	(18.0)		
Average	41	(44.1)	405	(41.5)	446	(41.8)		
Good	24	(25.8)	211	(21.6)	235	(22.0)		
Excellent	17	(18.3)	153	(15.7)	170	(15.9)		
<b>Comparison with peer group health</b>							4.791	0.029
Less healthy	12	(12.9)	179	(18.3)	191	(17.9)		
About as healthy	42	(45.2)	495	(50.7)	537	(50.2)		
More healthy	39	(41.9)	302	(30.9)	341	(31.9)		
<b>Smoking</b>							0.079	0.779
Yes	27	(27.3)	292	(29.2)	319	(29.0)		
No	72	(72.7)	709	(70.8)	781	(71.0)		
<b>Arthritis or rheumatism</b>							0.149	0.699
Yes	32	(32.3)	299	(29.9)	331	(30.1)		
No	67	(67.7)	701	(70.1)	768	(69.9)		
<b>Heart disease</b>							0.158	0.691
Yes	18	(18.2)	204	(20.4)	222	(20.2)		
No	81	(81.8)	795	(79.6)	876	(79.8)		
<b>Stomach problem</b>							0.757	0.384
Yes	25	(25.3)	209	(20.9)	234	(21.3)		
No	74	(74.7)	789	(79.1)	863	(78.7)		
<b>Dizziness</b>							0.955	0.329
Yes	6	(6.1)	35	(3.5)	41	(3.8)		
No	93	(93.9)	953	(96.5)	1046	(96.2)		
<b>High blood pressure</b>							0.441	0.507
Yes	22	(22.2)	258	(25.8)	280	(25.5)		
No	77	(77.8)	741	(74.2)	818	(74.5)		
<b>Urinary problem</b>							0.113	0.737
Yes	11	(11.8)	100	(10.1)	111	(10.3)		
No	82	(88.2)	887	(89.9)	969	(89.7)		
<b>Walking problem</b>							0.248	0.619
Difficulty	25	(25.3)	225	(22.5)	250	(22.7)		

No difficulty	74	(74.7)	775	(77.5)	849	(77.3)		
Walking aid use								
Yes	12	(12.1)	83	(8.3)	95	(8.6)	1.217	0.270
No	87	(87.9)	917	(91.7)	1004	(91.4)		
Loneliness								
Lonely	29	(31.2)	215	(22.1)	244	(22.9)	3.430	0.064
Not lonely	64	(68.8)	756	(77.9)	820	(77.1)		
Friends								
Some friends	60	(93.8)	739	(94.4)	799	(94.3)	0.000	1.000
No friend	4	(6.3)	44	(5.6)	48	(5.7)		
Read newspaper or journal								
Yes	46	(46.5)	305	(30.5)	351	(32.0)	9.796	0.002
No	53	(53.5)	694	(69.5)	747	(68.0)		
Religious group participation								
Yes	14	(14.1)	97	(9.7)	111	(10.1)	1.507	0.220
No	85	(85.9)	904	(90.3)	989	(89.9)		
TV or radio								
Yes	96	(97.0)	935	(93.6)	1031	(93.9)	1.251	0.263
No	3	(3.0)	64	(6.4)	67	(6.1)		
Club/organization participation								
Yes	12	(12.1)	65	(6.5)	77	(7.0)	3.549	0.060
No	87	(87.9)	935	(93.5)	1022	(93.0)		
Pets								
Yes	11	(11.1)	146	(14.6)	157	(14.3)	0.651	0.420
No	88	(88.9)	851	(85.4)	939	(85.7)		

#### 4.4.3.3 Logistic Regression analyses for selective attrition

Logistic regression analyses were carried out to examine the selected significant variables (including continuous and categorical variables) from Mann-Whitney U tests and Chi-Square tests to see which variables were significant in multivariate analysis.

#### NLSAA

Table 4.23 shows the results of the separate logistic regression models for the NLSAA variables to determine how the baseline variables predicted whether the 1985 and 1989 survivors were re-interviewed in 1989 and 1993 or not.

**Table 4.23: Prediction of attrition among older people in the NLSAA study.**

Study	Variable (reference category)	Category	Odds ratio	95% CI	p value
NLSAA	Self-rated health				0.043
1985-1989	(Excellent)	Poor	0.221	0.071-0.687	0.009
		Fair	0.759	0.266-2.168	0.606
		Average	0.460	0.179-1.185	0.108
		Good	0.769	0.326-1.813	0.548
NLSAA	Age		0.972	0.934-1.010	0.150
1985-1993	Marital status				0.941
	(Married)	Single	0.724	0.258-2.037	0.541
		Widowed	0.904	0.413-1.978	0.801
		Separated/Divorced	0.872	0.245-3.106	0.832
	Living status	Live with someone	1.427	0.659-3.090	0.367
	(Live alone)				
	Comparison with peer group health				0.219
	(More healthy)	Less healthy	0.564	0.265-1.202	0.138

	About as healthy	0.796	0.395–1.604	0.523
Reading newspaper or journals (No)	Yes	1.613	0.723–3.600	0.243
Attending religious group (No)	Yes	1.630	0.989–2.688	0.055
Attending clubs (No)	Yes	1.378	0.879–2.162	0.162
Standardised LSI score		1.008	0.968–1.050	0.685

For survivors re-interviewed in 1989, the overall model ( $\chi^2=8.751$ ,  $df=4$ ,  $p=0.068$ ) was not significant. However, self-rated health was a significant predictor of attrition ( $p=0.043$ ). Survivors who had rated their health as poor in 1985 were less likely to participate in the 1989 interview than survivors who had rated their health as excellent (OR=0.221; 95% CI=0.071–0.687;  $p=0.009$ ). When all the selected variables were considered together, there were significant baseline predictors of difference between survivors re-interviewed versus not re-interviewed in 1993 ( $\chi^2=25.121$ ;  $df=11$ ;  $p=0.009$ ). However, there were no significant associations between re-interview and any individual variables.

In summary, there was one predictor of attrition, i.e., poor self-rated health, for 1985-1989, but no predictors of attrition in 1985-1993 in the NLSAA study.

### SHLSET

Table 4.24 shows the results of the logistic regression models for baseline (1989) SHLSET variables to determine if any baseline variables predicted whether survivors were re-interviewed in 1993 or not.

**Table 4.24: Prediction of attrition among older people in the SHLSET study.**

Study	Variable (reference category)	Category	Odds ratio	95% CI	p value
SHLSET 1989-1993	Marital status (Married)	Single	1.165	0.241–5.642	0.849
		Widowed	0.481	0.278–0.834	0.009
		Separated/Divorced	0.798	0.210–3.035	0.740
	No. of people living in household		1.232	1.108–1.370	<0.001
	Socioeconomic class (Professional/intermediate)	Skilled/manual & non-manual	1.575	0.717–3.460	0.258
		Semiskilled/unskilled/others	2.309	1.121–4.757	0.023
	Comparison with peer group health (More healthy)	Less healthy	1.579	0.718–3.473	0.256
		About as healthy	1.013	0.583–1.759	0.963
		Reading newspaper or journals (No)	Yes	0.787	0.426–1.456

In the SHLSET study, the overall model ( $\chi^2=36.518$ ;  $df=9$ ;  $p<0.001$ ) with all independent variables entered, was significant. There was a significant association between 1993 re-interview and the number of people living in the household in 1989



( $p < 0.001$ ), in that those who lived with others in 1989 were more likely to be re-interviewed in 1993 (OR=1.232; 95% CI=1.108–1.370). In brief, living with someone else in 1989-1993 was a significant predictor of a 1993 re-interview.

### 4.5 Discussion

The present chapter was written to report the development of a harmonised data set to compare life satisfaction between the UK and Taiwan, and then in later chapters develop an understanding of how different factors affect life satisfaction in old age. Preliminary analysis revealed that there were differences between older people in the two study samples (from the NLSAA conducted in the UK, and the SHLSET study conducted in Taiwan). Whether these differences could be generalized to the wider populations of Taiwanese and British older people was deemed at least partially dependent upon making sure that the data were truly comparable. Data harmonisation is one way to address this issue.

#### Data harmonisation

Data harmonisation yielded two new datasets: one containing 2,128 records from 1989 (690 records from the NLSAA study and 1,438 records from the SHLSET study) and one containing 1,413 records from 1993 (410 records from the NLSAA study and 1,003 records from the SHLSET study). The harmonised datasets contained twenty-seven variables, covering the areas of participant demographics, socioeconomic status, physical health, self-rated health, mobility, mental health, socioeconomic engagement, and life satisfaction.

The two datasets were collected for different purposes and using different questionnaires. As mentioned in the section on methodology, the NLSAA was rich with data concerning physical activity. In contrast, the SHLSET survey focused on health, family networks, and dimensions of social support. Therefore, a number of questions and variables appeared in one study and not the other, so that many variables could not be included in order to make valid comparisons.

An important issue pertains to whether the response-order effect influences a participant's response. Chan (1991) argued that Likert-type response scales conventionally provide the most positive response options first; e.g., excellent, good, average, fair, poor. If the response-order is reversed (e.g., poor, fair, average, good, excellent), there is concern that this affects participants' responses. According to

Chan's research (1991), the first in any list of response options is disproportionately chosen by respondents. Furthermore, Knäuper (1999) discovered that response order effects tended to affect more older than younger respondents. Given that the two studies were exclusive to older people, the response-order effect may have influenced the relative numbers of responses in the two studies.

During the harmonisation process, it was not possible to measure the influence of language differences between countries regarding how older people answered questionnaires. There may have been language differences in the exact wording and meaning of the questions and response options in the two studies, given that English was the language used in the NLSAA study, and Chinese in the SHLSET study. Translating from one language into another is not always entirely feasible, e.g., some concepts just do not cross the language barrier well. Hence, the process of translating questions from Chinese into English might have altered some meanings, thereby rendering harmonization less than 100% accurate. This possible has a particular effect on the results of this research, even though the English translation of the SHLSET was provided by the Population Studies Center at the University of Michigan.

Finally, different instruments were used in the two studies to examine specific concepts of interest, especially in the measurement of depression and life satisfaction. For instance, the 14-item Anxiety and Depression scale was used in the NLSAA study and the CES-D scale was used in SHLSET. These two scales measure roughly the same concept, but differences in the individual questions within the scales might have affected the reported levels of depression in the two studies. Regarding life satisfaction, the 13-item LSI-Z was used in the NLSAA study and the 10-item LSI-A was used in SHLSET. Between these two scales, there were differences in specific items, but the questions in these scales were generally similar. However, these scales were used the standardised scores to make comparison of raw scores that came from the two studies.

### **Differences between the NLSAA and SHLSET**

The primary aim in this section is to discuss the differences between the NLSAA and SHLSET studies with relation to life satisfaction and related variables. The variables examined were health (e.g., physical and mental health), socioeconomic factors, age, gender, marital status, socioeconomic class, and social engagement.

There have been few international comparative studies of life satisfaction. In this study, life satisfaction and other variables were compared between people, 65 years old and over, living in the UK and Taiwan. The results revealed that older people in Taiwan reported a lower life satisfaction than those in the UK in 1989 and 1993. However, the standardised life satisfaction score was not a significant predictor of differences between the NLSAA and SHLSET datasets following multivariate logistic regression analysis.

There were differences in age and gender between the NLSAA and SHLSET datasets. Participants in the NLSAA sample were older and a greater percentage was female. The most likely explanation is, as mentioned in Section 1.4, that following the Chinese Communist Party's victory in the Chinese Civil War in 1949, two million Nationalists fled to Taiwan and established authority (The Central Intelligence Agency, 2006). These two million Nationalists were mostly young male soldiers and officers in the army who lived in Taiwan (Ofstedal et al., 2004). This may explain why people in the SHLSET sample were younger and more likely to be male than their counterparts in the NLSAA sample.

People who have disease or mobility problems are much less likely to express being satisfied with their lives. This study employed the variables 'self-rated health', 'health relative to peers', specific diseases, and 'mobility' to compare older people in the UK and Taiwan. People in the UK reported better health in 1989 than their Taiwanese counterparts, but the differences failed to achieve statistical significance in 1993. When comparing one's own health with that of peers, there was no difference between the two study sites in 1989, but the Taiwanese participants were more likely than their UK counterparts to report feeling that their health was as about as good as their peers in 1993. People in Taiwan reported less dizziness, fewer problems with arthritis, and more problems with high blood pressure in 1989. In 1993, older people in the UK reported more diseases (e.g., arthritis, stomach problems, dizziness, and urinary incontinence), smoked less, and were more likely to use a walking aid than those in Taiwan. Interestingly, high blood pressure is an important risk factor for stroke or death, and people from SHLSET appeared to be more likely to have this condition than their Western counterparts.

Health care is important for older people. As discussed in Section 1.4, older people in the UK seem to receive better healthcare than older people in Taiwan. This may

provide some evidence to explain why in this research older people in Taiwan were of lower socioeconomic class and had poorer physical health than British older people. However, in Chi-square tests self-rated health was not significantly different among older people in the UK and Taiwan in 1993. The Taiwan government established the Veterans General Hospital in 1958 (one of the best hospitals in Taiwan) to serve people. This might explain why there were no significant differences in self-rated health between the UK and Taiwan in 1993. On the other hand, the war itself likely had a significant adverse effect on the health of these Taiwanese soldiers and their kin.

The research showed that Taiwanese older people had a higher rate of depression than British older people in both 1989 and 1993. One possible explanation is that Taiwanese older people have more health problems than their counterparts in the UK. In cross-cultural research depression in later life, Krause and Liang (1992) found that older Japanese and Taiwanese showed a lower level of depressive disorders than Americans by using the CES-D scale. They also suggested that Taiwanese have depression because poor physical conditions because they worry their illness and medical expense too much. Older Taiwanese had a high risk of depressive disorder and were more likely to manifest somatic symptoms (Krause and Liang, 1992; Chong et al., 2001); furthermore, most of these people were widows with physical illness and a low level of education. As discussed in Section 1.4, the UK government provides good health services for older people and enhance their well-being in later life.

A particularly interesting result is the difference between the UK and Taiwan in terms of social engagement variables, both on bivariate and multivariate analysis. In contrast to older people in the UK, older people in Taiwan were less likely to read a newspaper or journal. A partial explanation for this may be the relative poverty and lower level of education among Taiwanese older people. In addition, though older people in Taiwan were less likely to read newspapers and journals, they were more likely to have friends and less likely to feel lonely. These findings are consistent with those of a previous study (Sun and Chang, 2006), in which Taiwanese older people again were found to be less likely to spend time reading a newspaper or journal, but more likely to visit friends (including neighbours) to drink tea and gossip. Hence, it should be concluded, from what has been said above, that some differences exist between older people in the UK and Taiwan in terms of life satisfaction, physical health, psychological well-being, social engagement, and demographic characteristics, which

may be the result of differences in race, culture, and society. One somewhat surprising finding was that, although Taiwanese older people appeared to be less disease than their UK counterparts, however, they still reported higher life satisfaction, a finding that is contrary to the otherwise empirically-supported belief that level of health is a major determinant of life satisfaction. This will be explored further in Chapter 5.

### Attrition

In any analysis of longitudinally-collected data, it is crucial to look for sources of bias that might result from subject attrition, and it is important to discriminate between mortality and non-mortality-related attrition, such as non-response or moving away. A major challenge in studies of older people is that death is a common source of attrition. In this study, there was substantial mortality-related attrition from 1985 to 1989 and from 1985 to 1993 in the NLSAA sample; and from 1989 to 1993 in the SHLSET sample. However, mortality-related attrition occurred in both samples, as well as in the population from which the samples came, and seems unlikely to have led to significant bias.

Attrition is always a concern in any longitudinal study, as it was in both of the studies included in the present research. That attrition occurred was never a question, it occurs in all large longitudinal studies. Rather, the question was, does attrition significantly affect the comparison between the UK and Taiwanese studies examined here? Mann-Whitney U tests showed that there were no significant differences between those who survived and were re-interviewed and those who survived but were not re-interviewed in the NLSAA study follow-up survey that transpired in 1989. However, age and level of life satisfaction were different between those who were re-interviewed and not re-interviewed in the 1993 NLSAA follow-up survey; and in the SHLSET study, older people who lived with someone in 1989 were more likely to be re-interviewed in 1993 than those who had lived alone.

Chi-square analysis yielded somewhat different results, in that significant differences were evident in the proportion rating their health as good relative to peers between those who were re-interviewed and those who were not in the 1989 NLSAA survey. Even more baseline differences were found in terms of being re-interviewed for NLSAA in 1993, with a statistically significant effect of attrition on marital status,

living with others, reporting oneself as healthy relative to peers, reading newspapers or journals, and attending religious groups, clubs or organisations.

No statistically significant association was found from logistic regression analyses between attrition and other factors in the second (1989) and third (1993) wave of the NLSAA survey. However, logistic regression did reveal an association between attrition and having lived with someone else at baseline in the SHLSET.

With regard to non-mortality-related attrition, refusal can be problematic, if those who refuse to participate further in a study are systematically different from those who continue to participate; and this is commonly the case. However, in these analyses of the effect of attrition, it seemed to have a relatively minor effect in terms of the overall difference between the British and Taiwanese samples.

### **4.6 Conclusion**

The aim of the research in this chapter of the thesis is to create a new data set using data from existing studies that measures the same concepts and attributes, and aims to measure these data from harmonised datasets and compare the impact of health, socio-economic attributes, and demographic characteristics on life satisfaction of older people in the two countries.

A key point in this chapter is how different data sets are comprised to compare life satisfaction in an appropriate way. In this research, similar variables were selected and assumed to have the same meaning for the purpose of data analyses. Therefore, the present analyses are based on harmonised data. Second, the results presented provide differences in life satisfaction and related factors across two countries. The older Taiwanese people were younger and more predominantly male, and had high blood pressure; conversely, the UK older people rated themselves as having good health despite a higher proportion using a walking aid. Finally, the issue is important to examine given the discussions in non-mortality-related attrition. The attrition showed its effect on 'living with some people' among older people in Taiwan. It may reflect the outcome of an individual's living status to affect whether participant accepts an interview or not. Older people live with someone that may be willing to accept interview because someone else could help and answer the questions for them. Older Taiwanese might accept an interview by proxy due to health problems, lower levels of

education or other reasons. Thus, the use of a proxy in ageing research is a challenge for future research.

To conclude, the evidence shows British older people reported higher life satisfaction than their counterparts in Taiwan and lots of differences between the two countries. Chapter 5, therefore, will examine the predictors of life satisfaction and compare the differences between the two countries.

## Chapter 5 Predictors of life satisfaction

Chapter 4 developed a harmonised data set for research into life satisfaction, to examine differences in life satisfaction between the UK and Taiwan. This chapter discusses the predictors of life satisfaction, the predictors of change in life satisfaction, and the location study variable as a predictor of life satisfaction to examine differences between the two countries.

### 5.1 Introduction

According to the literature review (Section 2.5), life satisfaction is a broader concept than health, placing an emphasis on social, financial, environmental, physical, and mental health. Understanding which factors affect changes the most may be important in determining ways to improve life satisfaction in a rapidly ageing society. In striving to understand differences in predictors of life satisfaction and compare two studies (NLSAA and SILSET), there are two purposes to this study. One purpose is to identify what factors predict life satisfaction and how these factors are different between the UK and Taiwan. The other is to consider change in life satisfaction among older people from 1989 to 1993, and what factors affect these changes, again comparing the two countries.

First, this chapter tries to assess the impact of the passage of four years on perceived life satisfaction in old age, and differences in this impact between the UK and Taiwan. It is important to understand how individuals perceive their life satisfaction over time; but it can be difficult to interpret changes in perceived life satisfaction, because other perceptions may change too, such as a person's expectations and experiences, as well as their health, etc.

This chapter is also concerned with examining whether or not the study location has any association with the objective factors that affect life satisfaction among older people living in the UK and Taiwan. Chapter 4 showed that older people in the UK had a higher standardised life satisfaction, or vice versa. The welfare of a nation or the social institutions that support older people may be among the factors that determine life satisfaction in an ageing population. As discussed in Section 2.10, studies on differences in life satisfaction among older people between different countries are few. A major aim of this chapter is to illustrate the importance of country differences, in an



attempt to advance understanding of life satisfaction in old age. The chapter has the following three objectives:

- ❖ What factors are associated with life satisfaction among older people?
- ❖ Does the study location variable interact with other variables in predicting life satisfaction?
- ❖ Which factors are associated with a change in life satisfaction among older people?

This chapter is divided into five sections: the introduction followed by the methods and the results. The results are presented in three parts; the first part presents statistical data analysis to identify predictors of life satisfaction and differences between the NLSAA and SHLSET. The second is the effects of interaction between the location of study and other (independent) variables in 1989 and 1993. In the third part, further data analysis is presented examining change in life satisfaction from 1989-1993 and, again, differences between the two studies. The fourth and final section consists of discussions and conclusions.

### **5.2 Methods**

As discussed in the Section 4.4.1.7, the standardized life satisfaction score was developed to use as the dependent variable this research. Twenty-seven independent variables from the data harmonisation process were used: gender, marital status, living status, number of people living in the household, socioeconomic class, satisfaction with income, self-rated health, perceived health relative to peers, smoking, arthritis or rheumatism, heart trouble, stomach problem, dizziness, high blood pressure, urinary incontinence, walking difficulties, use of a walking aid, loneliness, standardized SAD score, friends, reading newspapers or journals, attending a religious group, attending some other club or organisation, having a TV or radio, and having a pet. For the analyses examining the effects of interactions, nominal variables such as marital status, socioeconomic class, self-rated health, perceived health relative to peers were coded to binary (dummy) variables.

#### **5.2.1 Predictors of life satisfaction**

In the first part, life satisfaction was analyzed in two ways: firstly as a continuous variable, for which stepwise regression models were used to identify factors associated with life satisfaction. The other was a categorical variable, in which life

satisfaction (quality of life) was dichotomised into high and low according to a median split. Mann-Whitney U tests were used to test the null hypotheses that there was no significant difference between the two groups in the harmonised continuous variables; Chi-square tests were used to examine the null hypotheses that there was no significant association between factors (independent variables) and high/low life satisfaction. Finally, multivariate logistic regression models were used to identify which selective variables were the best predictors of life satisfaction.

Because of the large number of tests carried out,  $\alpha$  was set to 0.01 in order to reduce the likelihood of a Type I error. However, any variables that had a  $p$  value of 0.05 or less were included in the logistic regression model to ensure no potentially important factors were omitted. Even though these variables were significantly associated with low/high life satisfaction they may have an important modifier effect on the other variables.

### 5.2.2 Study location as a predictor of life satisfaction

When comparing two countries, study location might be an important element, having an interactional effect with specific factors affecting life satisfaction. In these two data sets (the NLSAA and SHLSET), the goal was to see whether all predictors (e.g., age, gender, socioeconomic, physical, mental, and social factors) affect life satisfaction, and whether location of study plays a role as well. Therefore, in the second part, multivariate logistic regression analysis was conducted to deal with the dependent variable, life satisfaction (low life satisfaction/high life satisfaction), and all independent variables, and any interactions between each independent variable and location of study (the UK vs. Taiwan). This analysis included interaction terms whenever it had a conditional hypothesis. A conditional hypothesis is simply one in which a relationship between two or more variables depends on the value of one or more other variables (Figueiras et al., 1998). In other words, the term interaction, in the current context, refers to how one independent variable depends upon the level of another independent variable.

For the interaction term analyses, all independent variables were coded as categorical variables, and included a reference category. For testing the relationship between study location (NLSAA=1, SHLSET=0) and each independent variable, each independent variable had to be reverse coded. For example, if the gender variable was

coded 'zero' for females and 'one' for males (such that 'female' was the reference category) and the study location variable was coded 'one' for the NLSAA study and 'zero' for the SHLSET study. There is an interaction (i.e., study location\*gender) if the study location exerts an effect on the female life satisfaction that is distinct from any effect on the males. Conversely, the male category can be represented by the reference category 'zero' and the female category represented by 'one' and a similar analysis performed to identify any interactive effect upon males. If the interaction term (i.e., study location\*gender) is not significant, it identifies that the relationship between gender and life satisfaction is not different in the two countries. This process essentially is testing for any interactional effect between the study location and gender, and for the other variables.

### 5.2.3 Predictors of change in life satisfaction

Change in standardized life satisfaction score was the dependent variable used in the third part of the analyses. The change in life satisfaction was produced from the life satisfaction standardized score in 1989 minus the life satisfaction standardized score in 1993, so that a positive value was an increase in the life satisfaction from 1989 to 1993 and a negative value was a decrease in the life satisfaction from 1989 to 1993. As before, twenty-five independent variables were used. These independent variables were assessed for whether they were associated with a change in life satisfaction index between 1989 and 1993. For example, the new response category was created as 'no change', 'became widowed or separated/divorced', 'became married', and 'two changes' for marital status variable according to the difference situations between 1989 and 1993. With regard to diseases, for instance, the new response category of 'new problem', 'no change', and 'no longer a problem in 1993' was generated for the arthritis or rheumatism problem variable. However, the age variable used was the participants' age in 1993; the gender and socioeconomic class variables were those used in 1989; the standardised SAD score used the difference between 1989 and 1993 (the score in 1989 minus the score in 1993). Finally, statistical methods are the same as Section 5.2.1.

## 5.3 Results

### 5.3.1 Identifying predictors of life satisfaction

To start with, this section answers the research question: what factors are associated with life satisfaction among older people? The results from the analysis of these data also allow us to compare and answer the question: what are the differences between the UK and Taiwan?

#### 5.3.1.1 Life satisfaction as a continuous variable

Stepwise regression models were used to examine factors related to life satisfaction as a continuous variable in the NLSAA and SHLSET studies, and in the combined datasets from 1989 and from 1993. Multiple linear regression used stepwise method with criteria as probability-of-F-to-enter  $\leq 0.050$  and probability-of-F-to-remove  $\geq 0.100$ .

#### The NLSAA study in 1989

Table 5.1 presents the results of stepwise regression analysis to identify predictors of life satisfaction in the NLSAA study. Stepwise regression was conducted to determine the best linear combination of variables. The following possible variables were included in the final model: standardised SAD score, loneliness, self-rated health, satisfaction with income, friends, walking aid use, religious group participation, and other club or organisation participation. This combination of variables significantly predicted life satisfaction,  $F_{(8,541)} = 49.373$ ,  $p < 0.001$ , with all eight variables contributing significantly to the prediction.

Eight variables were included in the final model to predict life satisfaction in the 1989 NLSAA study, and together these explained these 65.0% of the variance in life satisfaction. The standardised SAD score (25.8% of the variance) explained the largest share of this variance, followed by loneliness (5.0%), self-rated health (3.6%), satisfaction with income (2.6%), having friends (1.9%), using a walking aid (1.2%), attending a religious group (0.4%), and attending a club or organisation (0.5%).

**Table 5.1: Factors affecting life satisfaction in the 1989 NLSAA (N=549) in 1989.**

Model <sup>1</sup>		r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1	Standardised SAD score	0.509	0.258	–	-0.509	-1.078–-0.811	<0.001
2	Loneliness	0.557	0.308	0.050	0.240	7.049–13.380	<0.001
3	Self-rated health	0.590	0.344	0.036	0.214	2.526–5.234	<0.001
4	Satisfaction with income	0.612	0.370	0.026	0.162	4.775–11.461	<0.001
5	Friend	0.628	0.389	0.019	0.144	4.056–10.928	<0.001
6	Walking aid use	0.638	0.401	0.012	-0.117	-9.387–-2.550	0.001
7	Religious group	0.645	0.409	0.008	0.097	1.404–7.412	0.004
8	Club or organisation	0.650	0.413	0.004	0.077	0.472–6.031	0.022

1. The excluded variables include age, gender, marital status, perceived health relative to peers, number of people living in household, socioeconomic class, smoking, arthritis or rheumatism, heart trouble, stomach problems, dizziness, high blood pressure problem, urinary incontinence, reading a newspaper or journal, having a pet, having a TV or radio, and difficulties with walking.

In regression model 1, the relationship between the standardised SAD score variable and the standardised life satisfaction score was negative (-0.509), meaning that 0.509 point would be subtracted from an individual’s predicted standardised life satisfaction score for each increase in the standardised SAD score. As well, 0.117 point would be subtracted from standardised life satisfaction score in model 6 if a person used a walking aid.

All eight variables significantly contribute to life satisfaction, and suggest that higher levels of depression, being lonely, and using a walking aid contribute most to predicting lower life satisfaction. On the other hand, older people who rated their health better than peers, were satisfied with income, had friends, attended a religious group, and attended some other club or organisation tended to be associated with higher life satisfaction.

**The SHLSET study in 1989**

Table 5.2 shows the results of stepwise regression analysis to identify predictors of life satisfaction in the SHLSET study conducted in Taiwan in 1989. The full model was statistically significant ( $F_{(9, 790)} = 53.667, p < 0.001$ ), with all nine variables contributing significantly to the prediction.

As can be seen in Table 5.2, nine variables were included in the final model to predict life satisfaction in SHLSET in 1989, a model that explained 61.6% of the variance in life satisfaction. Self-rated health (18.2% of the variance) explained the largest share of this variance, followed by satisfaction with income (9.0%), standardised SAD score (4.8%), perceived health relative to peers (2.3%), marital status (1.5%), loneliness (0.4%), socioeconomic class (0.4%), heart problem (0.3%), and walking difficulties (0.3%).

**Table 5.2: The factors affecting life satisfaction in SHLSET (N=800) in 1989.**

Model <sup>1</sup>	r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1 Self-rated health	0.428	0.182	–	0.428	8.523–11.450	<0.001
2 Satisfaction with income	0.523	0.272	0.090	0.310	12.052–17.966	<0.001
3 Standardised SAD score	0.568	0.320	0.048	-0.246	-0.489–-0.288	<0.001
4 Perceived health relative to peers	0.588	0.343	0.023	0.196	4.159–9.026	<0.001
5 Marital status	0.602	0.358	0.015	0.127	3.416–8.790	<0.001
6 Socioeconomic class	0.605	0.362	0.004	-0.069	-4.295–-0.400	0.018
7 Loneliness	0.609	0.366	0.004	-0.078	-7.756–-0.846	0.015
8 Heart problem	0.613	0.369	0.003	0.069	0.661–7.176	0.018
9 Walking difficulties	0.616	0.372	0.003	-0.066	-6.793–-0.333	0.031

1. The excluded variables included age, gender, number of people living in household, smoking, arthritis or rheumatism, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, taking newspaper or journal, attending religious group, attending club or organisation, having a pet, having a TV or radio, having friend, and using walking aid.

In the regression model 3, the relationship between the standardised SAD score variable and the standardised life satisfaction score was negative (-0.246), meaning that 0.246 point would be subtracted from an individual's predicted standardised life satisfaction score for each increase in the standardised SAD score. 0.069 point would be subtracted from standardised life satisfaction score in model 6 if a person were in lower levels of socioeconomic class. 0.078 point would be reduced from standardised life satisfaction score if a person felt lonely. As well, 0.066 would be reduced from standardised life satisfaction score if a person had walking problems.

Interestingly, in the SHLSET study, nine variables significantly contributed to reduced life satisfaction: higher levels of depression, being married, being lonely, belonging to a lower socioeconomic class, and having walking difficulties were related to low life satisfaction. However, being satisfied with income, reporting better health relative to one's peers, and having heart problems made one more likely to have a higher level of life satisfaction. Compared to the UK older people, in 1989, demographic factors (e.g., marital status and socioeconomic class) and health appeared to exert more effect on life satisfaction among older people in Taiwan.

### The NLSAA study in 1993

Table 5.3 presents the results of stepwise regression analysis to identify predictors of life satisfaction in the UK NLSAA study in 1993. This combination of variables significantly predicted life satisfaction,  $F_{(10, 343)} = 22.447$   $p < 0.001$ , with all ten variables contributing significantly to the prediction. The adjusted R squared value was 0.378, indicating that 37.8% of the variance in life satisfaction was explained by the model.

## Chapter 5 Predictors of life satisfaction

Ten variables were included to predict life satisfaction in older people in 1993. The standardized SAD score (19.2% of the variance) explained the greatest percentage of this variance, followed by self-rated health (7.2%), loneliness (2.3%), walking difficulty (2.6%), satisfaction with income (1.9%), attending a religious group (1.1%), reading a newspaper or journal (0.7%), gender (1.1%), living status (1.1%), and having high blood pressure (0.6%).

**Table 5.3: The factors affecting life satisfaction in the NLSAA (N=352) in 1993.**

Model <sup>1</sup>		r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1	Standardised SAD score	0.441	0.192	—	-0.441	-1.063--0.689	<0.001
2	Self-rated health	0.518	0.264	0.072	0.293	3.522-7.007	<0.001
3	Loneliness	0.542	0.287	0.023	-0.163	-10.298--2.928	<0.001
4	Walking difficult	0.566	0.313	0.026	-0.177	-11.434--3.559	<0.001
5	Satisfaction with income	0.585	0.332	0.019	0.147	3.413-13.195	0.001
6	Religious group	0.595	0.343	0.011	0.112	1.163-9.015	0.011
7	Newspaper or journal read	0.603	0.350	0.007	0.098	0.775-12.180	0.026
8	Gender	0.613	0.361	0.011	0.116	1.207-8.670	0.009
9	Living status	0.623	0.372	0.011	0.099	0.274-5.788	0.009
10	High blood pressure	0.629	0.378	0.006	-0.088	-8.211--0.224	0.036

1. The excluded variables include age, marital status, perceived health relative to peers, socioeconomic class, smoking, arthritis or rheumatism, heart trouble, stomach problem, giddiness problem, urinary incontinence, attending club or organisation, having friends, having a pet, having a TV or radio, and walking problem.

In the regression model 1, the relationship between the standardised SAD score variable and the standardised life satisfaction score was negative (-0.441), meaning that 0.441 point would be subtracted from an individual's predicted standardised life satisfaction score for each increase in the standardised SAD score. 0.088 point would be subtracted from standardised life satisfaction score in model 6 if a person had high blood pressure. 0.163 point would be reduced from standardised life satisfaction score if a person felt lonely. As well, 0.177 would be reduced from standardised life satisfaction score if a person had walking problems.

As can be seen in Table 5.3, ten variables significantly contributed to life satisfaction in the NLSAA study: higher levels of depression, feeling lonely, using a walking aid, and having high blood pressure contributed most to reduced life satisfaction. However, none exerted a large effect (<1). Self-reported better health, satisfaction with income, attending a religious group, reading a newspaper or journal, being male, and living with someone else were associated with higher life satisfaction.

### The SHLSET study in 1993

Table 5.4 shows the results of stepwise regression analysis to identify predictors of life satisfaction in the SHLSET study conducted in Taiwan in 1993. This combination

of variables significantly predicted life satisfaction,  $F_{(8, 632)}=33.692, p<0.001$ , with all eight variables contributing significantly to the model. The R squared value was 0.29, indicating that 29% of the variance in life satisfaction was explained by the model.

As can be seen in Table 5.4, eight variables were included in the final model to predict life satisfaction in SHLSET in 1993. Self-rated health (14.9% of the variance) explained much of this variance, followed by satisfaction with income (6.6%), loneliness (3.8%), perceived health relative to peers (1.4%), having a TV or radio (1.0%), smoking (0.5%), having arthritis or rheumatism (0.4%), and walking difficulties (0.4%).

**Table 5.4: The factors affecting life satisfaction in SHLSET (N=640) in 1993.**

Model <sup>1</sup>	r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1 Self-rated health	0.387	0.149	–	0.387	10.141–14.741	<0.001
2 Satisfaction with income	0.467	0.215	0.066	0.266	13.679–23.495	<0.001
3 Loneliness	0.506	0.253	0.038	-0.202	-21.812–-10.654	<0.001
4 Perceived health relative to peers	0.521	0.267	0.014	0.157	3.718–12.164	<0.001
5 TV or radio	0.532	0.277	0.010	0.107	4.510–19.738	0.002
6 Smoking	0.537	0.282	0.005	-0.078	-11.971–-0.942	0.022
7 Arthritis or rheumatism	0.542	0.286	0.004	0.071	0.321–11.141	0.038
8 Walking difficult	0.547	0.290	0.004	-0.080	-14.461 –-0.933	0.026

1. The excluded variables include age, gender, marital status, Standardised SAD score, number of people living in household, socioeconomic class, heart trouble, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, taking newspaper or journal, having a pet, attending religious group, attending club or organisation, having friends, and walking aid use.

In the regression model 3, the relationship between the loneliness variable and the standardised life satisfaction score was negative (-0.202), meaning that 0.202 point would be subtracted from an individual’s predicted standardised life satisfaction score for each increase in the standardised SAD score. 0.078 point would be subtracted from the standardised life satisfaction score in model 6 if a person had smoking habit. 0.080 point would be reduced from the standardised life satisfaction score if a person had walking problems.

In 1993, all eight variables contributed significantly to life satisfaction in Taiwanese older people: self-rated better health, satisfaction with income, self-reported better health relative to one’s peers, having a TV or radio, and not having arthritis or rheumatism contributed most to increase life satisfaction. However, being lonely, smoking, and using a walking aid contributed to a lower-level of life satisfaction.



**The combined dataset of 1989**

Table 5.5 shows the results of stepwise regression analysis to identify predictors of life satisfaction in the combined dataset from 1989. This combination of variables significantly predicted life satisfaction,  $F_{(10, 1339)} = 78.025$ ,  $p < 0.001$ , with all thirteen variables contributing significantly to the prediction. The adjusted R squared value was 0.368, indicating that 36.8% of the variance in life satisfaction was explained by the model.

Ten variables were included in the final model to predict life satisfaction in the combined dataset from 1989, and these together explained 60.7% of the variance in life satisfaction. The standardized SAD score (19.1% of the variance) explained the largest share of this variance, followed by self-rated health (6.7%), satisfaction with income (4.1%), living status (2.1%), having friends (1.1%), marital status (0.5%), study location (0.7%), reading newspaper or journal (0.3%), using a walking aid (0.2%), and attending a club or organisation (0.2%).

**Table 5.5: The factors affecting life satisfaction in the combined data set (N=1,350) in 1989.**

Model <sup>1</sup>	r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1 Standardised SAD score	0.437	0.191	–	-0.437	-0.758–-0.608	<0.001
2 Self-rated health	0.508	0.257	0.067	0.286	4.937–7.068	<0.001
3 Satisfaction with income	0.547	0.298	0.041	0.211	7.607–11.942	<0.001
4 Living status	0.567	0.319	0.021	0.154	6.188–11.416	<0.001
5 Perceived health relative to peers	0.579	0.333	0.014	0.152	3.125–6.709	<0.001
6 Friend	0.589	0.344	0.011	0.109	4.698–11.064	<0.001
7 Marital status	0.593	0.349	0.005	0.081	1.423–5.912	0.001
8 Study location	0.600	0.356	0.007	0.123	2.933–8.476	<0.001
9 Newspaper or journal reading	0.602	0.359	0.003	0.076	0.991–5.953	0.006
10 Walking aid use	0.605	0.361	0.002	-0.055	-6.343–-0.670	0.015
11 Club or organisation attending	0.607	0.363	0.002	0.057	0.578–5.890	0.017

1. The excluded variables include age, gender, number of people living in household, socioeconomic class, smoking, arthritis or rheumatism, heart trouble, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, loneliness, having a pet, having a TV or radio, and walking difficult.

In the regression model 1, the relationship between the standardised SAD score variable and the standardised life satisfaction score was negative (-0.437), meaning that 0.437 point would be subtracted from an individual’s predicted standardised life satisfaction score for each increase in the standardised SAD score. 0.055 point would be subtracted from standardised life satisfaction score in model 10 if a person had walking problems.

All eleven variables contributed significantly to life satisfaction in the combined dataset from 1989. Higher levels of depression contributed most to lower levels of life

satisfaction, and using a walking aid also predicted lower levels of life satisfaction. People reported better health, were satisfied with their personal income, were living with someone else, rated their own health as better than their peers, had friends, were from the UK, read newspapers or journals, attended a club or organisation, and attended a religious group tended to have high life satisfaction.

**The combined dataset of 1993**

Table 5.6 presents the results of stepwise regression analysis to identify predictors of life satisfaction in the combined dataset from 1993. This combination of variables significantly predicted life satisfaction,  $F_{(8, 985)} = 47.852$ ,  $p < 0.001$ , with all nine variables contributing significantly to the model. The adjusted R squared value was 0.298, indicating that 29.8 of the variance in life satisfaction was explained by the model.

As can be seen in Table 5.6, nine variables were included in the final model to predict life satisfaction in the combined dataset from 1993. The study location variable was not selected and no longer showed a significant relationship with the standardised life satisfaction score. Self-rated health (14.6% of the variance) explained the largest percentage of this variance, followed by satisfaction with income (6.3%), loneliness (3.4%), perceived health relative to peers (2.0%), having a TV or radio (1.0%), standardised SAD score (0.9%), walking difficult (0.9%), living status (0.3%) and religious group (0.4%).

**Table 5.6: The factors affecting life satisfaction in the combined data set (N=993) in 1993.**

Model <sup>1</sup>	r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1 Self-rated health	0.384	0.146	–	0.384	9.064–12.260	<0.001
2 Satisfaction with income	0.458	0.209	0.063	0.254	12.753–19.969	<0.001
3 Loneliness	0.495	0.243	0.034	-0.191	-15.742–-8.691	<0.001
4 Perceived health relative to peers	0.515	0.263	0.020	0.176	4.875–10.747	<0.001
5 TV or radio	0.526	0.273	0.010	0.109	6.591–19.693	<0.001
6 Standardised SAD score	0.536	0.282	0.009	-0.113	-0.305–-0.093	<0.001
7 Walking difficult	0.544	0.291	0.009	-0.100	-11.368–-3.203	<0.001
8 Living status	0.548	0.294	0.003	0.072	1.137–9.317	0.012
9 Religious group	0.552	0.298	0.004	0.067	1.107–10.297	0.015

1. The excluded variables include age, gender, marital status, number of people living in household, socioeconomic class, arthritis or rheumatism, heart trouble, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, taking newspaper or journal, having a pet, having friends, attending club or organisation, location studies, and walking problem.

In the regression model 6, the relationship between the standardised SAD score variable and the standardised life satisfaction score was negative (-0.113), meaning that 0.113 point would be subtracted from an individual’s predicted standardised life

satisfaction score for each increase in the standardised SAD score. 0.191 point would be subtracted from the standardised life satisfaction score in model 3 if a person had walking problems. As well, 0.1 point would be reduced from the standardised life satisfaction score if a person had walking problem.

In 1993, nine variables contributed significantly to life satisfaction in the combined datasets. Self-rated better health contributed most to higher life satisfaction, but also contributing were being satisfied with one's income, reporting better health than one's peers, having a TV or radio, living with someone, and attending a religious group. On the other hand, people who had higher levels of depression, felt lonely, and used a walking aid were more likely to have lower life satisfaction.

### **5.3.1.2 Life satisfaction as a categorical variable**

Older people assessed their life satisfaction score and this covered the full range from extremely satisfy to extremely dissatisfied. To understand factors affecting whether people had high or low life satisfaction, the continuous scale was dichotomised.

To identify which predictors affect both higher and lower levels of life satisfaction, and to compare higher and lower levels of life satisfaction and each of the harmonisation dataset variables for 1989 and 1993, the standardised LSI score was converted into a dichotomous variable (i.e., a high versus a low level of life satisfaction) according to its median score, to be the dependent variable. The median score was 69.23 in the NLSAA study in both 1989 and 1993; 70.00 (1989) and 50.00 (1993) in SHLSET; and 69.23 (1989) and 61.54 (1993) in the combined data sets.

The independent variables examined are those presented in Section 5.2. In order to compare predictors in the differences between high and low life satisfaction, the dichotomous dependent variable and all independent variables were examined using Mann-Whitney U tests, chi-squared tests, and logistic regression analysis. Mann-Whitney U tests were used to evaluate continuous independent variables. Separate chi-square tests were used to test the null hypothesis that there were no associations between those variables and the level of life satisfaction. Variables with a significant association with high/low life satisfaction were then included in logistic regression models.

### 5.3.1.2.1 Mann-Whitney U tests for continuous independent variables

#### The NLSAA and SHLSET in 1989

Table 5.7 shows the results of the Mann-Whitney U tests on continuous independent variables in the NLSAA and SHLSET datasets in 1989.

**Table 5.7: Results of M-W U tests for high and low of life satisfaction in the NLSAA and SHLSET in 1989.**

Study	Variable	Low life	High life	Z	p
		satisfaction	satisfaction		
		Mean Rank (N)	Mean Rank (N)	statistic	value
NLSAA	Age	326.83 (373)	323.71 (277)	-0.209	0.834
	Standardised SAD score	375.04 (370)	255.82 (277)	-8.255	<0.001
	Number of people living in household	304.80 (370)	348.57 (276)	-3.304	<0.001
SHLSET	Age	682.58 (642)	662.31 (701)	-0.956	0.339
	Standardised SAD score	762.72 (634)	571.51 (691)	-9.115	<0.001
	Number of people living in household	643.40 (641)	697.20 (701)	-2.558	0.011

Overall, there was a significant difference in the mean rank for the standardised SAD score (Z statistic=-8.255;  $p<0.001$ ) in the NLSAA. Older people in the low life satisfaction group had high levels of depression in 1989. There also was a significant difference between the two groups in the mean rank for the number of people living in the household (Z statistic=-3.304;  $p<0.001$ ) in the NLSAA. Older people with high life satisfaction lived with more people in the household than their counterparts with low life satisfaction. The SHLSET study in 1989, older people in the high life satisfaction group had low levels of depression (Z statistic=-9.115;  $p<0.001$ ) and lived with more people in the household (Z statistic=-2.558;  $p=0.011$ ) relative to those in the low life satisfaction group.

#### The NLSAA and SHLSET datasets in 1993

Table 5.8 presents the data on continuous independent variables for participants in the NLSAA and SHLSET datasets in 1993.

**Table 5.8: Results of M-W U tests for high and low life satisfaction in the NLSAA and SHLSET in 1993.**

Study	Variable	Low life	High life	Z	p
		satisfaction	satisfaction		
		Mean Rank (N)	Mean Rank (N)	statistic	value
NLSAA	Age	204.16 (165)	181.87 (217)	1.955	0.051
	Standardised SAD score	234.92 (165)	158.48 (217)	-7.025	<0.001
	Number of people living in household	173.25 (163)	203.46 (217)	-2.981	0.003
SHLSET	Age	513.44 (560)	487.54 (443)	-1.406	0.160
	Standardised SAD score	501.58 (458)	395.29 (440)	-6.168	<0.001
	Number of people living in household	487.52 (556)	515.66 (443)	-1.544	0.123

There was no significant difference with respect to age between the high and low life satisfaction groups in the two studies. In the NLSAA study, participants with high life satisfaction had low levels of depression and lived with some else compared with those with low life satisfaction. Older people in SHLSET in 1993 who had a high level of depression tended to have low life satisfaction.

**The combined datasets in 1989 and 1993**

Table 5.9 shows the results of the Mann-Whitney U tests on continuous independent variables from the combined datasets in 1989 and 1993.

**Table 5.9: Results of M-W U tests for high and low life satisfaction in the combined data sets in 1989 and 1993.**

Study	Variable	Low life satisfaction	High life satisfaction	Z statistic	p value
		Mean Rank (N)	Mean Rank (N)		
1989	Age	1013.43 (963)	981.64 (1030)	-1.232	0.218
	Standardised SAD score	1136.43 (952)	846.57 (1020)	-11.349	<0.001
	Number of people living in household	955.25 (959)	1031.08 (1029)	-2.972	0.003
1993	Age	513.44 (560)	487.54 (443)	-1.406	0.160
	Standardised SAD score	501.58 (458)	395.29 (440)	-6.168	<0.001
	Number of people living in household	487.52 (556)	515.66 (443)	-1.544	0.123

There was a significant difference in the mean rank for the standardised SAD score (Z statistic=-11.349;  $p<0.001$ ) and the number of people living in the household (Z statistic=-2.972;  $p=0.003$ ) in the combined dataset of 1989. Participants in the two studies with high life satisfaction had low levels of depression and lived with other people compared with those with low life satisfaction.

In the 1993 combined dataset, there was a significant difference in the mean rank for the standardised SAD score (Z statistic=-6.168;  $p<0.001$ ). Older people with high life satisfaction had high levels of depression compared with those with low life satisfaction. The difference in the mean rank for the number of people living in the household did not achieve a level of significance ( $p=0.123$ ) in 1993.

***5.3.1.2.2 Chi-square tests for categorical independent variables***

For the Chi-squared analyses, because of the large number of tests carried out,  $\alpha$  was set to 0.01 in order to reduce the likelihood of a Type I error.

**The NLSAA in 1989**

Table 5.10 presents variables associated with high and low life satisfaction in the NLSAA dataset from 1989.

As can be seen from the NLSAA data in Table 5.10, there was a significant association between level of life satisfaction and each of the following variables: marital status ( $\chi^2=11.951$ ;  $p=0.001$ ), living status ( $\chi^2=10.151$ ;  $p=0.001$ ), satisfaction with income ( $\chi^2=27.001$ ;  $p<0.001$ ), self-rated health ( $\chi^2=65.820$ ;  $p<0.001$ ), perceived health relative to peers ( $\chi^2=55.504$ ;  $p<0.001$ ), stomach problems ( $\chi^2=12.225$ ;  $p<0.001$ ), dizziness ( $\chi^2=16.717$ ;  $p<0.001$ ), urinary incontinence ( $\chi^2=7.723$ ;  $p=0.005$ ), walking aid use ( $\chi^2=12.432$ ;  $p<0.001$ ), loneliness ( $\chi^2=52.841$ ;  $p<0.001$ ), having friends ( $\chi^2=13.846$ ;  $p<0.001$ ), reading a newspaper or journal ( $\chi^2=7.103$ ;  $p=0.008$ ), and participating in a club or organisation ( $\chi^2=11.915$ ;  $p=0.001$ ).

**Table 5.10: Variables associated with high and low life satisfaction in the NLSAA in 1989.**

Variable	Low life satisfaction N (%)		High life satisfaction N (%)		Total (%)	$\chi^2$	p value
Gender							
Male	136 (36.5)		114 (41.2)		250 (38.5)	1.288	0.256
Female	237 (63.5)		163 (58.8)		400 (61.5)		
Marital status							
Married	140 (37.5)		141 (50.9)		281 (43.2)	11.951	0.001
Single	22 (5.9)		17 (6.1)		39 (6.0)		
Widowed	195 (52.3)		110 (39.7)		305 (46.9)		
Separated/Divorced	16 (4.3)		9 (3.2)		25 (3.8)		
Socioeconomic class							
Professional/intermediate	439 (13.2)		50 (18.1)		99 (15.3)	1.87	0.171
Skilled-non manual/ skilled-manual	229 (61.7)		162 (58.7)		391 (60.4)		
Semiskilled/unskilled	93 (25.1)		64 (23.2)		157 (24.3)		
Living status							
Living with someone	170 (46.1)		163 (59.1)		333 (51.6)	10.151	0.001
Living alone	199 (53.9)		113 (40.9)		312 (48.4)		
Satisfied with income							
No	109 (29.5)		33 (12.0)		142 (22.0)	27.001	<0.001
Yes	261 (70.5)		242 (88.0)		503 (78.0)		
Self-rated health							
Poor	42 (11.3)		5 (1.8)		47 (7.2)	65.820	<0.001
Fair	86 (23.1)		28 (10.1)		114 (17.6)		
Average	83 (22.3)		43 (15.6)		126 (19.4)		
Good	129 (34.6)		140 (50.7)		269 (41.4)		
Excellent	33 (8.8)		60 (21.7)		93 (14.3)		
Perceived health relative to peers							
Less healthy	60 (16.6)		8 (2.9)		68 (10.7)	55.504	<0.001
About as healthy	181 (50.0)		103 (37.7)		284 (44.7)		
More healthy	121 (33.4)		162 (59.3)		283 (44.6)		
Smoking							
Yes	84 (23.1)		56 (20.5)		140 (22.0)	0.458	0.499
No	280 (76.9)		217 (79.5)		497 (78.0)		
Arthritis or rheumatism							
Yes	203 (61.7)		160 (57.8)		390 (60.0)	0.852	0.356
No	143 (38.3)		117 (42.2)		260 (40.0)		
Heart problem							
Yes	83 (22.3)		48 (17.3)		131 (20.2)	2.098	0.147
No	290 (77.7)		229 (82.7)		519 (79.8)		
Stomach problem							
Yes	129 (34.6)		60 (21.7)		189 (29.1)	12.225	<0.001

No	244	(65.4)	217	(78.3)	461	(70.9)		
Giddiness problem								
Yes	172	(46.1)	83	(30.0)	255	(39.2)	16.717	<0.001
No	201	(53.9)	194	(70.0)	395	(60.8)		
High blood pressure								
Yes	93	(24.9)	51	(18.4)	144	(22.2)	3.551	0.060
No	280	(75.1)	226	(81.6)	506	(77.8)		
Urinary incontinence								
Yes	102	(27.5)	49	(17.8)	151	(23.4)	7.723	0.005
No	269	(72.5)	226	(82.2)	495	(76.6)		
Walking problem								
Difficulty	120	(32.9)	67	(24.2)	187	(29.1)	5.346	0.021
No difficulty	245	(67.1)	210	(75.8)	455	(70.9)		
Walking aid use								
Yes	89	(26.6)	37	(14.3)	126	(21.3)	12.432	<0.001
No	245	(73.4)	221	(85.7)	466	(78.7)		
Loneliness								
Lonely	193	(51.7)	221	(79.8)	414	(63.7)	52.841	<0.001
Not lonely	180	(48.3)	56	(20.2)	236	(36.3)		
Friends								
Some friends	276	(74.0)	239	(86.3)	515	(79.2)	13.846	<0.001
No friend	97	(26.0)	38	(13.7)	135	(20.8)		
Newspaper or journal								
Yes	320	(85.8)	257	(92.8)	577	(88.8)	7.103	0.008
No	53	(14.2)	20	(7.2)	73	(11.2)		
Religious group								
Yes	87	(23.3)	88	(31.8)	175	(26.9)	5.340	0.021
No	286	(76.7)	189	(68.2)	475	(73.1)		
TV or radio								
Yes	346	(93.0)	260	(93.9)	606	(93.4)	0.074	0.786
No	26	(7.0)	17	(6.1)	43	(6.6)		
Club or organisation								
Yes	114	(30.6)	122	(44.0)	236	(36.3)	11.915	0.001
No	259	(69.4)	155	(56.0)	414	(63.7)		
Pets								
Yes	91	(24.4)	63	(22.7)	154	(23.7)	0.158	0.691
No	282	(75.6)	214	(77.3)	496	(76.3)		

In 1989, older people from the NLSAA who were married, living with someone, or more satisfied with their income, reported good or excellent health, felt that they were more healthy than their peers, did not have a stomach problem, dizziness, and urinary incontinence, did not use a walking aid, felt lonely, had friends, read a newspaper or journal, and attended some other club or organisation were more likely to report a high level of life satisfaction.

### The SHLSET study in 1989

Table 5.11 shows the variables that were associated with high versus low life satisfaction in the SHLSET dataset from 1989.

Table 5.11 indicates that there was a significant association between life satisfaction and gender ( $\chi^2=11.655$ ;  $p=0.001$ ), marital status ( $\chi^2=17.536$ ;  $p<0.001$ ), socioeconomic class ( $\chi^2=22.471$ ;  $p<0.001$ ), satisfaction with income ( $\chi^2=145.402$ ;  $p<0.001$ ), self-

rated health ( $\chi^2=126.750$ ;  $p<0.001$ ), perceived health relative to peers ( $\chi^2=101.425$ ;  $p<0.001$ ), having arthritis or rheumatism problems ( $\chi^2=7.867$ ;  $p=0.005$ ), having stomach problems ( $\chi^2=15.318$ ;  $p<0.001$ ), having urinary incontinence ( $\chi^2=11.456$ ;  $p=0.001$ ), having walking difficulties ( $\chi^2=44.202$ ;  $p<0.001$ ), using a walking aid ( $\chi^2=11.722$ ;  $p=0.001$ ), feeling lonely ( $\chi^2=52.702$ ;  $p<0.001$ ), reading a newspaper or journal ( $\chi^2=46.237$ ;  $p<0.001$ ), attending a religious group ( $\chi^2=7.775$ ;  $p=0.005$ ), and having a TV or radio ( $\chi^2=8.694$ ;  $p=0.003$ ).

**Table 5.11: Variables associated with high and low life satisfaction in SHLSET in 1989.**

Variable	Low life satisfaction N (%)		High life satisfaction N (%)		Total (%)		$\chi^2$	p value
Gender								
Male	313	(48.8)	408	(58.2)	721	(53.7)	11.655	0.001
Female	329	(51.2)	293	(41.8)	622	(46.3)		
Marital status								
Married	299	(46.6)	406	(58.0)	705	(52.6)	17.536	<0.001
Single	28	(4.4)	11	(1.6)	39	(2.9)		
Widowed	281	(43.8)	273	(39.0)	554	(41.3)		
Separated/Divorced	33	(5.1)	10	(1.4)	43	(3.2)		
Socioeconomic class								
Professional/intermediate	44	(8.1)	102	(17.8)	146	(13.1)	22.471	<0.001
Skilled-non manual/skilled-manual	82	(15.1)	91	(15.9)	173	(15.5)		
Semiskilled/unskilled	416	(76.8)	379	(66.3)	795	(71.4)		
Living status								
Living with someone	640	(99.8)	701	(100)	1341	(99.9)	0.002	0.994
Living alone	1	(0.2)	0	(0)	1	(0.1)		
Satisfied with income								
No	475	(74.2)	290	(41.4)	765	(57.1)	145.402	<0.001
Yes	165	(25.8)	410	(58.6)	575	(42.9)		
Self-rated health								
Poor	50	(7.8)	11	(1.6)	61	(4.5)	126.750	<0.001
Fair	189	(29.4)	81	(11.6)	270	(20.1)		
Average	254	(39.6)	295	(42.1)	549	(40.9)		
Good	103	(16.0)	174	(24.8)	277	(20.6)		
Excellent	46	(7.2)	140	(20.0)	186	(13.8)		
Perceived health relative to peers								
Less healthy	205	(31.9)	80	(11.4)	285	(21.2)	101.425	<0.001
About as healthy	305	(47.5)	346	(49.4)	651	(48.5)		
More healthy	132	(20.6)	275	(39.2)	407	(30.3)		
Smoking								
Yes	185	(28.9)	215	(30.7)	400	(29.8)	0.441	0.507
No	456	(71.1)	486	(69.3)	942	(70.2)		
Arthritis or rheumatism								
Yes	218	(34.0)	181	(26.8)	406	(30.3)	7.867	0.005
No	423	(66.0)	513	(73.2)	936	(69.7)		
Heart problem								
Yes	158	(24.7)	133	(19.0)	291	(21.7)	5.965	0.015
No	482	(75.3)	566	(81.0)	1048	(78.3)		
Stomach problem								
Yes	176	(27.5)	128	(18.3)	304	(22.7)	15.318	<0.001
No	465	(72.5)	570	(81.7)	1035	(77.3)		
Giddiness problem								
Yes	32	(5.1)	22	(3.1)	54	(4.1)	2.697	0.101
No	598	(94.9)	677	(96.9)	1275	(95.9)		
High blood pressure								
Yes	165	(25.8)	186	(26.6)	351	(26.2)	0.070	0.791
No	474	(74.2)	513	(73.4)	987	(73.8)		
Urinary incontinence								



## Chapter 5 Predictors of life satisfaction

Yes	99	(15.4)	64	(9.2)	163	(12.2)	11.456	0.001
No	543	(84.6)	631	(90.8)	1174	(87.8)		
Walking problem								
Difficulty	227	(35.4)	134	(19.1)	361	(26.9)	44.202	<0.001
No difficulty	414	(64.6)	566	(80.9)	980	(73.1)		
Walking aid use								
Yes	92	(14.3)	58	(8.3)	150	(11.2)	11.722	0.001
No	570	(85.7)	642	(91.7)	1192	(88.8)		
Loneliness								
Lonely	216	(33.6)	115	(16.4)	1012	(75.4)	52.702	<0.001
Not lonely	426	(66.4)	586	(83.6)	331	(24.6)		
Friends								
Some friends	432	(93.1)	546	(95.6)	978	(94.5)	2.654	0.103
No friend	32	(6.9)	25	(4.4)	57	(5.5)		
Newspaper or journal								
Yes	142	(22.1)	276	(39.5)	418	(31.2)	46.237	<0.001
No	500	(77.9)	423	(60.5)	923	(68.8)		
Religious group								
Yes	44	(6.9)	80	(11.4)	124	(9.2)	7.775	0.005
No	598	(93.1)	621	(88.6)	1219	(90.8)		
TV or radio								
Yes	580	(90.3)	662	(94.7)	1242	(92.6)	8.694	0.003
No	62	(9.7)	37	(5.3)	99	(7.4)		
Club or organisation								
Yes	31	(4.8)	58	(8.3)	89	(6.6)	5.847	0.016
No	610	(95.2)	643	(91.7)	1253	(93.4)		
Pets								
Yes	80	(12.5)	105	(15.0)	185	(13.8)	1.605	0.205
No	560	(87.5)	593	(85.0)	1153	(86.2)		

Participants who were male, married, in semiskilled or unskilled labour, satisfied with their income, reported average, good, or excellent self-rated health, felt that their health was about as good or better than their peers, did not have arthritis or rheumatism, stomach problems, urinary incontinence, or walking difficulties, were not using a walking aid, did not feel lonely, did not read a newspaper or journal, did not attend a religious group, and had a TV or radio were more likely to report a high level of life satisfaction.

From these results, it is clear that gender, socioeconomic class, having arthritis or rheumatism, having a heart problem, and having a TV or radio were more likely to affect life satisfaction in the Taiwanese SHLSET study in 1989 than in the UK NLSAA study in 1989. However, living status and feeling dizzy were more likely to influence people's life satisfaction in the UK versus Taiwan.

### The NLSAA study in 1993

Table 5.12 presents variables associated with high and low life satisfaction in the NLSAA dataset from 1993.

Among UK older people in 1993, a significant association was identified between life satisfaction and marital status ( $\chi^2=9.163$ ;  $p=0.002$ ), living status ( $\chi^2=9.255$ ;  $p=0.002$ ),

self-rated health ( $\chi^2=48.663$ ;  $p<0.001$ ), health compared with one's peer group ( $\chi^2=28.935$ ;  $p<0.001$ ), stomach problems ( $\chi^2=11.116$ ;  $p=0.001$ ), dizziness ( $\chi^2=15.974$ ;  $p<0.001$ ), urinary incontinence ( $\chi^2=6.103$ ;  $p=0.013$ ), walking problems ( $\chi^2=21.316$ ;  $p<0.001$ ), use of a walking aid ( $\chi^2=35.250$ ;  $p<0.001$ ), loneliness ( $\chi^2=19.705$ ;  $p<0.001$ ), and reading newspaper or journal ( $\chi^2=9.989$ ;  $p=0.002$ ).

**Table 5.12: Variables associated with high and low life satisfaction in the NLSAA in 1993.**

Variable	Low life satisfaction N (%)		High life satisfaction N (%)		Total (%)		$\chi^2$	p value
Gender								
Male	21	(27.3)	110	(36.1)	131	(34.3)	1.737	0.187
Female	56	(72.7)	195	(63.9)	251	(65.7)		
Marital status							9.163	0.002
Married	19	(24.7)	134	(43.9)	153	(40.1)		
Single	4	(5.2)	18	(5.9)	22	(5.8)		
Widowed	51	(66.2)	141	(46.2)	192	(50.3)		
Separated/Divorced	3	(3.9)	12	(3.9)	15	(3.9)		
Socioeconomic class							0.005	0.944
Professional/intermediate	12	(15.6)	54	(17.8)	66	(17.3)		
Skilled-non manual/skilled-manual	48	(62.3)	178	(58.6)	226	(59.3)		
Semiskilled/unskilled	17	(22.1)	72	(23.7)	89	(23.4)		
Living status							9.255	0.002
Living with someone	30	(39.5)	182	(59.7)	212	(55.6)		
Living alone	46	(60.5)	123	(40.3)	169	(44.4)		
Satisfied with income							0.264	0.608
No	13	(16.9)	42	(13.8)	55	(14.4)		
Yes	64	(83.1)	263	(86.2)	327	(85.6)		
Self-rated health							48.663	<0.001
Poor	19	(24.7)	9	(3.0)	28	(7.3)		
Fair	22	(28.6)	56	(18.4)	78	(20.4)		
Average	18	(23.4)	65	(21.3)	83	(21.7)		
Good	17	(22.1)	130	(42.6)	147	(38.5)		
Excellent	1	(1.3)	45	(14.8)	46	(12.0)		
Perceived health relative to peers							28.935	<0.001
Less healthy	16	(20.8)	19	(6.2)	35	(9.2)		
About as healthy	44	(57.1)	128	(42.0)	172	(45.0)		
More healthy	17	(22.1)	158	(51.8)	175	(45.8)		
Smoking							0.767	0.381
Yes	16	(20.8)	48	(15.8)	64	(16.8)		
No	61	(79.2)	256	(84.2)	317	(83.2)		
Arthritis or rheumatism							3.900	0.048
Yes	56	(73.7)	185	(60.7)	241	(63.3)		
No	20	(26.3)	120	(39.3)	140	(36.7)		
Heart problem							2.940	0.086
Yes	23	(29.9)	61	(20.0)	84	(22.0)		
No	54	(70.1)	244	(80.0)	298	(78.0)		
Stomach problem							11.116	0.001
Yes	29	(37.7)	58	(19.0)	87	(22.8)		
No	48	(62.3)	247	(81.0)	295	(77.2)		
Giddiness problem							15.974	<0.001
Yes	39	(50.6)	80	(26.2)	119	(31.2)		
No	38	(49.4)	225	(73.8)	263	(68.8)		
High blood pressure							0.838	0.360
Yes	22	(28.6)	69	(22.8)	91	(23.9)		
No	55	(71.4)	234	(77.2)	289	(76.1)		
Urinary incontinence							6.103	0.013
Yes	29	(37.7)	70	(23.0)	99	(26.0)		
No	48	(62.3)	234	(77.0)	282	(74.0)		
Walking problem							21.316	<0.001
Difficulty	41	(53.9)	76	(25.6)	117	(31.4)		

No difficulty	35	(46.1)	221	(74.4)	256	(68.6)		
Walking aid use								
Yes	48	(66.7)	85	(28.4)	133	(35.8)	35.250	<0.001
No	24	(33.3)	214	(71.6)	238	(64.2)		
Loneliness								
Lonely	58	(75.3)	141	(46.2)	199	(52.1)	19.705	<0.001
Not lonely	19	(24.7)	164	(53.8)	183	(47.9)		
Friends								
Some friends	65	(84.4)	268	(88.2)	333	(87.4)	0.479	0.489
No friend	12	(15.6)	36	(11.8)	48	(12.6)		
Newspaper or journal								
Yes	60	(77.9)	279	(91.5)	339	(88.7)	9.989	0.002
No	17	(22.1)	26	(8.5)	43	(11.3)		
Religious group								
Yes	17	(22.1)	85	(27.9)	102	(26.7)	0.778	0.378
No	60	(77.9)	220	(72.1)	280	(73.3)		
TV or radio								
Yes	77	(100)	304	(99.7)	381	(99.7)	0.000	1.000
No	0	(0)	1	(0.3)	1	(0.3)		
Club or organisation								
Yes	37	(48.1)	127	(41.6)	164	(42.9)	0.787	0.375
No	40	(51.9)	178	(58.4)	218	(57.1)		
Pets								
Yes	10	(13.0)	64	(21.0)	74	(19.4)	2.031	0.154
No	67	(87.0)	241	(79.0)	308	(80.6)		

In other words, people who were married or widowed, lived with someone, had rated their health as average or good, felt that they were about as healthy or more healthy than their peers, did not have stomach problems, did not have dizziness, did not have urinary incontinence, did not have walking difficulties, did not use a walking aid, did not feel lonely, and read a newspaper or journal were more like to have a high level of life satisfaction.

### The SHLSET study in 1993

Table 5.13 shows variables associated with high and low life satisfaction in the SHLSET dataset from 1993.

As shown in Table 5.13, there was a significant association between life satisfaction and living status ( $\chi^2=22.601$ ;  $p<0.001$ ), satisfaction with income ( $\chi^2=105.891$ ;  $p<0.001$ ), self-rated health ( $\chi^2=96.745$ ;  $p<0.001$ ), health compared to peers ( $\chi^2=93.942$ ;  $p<0.001$ ), using a walking aid ( $\chi^2=9.048$ ;  $p=0.003$ ), feeling lonely ( $\chi^2=84.554$ ;  $p<0.001$ ), reading a newspaper or journal ( $\chi^2=9.893$ ;  $p=0.002$ ), having a TV or radio ( $\chi^2=11.887$ ;  $p=0.001$ ), and having a pet ( $\chi^2=7.115$ ;  $p=0.008$ ).

**Table 5.13: Variables associated with high and low life satisfaction in SHLSET in 1993.**

Variable	Low life satisfaction N (%)		High life satisfaction N (%)		Total (%)	$\chi^2$	p value
<b>Gender</b>							
Male	141	(49.8)	390	(54.2)	531 (52.9)	1.369	0.242
Female	142	(50.2)	330	(45.8)	472 (47.1)		
<b>Marital status</b>							
Married	141	(49.8)	421	(58.6)	562 (56.1)	3.616	0.057
Single	15	(5.3)	7	(1.0)	22 (2.2)		
Widowed	118	(41.7)	272	(37.8)	390 (38.9)		
Separated/Divorced	9	(3.2)	19	(2.6)	28 (2.8)		
<b>Socioeconomic class</b>							
Professional/intermediate	22	(10.0)	80	(13.6)	102 (12.6)	2.054	0.152
Skilled-non manual/skilled-manual	31	(14.1)	88	(14.9)	119 (14.7)		
Semiskilled/unskilled	167	(75.9)	422	(71.5)	589 (72.7)		
<b>Living status</b>							
Living with someone	226	(80.1)	654	(91.2)	880 (88.1)	22.601	<0.001
Living alone	56	(19.9)	63	(8.8)	119 (11.9)		
<b>Satisfied with income</b>							
No	201	(71.0)	212	(34.0)	413 (45.6)	105.891	<0.001
Yes	82	(29.0)	411	(66.0)	493 (54.4)		
<b>Self-rated health</b>							
Poor	30	(10.6)	9	(1.4)	39 (4.2)	96.745	<0.001
Fair	94	(33.2)	100	(15.7)	194 (21.1)		
Average	100	(35.3)	231	(36.3)	331 (36.0)		
Good	42	(14.8)	161	(25.3)	203 (22.1)		
Excellent	17	(6.0)	136	(21.4)	153 (16.6)		
<b>Perceived health relative to peers</b>							
Less healthy	109	(38.8)	61	(9.9)	170 (18.9)	93.942	<0.001
About as healthy	130	(46.3)	351	(56.9)	481 (53.6)		
More healthy	42	(14.9)	205	(33.2)	247 (27.5)		
<b>Smoking</b>							
Yes	65	(23.0)	165	(22.9)	230 (22.9)	0.000	1.000
No	218	(77.0)	555	(77.1)	773 (77.1)		
<b>Arthritis or rheumatism</b>							
Yes	76	(27.4)	149	(21.3)	225 (23.0)	3.941	0.047
No	201	(72.6)	552	(78.7)	753 (77.0)		
<b>Heart problem</b>							
Yes	57	(21.4)	135	(19.0)	192 (19.7)	0.569	0.451
No	209	(78.6)	575	(81.0)	784 (80.3)		
<b>Stomach problem</b>							
Yes	31	(11.0)	61	(8.5)	92 (9.2)	1.219	0.270
No	252	(89.0)	659	(91.5)	911 (90.8)		
<b>Giddiness problem</b>							
Yes	1	(0.6)	2	(0.3)	3 (0.3)	0.000	1.000
No	282	(99.6)	718	(99.7)	1000 (99.7)		
<b>High blood pressure</b>							
Yes	82	(30.3)	223	(31.8)	305 (31.3)	0.142	0.706
No	189	(69.7)	479	(68.2)	668 (68.7)		
<b>Urinary incontinence</b>							
Yes	42	(15.3)	80	(11.3)	122 (12.4)	2.523	0.112
No	233	(84.7)	628	(88.7)	861 (87.6)		
<b>Walking problem</b>							
Difficulty	96	(33.9)	173	(24.0)	269 (26.8)	9.636	0.002
No difficulty	187	(66.1)	547	(76.0)	734 (73.2)		
<b>Walking aid use</b>							
Yes	63	(38.2)	102	(14.2)	165 (16.5)	9.048	0.003
No	220	(77.7)	617	(85.8)	837 (83.5)		
<b>Loneliness</b>							
Lonely	128	(45.2)	102	(16.3)	230 (25.3)	84.554	<0.001
Not lonely	155	(54.8)	523	(83.7)	678 (74.7)		
<b>Friends</b>							
Some friends	196	(69.8)	456	(73.1)	652 (72.0)	0.905	0.341
No friend	85	(30.2)	168	(26.9)	253 (28.0)		

Newspaper or journal								
Yes	61	(21.6)	229	(31.8)	290	(28.9)	9.893	0.002
No	222	(78.4)	491	(68.2)	713	(71.1)		
Religious group								
Yes	13	(4.6)	69	(9.6)	82	(8.2)	6.089	0.014
No	270	(95.4)	651	(90.4)	921	(91.8)		
TV or radio								
Yes	231	(81.6)	647	(89.9)	878	(87.5)	11.887	0.001
No	52	(18.4)	73	(10.1)	125	(12.5)		
Club or organisation								
Yes	11	(3.9)	45	(6.3)	56	(5.6)	1.727	0.189
No	272	(96.1)	675	(93.8)	947	(94.4)		
Pets								
Yes	29	(10.2)	124	(17.2)	153	(15.3)	7.115	0.008
No	254	(89.8)	596	(82.8)	850	(84.7)		

People who were living with someone were satisfied with their income, reported average, good or excellent self-rated health, felt that they were about as healthy or more healthy than their peers, were not using a walking aid, did not feel lonely, did not subscribe to a newspaper or journal, had a TV or radio, and had a pet were more like to have a high level of life satisfaction.

### The combined dataset in 1989

Table 5.14 the shows variables associated with high and low life satisfaction in the combined dataset from 1989. Chi-square tests were used to examine the combined dataset for understanding the relationship, if any, between study location and high and low life satisfaction.

As shown in Table 5.14, there was a significant association between level of life satisfaction and gender ( $\chi^2=15.344$ ;  $p<0.001$ ), marital status ( $\chi^2=34.791$ ;  $p<0.001$ ), socioeconomic class ( $\chi^2=18.126$ ;  $p<0.001$ ), living status ( $\chi^2=12.417$ ;  $p<0.001$ ), satisfaction with income ( $\chi^2=145.478$ ;  $p<0.001$ ), self-rated health ( $\chi^2=201.093$ ;  $p<0.001$ ), health compared to peers ( $\chi^2=153.450$ ;  $p<0.001$ ), having arthritis or rheumatism ( $\chi^2=11.525$ ;  $p=0.001$ ), having heart problems ( $\chi^2=9.180$ ;  $p=0.002$ ), having stomach problems ( $\chi^2=23.911$ ;  $p<0.001$ ), having dizziness ( $\chi^2=24.595$ ;  $p<0.001$ ), having urinary incontinence ( $\chi^2=18.910$ ;  $p<0.001$ ), having walking difficulties ( $\chi^2=54.694$ ;  $p<0.001$ ), using a walking aid ( $\chi^2=27.378$ ;  $p<0.001$ ), having friends ( $\chi^2=21.334$ ;  $p<0.001$ ), reading a newspaper or journal ( $\chi^2=35.853$ ;  $p<0.001$ ), attending a religious group ( $\chi^2=13.228$ ;  $p<0.001$ ), and attending a club or organisation ( $\chi^2=11.097$ ;  $p=0.001$ ).

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For comparing the two countries, the study of location variable did not show a significant in chi-square tests. Thus, there did not need to do further analysis, e.g., logistic regression analysis.

**Table 5.14: Variables associated with high and low life satisfaction in the combined data set in 1989.**

Variable	Low life satisfaction N (%)		High life satisfaction N (%)		Total (%)		$\chi^2$	P value
Study location								
NLSAA	321	(33.3)	329	(31.9)	650	(32.6)	0.377	0.539
SHLSET	642	(66.7)	701	(68.1)	1343	(67.4)		
Gender								
Male	425	(44.1)	546	(53.0)	971	(48.7)	15.344	<0.001
Female	538	(55.9)	484	(47.0)	1022	(51.3)		
Marital status								
Married	412	(42.8)	574	(55.8)	986	(49.5)	34.791	<0.001
Single	46	(4.8)	33	(3.1)	78	(3.9)		
Widowed	456	(47.4)	403	(39.2)	859	(43.1)		
Separated/Divorces	48	(5.0)	20	(1.9)	68	(3.4)		
Socioeconomic class								
Professional/intermediate	87	(10.1)	158	(17.6)	2453	(13.9)	18.126	<0.001
Skilled-non manual/skilled-manual	277	(32.2)	287	(31.9)	564	(32.0)		
Semiskilled/unskilled	497	(57.7)	455	(50.6)	952	(54.1)		
Living status								
Living with someone	778	(81.2)	896	(87.1)	1674	(84.2)	12.417	<0.001
Living alone	180	(18.8)	133	(12.9)	313	(15.8)		
Satisfied with income								
No	572	(59.7)	335	(32.6)	907	(45.7)	145.478	<0.001
Yes	386	(40.3)	692	(67.4)	1078	(54.3)		
Self-rated health								
Poor	91	(9.4)	17	(1.7)	108	(5.4)	201.093	<0.001
Fair	269	(27.9)	115	(11.2)	384	(19.3)		
Average	324	(33.6)	351	(34.1)	675	(33.9)		
Good	207	(21.5)	339	(32.9)	546	(27.4)		
Excellent	72	(7.5)	207	(20.1)	279	(14.0)		
Perceived health relative to peers								
Less healthy	261	(27.4)	92	(9.0)	353	(17.8)	153.450	<0.001
About as healthy	463	(48.6)	472	(46.0)	935	(47.3)		
More healthy	229	(24.0)	461	(45.0)	690	(34.9)		
Smoking								
Yes	255	(26.8)	285	(27.8)	540	(27.3)	0.210	0.647
No	698	(73.2)	741	(72.2)	1439	(72.7)		
Arthritis or rheumatism								
Yes	422	(43.9)	374	(36.3)	796	(40.0)	11.525	0.001
No	540	(56.1)	656	(63.7)	1196	(60.0)		
Heart problem								
Yes	232	(24.1)	190	(18.5)	422	(21.2)	9.180	0.002
No	729	(75.9)	838	(81.5)	1567	(78.8)		
Stomach problem								
Yes	286	(29.7)	207	(20.2)	493	(24.8)	23.911	<0.001
No	676	(70.3)	820	(79.8)	1496	(75.2)		
Giddiness problem								
Yes	189	(19.9)	120	(11.7)	309	(15.6)	24.595	<0.001
No	762	(80.1)	908	(88.3)	1670	(84.4)		
High blood pressure								
Yes	246	(25.6)	249	(24.2)	495	(24.9)	0.450	0.502
No	714	(74.4)	779	(75.8)	1493	(75.1)		
Urinary incontinence								
Yes	188	(19.6)	126	(12.3)	314	(15.8)	18.910	<0.001
No	773	(80.4)	896	(87.7)	1669	(84.2)		
Walking problem								
Difficulty	338	(35.4)	210	(20.4)	548	(27.6)	54.694	<0.001

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No difficulty	617	(64.6)	818	(79.6)	1435	(72.4)		
Walking aid use								
Yes	173	(18.7)	103	(10.2)	276	(14.3)	27.378	<0.001
No	754	(81.3)	904	(89.8)	1658	(85.7)		
Loneliness								
Not lonely	596	(61.9)	652	(63.3)	1248	(62.6)	0.365	0.546
Lonely	367	(38.1)	378	(36.7)	745	(37.4)		
Friends								
Some friends	665	(84.7)	828	(92.0)	1493	(88.6)	21.334	<0.001
No friend	120	(15.3)	72	(8.0)	192	(11.4)		
Newspaper or journal								
Yes	414	(43.0)	581	(56.5)	995	(50.0)	35.853	<0.001
No	549	(57.0)	447	(43.5)	996	(50.0)		
Religious group								
Yes	115	(11.9)	184	(17.9)	299	(15.0)	13.228	<0.001
No	848	(88.1)	846	(82.1)	1694	(85.0)		
TV or radio								
Yes	882	(91.7)	966	(94.0)	1848	(92.9)	3.578	0.059
No	80	(8.3)	62	(6.0)	142	(7.1)		
Club or organisation								
Yes	129	(13.4)	196	(19.0)	325	(16.3)	11.097	0.001
No	833	(86.6)	834	(81.0)	1667	(83.7)		
Pets								
Yes	158	(16.4)	181	(17.6)	339	(17.1)	0.411	0.521
No	803	(83.6)	846	(82.4)	1649	(82.9)		

People who were male, married or widowed, of lower socioeconomic class, living with someone, satisfied with their income, reported average or good health, felt that they were about as healthy or more healthy than their peers, did not have arthritis or rheumatism, heart problems, dizziness, urinary incontinence, or walking difficulties, were not using a walking aid, had friends, subscribed to a newspaper or journal, or were not attending a religious group, club or organisation were more likely to report high life satisfaction. Interestingly, psychological health did not affect life satisfaction in the combined dataset from 1989.

### The combined dataset in 1993

Table 5.15 presents variables associated with high and low life satisfaction in the combined dataset from 1993.

There was a significant association between life satisfaction and study location ( $\chi^2=17.212$ ;  $p<0.001$ ), marital status ( $\chi^2=18.170$ ;  $p<0.001$ ), socioeconomic class ( $\chi^2=9.957$ ;  $p=0.002$ ), satisfaction with income ( $\chi^2=93.243$ ;  $p<0.001$ ), self-rated health ( $\chi^2=127.511$ ;  $p<0.001$ ), perceived health relative to peers ( $\chi^2=105.518$ ;  $p<0.001$ ), high blood pressure ( $\chi^2=7.783$ ;  $p=0.005$ ), urinary incontinence ( $\chi^2=18.782$ ;  $p<0.001$ ), walking difficulties ( $\chi^2=68.666$ ;  $p<0.001$ ), using a walking aid ( $\chi^2=33.075$ ;  $p<0.001$ ), feeling lonely ( $\chi^2=58.426$ ;  $p<0.001$ ), reading a newspaper or journal ( $\chi^2=38.954$ ;

$p < 0.001$ ), attending a religious group ( $\chi^2 = 18.070$ ;  $p < 0.001$ ), having a TV or radio ( $\chi^2 = 37.068$ ;  $p < 0.001$ ), and attending a club or organisation ( $\chi^2 = 10.166$ ;  $p = 0.001$ ).

The study location variable had a significant association with level of life satisfaction. It is clear a higher proportion of people that people with high life satisfaction were from the NLSAA study. Conversely, a higher proportion of people with low life satisfaction were from SHLSET.

**Table 5.15: Variables associated with high and low life satisfaction in the combined data set in 1993.**

Variable	Low life satisfaction N (%)		High life satisfaction N (%)		Total (%)		$\chi^2$	<i>p</i> value
Study location								
NLSAA	165	(22.8)	217	(32.9)	382	(27.6)	17.212	<0.001
SHLSET	560	(77.2)	443	(67.1)	1003	(72.4)		
Gender							0.189	0.664
Male	342	(47.2)	320	(48.5)	662	(47.8)		
Female	383	(52.8)	340	(51.5)	723	(52.2)		
Marital status							18.170	<0.001
Married	334	(46.1)	381	(57.7)	715	(51.7)		
Single	24	(3.3)	20	(3.0)	44	(3.2)		
Widowed	341	(47.1)	241	(36.5)	582	(42.1)		
Separated/Divorces	25	(3.5)	18	(2.7)	43	(3.1)		
Socioeconomic class							9.957	0.002
Professional/intermediate	75	(12.1)	93	(16.3)	168	(14.1)		
Skilled-non manual/skilled-manual	165	(26.6)	180	(31.5)	345	(29.0)		
Semiskilled/unskilled	380	(61.3)	298	(52.2)	678	(56.9)		
Living status							4.637	0.031
Living with someone	553	(76.8)	539	(81.7)	1092	(79.1)		
Living alone	167	(23.2)	121	(18.3)	288	(20.9)		
Satisfied with income							93.243	<0.001
No	312	(49.7)	156	(23.6)	468	(36.3)		
Yes	316	(50.3)	504	(76.4)	820	(63.7)		
Self-rated health							127.511	<0.001
Poor	58	(9.0)	9	(1.4)	67	(5.1)		
Fair	185	(28.8)	87	(13.2)	272	(20.9)		
Average	214	(33.3)	200	(30.3)	414	(31.8)		
Good	126	(19.6)	224	(33.9)	350	(26.9)		
Excellent	59	(9.2)	140	(21.2)	199	(15.3)		
Perceived health relative to peers							105.518	<0.001
Less healthy	161	(25.8)	44	(6.7)	205	(16.0)		
About as healthy	321	(51.4)	332	(52.6)	653	(51.0)		
More healthy	142	(22.8)	280	(42.7)	422	(33.0)		
Smoking							2.286	0.131
Yes	166	(22.9)	128	(19.4)	294	(21.2)		
No	559	(77.1)	531	(80.6)	1090	(78.8)		
Arthritis or rheumatism							0.920	0.337
Yes	252	(35.5)	214	(32.9)	466	(34.3)		
No	457	(64.5)	436	(67.1)	893	(65.7)		
Heart problem							0.107	0.744
Yes	146	(20.7)	130	(19.9)	276	(20.3)		
No	558	(79.3)	524	(80.1)	1082	(79.7)		
Stomach problem							5.633	0.018
Yes	109	(15.0)	70	(10.6)	179	(12.9)		
No	616	(85.0)	590	(89.4)	1206	(87.1)		
Giddiness problem							1.587	0.208
Yes	71	(9.8)	51	(7.7)	122	(8.8)		
No	654	(90.2)	609	(92.3)	1263	(91.2)		
High blood pressure								



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Yes	229	(32.7)	167	(25.6)	396	(29.3)	7.783	0.005
No	472	(67.3)	485	(74.4)	957	(70.7)		
Urinary incontinence								
Yes	145	(20.4)	76	(11.6)	221	(16.2)	18.782	<0.001
No	565	(79.6)	578	(88.4)	1143	(83.8)		
Walking problem								
Difficulty	272	(37.7)	114	(17.4)	386	(28.1)	68.666	<0.001
No difficulty	450	(62.3)	540	(82.6)	990	(71.9)		
Walking aid								
Yes	200	(27.9)	98	(14.9)	298	(21.7)	33.075	<0.001
No	517	(72.1)	558	(85.1)	1075	(78.3)		
Loneliness								
Lonely	275	(43.6)	154	(23.4)	429	(33.3)	58.426	<0.001
Not lonely	356	(56.4)	505	(76.6)	861	(66.7)		
Friends								
Some friends	466	(73.5)	519	(79.6)	985	(76.6)	6.335	0.012
No friend	168	(26.5)	133	(20.4)	301	(23.4)		
Newspaper or journal								
Yes	271	(37.4)	358	(54.2)	629	(45.4)	38.954	<0.001
No	454	(62.6)	302	(45.8)	756	(54.6)		
Religious group								
Yes	69	(9.5)	115	(17.4)	184	(13.3)	18.070	<0.001
No	656	(90.5)	545	(82.6)	1201	(86.7)		
TV or radio								
Yes	626	(86.3)	633	(95.9)	1259	(90.9)	37.068	<0.001
No	99	(13.7)	27	(4.1)	126	(9.1)		
Club or organisation								
Yes	93	(12.8)	127	(19.2)	220	(15.9)	10.166	0.001
No	632	(87.2)	533	(80.8)	1165	(84.1)		
Pets								
Yes	104	(14.3)	123	(18.6)	227	(16.4)	4.335	0.037
No	621	(85.7)	537	(81.4)	1158	(83.6)		

A high proportion of participants with high life satisfaction were older people in the NLSAA, married, did semiskilled/unskilled work, were satisfied with their income, rated their health as good, felt that they were about as healthy or more healthy than their peers, did not have high blood pressure, did not have urinary incontinence, did not have walking problems, did not use a walking aid, did not feel lonely, read newspaper or journal, did not attend a religious group, had a TV or radio, and did not attend clubs or organisations compared with their counterparts with low life satisfaction.

Participants with low life satisfaction were in the SHLSET study, were widowed, were semiskilled/unskilled, lived alone, were not satisfied with income, rated worse health, reported less healthy than peers, had stomach, high blood pressure, and walking problems, used a walking aid, felt lonely, did not have friend, did not read a newspaper or journal, did not attend a religious group, club or organisation, did not watch a TV or listen to a radio, and did not have a pet.

### 5.3.1.2.3 Logistic regression analyses for selected variables

Factors were included in a logistic regression model to identify which factors independently predicted high or low life satisfaction for the two studies in 1989 and 1993.

#### The NLSAA study in 1989

Table 5.16 shows the results of the logistic regression analyses to identify factors predicting high life satisfaction in the 1989 NLSAA study.

When all the selected variables were considered together, the model was statistically significant ( $\chi^2=166.973$ ;  $df=22$ ;  $p<0.001$ ). As shown in Table 5.16, there was a significant association between high life satisfaction and being satisfied with one's income ( $p<0.001$ ), having walking difficulties ( $p=0.042$ ), feeling lonely ( $p=0.001$ ), level of depression ( $p<0.001$ ), attending a club or organisation ( $p=0.008$ ), and having friends ( $p=0.011$ ).

**Table 5.16: Selected variables affecting high and low life satisfaction in the NLSAA in 1989.**

Variable (reference category)	Category	Odds ratio	95% CI	p value
Marital status (Married)	Single	1.969	0.683–5.678	0.210
	Widowed	1.744	0.816–3.727	0.151
	Separated/Divorced	1.210	0.311–4.713	0.783
Living status (Living alone)	Living with someone	1.702	0.805–3.602	0.164
Satisfaction with income (No)	Yes	2.673	1.608–4.441	<0.001
Self-rated health (Excellent)	Poor	0.390	0.097–1.562	0.183
	Fair	0.518	0.233–1.150	0.106
	Average	0.653	0.322–1.326	0.239
	Good	0.988	0.551–1.772	0.968
Perceived health relative to peers (More healthy)	Less healthy	0.447	0.159–1.255	0.126
	About as healthy	0.628	0.406–0.971	0.036
Stomach (No)	Yes	0.813	0.507–1.305	0.392
Giddiness (No)	Yes	0.875	0.565–1.356	0.551
Urinary incontinence (No)	Yes	0.714	0.437–1.167	0.179
Walking difficulties (No)	Yes	1.657	1.018–2.698	0.042
Walking aid use (No)	Yes	0.587	0.341–1.012	0.055
Loneliness (No)	Yes	2.367	1.441–3.887	0.001
Standardise SAD d score		0.943	0.914–0.972	<0.001
Newspaper or journal read (No)	Yes	1.320	0.660–2.640	0.432
Religious group (No)	Yes	1.191	0.758–1.872	0.447
Club or organisation (No)	Yes	1.758	1.160–2.663	0.008
Friends (No)	Yes	2.004	1.173–3.426	0.011

People who were satisfied with their income (OR=2.673; 95% CI=1.608–4.441), did not have walking difficult (OR=1.657; 95% CI=1.018–2.698), felt lonely (OR=2.367; 95% CI=1.441–3.887), had lower levels of depression (OR=0.943; 95% CI=0.914–0.972), attended a club or organisation (OR=1.758; 95% CI=1.160–2.663), and had some friends (OR=2.004; 95% CI=1.173–3.426) were more likely to report high life satisfaction.

**The SHLSET study in 1989**

Table 5.17 presents the variables associated with life satisfaction in the SHLSET database from 1989.

The overall model with all the variables entered was significant ( $\chi^2=309.158$ ;  $df=27$ ;  $p<0.001$ ). As shown in Table 5.17, there was a significant association between level of life satisfaction and marital status ( $p=0.001$ ), being satisfied with one’s income ( $p<0.001$ ), socioeconomic class ( $p=0.045$ ), perceived health relative to peers ( $p<0.001$ ), standardised SAD score ( $p<0.001$ ), and reading a newspaper or journal ( $p=0.021$ ).

**Table 5.17: Selected variables affecting high and low life satisfaction in SHLSET in 1989.**

Variable (reference category)	Category	Odds ratio	95% CI	p value
Gender (Male)	Female	1.119	0.798–1.569	0.514
Marital status (Married)	Single	0.339	0.120–0.961	0.001
	Widowed	0.854	0.622–1.172	0.328
	Separated/Divorced	0.128	0.044–0.370	<0.001
Satisfaction with income (No)	Yes	3.339	2.484–4.487	<0.001
Socioeconomic class (Professional/intermediate)	Skilled/manual & non-manual	0.490	0.280–0.860	0.045
	Semiskilled/unskilled/others	0.652	0.401–1.062	0.013
Number of people living in household		1.017	0.970–1.066	0.478
Self-rated health (Excellent)	Poor	0.773	0.273–2.185	0.165
	Fair	0.552	0.289–1.056	0.627
	Average	0.934	0.545–1.589	0.072
	Good	0.786	0.456–1.355	0.802
Perceived health relative to peers (More healthy)	Less healthy	0.364	0.215–0.615	<0.001
	About as healthy	0.536	0.372–0.773	<0.001
Arthritis or Rheumatism (No)	Yes	1.019	0.748–1.388	0.001
Stomach (No)	Yes	0.801	0.569–1.127	0.203
Heart problem (No)	Yes	1.375	0.966–1.957	0.077
Giddiness (No)	Yes	0.887	0.438–1.795	0.739
Urinary incontinence (No)	Yes	0.950	0.618–1.461	0.815
Walking difficulties (No)	Yes	0.790	0.552–1.131	0.198

Walking aid use (No)	Yes	0.838	0.515–1.363	0.476
Loneliness (No)	Yes	0.758	0.529–1.085	0.130
Standardised SAD score		0.972	0.960–0.983	<0.001
Religious group (No)	Yes	1.579	0.957–2.607	0.074
Newspaper or journal read (No)	Yes	1.585	1.072–2.343	0.021
TV or radio (No)	Yes	1.032	0.588–1.811	0.914
Club or organisation (No)	Yes	1.391	0.732–2.643	0.313

Compared to people who were married, people who were single (OR=0.339; 95% CI=0.120–0.961;  $p=0.042$ ), or separated/divorced (OR=0.128; 95% CI=0.044–0.370;  $p<0.001$ ) were less likely to report high life satisfaction. Older people who were in skilled/manual or non-manual labour socioeconomic class (OR=0.490; 95% CI=0.280–0.860;  $p=0.013$ ) were less likely to report high life satisfaction relative to their counterparts who were professional/intermediate. People who were satisfied with their income (OR=3.339; 95% CI=2.484–4.487) and read a newspaper or journal (OR=1.585; 95% CI=1.072–2.343) were more likely to report high life satisfaction than those who were not or did not, respectively.

People who reported feeling less healthy (OR=0.364; 95% CI=0.215–0.615;  $p<0.001$ ) and about as healthy (OR=0.536; 95% CI=0.372–0.773;  $p=0.001$ ) as their peers were less likely to report high life satisfaction in comparison with those who rated themselves more healthy than their peers. People with higher depression scores were less likely to report high levels of life satisfaction (OR=0.972; 95% CI=0.960–0.983).

### **The NLSAA study in 1993**

Table 5.18 presents the variables associated with life satisfaction in the 1993 NLSAA study.

When all the selected variables were considered together, they significantly predicted high life satisfaction ( $\chi^2=110.969$ ;  $df=19$ ;  $p<0.001$ ). It can be seen from Table 5.18 that there was a significant association between levels of life satisfaction and self-rated health ( $p=0.014$ ), using a walking aid ( $p=0.001$ ), feeling lonely ( $p=0.002$ ), standardised SAD score ( $p=0.007$ ), and reading a newspaper or journal ( $p=0.033$ ).

**Table 5.18: Selected variables affecting high and low life satisfaction in the NLSAA in 1993.**

Variable (reference category)	Category	Odds ratio	95% CI	<i>p</i> value
Marital status (Married)	Single	1.296	0.245–6.862	0.760
	Widowed	0.752	0.270–2.097	0.586
	Separated/Divorced	0.931	0.108–8.040	0.948
Living status (Living alone)	Living with someone	1.107	0.441–2.779	0.828
Perceived health relative to peers (More healthy)	Less healthy	1.447	0.357–5.862	0.605
	About as healthy	0.671	0.293–1.536	0.345
Stomach (No)	Yes	0.774	0.357–1.680	0.517
Giddiness (No)	Yes	0.518	0.260–1.032	0.062
Self-rated health (Excellent)	Poor	0.030	0.003–0.364	0.006
	Fair	0.170	0.017–1.711	0.133
	Average	0.182	0.019–1.744	0.140
	Good	0.256	0.028–2.299	0.224
Urinary incontinence (No)	Yes	0.940	0.448–1.973	0.871
Walking difficulties (No)	Yes	0.819	0.361–1.858	0.633
Walking aid use (No)	Yes	0.276	0.132–0.576	0.001
Loneliness (No)	Yes	0.309	0.145–0.659	0.002
Standardised SAD score		0.954	0.922–0.987	0.007
Arthritis or rheumatism (No)	Yes	1.918	0.846–4.347	0.119
Newspaper or journal (No)	Yes	2.872	1.091–7.566	0.033

People who rated their health as poor (OR=0.030; 95% CI=0.003–0.364;  $p=0.006$ ) were less likely to have high life satisfaction relative to those who rated their health as excellent. People who used a walking aid (OR=0.276; 95% CI=0.132–0.576) and felt lonely (OR=0.309; 95% CI=0.145–0.659) were less likely to have high life satisfaction. People with higher depression scores were less likely to have high levels of life satisfaction (OR=0.954; 95% CI=0.922–0.987). Those who read a newspaper or journal were more likely to have high life satisfaction (OR=2.872; 95% CI=1.091–7.566).

**The SHLSET study in 1993**

Table 5.19 shows the variables associated with life satisfaction in the 1993 SHLSET study. The overall model with all predictors entered was significant ( $\chi^2=255.514$ ;  $df=17$ ;  $p<0.001$ ). Table 5.19 shows that there was a significant association between levels of life satisfaction and satisfaction with one’s income ( $p<0.001$ ), one’s living status ( $p=0.016$ ), perceived health relative to peers ( $p<0.001$ ), feeling lonely ( $p<0.001$ ), having a TV or radio ( $p=0.038$ ), and having a pet ( $p=0.039$ ).

**Table 5.19: Selected variables affecting high and low life satisfaction in SHLSET in 1993.**

Variable (reference category)	Category	Odds ratio	95% CI	p value
Satisfaction with income (No)	Yes	3.390	2.378–4.832	<0.001
Living status (Living alone)	Living with someone	1.851	1.120–3.059	0.016
Self-rated health (Excellent)	Poor	0.254	0.077–0.835	0.173
	Fair	0.512	0.246–1.064	0.073
	Average	0.717	0.374–1.376	0.317
	Good	0.770	0.391–1.517	0.451
Perceived health relative to peers (More healthy)	Less healthy	0.293	0.157–0.548	<0.001
	About as healthy	0.745	0.470–1.183	0.212
Arthritis or rheumatism (No)	Yes	1.028	0.688–1.536	0.894
Walking difficulties (No)	Yes	1.009	0.626–1.626	0.971
Walking aid use (No)	Yes	0.752	0.436–1.297	0.305
Loneliness (No)	Yes	0.373	0.249–0.559	<0.001
Standardised SAD score		0.999	0.987–1.011	0.854
Newspaper or journal (No)	Yes	1.203	0.806–1.796	0.365
TV or radio (No)	Yes	1.857	1.036–3.326	0.038
Religious group (No)	Yes	1.641	0.791–3.403	0.183
Pet (No)	Yes	1.736	1.029–2.929	0.039

People who were satisfied with their income (OR=3.390; 95% CI=2.378–4.832) and lived with someone (OR=1.851; 95% CI=1.120–3.059) were more likely to report high life satisfaction. People who reported feeling less healthy (OR=0.293; 95% CI=0.157–0.548;  $p<0.001$ ) than their peers were less likely to report high life satisfaction versus those who rated themselves more healthy. Participants who felt lonely (OR=0.373; 95% CI=0.249–0.559) were less likely to report high life satisfaction. However, people who had a TV or radio (OR=1.857; 95% CI=1.036–3.326) and had a pet (OR=1.736; 95% CI=1.029–2.929) were more likely to have higher level of life satisfaction.

Compared with those older people in the 1989 SHLSET dataset, both living status and having a pet made much more of a contribution to life satisfaction in 1993. Interestingly, in 1993, reading a newspaper or journal was associated with greater life satisfaction in the NLSAA, whereas having a TV or radio and having a pet were associated with greater life satisfaction in Taiwan.

**The combined dataset in 1993**

Table 5.20 presents the variables associated with life satisfaction in the combined dataset for 1993. The overall model with all variables entered was significant ( $\chi^2=256.481$ ;  $df=27$ ;  $p<0.001$ ). The study location variable did not have a significant

association with people having high/low life satisfaction in the two samples, although this was significant in the chi-squared test. As can be seen from the combined data in 1993 in Table 5.20, there was a significant association between life satisfaction and satisfaction with income ( $p<0.001$ ), living status ( $p=0.021$ ), self-rated health ( $p<0.001$ ), perceived health relative to peers ( $p=0.015$ ), walking aid use ( $p=0.016$ ), feeling lonely ( $p=0.002$ ), and standardised SAD score ( $p=0.026$ ).

**Table 5.20: Selected variables affecting high and low life satisfaction in the combined data set in 1993.**

Variable (reference category)	Category	Odds ratio	95% CI	p value
Study location (NLSAA)	SHLSET	0.826	0.492–1.385	0.468
Marital status (Married)	Single	0.906	0.383–2.142	0.964
	Widowed	0.920	0.655–1.291	0.822
	Separated/Divorced	0.866	0.363–2.066	0.630
Satisfaction with income (No)	Yes	2.510	1.823–3.456	0.746
Living status (Living alone)	Living with someone	1.661	1.080–2.557	<0.001
Socioeconomic class (Professional/intermediate)	Skilled/manual & non-manual	0.742	0.467–1.181	0.021
	Semiskilled/unskilled/others	1.115	0.708–1.758	0.115
Self-rated health (Excellent)	Poor	0.086	0.028–0.267	<0.001
	Fair	0.326	0.179–0.592	<0.001
	Average	0.526	0.314–0.882	0.015
	Good	0.694	0.417–1.153	0.159
Perceived health relative to peers (More healthy)	Less healthy	0.430	0.242–0.761	0.015
	About as healthy	0.803	0.570–1.132	0.004
Stomach (No)	Yes	0.942	0.612–1.448	0.211
High blood pressure (No)	Yes	0.823	0.599–1.129	0.784
Urinary incontinence (No)	Yes	0.722	0.475–1.099	0.227
Walking difficulties (No)	Yes	1.107	0.753–1.627	0.129
Walking aid use (No)	Yes	0.608	0.407–0.910	0.606
Loneliness (No)	Yes	0.593	0.423–0.831	0.016
Standardised SAD score		0.987	0.976–0.998	0.002
Religious group (No)	Yes	1.534	1.000–2.351	0.026
Newspaper or journal read (No)	Yes	1.282	0.871–1.886	0.050
TV or radio (No)	Yes	1.300	0.689–2.453	0.207
Friends (No)	Yes	1.054	0.747–1.485	0.417
Club or organisation (No)	Yes	0.936	0.616–1.422	0.766
Pet (No)	Yes	0.929	0.638–1.352	0.757

People who lived with someone (OR=2.510; 95% CI=1.823–3.456) and were satisfied with their income (OR=1.661; 95% CI=1.080–2.557) were more likely to report high life satisfaction.

Compared with older people who reported excellent health, people who rated their health as poor (OR=0.086; 95% CI=0.028–0.267;  $p<0.001$ ), fair (OR=0.326; 95% CI=0.179–0.592;  $p<0.001$ ), or average (OR=0.526; 95% CI=0.314–0.882;  $p=0.015$ ) were less likely to have high life satisfaction. Compared to those who rated their health as better than their peers, older people who perceived themselves as less healthy (OR=0.430; 95% CI=0.242–0.761;  $p=0.04$ ) were less likely to report high life satisfaction. People who used a walking aid (OR=0.608; 95% CI=0.407–0.910), felt lonely (OR=0.593; 95% CI=0.423–0.831), and had lower levels of depression (OR=0.987; 95% CI=0.976–0.998) were less likely to report high life satisfaction.

In the combined dataset, financial conditions, living status, and physical and mental health still had an important influence on life satisfaction in 1993.

### 5.3.2 Study location with interaction as a predictor of life satisfaction

Testing effect modification often implies that two or more variables interact in their effects upon a dependent variable. Thus, in the regression model including a given independent variable may provide more information about a dependent variable than the model without this variable.

In this section, examining the study location variable as a predictor of life satisfaction, there was no significant difference in any predictor between the NLSAA (UK) and SHLSET (Taiwan) data in 1989. In other words, the interaction between the study location variable and the independent variables did not have any significant association with the levels of life satisfaction. Therefore, the result from analyzing data in 1989 is not presented in here.

Table 5.21 presents the groups for which study location was a significant predictor of high life satisfaction in 1993. As can be seen in Table 5.21, there was a significant interaction between location of study and marital status (married,  $p=0.032$ ), self-rated health (excellent health,  $p=0.012$ ), smoking (yes,  $p=0.003$ ), heart problems (yes,  $p=0.005$ ), stomach problems (yes,  $p=0.004$ ), dizziness (yes,  $p=0.006$ ), high blood pressure (yes,  $p=0.002$ ), walking difficulties (yes,  $p=0.005$ ), walking aid use (yes,



$p=0.002$ ), standardised SAD score (above median score,  $p<0.001$ ), having friends (no,  $p=0.006$ ), reading a newspaper or journal (no,  $p=0.002$ ), belonging to a club or organisation (yes,  $p=0.005$ ), and having a pet (yes,  $p=0.005$ ) in 1993.

**Table 5.21: Effects of interaction terms for study location as a predictor of life satisfaction in 1993, from separate models.**

Independent variable	Category	Odds ratio	95% CI	<i>p</i> value
Marital status	Married	2.319	1.075–5.000	0.032
	Other	2.705	1.265–5.786	0.100
Self-rated health	Excellent	2.315	1.199–4.471	0.012
	Other	8.915	0.949–83.711	0.056
Smoking	No	1.685	0.659–4.312	0.276
	Yes	2.822	1.427–5.577	0.003
Heart problem	No	2.180	0.872–5.449	0.096
	Yes	2.608	1.333–5.103	0.005
Stomach problem	No	1.874	0.713–4.926	0.203
	Yes	2.698	1.376–5.292	0.004
Dizziness	No	2.619	0.129–52.974	0.530
	Yes	2.508	1.309–4.805	0.006
High blood pressure	No	1.461	0.611–3.492	0.394
	Yes	3.026	1.527–5.997	0.002
Walking difficulties	No difficulty	2.113	0.931–4.794	0.074
	Yes, difficulties	2.740	1.359–5.523	0.005
Walking aid use	No use	1.645	0.731–3.701	0.229
	Yes, use aid	3.291	1.577–6.869	0.002
Standardised SAD score	Below median score	1.306	0.644–2.647	0.459
	Above median score	8.559	3.307–22.154	<0.001
Friends	No friends	2.577	1.314–5.054	0.006
	Some friends	2.257	0.837–6.089	0.108
Newspaper or journal	No	2.866	1.456–5.638	0.002
	Yes	1.508	0.557–4.086	0.419
Club or organisation	No	2.012	0.716–5.654	0.185
	Yes	2.673	1.344–5.317	0.005
Pets	No	2.038	0.699–5.943	0.192
	Yes	2.590	1.339–5.012	0.005

Note: N=1,070.

Married people in the NLSAA study were more likely to report high life satisfaction (OR=2.319; 95% CI=1.075–5.000) compared with their counterparts in SHLSET. Conversely, there was no difference in levels of life satisfaction among unmarried people in the two samples. People who reported excellent health in the NLSAA study were also more likely to report high life satisfaction (OR=2.315; 95% CI=1.199–4.471) in comparison with their counterparts in SHLSET. However, there was no difference in levels of life satisfaction among older people who did not rate their health as excellent in the two samples. Contrary to those who smoked in the Taiwanese sample, people with a smoking habit in the NLSAA study were more

likely to report high life satisfaction (OR=2.315; 95% CI=1.199–4.471); however, there was no significant difference among non-smokers in the two samples.

Older people with heart or stomach problems, dizziness, high blood pressure, walking problems, walking aid use, or higher levels of depression in the NLSAA study were more likely to report a high level of life satisfaction than those with these same diseases/conditions in SHLSET. On the other hand, there was no significant difference in levels of life satisfaction among people without these disorders. Older people in SHLSET without friends had lower life satisfaction than their counterparts who had no friend in the NLSAA study; study location did not have a statistically significant association with life satisfaction among older people with friends. Older people in the NLSAA study who did not read newspapers or journals, attended clubs or organisations, and had a pet were more likely to report being satisfied with life than their counterparts in SHLSET; however, there was no significant difference in levels of life satisfaction between the two samples with their counterparts for these variables.

The interaction term was significant on other independent variables for both of the two categories, i.e., age, gender, socioeconomic class, satisfaction with income, living status, perceived health relative to peers, arthritis or rheumatism, urinary incontinence, loneliness, having a TV or radio, religious group. It could be concluded that study location variable was significantly associated with life satisfaction for both categories of variables; thus, there was no difference to discuss and these results are not shown in the table.

### **5.3.3 Identifying predictors of changes in life satisfaction**

The section discusses the change in life satisfaction from 1989 to 1993 and examines the relationship between change in life satisfaction and its predictors.

#### **5.3.3.1 Descriptive statistics**

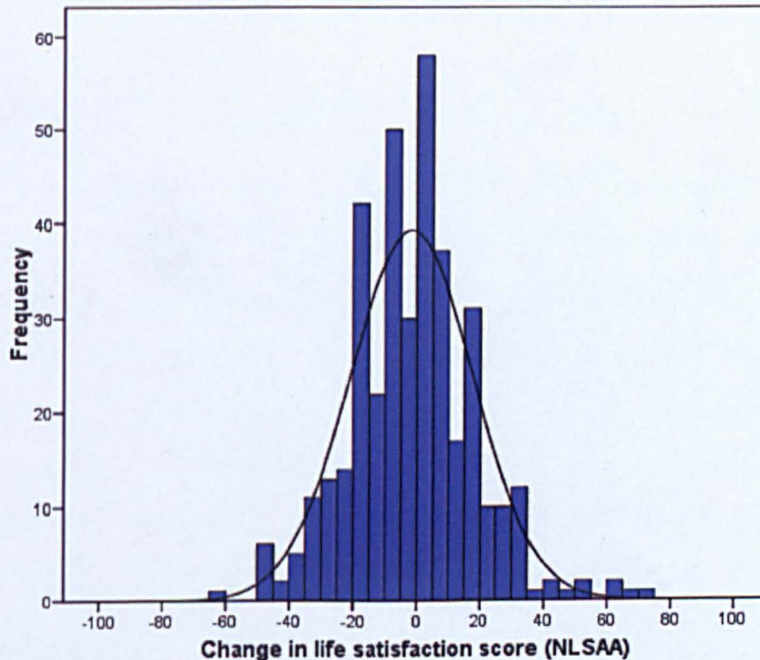
Table 5.22 shows the results of the descriptive analyses of changes in life satisfaction score from 1989 to 1993. The one-sample Kolmogorov-Smirnov test was used to test whether the distribution for the change in the standardised LSI score was normal or not. The finding shows that change in the standardised LSI score for the NLSAA study, the SHLSET study, and the combined dataset exhibited a distribution that was not normal.

**Table 5.22: Descriptive of change in standardised life satisfaction score from 1989 to 1993.**

Study	N	Mean change	SD	Range	Kolmogorov-Smirnov Z	p value
NLSAA study	381	-1.64	19.395	-62-73	1.543	0.017
SHLSET study	960	-5.06	35.131	-100-100	1.990	0.001
Combined data set	1341	-4.069	31.501	-100-100	1.510	0.021

In the SHLSET study, one person had a change of 100 points because he/she had a score of 0 point in 1989. On the other hand, there were two persons who had a change of -100 point because they went from 100 points in 1989 to 0 point in 1993. This may well have happened because these two people could not answer the four questions in the LSI in 1993. Comparing the mean score for the change in the standardised LSI, older people in the NLSAA study had a smaller reduction in the standardised LSI score than older people in the SHLSET study.

Figure 5.1 shows that the change in standardised life satisfaction scores in the NLSAA study. The change in the standardised life satisfaction score in the NLSAA study was more peaked than would be expected for a normal distribution.



**Figure 5.1: The change in standardised life satisfaction scores from 1989 to 1993 in the NLSAA study.**

Figure 5.2 shows the change in standardised life satisfaction scores in the SHLSET study.

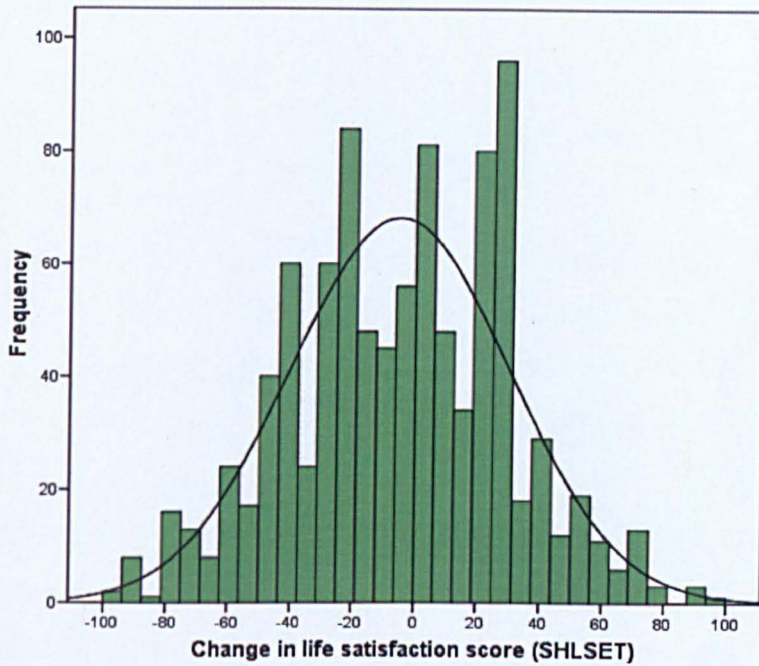


Figure 5.2: The change in standardised life satisfaction scores from 1989 to 1993 in the SHLSET study.

### 5.3.3.2 Change in life satisfaction as a continuous variable

Stepwise regression models were used to examine factors influencing the change in life satisfaction score from 1989 to 1993 first in the NLSAA and SHLSET studies individually, and then for the combined datasets to examine any differences between the two countries and determine whether the study location variable affected changes in life satisfaction. Multiple linear regression used stepwise method with criteria as probability-of-F-to-enter $\leq 0.050$  and probability-of-F-to-remove $\geq 0.100$ . The marital status variable was a nominal variable, so it had to be re-coded to a binary variable, i.e., married or unmarried in 1993 for this analysis.

#### The NLSAA study

Table 5.23 presents the results of stepwise regression analysis to identify predictors of change in life satisfaction in the NLSAA study between 1989 and 1993. Stepwise regression was conducted and the final combination of variables was perceived health relative to peers, self-rated health, and age in 1993. This combination of variables significantly predicted change in life satisfaction,  $F_{(3, 306)} = 13.647$ ,  $p < 0.001$ , with all three variables significantly contributing to the model.

**Table 5.23: The factors affecting change in life satisfaction in the NLSAA (N=381).**

Model <sup>1</sup>	r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1 Change in perceived health relative to peers	0.265	0.067	-	0.265	4.818–11.438	<0.001
2 Change in self-rated health	0.321	0.097	0.030	0.188	2.028–7.844	0.001
3 Age in 1993	0.344	0.109	0.012	-0.122	-0.958–0.070	0.023

1. The excluded variables include gender, marital status, socioeconomic class, number of people living in household, socioeconomic class, satisfaction with income, smoking, arthritis or rheumatism, heart trouble, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, walking problem, walking aid, loneliness, standardised SAD score, having a pet, having friend, taking newspaper or journal, attending religious group, and attending club or organisation.

Three variables were included in the final model to predict change in standardised life satisfaction score in the NLSAA study, and this model explained 10.9% of the variance in change in life satisfaction. The change in perceived health relative to peers variable (6.7% of the variance) explained the largest share of the variance, followed by change in self-rated health (3.0%) and age (1.2%). In the regression model 3, the relationship between the age (1993) variable and the change in standardised life satisfaction score was negative (-0.122), meaning that older people had a reduction in life satisfaction.

All three variables contributed significantly to changes in life satisfaction. Change in rating one’s health as better than one’s peers contributed most to changes in life satisfaction. People who increased their health rating relative to their peers had higher life satisfaction. These results are in agreement with the reviewed literature in Sections 2.5.1 (physical health) and 2.5.5.1 (demographic characteristics), indicating that health and demographics are important predictors of life satisfaction and change in life satisfaction. However, compared with the models in the previous section, these variables accounted for only a small proportion of the variance in change in life satisfaction.

**The SHLSET study**

Table 5.24 shows the results of stepwise regression analysis to identify predictors of change in life satisfaction in the SHLSET study between 1989 and 1993. Table 5.24 shows the variables included in the final model. The adjusted R squared value was 0.126, indicating that 12.6% of the variance in change in life satisfaction was explained by the five variables in the model. Self-rated health (6.4% of the variance) explained more than half of this variance, followed by satisfaction with income (2.7%), walking problems (1.5%), perceived health relative to peers (1.0%), and

having a TV or radio (1.0%). In the regression model 3, the relationship between the walking difficult variable and the change in standardised life satisfaction score was negative (-0.135), meaning that a person with walking problems had reduced life satisfaction score. This combination of variables significantly predicted change in life satisfaction,  $F_{(5, 450)} = 14.100$ ,  $p < 0.001$ , with all five variables contributing significantly to the model.

**Table 5.24: The factors affecting change in life satisfaction in SHLSET (N=488).**

Model <sup>1</sup>	r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1 Change in self-rated health	0.258	0.064	-	0.258	7.517-15.458	<0.001
2 Change in satisfaction with income	0.308	0.091	0.027	0.169	4.499-14.372	<0.001
3 Change in walking problems	0.334	0.106	0.015	-0.135	-15.816--3.116	0.004
4 Change in perceived health relative to peers	0.352	0.116	0.010	0.128	1.387-10.736	0.011
5 Having a TV or radio	0.368	0.126	0.010	0.107	2.149-20.501	0.016

1. The excluded variables include age, gender, marital status, socioeconomic class, number of people living in household, socioeconomic class, smoking, arthritis or rheumatism, heart trouble, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, walking aid, loneliness, having a pet, having friend, taking newspaper or journal, attending religious group, and attending club or organisation.

In the SHLSET study, five variables contributed significantly to changes in life satisfaction: higher self-rated health, satisfaction with income, perceived health better than peers, and having a TV or radio were related to an increase in life satisfaction. However, walking difficulties predicted a negative change in life satisfaction.

**The combined dataset**

Table 5.25 shows the results of stepwise regression analysis to identify predictors of change in life satisfaction in the combined dataset from 1989 and 1993.

Table 5.25 shows the variables included in the final model. The adjusted R squared value was 0.118. This indicates that 11.8% of the variance in change in life satisfaction was explained by the model. Six variables were included in the final model, which explained 11.8% of the variance in change in life satisfaction. Perceived health relative to peers (5.8% of the variance) explained much of this variance, followed by self-rated health (2.3%), satisfaction with income (1.8%), walking difficulties (0.8%), study location (0.6%), and having a TV or radio (0.5%). This combination of variables significantly predicted change in life satisfaction,  $F_{(6, 759)} = 17.981$ ,  $p < 0.001$ , with all six variables contributing significantly to the prediction.

**Table 5.25: The factors affecting change in life satisfaction in the combined data set (N=1,341).**

Model <sup>1</sup>		r	Adjusted R <sup>2</sup>	Change in R <sup>2</sup>	Beta	95% CI	p value
1	Change in perceived health relative to peers	0.244	0.058	–	0.244	7.395–13.225	<0.001
2	Change in self-rated health	0.288	0.081	0.023	0.167	3.550–9.178	<0.001
3	Change in satisfaction with income	0.320	0.099	0.018	0.140	3.878–11.248	<0.001
4	Change in walking problems	0.333	0.107	0.008	-0.098	-9.725--1.679	0.006
5	Study location	0.345	0.113	0.006	-0.090	-9.331--1.311	0.009
6	Having a TV or radio	0.353	0.118	0.005	0.075	0.687–14.335	0.031

1. The excluded variables include age, gender, marital status, socioeconomic class, number of people living in household, socioeconomic class, smoking, arthritis or rheumatism, heart trouble, stomach problem, giddiness problem, high blood pressure problem, urinary incontinence, walking aid, loneliness, standardised SAD score, having a pet, having friend, taking newspaper or journal, attending religious group, and attending club or organisation.

In the regression model 4, the relationship between the walking difficult variable and the change in standardised life satisfaction score was negative (-0.098), meaning that having walking difficulties was associated with a reduction in life satisfaction from 1989-1993. 0.090 point would be subtracted from change in standardised life satisfaction score in model 5 if a person were in the NLSAA study.

People who reported better health, were satisfied with their income, rated themselves as healthier than their peers, and had a TV or radio tended to have an increase in life satisfaction. People who reported having walking difficulties tended to have a reduction in life satisfaction. Participants in the NLSAA study were more likely to have decrease in life satisfaction, but the difference was small.

### 5.3.3.3 Change in life satisfaction as a categorical variable

To identify which factors affect change in life satisfaction, the variable ‘change in standardised LSI score’ was dichotomised into ‘decrease’ and ‘no change/increase’ in life satisfaction and, and using both bivariate and multivariate analysis, assessed for the relationship between this new dichotomized dependent variable and each of the harmonized variables from the 1989 and 1993 surveys. The independent variables examined were those presented in Section 5.2.2. Bivariate analysis was conducted using the Mann-Whitney U test for continuous independent variables, and Pearson chi-square analysis for categorical independent variables, in each instance assessing whether a relationship between the variables was significant or not. For multivariate analysis, logistic regression analysis was performed to identify the most important factors affecting change in life satisfaction.

5.3.3.3.1 Mann-Whitney U tests for continuous independent variables

The NLSAA study

Table 5.26 shows the results of Mann-Whitney U tests assessing the relationship between the continuous independent variables and change in life satisfaction between 1989 and 1993 in the NLSAA survey.

**Table 5.26: The differences of change in life satisfaction in the NLSAA.**

Variable	No change/increase In life satisfaction Mean Rank (N)	Decrease in life satisfaction Mean Rank (N)	Z statistic	p value
Age in 1993	207.09 (206)	216.66 (217)	-0.805	0.421
Change in standardised SAD score	183.44 (205)	238.01 (277)	-4.663	<0.001
Change in number of people living in household	211.00 (205)	211.00 (216)	-0.002	0.999

Mann-Whitney U tests revealed a statistically-significant difference in the mean rank for the change in standardised SAD score (Z statistic=-4.663;  $p < 0.001$ ) between those with no change or an increase in life satisfaction versus those with a decrease. Older people who experienced a decrease in life satisfaction were more depressed than the others.

The SHLSET study

Table 5.27 shows the results of the Mann-Whitney U tests assessing the relationship between the continuous independent variables and change in life satisfaction between 1989 and 1993 for the SHLSET survey.

**Table 5.27: The differences of change in life satisfaction in SHLSET.**

Variable	No change/increase In life satisfaction Mean Rank (N)	Decrease in life satisfaction Mean Rank (N)	Z statistic	p value
Age in 1993	494.57 (463)	479.16 (509)	-0.855	0.393
Change in standardised SAD score	383.09 (395)	444.04 (434)	-3.660	<0.001
Change in number of people living in household	462.01 (432)	453.46 (482)	-0.512	0.608

The results were similar to those of the NLSAA study. Older people who had higher levels of depression (Z statistic=-3.660;  $p < 0.001$ ) were more likely to experience a decrease in life satisfaction.



**The combined datasets**

Table 5.28 shows the results of the Mann-Whitney U tests assessing the relationship between the continuous independent variables and change in life satisfaction for the combined datasets from 1989 and 1993.

**Table 5.28: The differences of change in life satisfaction in the combined data set.**

Variable	No change/increase In life satisfaction Mean Rank (N)	Decrease in life satisfaction Mean Rank (N)	Z statistic	p value
Age in 1993	702.28 (669)	694.05 (726)	-0.381	0.703
Change in standardised SAD score	572.38 (600)	675.42 (651)	-5.045	<0.001
Change in number of people living in household	674.68 (637)	661.90 (698)	-0.629	0.529

Participants in the two studies who had higher levels of depression (Z statistic=-5.045;  $p<0.001$ ) were more likely to experience a decrease in their life satisfaction versus those with lower levels of depression.

**5.3.3.3.2 Chi-square analysis for categorical independent variables**

Because of the large number of tests carried out,  $\alpha$  was set to 0.01 in order to reduce the likelihood of a Type I error. However, any variables that had a  $p$  value of 0.05 or less were included in the logistic regression model to ensure no potentially important factors were omitted. Even though these variables were significantly associated with low/high life satisfaction they may have an important modifier effect on the other variables.

**The NLSAA study 1989-1993**

Table 5.29 shows the association between change in independent variables (except gender and socioeconomic class) and change in life satisfaction between 1989 and 1993 in the NLSAA study. As can be seen from Table 5.29, a significant association existed between changes in life satisfaction and changes in self-rated health ( $\chi^2=4.199$ ;  $p=0.040$ ), perceived health relative to peers ( $\chi^2=7.607$ ;  $p=0.006$ ), and arthritis or rheumatism ( $\chi^2=4.033$ ;  $p=0.045$ ).

Table 5.29: Variables associated with change in life satisfaction in the NLSAA study.

Variable	No change/increase in life satisfaction N (%)		Decrease in life satisfaction N (%)		Total (%)	$\chi^2$	p value
Gender (1989)							
Male	67	(45.0)	82	(55.0)	149 (100)	1.063	0.303
Female	139	(50.7)	135	(49.3)	274 (100)		
Marital status							
No change	165	(48.7)	174	(51.3)	339 (100)	0.466	0.495
Became widowed or separated/divorced	15	(41.7)	21	(58.3)	36 (100)		
Became married	3	(75.0)	1	(25.0)	4 (100)		
Two changes	2	(100)	0	(0.0)	2 (100)		
Socioeconomic class (1989)							
Professional/intermediate	35	(49.3)	36	(50.7)	71 (100)	0.044	0.835
Skilled-non manual/ skilled-manual	122	(47.7)	134	(52.3)	256 (100)		
Semiskilled/unskilled	48	(50.5)	47	(49.5)	95 (100)		
Satisfied with income							
Dissatisfied with income	14	(43.8)	18	(56.3)	32 (100)	0.111	0.739
No change	160	(47.6)	176	(52.4)	336 (100)		
Satisfied with income	31	(58.5)	22	(41.5)	53 (100)		
Living status							
New living alone	0	(0.0)	1	(100)	1 (100)	1.841	0.175
No change	195	(49.4)	200	(50.6)	395 (100)		
Living with someone	10	(38.5)	16	(61.5)	26 (100)		
Self-rated health							
A worsening	64	(39.3)	99	(60.7)	163 (100)	4.199	0.040
No change	82	(50.6)	80	(49.4)	162 (100)		
An improvement	59	(60.8)	38	(39.2)	97 (100)		
Perceived health relative to peers							
Worse health	35	(34.0)	68	(66.0)	103 (100)	7.607	0.006
No change	119	(52.2)	109	(47.8)	228 (100)		
Better health	45	(55.6)	36	(44.4)	81 (100)		
Smoking							
No smoking	11	(47.8)	12	(52.2)	23 (100)	0.100	0.754
No change	186	(48.7)	196	(51.3)	382 (100)		
New smoker	4	(36.4)	7	(63.6)	11 (100)		
Arthritis or rheumatism							
New problem	36	(59.0)	25	(41.0)	61 (100)	4.033	0.045
No change	143	(46.0)	168	(54.0)	311 (100)		
No longer a problem	27	(54.0)	23	(46.0)	50 (100)		
Heart problem							
New problem	16	(53.3)	14	(46.7)	30 (100)	1.237	0.266
No change	176	(51.0)	169	(49.0)	345 (100)		
No longer a problem	14	(29.2)	34	(70.8)	48 (100)		
Stomach							
New problem	27	(50.0)	27	(50.0)	54 (100)	0.049	0.824
No change	163	(49.4)	167	(50.6)	330 (100)		
No longer a problem	16	(41.0)	23	(59.0)	39 (100)		
Giddiness							
New problem	43	(53.1)	38	(46.9)	81 (100)	0.464	0.496
No change	147	(48.0)	159	(52.0)	306 (100)		
No longer a problem	16	(44.4)	20	(55.6)	36 (100)		
High blood pressure							
New problem	20	(52.6)	18	(47.4)	38 (100)	0.001	0.980
No change	166	(49.4)	170	(50.6)	336 (100)		
No longer a problem	20	(43.5)	26	(56.5)	46 (100)		
Urinary incontinence							
New problem	24	(48.0)	26	(52.0)	50 (100)	1.064	0.302
No change	158	(51.1)	151	(48.9)	309 (100)		
No longer a problem	23	(38.3)	37	(61.7)	60 (100)		
Walking problem							
New problem	26	(49.1)	27	(50.9)	53 (100)	0.853	0.356
No change	150	(50.7)	146	(49.3)	296 (100)		
No longer a problem	23	(36.5)	40	(63.5)	63 (100)		

Walking aid use							
New user	11	(68.8)	5	(31.3)	16	(100)	1.133 0.287
No change	140	(47.3)	156	(52.7)	296	(100)	
No longer use	32	(46.4)	37	(53.6)	69	(100)	
Loneliness							
New problem	89	(50.6)	87	(49.4)	176	(100)	0.653 0.419
No change	61	(45.9)	72	(54.1)	133	(100)	
No longer a problem	56	(49.1)	58	(50.9)	114	(100)	
Friends							
Became no friend	16	(43.2)	21	(56.8)	37	(100)	0.034 0.855
No change	159	(48.3)	170	(51.7)	329	(100)	
Became having friend	29	(53.7)	25	(46.3)	54	(100)	
TV or radio							
Became not have	1	(33.3)	2	(66.7)	3	(100)	2.505 0.113
No change	197	(49.7)	199	(50.3)	396	(100)	
Became have	8	(33.3)	16	(66.7)	24	(100)	
Newspaper or journal							
Became not read	23	(48.9)	24	(51.1)	47	(100)	0.019 0.890
No change	175	(48.5)	186	(51.5)	361	(100)	
Became read	8	(53.3)	7	(46.7)	15	(100)	
Religious group							
Became not attend	19	(40.4)	28	(59.6)	47	(100)	0.897 0.344
No change	171	(49.4)	175	(50.6)	346	(100)	
Became attend	16	(53.3)	14	(46.7)	30	(100)	
Club or organisation							
Became not attend	25	(41.0)	36	(59.0)	61	(100)	2.026 0.155
No change	155	(50.7)	151	(49.3)	306	(100)	
Became attend	26	(46.4)	30	(53.6)	56	(100)	
Pets							
Became not have	25	(56.8)	19	(43.2)	44	(100)	0.970 0.325
No change	173	(47.9)	188	(52.1)	361	(100)	
Became have	8	(44.4)	10	(55.6)	18	(100)	

Older people who rated their health as worsening (60.7%), perceived their health relative to peers as becoming worse (66%), and had no change in arthritis or rheumatism (54%) were associated with decreased life satisfaction.

### The SHLSET study 1989-1993

Table 5.30 shows the association between changes in independent variables and change in life satisfaction between 1989 and 1993 in the SHLSET dataset.

Table 5.30 indicates that there was a significant association between changes in life satisfaction and change in self-rated health ( $\chi^2=9.855$ ;  $p=0.002$ ), perceived health relative to peers ( $\chi^2=11.746$ ;  $p=0.001$ ), having a TV or radio ( $\chi^2=4.136$ ;  $p=0.042$ ), reading a newspaper or journal ( $\chi^2=6.013$ ;  $p=0.014$ ), and attending a club or organisation ( $\chi^2=4.064$ ;  $p=0.044$ ).

Table 5.30: Variables associated with change in life satisfaction in SHLSET.

Variable	No change/increase in life satisfaction N (%)		Decrease in life satisfaction N (%)		Total (%)	$\chi^2$	p value
Gender							
Male	236	(45.9)	278	(54.1)	514 (100)	1.151	0.283
Female	227	(49.6)	231	(50.4)	458 (100)		
Marital status							
No change	419	(47.5)	464	(52.5)	883 (100)	0.840	0.359
Became widowed or separated/divorced	39	(47.6)	43	(52.4)	82 (100)		
Became married	1	(50.0)	1	(50.0)	2 (100)		
Two changes	3	(100)	0	(0.0)	3 (100)		
Socioeconomic class in 1989							
Professional/intermediate	44	(44.9)	54	(55.1)	98 (100)	0.136	0.712
Skilled-non manual/ skilled- manual	62	(53.4)	54	(46.6)	116 (100)		
Semiskilled/unskilled	280	(49.1)	290	(50.9)	570 (100)		
Satisfied with income							
Dissatisfied with income	36	(31.9)	77	(68.1)	113 (100)	1.664	0.197
No change	250	(46.8)	284	(53.2)	534 (100)		
Satisfied with income	116	(58.9)	81	(41.1)	197 (100)		
Living status							
New living alone	45	(39.5)	69	(60.5)	114 (100)	3.335	0.068
No change	387	(48.4)	412	(51.6)	799 (100)		
Living with someone	0	(0.0)	1	(10)	1 (100)		
Self-rated health							
A worsening	102	(36.4)	178	(63.6)	280 (100)	9.855	0.002
No change	159	(49.8)	160	(50.2)	319 (100)		
An improvement	147	(57.9)	107	(42.1)	254 (100)		
Perceived health relative to peers							
Worse health	77	(34.5)	146	(65.5)	223 (100)	11.746	0.001
No change	211	(50.7)	205	(49.3)	416 (100)		
Better health	112	(56.6)	86	(43.4)	198 (100)		
Smoking							
No smoking	30	(39.0)	47	(61.0)	77 (100)	3.549	0.060
No change	398	(48.4)	425	(51.6)	823 (100)		
New smoker	5	(27.8)	13	(72.2)	18 (100)		
Arthritis or rheumatism							
New problem	72	(48.6)	76	(51.4)	148 (100)	0.106	0.745
No change	317	(48.2)	341	(51.8)	658 (100)		
No longer a problem	34	(38.6)	54	(61.4)	88 (100)		
Heart problem							
New problem	41	(48.8)	43	(51.2)	84 (100)	0.301	0.583
No change	339	(47.0)	382	(53.0)	721 (100)		
No longer a problem	44	(51.2)	42	(48.8)	86 (100)		
Stomach							
New problem	68	(45.6)	81	(54.4)	149 (100)	0.451	0.502
No change	348	(47.9)	378	(52.1)	726 (100)		
No longer a problem	16	(40.0)	24	(60.0)	40 (100)		
Giddiness							
New problem	11	(35.5)	20	(64.5)	31 (100)	1.858	0.173
No change	414	(47.4)	459	(52.6)	873 (100)		
No longer a problem	1	(33.3)	2	(66.7)	3 (100)		
High blood pressure							
New problem	35	(51.5)	33	(48.5)	68 (100)	0.087	0.768
No change	334	(47.0)	377	(53.0)	711 (100)		
No longer a problem	48	(43.6)	62	(56.4)	110 (100)		
Urinary incontinence							
New problem	39	(58.2)	28	(41.8)	67 (100)	1.708	0.191
No change	348	(46.6)	399	(53.4)	747 (100)		
No longer a problem	35	(42.7)	47	(57.3)	82 (100)		
Walking problem							
New problem	50	(53.2)	44	(46.8)	94 (100)	0.445	0.505
No change	339	(49.0)	353	(51.0)	692 (100)		
No longer a problem	44	(33.6)	87	(66.4)	131 (100)		

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Walking aid use							
New user	15	(46.9)	17	(53.1)	32	(100)	3.524 0.060
No change	378	(48.8)	397	(51.2)	775	(100)	
No longer use	38	(34.9)	71	(65.1)	109	(100)	
Loneliness							
New problem	46	(48.9)	48	(51.1)	94	(100)	3.275 0.070
No change	317	(50.7)	308	(49.3)	625	(100)	
No longer a problem	40	(31.7)	86	(68.3)	126	(100)	
Friends							
Became no friend	59	(41.3)	84	(58.7)	143	(100)	1.601 0.206
No change	240	(47.6)	264	(52.4)	504	(100)	
Became having friend	12	(52.2)	11	(47.8)	23	(100)	
TV or radio							
Became not have	33	(37.5)	55	(62.5)	88	(100)	4.136 0.042
No change	386	(48.4)	411	(51.6)	797	(100)	
Became have	13	(41.9)	18	(58.1)	31	(100)	
Newspaper or journal							
Became not read	17	(29.3)	41	(70.7)	58	(100)	6.013 0.014
No change	395	(48.3)	422	(51.7)	817	(100)	
Became read	21	(51.2)	20	(48.8)	41	(100)	
Religious group							
Became not attend	22	(36.1)	39	(63.9)	61	(100)	1.276 0.259
No change	383	(47.5)	424	(52.5)	807	(100)	
Became attend	28	(56.0)	22	(44.0)	50	(100)	
Club or organisation							
Became not attend	7	(23.3)	23	(76.7)	30	(100)	4.064 0.044
No change	409	(47.7)	449	(52.3)	858	(100)	
Became attend	16	(55.2)	13	(44.8)	29	(100)	
Pets							
Became not have	31	(37.8)	51	(62.2)	82	(100)	1.016 0.313
No change	350	(47.5)	387	(52.5)	737	(100)	
Became have	51	(53.7)	44	(46.3)	95	(100)	

Participants in Taiwan whose level of self-rated health had decreased (63.6%), reported that their health relative to their peers had got worse (65.5%), no longer had a TV or radio (62.5%), no longer reading a newspaper or journal (70.7%), and no longer attended a club or organisation (76.7%) were more likely to have a decrease in life satisfaction.

From these results, it appears that health, and social engagement factors played a more significant role in life satisfaction change in Taiwanese compared to the NLSAA older people. However, arthritis or rheumatism trouble was more likely to influence people's life satisfaction change in the NLSAA study compared to people in SHLSET.

### **The combined dataset 1989-1993**

Table 5.31 shows the association between change in independent variables and change in life satisfaction in the combined dataset.

For the Chi-squared analyses, because of the large number of tests carried out,  $\alpha$  was set to 0.01 in order to reduce the likelihood of a Type I error.

As shown in Table 5.31, there was no significant association between study location and change in life satisfaction. There was a significant association between changes in life satisfaction and self-rated health ( $\chi^2=13.959$ ;  $p<0.001$ ), health compared to peers ( $\chi^2=19.315$ ;  $p<0.001$ ), and having a TV or radio ( $\chi^2=6.081$ ;  $p=0.014$ ).

**Table 5.31: Variables associated with change in life satisfaction in the combined data set.**

Variable	No change/increase life satisfaction N (%)		Decrease life satisfaction N (%)		Total (%)	$\chi^2$	p value
Study location							
NLSAA	206	(48.7)	217	(51.3)	423 (100)	0.095	0.758
SHLSET	463	(47.6)	509	(52.4)	972 (100)		
Gender							
Male	303	(45.7)	360	(54.3)	663 (100)	2.406	1.121
Female	366	(50.0)	366	(50.0)	732 (100)		
Marital status							
No change	584	(47.8)	638	(52.2)	1222 (100)	1.334	0.248
Became widowed or separated/divorced	54	(45.8)	64	(54.2)	118 (100)		
Became married	4	(66.7)	2	(33.3)	6 (100)		
Two changes	5	(100)	0	(0.0)	5 (100)		
Socioeconomic class							
Professional/intermediate	79	(46.7)	90	(53.3)	169 (100)	0.224	0.636
Skilled-non manual/ skilled- manual	184	(49.5)	188	(50.5)	372 (100)		
Semiskilled/unskilled	328	(49.3)	337	(50.7)	665 (100)		
Satisfied with income							
Dissatisfied with income	50	(34.5)	95	(65.5)	145 (100)	0.980	0.322
No change	410	(47.1)	460	(52.9)	870 (100)		
Satisfied with income	147	(58.8)	103	(41.2)	250 (100)		
Living status							
New living alone	45	(39.1)	70	(60.9)	115 (100)	4.650	0.031
No change	582	(48.7)	612	(51.3)	1194 (100)		
Living with someone	10	(37.0)	17	(63.0)	27 (100)		
Self-rated health							
A worsening	166	(37.5)	277	(62.5)	443 (100)	13.959	<0.001
No change	241	(50.1)	240	(49.9)	481 (100)		
An improvement	206	(58.7)	145	(41.3)	351 (100)		
Perceived health relative to peers							
Worse health	112	(34.4)	214	(65.6)	326 (100)	19.315	<0.001
No change	330	(51.2)	314	(48.8)	644 (100)		
Better health	157	(56.3)	122	(43.7)	279 (100)		
Smoking							
No smoking	41	(41.0)	59	(59.0)	100 (100)	3.271	0.071
No change	584	(48.5)	621	(51.5)	1205 (100)		
New smoker	9	(31.0)	20	(69.0)	29 (100)		
Arthritis or rheumatism							
New problem	108	(51.7)	101	(48.3)	209 (100)	0.686	0.408
No change	460	(47.5)	509	(52.5)	969 (100)		
No longer a problem	61	(44.2)	77	(55.8)	138 (100)		
Heart problem							
New problem	57	(50.0)	57	(50.0)	114 (100)	0.020	0.888
No change	515	(48.3)	551	(51.7)	1066 (100)		
No longer a problem	58	(43.3)	76	(56.7)	134 (100)		
Stomach							
New problem	95	(46.8)	108	(53.2)	203 (100)	0.481	0.488
No change	511	(48.4)	545	(51.6)	1056 (100)		
No longer a problem	32	(40.5)	47	(59.5)	79 (100)		
Giddiness							
New problem	54	(48.2)	58	(51.8)	112 (100)	0.000	0.998
No change	561	(47.6)	618	(52.4)	1179 (100)		
No longer a problem	17	(43.6)	22	(56.4)	39 (100)		
High blood pressure							

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New problem	55	(51.9)	51	(48.1)	106	(100)	0.069	0.793
No change	500	(47.8)	547	(52.2)	1047	(100)		
No longer a problem	68	(43.6)	88	(56.4)	156	(100)		
Urinary incontinence								
New problem	63	(53.8)	54	(46.2)	117	(100)	0.178	0.673
No change	506	(47.9)	550	(52.1)	1056	(100)		
No longer a problem	58	(40.8)	84	(59.2)	142	(100)		
Walking problem								
New problem	76	(51.7)	71	(48.3)	147	(100)	1.135	0.287
No change	489	(49.5)	499	(50.5)	988	(100)		
No longer a problem	67	(34.5)	127	(65.5)	194	(100)		
Walking aid use								
New user	26	(54.2)	22	(45.8)	48	(100)	0.764	0.382
No change	518	(48.4)	553	(51.6)	1070	(100)		
No longer use	70	(39.3)	108	(60.7)	178	(100)		
Loneliness								
New problem	135	(50.0)	135	(50.0)	270	(100)	0.354	0.552
No change	378	(49.9)	380	(50.1)	758	(100)		
No longer a problem	96	(40.0)	144	(60.0)	240	(100)		
Friends								
Became no friend	75	(41.7)	105	(58.3)	180	(100)	1.543	0.214
No change	399	(47.9)	434	(52.1)	833	(100)		
Became having friend	41	(53.2)	36	(46.8)	77	(100)		
TV or radio								
Became not have	34	(37.4)	57	(62.6)	91	(100)	6.081	0.014
No change	583	(48.9)	610	(51.1)	1193	(100)		
Became have	21	(38.2)	34	(61.8)	55	(100)		
Newspaper or journal								
Became not read	40	(38.1)	65	(61.9)	105	(100)	3.047	0.081
No change	570	(48.4)	608	(51.6)	1178	(100)		
Became read	29	(51.8)	27	(48.2)	56	(100)		
Religious group								
Became not attend	41	(38.0)	67	(62.0)	108	(100)	2.031	0.154
No change	554	(48.0)	599	(52.0)	1153	(100)		
Became attend	44	(55.0)	36	(45.0)	80	(100)		
Club or organisation								
Became not attend	32	(35.2)	59	(64.8)	91	(100)	4.516	0.034
No change	564	(48.5)	600	(51.5)	1164	(100)		
Became attend	42	(49.4)	43	(50.6)	85	(100)		
Pets								
Became not have	56	(44.4)	70	(55.6)	126	(100)	0.078	0.780
No change	523	(47.6)	575	(52.4)	1098	(100)		
Became have	59	(52.2)	54	(47.8)	113	(100)		

People in the two studies who had worse self-rated health (62.5%), had worse health relative to their peers (65.6%), and no longer had a TV or radio (62.6%), were more like to have a decrease in life satisfaction.

Interestingly, people who were in the SHLSET study were more likely to have a change in life satisfaction compared with those in the NLSAA study; however, this was not a statistically significant difference. Therefore, it was not necessary to do logistic regression for further analysis on the combined dataset, only on the split dataset.

### 5.3.3.3 Logistic regression analyses for selected variables

A logistic regression model was created for the dichotomous dependent variable 'change in life satisfaction' and those independent variables identified as associated during bivariate analyses. Logistic regression models were used to identify which selected variables were the best predictors of change in life satisfaction from 1989 to 1993 using data from each of the two studies separately.

#### The NLSAA study

Table 5.32 shows the selected independent variables associated with change in life satisfaction between 1989 and 1993 in the NLSAA study. When all the selected variables were considered together, they were significantly associated with changes in life satisfaction ( $\chi^2=33.497$ ;  $df=7$ ;  $p<0.001$ ). In Table 5.32, there was a significant association between changes in life satisfaction and level of depression ( $p=0.001$ ).

**Table 5.32: Selected variables associated with reduced in life satisfaction in the NLSAA study (1989-93).**

Variable (reference category)	Category	Odds ratio	95% CI	p value
Self-rated health (No change)	An improvement	0.740	0.427-1.284	0.052
	A worsening	1.465	0.923-2.324	0.284
Perceived health relative to peers (No change)	Better health	1.058	0.615-1.820	0.074
	Worse health	1.797	1.080-2.990	0.838
Arthritis or rheumatism (No change)	No longer present	0.682	0.365-1.276	0.024
	New problem	0.555	0.299-1.030	0.113
Change in standardised SAD score		1.031	1.013-1.050	0.231
				0.062
				0.001

People who were had higher levels of depression (OR=1.031; 95% CI=1.013-1.050) were more likely to experience decreased life satisfaction. The other variables did not have a statistically significant association.

#### The SHLSET study

Table 5.33 presents the selected variables associated with change in life satisfaction between 1989 and 1993 in the SHLSET dataset.

The overall model with all the variables entered was significant ( $\chi^2=55.169$ ;  $df=11$ ;  $p<0.001$ ). As shown in Table 5.33, there was a significant association between changes in life satisfaction and self-rated health ( $p=0.016$ ) and perceived health



relative to peers ( $p=0.009$ ); the same association was true with change in levels of depression ( $p=0.018$ ).

**Table 5.33: Selected variables associated with reduced in life satisfaction in SHLSET (1989-93).**

Variable (reference category)	Category	Odds ratio	95% CI	<i>p</i> value
Self-rated health (No change)	An improvement	0.826	0.579–1.177	0.289
	A worsening	1.437	1.012–2.041	0.043
Perceived health relative to peers (No change)	Better health	0.872	0.607–1.252	0.457
	Worse health	1.631	1.140–2.333	0.007
Change in standardised SAD score		1.009	1.002–1.017	0.018
Newspaper or journal (No change)	No longer read	0.833	0.425–1.633	0.596
	Started reading	1.874	0.983–3.571	0.056
TV or radio (No change)	No longer to have	1.900	0.799–4.516	0.146
	Became able to have	1.730	0.971–3.083	0.063
Club or organisation (No change)	No longer attending	0.887	0.396–1.987	0.771
	Became able to attend	2.250	0.922–5.490	0.075

Compared to people who experienced no change, people whose self-rated health got worse (OR=1.437; 95% CI=1.012–2.041;  $p=0.043$ ) were more likely to have decreased life satisfaction; and people whose health relative to their peers had got worse (OR=1.631; 95% CI=1.140–2.333;  $p=0.007$ ) were more likely to experience a decrease in life satisfaction. People who had higher levels of depression (OR=1.009; 95% CI=1.002–1.017;  $p=0.018$ ) were more likely to experience decreased life satisfaction.

Similar to people in the UK, older people who had a depression problem in SHLSET had decreased life satisfaction in Taiwan. However, among the SHLSET older people, those whose self-rated health got worse and whose perceived worse health relative to their peers tended to reduce life satisfaction in 1993.

## **5.4 Discussion**

### **Identifying predictors of life satisfaction**

As discussed in the introduction and literature review chapter, there are increasing numbers of older people in society (Lowenstein, 2005). There is an increased interest in life satisfaction in the ageing population (Caspi and Elder, 1986; Chou and Chi, 1999; Chipperfield and Havens, 2001), and also in identifying important factors that affect life satisfaction (Adams and Serpe, 2000; Chou and Chi, 2002; Wang et al.,

2002). In this section, the study identified predictors of life satisfaction and differences in these between the UK and Taiwan.

Table 5.34 summarises the results from the stepwise regression analyses that identified predictors of life satisfaction. It compares the factors that predicted life satisfaction in the NLSAA and SHLSET in 1989 and 1993.

**Table 5.34: Factors relating to life satisfaction between NLSAA and SHLSET in 1989 and 1993 in order of their inclusion in the models.**

Year	NLSAA	SHLSET
1989	Standardised SAD score <sup>1</sup>	Self-rated health
	Loneliness	Satisfaction with income
	Self-rated health	Standardised SAD score
	Satisfaction with income	Perceived health relative to peers
	Having friends <sup>2</sup>	Married people
	Using a walking aid	Socioeconomic class
	Attending a religious group	Loneliness
	Attending a club or organisation	Having a heart problem
		Walking difficulties
1993	Standardised SAD score	Self-rated health
	Self-rated health	Satisfaction with income
	Loneliness	Loneliness
	Walking difficulties	Perceived health relative to peers
	Satisfaction with income	Having a TV or radio
	Attending a religious group	Smoking
	Reading newspaper or journal	Having arthritis or rheumatism problem
	Gender (males)	Walking difficulties
	Living with someone	
	Having high blood pressure problem	

<sup>1</sup> variables in common between NLSAA and SHLSET cross-sectionally; <sup>2</sup> variables not in common cross-sectionally.

In summary, Table 5.34 indicated a number of variables that were consistently identified as being predictive of life satisfaction across the two studies and time-points. Loneliness, self-rated health, having problems walking (either reported walking difficulties or using a walking aid) and satisfaction with income were selected in all four models, and a standardised depression score was selected in three of the stepwise regression models. These variables tended to be selected first in the regression and account for a larger proportion of the variance; therefore, they have a persistent and strong relationship with life satisfaction.

Attending a religious group was related to higher life satisfaction in the NLSAA at both time points and perceived health relative to peers was associated with life satisfaction in the SHLSET at both time points. Additional variables were selected individually at different time points in the two studies.

An unexpected result was a high proportion of older people with loneliness who had high life satisfaction in the Chi-square test in 1989. One possible explanation is that

for people who reported feeling lonely ‘seldom’, their responses were merged to the ‘lonely’ category. Those people responded ‘seldom’ that loneliness happened only occasionally and they possibly had a positive response in the life satisfaction variable. Thus, some of these people in the ‘lonely’ category probably reported high life satisfaction. Another explanation is that these people were below 80 years old and/or had good health. Those who still had the ability to do some activities might have had higher life satisfaction. In 1993, however, people who experienced loneliness were associated with low life satisfaction. Therefore, physical and mental health appeared to be the common problems affecting life satisfaction among older people in the UK. With regard to demographic variables, satisfaction with income, gender, and living status were related to life satisfaction in 1993.

For the older people in the 1989 SHLSET study, physical and mental health variables and demographic characteristics had the strongest relationship with life satisfaction. Income, marital status, and socioeconomic class were the most important influences on life satisfaction. In comparison, in 1993, health and demographic variables still influenced life satisfaction in the sample of Taiwanese older people, but having a TV or radio also became a significant predictor of life satisfaction. In the literature review, Chen (2001) showed that having a TV was important for social engagement among Taiwanese older people, this might explain the importance of this as a predictor of life satisfaction.

Table 5.35 summarises the results from the logistic regression analyses that identified predictors of life satisfaction. It compares factors that predicted life satisfaction in the NLSAA and SHLSET in 1989 and 1993.

**Table 5.35: Factors relating to life satisfaction between NLSAA and SHLSET in 1989 and 1993.**

Year	NLSAA	SHLSET
1989	Satisfaction with income <sup>1</sup>	Satisfaction with income
	Standardised SAD score	Standardised SAD score
	Loneliness <sup>2</sup>	Marital status (single, separated/divorced)
	Walking aid use	Socioeconomic class (skilled/manual and non-manual)
	Having friends	Perceived health relative to peers (less, about as)
		Newspaper or journal read
1993	Self-rated health (poor, fair)	Loneliness
	Loneliness	Living with someone
	Walking aid use	Satisfaction with income
	Standardised SAD score	Perceived health relative to peers (less healthy)
	Newspaper or journal read	Having a TV or radio
		Having a pet

<sup>1</sup> variables in common between NLSAA and SHLSET cross-sectionally; <sup>2</sup> variables not in common cross-sectionally.

In summary, Table 5.35 indicates a number of variables that were consistently identified as being predictive of life satisfaction across the two studies and time-points. Satisfaction with income and standardised SAD score predicted life satisfaction in both countries in 1989. Loneliness also predicted life satisfaction in the two countries in 1993.

Having depression, feeling lonely, and using a walking aid were related to lower life satisfaction in the NLSAA at both time points; and satisfaction with income and perceived health relative to peers were associated with life satisfaction in the SHLSET at both time points. Social engagement variables were significant at different time points in both studies.

The results suggest that physical and mental health, financial problems, and social engagement were related to life satisfaction in the two countries. First, physical health was different in both studies. Older people in the UK who rated their health as poor and used a walking aid tended to have lower life satisfaction. This probably indicates that using a walking aid might affect an older person's activities and tend to reduce their engagement with others, and this may have lowered their morale. According to Fox (1999), physical activity is associated with improving mental health (e.g., depression, anxiety) and enhancing subjective well-being. As discussed in the literature review, lower quantitative activities of daily living were related to depression and lower quality of life (Sato et al., 2002; Wada et al., 2005). Conversely, the older Taiwanese people who perceived themselves as less healthy relative to their peers had low life satisfaction. Previous studies have focused on the relationship between self-rated health and life satisfaction (Schneider et al., 2004; Borglin et al., 2005), but few discuss whether peoples' perceived health relative to peers affected life satisfaction or quality of life. However, an individual's perceived health is a complex matter and cannot be defined as either illness or disease. A possible explanation is that these people might have negative thoughts or feelings about their health compared with others leading to lower levels of life satisfaction. However, this finding may be explained by other factors unmeasured in this research, i.e., older people with poor perceived health compared with others might have low life satisfaction through the mediating effect of other unmeasured confounding variables.

Second, mental health appeared to have a relationship with life satisfaction among older people in the UK and Taiwan at both time points. This result was consistent

with previous studies and the literature review discussion that depression has a negative relationship with life satisfaction (Headey et al., 1993; Holmén et al., 1999; Liu and Guo, 2007). As discussed in the literature review, depression is likely to be explained by anxiety, sadness, and so on. These negative feelings may change a person's activity levels with others and their engagement with society in terms of impairment in social functioning (Hays et al., 1997). Moreover, people with mental health problems are likely to lack social support (Prince et al., 1997). These reasons might be link to low life satisfaction in old age. Thus, if older people have a better family network or friends to help them cope with emotional stress and reduce the risk of depression, it might improve their life satisfaction.

Third, financial problems seemed to affect life satisfaction more among older people in Taiwan than the UK. For older people who live in Taiwan are traditionally dependent on either their retirement pension or adult children to support them. However, family responsibility for the financial support and care of older family members has gradually declined, as the traditional concept of the extended family has been replaced by the newer concept of the nuclear family. Thus, most older people in Taiwan feel worried about financial problems relating to increasing healthcare costs on account of decreasing family support and the lack of social security support from the Taiwanese government. In contrast with Taiwan, there has been a long history of the National Health Service (NHS) and social security for older people in the UK; personal pensions began in 1988 (The Pensions Advisory Service, 2006) along with the existing state pension. This may explain why 'satisfaction with income' did not appear to affect life satisfaction amongst UK older people in 1993.

Indeed, the financial needs of older people influence their life satisfaction. As concluded in the literature review (Section 2.5.5.5), older people who are dissatisfied with their income are more likely to express difficulties spending money for healthcare (e.g., in Taiwan), maintaining their own home, and driving a car for shopping and travelling. In other words, older people with higher incomes and/or greater savings could be more satisfied with their financial situation. This could translate into heightened life satisfaction, whether in the UK or Taiwan. The fundamental difference between these two countries, then, may be that older people in Taiwan feel less secure about their financial future and ability to care for themselves

financially and this causes finances to play a bigger part in their overall satisfaction with life.

Finally, social engagement variables were related to life satisfaction in both countries; this was consistent with previous research, which indicated that low social engagement tends to be related to low levels of life satisfaction (Jang et al., 2004). According to Jang et al. (2004), older people with different combinations of disease and disability, who experience low levels of social engagement, (e.g., social networks and participation in social activities) tend to have low life satisfaction, and they suggest that enhancing social engagement may improve this situation. Owning a TV or radio was an important factor in predicting high life satisfaction among older Taiwanese people, and this finding is consistent with Chen's studies (2001; 2003). Being tightly engaged in social activities and watching TV were the most important leisure activities associated with high life satisfaction in older Taiwanese people (Chen, 2001; Chen, 2003).

The location of the study, whether the UK or Taiwan, had relatively little effect on life satisfaction, either in the stepwise regression analyses of 1989, or in the chi-square analyses of 1993 in the combined dataset. It also had no statistically significant effect in the logistic regression models of 1993. One potential explanation for this may be that older Taiwanese people are more likely to be single, separated or divorced, and belong to a lower socioeconomic class than their counterparts in the NLSAA. As discussed in Section 2.5.5, this may create some problems relating to health and/or income conditions, because people who are single, separated or divorced, and from lower socioeconomic classes, may generally be in poorer health and have lower income, and therefore these older people may be more likely to experience lower life satisfaction and quality of life.

The implications of these findings for Taiwan may be especially relevant to the next generation, for at least two reasons, the first of which is that the (ageing) population in Taiwan is currently facing unexpected challenges and changes in the social structure. For example, more families are becoming 'nuclear' instead of 'extended', and this change may diminish support (e.g., finance and care) for older people in families (Mohan, 2004). Secondly, more older Taiwanese people are losing familial and financial support because of the rising number of adult children studying and/or working abroad. It is unclear how older Taiwanese people will adjust to these changes

and maintain their health and well-being. Future research is needed to determine whether the life satisfaction of the next generation of older Taiwanese people will actually decline, and for what reasons. Since this problem is not unique to Taiwan, studies involving multiple countries and cultures are warranted, as well as meta-analyses of findings from different countries.

### **The study location variable with the interaction term as a predictor of life satisfaction**

This section answered the research question by examining interactions between the location of the study and life satisfaction. Different countries have different cultural contexts, and this may affect how a person assesses his or her life satisfaction. Additionally, the role of culture in the development of life satisfaction is far from clear. Therefore, it was not known how 'nation' as an interactive term might predict life satisfaction, since there has been no previous research. However, how satisfactory an individual perceives his or her life to be may be influenced by how well his or her needs are being met by the society in which they live. In general, a nation with greater resources has the potential to offer people more opportunities to achieve their goals, and goal achievement is likely to include feeling satisfied with life. On the other hand, people may experience deprivation, and/or enormous pressures to achieve, which can lead to lower life satisfaction because of the perception of these conditions.

The results of this study show that life satisfaction among older people did not differ substantially between the UK and Taiwan in 1989. However, this had changed by the year 1993, so that certain subgroups of older Taiwanese people experienced significantly lower life satisfaction than their counterparts in the UK. Subgroups for which this was true included older people who were married, who habitually smoked, had certain health conditions, had walking problems, used a walking aid, were more depressed, were friendless, did not read newspapers or journals, did not attend clubs or organisations, and had a pet. Many of these were negative attributes, suggesting that people without these in Taiwan had lower life satisfaction than people in the UK in the same situations, i.e., they were less resilient.

Several attributes were health-related problems which tended to be associated with lower levels of life satisfaction, and this was consistent with previous analyses in this chapter (e.g., stepwise and logistic regression). This result was also in agreement with

the literature review, in which it was illustrated that, in international comparisons of quality of life, health was the most important attribute of the overall quality of life. The initial analyses (e.g., chi-square tests) also demonstrated that the study location variable had a relationship with life satisfaction, and that older UK people tended to have high life satisfaction, and this result was consistent with the earlier study. According to Ferring et al. (2004), older people in the UK had a higher life satisfaction than other European countries because older UK people had a good standard of living and better health care. Even UK older people have high levels of depression; the NHS provides an annual mental examination for older people aged 75 and over to ensure early identification of mental problems and further to give prompt treatment for mental disorders. Another possible contributor was that Chinese people tended to relate their life satisfaction to objective conditions, such as welfare and healthcare implications (Shek et al., 2005).

This contrast is relevant in terms of trying to understand how differences in life satisfaction arise between nations. One substantive explanation for differences between these two countries is that the UK is an industrial and welfare nation with material wealth, social equality, and better public policies. As mentioned in Section 1.4, the UK has a good social security system for its older people, for example, its pension scheme. It can be assumed that older UK people may have a good standard of living compared with their Taiwanese counterparts, which may underline self-rated life satisfaction, since the State Earnings Related Pension Scheme began in 1978 and Personal Pensions started in 1988, and therefore these have been available for a long time. These welfare services are provided to enhance people's living conditions and ease their financial problems, which may, therefore, explain the high life satisfaction rating among older people in the UK. On the other hand, the government of Taiwan has offered several temporary allowances over the past ten years, although annuities for citizens only began for people of 65 years and over on the 1<sup>st</sup> of October 2008.

A response style in which feelings are rated at different response levels (e.g., 'yes', 'don't know' or 'no answer') could also explain people's differences in life satisfaction. According to Schuessler (1985), 'quality of life' research began in the 1960s, and it can be said that quality of life is a typically Western concept. Because of this, perhaps people do not find it easy to say 'yes, I am satisfied' as a response. The 'don't know' answer could become the 'default' response when someone is not be



sure, or may not really understand the meaning of life satisfaction, or cross-cultural verbal interactions may vary widely. As Coombs and Coombs (1976) report, the ‘don’t know’ element may be a sensitive response. Participants may not wish to expose their feelings, or the item may not be understood. Consequently, therefore, many may respond ‘don’t know’ or ‘no answer’, leading to lower scores for life satisfaction.

Another explanation for the differences between nations may be that cultures differ in their expression of individual feelings, and people in Western countries may be more likely to indicate their feelings and level of life satisfaction. As discussed in the literature review of comparisons of quality of life, Lamb (1996) suggested that Asian people have more functional disablement and emotional problems. Thus, it can be assumed that Asian people whose conservative diplomacy may cause them to hide their feelings and give more neutral responses, would again exhibit lower life satisfaction values.

**Identifying predictors of change in life satisfaction**

This section examined change in life satisfaction among older people from 1989 to 1993, and compared the two studies from the UK and Taiwan.

Table 5.36 shows the predictors of change in life satisfaction in the two nations by using stepwise regression and logistic regression analyses. The variables are ordered according to their inclusion in the stepwise linear regression models, i.e., the first ones showing the most variances. The purple words show the different variables between the two countries.

**Table 5.36: Factors relating to change in life satisfaction between NLSAA and SHLSET in 1989 and 1993.**

Method	NLSAA	SHLSET
Stepwise regression <sup>1</sup>	Perceived better health relative to peers <sup>2</sup>	Self-rated health improvement
	Self-rated health improvement	Satisfaction with income
	Age in 1993 <sup>3</sup>	New walking problem
		Perceived better health relative to peers
		Became able to have a TV or radio
Logistic regression	Increased standardised SAD score	Increased standardised SAD score
		Self-rated better health
		Perceived better health relative to peers

<sup>1</sup> factors relating to life satisfaction in order of their inclusion in the models;

<sup>2</sup> variables in common between NLSAA and SHLSET cross-sectionally;

<sup>3</sup> variables not in common cross-sectionally.

In summary, Table 5.36 indicates a number of variables that were consistently identified as being predictive of change in life satisfaction across the two studies. Perceived better health relative to peers and improvement in self-rated health were associated with increased life satisfaction in both stepwise regression models. Additional variables were selected individually at different points in the two studies. These variables were selected in the regression models and account for a small proportion of the variances, and therefore, have a relationship with change in life satisfaction. In the logistic regression models, an increased standardised SAD score was related to decreased levels of life satisfaction in the two studies, and worse self-rated health and worse perceived health relative to peers were associated with decreased life satisfaction among older people in SHLSET.

The result was in agreement with previous studies that age, self-rated health, and social activities are associated with changes in life satisfaction (Palmore and Kivett, 1977; Bowling et al., 1996; Sato et al., 2002; Mroczek and Spiro, 2005), but very little is known about the relationship between change in depression level and change in life satisfaction. People who grew older, rated health worse, perceived health worse relative to peers, and had new walking difficulties were more likely to show a decreased life satisfaction level. As discussed in the previous paragraph, self-rated health and perceived health relative to peers were difficult to assess and might confound other unmeasured variables. Although these variables had only minor variances identified as affecting a change in life satisfaction, small life satisfaction changes may be statistically significant, especially with large studies. However, a limitation of this research is that it did not explore how many changes in the standardised LSI scores could be interpreted in terms of small, moderate, or large changes in life satisfaction as reported by older people. Further research is needed to understand what factors affect the different levels of life satisfaction.

Life satisfaction is a dynamic process that changes according to an individual's circumstances (Fernández-Ballesteros, 1998). These results supported this contention among older people, who appeared to evaluate their overall life satisfaction based upon such circumstances as their financial status or whether they had a TV or radio. The financial problems of old age have already been discussed in Sections 2.5.5. Financial strain and low income have been found to be key factors causing low life satisfaction among older people (Hutchison III, 1975; Zhang and Yu, 1998; Chou and

Chi, 1999; Fernández-Ballesteros et al., 2001; Aurelia and Baldazzi, 2002; Chou and Chi, 2002). However, a decreased income might have had a stronger affect in decreasing the levels of life satisfaction in old age.

### **5.5 Conclusion**

The present research indicates what factors are associated with life satisfaction among older people. There are numerous determinants of life satisfaction in older people, and most of these hold true in both the United Kingdom and in Taiwan. Aspects of physical health are important, as are one's mobility and one's mental health. Satisfaction with one's personal financial status also appears to play a significant part. In addition, these relationships largely seem to hold true over time. However, the numerous interactions between these various contributors to health are complicated. In other words, what is the horse, what is the cart, and what is the chain linking the two is not entirely clear; further research remains warranted. This study has helped tease out general trends and the most important variables.

More importantly, the question arises whether the study location variable interacts with other variables in predicting life satisfaction. This chapter has been concerned with the relationships between a nation in which older people live and their life satisfaction, and between another country and other factors that influence life satisfaction. It was very clear that the study location variable did not exert much of an effect in 1989; however, it did in 1993. Certain subgroups of older people in the UK expressed higher-level life satisfaction despite having more health problems. The present findings suggest that these older people may have had better living conditions than their counterparts in Taiwan. Lamb and Myers (1999) suggested that political and economic situations have a possible impact on life satisfaction associated with successful ageing in Asia. This difference might be explained, at least in part, by differences in the UK and Taiwan, especially among older people. However, further research focusing on the effects of public policies, social security and the welfare system on older people would be of great interest and value in understanding the role of 'nation' and its influence on life satisfaction. Other unmeasured variables might be confounding to affect life satisfaction.

Aspects of physical and mental health were associated with changes in life satisfaction among people in the two countries. In particular depression affected

change in life satisfaction among people as they grew older. Although there are few previous studies regarding change in life satisfaction, there was some evidence in this research that changes in perceived health and mobility might be associated with increased depression because depression might be a result of disease and lessen activities of daily living leading to low life satisfaction.

The important factors (e.g., physical health, diseases) affecting life satisfaction may change with age. However, what are factors influence on life satisfaction among older people with advancing age and the survival of the fittest. Therefore, Chapter 6 will examine the effect of life satisfaction on older people's mortality.