The Australian Longitudinal Study of Ageing

15 Years of Ageing in South Australia
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The Australian Longitudinal Study of Ageing
15 Years of Ageing in South Australia

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We would like to dedicate this monograph to the memory of Professor Gary Robert Andrews. His untimely death meant that it has fallen to others to complete this work, which meant so very much to him. Gary, as we all knew him, was the Director of the Centre for Ageing Studies, which he established to provide a ‘home’ for the Australian Longitudinal Study of Ageing (ALSA). He was the founding Chief Investigator of the ALSA and instrumental to its success over the past 15 years. His vision in conceptualising the project, tenacity in making it happen and dedication to its continuing development attest to his abiding commitment to understanding the ageing process, in all its complexity. He inspired others and encouraged research collaborations and was instrumental in setting research agendas. This monograph is one legacy of his influence, which will continue as the myriad of findings from the ALSA continues to emerge.
ACKNOWLEDGEMENTS

Older people in and around Adelaide, South Australia have participated in the Australian Longitudinal Study of Ageing over many years. They have given generously of their time and without them this monograph would not have been possible. We owe them a debt of thanks that words can not express.

The team of interviewers, clinical assessors and support staff who implemented each of the waves also deserve special mention for the dedication and care they have given to the ALSA. They too are vital to the success of ALSA and we extend our thanks to them.

Because of them our understanding of the ageing process has been enriched tremendously and ALSA has become one of the influential international cohort studies of later life.

The Australian Longitudinal Study of Ageing was conducted by the Centre for Ageing Studies, Flinders University, Science Park, Adelaide, Australia.

Funding for data collection began in 1991 with major funding from the US National Institute on Aging, (No AG08523), for a period of 5 years. Funding from the Office for the Ageing (SA), and ECH Inc. SA was vital to the conduct of Wave 6 of ALSA in 2000-2001. The National Health and Medical Research Council, Australia (NH&MRC) grant (ID22922) enabled conduct of the 7th and 8th Wave of ALSA. Wave 9 will be supported by funds from the Premier’s Science Research Fund as part of a Science and Innovation Strategic Project Building A Fit and Healthy South Australia. Funding for future waves will come from the Australian Research Council: Discovery Projects (ID: DP0879152).

Further funding for pilot work and data analysis came from a variety of sources including the:

- South Australian Health Commission;
- Australian Rotary Health Research Fund;
- Sandoz Foundation for Gerontological Research;
- Flinders Medical Centre Foundation;
- Australian Housing and Urban Research Institute;
- several grants from Flinders University Research Grants Schemes, including infrastructure to maintain the project between active data collection periods and enable collaborations.

The late Gary Andrews, along with the late George Myers, secured funding that launched ALSA. Michael Clark deserves special mention also as one of the initial investigators. He was involved in ALSA since its inception, and in the early stages of preparation of this monograph. Sadly he lost a noble battle with a prolonged illness in July 2007. The report would no doubt have been strengthened by his clear thinking, analytic skills and work ethic. They built and left behind a dedicated team of researchers, in addition to those who have been instrumental in producing this report. We wish to acknowledge the ongoing commitment and involvement at various points during the project of Kaarin Anstey, Lynne Cobiac, Maria Crotty, Debbie Faulkner, Lynne Daniels, Andy Gilbert, James Harrison, Konrad Pseudovs, and Linnett Sanchez.
Two early career researchers launched their research programs through the mechanism of ALSA, in association with Professor Luszcz. Dr. Kaarin Anstey took up her NHMRC Australian Clinical Research Fellowship (#987100), in 1998 for a period of 5 years. Her work on cognitive and sensory ageing, psychological risk and protective factors for survival, and more recently the links between cognitive ageing and mobility, and well-being and independence have been a core part of the overall research agenda stemming from the ALSA. Some of this work is captured later in this volume. Dr. Ruth Walker began her ARC-Linkage Post-doctoral Fellowship (LP0669272) in 2007 for 3 years. Her project focuses on the dynamics of spousal relationships in very late life among the 565 couples who enrolled in the ALSA.

The Centre for Ageing Studies would also like to acknowledge other support from the Office for the Ageing over the years, in particular funding for the innovative South Australian Network for Research on Ageing (SANRA). Between 1998 and 2002 SANRA provided a lively focus for Adelaide-based and visiting researchers to exchange ideas, collaborate in research, and attend seminars. A quarterly newsletter kept researchers, practitioners, and those involved in policy and government abreast of the latest research going on in the state.
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# Table of Contents

1. Introduction ............................................................................................................... 1
   1.1 Our Ageing Population ..................................................................................... 1
   1.2 Ageing Research ............................................................................................. 2
   1.3 Longitudinal And Multi-Disciplinary Research ............................................... 8

2. The Australian Longitudinal Study Of Ageing ......................................................... 10
   2.1 ALSA And The Centre For Ageing Studies ...................................................... 10
   2.2 The Pilot Study .............................................................................................. 10
   2.3 Objectives Of The Australian Longitudinal Study Of Ageing ......................... 11
   2.4 Research Design And Method ...................................................................... 12
   2.5 Survey Instruments ....................................................................................... 15

3. Demographic And Social Characteristics ............................................................... 17
   3.1 Key Findings .................................................................................................. 17
   3.2 Age And Gender Distribution ........................................................................ 19
   3.3 Marital Status And Household Structure ...................................................... 20
   3.4 Social Relationships ...................................................................................... 22
   3.5 Ethnicity ........................................................................................................ 25
   3.6 Education ....................................................................................................... 26
   3.7 Work And Volunteering ................................................................................ 27
   3.8 Income ........................................................................................................... 30
   3.9 Living Arrangements ..................................................................................... 33

4. Physical Health And Functional Disability ............................................................. 36
   4.1 Key Findings .................................................................................................. 36
   4.2 Medical Conditions ....................................................................................... 37
   4.3 Self-Rated Health And Health Trajectory ...................................................... 41
   4.4 Medications ................................................................................................... 43
   4.5 Changes In Physical Function ....................................................................... 45

5. Cognition, Mild Cognitive Impairment And Sensory Perception .......................... 49
   5.1 Key Findings .................................................................................................. 49
   5.2 Describing Change Over 12 Years In ALSA ................................................... 51
   5.3 Mild Cognitive Impairment: Pre-Clinical Dementia ......................................... 56
   5.4 Sensory Perception And Cognitive Change ................................................... 58
   5.5 Cognitive And Sensory Change - Conclusions .............................................. 61

6. Psychological Well-Being: Depression And Sense Of Self .................................. 62
   6.1 Key Findings .................................................................................................. 62
   6.2 Sense Of Self Measures ................................................................................ 62
   6.3 Depressive Status: Transitions Across Waves ................................................ 66
   6.4 Prevalence Of, And Risk Factors For, Depression In ALSA Participants Living In The Community Or In Residential Aged Care ........................................... 68
   6.5 Change In Depressive Symptoms Over 12 Years .......................................... 69
   6.6 Summary - Depression ............................................................................... 70
   6.7 Conclusions And Implications .................................................................... 71
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Health Behaviours</td>
<td>73</td>
</tr>
<tr>
<td>7.1 Key Findings</td>
<td>73</td>
</tr>
<tr>
<td>7.2 Alcohol</td>
<td>73</td>
</tr>
<tr>
<td>7.3 Smoking</td>
<td>74</td>
</tr>
<tr>
<td>7.4 Exercise And Activities</td>
<td>75</td>
</tr>
<tr>
<td>7.5 Nutrition</td>
<td>75</td>
</tr>
<tr>
<td>8. Health Service Utilisation And Expenditure</td>
<td>77</td>
</tr>
<tr>
<td>8.1 Key Findings</td>
<td>77</td>
</tr>
<tr>
<td>8.2 Health Service Expenditure In The Elderly</td>
<td>78</td>
</tr>
<tr>
<td>8.3 ALSA Study Data Collected On Resource Use</td>
<td>78</td>
</tr>
<tr>
<td>8.4 Pbs And Mbs Expenditure In Hic Patients</td>
<td>79</td>
</tr>
<tr>
<td>8.5 Self - Reported Hospitalisations Of ALSA Participants</td>
<td>81</td>
</tr>
<tr>
<td>8.6 Overall Service Mix And Expenditure In Survivors By Sex And Age In Older Populations</td>
<td>81</td>
</tr>
<tr>
<td>8.7 Residential Care</td>
<td>83</td>
</tr>
<tr>
<td>8.8 Use Of Care Organisations</td>
<td>84</td>
</tr>
<tr>
<td>9. Risk Factors For Mortality</td>
<td>86</td>
</tr>
<tr>
<td>9.1 Key Findings</td>
<td>86</td>
</tr>
<tr>
<td>9.2 Nutrition</td>
<td>86</td>
</tr>
<tr>
<td>9.3 Exercise</td>
<td>87</td>
</tr>
<tr>
<td>9.4 Social Networks</td>
<td>87</td>
</tr>
<tr>
<td>9.5 Psychological Factors</td>
<td>87</td>
</tr>
<tr>
<td>9.6 Depression</td>
<td>88</td>
</tr>
<tr>
<td>9.7 Summary</td>
<td>88</td>
</tr>
<tr>
<td>10. Policy And Program Implications</td>
<td>89</td>
</tr>
<tr>
<td>10.1 Independence, Living Arrangements And Housing</td>
<td>89</td>
</tr>
<tr>
<td>10.2 Work, Volunteering And Making A Contribution</td>
<td>91</td>
</tr>
<tr>
<td>10.3 Social Networks</td>
<td>92</td>
</tr>
<tr>
<td>10.4 Health Service Use</td>
<td>93</td>
</tr>
<tr>
<td>10.5 Healthy Ageing And Quality Of Life</td>
<td>94</td>
</tr>
<tr>
<td>10.6 Determinants Of Longevity</td>
<td>95</td>
</tr>
<tr>
<td>10.7 Psychological Ageing</td>
<td>95</td>
</tr>
<tr>
<td>11. Conclusion</td>
<td>97</td>
</tr>
<tr>
<td>11.1 Looking Forward: Selected Topics For Future Research</td>
<td>97</td>
</tr>
<tr>
<td>11.2 ALSA As Part Of Secondary Data Analysis Consortia</td>
<td>99</td>
</tr>
<tr>
<td>11.3 Summing Up</td>
<td>99</td>
</tr>
<tr>
<td>12. References</td>
<td>100</td>
</tr>
<tr>
<td>Appendix 1: Summary Of Domains</td>
<td>108</td>
</tr>
<tr>
<td>Appendix 2: Domains And Instrument Sources</td>
<td>110</td>
</tr>
<tr>
<td>Appendix 3: ALSA Associates</td>
<td>115</td>
</tr>
<tr>
<td>Appendix 4: ALSA Bibliography</td>
<td>118</td>
</tr>
</tbody>
</table>
List of Tables

Table 2.4.1: Summary of responses of potential primary participants at Wave 1 of ALSA .......... 13
Table 2.4.2: ALSA primary cohort: response rate over Waves 1 to 6 ........................................ 14
Table 2.4.3: ALSA time line ........................................................................................................ 15
Table 3.1: Summary profile of ALSA participants at Wave 1 ...................................................... 18
Table 3.2.1: Age and gender distribution of ALSA participants by Wave ................................... 19
Table 3.4.1: Baseline summary statistics for structure of social relationships of ALSA participants (n=2087) ........................................................................................................ 23
Table 3.4.2: Baseline statistics for function of social relationships of ALSA participants (n=1939) .............................................................................................................................. 23
Table 3.4.3: Baseline statistics for reciprocity of support with children for ALSA participants (n=1839) ................................................................................................................................... 24
Table 4.2.1: Prevalence of medical conditions at Wave 1 interview for 2087 participants .......... 38
Table 4.2.2: Comorbidities at Wave 1 by Age ............................................................................... 39
Table 4.2.3: Prevalence of medical conditions at Wave 6 interview for 791 participants .......... 40
Table 4.4.1: Anatomical groups used in ATC system .................................................................. 43
Table 4.4.2: Ten most common medications taken at Wave 1 .................................................... 44
Table 4.5.1: Transitions from each mobility state over Waves 1 to 6 .......................................... 47
Table 4.5.2: Transitions from each Nagi state over Waves 1 to 6 .................................................. 48
Table 5.3.1: Dementia Transitions Waves 1 to 7 ....................................................................... 57
Table 6.3.1: Depression Transitions: Waves 1 to 7 .................................................................. 67
Table 6.4.1: Prevalence of depression by place of residence .................................................... 69
Table 8.4.1: Average Medical Benefits Schedule and Pharmaceutical Benefit Schedule (2002-03 constant price) expenditure per person year by Age and Sex ........... 79
Table 8.4.2: Average Pharmaceutical Benefit Schedule scripts (2002-03 constant price) expenditure per person year by Age and Sex ......................................................... 80
Table 8.4.3: Average GP in surgery consults* and expenditure per person per year (2002-03 constant prices) by Age and Sex ................................................................. 80
Table 8.5.1: Self reported hospitalisations and bed days by Age and Sex .................................. 81
Table 8.6.1: Average Medical Benefits Schedule, Pharmaceutical Benefit Schedule and hospital bed day expenditure (constant 2002-03 prices) per person year by Age and Sex ......................................................... 82
List of figures

Figure 2.4.1: Response rate by Local Government Area for five-year age groups and gender .... 13
Figure 3.2.1: Gender distribution of ALSA participants by Wave................................................. 19
Figure 3.3.1: Marital status by Wave - Males................................................................. .................. 20
Figure 3.3.2: Marital status by Wave - Females ................................................................. .................. 20
Figure 3.3.3: Co-resident status of ALSA participants by Wave and Gender........................................... 21
Figure 3.5.1: ALSA participants – country of birth.............................................................. .................. 25
Figure 3.6.1: Wave 1 – Age left school by Gender ................................................................. .................. 26
Figure 3.6.2: ALSA participants who had obtained a certificate, diploma, degree or other qualification since leaving school by Age and Gender – Wave 1 .................................................. 26
Figure 3.6.3: Wave 1 - Highest post-school qualification obtained by Gender ........................... 27
Figure 3.7.1: Participants currently in paid employment by Wave .................................................. 28
Figure 3.7.2: Type of work done for most of life by Gender .......................................................... 28
Figure 3.7.3: Hours spent doing paid or voluntary work in a 3 month period by Wave – Males ... 29
Figure 3.7.4: Hours spent doing paid or voluntary work in a 3 month period by Wave - Females 29
Figure 3.8.1: Total annual income by Gender – Wave 1 ............................................................. 30
Figure 3.8.2: Total annual income by Age – Wave 1 ........................................................................ 31
Figure 3.8.3: How well needs met (by income) by Age – Wave 1 ..................................................... 31
Figure 3.8.4: How well needs met (by income) by Wave ............................................................ 32
Figure 3.8.5: Source of income by Gender and Wave ................................................................. 32
Figure 3.9.1: ALSA participants – Domicile by Wave ................................................................. 33
Figure 3.9.2: Type of tenure by Wave ......................................................................................... 34
Figure 4.2.1: Number of medical conditions by Age at Wave 1 ..................................................... 37
Figure 4.2.2: Number of medical conditions by Age at Wave 6 ..................................................... 39
Figure 4.3.2: Health compared to others by Gender – Wave 1 ....................................................... 41
Figure 4.3.3: Health compared to others by Age – Wave 1 .......................................................... 42
Figure 4.3.4: Health compared to 12 months ago by Age – Wave 1 .................................................. 42
Figure 4.5.1: The International Classification of Functioning, Disability and Health .................. 45
Figure 4.5.2: Average disability at each of Waves 1, 3, 6, and 7 ..................................................... 46
Figure 5.2.1: Mini-Mental State Exam - mean scores by Age and Wave ........................................ 51
Figure 5.2.2: Number of medical conditions by Age at Wave 6 ..................................................... 52
Figure 5.2.3: Mean immediate recall of pictures by Age and Wave ................................................ 52
Figure 5.2.4: Reasoning performance by Age in Wave 1 .............................................................. 53
Figure 5.2.5: Vocabulary by Age and Wave (Waves 1, 6 and 7) ......................................................... 53
Figure 5.2.6: Mean scores in naming performance by Age and Wave .............................................. 54
Figure 5.2.7: Gains, Losses and Stability between Wave 1 and Wave 3 in Cognitive Abilities ....... 55
Figure 5.3.1: Cognitive classifications at Wave 1 and 3 ................................................................. 57
Figure 5.4.1: Random sample of individual cognitive or sensory scores for 150 participants for 1, 2 or 3 occasions ................................................................. 60
Figure 5.4.2: Mean depression score by Age and Wave ................................................................. 63
Figure 5.4.3: Mean morale score by Age and Wave ................................................................. 63
Figure 5.4.4: Mean self-esteem score by Age and Wave ............................................................... 64
Figure 5.4.5: Gains, Losses and Stability over time in sense of self domains .............................. 65
Figure 5.6.1: Depression classifications at Wave 1 and 3 ............................................................. 66
Figure 5.7.1: Frequency of alcohol consumption by Age ............................................................ 73
Figure 5.7.2: Preferred weight by Age ......................................................................................... 76
Figure 5.7.3: Percent tried to lose weight in past year by Age ...................................................... 76
Figure 5.7.4: BMI category by Age for Males and Females ............................................................ 75
Figure 8.7.1: Summary of place of residence at each Wave .......................................................... 84
Figure 8.8.1: Service Use by Sex and Wave..................................................................................... 85
EXECUTIVE SUMMARY

The overarching aim of the Australian Longitudinal Study of Ageing (ALSA) has been to gain an increased understanding of how social, biomedical, behavioural, economic and environmental factors are associated with age-related changes in the health and well-being of older Australians. The design of the study is therefore multidimensional and includes interview, clinical, laboratory and performance based measures. The breadth and scope of ALSA are unusual, even by comparison with longitudinal studies of ageing conducted in other countries. The inclusion of both survey and clinical components makes it possible to link objective clinical measures with details of the lifestyle, attitudes and personal histories of respondents. With the added dimension of repeated observations over time, ALSA provides a richness of data not available in previous Australian studies, and promises to substantially increase our understanding of the quality of life of older Australians.

The Study

The study, which commenced in 1992, was devised to generate longitudinal data over multiple time points - eight Waves have been carried out to date; four Waves (Waves 1, 3, 6, 7) comprised of an extensive face to face interview and clinical assessment and four Waves (Waves 2, 4, 5, 8) shorter telephone interviews. Wave 9 face-to-face interviews and individual assessments are due to commence in late 2007, as part of a Science and Innovation Strategic Project Building A fit and healthy South Australia awarded by the Premier’s Science Research Fund. Funding for future waves will come from the Australian Research Council: Discovery Projects (ID: DP0879152).

The primary sample of the older old adults (70 and older) was randomly drawn from the database of the South Australian Electoral Roll. Persons in the older age groups as well as males were deliberately over sampled to compensate for the higher mortality that could be expected over the study period. In addition, spouses of primary respondents (aged 65 and over) and other household members aged 70 and over were asked to participate. Two thousand and eight-seven participants were initially interviewed at Wave 1 in 1992. Over the years attrition due to either refusal, ill health, moving out of scope, death or being un-contactable has reduced the number of participants. By Wave 7 in 2003/4 487 participants agreed to be interviewed again and 349 were interviewed by telephone for Wave 8 in 2005/6.

Scope of the Report

While this report provides a comprehensive overview of the ALSA and the main findings from it, it is not exhaustive. This report contains descriptive data on the ALSA participants at different time points. These include demographic and social characteristics; physical health, sensory and functional ability; psychological well-being, including cognitive function; health behaviours and health service use. The report also includes an overview of risk and protective factors for survival and an indication of recent aged care expenditure and health service use over the period 2000-2005.

Key Findings

1. Participants have aged with differing degrees of success. Those classified at Baseline as ageing less successfully were more likely to die in the intervening eight years.

2. Risk factors for mortality included
   - Under nutrition.
   - Lack of exercise: people who did not exercise were found to be at high risk of mortality over the first 2 years of the study. Those who reported exercising more, survived longer, were more likely to be male and have better self reported health.
• Social networks comprising discretionary relationships were protective against mortality in a ten year follow up. This was found for participants living in both the community and residential care facilities.

• Psychological factors including intact cognitive functioning, higher expectancy of control over life, and for women, better morale, were linked to better survival odds over 8 years, independent of health and physical functioning.

• Depressive symptoms present a greater risk of mortality for men than women, with incident depression in old age representing a greater risk for men.

3. Risk factors for depression itself are considered also. Starting the study as a widow, being in, or moving to, a residential aged care facility, and experiencing difficulties in ADLs or IADLs are all risk factors. Importantly, we found no evidence that major chronic conditions resulted in increased depression and also that use of anti-depressants was efficacious in lifting depression late in life.

4. The anthropometric measures of weight change and corrected arm muscle were found to be the most useful screening tools for nutrition and assessment of nutritional status in older adults living in the community.

5. At wave 1 male and female participants reported the same number of medical conditions. By wave 6 the difference was very small, with males having an average of 4.5 conditions and females an average of 4.8.

6. The same medical conditions that were reported most frequently at wave 1 (arthritis, hypertension, skin cancer, corns and bunions and cataracts) were still the most prevalent conditions reported in wave 6.

7. At wave 1, 61 percent of respondents reported that they had exercised the previous fortnight, with a higher proportion of the male respondents having exercised than that of the female respondents.

8. Women had a higher PBS expenditure in each age group, while men had a higher proportion of expenditure on hospital services.

9. During the first six waves of the study, 60 percent of participants had not been in high level care or had died without having used high level care.

10. Overall, participants were very healthy in both psychological well-being and cognition.

    • Across each wave, two-thirds to three-quarters of participants showed no signs of depression, although depression was higher amongst those living in residential care than those living in the community.

    • Cognitive ability was overwhelmingly sound. Less than 15 percent of the sample showed any sign of mild cognitive impairment at any wave.

    • Fluid intelligence (linked to biological factors and innate ability) declined with age in memory and speed of processing, however crystallised intelligence (resulting more from education and ‘culture’) remained stable well into old age. Older adults can compensate, to some degree, for losses in the fluid domain by applying their continued expertise in the crystallised domain.

What is reassuring about these findings is that many of the factors identified that promote longevity and quality of life are aspects of lifestyle that are amenable to change. Risk factors such as poor nutrition can be identified early through screening. Intervention strategies that encourage regular exercise, support social networks and engender a positive emotional state of mind help promote survival and a good quality of life for older Australians.
Implications

Implications for policy and program implementation arising from the Australian Longitudinal Study of Ageing are discussed, and future directions and opportunities for further research from this unique and extensive data base are explored. Implications for policy and program development arising from the ALSA include:

- Attention must be paid to social and health services for those who lack informal support from spouse or family. Elderly women will become a significant sub-group of the population who require informal/formal assistance to remain at home.
- The stereotypes of older people as frail, unproductive and unable to cope with the changing demands of modern society are clearly incorrect. ALSA shows that many people in their 80’s and older live independently in their homes with little or no assistance. Therefore the assumption that ageing is associated with poor health and loss of independence needs to be challenged.
- Social networks provide opportunities for social support, social influence, social engagement, interpersonal contact and access to financial and health care resources. Strategies to promote the establishment and maintenance of such relationships in later life deserve further attention.
- Older people report social involvement and encouragement as significant factors in leading healthy lives. Older people should be encouraged to be active consumers of services and to exercise their control and choice. Social participation is facilitated by an environment where older people feel safe, and where there is easy access for older people to appropriate recreational facilities.
- Intervention strategies which support and encourage the elderly to undertake regular exercise, maintain strong friendship networks and support a positive outlook are of utmost importance in ensuring healthy ageing.
- Adopting a healthy lifestyle in middle age, and later, can dramatically improve one’s health and life chances, and the effects can be seen quickly. There needs to be structural changes and supportive environments so that healthy choices are easier for people to make.
- Public information campaigns should emphasise the gains, as well as the losses that are possible in late life. The importance of a person’s attitude toward their own ageing also warrants emphasis in order to capitalise on preserved strengths or acquired expertise.
- Transitions to residential care are associated with increased depressive symptoms among the elderly, independent of functional and cognitive decline. Policies need to be in place which recognise the importance of supporting this vulnerable group of elderly to counteract further ill health.
- Systems to identify and treat later life depression must be universal. A national standard should be adopted by all aged care providers, including home care nurses, so that identification is not limited to residential aged care facilities.
- In addition to the key role for mental development and activity, there is emerging evidence that attention to simple preventive measures such as physical activity and healthy diet, as well as control of cardiovascular risk factors such as high blood pressure can improve cognitive function and delay the onset of dementia.
Conclusion

Following the ALSA participants over fifteen years has enabled collaborators to contribute to the determination of those factors which positively contribute to healthy late life and to identify potentially effective interventions which can be applied to individuals and populations for the purpose of prevention and health promotion. The longitudinal design allows for the identification of strategies which may prevent, delay or reverse the transition from health, to impairments and loss of autonomy and also allows for the evaluation of factors which positively promote continued independence and productivity. The ALSA study contributes to the positive approach to ageing that suggests that the goal for all should be to achieve health, vitality, and independence and to contribute and actively participate in society into very advanced age.

The investment over the years in the ALSA study has seen the development of a comprehensive longitudinal study into older South Australians. Its value can be fully realised in the use of ALSA as an evidence base on which to build innovative strategies and responses to the changing profile of the state’s demography. The continuation of the study, through the following of remaining participants, now on average 85 years or more, will increase the data’s potential as a source of knowledge for policy-makers and position South Australia as the holder of the most extensive record of ageing at the latest stage of life. This sector is the most rapidly growing of the states population, as it is in worldwide demographic trends. Through ALSA, South Australia is poised to be at the forefront of new understandings of the issues and choices facing ageing populations in the decades to come.
1. INTRODUCTION

1.1 OUR AGEING POPULATION

This section briefly describes the global and Australian impact of the ageing population and its implications and challenges for policy. Gerontology is defined and the need for a multidisciplinary and longitudinal approach to Ageing Research is emphasised if we are to understand the physical, mental and social changes that occur during the ageing process. The different agendas for Ageing Research are described. A brief overview of some of the longitudinal studies in Australia are included. Finally, the advantages and disadvantages of longitudinal studies are discussed.

Global, National and Local Perspectives

As we progress into the twenty-first century, ageing has become increasingly recognised as an important issue facing individuals, families, communities and nations. Increasing age is related to long-term health conditions, higher rates of disability and poorer reported health status. In 1960 the UN estimated that there were just 225 million people aged 60 years and over worldwide, while 30 years later in 1990 that figure had doubled to 450 million. Globally, the proportion of the population aged 65 years and over is projected to reach 25 percent in the more developed regions, 14 percent in the less developed regions and 8 percent in the least developed countries of the world by the year 2051. The worldwide population aged 80 years and over is also expected to experience a more than fivefold increase by 2020 (ABS 2004). Life expectancy in Australia is projected to increase to 92.2 years for men and 95.0 years for women by the year 2051.

The ageing of the world’s population is primarily a result of the high fertility levels reached after World War II combined with reduced death rates at all ages. Along with the significant increase in the proportion of the world’s population that is elderly will come a need for further understanding of older populations and their specific requirements around the world, with an aim to anticipating and meeting the changing needs of an ageing international community.

In 2005, South Australia had the oldest population of all the states and territories with a median age of 38.8 years. Tasmania was the second oldest with a median age of 38.7 years, and the Northern Territory had the youngest median age (30.9 years) (ABS 2005a). At present SA has the highest proportion of people aged 65 years and over. This older age profile is expected to continue with this age group projected to make up 26.5 percent of the states population by 2031 (ABS 2005). In South Australia those aged over 65 will outnumber those aged under 15 in 2012, compared with 2019 in Australia as a whole.

The change in the age structure of Australia’s population can mainly be attributed to the sustained decline in fertility that followed the post-war baby boom. The Baby Boomer generation (generally categorised as Australian residents who were born in Australia or overseas during the years 1946 to 1965) was the result of a period of high fertility and high levels of immigration that followed World War II. It is a significantly larger cohort than those before and as a result, as this group progresses through the age structure its impact upon society and policy is significant.

The ageing of the Baby Boomers will have implications for social expenditure as income support, care and health services can be expected to increase. Changes in social values, attitudes and government policy will also influence the level of support provided for older people. Baby Boomers are, however, in a better position than previous generations in that many of them have benefited from favourable economic conditions including low unemployment rates and the option of working beyond retirement age. Many in this generation will be able to provide for a financially secure retirement without relying on the age pension for most of their income.

While the number of aged persons is increasing, the age structure of the older population is also changing and it too is ageing. The age group projected to experience the highest growth rate is the population aged 85 years and over. In 2004 the proportion of Australia’s population in this age group was 1.5 percent. This group is projected to increase over the next fifty years to comprise over 9 percent of the population or 2.3 million people (Dept of Health and Ageing 2001). Growth in this age group is of particular importance because of the potential
need for support among the frail aged and the impact this will have on the efficiency and organisation of such services. South Australia is projected to remain the state with the highest proportion of people aged 85 years and over with 12 percent of the population in this age group by 2051, up from 1.5 percent in 2004.

The steady growth of the global population poses interesting challenges for policy makers in many countries. Australia is advantaged by having the opportunity to learn from other developed countries how best to plan and implement effective policies for an ageing population. While demographic predictions so far into the future are not immutable, they do offer the opportunity to speculate about our demographic future. As the Australian population ages, society will face the challenges of a decreased labour force, coupled with an increased financial commitment to support the aged. The task will be to provide policies, programs and services to meet the changing values, behaviours and attitudes of an older population.

1.2 AGEING RESEARCH

This section defines the field of gerontology and introduces the notion that by its very nature, gerontological research is ideally multidisciplinary and longitudinal. It goes on to address the importance of conducting research on ageing and then summarises a number of international, national and local research agendas that have been developed in recent years. It concludes by introducing the Australian Longitudinal Study of Ageing (ALSA) which is the source for all the data presented in this monograph.

Gerontology

Gerontology is the study of the elderly, and of the ageing process itself. Successful adaptation to this process depends on the interaction of a wide range of events. Gerontology is a collection of disciplines, all focused on late life and the process of achieving old age. It includes the study of physical, mental and social changes (among others) in people as they age, investigates the effects of our ageing population on society and applies this knowledge to policies and programs. Therefore a multidisciplinary approach to the study of ageing is necessary in order to identify any changes and investigate the dynamics associated with them.

Why research an ageing population?

Ageing of the world’s population is an unprecedented phenomenon and therefore it is difficult to predict what all the implications might be. Whatever the effects, there is a need for improved access to information, derived from sound research that can provide an evidence base for policies that cover a wide range of personal, economic and social areas. Both individual and societal ageing is in need of an enhanced evidence base and this requires a substantial commitment of funds for research on ageing. Such an investment now will lead to significant advances in our ability to address the major medical, social and economic issues that confront Australian society as our population ages.

Public, government and professional concern regarding population ageing and the health and social consequences of individual ageing has extended well beyond the simple demographic, economic, social, and epidemiological descriptions that have been the principal source of information on ageing in recent decades. There is now widespread recognition that ageing is a complex, dynamic process that extends across the life course and has consequences not only for individuals, but also for families, communities, and the wider society. This more expanded paradigm has evoked new research perspectives that call for dynamic modelling and suitable comprehensive data of a longitudinal nature. These developments are world-wide, but have progressed at different trajectories in various countries (Myers, Maggi et al. 1994).

Demographic momentum is producing increasingly aged populations in most nations of the world. As a result a wide range of organisations have initiated studies and research into the implications of ageing. Despite the focus of world ageing agendas on ‘positive’, ‘healthy’ and ‘active’ ageing, much research has tended to concentrate on the chronic diseases that increase with advancing age or the economic implications of population ageing and often these patterns and their impact are reported in negative terms. New agendas are emerging.
**Agendas for Research on Ageing**

The past decade has seen the development of agendas for research on ageing both internationally and within Australia. Some of these agendas and the research priorities identified are outlined briefly below.

**INTERNATIONAL AGENDAS**

**UNITED NATIONS RESEARCH AGENDA ON AGEING FOR THE 21ST CENTURY (2002)**

The UN Research Agenda on Ageing for the 21st Century represented a major initiative in the area of ageing and development and will continue to contribute to the formulation of ageing policies and influence the direction and priorities for scientific gerontology for decades to come. The Agenda identifies key research priorities while recognising the diversity in societies at different levels of demographic as well as social and economic development. The Research Agenda provides a mechanism for the implementation of a plan of action for Ageing Research at global, regional, national and local levels (Sideorenko and Andrews 2000).

The major research priorities identified in the UN Research Agenda on Ageing for the 21st Century are:

- Relationships of population ageing and socio-economic development
- Current practices and options for maintaining material security into older age
- Changing family structures, intergenerational transfer systems and emergent patterns of family and institutional dynamics
- Determinants of Healthy Ageing
- Basic Biological Mechanisms and Age Associated Disease
- Quality of Life and Ageing in diverse cultural, socio-economic and environmental situations


**INTERNATIONAL PLAN OF ACTION ON AGEING – 2002**

The International Plan of Action on Ageing was adopted at the First World Assembly on Ageing in Vienna in 1982. The International Plan of Action - 2002 (Madrid) takes into account the transitions in economic policies, globalisation and technological progress which have occurred and is based on the principle of ‘a society for all ages’ that was the theme of the International Year of Older Persons in 1999.

Priority directions recommended in the plan are:

- Older persons and development – Ensuring the continued contributions, integration and empowerment of older persons and their participation in society, development, employment and education.
- Advancing health and wellbeing into old age – Ensuring full access of older persons to health care and services and stressing health promotion throughout the life-course.
- Ensuring enabling and supportive environments – Governments must play a central role in fostering supportive environments and should encourage the input of older persons themselves in this policy formulation.

The Plan of Action stresses the value of research on ageing. The Plan states that research provides essential evidence for effective policies and is vital for monitoring and evaluating the success of the Plan of Action.

www.un.org/ageing/coverage/action.pdf

This policy framework is intended to inform discussion and the formulation of action plans that promote healthy and active ageing. The document provides a policy framework for active ageing and concrete suggestions for key policy proposals, and is ultimately guided by the UN Principles for Older People.

The key policy proposals are designed to address the three key areas of active ageing: health, participation and security.


NATIONAL AGENDAS

A REVIEW OF HEALTHY AGEING RESEARCH IN AUSTRALIA – Commonwealth Department of Health and Aged Care (2000).

The primary aim of this report was to review current and planned research in healthy ageing, determine the information needs of policy makers and recommend strategies for contributing and applying knowledge.

The report identified the following seven areas as priorities for healthy Ageing Research in Australia: Well-being, independence and activity

- Social and cultural diversity
- Improving and maintaining health
- Intergenerational relations and planning for ageing
- Income, employment and voluntary contributions
- Programs and services research
- The baby boom and social change.


NATIONAL STRATEGY FOR AN AGEING AUSTRALIA – 2001

The Federal Government developed a National Strategy for an Ageing Australia to provide a framework for a national response to the challenges and opportunities that Australia’s ageing population will present. The National Strategy is intended to provide a basis for action not only for the Commonwealth government, but also for other levels of government, business, communities and individuals. The strategic framework outlined in the National Strategy is intended to be a guide for future policies, programs and activities in a wide range of areas.

The strategy focuses on the four themes of:

- Independence and self provision
- Attitude, lifestyle and community support
- Healthy ageing, and
- World class care
The strategy is based on principles reflecting a ‘life span’ approach rather than solely focussing on older people. It stresses the importance and value of research in the implementation of the strategy and the monitoring and review process. Research is required to guide policy development, set future priorities for action, identify best practice, identify barriers to change, and evaluate the impact of policies, programs and services. A strong evidence base is required to support policy and program decisions that will need to be made by a broad range of individuals and organisations. The strategy states that research needs to be strategic, multidisciplinary and accessible (Commonwealth Department of Health and Aged Care, 2001).


BUILDING AGEING RESEARCH PRIORITIES (BARC) PROJECT - 2003

A major principal guiding the National Strategy for an Ageing Australia is that a strong evidence base should inform the policy response to population ageing. In response to this the Commonwealth Department of Health and Ageing along with the Australian Institute of Health and Welfare initiated the Building Ageing Research Capacity (BARC) Project, designed to assist the provision of a strong evidence base to support the development of healthy ageing policy.

In 2003 the BARC Project developed a Framework for an Australian Research Agenda. It provided an overview of the research environment at the time and discussed the key structures required to further develop an Ageing Research agenda for Australia.

Strategic Ageing Research themes developed by the BARC Project included:

- Maintaining economic growth in the face of an ageing workforce and reduction in the supply of younger workers.
- Achieving adequate, sustainable retirement income over lengthening periods of retirement.
- Developing positive images of ageing and supporting continued social participation
- Developing age-friendly infrastructure and built environment
- Achieving healthy ageing to maintain health and independence
- Providing accessible, appropriate, high quality health and aged care.

These themes will be further defined and priorities identified leading to specific researchable questions.

SOUTH AUSTRALIAN AGENDA

IMPROVING WITH AGE: OUR AGEING PLAN FOR SOUTH AUSTRALIA (2006)

Census figures show that in 2006, South Australia along with Tasmania had the oldest population of all states and territories (ABS, 2006). The State Government has therefore recognised the opportunity to lead the nation in policy making that tackles the issues associated with population ageing.

The Ageing Plan for South Australia: Improving with Age (2006) states that ‘policies (must be developed) that put people at the centre; that enshrine the principles of choice and independence in our services and programs; and that consider the diversity of needs and the continuum of capacities as they change over time’.

The Plan also recognises the value and importance of research and information gathering in the support of decision making. Key themes recognised as integral to the plan are work, safety, housing, contribution, grandparents, diversity of needs and active and healthy ageing.

Priority actions outlined in the Plan are:

• Enabling choice and independence – in where we live, in getting around, connecting to our community and staying healthy
• Valuing and recognising contribution – in our work, as grandparents, carers and volunteers
• Providing safety, security and protection – in our homes, communities and as consumers
• Delivering the right services and the right information – timely, responsive and tailored to the needs of individuals
• Staying in front – through research, innovative practices and collaboration with others.

The Office for the Ageing (OFTA) in the Department for Families and Communities will oversee implementation of the plan and make recommendations for further developments and actions for the future.


Ageing Research in Australia

There is increasing recognition that while societal and individual issues facing the oldest-old have become pressing, little research exists drawing on population-based longitudinal panel data of the oldest old in Australia or internationally. While Australian research on ageing has been advancing on several fronts, there has been only limited effort to obtain multidimensional, population-based longitudinal data that are analytically suitable for providing answers to many of the critical issues emerging today. While longitudinal studies of ageing have been increasingly undertaken throughout the world such as the English Longitudinal Study of Ageing (ELSA), the Baltimore Longitudinal study of Aging (BLSA) and the Health and Retirement Study (HRS) in North America, it is only recently such studies have been initiated in Australia (Logie, Hogan et al. 2004).

Here, in South Australia, the Florey Adelaide Male Aging Study (FAMAS) commenced in 2002-03. FAMAS aims to identify the wide range of factors that contribute to Australian men’s reproductive, physical and emotional health, and their relationship with the ageing process. The aim is to identify the causes of men’s poorer physical and mental health in an effort to develop strategies to promote a healthy and active lifestyle, prevent disease and guide the development of appropriate health services and policy. In 2002-03 the study recruited 590 men aged between 35 – 80 years in Adelaide’s North-west suburbs and a further 600 men were recruited in 2004. FAMAS involves a collaborative team headed by Professor Gary Wittert from the Department of Medicine, Adelaide University (Logie, Hogan et al. 2004).
The Dubbo Study is conducted as part of the Australian Ageing and the Family Project. The Dubbo Study is a longitudinal community study of people born before 1930 living in Dubbo, NSW. The goals of this study are to identify patterns and predictors of mortality, hospitalisation and need for residential care. The participants in this study were first interviewed in 1988 and have been followed to the present (McCallum, J. et al, 1994).

The Canberra Longitudinal Study of Ageing (CLSA) is a four Wave 12 year longitudinal study of 1,000 individuals aged 70 and over. Starting in 1990, the study aims to identify predictors of memory decline and dementia and to provide epidemiological data on mental disorders in older Australians. This study was conducted by a team from the Centre for Mental Health Research at the ANU (Logie, Hogan et al. 2004).

The relative lack of Australian effort in conducting multidimensional longitudinal studies is due to such factors as the inherent complexity involved in such research, the commitment required over an extended time period, and the costs associated with carrying out such investigations. Government and grant funding bodies in Australia have been notably reluctant to support these types of efforts in the past or over protracted periods. The ALSA is an exception to this trend.

**Ageing Research in Adelaide**

The Australian Longitudinal Study of Ageing (ALSA) was conceived in the late 1980s as a response to the expressed needs for more sophisticated data on the ageing of the Australian population. In particular, research was needed on persons at advanced ages (70 years and over), the fastest growing segment of the overall population and about whom the least was known. It recognises that increased longevity and the growing proportion of older persons in Australia - especially the ‘oldest old’ (those over 85 years of age) - pose critical challenges for health and social policy and program needs. The consequences for health, well-being and functional ability of the individual, the impact upon families and carers, and the economic and policy implications for government and society are wide-ranging.

The ALSA Study has combined health-related information on a panel of older persons with a full range of epidemiological, behavioural, functional, psychological, socio-economic, life style, biological and other dimensions that impact on the individual and collective experience of ageing. The cumulative data over 15 years includes clinical assessments, survey information and service utilisation records, with repeated observations over time. It represents one of the richest sources in the world of longitudinal information now available on an older population. This marks ALSA as unique, attracting interstate and international recognition.

**Why is ageing research changing?**

Much of the research in the past has been descriptive and has focused mainly on single aspects of the phenomenon of ageing. In general, the emphasis has been on negative aspects of ageing, focusing on the physical, mental and social declines that sometimes accompany old age. More recently attention has shifted to consideration of ‘healthy’ and ‘successful’ ageing, i.e, to the maintenance of health and function in old age, and to multi-dimensional studies that place ageing in a wider context.

There are some signs that the relative health status of older people may be improving compared to earlier periods. Recent evidence indicates that levels of active life expectancy have begun to rise at a faster pace than life expectancy. Thus, an increasing proportion of remaining life at older ages is spent in good health and without major functional limitations compared to a decade ago (Andrews, Clark et al. 2002). A variety of factors have been suggested for these recent developments, including declining chronic morbidity rates, reductions in a variety of medical conditions, and the increasing use of special equipment and assisted housing devices that facilitate the performing of activities of daily living and reduce the need for personal assistance. There is evidence that the cohorts entering the older ages enjoy socio-economic advantages (higher educational attainment and better economic resources) that contribute to improved healthful behaviour (less smoking, greater physical activity and better nutrition).
Also referred to as ‘healthy ageing’, ‘successful ageing’ and ‘positive ageing’, the term advocated by the WHO is active ageing, for use in research focusing on those factors which contribute to survival without loss of function and consequent vulnerability to morbidity and disability.

*Active ageing is the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age (WHO 2002).*

A better understanding of the elements which contribute to healthy life expectancy is the goal of several multi-dimensional longitudinal surveys applied to representative samples of ageing persons in a number of countries. The longitudinal design allows for the identification of strategies which may prevent, delay or reverse the transition from health to impairments and loss of autonomy, and also allows the evaluation of factors which positively promote continued independence and productivity.

The view of ageing is shifting from negative stereotypic views, which suggest that decline and decay are inevitable to a more positive outlook, indicating that the goal for all should be to achieve health and vitality even into very advanced age.

### 1.3 LONGITUDINAL AND MULTI-DISCIPLINARY RESEARCH

As stated previously there is a need for more research that can increase understanding of the dynamics of age-related health, psychosocial and other transitions, and their impact at the relative extremes of old age. Effective study of these issues requires integration of information over time and across several levels of analysis, to demonstrate the connections between macro-level factors, social influences or structures, cultural norms, individual practices, function and health (Singer & Ryff, 2000). Longitudinal studies of ageing provide a rich source of data for such endeavours, and their heuristic value is enhanced when they are coupled with innovative theoretical approaches that emphasise the dynamic nature of ageing. Longitudinal data can make a unique contribution to understanding and analysing the burden of diseases for individuals and the implications this has for their experience of ageing and their need for care or other intervention measures. Furthermore this data can be used to inform policy, planning and service delivery.

Longitudinal designs are recognised as the main method to study the intrinsic (internal) and extrinsic (external) factors that influence the ageing process (Deeg and Zanden 1991). A Longitudinal or Cohort study selects a large sample from the population, and observes them at intervals for some period of time. Longitudinal studies must observe the participants more than twice and for a long enough period to enable the ascertainment of changes (Deeg and Zanden 1991). The ALSA participants (n=2087 at Wave 1) were initially interviewed in 1992 and on seven subsequent occasions to 2006 (see Chapter 2 for more details on overall timing and intervals).

Follow up studies which use only a baseline assessment of participants and follow up information of some outcome measure such as mortality, while yielding useful results, are not longitudinal in design. However, cross sectional analysis yielded from follow up studies is often used in longitudinal studies to distinguish between cohort effects and the effects of ageing (Wenger 1991). A cohort or generational effect is characterised by each consecutive birth cohort being exposed to a unique environment that coincides with its life span (Last 2001). To some extent these can be separated from effects that are related to the passage of time by using longitudinal design. Longitudinal studies enable hypotheses to be tested prospectively – observing rather than deducing the outcome of events (Wenger 1991). This helps to identify both the appropriate type and the timing of interventions. The two dominant approaches to the analysis of longitudinal data - correlates of survival (i.e., risk and protective factors for longevity) and change among survivors (Wenger 1991) have both been applied to ALSA data.
Additional advantages of a longitudinal approach include: obtaining high quality evidence about the ageing process across the life span; the ability to examine multiple exposures, determinants and outcomes; the ability to track patterns of development over time and to examine causal relationships between exposure or determinants and outcomes. A further strength of longitudinal research is that the data generated from it is amenable to questions that arise long after the initiation of the study. Hence, hypothesis testing is a generative and iterative process that follows from scientific and practical developments in the field.

The main disadvantage of longitudinal methods is the cost and difficulty securing long term commitment to funding. Longitudinal studies do not always fit into the shorter term funding cycles of most research bodies (Logie, Hogan et al. 2004). Difficulty in establishing an analytical program to run alongside a data collection program can result in under-utilisation of the data collected. It is typical for analysis to continue long after the formal data collection process has been concluded.

Studies like ALSA generate large volumes of data but do not always have the resources to carry out regular analysis, reporting and dissemination of findings. ALSA has largely overcome this problem by having a substantial number of research collaborators and by being actively involved in collaborations both in Australia and overseas (see Appendix 3). In addition the data sets from all ALSA Waves have been archived with the Australian Social Science Data Archive at the Australian National University, Canberra (http://assda.anu.edu.au/).
2. THE AUSTRALIAN LONGITUDINAL STUDY OF AGEING

2.1 ALSA AND THE CENTRE FOR AGEING STUDIES

Many years of detailed planning led to the development of a comprehensive research plan for the Australian Longitudinal Study of Ageing (ALSA). The Centre for Ageing Studies was established in 1987 primarily for the purposes of the ALSA project including resources for research design, survey management, data base creation, data analysis and reporting, as well as day-to-day management of the project in and out of the field. The Centre was initially established as an independent unit of Flinders University within the Department of Primary Health Care.

A group of local co-investigators was formed to advise the project, comprising 36 scientists representing a wide range of relevant disciplines from Adelaide Universities and teaching hospitals as well as the Australian Commonwealth Scientific and Research Organisation (CSIRO), the Institute of Medical and Veterinary Science (IMVS) and South Australian Health Commission. The South Australian Branch of the Australian Bureau of Statistics provided significant consultative assistance in technical aspects of sampling procedures, survey conduct, training and analysis.

During the development period of the ALSA the Centre for Ageing Studies became established as an internationally recognised Centre of excellence in the field of epidemiology of ageing. In 1988 it was designated as a World Health Organisation Collaborating Centre for Research on the Epidemiology of Ageing, and was the co-ordinating centre providing research design advice, technical oversight and data management for a series of WHO sponsored population based surveys on ageing in fourteen countries in Asia and the Pacific. In 2000, WHO Collaborating Centre status was renewed and the Centre for Ageing Studies was renamed as a Centre on Population Ageing: Research, Education and Planning, reflecting the Centre’s expanding role and international stature. A further application for re-designation Collaborating Centre status is currently with the WHO. The Centre is an important focus for professional gerontological activities locally, nationally and internationally.

2.2 THE PILOT STUDY

An intensive pilot study, which incorporated the principal elements of the final study design, was conducted in Adelaide between February and June 1988. A comprehensive questionnaire, Dietary Instrument, Psychological Inventories, Clinical Assessment Battery and Laboratory studies were all included.

The pilot was aimed at testing the feasibility and proposed methodology. In addition the pilot was used to test the chosen sampling methods, gauge response rates and provide a basis for estimating the required sample size and cost of the full scale study. Specific instruments and items selected for each of the study components were also tested.

Of the 223 people eligible for inclusion in the pilot study, 178 (79.8 percent) completed the questionnaire. They were interviewed in depth about their health, social, economic and environmental circumstances. Of these, 125 agreed to attend a clinical examination for physical and psychological tests and 140 completed a questionnaire on their food habits and dietary intake. Forty-five people refused to take part, however it should be noted that attempts at refusal conversion were limited due to the pilot nature of the exercise, thus the achieved response rate was encouraging.

In the process of undertaking the pilot study a substantial amount of data was generated. Results presented from the pilot were tentative as the primary purpose of the pilot was to demonstrate the technical feasibility of the proposed study. Sample size was kept deliberately small so that only limited valid analysis of the data was possible. However, some very interesting results emerged (e.g., Gilbert, Luszcz and Owen, 1993; Luszcz, 1992) and it was clear that with a more significant data base and a longitudinal perspective it would be possible to do much more.
The feasibility of all features of the proposed study design was well demonstrated by the pilot. Validation interviews were conducted with 10 percent of the pilot respondents, and in addition statistical reliability tests were performed on composite scales included in the questionnaire.

A 12 month follow-up telephone survey of the original respondents was undertaken to test some of the longitudinal aspects of the study. Analysis of the data from the 12 month follow-up indicated a measurable decline in physical functioning in the study population even in the relatively short interval (Andrews, Cheok et al. 1989).

### 2.3 OBJECTIVES OF THE AUSTRALIAN LONGITUDINAL STUDY OF AGEING

The overarching aim of ALSA is to gain increased understanding of how psychosocial, biomedical, lifestyle and environmental factors are associated with health and well-being in late life (Andrews, Clark et al. 2002). A main objective is to determine factors that contribute to ‘healthy and successful ageing’ and to identify strategies that can be employed to reduce the risk and the impact of dependence and disability in old age. The specific research objectives include:

- determination of levels of health and functional status of an older population and tracking changes in these characteristics over time
- identification of factors that promote and maintain health and well-being in an ageing population
- assessment of risk factors for major morbid conditions and other social, behavioural problems that may exist among an aging population
- analysis of transitions in health and functional status as related to age, gender, different patterns of co-morbidity, availability and nature of informal and formal support arrangements, social and economic circumstances, health care provision and utilisation and other variables of interest
- assessment of the effects of disease processes on functional status and the demand for health care services and both informal and formal long-term care
- examination of patterns of need for and the utilisation of informal and formal sources of long-term care as they relate to social support networks, economic and housing conditions, care giving arrangements and the availability of appropriate services;
- examination of mortality outcomes in the light of changes in health and functional status, medical interventions, self-assessed health, social networks, and individual characteristics

By 2000 five Waves of data collection had been completed, two of which entailed intensive home assessment of numerous aspects of functioning. This longitudinal data provided an excellent basis from which to pursue and build on specific areas of the research in greater detail, while maintaining the longitudinal integrity of the study. For example, the impact of morbid conditions on functional ability was becoming evident from the previous Waves of data. Closer inspection of prevalent morbid conditions at Wave 6 identified specific morbidities which may predict functional decline or improvement. Furthermore, Wave 6 extended the research focus into a longitudinal examination of the relationships among health, cognition, sensory aging, everyday activity and quality of life in greater detail.

By 2003 (Wave 7) participants were over 80 years of age, reflecting the demographic reality of a rapidly growing oldest-old cohort. This presented a unique opportunity to examine the consequences of their survival for themselves, their families and carers, and the broader social system. Of particular interest was to determine how this older age group cope with late life transitions or challenges. The additional aims included in this Wave were:

- To understand how major transitions occurring late in life are negotiated by individuals and facilitated by social and family networks and access to health care.
- To delineate, through the use of informant or collateral data, the extent and implications of life challenges faced by the oldest old.
- To use prospective biopsychosocial data to identify factors predisposing to healthy ageing.
These aims were achieved by identifying the occurrence of particular transitions and asking the participants in more depth about perceptions of, responses to and consequences of these challenges. In addition, informants, with permission from participants, were invited to give converging information on cognition and social support in relation to specific transitions. Data were also collected from the Health Insurance Commission (HIC) and Prescription Benefits Scheme (PBS) to determine the wider implications of these transitions for close networks and the health care system.

2.4 RESEARCH DESIGN AND METHOD

Sampling Strategy

The selection of the sample for the study was directed at establishing a panel of the older-old (70 years and over) in an Australian urban population of both people living in the general community and those in special accommodation including nursing homes and other institutions. The target population was the whole of the population born before 30 June 1922 who were living in the Adelaide Statistical Division (the wider City of Adelaide). A stratified random sample was initially drawn by the Australian Bureau of Statistics from the South Australian Electoral Roll. Eligible persons (defined as those individuals 70 years and over as at 30 June, 1992 and who were at the time resident in the Adelaide Statistical Division) and their spouses (aged 65 and over), or co residents (aged 70 and over) were asked to participate (Andrews, Clark et al. 2002).

The sample was stratified to provide estimated equal numbers in five-year age and sex cohorts from 70 to 84 years and over 85 years, taking into account likely household composition. Males and those aged over 85 were deliberately over-sampled to provide sufficient numbers for longitudinal follow-up.

Response Rate

A total sample of 3,263 individuals was drawn from the Electoral Roll of whom 2,705 were eligible for inclusion in the study. From this group of primary sample cases, 1,477 were recruited successfully into the panel. From within the households of those responding, there were 879 spouses identified as eligible for inclusion in the study, of whom 597 were recruited to the panel. The age requirement for spouses was 65 years and over since wives are usually younger than their husbands. In addition, 13 of the 24 other eligible household members (aged 70+) who were identified agreed to participate.

Thus, 55 percent of the primary subjects identified through the Electoral Rolls were recruited into the study, while 68 percent of identified spouses and other household members agreed to participate. A total of 2087 persons participated at Wave 1 of the ALSA study. Individual recruitment into the panel for the baseline evaluation was undoubtedly influenced by the prospect of a long and comprehensive series of interviewing and clinical assessments. A high proportion (36%) of those declining to participate (non-respondents) gave personal illness or illness of another household member as their reason for not wishing to take part. This factor probably led to an under-recruitment into the panel of those with significant intercurrent or continuing physical or mental ill health at the time of contact (Giles, 2007). Table 2.4.1 provides further details concerning the response of the 3263 primary members of the sample list.
Table 2.4.1: Summary of responses of potential primary participants at Wave 1 of ALSA

<table>
<thead>
<tr>
<th>Eligible</th>
<th>n</th>
<th>% of eligible</th>
<th>Ineligible</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewed</td>
<td>1477</td>
<td>54.6</td>
<td>Deceased</td>
<td>210</td>
</tr>
<tr>
<td>Bereaved</td>
<td>10</td>
<td>0.4</td>
<td>Translator not available</td>
<td>88</td>
</tr>
<tr>
<td>Refused</td>
<td>779</td>
<td>28.8</td>
<td>Not contacted at address</td>
<td>189</td>
</tr>
<tr>
<td>Illness</td>
<td>437</td>
<td>16.2</td>
<td>Out of geographical scope</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>2703</td>
<td></td>
<td></td>
<td>560</td>
</tr>
</tbody>
</table>

Figure 2.4.1 presents the response rate for the primary sample, classified by Local Government Area, age group and gender. The Local Government Areas with the largest number of study participants were Marion, Mitcham and Woodville, while Gawler, Happy Valley and Munno Para had the fewest participants. This reflects the demographic profile of the Adelaide population quite well, with more participants from suburbs with a higher median age than from suburbs with a majority of younger people (Giles, 2007).

Males’ response rate - (grey) Females’ response rate - (black)

*: Adelaide/Thebarton/Hindmarsh; Kensington and St Peters/ Norwood
†: Burnside all eligible sample members were interviewed for both males and females
Table 2.4.2 tracks the response of the 1477 primary ALSA participants over the six Waves of the study. As expected, the retention of participants across the study diminished over time, from around 90 percent of eligible survivors at Waves 2 and 3 to approximately 70 percent of the eligible survivors continuing to take part in the sixth study Wave.

<table>
<thead>
<tr>
<th>Wave</th>
<th>n</th>
<th>Interviewed</th>
<th>Lost to follow-up*</th>
<th>Refused†</th>
<th>Deceased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1477</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>%‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1260</td>
<td>17</td>
<td>120</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% 85.3</td>
<td>1.1</td>
<td>8.1</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%surv 90.2</td>
<td>1.2</td>
<td>8.6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1171</td>
<td>31</td>
<td>82</td>
<td>193</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% 79.3</td>
<td>2.1</td>
<td>5.6</td>
<td>13.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%surv 91.2</td>
<td>2.4</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1036</td>
<td>35</td>
<td>115</td>
<td>291</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% 70.1</td>
<td>2.3</td>
<td>7.8</td>
<td>19.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%surv 87.4</td>
<td>3</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>773</td>
<td>67</td>
<td>131</td>
<td>506</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% 52.3</td>
<td>4.5</td>
<td>8.9</td>
<td>34.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%surv 79.6</td>
<td>6.9</td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>500</td>
<td>39</td>
<td>176</td>
<td>762</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% 33.9</td>
<td>2.6</td>
<td>11.9</td>
<td>51.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>%surv 69.9</td>
<td>5.5</td>
<td>24.6</td>
<td></td>
</tr>
</tbody>
</table>

*: moved out of Adelaide Statistical Division or not traced
†: refused interview in that Wave
‡: % of Wave 1 participants (n=1477)
§: % of surviving participants
Procedure

To date, the study comprises 8 Waves of data collection. The first Wave took place between September 1992 and March 1993. Subsequent Waves took place as close to 12 (W2), 24 (W3), 36 (W4), 48 (W5) or 72 (W6) months after Wave I as possible, with Wave 7 data collection completed in April 2004 and Wave 8 in April 2006.

Waves 1, 3, 6, and 7 were full face to face interviews and clinical assessments conducted in the participant’s place of residence. Waves 2, 4, 5 and 8 were short telephone interviews of about 20-30 minutes duration. The telephone interviews focussed on major intervening life events and changes in marital status, accommodation, health, and activities of daily living. Table 2.4.3 shows a time line for the ALSA study and the response rates for eligible participants.

Table 2.4.3: ALSA time line

<table>
<thead>
<tr>
<th>Wave</th>
<th>Type</th>
<th>Year</th>
<th>Time since baseline</th>
<th>Time since last Wave</th>
<th>Response rate for eligible (%)</th>
<th>Response (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Full</td>
<td>1992</td>
<td>1 yr</td>
<td>1 yr</td>
<td>91.3</td>
<td>2087</td>
</tr>
<tr>
<td>2</td>
<td>Telephone</td>
<td>1993</td>
<td>1 yr</td>
<td>1 yr</td>
<td>93.1</td>
<td>1779</td>
</tr>
<tr>
<td>3</td>
<td>Full</td>
<td>1994</td>
<td>2 yrs</td>
<td>1 yr</td>
<td>89.5</td>
<td>1504</td>
</tr>
<tr>
<td>4</td>
<td>Telephone</td>
<td>1995</td>
<td>3 yrs</td>
<td>1 yr</td>
<td>85.5</td>
<td>1171</td>
</tr>
<tr>
<td>5</td>
<td>Telephone</td>
<td>1998</td>
<td>6 yrs</td>
<td>3 yrs</td>
<td>74.1</td>
<td>791</td>
</tr>
<tr>
<td>6</td>
<td>Full</td>
<td>2000</td>
<td>8 yrs</td>
<td>2 yrs</td>
<td>65.2</td>
<td>486</td>
</tr>
<tr>
<td>7</td>
<td>Full</td>
<td>2003</td>
<td>11 yrs</td>
<td>3 yrs</td>
<td>85.1</td>
<td>349</td>
</tr>
<tr>
<td>8</td>
<td>Telephone</td>
<td>2005</td>
<td>13 yrs</td>
<td>2 yrs</td>
<td>85.1</td>
<td>349</td>
</tr>
</tbody>
</table>

* where ‘eligible’ means survivors

Ethical approval for the study was obtained from the Clinical Investigation Committee of Flinders Medical Centre. Written informed consent was given by each participant in the study. Participants were made aware of the voluntary nature of the study and that they could decline from participation at any stage. As a result, some participants may have declined involvement in one Wave to return to the study in subsequent Waves. All data is securely stored, and kept confidential; identifying information is stored separately. Access to the de-identified data is confined to researchers involved in the study or approved collaborators.

2.5 SURVEY INSTRUMENTS

Items in the household interview schedule represent a comprehensive set of measures chosen for their reliability and validity in previous studies, sensitivity to change over time, and suitability for use in a study of elderly persons. The domains included demography, health, depression, morbid conditions, hospitalization, cognition, gross mobility and physical performance, activities of daily living and instrumental activities of daily living, lifestyle activities, exercise education and income. Appendix 1 lists questionnaire domains included in each Wave of the study and Appendix 2 indicates source references.

The home interview was administered using Computer Assisted Personal Interviewing (CAPI; see (Birkett 1988). The software used in the early data collections of ALSA was an integrated computer program for survey management known as Blaise (version 2.3) which was developed by the Netherlands Central Bureau of Statistics (Bethlehem, Hunderpool et al. 1989). Blaise presents each question to the interviewer for administration and immediate coding of responses. Responses were downloaded directly from this program for subsequent SPSS file creation and analyses. Waves 6 and 7 were conducted using Quest, a similar survey software package developed in Australia in 1998 (more information on Quest available on http://www.dipolar.com.au).
Self-administered Questionnaires

At the completion of the interview, participants were left with four self-administered questionnaires, which were mailed back in pre-paid envelopes or collected at the time of the clinical assessment. The domains covered by the questionnaires were nutrition, dental health, sexual activity and psychological measures of self esteem, morale and perceived control.

Clinical Assessment

The individual assessment objectively measured both physical and cognitive functioning. The physical examination included measures of blood pressure, anthropometry, visual acuity, audiometry, grip strength, balance, gait, and spirometry. The cognitive assessment included measures of memory, information processing efficiency, verbal ability and executive function. All clinical assessments were conducted by graduates who received special training in the standard administration of all physical functions, psychological instruments and the anthropometric measures.

Biochemical Analysis

Fasting blood samples and urine specimens were collected on the morning following the clinical assessment at Waves 1 and 3. Laboratory measures conducted were basic haematology including haemoglobin estimation, cell counts, indices and blood smear examination; 20 Channel Biochemical Analysis comprising, Glucose, Sodium, Potassium, Bicarbonate, Chloride, Anion Gap, Creatinine, Urea, Urate, Calcium, Phosphorus, Albumin, Globulins, Bilirubin (T), Bilirubin (C), ALP, AST, GGT, LD, ALT; Lipid Profiles measuring S-Cholesterol (total, HDL, LDL) and S-Triglyceride; fasting urine assay that measured Sodium, Phosphate, Creatinine and Calcium (sub-sample); and selected hormone assays of Dihydroepiandrosterone (DHAS, females), Testosterone (males), parathyroid hormone and Vitamin D. At Wave 6, Guthrie cards were used to retain a DNA sample.

Secondary Provider Data

Information was also sought at Wave 1, with full respondent approval, from personal physicians, community service providers and institutions, including Meals on Wheels, Royal District Nursing Society and Domiciliary Care, on services provided within the preceding year. These data were obtained using a pre-tested standard protocol specific for each service.

Several methods were employed to monitor and keep in touch with the study population to avoid loss to follow-up. At the time of interview, each participant was asked to provide the name, address, and telephone number of three people who could provide information about their future location. Deaths among participants also have been systematically monitored annually through the government Registry of Births, Deaths and Marriages. Relatives or other informant contacts also provided information on deaths between these official reports. By August 2005, more than two-thirds of the sample had died.

In Wave 7, collateral electronic data was gathered from the files of the Health Insurance Commission in order to determine the wider implications of the targeted transitions for close networks and the health care system, as well as to generally establish use of medical care and services and expenditure. The information sought from the HIC database included: the number of medical care services, and, for each service, the nature of the service, date, charge, and benefit; the number of PBS prescriptions, and for each prescription, the drug prescribed, number of repeats, date, charge, and benefit. This information was obtained for the period since the collection of Wave 6 data (2000-2001) and for one year subsequent to the collection of Wave 7 data.
3. DEMOGRAPHIC AND SOCIAL CHARACTERISTICS

This section summarises some of the demographic aspects of the participants of the ALSA study at baseline (1992) (e.g. age, sex, ethnicity) as well as observing changes in particular demographic variables over time (e.g. marital status, living arrangements). Data from the personal interviews conducted at Waves 1, 3, 6 and 7 of the study are used for the analysis.

3.1 KEY FINDINGS

- Over the fifteen years of the ALSA study older women began to outnumber older men as participants, particularly in the older age groups.
- The majority of male ALSA participants were either married/defacto across all the Waves of the study; as females grew older they were more likely to be widowed.
- At baseline 3.4 percent of males and 4 percent of females had never married.
- There were higher proportions of females than males living alone among the ALSA participants. These figures increased with age.
- 88 percent of respondents had children, 83 percent had grandchildren and 94 percent had siblings. 69 percent reported that they had close friends.
- 71 percent of respondents reported weekly personal contact with their children.
- The majority of participants reported receiving either emotional or instrumental social support from their relationships.
- The majority of participants (68%) were Australian born followed by 20 percent born in the UK.
- Over 55 percent of respondents had left school aged 14 or younger.
- One-third of respondents had gained a qualification since leaving school, with the proportion being higher for males than females.
- At baseline less than 1.5 percent of all respondents were in paid employment.
- ‘Tradesperson or related worker’ was the most often reported type of work done throughout life by male respondents, whereas ‘clerical, sales and service work’ was the occupation type most often reported by female respondents.
- A significant proportion of respondents (83 percent of males and 84 percent of females) reported they did no paid or voluntary work in a typical three month period.
- The number of participants engaged in either paid or voluntary work decreased with age.
- Women reported having lower incomes than men.
- Those in the older age groups (i.e. aged 80+) reported the lowest income levels.
- At Wave 1 of the study the majority of respondents reported that their needs were ‘fairly well’ met by their income.
- The pension was the main source of income for the majority of people throughout the study.
- At Wave 1 of the study 93 percent of participants lived in the community and 6 percent lived in residential care. By Wave 7 the proportion of participants living in the community had decreased to 84.5 percent while 15 percent were living in residential care.
- Home ownership is the dominant type of tenure throughout the study.
Table 3.1 gives a snapshot of the basic socio-demographic profile of the 2087 ALSA participants at Wave 1.

**Table 3.1: Summary profile of ALSA participants at Wave 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N++</th>
<th>Classification</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td>2087</td>
<td>65-69</td>
<td>140</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70-74</td>
<td>562</td>
<td>26.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75-79</td>
<td>524</td>
<td>25.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80-84</td>
<td>429</td>
<td>20.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85+</td>
<td>432</td>
<td>20.7</td>
</tr>
<tr>
<td>Sex</td>
<td>2087</td>
<td>Male</td>
<td>1056</td>
<td>50.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>1031</td>
<td>49.4</td>
</tr>
<tr>
<td>Marital Status</td>
<td>2087</td>
<td>Married - Defacto</td>
<td>1367</td>
<td>65.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widowed</td>
<td>594</td>
<td>28.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not Married</td>
<td>126</td>
<td>6.0</td>
</tr>
<tr>
<td>Living arrangements*</td>
<td>1937</td>
<td>Lives alone</td>
<td>525</td>
<td>26.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not alone</td>
<td>1412</td>
<td>72.1</td>
</tr>
<tr>
<td>Born in Australia</td>
<td>2087</td>
<td>Yes</td>
<td>1424</td>
<td>68.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>663</td>
<td>31.8</td>
</tr>
<tr>
<td>Education: Age left school</td>
<td>2061</td>
<td>&lt; 14 years</td>
<td>1155</td>
<td>55.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 15 years</td>
<td>906</td>
<td>43.4</td>
</tr>
<tr>
<td>Annual Income</td>
<td>1930</td>
<td>&lt; $AUD 12,000</td>
<td>686</td>
<td>32.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$12,000 – 50,000</td>
<td>1219</td>
<td>58.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; $AUD 50,000</td>
<td>25</td>
<td>1.2</td>
</tr>
<tr>
<td>Domicile</td>
<td>2067</td>
<td>Community</td>
<td>1959</td>
<td>93.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Institution</td>
<td>128</td>
<td>6.1</td>
</tr>
</tbody>
</table>

* community sample only          ++ number responding
3.2 AGE AND GENDER DISTRIBUTION

Table 3.2.1 and Figure 3.2.1 shows the age and gender distribution of ALSA participants across the 4 major Waves of the ALSA study.

Figure 3.2.1 shows that over the 15 years of the ALSA study older women began to outnumber older men as participants, particularly in the older age groups.

Between Wave 1 and Wave 7 the cumulative percentage of female participants increases from 49.4 percent to over 62 percent, whereas the proportion of male participants falls from 50.6 percent at Wave 1 to 37.7 percent at Wave 7. In the oldest age group (85+) the percentage of men rose from 11.6 to 19.3 percent between Waves 1 and 7 whereas the proportion of women aged over 85 years participating in the study increased from 9.1 percent in Wave 1 to 30 percent by Wave 7.

Table 3.2.1: Age and gender distribution of ALSA participants by Wave

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Wave 1</th>
<th>Wave 3</th>
<th>Wave 6</th>
<th>Wave 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>65-69</td>
<td>17</td>
<td>123</td>
<td>4</td>
<td>91</td>
</tr>
<tr>
<td>70-74</td>
<td>279</td>
<td>241</td>
<td>164</td>
<td>148</td>
</tr>
<tr>
<td>75-79</td>
<td>283</td>
<td>234</td>
<td>214</td>
<td>188</td>
</tr>
<tr>
<td>80-84</td>
<td>235</td>
<td>194</td>
<td>214</td>
<td>188</td>
</tr>
<tr>
<td>85+</td>
<td>242</td>
<td>190</td>
<td>209</td>
<td>188</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1056</td>
<td>1031</td>
<td>825</td>
<td>854</td>
</tr>
</tbody>
</table>

Figure 3.2.1: Gender distribution of ALSA participants by Wave
In Australia since the 1880s, the ratio of men aged 65 and over to women of the same age has shifted from a predominance of males to a predominance of females. In the Australian population women of all ages have a greater life expectancy than men. This contributes significantly to a greater number of women in the older population. Figures for the South Australian population show that at age 80 years and over, women outnumber men by a ratio of 2:1 (ABS 2004).

Factors contributing to this change include the increasing representation of females in immigration intakes along with the improvement in female life expectancy which has exceeded that of males. Older women will continue to outnumber older men in the future especially at the oldest ages, however ABS (2005) figures project that the proportion of males in the 85+ age group will increase from 32 percent in 2004 to 47 percent in 2101. Recent improvements in male life expectancy in the upper age groups are starting to diminish the difference between the sexes.

Although older men and women generally suffer from the same types of health problems, the patterns of ill health and their presentation, diagnosis, and management often show pronounced gender differences. Older men tend to have acute illnesses followed by a relatively short period of ill health before death while older women are more likely to have a longer period of chronic ill health before death. Figures also show that older women are more vulnerable to cardiovascular disease and osteoporosis, which together with cancer are the main contributors to death and disability of older women (Bonita 1996).

The interests of older women can be expected to become a major issue in the years ahead. Given that sex ratios decline steeply with age, more women as widows are reaching ages at which infirmities are most prevalent and are therefore reliant on persons other than a spouse. Therefore older women are more likely to be both the major users and providers of care for the elderly. It is suggested also that women are more likely than men to approach old age in a vulnerable financial position. Policies and programs for the older population will need to be especially sensitive to the circumstances of very old women.

### 3.3 Marital Status and Household Structure

An important factor in the degree of well-being felt by older people is the nature of their living arrangements and the family context in which they live. Living arrangements have an obvious link to marital status.

Figure 3.3.1 and Figure 3.3.2 show the changes in marital status over the course of the study for both men and women. These figures show that the majority of males involved in the study were either married (or de facto) across all the Waves of the study whereas as females grew older they were more likely to be widowed.

**Figure 3.3.1: Marital status by Wave - Males**

**Figure 3.3.2: Marital status by Wave - Females**
The proportion of women who were widowed increased from 34 percent at Wave 1 to over 75 percent by Wave 7. Thus for the ALSA participants, as for the South Australian older population, the extent of widowhood increases with age and throughout all older age groups the percentage of women who are widowed is higher than that of men.

On average older women live longer, tend to marry men who are older than they are and to re-marry much less frequently after divorce or death of a spouse than do men (Bonita 1996). Thus the demographic picture of the very old population, and that of the surviving ALSA participants, is becoming one of aged widows.

Another important group to consider when looking at marital status is those who are ‘never married’. At Wave 1, 3.4 percent of males and 4 percent of females had never married. For the South Australian population these figures are 4.9 and 3.7 percent respectively (ABS 2003). In recent years there has been a shift in policy to encouraging older people to remain in the community – ‘ageing in place’. A significant proportion of the older population may have no immediate family as a source of support because they have never married, and therefore will need other sources of support in order to age in place.

Living arrangements and the structure of the household can also be dependent upon other circumstances such as economic necessity, social custom, sex and health.

Of the 1937 ALSA participants who were living in the community at Wave 1, 27 percent lived alone. Figure 3.3.3 shows that there are higher proportions of older women than men living alone in the ALSA study. At Wave 1, 25 percent of the community living male ALSA participants lived alone and this figure had increased to 40 percent by Wave 7. For females 30 percent lived alone at Wave 1 and by Wave 7 over 68 percent of female participants lived alone.

Figure 3.3.3: Co-resident status of ALSA participants by Wave and Gender

![Figure 3.3.3: Co-resident status of ALSA participants by Wave and Gender](image-url)
Most older men spend their final years in their own homes with the companionship of a spouse whereas older women are more likely to spend their final years in residential care. The planning and policy implications of this pattern, particularly as they relate to health care, are very significant. While men are likely to have a spouse to care for them in later life, women are much less likely to have this same access to informal support at advanced ages and more often are forced to seek formal support or supported accommodation. The challenges faced by the segment of the aged who have never married are less certain to predict. These people will not have spouses and may not have children to provide them with support and therefore may be at higher risk of experiencing the psychological, social and physical problems associated with ageing. On the other hand, having led a life as a single person, they are likely to have developed networks of friends and other strategies for managing life that will also serve them well into old age. Close examination of this group could provide valuable insights into strategies for ageing well or poorly.

3.4 SOCIAL RELATIONSHIPS

Much research has suggested that social relationships have direct effects on health status, and also serve to buffer the effects of psychosocial and physical stresses on the health and well-being of individuals (Cassel 1976), (Cobb 1976). Work by Giles et al (1994) has explored the social relationships of ALSA participants based on a broad range of items that characterise social relationships at the baseline ALSA interview.

Table 3.4.1 summarises the structure of social relationships for ALSA participants and the frequency of contact with key types of social ties. The results show that 88 percent of respondents had children, with an average of 2.4 children for each ALSA participant. More than 90 percent of participants with children had children living within one hour’s travel from them, with the majority much closer. The average age of participant’s children was between 42 years and 50 years of age.

The majority of participants also had grandchildren (83%) and siblings (94%). However, only slightly more than two-thirds of participants reported that they had close friends (69%), with an average of close to four close friends each. Most participants reported that they had a confidant – that is, someone with who they enjoyed an emotionally close, confiding relationship. There was an interesting difference between married men and women in terms of the relationship of the confidant to the participant. For married women, 68 percent reported their spouse was their confidant, with many female respondents also reporting their daughter (10%) or a female friend (12%) as their confidant. However, 83 percent of married men reported their wife was their confidant; daughters (5%) and male friends (4%) were also reported by married men as confidants.

Participants enjoyed good contact with their children, with close to three quarters of respondents reporting they saw at least one child weekly or more. Similar results were observed for phone contact with children. In contrast, participants did not generally report very frequent contact with other relatives such as siblings or grandchildren. Just over 20 percent of respondents had at least weekly personal or phone contact with these other types of social ties. Slightly more than half of the respondents saw their friends or had telephone contact with them on a weekly or more frequent basis.
Table 3.4.1: Baseline summary statistics for structure of social relationships of ALSA participants (n=2087)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure of social relationships</td>
<td>N</td>
</tr>
<tr>
<td>Has children</td>
<td>1839</td>
</tr>
<tr>
<td>Number of living children</td>
<td>2.4</td>
</tr>
<tr>
<td>Proximity of children (% with children within one hour’s travel)</td>
<td>91</td>
</tr>
<tr>
<td>Age of children</td>
<td></td>
</tr>
<tr>
<td>Oldest child</td>
<td>50.0</td>
</tr>
<tr>
<td>Youngest child</td>
<td>42.1</td>
</tr>
<tr>
<td>Only child</td>
<td>47.6</td>
</tr>
<tr>
<td>Has grandchildren</td>
<td>1736</td>
</tr>
<tr>
<td>Number of grandchildren</td>
<td>6.2</td>
</tr>
<tr>
<td>Has siblings</td>
<td>1968</td>
</tr>
<tr>
<td>Number of living siblings</td>
<td>1.7</td>
</tr>
<tr>
<td>Has close friends</td>
<td>1443</td>
</tr>
<tr>
<td>Number of close friends</td>
<td>3.9</td>
</tr>
<tr>
<td>Has confidant</td>
<td>1863</td>
</tr>
</tbody>
</table>

Frequency of contact

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Weekly personal contact with children</td>
<td>1314</td>
</tr>
<tr>
<td>&gt; Weekly phone contact with children</td>
<td>1455</td>
</tr>
<tr>
<td>&gt; Weekly personal contact with other relatives</td>
<td>438</td>
</tr>
<tr>
<td>&gt; Weekly phone contact with other relatives</td>
<td>606</td>
</tr>
<tr>
<td>&gt; Weekly personal contact with friends</td>
<td>1138</td>
</tr>
<tr>
<td>&gt; Weekly phone contact with friends</td>
<td>1109</td>
</tr>
</tbody>
</table>

Social support is usually characterised as either emotional social support or instrumental social support. The former reflects the positive or negative emotional exchanges that can arise from social relationships. Instrumental social support is concerned with the tangible aid that may be given to or received from others. Such support may be in the form of assistance with activities of daily living, transport or financial aid.

ALSA participants who were resident in the community were asked about the availability of instrumental social support to them if needed. Participants with a partner were asked about their receipt of emotional social support when needed. The results showed the vast majority of participants received emotional and instrumental social support (Table 3.4.2).

Table 3.4.2: Baseline statistics for function of social relationships of ALSA participants (n=1939)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrumental social support</td>
<td>n</td>
</tr>
<tr>
<td>Help available if sick</td>
<td>1735</td>
</tr>
<tr>
<td>In emergency, someone could call on immediately</td>
<td>1859</td>
</tr>
<tr>
<td>Extra help with ADLs when needed</td>
<td>1888</td>
</tr>
<tr>
<td>Emotional social support</td>
<td>n</td>
</tr>
<tr>
<td>Can count on partner when needed*</td>
<td>1227</td>
</tr>
</tbody>
</table>

* Denominator is number of married/partnered participants (n=1367)
The reciprocity of social support with children is summarised in Table 3.4.3. Participants were asked about the ways in which they helped their children and/or children in law in terms of money, home maintenance, minding of grandchildren, and in times of illness. The participants were also asked about how their children/children-in-law provided support. The reciprocity of support was also calculated as the ratio of the average support given to children to the average support given by children (i.e. the ratio of provided to received support). Five common domains were used to assess the reciprocity of support. Four were directly comparable, namely gift giving, money, support in times of illness, home maintenance. Childminding was compared to assistance with transport to the doctor, shopping or church for the purposes of computing the reciprocity variable.

The results showed large variation in the kinds of support that were given and received. The large proportion of respondents reporting gifts reflects that the question was not sensitive to the timing of gifts. It is consistent with the majority of respondents giving and/or receiving birthday and/or Christmas gifts. There was wide variation in the ratio reflecting the reciprocity of support. Overall, participants gave slightly more support than they received, reflected by the ratio greater than one.

Table 3.4.3: Baseline statistics for reciprocity of support with children for ALSA participants (n=1839)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of social support to children (&gt; sometimes)</td>
<td>n</td>
</tr>
<tr>
<td>Give gifts</td>
<td>1588</td>
</tr>
<tr>
<td>Money</td>
<td>726</td>
</tr>
<tr>
<td>Illness</td>
<td>884</td>
</tr>
<tr>
<td>Home maintenance</td>
<td>382</td>
</tr>
<tr>
<td>Child-minding</td>
<td>538</td>
</tr>
<tr>
<td>Receipt of social support from children (&gt; sometimes)</td>
<td>n</td>
</tr>
<tr>
<td>Illness</td>
<td>1108</td>
</tr>
<tr>
<td>Give gifts</td>
<td>1571</td>
</tr>
<tr>
<td>Run errands</td>
<td>748</td>
</tr>
<tr>
<td>Help with money</td>
<td>136</td>
</tr>
<tr>
<td>Home maintenance</td>
<td>734</td>
</tr>
<tr>
<td>Meal preparation</td>
<td>351</td>
</tr>
<tr>
<td>Transport</td>
<td>605</td>
</tr>
<tr>
<td>Reciprocity of support (given to received)</td>
<td>Mean</td>
</tr>
<tr>
<td>Support ratio</td>
<td>1.2</td>
</tr>
</tbody>
</table>
3.5 ETHNICITY

The majority of participants in the ALSA study reported their country of birth as Australia (68 percent), this was followed by 20 percent of the sample reporting their ethnic origin as English, Scottish or Irish. European countries were also stated as the country of birth by over 9 percent of respondents. (see Figure 3.5.1)

**Figure 3.5.1: ALSA participants – country of birth**

Stratification of the sample by country of birth shows a deficit of overseas born persons and it must be noted that those from non-English speaking countries may be under-represented due to possible reluctance to join the study due to language difficulties. 89 percent of the sample reported their country of origin as English speaking, while only 11 percent reported a non-English speaking background.

The ALSA sample does however reflect the post war immigration schemes which saw a high proportion of British immigrants settle in South Australia. Following this, the 1950’s and 60’s saw an increase in the proportion of immigrants from the Southern European regions and the 1970’s saw a greater number of immigrants originating from Asian countries. Post-war immigration followed by lower immigration levels in the last thirty years has been a major element in the current growth of the aged population. In 2004 10 percent of the Australian born population was aged over 65, while this figure was 18 percent for the overseas born population (Hugo, 2006).

The immigration programs of the 1950s and 1960s placed particular emphasis on young economically and demographically active persons who arrived in Australia aged in their twenties, thirties and forties (Hugo 1986). Therefore these people are now predominantly in the 85 and over age group and their numbers are increasing rapidly. Along with this, the shift in immigration policy in the 1980s to one in which family reunion predominated meant that incoming immigrants were generally older than in the earlier post-war years. These factors have led to the significant growth in the numbers of ethnic aged in the ‘old-old’ age group who are intensive users of health welfare and other services.

South Australia’s ethnic older population is growing between two and three times faster than the Australian born population (Hugo 1998). Within the ethnic aged group, the non-English speaking group (particularly the European born community) is growing even more rapidly.

Existing studies suggest that except for the receipt of the pension, there appears to be significant under utilisation of services by the ethnic aged. This pattern may be confounded by language barriers which prevent non-English speaking elderly from being aware of or using existing services, and also by the fact that there is a greater tendency for support from family among the major ethnic groups than is the case among other Australians (Hugo 1986).
With regard to policy and programs for the ethnic aged, it is important to ensure that government services are appropriate for the full range of cultural groups in Australia. Data from the Australian Institute of Multicultural Affairs suggest that people from non-English speaking backgrounds are more likely to make use of home based, rather than residential, services (AIHW 2002). Consultation between policy makers and the relevant ethnic communities is essential particularly given that in the past most service administrators gained their experience in dealing with an aged population which was fairly homogenous in language and culture.

3.6 EDUCATION

Participants in the ALSA study were asked how old they were when they left school. Of the 2061 respondents to this question, 55.3 percent had left school at 14 years or younger while 43.4 percent were aged over 14 years. Figure 3.6.1 shows that 59 percent of males and 53 percent of females had left school aged 14 or younger, while 40.9 percent of males and 46.7 percent of females were aged over 14 when they left school.

Figure 3.6.1: Wave 1 – Age left school by Gender

Participants were also asked if they had obtained a ‘certificate, diploma, degree or other qualification’ since leaving school. Most of the sample had not gained such a qualification since leaving school while 33.5 percent stated that they had. Figure 3.6.2 shows the proportion of participants who had obtained such a qualification by age and gender at Wave 1. This figure shows that the proportion of males with a post-school qualification was nearly double that of females within each age group. Females and those aged over 80 were less likely to obtain post school qualifications.

Figure 3.6.2: ALSA participants who had obtained a certificate, diploma, degree or other qualification since leaving school by Age and Gender – Wave 1
Of the 33.5 percent of ALSA participants who had received a post-school qualification most males reported ‘trade/apprenticeships’ as their highest qualification (44.2 percent) while the most commonly reported highest qualification for females was a ‘certificate or diploma. (See Figure 3.6.3)

Figure 3.6.3: Wave 1 - Highest post-school qualification obtained by Gender

As the baby boom generation moves through the older age groups, the proportion of older people who have completed secondary education will increase. The generations of older people to come will be better educated than their predecessors.

Low levels of education among older people can become an issue in accessing services and programs. Some poorly educated older people may experience difficulty with having to deal with the paperwork associated with such services and may experience further frustration with an increasing amount of information now only being available on-line. On the other hand, those with more education are likely to be better informed and hence expect and demand more services than their less-informed peers.

3.7 WORK AND VOLUNTEERING

The vast majority (93.4%) of ALSA participants had worked at some point in their lives. However, as Figure 3.7.1 shows, at Wave 1 of the ALSA study less than 1.5 percent of all participants were in paid employment, reflecting the tendency among this cohort to adhere to the traditional retirement age of 65 years. This figure declined steadily over the fifteen years of the study. By Wave 7 only one participant reported that they were currently in paid employment.
At Wave 1 participants also were asked to specify the type of work they had done most of their lives (Figure 3.7.2): 977 males and 385 females answered this question (two-thirds of the sample). For the male respondents the most often reported occupation was ‘Tradesperson and related workers’ (28.5%) followed by ‘Professionals’ (23.1%) and ‘Clerical, Sales and Service workers’ (14.5%). For the female respondents 38.4 percent had been employed as “Clerical, Sales and Service workers” followed by ‘Professionals and Associate Professionals’ (30.4%) and “Tradesperson and related workers” (15.8%).

Figure 3.7.2: Type of work done for most of life by Gender
In recent years the implications of demographic change and ageing for the future of the Australian workforce has come to prominence. Over the next 20 years around four million baby boomers will be considering retirement while at the same time low fertility rates are reducing the supply of younger workers. Despite this it is important to remember that older Australians are healthier and living longer than ever before and may therefore be more likely to stay in the workforce longer (Windsor 2005).

While it is acknowledged that there would be many social and economic benefits from retaining older workers, there are also many barriers, such as the mismatch between the needs of older workers and the current labour market, and social security policies.

Windsor (2005) suggests that the key challenge for government is to ‘develop strategies and policies to maintain and promote the health of the workforce to counteract the negative impact of ageing, and to encourage older workers to remain in employment longer, phase out gradually or re-enter the workforce following periods of retirement’ (p.4).

ALSA participants were also asked how many hours they spent doing either paid or voluntary work in a typical three month period (Figure 3.7.3 and Figure 3.7.4). Of the respondents at Wave 1, 83 percent of males and 84 percent of females specified ‘none’ and 12.7 percent of males and 13.4 percent of females specified that they had done up to 10 hours. 3.7 percent of males and 2.6 percent of females had done more than 10 hours of voluntary or paid work in a three month period. Figures 3.7.3 and 3.7.4 show remarkable stability in time spent working over the course of the study.

There is significant literature that shows that older people have much to offer the community in both paid and volunteer work. Research by the Volunteer Centre of SA states that volunteers aged 50 and over are likely to be involved in areas of volunteer work such as maintenance, repairs, environmental work, fundraising, emergency services, recreation, committee work and aged care services (Williams 1995).

A South Australian study (Ranzijn and Andrews 1999) investigated the productive activities of 391 people aged between 65 and 101 years old in urban and regional settings. This study included 282 of the original ALSA participants as the metropolitan sample. It was estimated that participants spent an average of 42 hours per week in productive activity, with differences due to age. The estimate for the 65-74 year old age group was 54 hours compared to 33 hours for people aged 85 or more. Most of this time was spent doing household chores and an average of 5.5 hours per week was devoted to doing unpaid work for other people such as child care, care of other adults, formal volunteering and work for service organisations.

The study estimated that the value of these productive activities of older South Australians was between $5.2 and $9 billion per year. The value of productive work outside the participants’ homes was estimated to be between $822 million and $1.38 billion per year.
For many older people who have retired, voluntary work is perceived as occupying their time, enhancing their sense of usefulness and thereby self-esteem, as well as giving their life meaning. Volunteering for both men and women is a way of keeping active in retirement while maintaining social contact. This factor is extremely important in order to avoid social isolation for many older people.

### 3.8 INCOME

Financial security is important to older people because it can affect their quality of life and the choices they can make about their lifestyle. The well-being of older people is dependent to a great extent on their access to a reliable income following retirement. Many of the elderly, however, receive very low incomes and are reliant on government benefits and pensions; these people have limited choices in caring for their health as a result of low income. Reduced income can also restrict the ability of elderly people to participate in community and recreational activities, thus limiting social exchange.

**Figure 3.8.1: Total annual income by Gender – Wave 1**

Figure 3.8.1 shows that on average females had lower annual incomes than males at Wave 1 of the study. 37.5 percent of female respondents reported their annual income as $12,000 or less. This may reflect the greater likelihood of women being on the single pension rate and the low number of females in the labour force. An annual income of not more than $20,000 was most often reported by both men and women at Wave 1 of the study.

Figure 3.8.2 shows that the older age groups were more likely to report their annual income as $12,000 or less. 58.8 percent of respondents aged over 85 reported this income level compared to only 16.6 percent of those in the 65-69 year age group. The majority of respondents aged between 65 and 79 reported an income level of between $12,000 and $20,000 however the majority of those aged over 80 reported a level of $12,000 or less at Wave 1.
At each Wave participants were also asked how well their annual income took care of their needs. Figure 3.8.3 shows that at Wave 1 the majority of respondents reported that their needs were met “fairly well” by their income. It is interesting to note that the older age groups, i.e. those aged 80-84 and 85+ were more likely to report that their needs were ‘very well’ met, even though the majority (aged 80+) had reported their annual income as $12,000 or less.

Figure 3.8.3: How well needs met (by income) by Age – Wave 1
Figure 3.8.4 shows that across all Waves of the study the majority of respondents reported that their needs were being “fairly well” met by their income.

**Figure 3.8.4: How well needs met (by income) by Wave**

In recent years there have been changes in the major sources of income to the elderly. While there has been a marginal increase in the proportion dependent upon pensions, there has been a significant increase in the proportion of the aged for whom superannuation is the main source of income. The expansion of superannuation funding in Australia in the 1960s and 1970s is starting to have an impact, particularly as the baby boom generation enters the older age groups.

For the ALSA participants however, Figure 3.8.5 shows that a pension was the main source of income for the majority of people over each of the Waves of the study. The proportion of participants receiving income from superannuation increased particularly for males (from 18.6% to 22%) reflecting their higher rates of workforce participation throughout the life course. The reduction in workforce participation among the older age group is also evident in the fall in the proportion of older persons dependent upon a wage or salary for income.

**Figure 3.8.5: Source of income by Gender and Wave**
Figures from the Australian Bureau of Statistics state that in the early 1980’s superannuation funds covered less than half of the workforce and existed mainly in the public sector and among large private sector employers (ABS 1995). The Superannuation Guarantee, introduced in 1992, along with the introduction of superannuation in awards that began in 1986, led to a marked increase in the membership of superannuation schemes. However, as all ALSA participants were aged 65 or older at baseline in 1992, very few of them have benefitted from these superannuation arrangements and are therefore dependent upon a pension scheme as their main source of income in retirement.

The claims made about the benefits of superannuation coverage include that superannuation improves the quality of retirement lifestyle through increasing the level of income, that it increases the level of both private and national savings and that in the longer term it will reduce the level of government expenditure required for retirement incomes.

### 3.9 LIVING ARRANGEMENTS

As people become older their living arrangements are likely to change; as age increases, the likelihood of living in a family steadily diminishes and the chance of living in an establishment for the aged rises. Over the last two decades the issue of housing for the older population has gained increasing significance in large part because of the shift in policy to encouraging older people to remain in the community – ‘ageing in place’ (Faulkner and Bennett 2002).

Older people become increasingly likely to be living alone until they reach their early 80s. In recent years, greater financial security and changing societal attitudes has meant that there is a greater tendency for older people to stay in independent separate households longer, even after the death of a spouse. Many elderly people seem to prefer to remain in their own homes as long as possible and services such as Meals on Wheels, The Royal District Nursing Society, home maintenance and housekeeping help many to achieve this.

Of the 2087 ALSA participants 94 percent were living in the community at baseline, and 6 percent were living in residential care. (Figure 3.9.1). By Wave 7 the proportion of participants living in the community had decreased to 84.5 percent, while 15.4 percent were living in residential care. The transitions of the ALSA participants into residential care are explored further in Section 7.

**Figure 3.9.1: ALSA participants – Domicile by Wave**
As Figure 3.9.2 indicates, home ownership is particularly high among the ALSA participants across all Waves of the study and this is true of the older Australian population as a whole. Home ownership is generally viewed as an advantage by providing security of tenure and for some, the means to alter their housing situation to suit changing needs (Faulkner and Bennett 2002). The majority of older people who own their own home have an asset which can be used to obtain entry to a range of accommodation types, including retirement villages, self-contained supported accommodation, hostels and nursing homes.

Figure 3.9.2 shows that the proportion of ALSA participants living in public rental housing decreased from 11 percent to 5 percent over the fifteen years of the study, while the proportion renting privately increased from 6 percent at Wave 1 to 8 percent at Wave 7. Of the ALSA respondents, a higher proportion of women than men were renting either public or private accommodation at all Waves of the study. These fluctuations are partly due to variations in available housing stock.

**Figure 3.9.2: Type of tenure by Wave**

A study funded by the Australian Housing and Urban Research Institute (Faulkner and Bennett 2001) examined the influence of housing on the quality of life and well-being of the older population using data from the first six Waves of the ALSA. The findings of this study included:

- The level of service use was affected by tenure and type of accommodation.
- Public renters had significantly poorer health and psychological well-being than home owners.
- Over two thirds of respondents would prefer to stay in their own home with outside help if they or their partner became dependent on others.
- In reality however, more participants who had relocated between Waves had moved to residential care than had indicated this preference.
- Patterns of relocation between the Waves showed that more private renters had moved to residential care than public renters or home owners.
- Participants who relocated between Waves from the community to residential care were more likely to be older, have lower incomes or assets, have lower morale, had more problems with activities of daily living, had lower functional ability, used more community services and had less social contact with family. (Faulkner and Bennett, 2001, p.9)

The current Government policy of ‘ageing in place’ aims to assist older people to remain independent either in their own homes, community or a care facility. The ability of the older population to stay in their own homes as they age is dependent on the quality, suitability and sustainability of their housing in conjunction with the availability of appropriate services. Housing, in combination with the accessibility of services can strongly influence the physical and psychological wellbeing of many older people.
While most older people would prefer to remain in their own home for as long as possible, a diverse housing market combined with adequate services and in-home support must be made available to make this possible. Policies favouring providing care in the home must also be vigilant to the possibility of increasing pressure on partners, families and friends who are sometimes put into a carer role for the older person in need (Faulkner and Bennett 2002). Access to information and support services for carers must be made available. The South Australian Government’s Ageing Plan for South Australia makes significant provision for the changing accommodation needs of our ageing population and supports a housing plan that will provide a greater degree of flexibility, adaptability and support to allow older people to remain in their own homes as they age.

Housing constitutes a significant personal, social and financial resource for many older people. With regards to policy formation, the living arrangements of the aged can be an important indicator of need, having implications for social integration, dependency and physical and psychological wellbeing.
4. PHYSICAL HEALTH AND FUNCTIONAL DISABILITY

This section describes the main medical conditions of participants at baseline (Wave 1) and compares them with those reported at Wave 6 (2000). The distribution of responses to questions on self rated health at Wave 1 is illustrated. Participants were asked to rate their own health, compare it to people of a similar age and compare their own health now to their health 12 months ago. The ten most common medications used are identified and changes in patterns of analgesic use between Waves 1 and 3 are described.

4.1 KEY FINDINGS

- More than 90 percent of participants in each age group reported having between one and ten medical conditions.
- Overall, 5.5 percent of participants reported having more than ten medical conditions.
- There was no difference between the male and female participants in terms of the number of medical conditions they reported.
- At Wave 1 the five conditions with the greatest prevalence were arthritis, hypertension, skin cancer, corns and bunions and cataracts.
- The conditions requiring hospitalisation most reported were hernia, prostate trouble, cataracts and heart attack.
- The most common reported combination of medical conditions (co-morbidities) was arthritis and skin cancer.
- Compared with Wave 1, participants reported fewer medical conditions at Wave 6.
- At Wave 6 males had an average of 4.5 conditions and females reported an average of 4.8.
- At Wave 6 the conditions with the greatest prevalence remained the same as Wave 1, however the prevalence of some of these conditions had increased.
- More than a third of participants rated their health as ‘excellent or very good’ while 32 percent rated their health as ‘fair or poor’ at Wave 1.
- Thirty percent of participants reported a decline in their health status over the twelve months prior to the interview.
- At Wave 1, 89 percent of respondents reported taking at least one medication, with an average of 3.2 medications per person.
- Cardiovascular system drugs were the most commonly used types of medications among the ALSA participants followed by nervous system medications.
- At Wave 3, 19 percent of participants were taking at least one benzodiazepine and 8 percent were using one or more anti-depressants.
- Mobility, assessed in Waves 1, 3, 6 and 7, showed an overall trend of increased disability over time. However, some participants also moved at each wave from being disabled to having no disability in the subsequent wave.
- A similar pattern was found in assessment of Nagi tasks (at waves 1, 3, 6 and 7), with some participants at each wave moving from having a disability to having no disability. The overall trend over time was for an increase in the proportion of participants with a disability.
4.2 MEDICAL CONDITIONS

Information concerning 63 different medical conditions was sought from the participants in the Wave 1 interview. For each participant, the total number of conditions reported was classified as 0, 1-4, 5-10, and >10. As shown in Figure 4.2.1, there was no association between age group and medical conditions. This figure reveals that there were high levels of comorbidity, i.e. more than one medical condition. More than 90 percent of participants in each age group reported at least one medical condition (range 1-10). Strikingly, 5.5 percent of participants overall reported more than 10 medical conditions. The average number of medical conditions that participants reported they had ever suffered from was 5.3 (SD 3.0). There was no difference between the male and female participants in the number of medical conditions reported. These results imply that neither age nor gender alone are good indicators of degree of illness as indexed by self reported medical conditions.

Figure 4.2.1: Number of medical conditions by Age at Wave 1

As shown in Table 4.2.1, the five conditions with the greatest prevalence at Wave 1 were arthritis (49%), hypertension (24%), skin cancer (17%), corns or bunions (16%), and cataracts (16%). The conditions for which hospitalisation was the most frequently reported were hernia (17%), prostate trouble (15%), and cataracts (14%). Heart attack (11%) and heart condition (11%) also resulted in hospitalisation for more than 10 percent of participants.
Table 4.2.1: Prevalence of medical conditions at Wave 1 interview for 2087 participants

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>%</th>
<th>Other medical condition</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>1026</td>
<td>49.2</td>
<td>Other medical condition</td>
<td>53</td>
<td>2.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>507</td>
<td>24.3</td>
<td>Other vascular disease</td>
<td>46</td>
<td>2.2</td>
</tr>
<tr>
<td>Corns/bunions/calluses</td>
<td>458</td>
<td>21.9</td>
<td>Small stroke/TIA</td>
<td>39</td>
<td>1.9</td>
</tr>
<tr>
<td>Skin cancer or sunspots</td>
<td>363</td>
<td>17.4</td>
<td>Gallstones</td>
<td>28</td>
<td>1.3</td>
</tr>
<tr>
<td>Cataracts</td>
<td>330</td>
<td>15.8</td>
<td>Shingles</td>
<td>28</td>
<td>1.3</td>
</tr>
<tr>
<td>Heart condition or trouble</td>
<td>294</td>
<td>14.1</td>
<td>Infectious disease</td>
<td>14</td>
<td>0.7</td>
</tr>
<tr>
<td>Varicose veins</td>
<td>255</td>
<td>12.2</td>
<td>Nervous breakdown</td>
<td>13</td>
<td>0.6</td>
</tr>
<tr>
<td>Hiatus hernia</td>
<td>225</td>
<td>10.8</td>
<td>Kidney stones</td>
<td>8</td>
<td>0.4</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>147</td>
<td>7.0</td>
<td>Stroke/CVA</td>
<td>41</td>
<td>2.0</td>
</tr>
<tr>
<td>Diabetes</td>
<td>143</td>
<td>6.9</td>
<td>Other musculoskeletal problems</td>
<td>37</td>
<td>1.8</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>136</td>
<td>6.5</td>
<td>Psoriasis</td>
<td>35</td>
<td>1.7</td>
</tr>
<tr>
<td>Eczema/dermatitis</td>
<td>133</td>
<td>6.4</td>
<td>Spinal problem</td>
<td>32</td>
<td>1.5</td>
</tr>
<tr>
<td>Ingrown toe nails</td>
<td>129</td>
<td>6.2</td>
<td>Parkinsons disease</td>
<td>28</td>
<td>1.3</td>
</tr>
<tr>
<td>Asthma</td>
<td>117</td>
<td>5.6</td>
<td>Other kidney problems</td>
<td>22</td>
<td>1.1</td>
</tr>
<tr>
<td>Ulcers</td>
<td>117</td>
<td>5.6</td>
<td>Broken or fractured hip</td>
<td>24</td>
<td>1.1</td>
</tr>
<tr>
<td>Prostate trouble</td>
<td>108</td>
<td>5.2</td>
<td>ENT</td>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>Slipped/ruptured disk</td>
<td>109</td>
<td>5.2</td>
<td>Eye disease</td>
<td>19</td>
<td>0.9</td>
</tr>
<tr>
<td>Gout</td>
<td>92</td>
<td>4.4</td>
<td>Haemorrhoids</td>
<td>17</td>
<td>0.8</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>87</td>
<td>4.2</td>
<td>Other neurological disorder</td>
<td>13</td>
<td>0.6</td>
</tr>
<tr>
<td>Heart attack</td>
<td>88</td>
<td>4.2</td>
<td>Polymyalgia rheumatica</td>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td>Other foot problem</td>
<td>88</td>
<td>4.2</td>
<td>Mental problems</td>
<td>11</td>
<td>0.5</td>
</tr>
<tr>
<td>Hernia</td>
<td>79</td>
<td>3.8</td>
<td>Temporal arteritis</td>
<td>8</td>
<td>0.4</td>
</tr>
<tr>
<td>Migraine</td>
<td>79</td>
<td>3.8</td>
<td>Genitourinary problem</td>
<td>7</td>
<td>0.3</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>61</td>
<td>2.9</td>
<td>Gynaecological problem</td>
<td>4</td>
<td>0.2</td>
</tr>
<tr>
<td>UTI &gt;3 times</td>
<td>59</td>
<td>2.8</td>
<td>Cirrhosis of the liver</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>Anaemia</td>
<td>55</td>
<td>2.6</td>
<td>Multiple sclerosis</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other bowel condition</td>
<td>53</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
An analysis of comorbidities reported at Wave 1 showed the most common combination of medical conditions was arthritis and skin cancer, reported by 21 percent of the sample. Arthritis and hypertension was also a common combination of medical conditions experienced by the participants, with 19 percent of the participants reporting this comorbid state. The 10 most common pairs of conditions reported are shown in Table 4.2.2. While combinations involving arthritis were more prevalent among the participants aged 85 years or more, those combinations that involved hypertension appeared to be less prevalent among the oldest-old participants.

Table 4.2.2: Comorbidities at Wave 1 by Age

<table>
<thead>
<tr>
<th>Conditions</th>
<th>%</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis-skin cancer</td>
<td>21.2</td>
<td>15.0</td>
<td>21.4</td>
<td>21.4</td>
<td>21.9</td>
<td>22.2</td>
</tr>
<tr>
<td>Arthritis-hypertension</td>
<td>19.1</td>
<td>15.0</td>
<td>22.8</td>
<td>20.2</td>
<td>17.9</td>
<td>15.5</td>
</tr>
<tr>
<td>Hypertension-skin cancer</td>
<td>13.3</td>
<td>11.4</td>
<td>17.3</td>
<td>14.3</td>
<td>11.6</td>
<td>9.3</td>
</tr>
<tr>
<td>Heart condition-arthritis</td>
<td>11.6</td>
<td>8.6</td>
<td>11.4</td>
<td>11.5</td>
<td>12.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Arthritis-varicose veins</td>
<td>10.6</td>
<td>15.0</td>
<td>11.8</td>
<td>11.6</td>
<td>10.0</td>
<td>6.9</td>
</tr>
<tr>
<td>Arthritis-ulcers</td>
<td>9.0</td>
<td>5.7</td>
<td>9.3</td>
<td>8.2</td>
<td>9.5</td>
<td>10.0</td>
</tr>
<tr>
<td>Arthritis-any cancer</td>
<td>8.4</td>
<td>10.7</td>
<td>8.6</td>
<td>7.8</td>
<td>8.8</td>
<td>7.9</td>
</tr>
<tr>
<td>Arthritis-dermatitis</td>
<td>8.4</td>
<td>5.0</td>
<td>11.2</td>
<td>8.2</td>
<td>7.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Hypertension-heart condition</td>
<td>8.3</td>
<td>6.4</td>
<td>8.4</td>
<td>8.8</td>
<td>10.7</td>
<td>6.0</td>
</tr>
<tr>
<td>Arthritis-heart attack</td>
<td>8.0</td>
<td>4.3</td>
<td>6.2</td>
<td>9.7</td>
<td>7.4</td>
<td>9.7</td>
</tr>
</tbody>
</table>

At Wave 6 interview, participants were again asked whether they had any of 63 medical conditions. Figure 4.2.2 presents the number of medical conditions (in categories of 0, 1-4, 5-10 and >10) by age group. Compared with Wave 1, participants reported fewer medical conditions. Males had an average of 4.5 conditions (SD 2.5) whereas females reported a slightly higher average of 4.8 conditions (SD 2.5). It must be borne in mind that participants who survived to take part in Wave 6 were healthier than their contemporaries who took part in Wave 1 and subsequently died. In this light, the decrease in the number of morbid conditions is not surprising.

Figure 4.2.2: Number of medical conditions by Age at Wave 6
At Wave 6 interview, the same five conditions reported at Wave 1 were again the most prevalent ones from which participants suffered. However, the relative prevalence of some of these most common conditions had increased since the Wave 1 interview. For example, at Wave 1, 16 percent of participants reported they currently suffered from cataracts, whereas 26 percent of participants responded affirmatively to cataracts at Wave 6. The prevalence of hypertension had also increased from 24 percent to 32 percent at Wave 6, as had skin cancer (from 17% to 20%). The proportion of participants reporting corns or bunions was relatively constant across the two Waves (22% and 21%), while the prevalence of arthritis decreased slightly from 49 percent to 47 percent. Taken together these findings suggest that while the extent of illnesses decreases overall, the most common illnesses are affecting a larger subset of participants.

Table 4.2.3: Prevalence of medical conditions at Wave 6 interview for 791 participants

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>%</th>
<th>Condition</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>375</td>
<td>47.4</td>
<td>Other musculoskeletal problem</td>
<td>30</td>
<td>3.8</td>
</tr>
<tr>
<td>Hypertension or high blood pressure</td>
<td>252</td>
<td>31.9</td>
<td>Slipped or ruptured disc</td>
<td>30</td>
<td>3.8</td>
</tr>
<tr>
<td>Cataracts</td>
<td>207</td>
<td>26.2</td>
<td>Other vascular disease</td>
<td>28</td>
<td>3.5</td>
</tr>
<tr>
<td>Corns, bunions, and callouses on feet</td>
<td>167</td>
<td>21.1</td>
<td>Stroke or CVA</td>
<td>24</td>
<td>3.0</td>
</tr>
<tr>
<td>Skin cancer or sunspots</td>
<td>159</td>
<td>20.1</td>
<td>Anaemia</td>
<td>22</td>
<td>2.8</td>
</tr>
<tr>
<td>Heart condition or trouble</td>
<td>151</td>
<td>19.1</td>
<td>Migraine</td>
<td>22</td>
<td>2.8</td>
</tr>
<tr>
<td>Other medical condition</td>
<td>127</td>
<td>16.1</td>
<td>Prostate cancer</td>
<td>21</td>
<td>2.7</td>
</tr>
<tr>
<td>Angina</td>
<td>107</td>
<td>13.5</td>
<td>Broken or fractured hip</td>
<td>17</td>
<td>2.1</td>
</tr>
<tr>
<td>Ear nose and throat</td>
<td>101</td>
<td>12.8</td>
<td>Melanoma</td>
<td>15</td>
<td>1.9</td>
</tr>
<tr>
<td>Spinal problem</td>
<td>96</td>
<td>12.1</td>
<td>Psoriasis</td>
<td>14</td>
<td>1.8</td>
</tr>
<tr>
<td>Diabetes</td>
<td>94</td>
<td>11.9</td>
<td>Shingles</td>
<td>13</td>
<td>1.6</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>93</td>
<td>11.8</td>
<td>Gallstones</td>
<td>11</td>
<td>1.4</td>
</tr>
<tr>
<td>Varicose veins</td>
<td>82</td>
<td>10.4</td>
<td>Parkinsons disease</td>
<td>10</td>
<td>1.3</td>
</tr>
<tr>
<td>Mental problems</td>
<td>81</td>
<td>10.2</td>
<td>Breast cancer</td>
<td>9</td>
<td>1.1</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>78</td>
<td>9.9</td>
<td>Kidney stones</td>
<td>8</td>
<td>1.0</td>
</tr>
<tr>
<td>Small stroke TIA</td>
<td>70</td>
<td>8.8</td>
<td>Other kidney problems</td>
<td>8</td>
<td>1.0</td>
</tr>
<tr>
<td>Hiatus hernia</td>
<td>68</td>
<td>8.6</td>
<td>Polymyalgia rheumatica</td>
<td>7</td>
<td>0.9</td>
</tr>
<tr>
<td>Eye disease</td>
<td>57</td>
<td>7.2</td>
<td>Other cancer</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Gout</td>
<td>52</td>
<td>6.6</td>
<td>Colon rectal or bowel cancer</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Asthma</td>
<td>49</td>
<td>6.2</td>
<td>Gynaecological problem</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Other foot problem</td>
<td>47</td>
<td>5.9</td>
<td>Leukemia</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>Haemorrhoids</td>
<td>45</td>
<td>5.7</td>
<td>Bladder cancer</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Thyroid disease</td>
<td>45</td>
<td>5.7</td>
<td>Temporal arteritis</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Genito urinary problem</td>
<td>43</td>
<td>5.4</td>
<td>Gynaecological cancer</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Other bowel condition</td>
<td>43</td>
<td>5.4</td>
<td>Infectious disease</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Ingrown toe nails</td>
<td>39</td>
<td>4.9</td>
<td>Lymphoma</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Ulcers</td>
<td>39</td>
<td>4.9</td>
<td>Multiple sclerosis</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Eczema or dermatitis</td>
<td>35</td>
<td>4.4</td>
<td>Nervous breakdown</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Prostate trouble</td>
<td>35</td>
<td>4.4</td>
<td>Other neurological disorder</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Hemia</td>
<td>31</td>
<td>3.9</td>
<td>Urinary tract or kidney infection</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Chronic bronchitis or emphysema</td>
<td>30</td>
<td>3.8</td>
<td>Cirrhosis of liver</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Heart attack</td>
<td>30</td>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3 SELF-RATED HEALTH AND HEALTH TRAJECTORY

In response to a question concerning perception of their own health, more than a third of participants rated their own health as excellent or very good. However, 32 percent of participants rated their health as fair or poor. There was a similar distribution of responses concerning self-rated health for male and female participants. However, participants aged 75 years or more were less likely to rate their own health as excellent or very good than the younger participants. There was a gradient with age in the increase in the proportion of participants who rated their health as fair or poor. While 29 percent of the participants aged 65 to 69 years rated their health as only fair or poor, 38 percent of the oldest-old participants rated their health as fair or poor. Figure 4.3.1 illustrates this trend.

**Figure 4.3.1: Self-rated health by Age – Wave 1**

Participants were also asked to compare their health status to most other people their own age. As shown in Figure 4.3.2, male participants were more likely than female participants to rate their health as better than others (65% versus 57%). The male respondents were also slightly more likely to rate their health as worse than their contemporaries in comparison to females (8% versus 7%).

**Figure 4.3.2: Health compared to others by Gender – Wave 1**
There was a strong effect of age among participants on the perception of health compared to others (Figure 4.3.3). While around half of the 65-69 year old respondents rated their health as better than others their age, more than two thirds of the respondents aged 85 or more rated their health as better than their similarly aged contemporaries. Younger participants were more likely to rate their health as the same as other people their own age than the older participants.

**Figure 4.3.3: Health compared to others by Age – Wave 1**

In the final questions concerning self-perceived health, participants were asked to compare their own health to their health 12 months ago. Males and females responded similarly to this question. Overall, 14 percent of participants reported their health had improved from their health state one year prior and 56 percent of respondents reported their health was the same as 12 months ago. Thirty percent of participants reported a decline in their health compared to their health status 12 months prior to the Wave 1 interview.

As shown in Figure 4.3.4, there was a strong relationship between health compared to 12 months ago and age group. Older participants were less likely to report improvements in health than younger participants. Conversely, older participants were more likely to report a decline in health status over the year preceding interview than the younger participants.

**Figure 4.3.4: Health compared to 12 months ago by Age – Wave 1**
4.4 MEDICATIONS

During the Wave 1 interview, participants were asked to bring all of their medications to the interview table. Both prescription and over the counter drugs were included. Information from the medication container labels as well as a series of structured questions concerning each medication were then asked.

As reported by Gilbert et al. (1993), 89 percent of respondents reported taking at least one medication, with an average of 3.2 medications (SD 2.4) per person. 10 percent of all medications were non-prescription drugs. More than one quarter of the participants were taking at least five medications concurrently. One third of the participants were using non-prescription drugs in combination with prescribed medications.

The medication data were also classified according to the World Health Organization’s Anatomical Therapeutic Chemical (WHO 2007) classification system by Roughead (Roughead 1993; 1998). The 1993 version of the ATC classification was used in this research, and it is noted that there are a number of differences with the current ATC classification system.

In this classification, each medication is coded into different groups according to the organ or system on which they act and/or their therapeutic and chemical characteristics. Medications are classified into groups at five levels according to the ATC. Each drug is assigned a unique 7 character code according to its properties.

Under the ATC, the anatomical group is described at the first level, and this level is the most relevant for the present purpose. There are 14 anatomical groups, and these are shown in Table 4.4.1.

Table 4.4.1: Anatomical groups used in ATC system

<table>
<thead>
<tr>
<th>Code</th>
<th>Anatomical group</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Alimentary tract and metabolism</td>
</tr>
<tr>
<td>B</td>
<td>Blood and blood forming organs</td>
</tr>
<tr>
<td>C</td>
<td>Cardiovascular system</td>
</tr>
<tr>
<td>D</td>
<td>Dermatologicals</td>
</tr>
<tr>
<td>G</td>
<td>Genito-urinary system and sex hormones</td>
</tr>
<tr>
<td>H</td>
<td>Systemic hormonal preparations, excluding sex hormones and insulins</td>
</tr>
<tr>
<td>J</td>
<td>Anti-infectives for systemic use</td>
</tr>
<tr>
<td>L</td>
<td>Antineoplastic and immunomodulating agents</td>
</tr>
<tr>
<td>M</td>
<td>Musculo-skeletal system</td>
</tr>
<tr>
<td>N</td>
<td>Nervous system</td>
</tr>
<tr>
<td>P</td>
<td>Antiparasitic products, insecticides and repellents</td>
</tr>
<tr>
<td>Q</td>
<td>Veterinary drug</td>
</tr>
<tr>
<td>R</td>
<td>Respiratory system</td>
</tr>
<tr>
<td>S</td>
<td>Sensory organs</td>
</tr>
<tr>
<td>V</td>
<td>Various</td>
</tr>
</tbody>
</table>
The second through fifth levels describe therapeutic and chemical properties of the drug. By way of example, paracetamol is represented by N02BE01, comprising N (Nervous system), 02 (Analgesics), B (Other analgesics and antipyretics) and E (Anilides). The suffix 01 represents the drug within this class; other medications with the N02BE prefix include bucatin (N02BE04) and paracetamol, combinations with psycholeptics (N02BE71).

Overall, cardiovascular system drugs (i.e. C group) were most commonly used group of medications. There was an average of 1.0 cardiovascular drugs per person and 2100 cardiovascular system medications used among the 2087 Wave 1 participants. Medications for the nervous system (N group) were also common, with an average of 0.7 nervous system medications per respondent and 1496 nervous system medications among the 2087 Wave 1 participants. Alimentary tract medications, especially ranitidine, were also commonly used. A total of 1134 A group drugs were recorded, giving an average of 0.5 of these class drugs per participant.

The individual medications that were most commonly used by ALSA participants at Wave 1 are shown in Table 4.4.2.

Table 4.4.2: Ten most common medications taken at Wave 1

<table>
<thead>
<tr>
<th>ATC code</th>
<th>Generic name</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>N02BA01</td>
<td>Aspirin</td>
<td>23</td>
</tr>
<tr>
<td>N02BE01</td>
<td>Paracetamol</td>
<td>15</td>
</tr>
<tr>
<td>C03CA01</td>
<td>Furosemide (diuretic)</td>
<td>14</td>
</tr>
<tr>
<td>C01AA05</td>
<td>Digoxin</td>
<td>9</td>
</tr>
<tr>
<td>C07AB03</td>
<td>Atenolol (beta blocker)</td>
<td>8</td>
</tr>
<tr>
<td>C03DB01</td>
<td>Amiloride (diuretic)</td>
<td>7</td>
</tr>
<tr>
<td>C01DA08</td>
<td>Isosorbide dinitrate</td>
<td>6</td>
</tr>
<tr>
<td>C02EA01</td>
<td>Antihypertensives</td>
<td>6</td>
</tr>
<tr>
<td>A02BA02</td>
<td>Ranitidine</td>
<td>5</td>
</tr>
<tr>
<td>C01DA02</td>
<td>Glyceryl trinitrate</td>
<td>5</td>
</tr>
</tbody>
</table>

Roughead (1998) used the ALSA data to examine changes in patterns of analgesic use from Waves 1 to 3 of ALSA. These analyses showed that the number of persons reporting use of analgesic medications increased between the two Waves. The proportion of respondents reporting use of aspirin increased from 23 to 30 percent, and the proportion of persons reporting use of paracetamol increased from 15 percent to 22 percent. Roughead noted that the increase in use of aspirin was mostly confined to the use of low dose aspirin, which was not used for analgesia.

Roughead (1998) also compared psychotropic medication use (i.e. N05 and N06) among the ALSA cohort at the time of the Wave 1 and Wave 3 interview. These results showed that at Wave 1, 13 percent of participants were taking one or more benzodiazepines, and 6 percent were taking at least one antidepressant. At Wave 3, the proportion of the sample using these medications had increased. At the third Wave, a total of 19 percent of participants were taking at least one benzodiazepine and 8 percent of participants were using one or more anti depressants.

The increased use of benzodiazepines in particular is of concern since older people are most vulnerable to their adverse effects (Roughead 1993). National aggregate data from the same time period suggested a decrease in benzodiazepine use from 1992 to 1994. Roughead's research highlighted the importance of longitudinal studies such as ALSA to assess the quality use of medicines among older people and how such use changes over time (Roughead 1993).
4.5 CHANGES IN PHYSICAL FUNCTION

Assessing transitions in disability status is a critically important because disability may limit an individual’s ability to function independently in the community (Guralnik, Fried et al. 1996). One commonly used model concerning disability is the International Classification of Functioning, Disability and Health (ICF; World Health Organization 2002). The ICF defines health domains and health-related domains from two perspectives: i) body functions and structures and ii) activities and participation. In the ICF, disability is an umbrella term used to encompass impairments, activity limitations or participation restrictions. The ICF classification is particularly useful because it allows a broad conceptualization of disability, placing it within the context of the personal and other factors that surround an individual, as illustrated in Figure 4.5.1.

Figure 4.5.1: The International Classification of Functioning, Disability and Health

A wide range of instruments have been used to assess disability in older persons, including activities of daily living (ADL) Katz et al., 1963, (Katz, Ford et al. 1963; Katz, Downs et al. 1970) instrumental activities of daily living (IADL; Lawton and Brody 1969), mobility (Rosow and Breslau 1966), and Nagi physical function tasks (Nagi 1976). The ADL scale, usually composed of seven items that are self-reported, covers basic personal self-maintenance tasks of eating, toileting, bathing, dressing, walking across a small room, and transferring from a bed to a chair (Katz, Downs et al. 1970). The IADL scale is typically composed of ten items that cover higher level instrumental tasks than ADL. The ten items typically included in IADL scales are washing clothes, light housework, heavier housework, home maintenance including gardening, meal preparation, use of telephone, management of financial affairs, writing letters, using public transport, and grocery shopping. Questions concerning mobility usually include whether the respondent reports they can walk some specified distance (often ‘half a mile’), and climb stairs without help (Rosow and Breslau 1966). In contrast, the Nagi tasks address self-reported difficulty in moving large objects, stooping, carrying heavy weights, lifting arms above shoulder level, and fine joint movement (Nagi 1976).

Disability is often defined in epidemiological studies as the inability to carry out some nominal number of items or tasks in one of the above mentioned scales without the use of aids or devices, such as a walking frame or handrails, or help from another person. For example, a person would be classified as having a mobility disability if there were unable to climb a flight of stairs, or walk 800m without help. A person who was unable to use the toilet with handrails would be classified as having an ADL disability.

Disabilities in mobility and Nagi tasks usually precede IADL’s with a mobility component and ADL disability, while IADL disability will usually occur before ADL disability (Verbrugge and Jette 1994; Jette, Assmann et al. 1998). Because a significant cognitive component is inherent in several of the IADLs, IADLs are generally regarded as more complex than ADL tasks. In other words disability in IADL may not reflect physical disability per se, but rather the impact of mild cognitive impairment (Guralnik and LaCroix 1992). The measurement of disability in community-dwelling samples using only ADLs has been criticised because it will identify only
the most severely limited individuals (Guralnik and LaCroix 1992; Clark and Bond 1995). If disability can be identified at earlier points in the disablement process, then there may be more avenues for intervention to prevent disability or promote recovery from disability.

Given these points, functional disability was calculated on the basis of participant’s responses to questions concerning mobility and Nagi tasks. For the two mobility items, participants were scored as not disabled (0) or disabled (4). The five Nagi items were scored on a five point scale from 0 (no disability) through to 4 (just unable to do it). Thus a summary score between 0 (no disability) and 28 (disabled in all 7 items) was created. This was done for the responses to the mobility and Nagi items at Wave 1, 3, 6 and 7.

In Figure 4.5.2 the average disability score at each of these Waves is presented, broken down by age group and gender. The results show higher levels of disability among females than males at all age groups at Wave 1, and higher average disability as age increased. Furthermore, the difference between the average disability in males and females increased with age. This trend continued at Wave 3, with the exception of the youngest group of participants. However, there were only four males aged 65 to 69 years at Wave 3, explaining this apparent anomaly.

**Figure 4.5.2: Average disability at each of Waves 1, 3, 6, and 7**

At Wave 6, the difference between males and females overall was somewhat narrower than in the previous Waves, with an overall mean difference of 1.6 (standard error of the difference 0.6) between the average disability score for males and females. The trend of an increasing difference between males and females across age groups was still apparent. At Wave 7, the difference between males and females was similar to that observed in earlier Waves.
Transitions in disability status between each of Waves 1 through 6 in terms of mobility and Nagi tasks have been reported previously for the ALSA participants (Giles et al. 2004). Mobility and Nagi disability were considered separately in this work. As shown in Table 4.5.1 between 15 percent and 19 percent made the transition from no disability to being disabled in mobility at the subsequent Wave. Conversely, between 7 percent and 24 percent of participants made the transition from a mobility disability to no disability at the next Wave.

Table 4.5.1: Transitions from each mobility state over Waves 1 to 6

<table>
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<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
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<tr>
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<td>14.6</td>
<td>7.4</td>
<td>3.0</td>
</tr>
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<td>17.5</td>
<td>8.6</td>
<td>8.0</td>
</tr>
<tr>
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<td>54.0</td>
<td>19.4</td>
<td>19.3</td>
<td>7.3</td>
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<td>10.1</td>
<td>49.4</td>
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For Nagi tasks (Table 4.5.2), between 21 percent and 38 percent of participants made the transition from no disability to disability at the subsequent Wave. Between five and 21 percent of participants recovered from disability to no disability at the subsequent Wave. The proportion recovering generally decreased across the Waves.

For both disability measures, the proportion of participants developing disability increased over time. The proportion recovering from disability decreased with subsequent Waves.
Table 4.5.2: Transitions from each Nagi state over Waves 1 to 6

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<td>3.4</td>
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5. COGNITION, MILD COGNITIVE IMPAIRMENT AND SENSORY PERCEPTION

A few conceptual points guided our approach to psychological ageing (Luszcz, 1998).

- The life-span view of human development provided a theoretical starting point. It looks at psychological ageing in the context of other characteristics of the person and their environment. Often these contextual features provide resources for an individual as they age.

- Attention was directed to the role of processing resources and self resources in underpinning memory and well-being, respectively. Once a range of non-cognitive and cognitive contextual factors are taken into account, individual differences in these resources contribute significantly and substantially to functioning in each domain and the contribution from ageing per se is minimised.

- A ‘limited impact’ hypothesis of late life development was explored. It suggests that average observed cognitive declines may be a by-product of rather large decrements in some subset of a population, with the majority showing stability.

- With ageing, heterogeneity increases and chronological age per se is increasingly less able to predict functioning. Instead individual differences on a range of characteristics must be taken into account.

At Waves 1, 3, 6 and 7, participants had the opportunity to provide cognitive data through administration of a series of objective assessments during the household interview and the ‘clinical’ assessment. Data from Waves 1 and 3 will be used in this section to describe, and explain short term changes in these cognitive and self domains.

5.1 KEY FINDINGS

Cognitive function takes a variety of forms and rather than it being only subject to loss, it can also reflect positive change or gain.

- Fluid intelligence is closely linked to biological factors and innate ability. In ALSA declines with age in memory and speed of processing are consistent with change expected in fluid intelligence.

- Vocabulary and naming illustrate ‘crystallised’ intelligence, which is more a product of education or ‘culture’ and it remained stable, well into late life.

- The general trends in the ALSA data support the distinction in age-related decline between fluid intelligence and crystallised intelligence.

- To a certain extent older adults can compensate for losses in the fluid domain by their continuing expertise in the crystallised one, this was shown in the case of reasoning (similarities).

- Differences that are seen for older age groups are quite small and it is unlikely that they are of much functional significance in day to day life.

- The majority (> 70%) of participants maintain stability over the two year period in cognitive function and sense of self.

- Depending on the measure, sense of self remains at the same high level for 70-78 percent of respondents, while stability in cognitive function ranges from 73 to 86 percent.

- Loss is limited to 10 to 18 percent of the sample for Sense of Self and 8 to 19 percent of the sample for Cognitive Function.

- Psychological resources are more important than ageing per se for predicting change, e.g., for Memory at Wave 3, earlier memory performance and processing efficiency are important, but the non-cognitive (background) factors are not.

- Patterns of change at the individual level are extremely diverse, with scores widely distributed and differing not only as a function of age, but also as a result of other factors (referred to as a class as ‘context’).
This Chapter is divided into three major components and examines profiles of changes in cognitive function in the ALSA. In the first, levels of performance in 5-year age cohorts and those over 85 years of age for each Wave are presented in graphical form. Secondly, classification into, and transitions between, classifications of possible cognitive impairment (early dementia) is presented. Thirdly, it considers the interplay of sensory perception, specifically vision and hearing, and cognitive function. Many of the findings reported here stem from a program of research conducted in association with my colleague Kaarin Anstey².

**Cognitive Measures**

Cognitive measures were derived from standard psychometric tests (Luszcz et al., 1997 provides details). During the household interview these included items from the Mini Mental Status Examination (MMSE) to measure general cognitive functioning, and Weschler Adult Intelligence Scale (WAIS) vocabulary to measure verbal ability and similarities items to measure reasoning.

During the clinical assessment, perceptual processing speed was measures, as an index of processing efficiency. Speed of processing is regarded as a key cognitive resource (Luszcz, 1992; Salthouse, 1985, 1996), and was based on the Digit Symbol (DS) task and indexed by the number of symbols substituted correctly in 90 seconds. Incidental memory was assessed for 15 pictures named on the Boston Naming Task and the 9 symbols substituted on the DS.

Incidental memory tasks provide a moderate level of difficulty (Berkman et al., 1993). Further, they assess memory as a by-product of other processing activities, under conditions where encoding activities are equated and good performance relies on effective implementation of retrieval strategies. For these reasons, the incidental memory tasks were expected to lead to a wide range of performance levels.

² Dr. Anstey is an Adjunct Associate Professor at Flinders University whose substantive appointment is as a NH&MRC funded full-time Research Fellow at the ANU. I am deeply indebted to her for her unrelenting enthusiasm for ALSA and the fruitful collaboration we have cultivated over the past 9 years.
5.2 DESCRIBING CHANGE OVER 12 YEARS IN ALSA

The series of Figures 5.2.1 to 5.2.4 show levels of performance for each Wave by the age-cohorts in MMSE, perceptual speed (DSST), memory (BNTIR), and reasoning (Similarities). These measures are all examples of a type of cognitive function called ‘fluid’ intelligence which is subject to age-related decline. Fluid intelligence is closely linked to biological factors and innate ability, and hence as the brain ages it too is affected adversely.

In contrast, Figures 5.2.5 and 5.2.6 show performance on vocabulary (Definitions) and naming (BNTIW). They illustrate a second type of cognitive function, called ‘crystallised’ intelligence. Crystallised intelligence is more a product of education or ‘culture’ (in the Baltes’ sense), and can continue to increase or remain stable well into late life. Hence, cognitive function takes a variety of forms and rather than it being only subject to loss, it can also reflect positive change or gain. This is an important message, especially as to a certain extent older adults can compensate for losses in the fluid domain by their continuing expertise in the crystallised one.

The Mini-Mental State Exam (MMSE) measures current cognitive ability and a higher score indicates greater ability. Figure 5.2.1 shows that the mean MMSE score for each Wave decreases with age, indicating that general cognitive ability decreases as age increases.

It can also be seen that compared to earlier Waves, people of the same age at later Waves score higher (e.g., W1 vs W6, 75-79 and 80-84). This is the result of two factors: (1) selective dropout from the study, whereby people who are higher functioning remain in the study and hence the overall mean is better than if all those people at Wave 1 were still in the study at Wave 6 or (2) those who leave the study through death may also have been performing more poorly when they were last tested, again, lowering the overall mean. So when looking at the graphs, age trends (e.g., decline) will be more consistent than will the absolute level of performance across Waves. These comments apply not only to the cognitive measures, but to all measures in the study.

Figure 5.2.1: Mini-Mental State Exam - mean scores by Age and Wave

The Digit Symbol subtest requires people to recall and draw symbols that corresponds to its respective digit, immediately after exposure to pairings of digits and symbols. There are nine pairs of digits-symbols and so participants are scored out of 9, thus a higher score indicates better information processing. Figure 5.2.2 shows the mean recall decreases slightly as age increases after the age of 80. This erosion of this kind of memory does not seem to impact on daily life.
In the Boston Naming Task, participants were required to name the objects depicted in 15 simple line drawings. After this, they were asked to recall and name as many of the objects as they could. This recall performance was recorded to obtain a score out of fifteen, measuring immediate recall of the objects in the drawings. Thus a higher score indicates more objects recalled. Figure 5.2.3 shows a steady decrease in recall scores as age increases. Again it is most marked after the age of 80.
Reasoning performance was assessed through the Similarities subscale from the WAIS-R. Three items are each given a score of incorrect or correct and the scores from the three items are summed to give a measure of concept formation, with higher scores indicating better reasoning ability. Figure 5.2.4 shows the percent of participants who got none, one, two or all of the items correct in Wave one, for each of the age groups. The graph shows that a large percent of participants obtained perfect scores, although the percent decreases as age increases. The poorest scores are in the eighty-five and above age group. This task is a mixture of fluid and crystallised ability and the generally high level of performance stems in part from the preservation of basic vocabulary knowledge, even if there is some deterioration in reasoning. This is an example of how maintenance of crystallised ability can compensate for loss in fluid ability.

**Figure 5.2.4: Reasoning performance by Age in Wave 1**

The measure for vocabulary comprised three items taken from the WAIS-R. It was scored like reasoning performance, with each item being scored as incorrect or correct and the scores then summed. The items were not part of Wave 3. Figure 5.2.5 shows that the scores remained stable over each age group for each Wave. Thus there was no evidence of age-related decline impacting on vocabulary, as would be expected for this crystallized ability.

**Figure 5.2.5: Vocabulary by Age and Wave (Waves 1, 6 and 7)**
Naming ability is another element of crystallised ability. It was measured using the Boston Naming Test, as described previously. Scores indicate how many of the 15 line drawings participants could name when they first saw each drawing, so the possible highest score is fifteen. Figure 5.2.6 shows that naming performance remained stable except for the eighty-five and over group where there was a small decline. This indicates that naming ability too remains stable until very old age.

**Figure 5.2.6: Mean scores in naming performance by Age and Wave**

![Graph showing mean scores in naming performance by Age and Wave](image)

In summary, the general trends in the ALSA data support the distinction in age-related cognitive functioning between fluid intelligence and crystallised intelligence. Figures 5.1.5 to 5.1.4 each represent an aspect of fluid intelligence and show a downward trend, in contrast figures 5.1.5 and 5.1.6 show stability or very small decline for crystallised ability. This indicates that while innate cognitive ability may decline as we become older, it is possible to compensate for this with our acquired knowledge and skills which are preserved well into later life.

These findings also indicate that the differences that are seen even very late in life are quite small and are unlikely to have much functional significance in day to day life, although they can contribute to the disablement process in some cases. A final point is that while the figures show average performance for each group, the actual data were much more diverse, with scores widely distributed and differing not only as a function of age, but also as a result of other factors.

**Gains, Losses and Stability in Cognition over two years (Wave 1 to 3)**

In this section, we concentrate on how stable cognitive performance is in our individual measures of fluid and crystallised ability. All data presented here are based on those individuals living in the community and who are over the age of 70 at Wave 1 (see Luszcz 1998 for further details). In the previous section, longitudinal results were reported for all available participants.

A series of Age Group by Time (W1, W3) analyses were conducted for each cognitive variable. All of the measures (Cognition, Speed, Symbol Memory, Picture Memory) differed as a function of age group. In the case of how rapidly information could be processed and memory, reduced functioning over time was greater in the two older groups compared to the two younger ones.

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3 using categorical cutoffs adopting the criterion of +1 standard error of measurement (Bosworth, Schaie & Willis, 1996; Dudek, 1979)
The increased rate of change toward the end of life is consistent with notions of terminal change (Berg, 1996). It is likely to reflect the proximity of death in members of this cohort, as has been shown in our mortality analyses (reported in Chapter 9).

While these findings appear to show a predominance of loss that occurs more rapidly as age increases, there is a second way of looking at plasticity of function. Change scores (Williams & Zimmerman, 1996) were used to examine evidence of gains, losses or stability from Wave 1 to Wave 3. Figure 5.2.7 shows for each of the cognitive variables the per cent of participants whose change in scores between Baseline (W1) and Wave 3 (W3) was a gain (improvement), a loss (decrement) or stable (no change).

When looked at this way, i.e., comparing each person’s performance at two different points in time, the majority of participants (> 70%) maintain the same level of functioning, i.e., show stability over the two year period, with much smaller segments of the sample showing gains (e.g., 4 - 18%) or losses (e.g., 11 - 19%). Again, increasing age was more likely to be associated with membership in the loss group.

These findings demonstrate some support for the implications of Salthouse’s limited impact hypothesis of cognitive ageing. The basic implication of which is that the majority of people will show stability in performance from Time 1 to Time 2. Further, the picture of decline shown by the sample as a whole is more likely to reflect the impact of only a small group who experience loss.

Figure 5.2.7: Gains, Losses and Stability between Wave 1 and Wave 3 in Cognitive Abilities
At the core of longitudinal research is being able to predict subsequent behaviour from earlier behaviour or pre-existing characteristics. Because loss of one’s memory abilities is a widespread fear about growing older, we were particularly interested in knowing what would predict change in it. Early in the project, we looked at how memory at Wave 3 could be predicted by a range of cognitive and non-cognitive resources displayed at Wave 1.

Individuals with better baseline current cognitive status (MMSE), faster processing of information, and high levels of verbal ability, tended to recall more at Wave 1 and to show less decline in memory performance over two years. For both picture and symbol memory indices, after controlling for Wave 1 status on all other contextual variables, those who remembered well two years earlier recalled 10 percent more pictures and 20 percent more symbols two years later. (Previous memory had more of an effect for symbols than pictures perhaps in part because the same symbols, but different pictures, were recalled on the two occasions and the symbols were encoded multiple times while the pictures were encoded only once.) As was the case at Wave 1 (Luszcz, et al., 1997) cognitive factors had a larger impact on memory performance than did noncognitive factors (e.g., sociodemographics and lifestyle activity) at Wave 3.

5.3 MILD COGNITIVE IMPAIRMENT: PRE-CLINICAL DEMENTIA

The results in the previous sections describe normative age-related changes in functioning. Next we present results for those who have crossed a threshold from what can be considered normative into the range of impaired functioning. In epidemiological studies such as ALSA, ‘clinical cutoffs’ have been defined as a basis for estimating the prevalence of dementia (and depression). This section describes results from their application to the ALSA data.

These scores provide only a crude estimate of possible dementia. The term ‘possibly’ is deliberately used to indicate that a single test on a single occasion is an insufficient basis for making a definitive determination of cognitive impairment. Only a full neuropsychological work up, a detailed clinical history covering medical and family history and other criteria indicative of these conditions and ideally, brain imaging of each person, can properly diagnose these conditions.

In the case of dementia, scores on the MMSE < 24 are suggestive of mild dementia (Folstein et al., 1985). ‘Poor Cognition’ illustrates the percent of participants who fell below this threshold for mild cognitive impairment. The proportion of participants classified as mildly cognitive impaired or in early stages of possible dementia varied at each wave and were 13.6, 7.5, 5.1 and 9.4 percent at Waves 1, 3, 6, and 7, respectively.

Throughout the study period, cognitive ability is overwhelmingly sound. At Baseline approximately 14 percent of the sample scored in the range of possible cognitive impairment. At the outset of ALSA, the sample was much more diverse in all respects, and hence the likelihood of being designated as possibly cognitively impaired was greater than at later Waves. Anstey and Luszcz (2002) have previously reported that poor cognitive function at baseline is a risk factor for attrition from the study, either through death or non-response. By Wave 7, about 1 in 10 of the sample score within the possibly cognitively impaired range. Given the average age of the sample was 85 years by this time, population prevalence figures would have suggested a higher figure. This is again an indication of the ‘healthy’ bias in our surviving sample. Finally, the classification that is being used does not distinguish degrees of severity of cognitive limitations, but in most cases participants’ were only mildly impaired. Severe cognitive impairment would have interfered with their capacity to respond to the ALSA interview.

It bears repeating that these classifications are an insufficient basis on which to identify genuine cognitive impairment (dementia), but are most likely indicative of the lower end of the distribution of ‘typical ageing’ (Stones, Kozma, & Hannah, 1990). They are also illustrative of the fluctuating nature of performance and caution against reliance on a single measure at one point in time.
Transitions in Cognitive Status Across Waves 1, 3, 6 and 7

Cognitive status was not static in the ALSA participants. All possible patterns of transitions were observed over the course of the study. Figure 5.2.1 provides a striking representation of the overwhelming cognitively intact nature of the sample of community dwelling participants over the age of 70. Moreover, it shows the extent of stability (continuity) and change between Wave 1 and Wave 3. Classifications remained 'unimpaired' and stable in more than 90 percent of cases. Both gains and losses over the first two years were observed however. Improvement within the normative range was seen in 6 percent of participants while declines into the impaired range were seen for 4 percent of participants.

Table 5.3.1 provides results for all participants of possible transitions at each of the four major waves of ALSA. Continuity in classification status occurs when an individual falls into the same category across two Waves, e.g., possibly cognitively impaired or cognitively intact at both. Discontinuity occurs when the categories for two Waves do not match.

### Table 5.3.1: Dementia Transitions Waves 1 to 7

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<td>Wave 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>94.2</td>
<td>4.0</td>
<td>90.7</td>
</tr>
<tr>
<td>Yes</td>
<td>0.8</td>
<td>1.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Wave 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>91.1</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.3</td>
<td>0.6</td>
<td></td>
</tr>
</tbody>
</table>

There is plasticity of cognitive functioning, and recovery of function was experienced by many of the participants. The exact reasons for the movement between categories is not entirely clear, but it does again illustrate the wisdom of intervening to maximise functioning even in very late adulthood. Performance on the mini-mental status examination can be affected by acute illness, delirium, or bereavement for instance. If such events were present at one wave, but resolved at another, then cognitive status would also improve. On the other hand, at each wave new cases of possible dementia emerge. A normative increase in dementia is predicted based on epidemiological studies. However these figures do not indicate the underlying cause for the change.

The majority of participants again show no signs of cognitive impairment; the percent showing no impairment across two or more Waves ranges from 87 to 94 percent. Conversely, those who displayed signs of possible cognitive impairment over two consecutive Waves ranged from 0.6 to 3 percent. Incident figures (newly emergent cases) ranged from 3.9 to 8.8 percent.
5.4 SENSORY PERCEPTION AND COGNITIVE CHANGE

This section explores how changes in the sensory systems of hearing and vision may be associated with changes in the cognitive system. Understanding the developmental nature of the relationship between sensory and cognitive function in later life has important implications for the maintenance of independence and psychological well-being (e.g., Wallhagen et al., 2001), as well as providing an avenue of investigation into the possible causes of cognitive decline (e.g., Baltes & Lindenberger, 1997). Although moderate associations among sensory acuity and cognitive capabilities have been observed in cross-sectional studies of aging, with the age-related component of these capabilities found to be largely shared, little is known about the relation between changes in these functions within individuals over time.

Longitudinal studies have found a decline in distance acuity from 30 through 80 years of age, with similar declines for near distance acuity. Although decline in visual acuity is evidenced in adulthood the majority of people maintain at least fair corrected acuity (6/12 or better) into their eighties (Fozard, 1990). Longitudinal studies show that changes in pure tone thresholds occur continuously throughout adulthood, particularly in the higher ranges. Changes in both systems occur neurally as well as at the level of the end organ. Cognitive decline is likewise widespread in late life, and stems from both biologically based brain ageing, and environmental factors. Given the substantial evidence for age-related change in these functions, both sensory and cognitive performance have been identified as indices of functional or biological age. What is not yet known is whether individual differences in rates of change in vision, hearing and cognition are correlated.

Cognitive and sensory aging occur in the context of other changes in health and physical function and these influences may also confound or explain the association between sensory and cognitive performance. In particular, fluctuations in health may affect both sensory and cognitive performance in both cross-sectional and longitudinal studies (Anstey & Christensen, 2000; Luszcz, Bryan & Kent, 1997). Understanding this aspect of aging may be informed by including relevant variables when analysing datasets containing cognitive and sensory variables.

This section has three aims. First, to examine change in sensory (vision and hearing) and/or cognitive performance over an eight year period in the ALSA; second, to determine the extent of association between contextual variables (age, education, self-rated health, depression, and medical conditions) and rates of change; and third, to evaluate if rates of change in measures of cognitive and sensory function in old age are linked.

**Measures**

- Distance visual acuity (corrected) was measured at three meters for each eye using a well-illuminated Snellen chart. The smallest line read successfully, with a criterion of at least half of the characters in the line read correctly, was the score analysed.
- Near visual acuity was measured at 20 centimetres using a chart containing short passages of text printed in ascending sizes of font from 5 to 18. The left eye and right eye were tested separately and the score was the smallest font at which the participant could read with either eye.
- Audiometry. Portable audiometers with standard earphones were used to conduct puretone threshold testing. A ‘bracketing technique’ was used to determine 7 thresholds for each ear: 0.5, 1.0, 2.0, 3.0, 4.0, 6.0, and 8.0 kHz. After a successful response the presentation tone was decreased by 10 dB, whereas after a failure to respond the tone was increased by 5 dB. The lesser threshold at 2.0, 3.0 and 4.0 kHz dBHL for either the left or right ear (generating 3 threshold values) were analysed. These frequencies were chosen because they had minimum missing data at Wave 1 due to hearing impairment and therefore allowed for observation of change over the eight year follow-up period.

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4 Dr. Anstey led this work, which is published as Anstey, Hofer, & Luszcz (2003). Trajectories of change in cognitive and sensory function. Psychology and Aging, 18, 714-726 (see reference list for details).
Results for each sensory measure included in this section are shown in Table 5.4.1 for each of Waves 1, 3, and 6.

### Table 5.4.1: Means and standard deviations for observed scores at three Waves

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wave 1</th>
<th>Wave 3</th>
<th>Wave 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance Vision (Left)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1215</td>
<td>1079</td>
<td>394</td>
</tr>
<tr>
<td>M</td>
<td>-0.3</td>
<td>-0.29</td>
<td>-0.33</td>
</tr>
<tr>
<td>SD</td>
<td>0.23</td>
<td>0.26</td>
<td>0.24</td>
</tr>
<tr>
<td>Distance Vision (Right)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1212</td>
<td>1101</td>
<td>396</td>
</tr>
<tr>
<td>M</td>
<td>-0.31</td>
<td>-0.3</td>
<td>-0.33</td>
</tr>
<tr>
<td>SD</td>
<td>0.23</td>
<td>0.25</td>
<td>0.24</td>
</tr>
<tr>
<td>Near vision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1469</td>
<td>1256</td>
<td>396</td>
</tr>
<tr>
<td>M</td>
<td>5.79</td>
<td>7.32</td>
<td>7.07</td>
</tr>
<tr>
<td>SD</td>
<td>2.39</td>
<td>3.71</td>
<td>3.58</td>
</tr>
<tr>
<td>2 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1560</td>
<td>1406</td>
<td>525</td>
</tr>
<tr>
<td>M</td>
<td>31.76</td>
<td>33.22</td>
<td>35.61</td>
</tr>
<tr>
<td>SD</td>
<td>17.78</td>
<td>17.96</td>
<td>18.4</td>
</tr>
<tr>
<td>3 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1550</td>
<td>1406</td>
<td>525</td>
</tr>
<tr>
<td>M</td>
<td>40.93</td>
<td>33.22</td>
<td>44.55</td>
</tr>
<tr>
<td>SD</td>
<td>18.76</td>
<td>17.96</td>
<td>18.98</td>
</tr>
<tr>
<td>4 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1540</td>
<td>1405</td>
<td>525</td>
</tr>
<tr>
<td>M</td>
<td>47.28</td>
<td>27.14</td>
<td>52.88</td>
</tr>
<tr>
<td>SD</td>
<td>19.04</td>
<td>15.38</td>
<td>20.08</td>
</tr>
</tbody>
</table>

To give an idea of the wide individual differences in response trajectories, illustrative figures on cognition (Memory and Perceptual Speed), vision and hearing are presented in Figure 5.3.1. They represent a random selection of data from 150 participants (presenting all participants’ data results in an indecipherable ‘blob’) which capture typical patterns of change over time. Crosses indicate participants with a single observation; lines connect scores on 2 or 3 occasions.
Figure 5.4.1: Random sample of individual cognitive or sensory scores for 150 participants for 1, 2 or 3 occasions

Taken as a whole, each graph shows a pattern of worsening performance over time or as age increases. (Note that for hearing, upward trends or higher scores indicate poorer auditory function). Significant declines were observed for all variables, but only Vision, Hearing, Memory and Speed showed an increasing rate of change over time. Rate of decline accelerated with age.

- **Univariate Associations** refer to individual characteristics that are associated with the rate of change in each of these four variables. Age was associated with rate of change in all sensory and cognitive factors. Gender was associated with rate of change in vision, with men showing faster decline than women. Education was associated with rate of change in Speed, with higher levels of education being associated with slower rate of change over eight years. Depression, self-rated health and medical conditions were not associated with rate of change in any sensory or cognitive factor. These associations are all indicative of the link between a single characteristic and rate of change in sensory or cognitive function. What is more important is to see which of the characteristics is uniquely related to rate of change (i.e., when all the predictor variables are examined at the same time) and how changes in the association between pairs of sensory and cognitive measures relate to each other, once the contextual variables are taken into account (Luszcz, Hofer & Martin, 2004). Two kinds of information are of interest: level refers to how high scores are on each variable, while slope refers to the change (mostly decline) over time in each variable.

- **Multivariate Associations** refer to effects that remain when all other variables (see Table 8.3.4) are taken into account. Health, education and gender were associated with differences in level of sensory or cognitive performance and higher levels of education were also associated with slower rate of decline in Speed only. Decline in vision was associated with gender and medical conditions. The interrelationships among the cognitive and sensory factors varied in the extent to which they were influenced by age, education, SRH, CES-D and medical conditions. However, associations among the cognitive variables (Memory, Speed and NART) were virtually the same regardless of whether the effects of the background variables were taken into account or not. In contrast, correlations involving the sensory variables (Vision and Hearing) generally were reduced in size after taking into account the impact of Age and Education. Notably, health variables did not result in substantial changes in the strength of association between any pair of variables.
5.5 COGNITIVE AND SENSORY CHANGE - CONCLUSIONS

Results concerning the pattern of change in cognitive factors are consistent with age vulnerable (fluid intelligence) and age-maintained (crystallised intelligence) expectations in demonstrating significant decline in speed and memory but not verbal ability in old age. Apart from age, few of the covariates were associated with rates of change in sensory or cognitive performance. Education was associated with slower decline in Speed but was unrelated to change in memory or verbal ability.

The influence of health variables on decline in cognitive performance was negligible, and is consistent with a lack of strong support for the effect of health on cognitive decline except where a disease process is neurologically based (Anstey & Christensen, 2000). In essence these results suggest that disease-related frailty may not be a risk factor for cognitive decline, despite it compromising functioning in other domains. At this stage, there is no strong evidence in the literature that general measures of poor health influence the course of cognitive change in very old adults.

The results do not provide support for common factors playing a large role in explaining sensory and cognitive decline, although there was some support for commonality in decline in Speed and Memory factors. A possible interpretation of what is shared in the decline in Vision and Memory is that it reflects a disease process or biochemical dysfunction common to visual and memory ageing. Furthermore, while there may be some shared causes of memory and visual decline, for the most part, the causes of cognitive and sensory decline appear to be largely independent. Likewise, there appear to be some small shared causes of visual and auditory decline however, independent processes also appear to underlie visual and auditory decline.

Although complex, the overall picture presented when considering change in sensory and cognitive function in the context of other characteristics of older people is that change in one aspect does not imply a change in another aspect. This is a very positive result regarding the course of physiological and cognitive aging. Particularly for those subscribing to the view that “it all goes together when it goes”. An important public health message is to encourage older people to value and utilise their preserved capacities or strengths to the full, despite weaknesses in other areas. The preserved abilities may actually provide ways of compensating for other losses.

It appears that a combination of independent causal factors occurring in later life underlie simultaneous decline in vision, hearing, and cognitive function. These findings make a significant contribution by reporting results for sensory and cognitive performance over three occasions during eight years of the ALSA on a large population-based sample and by evaluating the influence of context on rates of change. Further research is required to determine if similar results obtain for other aspects of cognition such as executive function (Luszcz & Lane, in press) and physiological function (eg, grip strength or balance) and to investigate the unique association between visual and memory decline in both normal aging and dementia.

Other research based on ALSA has shown that normal cognitive decline is a risk factor for falling (Anstey, vonSanden & Luszcz, 2006). In addition it features in timing of cessation of driving (Anstey, Windsor, Luszcz, & Andrews, 2006). These reports are important because they highlight the importance of tracking not only dementia and frank cognitive impairment, but also normative patterns of cognitive decline that are typical of healthy ageing. Because cognitive functioning is amenable to improvement through simple practice or active interventions, efforts to improve or maintain it may also reduce the likelihood of a fall or delay the need to give up driving.
6. PSYCHOLOGICAL WELL-BEING: DEPRESSION AND SENSE OF SELF

This chapter examines another major psychological domain within ALSA – that of one’s subjective sense of self or how an individual perceives him or herself to be, and also the experience of depression or negative affect. Like the previous chapter, it will examine each of these variables across the four major waves of ALSA (1, 3, 6, 7) and will consider stability, gain and loss in their presentation.

6.1 KEY FINDINGS

- The majority of the sample is emotionally healthy – e.g., two-thirds to three-quarters show no signs of depression.
- The majority (> 70%) of participants maintained stability over the first two years.
- Loss is limited to 10 to 18 percent of the sample for Sense of Self.
- Small segments of the sample show gains (e.g., 4 - 18%), indicating reserve capacity in late life that could be tapped for other people.
- Psychological resources predicted current functioning and growth and resilience above and beyond that attributed to individual differences ascribed to age, gender, functional or physical health, or activity.
- Changes in morale were mainly determined by previous levels, but also by higher self-ratings of health and being married.
- For depression, in addition to health and being married, gender and self-esteem at Baseline were important contributors to lessening depression.
- Depressed affect is more prevalent in the ALSA at all Waves, compared to compromised cognition. After Baseline, the prevalence of depression is 2 to 3 times that of cognitive impairment.
- Baseline prevalence of depression is higher for those living in residential care than those living in the community, e.g., 32 percent compared with 14 percent; for women and for those in poorer health or with more disabilities.
- Cognitive status did not predict depression.
- Change in one aspect of psychological ageing does not imply a change in another aspect. This positive result provides an important public health message regarding the course of physiological and cognitive aging.
- Practitioners should encourage older people to value and utilise their preserved capacities or strengths to the full despite weaknesses in other areas. The preserved abilities may actually provide ways of compensating for other losses.

6.2 SENSE OF SELF MEASURES

Measures of sense of self included the Centre for Epidemiological Studies - Depression scale (CES-D; Radloff, 1977), a Self-esteem Scale (Bachman, O’Malley and Johnson, 1978 revision of Rosenberg, 1965), a 15-item version of the Philadelphia Geriatric Center Morale Scale (Lawton, 1975) and 12 items from the Expectancy of Control Subscale of the Desired Control Measure (Reid & Ziegler, 1981). High scores on these scales indicate more depressed affect, better self-esteem, stronger morale and a more external sense of control, respectively. In keeping with Thoits (1995), control and self-esteem were conceptualised as self resources that may explain the relationship between age or activity and well-being, which depression and morale were taken to index.
In ALSA wellbeing was evaluated in both a positive (morale) and negative (depression) terms. In this section we look at them across Waves 1, 3, 6, and 7 for different age groupings. Depression is given particular prominence in light of increasing awareness of the devastating impact it can have on those who experience it.

The CES-D scale was used to measure depression, sometimes referred to as negative affect or mood. Figure 6.2.1 shows that mean CES-D score for each age-group in Waves 1, 3, 6, and 7 increases from the youngest to oldest age group. Note that none of these scores meets the criterion for clinical depression (>16; see below for more detail on clinical depression in ALSA). The relationship between age and depressive symptoms could be moderated by other factors that increase in prevalence with age, such as declining health, reduced independence, loss of a loved one or moving to a residential care facility. Risk factors for depression are considered further in Section 6.4.

**Figure 6.2.1: Mean depression score by Age and Wave**

Morale means for each age group and Wave are shown in Figure 6.2.2. These show age-related decline, indicating that as people age, their morale declines. However, scores are at the upper end of the distribution of possible scores (i.e., top 20 percent or better), and as such are reflective of good morale, regardless of age.

**Figure 6.2.2: Mean morale score by Age and Wave**
Self-Esteem scores range from ten to fifty where higher scores indicate better self-esteem. Figure 6.2.3 shows a decrease in mean self-esteem scores with increasing age, for Waves 1, 3, 6, and 7, signifying that as age increases, self-esteem declines slightly, but remains good, again in the top 20 percent of possible scores.

Figure 6.2.3: Mean self-esteem score by Age and Wave

The Expectancy of Control Subscale from the Desired Control Measure (Reid & Zeigler, 1981) was used to measure the degree to which participants expect to have control over their involvement with others, engagement in activities and health. Scores could range from 12 – 60, with lower scores representing a greater expectancy of control. Fig 6.2.4 shows an increase in mean scores with age. This indicates that one's expectation of control is eroded with age, i.e., their belief in their own influence over their health, social life and actions decreases. These scores tend to fall in about the middle of the range of possible scores, implying that participants recognise that they are not the only source of control over these areas.

Figure 6.2.4: Mean expectancy of control score by age and Wave
Gains, Losses and Stability in Sense of Self

Using data from participants over the age of 70 and residing in the community only, we examined whether there were differences between age groups or over the first two years of the ALSA. Each of the measures differed as a function of age group (Depression, Morale, Self-esteem and Control) and Morale and Self-esteem were lower at Wave 3 than at Wave 1. Depression increased over the two years, but only for two older groups compared to the two younger ones. Hence at the extremes of late life, people are vulnerable to an increase in depressive symptoms. It should be remembered however that the average depression score is nonetheless far below the cut-off required for a designation of clinical depression even at this stage.

As was the case with the cognitive variables, we also looked at the likelihood that these variables were stable or subject to gains and losses over the first two years. Figure 6.2.5 clearly demonstrates that whether we look at well-being as measured by morale, depression self-esteem, or control, the vast majority of participants maintain stability in these domains. As this figure illustrates, 70 – 78 percent of respondents showed negligible change, whereas between 10 to 18 percent showed significant fluctuations. These took the form of both gains and losses. The measure most subject to variation (loss) was morale, while self-esteem was most robust to change and those who did change were equally (11%) likely to show a gain as a loss.

Overall, these results suggest that our sample has a strong sense of psychological well-being which is maintained well into advanced old age. These psychological resources are important in coping with the challenges and losses of ageing, and with negotiating the increasingly complex social relations that often accompany growing older.

Figure 6.2.5: Gains, Losses and Stability over time in sense of self domains
6.3 DEPRESSIVE STATUS: TRANSITIONS ACROSS WAVES

Possible Clinical Depression

The results in the previous section describe normative age-related changes in functioning. Next we present results for those who have crossed a threshold from what can be considered normative into the range of maladaptive functioning. As was the case for possible dementia, in epidemiological studies such as ALSA, ‘clinical cutoffs’ have been defined as a basis for estimating the prevalence of depression. Scores greater than 16 on the CES-D may indicate a clinically significant depression (Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977).

Figure 6.3.1 shows the patterns of stability and change between Wave 1 and Wave 3. ‘Depressed Affect’ illustrates the percent of participants who fell below the threshold for suspected depression.

These analyses showed that the overwhelming majority of the sample was not experiencing substantive depressed affect. Classifications remained stable over the first two years of the study in 85 percent of cases for depression. Both gains and losses were observed; improvement over the two years were seen for 6 percent of participants, i.e. depression went into remission. Losses were seen for 9 percent.

Again, it must be remembered that these classifications are an insufficient basis on which to identify clinical depression, but are most likely indicative of the lower end of the distribution of ‘typical ageing’ (Stones, Kozma, & Hannah, 1990).

Figure 6.3.1: Depression classifications at Wave 1 and 3

Depressive status was not static in the ALSA participants. All possible patterns of transitions were observed over the course of the study. Table 6.3.1 provides the percent of participants in each category for depression. Continuity occurs when an individual falls into the same category across two Waves. Discontinuity occurs when the categories for two Waves do not match – one can recover from or enter into depression anew. A ‘remission’ in depression is said to have occurred if someone who was depressed at Wave 1, obtains a score below the cutoff at Wave 3. In contrast ‘incident’ depression occurs if a person was not initially depressed but became so subsequently.
As has already been shown in the case of disability and dementia, there is also plasticity in the experience of depression and recovery from it was experienced by many of the participants. While some depression is due to endogenous factors, e.g., chemical imbalances, it can also be brought on by major life events, particularly significant losses such as bereavement, cessation of driving, or major physical illness. These figures do not indicate the underlying cause for the change, although we have shown that depression is more likely to occur in people who recently stopped driving or entered residential aged care.

The experience of depression can be attributed to a range of factors, both organic and environmental. It is also a condition that is treatable with behavioural and pharmacological options available. In most cases, a combination of these treatment regimes is more efficacious than one or the other in isolation. In ALSA, we have no information on the use of behavioural treatments, but in section 4.4, the role of antidepressant medication is addressed. Given that it is treatable and that it may be brought on by major life events or illnesses, we would expect to see a significant amount of fluctuation in depressive status over 15 years.

Between two-thirds to three-quarters of the sample show no indication of clinical depression across multiple Waves of the study (Table 6.3.1). This reflects a considerable amount of continuity or stability in affective state. Conversely, those who displayed signs of possible depression over two (or more) consecutive Waves ranged from about 4 to 10 percent. Incident figures ranged from 10 to 17 percent, and tended to decrease over time in the study.

Hence prevalence of possible cognitive impairment or depression in the ALSA was low and results for the study as a whole are unlikely to be tainted by compromised cognitive capacities or poor mood. While this is a strength of the study, ALSA may underestimate difficulties in these domains compared to the population at large, because those with severe cognitive or affective problems drop out from the study. On the other hand, as already mentioned, these classifications are crude indicators and more thorough batteries and clinical interviews would need to be undertaken to make accurate diagnoses.

**Well-being**

In contrast to cognition, when morale and depression were criterion variables indexing well-being, background (contextual) characteristics are much more important, with being married, reporting better health and using fewer medications featuring significantly. In the case of depression, poorer cognitive status and more illnesses and difficulties with ADLs were also important. After controlling for the contextual variables, activity added little to explaining depressive symptoms, whereas self resources did help to explain well-being.

For change in well-being over time, morale at Wave 1 but not self resources (self-esteem and control) contributed significantly to change. In contrast, for change in depression, the self resources continued to make a significant contribution. Those with a stronger sense of self-esteem two years earlier were less...
vulnerable to increases in depression over this period. As was the case in the cross-sectional analyses reported above, the contextual variables, rather than age per se, contribute the major component to well-being. For both morale and depression, higher self-rated health and being married are important contributors to well-being, while for depression being female is also associated significantly with overall levels of depression at Wave 3 and deterioration over two years.

The final section of this chapter takes a comparative look at prevalence of depressive symptoms for community residing participants and those in residential aged care. It also looks at risk and protective factors associated with depression and changes over the first 8 years of the ALSA.

6.4 PREVALENCE OF, AND RISK FACTORS FOR, DEPRESSION IN ALSA PARTICIPANTS LIVING IN THE COMMUNITY OR IN RESIDENTIAL AGED CARE

Considerable attention has been focused on the extent to which older adults suffer from depression. Our findings (i.e., of about 15 percent prevalence of depression in the ALSA sample as a whole) challenge a perception that depression is a common experience in late life. In this section, prevalence of depression in the elderly is examined for those living in the community and in residential aged care. Most epidemiological studies of ageing and depression exclude persons living in residential care, and this leads to difficulty in obtaining accurate figures for prevalence of depression in the population (Beekman et al., 1995; 1999). Typically it has been found that in community samples the rate of depression is lower compared to rates reported in studies of adults in residential care (Kay, Henderson et al. 1985; Beekman, Deeg et al. 1995). However, these figures arise from separate studies. In ALSA we can look at both groups in one sample.

Further, because there are strong associations between chronic illness and disability, on the one hand, and entry to residential care and depression on the other (Beekman, Penninx et al. 2002) it is important to take into account levels of illness when determining prevalence of depression in aged care residents. Both because entry to residential care is a major transition and because morbidity and disability are progressive conditions, it is important to know how depressive symptoms change over time. Only a few epidemiological studies have prospectively examined the relationship between moving into residential care and depression (Lenze, Schulz et al. 2005).

Using ALSA data we evaluated predictors of change in depressive symptoms over 12 years. Adopting the contextualism paradigm, predictors included demographic factors, antidepressant use, medical conditions, health behaviours, activities of daily living (ADL), instrumental activities of daily living (IADL), residential care status, cognitive decline and self-rated health (SRH). Because the transition to residential care may trigger or exacerbate depressive symptoms it is important to know if it is the entry to residential care per se or the associated functional and cognitive decline accompanying admission that precipitates change in symptom expression.

Data from Waves 1, 3, 6 and 7 were used in this study to determine prevalence. However for longitudinal modelling, only participants alive at Wave 6 were included (N=1131), because the large proportion of missing data at Wave 7 would have greatly reduced the sample size. Participant data (n=15) with Mini-Mental State Examination (MMSE) scores below the cut off for possible cognitive impairment were excluded, leaving a total of 1116.

We examined both time invariant (i.e., stable) measures from Wave 1, and those that varied over time (from Waves 1, 3, & 6). Stable measures included marital status, education, and gender, cardiovascular risk factors (self-reported heart condition/attack, hypertension, stroke/transient ischemic attack and diabetes), current smoking and frequency of alcohol consumption reported at Wave 1.

Time varying measures included living arrangements, [e.g., in the community (private dwelling) or in residential care (private rest homes, hostels, nursing homes, hospitals, or boarding houses)], whether they were taking antidepressants, depression scores, self-rated health (SRH), ADLs and IADLs (difficulty or no difficulty).
Prevalence Rates and Risk Factors at Baseline (Wave 1)

We have looked closely at the prevalence of depression in community dwelling participants and those residing in residential aged care (Anstey et al., 2007). There was a higher prevalence of depression at Wave 1 among those living in residential care (32%) compared with community dwelling adults (14%). For the sample as a whole depression prevalence ranges from 14 – 17 percent across Waves 1, 3, 6, and 7 (Table 6.4.1). These figures are comparable to those reported by others and are also not unlike that reported for younger samples who have responded to the CES-D. Compared to compromised cognition, depressed affect is more prevalent in the ALSA at all Waves. After Baseline the difference is two- to three-fold, this no doubt in part reflects the fact that cognitive impairment is more of a risk factor for attrition from the study than is depression.

Table 6.4.1: Prevalence of depression by place of residence

<table>
<thead>
<tr>
<th>Wave</th>
<th>Community Dwelling</th>
<th>Residential Care</th>
<th>Full Sample</th>
</tr>
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<tr>
<td>Wave 1</td>
<td>13.3</td>
<td>31.9</td>
<td>15.4</td>
</tr>
<tr>
<td>Wave 3</td>
<td>15.2</td>
<td>33.3</td>
<td>16.5</td>
</tr>
<tr>
<td>Wave 6</td>
<td>13.1</td>
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<tr>
<td>Wave 7</td>
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</tbody>
</table>

In addition to residential location, further analyses showed that those classified as depressed were more likely to be female, taking antidepressants, rate their health as poorer, and to report difficulties with ADLs and IADLs than those who were not depressed at Baseline. They did not differ in age, education, marital status, residential care type, hypertension, stroke, smoking status or MMSE. Compared to males, females scored 1.29 points higher on the CES-D. Thus, initial levels of depression were higher in women and those in poorer health or with more disabilities. Other demographic factors and cognitive status at Baseline did not predict depression.

6.5 CHANGE IN DEPRESSIVE SYMPTOMS OVER 12 YEARS.

More than half (54 percent) of the variability in CES-D scores over the 8-year follow-up period was due to between-person differences (i.e., characteristics mentioned above) and 47 percent was due to within-person change (i.e., ageing). Together these results indicate that it is not only age per se that is producing an increase in depressive symptoms, but rather attributes distinctive to individual persons must also be considered. The next sections go on to explore which of these distinctive individual characteristics are important in predicting change in depressive symptoms, and highlights those that are amenable to prevention or intervention.

Baseline Predictors of Change in Depressive Symptoms

- Demographic - The rate of change in depression was dependent on Baseline marital status. Those who were married or in a defacto relationship and those who were widowed at Wave 1 experienced a greater increase in CES-D scores over time compared to those who were never married. Participants who had never married at Wave 1 experienced a significant decrease in CES-D over time, while those who were divorced or separated experienced no change in depression.
- Antidepressant Use - Taking antidepressants was efficacious in relieving depression. Depression scores for those who did not take antidepressants at any Wave did not change, while those who did take antidepressants at any Wave experienced a significant decrease in depression score.
- Health and Lifestyle - Those reporting no history of heart condition or attack at Wave 1 experienced a decrease in depression scores over time while those reporting history of heart condition or attack remained stable. Those with lower drinking frequency (£4 times per month) decreased in depressive symptoms while those who consumed alcohol 2-3 times per week or more showed no change in level of depressive symptoms.
Time-varying Predictors

- **ADLs and IADLs** - The rate of change in depression score was also dependent on whether participants had difficulty with at least one ADL or IADL over the study period. Those with no difficulties scored lower on CES-D at Wave 1 by 3.86 and 2.54 points, for ADL and IADL difficulties respectively. When a participant changed from having no difficulty to having difficulty with at least one ADL or at least one IADL, their CES-D score increased by 1.84 points and 1.05 points, respectively.

- **SRH** - There were significant effects of SRH on CES-D scores. On average, participants who scored one point better on the SRH scale scored 2.67 points better on the CES-D scale. The within-person effect showed that participants who increased their health rating by one unit experienced an associated improvement in CES-D score of 1.64 points.

- **MMSE** also affected change in CES-D scores. For every point scored above 27, there was an associated decrease of 0.27 points on the CES-D.

- **Residential care** - In addition to the effects reported above, those who were not in residential care at any point in the followup period, scored on average 2.44 units lower (indicating less depression) on the CES-D than those who were in residential care at any point during the study. Moving into residential care increased CES-D by 1.73 points.

- **Unique effect of move to Residential Aged Care** - Because the transition to residential care is often a consequence of functional and/or cognitive deterioration, it is important to evaluate whether a transition to residential care was associated with change in depressive symptoms independent of functional and cognitive status. An additional model that simultaneously adjusted for ADL, IADL and MMSE showed that regardless of I/ADL or MMSE level, residential care had an adverse impact on depression both at the time of entry (1.75) and over the period of residency (1.61).

### 6.6 SUMMARY - DEPRESSION

In summary, although the Baseline prevalence of depression in residential care was 32 percent, compared with 14 percent in the community, this difference did not lead to a large overall inflation in the population prevalence (i.e., 15 percent noted above) because the number of participants in residential care was small. This finding does not diminish the significance of the higher prevalence of depression in residential care, but rather it suggests that community-based studies may underestimate depression prevalence in the population by only a small amount. On the other hand, double the prevalence of depression in residential age-care is a cause for concern. Factors examined in ALSA did not provide any indication that this was related to the type of residential care provided, but rather to characteristics of the individual, particularly to functional and cognitive health.

The prevalence rate observed in this study is within 1 to 2 percent of that observed in several other studies using the same measure of depression (Murrell, Himmelfarb et al. 1983; Berkman, Berkman et al. 1986; Kennedy, Kelman et al. 1989; Gatz and Hurwicz 1990). Notably, the rates of depression found among older adults in the ALSA are comparable to those of younger adults when also assessed with the CES-D (Eaton and Kessler 1981; Gatz and Hurwicz 1990). On this basis, there is little justification for viewing late life as more conducive to depression than any other period of adulthood, although a move to residential aged care can increase depressive symptoms.

Second, it is important to remember that the results describe the trajectory of depression within a cohort of survivors. The ALSA sample was healthier at baseline than those who declined to participate. This is typical of longitudinal studies of very old adults. In addition analyses reported here excluded participants who did not survive to Wave 6. Therefore, the results probably underestimate the prevalence and severity of depression in the age group studied but this would also be the case in most population-based studies.
Thirdly, cross-sectionally, there were no age-group differences in depressive symptoms. However, age effects emerged longitudinally, as older participants had a greater increase in depressive symptoms relative to younger participants. There was also an overall increase in depression over time independent of age, indicating the whole sample became more depressed over time. Those who were partnered at Baseline had a greater increase in depressive symptoms, probably due to their greater likelihood of losing a partner during the course of the study.

Interestingly, the analyses revealed relatively few medical conditions associated with depression. The lack of an association between depression and hypertension or diabetes was consistent with some previous literature (Kim, Stewart et al. 2006), nor were stroke or smoking associated with depression, possibly due to the self report nature of our measures (Kim, Stewart et al. 2006; Klungsoyr, Nygard et al. 2006). On the other hand, our analyses adjusted for demographic variables, which has not been done consistently in some previous reports (Bremmer, Hoogendijk et al. 2006; Kim, Stewart et al. 2006) and this may account for the seeming discrepancy.

The main interest was in the increased depressive risk associated with growing functional dependence, cognitive decline, deteriorating self-rated health and residential care. In contrast to the measures of physical health, these were all associated with depression prospectively. That is, knowledge of these variables would enable one to predict whether it was likely that an increase in depression would occur.

The results clearly show that functional impairment and normative cognitive decline are associated with increasing depression in late life in those without cognitive impairment. It is noteworthy that perceptions of health were more important than the presence or absence of medical conditions, for predicting depression. Our results also showed that transition to residential care was associated with increased depressive symptoms after adjusting for functional impairment and cognitive decline. Thus, the transition to residential care predicts depression, independent of the factors that lead to placement in residential care, which also predict depression. This points to a cascade of risk factors for depression occurring in a vulnerable group of older adults who experience functional and cognitive decline.

Despite being a longitudinal study, it is still not possible to firmly determine causality from observed associations. It remains possible that other factors cause both depression and dependency, or that depression causes disability. Furthermore, ALSA depression measures provide only a first step in determining a diagnosis of clinical depression, which relies upon individualised clinical assessment, a case history, and persistence of symptoms. Nonetheless these ALSA findings reiterate the significance and scope of late-life depression as a public health problem. It is strongly linked with factors indicating increased dependency, i.e., with decline in functional capacity, self-perceived health, and reduced cognitive capacity. In addition to previous history of depression and antidepressant use, risk assessment and targeting of intervention strategies for older adults should address changes in functional capacity, SRH and cognition, along with gender, marital status, and the need for residential care.

6.7 CONCLUSIONS AND IMPLICATIONS

The notion that concurrent or pre-existing self resources are conducive to well-being was the centrepiece of this snapshot of the data. Psychological resources contribute independently to well-being after taking into account a range of background variables including not only age, gender and education, but also activity level. Overall the results point to their importance in the range of well-being indicators examined here.

At baseline, both self-esteem and perceived control were important predictors of well-being and mediated the modest relationship between it and activity. Concurrent self resources are associated with higher levels of well-being. The longitudinal analyses confirmed that pre-existing self resources are beneficial to the maintenance or improvement in well-being over time, as measured by depressed affect.
As was the case for cognition, in the personality/self domain psychological resources predicted current functioning, growth and resilience, above and beyond that attributed to other individual differences ascribed to functional or physical health, activity, age and gender.

Nonetheless, we do have evidence that even if measured quite globally (Smider, Essex, & Ryff, 1996), self resources play a significant role in predicting well-being. As subjective evaluations on the part of the individual, these, unlike more objective constraints, liabilities or deficits, may be more amenable to manipulation or change. Hence they could be the focus of interventions aimed at improving an individual’s outlook on life and, in turn, quality of life and sense of well-being. Conceptualising some dimensions of well-being as resources that safeguard or bolster other dimensions will shed light on the mechanisms by which well-being is maintained or enhanced.

Multidirectionality, i.e., patterns of gains, losses and stability, is in evidence over the course of the study. That the trajectories of change varied within and across domains provides a further illustration of multidimensionality. Clearly the study and its findings are interpretable within the conceptually rich life-span developmental theoretical perspective. At a most basic level they show that the rate of ageing is not the same for all aspects of functioning and that in the psychological domain in particular, there is room for continued growth.
7. HEALTH BEHAVIOURS

Lifestyle behaviours such as smoking, alcohol consumption, diet and exercise can impact on a person’s health. In this section patterns of alcohol consumption and cigarette smoking are described and compared by sex and age groups. Exercise, activities, nutritional status and weight change are described and illustrated for Wave 1 participants.

7.1 KEY FINDINGS

- At Wave 1, 30 percent of males and 46 percent of females reported that they did not drink any alcohol
- 33 percent of males reported drinking alcohol at least four times per week at Wave 1 compared with 19 percent of females
- Overall 10 percent of respondents were drinking more than the current recommended daily intake at Wave 1
- At Wave 1, 9 percent of males and 8 percent of females were current smokers. 61 percent of males and 23 percent of females were former smokers
- At Wave 1, 61 percent of respondents reported that they had exercised in the previous fortnight. A higher proportion of males than females exercised
- Nearly half of the participants were classified as overweight or obese, while 15 percent were “malnourished”
- 21 percent of females and 14 percent of males reported that they had tried to lose weight in the 12 months prior to the Wave 1 interview
- More ‘young-old’ participants had tried to lose weight than those aged 85 or over.

7.2 ALCOHOL

At the time of the Wave 1 interview, more than one third of participants abstained from drinking alcohol. There was a strong difference between the male and female respondents with respect to alcohol consumption. While 30 percent of male participants reported that they did not drink alcohol, 46 percent of female respondents reported that they did not drink any alcohol. At the other extreme, males were also more likely to report drinking alcohol at least four times per week (33%) versus females (19%).

Figure 7.2.1 demonstrates the relationship between consumption and age group, with younger participants more likely to report they consumed alcohol at least occasionally than the older participants.

**Figure 7.2.1: Frequency of alcohol consumption by Age**
There was wide variation reported by drinkers in the amount of alcohol consumed on a typical day when drinking. While more than one quarter of the males reported they consumed three or more alcoholic drinks on a typical day when they were drinking, 12 percent of the female participants had three or more drinks on a typical drinking day. If the current guidelines of “Four men and women two” are used as the benchmark, then eight percent of the male respondents reported typically drinking five or more drinks on a drinking day. Overall, 10 percent of the sample were drinking more than the current recommended maximum daily intake. Three quarters of the male drinkers and 92 percent of the female drinkers reported they never drank six or more drinks on one occasion. While no female respondents reporting this level of drinking on a daily basis, three percent of the male drinkers reported their usual daily consumption was six or more drinks.

7.3 SMOKING

At the time of the Wave 1 interview, nine percent of the participants reported that they currently smoked, with a median daily consumption of 12 cigarettes. The proportion of males and females that were current smokers was similar, with nine percent of males and eight percent of females current smokers. Among those who were not smokers at the time of the Wave 1 interview 61 percent of the male participants had smoked in the past. In contrast, only 23 percent of female participants were former smokers. The median years of smoking for current or ex-smokers was 30.4 years.

There was a relationship between age and smoking status, as shown in Figure 7.3.1, reflecting that participants who had survived to 85 years of age or more were less likely be current or former smokers than younger study participants. The proportion of current smokers declined between each age group.

Figure 7.3.1: Smoking status by Age
7.4 EXERCISE AND ACTIVITIES

At Wave 1 interview, participants were asked a series of questions about the vigorous and less strenuous activities they had undertaken in the fortnight before interview that enabled participants to be classified as vigorous exercisers, moderate exercisers, or sedentary (Finucane, Giles et al. 1997). 61 percent of participants self-reported they had exercised in the previous fortnight, with 4 percent of these respondents indicating they had exercised vigorously. The remaining 39 percent of participants were sedentary. A higher proportion of male participants exercised (64 percent) than female participants (57 percent). There was also a gradient in the relationship between exercise and age, such that younger participants were more likely to exercise than older participants (e.g. 69% of 70-74 year olds exercised compared with 47 percent of participants aged 85+).

7.5 NUTRITION

Based on the results of the clinical assessment conducted at Wave 1, the body mass index (BMI) for each clinically assessed participant (n=1620) was calculated as weight (kg)/height (m)2. The average BMI for male participants was 25.8 (SD 3.6) and female participants was 26.3 (4.6).

Participants were classified according to standard criteria as having BMI <22 (malnourished), 22-26 (desirable), and >26 (overweight or obese) (Bannerman, Miller et al. 2002; Wahlqvist 1997). Overall, close to half of the participants were classified as overweight or obese (47%), with a further 15 percent of participants at risk of malnourishment with a BMI less than 22.

The distribution of the BMI classification, broken down by age group and gender, is shown in Figure 7.5.1. As this figure shows, the prevalence of overweight or obesity decrease with age. Participants in the oldest age group were most likely to be in the desirable range of 22 to 26 for BMI. There was no obvious relationship between malnourishment and age for either males or females.

Figure 7.5.1: BMI category by Age for Males and Females

![Figure 7.5.1: BMI category by Age for Males and Females](image-url)
Participants were also asked a series of questions concerning their weight in the Wave 1 interview. A total of 55 percent of participants self-reported they were about the right weight, and 37 percent reported they were overweight. Only 8 percent of participants thought they were underweight. Similar proportions of participants reported their preferred weight was about the same (56 percent), less (38 percent) or more (6 percent), although a higher proportion of men (60 percent) than women (50 percent) reported their preferred weight was about the same as their current actual weight. There was a striking age effect with respect to preferred weight. As shown in Figure 7.5.2, younger participants were more likely to report they were over or under weight than older participants.

Figure 7.5.2: Preferred weight by Age

A total of 17 percent of participants had tried to lose weight in the 12 months prior to the Wave 1 interview. A higher proportion of females (21%) versus males (14%) had tried to lose weight. There was also a relationship between age group and having tried to lose weight. As shown in Figure 7.5.3, one third of younger participants had tried to lose weight in the previous 12 months, whereas only 5 percent of participants aged 85 years or more had tried to lose weight in the previous year.

Figure 7.5.3: Percent tried to lose weight in past year by Age
8. HEALTH SERVICE UTILISATION AND EXPENDITURE

This section analyses the service use and health care costs of ALSA participants reported throughout the study. The areas of interest reported in this section include hospital, Medical Benefits Schedule (MBS) and Pharmaceutical Benefits Schedule (PBS) resource use. The ALSA data on health expenditure reported and analysed in this section has been qualified as restricted to that of survivors with self reported hospital and nursing home use and retrospectively collected Health Insurance Commission (HIC) data from 439 surviving patients on medication use (PBS data) and MBS data on out of hospital service use. Hence the questions which data from the ALSA study have been used to address in this section are restricted to those related to survivors.

The place of residence and movement between community living and residential care for ALSA participants for the first six Waves of the study are also considered, by type of residential care. Additionally, ALSA participants use of care organisations are examined.

8.1 KEY FINDINGS

- ALSA collected self-reported hospital admissions in the previous twelve months at Waves 1, 2, 3, 6 and 7. In Waves 6 and 7, 439 participants also gave consent to retrospective access to 2001-2004 MBS and PBS resource use and expenditure data from the Health Insurance Commission. Both data were restricted to utilisations among survivors.
- Among ALSA survivors, women were found to have significantly higher PBS expenditure in each age group (partly attributable to higher cost of scripts compared to males) whereas men had a significantly higher proportion of total expenditure on hospital services.
- The average cost of GP visits increased with age for both males and females.
- The number of GP visits per patient per year increased with age for both males and females, but was higher for females in each age group.
- Average hospital bed days increased rapidly in males after the age of 70.
- Hospitalisations among female participants remained relatively constant, as did MBS and PBS expenditure, however they did start significantly higher than that for males.
- Data from ALSA suggest that a lower use of preventative medications by males in earlier old age is leading to greater use of acute services in later old age, whereas females are more likely to be using cheaper preventative interventions earlier.
- Between Wave 1 and Wave 6 the percentage of the surviving participants living in the community decreased from 91 percent at Wave 1 to 82 percent at Wave 6.
- The proportion of participants who were living in residential care increased from 3 percent at Wave 1 to 12 percent at Wave 6.
- Over the first six Waves of the ALSA, 60 percent of participants were not in high level care at any Wave or died without having used high level care. Overall 13 percent of participants were in high level care at one or more Waves.
- Use of care organisations increased from 14.5 percent of males and 19.7 percent of females at Wave 1 to 53 percent of males and 73 percent of females at Wave 7.
- The proportion of males using care services is higher than that of females at each Wave.
8.2 HEALTH SERVICE EXPENDITURE IN THE ELDERLY

Health expenditure in Australia has been previously shown to be significantly greater in over 65 populations, particularly in hospital and pharmaceutical expenditure. In 1990, 35 percent of expenditure was consumed by 11 percent of the population aged over 65 (Goss, 1992; Goss, Eckermann, Pinyopusarerk, Wen 1994) with a rate of expenditure 4.3 times that of those under 65. More generally, expenditure has been shown to increase with age in all areas with populations over age 50 (Goss et al. 1994; AIHW 2006a). It is also the case that over time:

- the proportion of the population over age 65 has been increasing and is expected to continue increasing in Australia (19 percent by 2021, ABS 2006) and;
- the composition of over 65 populations is shifting towards older population as life expectancy of males and females over 65 has been and is expected to continue increasing.

Such data have been used to predict ageing effects on health expenditure by directly applying age-sex specific expenditure to changes in age-sex distributions, under the assumption that cross sectional age-sex spending levels remain constant over time. However, as Fuchs (1984) argues, health expenditure is better modelled as a function of proximity to death rather than chronological age. Rising health expenditure by age in cross sectional analysis can be largely explained by the increasing proportion of people nearing death increasing with age. More importantly in predicting expenditure:

“to the extent that the change in the age distribution is the result of increased life expectancy (falling age-sex specific mortality rates) the cross sectional differences in expenditure by age group overestimate the changes that would result from an aging population” Fuchs (1984:151).

The relationship between health care utilisation (cost), age and survival status will in general depend on the reason for the lower death rate. If age-sex mortality rates fall because people are living healthier lives or because of more effective preventive health measures then conventional estimation methods will overestimate the effect of ageing on health care utilisation. Alternatively, if lower mortality rates in age-sex groups are the result of ever more complex technological interventions, the rising cost of such interventions will tend to offset the fact that a lower proportion are in their last year of life as life expectancy increases (Fuchs 1984).

Therefore, to explain and predict health expenditure in the aged, questions need to be addressed about health care utilisation and expenditure over time in surviving patients as well as that in patients associated with proximity to death. Important questions in such survivors arise around utilisation of diagnostic procedures, pharmaceutical therapies and their impacts on capacity for self care versus needs for institutional care in residential care facilities and treatment in hospital. More generally, examining expenditure patterns in elderly survivors can address questions of the broad mix of acute (hospital) versus more preventative services (primary care and medications) which are being used by surviving elderly populations, and at what age.

8.3 ALSA STUDY DATA COLLECTED ON RESOURCE USE

The ALSA study collected self reported hospital admissions and bed days in the previous 12 months at Waves 1, 2, 3, 6 and 7. This self reported hospital use data was supplemented in Waves 6 and 7 by consent from 439 participants in 2004 for retrospective access to 2001 to 2004 Medical Benefit Schedule (MBS) and Pharmaceutical Benefit Schedule (PBS) resource use and expenditure data from the Health Insurance Commission (HIC).

However, each of these ALSA data on health care resource use and expenditure are restricted to that of survivors and consequently are unable to capture resource use proximate to death. Self reported hospital resource use does not include that of participants dying between Waves, while HIC data on PBS and MBS use is in a selected population who survived to give consent in 2004. Hence, all analysis of ALSA health care resource use and cost data is qualified to the extent it represents that of surviving populations, rather than a full cohort, including expenditure proximate to death.
Consequently, the self reported hospital data and retrospectively consented HIC data available for analysis in the ALSA study do not allow estimation of Australian health expenditure by proximity to death. However, the ALSA data do allow estimation of hospital resource use and MBS and PBS resource use and expenditure in survivors by age by sex group in populations over 70 among patients with HIC consent.

8.4 PBS AND MBS EXPENDITURE IN HIC PATIENTS

Medical Benefit Schedule (MBS) and Pharmaceutical Benefits Schedule (PBS) expenditure of the ALSA HIC cohort profiled by age-sex groups over 75 are reported in table 8.4.1. This data suggest that among survivors:

- PBS (medication) expenditure for ALSA males per person year increases with age (almost doubling from 75-79 to 90-94 with a constant gradient), while female PBS expenditure per person year is constant by age but significantly higher than that of males in each age group.
- MBS (medical services) expenditure per person year increase with age for both males and females.

Table 8.4.1: Average Medical Benefits Schedule and Pharmaceutical Benefit Schedule (2002-03 constant price) expenditure per person year by Age and Sex

<table>
<thead>
<tr>
<th></th>
<th>PBS expenditure</th>
<th>MBS expenditure</th>
<th>Total expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>349.34</td>
<td>567.23</td>
<td>916.57</td>
</tr>
<tr>
<td>80-84</td>
<td>424.54</td>
<td>746.76</td>
<td>1171.30</td>
</tr>
<tr>
<td>85-89</td>
<td>525.36</td>
<td>970.97</td>
<td>1496.33</td>
</tr>
<tr>
<td>90-94</td>
<td>616.83</td>
<td>844.27</td>
<td>1461.10</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>1022.20</td>
<td>917.38</td>
<td>1939.59</td>
</tr>
<tr>
<td>80-84</td>
<td>821.26</td>
<td>1012.78</td>
<td>1834.04</td>
</tr>
<tr>
<td>85-89</td>
<td>969.61</td>
<td>1000.37</td>
<td>2069.98</td>
</tr>
</tbody>
</table>

Table 8.4.2 decomposes PBS expenditure per person year into number of scripts per person year and average expenditure per script.

**Table 8.4.2: Average Pharmaceutical Benefit Schedule scripts (2002-03 constant price) expenditure per person year by Age and Sex**

<table>
<thead>
<tr>
<th>Male</th>
<th>PBS Expenditure</th>
<th>PBS Scripts</th>
<th>Average Cost/Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-79</td>
<td>349.3355</td>
<td>19.8</td>
<td>$17.6</td>
</tr>
<tr>
<td>80-84</td>
<td>424.5441</td>
<td>23.0</td>
<td>$18.5</td>
</tr>
<tr>
<td>85-89</td>
<td>525.3576</td>
<td>25.8</td>
<td>$20.4</td>
</tr>
<tr>
<td>90-94</td>
<td>616.8299</td>
<td>33.6</td>
<td>$18.3</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>1022.204</td>
<td>41.9</td>
<td>$24.4</td>
</tr>
<tr>
<td>80-84</td>
<td>821.2567</td>
<td>35.6</td>
<td>$23.1</td>
</tr>
<tr>
<td>85-89</td>
<td>969.6138</td>
<td>42.3</td>
<td>$22.9</td>
</tr>
<tr>
<td>90-94</td>
<td>1017.543</td>
<td>42.5</td>
<td>$23.9</td>
</tr>
</tbody>
</table>

Table 8.4.2 suggests that:
- for ALSA males, the increase in PBS expenditure as males age is attributable to an increase in rate of scripts, while cost per script remains relatively constant.
- for ALSA females, the number of scripts per person per year and average cost per script remain constant across 75-94 age groups.
- higher expenditure in females than males is partly attributable to higher cost per script in each age sex group.

Table 8.4.3 decomposes MBS expenditure on GP services by age and sex into number of scripts per person year and average expenditure per year.

**Table 8.4.3: Average GP in surgery consults* and expenditure per person per year (2002-03 constant prices) by Age and Sex**

<table>
<thead>
<tr>
<th>Male</th>
<th>GP Expenditure</th>
<th>GP Visits</th>
<th>Average Cost/Visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-79</td>
<td>152.6</td>
<td>5.7</td>
<td>$26.9</td>
</tr>
<tr>
<td>80-84</td>
<td>190.4</td>
<td>6.7</td>
<td>$28.5</td>
</tr>
<tr>
<td>85-89</td>
<td>315.0</td>
<td>9.9</td>
<td>$31.9</td>
</tr>
<tr>
<td>90-94</td>
<td>248.8</td>
<td>7.6</td>
<td>$32.9</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>256.4</td>
<td>9.1</td>
<td>$28.1</td>
</tr>
<tr>
<td>80-84</td>
<td>269.2</td>
<td>9.2</td>
<td>$29.3</td>
</tr>
<tr>
<td>85-89</td>
<td>330.3</td>
<td>10.0</td>
<td>$32.9</td>
</tr>
<tr>
<td>90-94</td>
<td>458.3</td>
<td>13.3</td>
<td>$34.6</td>
</tr>
</tbody>
</table>

This decomposition of MBS expenditure indicates that:

- the average cost (complexity) of GP visits increase in both males and female with age, with females being marginally more expensive (complex) in each age group
- the number of GP visits per patient per year increases for females and males with age and is higher for females in each age sex group

8.5 SELF-REPORTED HOSPITALISATIONS OF ALSA PARTICIPANTS

Average bed days increased rapidly in male survivors beyond 70 both in absolute terms and in comparison relative to the age profile of females survivors beyond 70 (Table 8.5.1).

Table 8.5.1: Self reported hospitalisations and bed days by Age and Sex

<table>
<thead>
<tr>
<th></th>
<th>% Hospitalised Last 12 Months</th>
<th>Average Hospitalisations in last 12 months</th>
<th>Average Days per Hospitalisation</th>
<th>Average Bed Days in last 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-74</td>
<td>20</td>
<td>0.25</td>
<td>6.41</td>
<td>1.58</td>
</tr>
<tr>
<td>75-79</td>
<td>26</td>
<td>0.36</td>
<td>6.82</td>
<td>2.47</td>
</tr>
<tr>
<td>80-84</td>
<td>24</td>
<td>0.36</td>
<td>7.09</td>
<td>2.53</td>
</tr>
<tr>
<td>85-89</td>
<td>25</td>
<td>0.41</td>
<td>8.94</td>
<td>3.70</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-74</td>
<td>19</td>
<td>0.26</td>
<td>6.88</td>
<td>1.79</td>
</tr>
<tr>
<td>75-79</td>
<td>19</td>
<td>0.26</td>
<td>7.75</td>
<td>2.05</td>
</tr>
<tr>
<td>80-84</td>
<td>20</td>
<td>0.28</td>
<td>8.40</td>
<td>2.32</td>
</tr>
<tr>
<td>85-89</td>
<td>28</td>
<td>0.33</td>
<td>7.13</td>
<td>2.37</td>
</tr>
</tbody>
</table>

Annual hospital bed days per person increased in males by 132 percent from 1.58 in 70-74 year old males to 3.70 in 85-89 year old males, while the increase was restricted to 32 percent for females, from 1.79 in 70-74 year old females to 2.38 in 85-89 year old females. This rapid increase for males relative to females is attributable to:

- the annual rate of hospitalisation in hospitalised patients increasing from 1.26 in 70-74 year old males to 1.58 in those aged 85-89, while falling in females from 1.40 when 70-74 years of age to 1.18 in those aged 85-89
- the average number of bed days per hospitalisation increasing from 6.4 days per admission in 70-74 year old males to 8.9 days when 85-89, while remaining relatively constant in females (6.9 days in 70-74 years of age to 7.1 days when 85-89)

8.6 OVERALL SERVICE MIX AND EXPENDITURE IN SURVIVORS BY SEX AND AGE IN OLDER POPULATIONS.

Combining the evidence of health care resource use and expenditure (PBS, MBS, Hospitals) in the 439 ALSA survivors who gave consent for HIC data, different patterns of service use and mix between males and females emerge as they progression into older age groups (Table 8.6.1).
For male survivors, number of hospitalisations per year and their complexity in terms of bed days per hospitalisation increase with older age groups, as do MBS and PBS expenditure per year. In comparison, for female survivors, hospitalisations, their complexity (bed days per hospitalisation) and MBS and PBS service use remain relatively constant across age groups.

However, female survivors in the 75-79 year old age group start with significantly higher average MBS and PBS expenditure. Hence, the relative increase in male expenditure with older age groups, while narrowing the gap, is not enough to reach the combined MBS and PBS expenditure of females in these age groups. The increasing rate of hospitalisation and bed day use with age groups for male survivors did however result in higher hospitalisation and bed day use than older female survivors, a trend also observed in AIHW analysis of hospital admissions by age (AIHW 2004, 2006b).

These trends reflect the health service mix for males in each age group having a relatively higher proportion of hospital services and lower proportion of MBS and PBS services. Valuing the expenditure of hospital admissions at a 2002-03 price per bed day of $871 (AIHW 2004, table 4.1) allows comparison between males and females of the total expenditure and mix of MBS, PBS and hospital expenditure in 75-89 year old age groups (there were not enough hospitalisations to allow comparison for 90-94 year olds).

Male survivors total expenditure per person per year, while starting from a smaller base than female survivors in 75-79 year olds, increases faster with age than that of females and consequently became higher in 85-89 year olds. Males consistently have a significantly higher proportion of total expenditure on hospital services and lower proportion on pharmaceutical benefit services.

Table 8.6.1: Average Medical Benefits Schedule, Pharmaceutical Benefit Schedule and hospital bed day expenditure (constant 2002-03 prices) per person year by Age and Sex

<table>
<thead>
<tr>
<th></th>
<th>PBS Expenditure per person year</th>
<th>MBS Expenditure per person year</th>
<th>Hospital Expenditure per person year*</th>
<th>Total Expenditure per person year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>$349 (11%)</td>
<td>$567 (19%)</td>
<td>$2,149 (70%)</td>
<td>$3,065 (100%)</td>
</tr>
<tr>
<td>80-84</td>
<td>$425 (13%)</td>
<td>$747 (22%)</td>
<td>$2,200 (65%)</td>
<td>$3,371 (100%)</td>
</tr>
<tr>
<td>85-89</td>
<td>$525 (11%)</td>
<td>$971 (21%)</td>
<td>$3,224 (68%)</td>
<td>$4,720 (100%)</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75-79</td>
<td>$1,022 (27%)</td>
<td>$917 (25%)</td>
<td>$1,781 (48%)</td>
<td>$3,721 (100%)</td>
</tr>
<tr>
<td>80-84</td>
<td>$821 (21%)</td>
<td>$1,013 (26%)</td>
<td>$2,022 (52%)</td>
<td>$3,856 (100%)</td>
</tr>
<tr>
<td>85-89</td>
<td>$970 (24%)</td>
<td>$1,090 (26%)</td>
<td>$2,064 (50%)</td>
<td>$4,124 (100%)</td>
</tr>
</tbody>
</table>

Expenditure for bed days is calculated multiplying self reported bed days by the 2002-03 cost per bed day of $871 reported by the AIHW (2004).

These patterns of service use suggest that lower use and expenditure on preventative medications and therapies by male survivors in earlier parts of old age are leading to greater use of acute services in the later part of old age. Female survivors are suggested to be using cheaper preventative interventions earlier while males use more expensive interventions later. The reasons for longer life expectancy in the elderly and consequences for predicting future health expenditure in Australia therefore are suggested from the analysis of ALSA data to be divided by gender along the two lines suggested by Fuchs (1984:154), presented earlier in this section. For females age-sex mortality rates in over 65’s are suggested to be falling because of more effective preventive health measures. However, for males, lower mortality rates in age-sex groups appear to be the result of complex technological interventions.
Hence, following the logic of Fuchs (1984), for females conventional health care prediction methods (based on chronological age rather than proximity to death) can be expected to overestimate the effect of ageing on health care utilisation, while for males the rising cost of such interventions will tend to offset the fact that a lower proportion are in their last year of life as life expectancy increases.

Evidence summarised in Vincent (2005) and Fries (2003) supports compression of morbidity over the past three decades in developed countries. In the elderly an annual decline in disability of approximately 2% was observed, greater than the annual decline of mortality of 1%. This has been attributed to improvements in education, availability of technology and even medical treatment facilitating independence of older persons in the industrialised world. Hence, better health care, an active lifestyle and greater preventative health behaviour have been suggested to have shortened the average period prior to death in morbidity, despite increased life expectancy over the past 3 decades.

However, in considering strategies for continued successful ageing in the future, there is at least one significant challenge on the horizon. The over 65 population of the past 3 decades did not experience the emerging obesity epidemic and morbidity from associated chronic disease co-morbidities such as diabetes that is currently occurring in younger and middle aged populations in developed countries such as Australia. This emerging epidemic is likely to have consequences for functional independence of the future elderly which could reverse gains in morbidity over the past 3 decades (Vincent, 2005). This highlights the need for prevention strategies which may extend back well before 65 to enable successful ageing with associated positive health and health care resource impacts in the elderly of the future.

### 8.7 RESIDENTIAL CARE

Around six percent of the older Australian population are currently living in some form of residential care, and the demand for residential care will increase as the population grows older. From both individual and societal perspectives, there are high personal and financial costs associated with admission to residential care. The costs of supplying aged care services in Australia are forecast to increase by almost $100 billion over the next four decades, from $7.8 billion in 2002-2003 to $106.8 billion in 2042-2043 (Hogan, 2004).

Two levels of care are provided in the Australian residential care setting, namely low level and high level care. Residential care facilities that provide low level care for older people are often referred to as hostels in the Australian setting, and indeed this was the preferred term until the mid 1990s. High level care is traditionally referred to as nursing home care. Nursing home residents generally have greater disability and, as the Australian nomenclature suggests, require higher levels of nursing and medical care than residents in hostels.

Participant's place of residence was recorded by the interviewer at each Wave of ALSA (Giles, Glonek et al. 2005). At each interview, participants were classified as either living in the community or having a low level or high level of residential care. Low level residential care (hostels) provides help and housing to older people who do not need continual, high level access to nursing care but have physical, medical, psychological or social care needs that cannot be met through living in the community. Participant's place of residence was classified as follows, according to where they were interviewed:

- Community-dwelling: house; home unit; granny flat; bedsitter's unit; semi-detached home; retirement village
- Low-level residential care: hostel; hospital; mental health facility; boarding house; other form of institutional care.
- High-level residential care: nursing home; private rest home

The place of residence at each of Waves 1 through 6 is shown in Figure 8.7.1. The percentage of the surviving cohort living in the community decreased over the nine years from 91 percent at Wave 1 to 82 percent at Wave 6. Between six percent and eight percent of participants lived in low-level care at each of the Waves. As expected, the proportion of participants who were resident in nursing homes increased over time, from three percent at Wave 1 to twelve percent at Wave 6.
More than half of the participants were not in low-level care at any of the study Waves, and 9 percent of participants were either in high-level care at Wave 1 or moved directly to high-level care from the community. Low-level care was known to have been used over the six Waves by 13 percent of participants. However, the use of low-level care prior to death could not be ascertained for one quarter of the participants, as participants may have died in care having lived in the community at the previous Wave. Over the six Waves discussed here, 60 per cent of participants were not in high-level care at any Wave or died without using high-level care at any previous Wave. Overall, 13 percent of participants were in high-level care at one or more Waves. Again, the use of care prior to death could not be ascertained for 27 percent of participants.

8.8  USE OF CARE ORGANISATIONS

At each Wave of the study participants were asked to indicate whether or not they had received help from care organisations for difficulties with ADLs and IADLs. Services included Domiciliary Care, local government or council, Meals on Wheels, private home care, paid help, Royal District Nursing Society, Royal Society for the Blind and the Australian Hearing Service.

While relatively few of the participants accessed services at Wave 1 (14.5 % of males and 19.7 % of females), the proportion increased considerably over time with 53 percent of males and 73 percent of females reporting service use at Wave 7. It is also important to note that the proportion of females utilising these services is higher than that of males at each Wave of the study (see Figure 8.8.1).
A study conducted by AHURI (2001) which looked at the service utilisation of older people and included data from the ALSA study found that the inability to access information about community services was an important factor in why many older people did not use these services. Hence, appropriate and easily accessible information may be of greatest importance in order to facilitate the use of community services and assist the older population to age in place successfully.
9. RISK FACTORS FOR MORTALITY

A way to examine the long term impact of a variety of factors in late life is to look at their consequences for survival. The Australian Longitudinal Study of Ageing (ALSA) has generated a number of research papers which have added to our understanding of some of these factors in very old adults. These findings can help to inform policy to improve lifestyle and care and promote survival of this age group. A number of these papers and their findings which looked at, for example, successful ageing, the use of anthropometric measurements, levels of exercise, the role of social networks, psychological factors which influence longevity and depression as a risk factor for mortality, are described briefly in this section.

9.1 KEY FINDINGS

- Malnutrition is a risk factor for mortality. Risk increased with weight loss of more than 10 percent over two years, and with arm muscle area loss of more than 21.4 cm² for males and 21.6 cm² for females.
- Lack of exercise is a risk factor for mortality. Those who reported to exercise more survived longer.
- For men, perceived control, self-rated health and physical function were protective against mortality. For women, social participation, morale and perceived control were associated with longevity.
- Poor performance on nearly all cognitive measures were associated with mortality. Findings suggest that poor cognitive performance and cognitive decline reflect both biological ageing and disease process. Cognitive performance could therefore be useful to identify individuals at risk.
- Depression was shown to be a risk factor for mortality in men, but not in women.

ALSA's overarching aim is to gain an increased understanding of how psychosocial, biomedical, lifestyle and environmental factors are associated with health and well-being in late life. To achieve this understanding ALSA used the criteria developed in the MacArthur studies on successful ageing to identify subgroups with higher, intermediate or lower levels of function and compared them across a range of biomedical, physiological, psychological and social functioning domains (Andrews, Clark, and Luszcz 2002). Data were included from 1,403 community dwelling respondents from the total of 2,087 ALSA participants for whom the necessary information was available from the three modes of data gathering – face to face interviews, self-complete questionnaires and functional assessments (Andrews et al. 2002). The findings confirmed that people age with differing degrees of success and that those ageing most successfully not only live longer but experience a better quality of life. Mortality data showed that death in the intervening eight years was most likely in those originally classified as ageing least successfully (Andrews, et al. 2002).

9.2 NUTRITION

Malnutrition is common in older adults, and both over and under nutrition can impact on life expectancy (Crotty, Miller et al. 2002). Studies on the impact of over nutrition on life expectancy have resulted in conflicting results, some showing decreased survival or no effect and others showing that being overweight can improve survival. Under nutrition does however appear to be related to increased risk of mortality (Crotty, Miller et al. 2002).

Using the ALSA data researchers aimed to identify which anthropometric measurements were the most useful in predicting mortality over a four year range. The anthropometric measurements performed in ALSA clinical assessments are those described by the World Health Organisation - weight, height, skin folds (triceps, abdominal, supra-spinale, sub-scapular, medial calf, and front thigh) and girth (arm, waist, hip, calf). A sample of 1,396 ALSA participants living in the community (772 men, 624 women ), aged 70 years and over were selected. These participants had taken part in the clinical assessments at Waves 1 and 3. From the data collected, waist-hip ratio,
percentage of weight loss, corrected-arm-muscle area (AMA) & body mass index (BMI) were calculated. These measures were categorised into quartiles and according to commonly adopted definitions of nutritional status. Cox regression analysis was undertaken with time to death from the initial interview as the endpoint, to assess the predictive value of the independent anthropometric variables for four-year mortality. Adjustment was made for potential confounders (age, gender, marital status, smoking, alcohol status, self-rated health, basic activities of daily living & co-morbidity). Risk of four-year mortality increased with weight loss of more than 10 percent over two years and corrected –arm muscle area loss more than 21.4cm² in males and greater than 21.6cm² in females, findings independent of confounding variables. These two measures were the only two found to have a significant relationship with 4 year mortality. These results confirm that under nutrition is a risk factor for mortality in community living older Australians. Furthermore, that weight change measurement and corrected arm muscle area are useful screening tools which can be used in the nutrition screening and assessment of nutritional status on community-living older adults (Crotty, Miller et al. 2002).

9.3 EXERCISE
Another study looked at the importance of exercise in a sub group of ALSA participants. The exercise patterns of 1,788 participants, aged 70 years and over were examined. The data showed that in the two weeks before interview at baseline (1992-92), 39 percent of subjects had taken no exercise and only 4 percent had exercised vigorously. When compared with those who took no exercise, exercisers were more likely to be male and younger, to self-report better health, to be former smokers and regular alcohol users. Elderly people who did not exercise were found to be in a high risk group, among whom one in six failed to survive two years. Mortality rates at two years follow-up were inversely related to the level of exercise at baseline, that is, those who reported to exercise more survived longer. This research highlighted a clear public health message in the benefits and importance of regular exercise for the very old as well as younger groups (Finucane, Giles et al. 1997).

9.4 SOCIAL NETWORKS
A further study of 1,477 ALSA participants, aged 70 years and over, examined if different types of social networks including children, relatives, friends, and confidants could predict survival over 10 years after controlling for a range of demographic, health, and lifestyle variables (Giles, Glonek et al. 2005). The participants were living in both the community and residential care facilities. The findings demonstrated that after controlling for a range of demographic, health, and lifestyle variables, greater networks with friends were protective against mortality in the 10 year follow up period. However, the effects of social networks with children and relatives were not significant with respect to survival over the following decade. The conclusion can be drawn that survival time may be enhanced by strong social networks with friends. Therefore strong social networks of discretionary relationships may be important in ensuring longer survival. This has policy implications for the development of strategies to enable establishment and maintenance of such relationships in late life (Giles, Glonek et al. 2005).

9.5 PSYCHOLOGICAL FACTORS
ALSA has also examined psychological factors to determine their influence on longevity on very old adults (Anstey, Luszcz et al. 2002). Using the complete sample of 2,087 participants the effect of psychological factors, self-rated health and self-rated life expectancy on mortality risk over a nine year period were studied. The analyses revealed that for men, perceived control was associated with longevity. For women, social participation, moral and perceived control were associated with longevity. This highlights the role of psychological indicators in determining longevity that is independent of an individual's health and physical functioning. There are aspects of lifestyle that are potentially amenable to change that could have positive consequences for longevity (Anstey, Luszcz et al. 2002). Therefore, policies that encourage social participation and activities that result in positive emotional states would improve health outcomes and longevity.
In addition, ALSA examined the cognitive and sensory variables together with the demographic and health measures to determine their mortality predictive value over a 6 year period (Anstey, Luszcz et al. 2001). Baseline performance on the cognitive measures, (see appendix), the sensorimotor measures of vision, hearing and grip strength were examined as well as subsequent decline measured over a 2 year period as predictors of mortality in the following 4 years of follow up (Anstey, Luszcz et al. 2001). The results demonstrated that poor performance on nearly all cognitive measures were associated with mortality. Significant decline in hearing and cognitive performance also predicted mortality as did the inability to perform all the tasks at Wave 1. This suggests that poor cognitive performance and cognitive decline in very old adults reflect both biological ageing and disease process. Therefore, cognitive performance could be a marker of biological ageing that is independent of disease and therefore useful to identify individuals at risk.

9.6 DEPRESSION
Clinical depression or depressive symptoms have been shown to be risk factors for mortality (Anstey and Luszcz 2002). In research on older adult, depression has been found to be more prevalent in women, however studies vary in their findings on gender differences in the mortality of depression (Anstey and Luszcz 2002). ALSA evaluated whether gender and different patterns of change in depressive status over 2 years were associated with different risks of mortality in the subsequent 6 year period. Depression was assessed in 1,947 participants in 1992 and a smaller proportion of the sample in 1994. The mortality risk in 2000, associated with depression and change in depression was estimated using proportional hazards models. After controlling for demographic variables, smoking, alcohol and medical conditions, depression was associated with mortality for men but not women. Chronic depression and remitted depression were also associated with mortality but the effect was explained by medical conditions. The study showed that while depression occurs more often in women it presents a greater risk of mortality for men with incident depression in old age representing the greatest risk for men (Anstey and Luszcz 2002).

9.7 SUMMARY
The above papers identify a range of variables associated with lengthening survival and quality of life in the oldest old. We have seen that those who age more successfully are more likely to have a better quality of life and survive longer that those who are ageing less successfully. Many of the factors identified that promote longevity and quality of life are aspects of lifestyle that are amenable to change. This has direct policy implications. Risk factors for mortality such as malnutrition can be identified through screening using basic anthropometric tools. Intervention strategies that encourage regular exercise, enhance and maintain social networks and support a positive emotional state of mind enable individuals to achieve a good quality of life and promote survival.
10. POLICY AND PROGRAM IMPLICATIONS

Increased longevity and the growing proportion of older persons in Australia - especially the ‘oldest old’ - pose critical challenges for health and social policy and program needs. The consequences for health, well-being and functional ability of the individual, the impact upon families and carers, and the economic and policy implications for government and society are profound.

Health and illness in old age result from a complex combination of biology, genetics, education, income, social status, social relationships and support, physical environment, physical and mental health practices, lifestyle choices and access to health services. Achieving healthy ageing presents a series of challenges for policy and program formulation. It necessitates concerted action on a wide range of fronts from social and economic policy, through to strategic and coordinated disease prevention and individual lifestyle factors. A systemic approach is called for, if we are to understand and cater for the older person as a unique individual with specific strengths and vulnerabilities that are not static, but vary over time. Furthermore, a systemic approach is inherently sensitive to the ‘joined-up’ nature of the many facets of function, lifestyle and history that contribute to individual and population ageing.

In this section we draw out a selection of policy implications based on the data provided in the ALSA. We have arranged them under broad headings beginning with demographic and living arrangements, moving onto social relationships, healthy ageing and service use, quality of life, determinants of longevity and closing with some implications of cognition for policy. These headings are not mutually exclusive; indeed scrutiny of ALSA data has demonstrated the inter-connectedness of these domains.

One conclusion has to be that in the development of any policy, consideration needs to be taken of the individual in context, rather than pursuing solutions for ‘the elderly’ as a monolithic category. As stated in the 2006 Ageing Plan for South Australia “no one size fits all when it comes to delivery of services” (p.3). Finally, these policy issues should be taken as indicative, rather than definitive: they indicate the value of the ALSA evidence base as a resource for planning and future interventions. More broadly, they point to the value of research in informing practice.

10.1 INDEPENDENCE, LIVING ARRANGEMENTS AND HOUSING

Basic demographic factors, such as place and type of accommodation, household composition, social supports, relocation patterns, etc., all have an impact on the quality of later life. The modal demographic profile among the surviving ALSA participants, consistent across the general SA ageing population, is one of widowed elderly women, living alone. While most older men spend their final years living with a spouse, evidence from the ALSA suggest older women are more likely to live longer and to spend their final years in residential care, or living alone.

This has implications for increasing demand in future years for informal or formal support as older women will be less likely to have a spouse to care for them in later life. This is particularly important for those who have never married (3.4% males and 4% of females of the ALSA sample at baseline) who may lack immediate family to provide support. This sub-group may be particularly vulnerable to psychological, physical and social ageing-related problems and should be recognised as possibly requiring targeted or specific interventions to support them as they endeavour to age in place. On the other hand, having lived a solitary life, it is probable that they may have developed resources earlier in life that will serve them well into advanced old age. This is yet another example of the diverse patterns that will continue to characterise older people in SA. Nonetheless, those who have never married may lack informal family support which is particularly important in relation to disabilities (see section10.3).

In terms of the importance of housing for older people – data from the ALSA showed that housing, in combination with the accessibility of services, can strongly influence the physical and psychological wellbeing of older people. While most elderly would prefer to remain in their own home for as long as possible, diversity in the housing market combined with adequate services and in-home support are essential components...
of successfully ‘ageing in place’. Furthermore, evidence from this research suggests that re-locating from the community to residential care can be associated with significant deficits in health and social functioning, including a rise in depressive symptoms, independent of cognitive and physical frailty.

These findings are relevant to the ‘Enabling Choice and Independence’ theme of Improving with Age: Our Ageing Plan for South Australia (2006). The plan gives priority to creating communities that work for older South Australian’s by encouraging adaptable housing design, efficient, affordable and safe transport, improving concession arrangements for older people and encouraging physical activity through safe and accessible physical environments.

Policy Implications:

- Elderly women will become a significant sub-group of the population who require informal/formal assistance to remain at home. Social and health services need to be targeted towards those who lack informal support from spouse or family.

- It is widely accepted that people generally prefer to stay in their own homes as they get older. While governments have made significant efforts to support older people to remain in the community, consideration must also be given to the spouses, families and friends who may be required to adopt a carer role for the older person in need. Continued support and financial compensation are vital to ensure this sort of assistance is sustainable. The 2006 Ageing Plan for South Australia states that government will continue to develop a consistent statewide response to the needs of carers through HACC funded services.

- As yet there does not appear to be significant information available regarding the issues facing the segment of the aged who have never married. The never-married may lack informal family support and therefore be at higher risk of experiencing psychological, social and physical problems associated with ageing. On the other hand, by virtue of their independence, they are likely to have developed networks of friends and other strategies for managing life that will also serve them well into old age. Close examination of the never-married cohort could provide valuable insights into strategies for ageing well or poorly.

- Information about formal services for the elderly need to be easily accessible and appropriate, in order to facilitate use of community services to assist this population to age in place successfully. At present the South Australian Ageing Plan states that it will ensure that health services are accessible to older people from indigenous and multi-cultural communities and to those in rural areas through the provision of more flexible and integrated health services.

- Transitions to residential care are associated with increased depressive symptoms among the elderly, independent of functional and cognitive decline. Policies need to be in place which recognise the importance of supporting this vulnerable group of elderly to counteract further ill health. Those health and social service agencies working with elderly who are re-locating to residential care need to liaise with family and staff of the residential facilities to provide necessary information and assistance to offset any negative psychosocial consequences of re-location.

- Findings from ALSA show that older people’s social networks with confidants can forestall residential aged-care use. Social networks may be particularly important in providing care to older people and may thereby delay or prevent admissions to residential care. Policy needs to reflect the importance of these relationships in considering where older people want to live in the later years of life.

- At present an individual’s eligibility for residential aged care is assessed against standardised criteria that include functional status, health and living arrangements. Evidence from ALSA suggests that an individual’s social relationships need to be reflected more strongly in eligibility criteria and furthermore, that social networks go beyond a simple ascertainment of marital status and number of children. Further consideration needs to be given to the relevance of social relationships in the current assessment and entry process.
10.2 WORK, VOLUNTEERING AND MAKING A CONTRIBUTION

Older people are at risk of being excluded directly or indirectly from community and social life. We must better understand how to maximise and maintain the productivity of older people, and to take advantage of their experience, wisdom and expertise. This will enable the promotion of productive ageing. While age-related declines in productive activity may be partially accounted for by health status and education, the role of other medical, functional and psychosocial factors are less clear.

At baseline less than 1.5 percent of all ALSA participants were in the workforce and this number declined over time, with only one person being in paid employment by Wave 7. Yet the vast majority of the ALSA cohort is cognitively healthy, mobile, and not incapacitated by chronic health problems. Thus there is capacity for continuing work (paid or voluntary). Given that South Australia has the highest proportion in Australia of 50-64 year olds retired from full-time work (Dept of Further Education, 2005), there is a likely to be an increasing shortfall in the optimal size of the workforce. Projecting ALSA results forward, there are likely to be many more people in our community with skills and experience that could make useful contributions in the spheres of business, community services or governance, or through volunteering.

As stated in Improving with Age: Our Ageing Plan for South Australia (2006), Government must develop the right environment and incentives for this to happen. Policies and programs which encourage older workers to either re-enter the workforce or stay in the workforce longer need to be developed and barriers to the continued participation of older people in the workforce must be removed. As the demographic profile of the state continues to age, labour and skills shortages will become more common. The growing number of older people will constitute a major resource for employers and this resource must be recognised and valued if older workers are to be retained.

South Australia’s Ageing Plan gives priority to recognising and valuing the contribution of older people in paid and unpaid work, through the implementation of a workforce Development Strategy and a commitment to reducing the on-going employment.

Policy Implications:

- Work patterns will need to become more flexible and attractive in order to retain older staff. Older workers will demand greater autonomy and more control over the balance of work and leisure. There is also a need for greater flexibility and adaptability in the workplace in assisting older people to continue working while actively managing a chronic health problem. The provision of part-time work opportunities would make the transition to retirement a more gradual process.

- Employers will need to make jobs more desirable. They will need to ensure a safe and comfortable environment. Priority must be given to the reduction of work induced physical and mental stress as these are often cited as reasons for why older people leave the workforce.

- Further consideration will be required from Government and business to develop an inclusive approach to training and professional development for all workers irrespective of their age to extend the skills and expertise of older workers.

- An easily accessible and comprehensive source of information regarding employment opportunities for older people should be developed which includes occasional, part-time, temporary, flexible and full-time work options.

- As many older people are now healthy and active in retirement they should be encouraged and assisted to contribute to the community through volunteering. South Australia had a high rate of volunteer participation. This should be further encouraged by providing flexible and varied opportunities and support for volunteers. Current initiatives such as the creation of a website within the Department of Families and Communities to connect organisations and volunteers and the provision of training opportunities are important steps towards recognising the contribution of older people as volunteers.
The attitudes of the community as a whole towards older people need to be challenged. The older population represents a range of individuals who wish to be largely responsible for their own quality of life, are actively involved with social activities and interactions, and have the capacity to continue to grow and to contribute. All older people, including those who are frail and living in residential care, are to be supported and valued for the contributions they have already made (PMSEIC 2004). Society will benefit from older people making contributions to the community and the economy through paid and volunteer work and in domestic and family life, as well as contributing to important social, cultural and political aspects of community life. In South Australia the contributions of older people are recognised and supported through the Grants for Seniors and Positive Ageing Development Grants which aim to encourage the participation of older people in the community and improve community attitudes towards ageing and older people.

10.3 SOCIAL NETWORKS

There is clear evidence from the ALSA that it is possible to distinguish various kinds of social networks. More importantly, benefits in terms of health outcomes vary according to different types of social networks. Specifically:

- strong social networks with friends ensure longer survival
- strong social networks with family are protective against disability
- a confidant relationship is protective against moving to residential aged care

Sixty-nine percent of respondents reported that they had close friends with an average of four close friends each and just over half were in contact with one or more of them at least once a week. Virtually all participants reported that they had at least one confidant. Family networks, incorporating spouses, children, grandchildren and siblings, provide stability over a lifetime and are invaluable in providing instrumental support in times of need and a buffer against stress. The quality of these social relationships, not only their size, facilitates participation in society. They also provide outlets for demonstrating care, using acquired expertise, and transition wisdom which are essential to strengthening the fabric of society.

Research suggests that social relationships have direct effects on health status and may help to protect individuals from ill health due to psychosocial and physical stress.

Policy implications:

- Social networks provide opportunities for social support, social influence, social engagement, interpersonal contact and access to financial and health care resources. Strategies to promote the establishment and maintenance of such relationships in later life deserve further attention.
- Local government has a pivotal role to play in the provision of services that support people to live independently in their own homes and remain connected to their neighbourhood and local community. The South Australian government’s social inclusion agenda is tackling the issues for those who are at risk of becoming isolated.
- Investment needs to be made in identifying and developing strategies which enable older people to establish and maintain new or existing relationships with friends. These could range from environmental factors such as ensuring access to good public transport (to visit friends once they move) to more proximal factors (e.g programs run by GPs or local councils which promote to the elderly the importance of maintaining friendships for good health; ensuring GPs are aware of the importance of friendship networks and that changes to these networks could signal declines in health and functioning).
Attention needs to be drawn to the fact that changes to social networks could signal declines in health outcomes and functioning. Assessment of need (for residential or community care, assistance with disabilities etc.) should include consideration of the availability and continuity of different types of social networks.

Older people should be encouraged and supported in using information technology. They should be made aware that this technology can support their ongoing participation in society by giving them the ability to communicate with people all over the world, the potential for further learning and access to health information and services that assist with ‘ageing in place’. We must ensure that this technology is accessible to older people. The South Australian Government has recommended the support of community libraries as an important resource for older people, not only for the provision of information technology, but also information about local services and activities.

The challenges posed by an ageing population will require innovation in tools or aids that restore and extend human function. The field of assistive technology can contribute to improving function, maintaining productivity and enable social interactions. To fulfill the potential of technology to assist communication, mobility and learning opportunities for older people, results are needed from research that identifies the barriers to use of technology by older people and how to overcome them.

10.4 HEALTH SERVICE USE

Health service expenditure has been shown to increase with age in all areas after age 50. The ALSA data shows that 89 percent of the sample were taking at least one medication and more than one-quarter were taking at least 5 drugs concurrently. Medications for the cardiovascular system and nervous system were the most common. The increased use of benzodiazepines in particular is of concern, particularly as the elderly are most vulnerable to their adverse effects, such as risk of falling.

Older women were found to have significantly higher PBS expenditure (partly attributable to higher cost by script compared to males) whereas older men had significantly higher proportion of total expenditure on hospital services. The average cost (complexity) of GP visits increased as age increased for both males and females. These patterns of health service use suggest that older men might be less likely to use preventative medications hence leading to a greater use of acute services in later life.

The percentage of surviving ALSA participants living in the community decreased from 91 percent at Wave 1 to 82 percent at Wave 6. More than half of the participants were not in low level care at any of the study Waves. 60 percent of participants were not in high level care at any Wave. Use of care organisations increased from 14.5 percent of males and 19.7 percent of females at Wave 1 to 53 percent of males and 73 percent of females at Wave 7.

Policy Implications:

- Efforts need to be made to ensure older men make appropriate use of preventive medicines that may lessen the need for acute services in future years. Increased education of elderly men, their carers/spouses and GPs about the importance of preventive health care should be a priority. At the same time, South Australia’s Ageing Plan continues to support the Quality Use of Medicines Program that is reducing overuse and inappropriate use of medicines.

- Culturally appropriate and accessible services need to be provided for the growing numbers of ethnic aged. It is essential that access to culturally appropriate services and information continues to be provided. People from multicultural backgrounds need individualised services that encourage choice and independence and ensure people maintain links with their communities.
• Improved coordination and cooperation between service providers is essential as people are likely to need care from a number of different services as they grow older. Better coordination of access to different services, through a common assessment process for a wide range of services would greatly benefit older people. South Australia’s Ageing Plan (2006) states that it is expected that all government agencies consider the needs of older South Australians in their services and programs. It also requires agencies to take on board the consequences of our ageing population in their planning processes. A priority of the plan is to ensure that the customer is at the centre of service planning and delivery, that services are tailored to the individual and that people have the information they need to make choices.

• Strategies to de-institutionalise care must be accompanied by the development and enabling of suitable services in the community.

10.5 HEALTHY AGEING AND QUALITY OF LIFE

Health is a central issue associated with longevity and population ageing. The maintenance of health status and functioning with age is a critical factor impacting upon many other aspects of the lives of older people, their families and communities. Improving our understanding of the way in which medical, biological, social and behavioural factors interact to maintain or to damage the health of older people will enable the promotion of healthy ageing. We need to identify the medical, social and psychological factors associated with health, rather than illness, among older people.

Most of the ALSA sample rated their health as good to excellent at baseline, with increasing age being associated with likelihood of rating health as fair or poor. Contextual factors were seen to be a major component in determining wellbeing over time. Evidence suggests that ‘self resources’ such as ones outlook in life, sense of control and morale can affect quality of life and sense of wellbeing (Luszcz 1998).

Policy implications:

• ALSA shows that many people in their 80’s and older live independently in their homes with little or no assistance. Therefore the assumption that ageing is associated with poor health and loss of independence needs to be challenged. The stereotypes of older people as frail, unproductive and unable to cope with the changing demands of modern society are clearly incorrect but continue to act as barriers to people’s capacity to participate in society and to maximise their quality of life and health. There are however positive signs that attitudes to older people are changing, and older people themselves, by their own actions, are changing the perceptions of the roles of older people.

• Opportunities for social inclusion must be made available to all older people. Older people should be encouraged to be active consumers of services and to exercise their control and choice. Older people report social involvement and encouragement as significant factors in leading healthy lives. Feeling valued and appreciated has a critical bearing on well-being. Social participation is facilitated by an environment where older people feel safe, and where there is easy access for older people to appropriate recreational facilities.

• Data from ALSA have been used to track changes in functional status and activity patterns. It is clear from the research looking at health transitions over time that ageing does not consist of a progressive and inevitable decline in function and health, but rather moves in a much less linear fashion, in which a temporary decline may be offset by substantial or complete recovery. We need to identify the characteristics that define individuals or groups who are able to reverse apparent deteriorations in function and health status. An understanding of these characteristics may ultimately lead to the development of intervention strategies for the prevention and minimisation of disability and its consequences.
10.6 DETERMINANTS OF LONGEVITY

Several longitudinal analyses have been undertaken to determine which factors significantly impact on survival (or longevity) among the ALSA sample. These factors are important to improve our knowledge of healthy lifestyles and care of the elderly, in addition to promoting survival. The main determinants or risk factors for mortality are: nutrition, exercise, social networks, psychological factors such as morale, control and depression and cognitive deterioration. We further need to determine the most effective techniques for promoting permanent change in adaptive health behaviours in older adults. A life-span approach is essential as the accumulation of health risks throughout an individual’s life affect the risk of experiencing ill health in later life.

Policy Implications:

- Intervention strategies which support and encourage the elderly to undertake regular exercise, maintain strong friendship networks and support a positive outlook are of utmost importance in ensuring healthy ageing. Such strategies need to adopt a holistic approach encompassing factors at the physical/environmental level as well as the individual level to facilitate action in these areas.
- Evidence from ALSA suggests that social networks with friends may exert an influence upon health behaviours such as smoking, alcohol consumption and exercise. Friends possibly encourage health seeking behaviour which in turn can impact survival. Friends can also have effects on depression, self-efficacy, self esteem, coping and morale.
- More consideration must be given to the medical, social and psychological conditions under which individuals become motivated to change health behaviours, and the role of spouses and support systems in adopting changes.
- Raised awareness among older people and their formal and informal carers of the benefits of engaging in healthy ageing activities is necessary.
- The National Strategy for an Older Australia (2002) states that “the leading causes of ill health and disability in the Australian population are chronic non-communicable, preventable diseases that relate to the known common risk factors of smoking, nutrition, alcohol consumption, lack of physical activity, high blood pressure and high cholesterol” (p.121). The health of future generations of older people will be influenced by their health prior to reaching old age. There is a need to be aware of conditions that may be increasing in incidence in the community.
- The plan for South Australia is to have a health system that is easy for people to use and to focus on health promotion, illness prevention and early intervention to improve the health and well-being of older people. The plan aims to continue to demonstrate the benefits of activity on good mental health, disease prevention and social connection.
- Adopting a healthy lifestyle in middle age, and later, can dramatically improve one’s health and life chances, and the effects can be seen quickly. There needs to be structural changes and supportive environments so that healthy choices are easier for people to make.

10.7 PSYCHOLOGICAL AGEING

The key psychological domains of cognition and sense of self provide a portrait of psychological wellbeing in ALSA. Both take a variety of forms and rather than being only subject to loss, they can also reflect positive change or gain. This is an important message, especially as to a certain extent older adults can compensate for losses in one domain by their expertise in others. The multidimensionality of psychological functions implies that ageing is not an all-or-none process. There will be areas of strength and weakness and the rate of ageing varies widely across individuals. Importantly, where loss occurs, it is not only ageing per se that determines it; lifestyle factors, gender, historical events, demands from the environment and other concomitants of late life interact to produce good or poor outcomes, as well as their timing and magnitude.
On the whole, until the fourth age (i.e., among the oldest old) erosion of cognitive and sensory function is unlikely to be of much functional significance on a day to day basis. Nonetheless, the relatively small differences seen for older age groups can contribute to the occurrence of undesirable, but normative, late life transitions, such as falling or ceasing to drive. Hence cognitive and sensory functioning are key contributors to maintaining mobility and independence.

On the whole ALSA participants are sound of mind and spirit. Only a small percentage satisfy conventional criteria for possible cognitive impairment or depression. For those that do, there is evidence of recovery from both conditions, suggesting continuing plasticity in late life, which is crucial to achieving gains from interventions or treatments designed to optimise functioning and adaptation to change.

Policy Implications:

- Given the diversity and plasticity that characterises psychological ageing, more attention needs to be given to developing flexible policies and programs that can be tailored to individual needs and preferences. Tailored programs that provide choice for older consumers and their carers will enhance sense of control and thereby wellbeing.
- Public information campaigns or information leaflets should emphasise the gains, as well as the losses that are possible in late life. The importance of a person’s attitude toward their own ageing also warrants emphasis in order to capitalise on preserved strengths or acquired expertise.
- Provision of information to health professionals and the general public is essential to increase knowledge and awareness of risk factors and the symptoms of later life dementias and depressions in order to improve differential identification of the disorders and to institute interventions or start treatment.
- Systems to identify and treat later life depression must be universal. A national standard should be adopted by all aged care providers, including home care nurses, so that identification is not limited to residential aged care facilities.
- The onset of difficulties with the requirements of daily living or entry to residential aged care are points of vulnerability to depression. Programs and policies should emphasise a preventative approach when difficulties first become apparent or a move to an aged care facility is imminent.
- The greater prevalence of depression among residents of aged care facilities, compared to those living in the community, cannot be accounted for by analogous differentials in physical or cognitive health of these groups. Policy and programs should be reviewed in order to identify characteristics of life in residential aged care that contribute to this differential.
- Optimism has been shown to be beneficial to longer survival. Cognitive therapies incorporating an element of mindfulness may be especially beneficial in enhancing ones outlook and therefore not only the length, but also the quality of life. Implementation of such programs, in both the community and residential aged care could be a cost-effective way to increase healthy life expectancy.
- Provision of additional psychological services, including assessment, interventions, and individual consultations, is critical to ensuring psychological well-being, particularly for the oldest-old.
- In addition to the key role for mental development and activity, there is emerging evidence that attention to simple preventive measures such as physical activity and healthy diet, as well as control of cardiovascular risk factors such as high blood pressure can improve cognitive function and delay the onset of dementia.
11. CONCLUSION

The breadth of information collected over the past fifteen years establishes the ALSA as one of the most comprehensive longitudinal cohort studies undertaken in Australia, as shown in this report. The data already available - clinical assessments, survey information and services utilisation data, with repeated observations over time - make ALSA one of the richest sources of such information available on an older Australian sample. Access to the surviving members of the cohort, who as a group are over the age of 85 and therefore fall squarely into the category of the ‘oldest old’, presents a unique opportunity to trace through extremely valuable longitudinal data to identify paths to healthy ageing. The Review of Healthy Ageing In Australia (2000) states that

"as more resources are invested in responding to ageing there is a clear need for investment in research that can guide action and support program development and monitor outcomes…it is essential to incorporate new knowledge into policy making, professional practice and broader community understanding” (p.31).

A greater understanding of the processes of ageing and their effects on health and quality of life is needed to address these issues successfully and the ASLA contributes to a further understanding of them. The ALSA study presents a unique opportunity to continue to follow a cohort of older persons into advanced old age and to examine the consequences of their survival for themselves, their families and carers, and the broader social system.

The South Australian government has a commitment to supporting Ageing Research. This is demonstrated by the Kick Start research grants which encourage collaboration and ensure that future policy and program initiatives continue to be based on current and applicable evidence. This report represents one outcome of this investment.

11.1 LOOKING FORWARD: SELECTED TOPICS FOR FUTURE RESEARCH

One of the aims of this Report was to highlight the range of uses to which the ALSA data lends itself in the generation of knowledge about our ageing population. The information presented here represents some of the key findings drawn from the ALSA data so far. The opportunities for further research involving the wealth of data generated from the ALSA are extensive. The following list is indicative only and highlights key areas where we know ALSA data could be utilised. It is by no means exhaustive. Future research directions could also be in response to specific questions or agendas of government, service provision bodies or consumer groups.

- **Gender** - A gendered analysis within and across domains has not been systematically implemented in ALSA. This is increasingly important as the panel ages and becomes, like the population at large, disproportionately female.

- **Marital Status** - Careful analysis of effects of marital status and changes in it over time would provide valuable information on this key demographic and transitions in it. The 6 percent of the panel who at baseline reported having never been married, and those who began the study or transitioned to widowhood are of particular relevance in the context of service provision, adaptation and strategies for ageing well.

- **Couples** - We have begun to systematically examine the 565 couples in the Baseline sample with a post-doctoral position funded by an ARC-Linkage grant. Longitudinal examination of spousal dynamics will provide valuable clues on how to maintain marital unions, reveal how activity patterns, depressive symptoms, cognitive impairment or serious losses (e.g., health, bereavement) of one member of a couple impact on the other, and the extent to which their change trajectories are in sync.

- **Socioeconomic Circumstances** - Little attention has been given directly to socioeconomic determinants of ageing well. To date our approach has been to control for such factors because they may indirectly influence the question of interest. However, it is important for the State to know more about how ageing is experienced and adapted to by those in varying socioeconomic strata.
- **Health Economics** - We have only scratched the surface of information on health economics or the public costs of ageing in South Australia. By using the HIC data on the sample a better quantified picture will emerge.

- **‘Usual’ (Normative) Ageing** - The descriptive data in this report could form the basis of publications on normative data aligned in a range of domains. Some examples include cognitive or sensory impairment, failures in high level cognitive coordination, patterns of injury and hospitalisation and so on. Such information is relevant to decision making about various needs of older people and would be invaluable in planning for ageing services in the near term.

- **Sense of Self** - We have only scratched the surface in researching the mechanisms through which quality of life or wellbeing is enhanced through one’s sense of self. Sense of self is largely about the way in which one views the world, and negative perceptions may result in dissatisfaction with the ageing process. Clues to the development of interventions for the elderly aimed at improving resources at an individual and community level are held in these data.

- **Sensory and cognitive capacities** are the foundation upon which independence of, and continued contributions to society by, older people rest. More work needs to be done to look at characteristics in the personal histories of the respondents to identify determinants of preserved functioning in these domains. In turn, linking these resources to expected and unexpected transitions in late life can assist in predicting who will adapt well or poorly to them and may be in need of government support or assistance.

- **Depression** - Our data show that incident depression in late life can have particularly adverse consequences for men, i.e., increase mortality. Identifying the risk factors associated with the onset of later life depression could contribute to preventative intervention programs. Further understanding of depression in aged care residents and older people who move through different living arrangements (residential, community and hospital care) and the effectiveness of strategies currently used to help them could improve quality of life and enhance the ageing experience.

- **Nutrition** – Research is underway on changes in nutrition, under-nutrition and malnutrition among the elderly to determine the risk factors involved and those vulnerable to adverse health outcomes as a result of poor dietary habits.

- **Quality use of Medications** - Monitoring the quality use of medicines among older people is important to ensure the health and wellbeing of this population. Co-morbidities and the accompanying pattern of poly-pharmacy require concerted efforts to develop practice guidelines for prescription use and modification of medication regimes. Work is ongoing in collaboration with colleagues at the other two SA universities with NH&MRC support from a separate Ageing Well, Ageing Productively grant.

- **The Fourth Age** – Since its inception, ALSA has provided a basis for studying the oldest-old (those in the fourth age, i.e., over the age of 85). Few studies had done so when we began, and the situation has not changed very much in the interim. As a segment of the population, the oldest-old is the one growing the most rapidly. ALSA is unique in that it now provides a prospective account of the 15 years preceding entry into this phase, as well as the opportunity to compare life during the fourth age at discrete points in history separated by 15 years.

Additional funding would be required to pursue most of these topics. To date the majority of funded grants have been directed toward collection of data, i.e., conducting comprehensive face-to-face or telephone assessments. Additional funding is needed to provide scholarships or post-doctoral training or salaries, for those skilled in data analysis. The long-term management of the dataset, liaising with a growing number of consortia interested in pooling data or making use of the ALSA data to address novel questions and facilities for storage and access to the data also impose costs which have no re-current source. To continue to follow the remaining sample, who are now on average 85 years of age or more, would add value and place SA in the distinct position of having the largest record of ageing at its extremes.
11.2 ALSA AS PART OF SECONDARY DATA ANALYSIS CONSORTIA

The ALSA database is an integral part of several research consortia that are aimed at doing secondary data analysis of existing data, these include:

- Two 5-year Ageing Well, Ageing Productively Research Program Grants funded by the ARC/NH&MRC, on which M. Luszcz is a Chief Investigator: (1) Using health outcome data from pooled Longitudinal Studies of Ageing to develop statistical and microsimulation models to determine how to best compress morbidity and optimize healthy and productive ageing. Chief Investigator: Kaarin Anstey, Australian National University. (2) The development and evaluation of management strategies designed to address poly-morbidity in older people: Implications for health policy planning, practitioners and patients. Chief Investigator: Andy Gilbert, University of South Australia.

- The Asia-Pacific Cohort Studies Collaboration (APCSC), which combines data from more than 500,000 adults and 30 studies, is conducting the largest-ever study of cardiovascular and other non-communicable diseases in the Asian region. Project partners include many institutions across the Asia Pacific region, including the Flinders Centre for Ageing Studies.

11.3 SUMMING UP

The data generated over the past 15 years reveals that ALSA participants are a diverse group; this is reflected in patterns of active lifestyles, dietary behaviour, dental health, hearing, mental agility (cognitive soundness). Factors that influence formal service use are better understood and it is obvious that older Adelaideans provide informal care and services to others. ALSA respondents by and large find ageing to be a positive experience, particularly when they perceive they continue to have control over some aspects of it. Although depression and dementia are risks of ageing, the sample showed remarkable resilience to these symptoms. In summary, ALSA provides numerous examples of individuals ageing well. Such positive images are being widely used as examples to dispel still widespread negative stereotypes of ageing as a time of loss and deterioration only.

A substantial investment in longitudinal research on older South Australians has been made. The challenge is to add value to it by fully utilising the existing ALSA data set as an evidence base to underpin innovative strategies and responses to the changing demography of our state. Hence through ALSA we are poised to continue to provide unique insights on the likely capacities, preferences and lifestyles of older adults and their families that will require services and policies over the next several decades.

ALSA has the potential to provide a mechanism for capacity building among new generations of researchers (e.g., for PhD and post-doctoral candidates), in a climate where evidence-based practice will be increasingly the norm. The cross-disciplinary nature of the study allows examination of older people in a variety of circumstances and contexts and enables us to capture some of the complexity of the ageing process. Private and public providers of services and programs for the elderly are increasingly called upon to work across boundaries of need, and ALSA can illustrate how these systems of functioning interact to produce desirable outcomes. We trust that this monograph has conveyed that the evidence base that is ALSA, like its valued panel members, has been steadily "improving with age".
12. REFERENCES


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## Appendix 1: Summary of Domains

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## LABORATORY STUDIES DOMAINS

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## ANCILLARY CLINICAL STUDIES DOMAINS

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## Appendix 2: Domains and Instrument Sources

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<pre><code>                       | ALSA                                                                   |
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<p>| Sitting and Standing         | Hypertension Unit, Flinders Medical Centre, Bedford Park, South Australia |
| Blood Pressure and Pulse     | ALSA                                                                   |
| Physical Signs               | ALSA                                                                   |
| ROSS Laboratories (1990) 'Estimating stature from knee-height', Columbus, Ohio |</p>
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Appendix 3: ALSA Associates

Dr Craig Anderson Rehabilitation and Ageing Studies Unit, Repatriation General Hospital
Professor Gary Andrews Centre for Ageing Studies, Flinders University
Assoc Professor Kaarin J Anstey Centre for Mental Health Research, Australian National University
Dr Katrine Baghurst Human Nutrition Division, CSIRO
Professor Greg Barritt Flinders Medical Research Institute, Flinders University
Dr Ian Beckman Department of Immunology, Flinders Medical Centre
Professor Michael Berry School of Medicine, Flinders Medical Centre
Professor Bill Blessing School of Medicine, Flinders University
Professor Malcolm Bond School of Medicine, Flinders University
Professor John Bradley Department of Immunology, Flinders University
Dr. Janet Bryan School of Psychology, University of South Australia
Dr Barry Chatterton Department of Nuclear Medicine, Royal Adelaide Hospital
Dr Frida Cheok Department of Human Services, Government of South Australia
Professor Ray Chynoweth Glenside Hospital
Dr Michael Clark Rehabilitation and Ageing Studies Unit, Repatriation General Hospital
Professor Lynne Cobiac Human Nutrition Division, CSIRO & Nutrition and Dietetics, Flinders University
Professor Maria Crotty Rehabilitation and Aged Care, Repatriation General Hospital
Assoc Prof Lynne Daniels Nutrition Unit, Flinders University
Dr Sam Davis School of Rural Health, Monash University
Dr Adrian Estermann Nursing And Midwifery, University of South Australia
Dr Debbie Faulkner School of Geography, Population, Environmental Management, Flinders University
Dr Paul Finucane Rehab & Ageing Studies Unit, Repatriation Hospital
Dr Denis Gerstorf Department of Psychology, The Pennsylvania State University
Dr Paolo Ghisletta University of Geneva, Switzerland
Assoc Prof Andrew Gilbert Samson Institute, University of South Australia
Ms Lynne Giles Rehabilitation and Aged Care, Repatriation General Hospital
Dr Petra Graham CSIRO
Assoc Prof Carol Grbich Palliative and Support Services, Flinders University
Ms Sophie Guy Primary Health Care, Research & Info Service, Flinders University
Dr Phil Hamdorf Office for Recreation and Sport
Mrs Anne Hamilton-Bruce Department of Neurology, The Queen Elizabeth Hospital
Dr Josephine Harris Rehabilitation and Aged Care, Repatriation General Hospital
Dr James Harrison National Injury Surveillance Unit
Mrs Dorothy Heath Meals on Wheels
Dr David Roder  Epidemiology Branch, SA Health Commission
Dr Libby Roughead  College of Pharmacy & Samson Institute, University of South Australia
Ms Dianne Rudd  Geography Department, University of Adelaide
Dr Cam Rungie  School of Marketing, University of South Australia
Assoc Prof Linnett Sanchez  Speech Pathology & Audiology, Flinders University
Ms Kerry Sargent-Cox  Centre for Mental Health Research, Australian National University
Professor Chris Silagy  Dept of General Practice, School of Medicine
Professor Gary Slade  Department of Oral Epidemiology, University of Adelaide
Professor John Spencer  Dental Statistics & Research Unit, University of Adelaide
Ms Margaret Springgay  Royal District Nursing Society
Dr Alan Stewart  Department of Primary Health Care, Flinders Medical Centre
Mr Burt Surman  Planning Branch, SA Health Commission
Mr Fearnley Szuster  Dental Statistics & Research Unit, University of Adelaide
Ms Susan Taylor  Centre for Ageing Studies, Flinders University
Dr Anne Tonkin  Clinical and Experimental Pharmacology, University of Adelaide
Assoc Prof Peter Travers  School of Social Admin and Social Work, Flinders University
Assoc Prof David Turner  School of Medicine, Flinders University
Dr Agnes Vitry  The Samson Institute University of South Australia
Ms Thean Vlahakis  College of Pharmacy, University of South Australia
Dr Lynn Ward  Psychology Department, University of Adelaide
Ms Hero Western  Health Commission Social Health
Dr Graham White  Biochemistry & Chemical Pathology, Flinders Medical Centre
Dr Malcolm Whiting  Biochemistry and Chemical Pathology, Flinders Medical Centre
Dr Timothy Windsor  Centre for Mental Health Research, Australian National University
Professor Robert Withers  School of Education, Flinders University
Professor Gary Wittert  Department of Medicine, University of Adelaide
Dr Alan Wycherley  Flinders Medical Centre
Appendix 4: ALSA Bibliography


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Miller, M., Bannerman, E., Crotty, M., Giles, L., Daniels, L., Whitehead, C., et al. (2001). Australian Longitudinal Study of Ageing: II. Prospective evaluation of anthropometric indices in terms of morbidity in community-living older adults, Dietitians Association of Australia (pp. 110 [ISSN 0728 4519]).

Miller, M., Bannerman, E., Daniels, L., Crotty, M., Cobic, L., Giles, L., et al. (2000). Evaluation of body mass index as a predictor of physical function and mobility in community-living older adults, Australasian Journal on Ageing (Vol. 19 (4), pp. 33-34 [ISSN 0726 4240]).


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