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the australian longitudinal
study on women's health

Women, health and ageing:
Findings from the Australian Longitudinal Study on Women's Health

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Major Report E

Women, Health and Ageing: Findings from the Australian Longitudinal Study on Women's Health

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1. Executive summary

This report focuses on the health of older women from the Australian Longitudinal Study on Women's Health (ALSWH). The report was developed on the basis of discussions between the ALSWH research team and the staff of the Australian Government Department of Health and Ageing and has the broad aim of examining the health of older Australian women.

The ALSWH is a very large longitudinal cohort study funded by the Department of Health and Ageing and conducted by a team of researchers and staff based at the Universities of Newcastle and Queensland. The ALSWH first collected data in 1996, from three cohorts of women then aged 18-23, 45-50 and 70-75. While some descriptive information concerning trends in health from all cohorts is included in the current report, the focus of analyses is on data collected from the oldest cohort, who were born 1921-26.

Women live longer than men and so as the population ages older women will comprise an increasingly larger proportion of the Australian population. Older women who are married may become carers of increasing frail or ill husbands and this may limit their capacity to look after their own health. When the women are widowed they suffer financial disadvantage and may face difficulty maintaining their homes and with transport. Nevertheless, provided they are in good health, they lead more active social lives than older men.

Due to their longer life expectancy, older women make up a majority of the people with dementia, sensory impairment, falls and fractured femurs. They are more likely to need aged care services. Also caring for older women impacts on the lives of middle-aged women, who often become their informal carers, Helping older women to remain healthy and live independently for as long as possible is a most important long term goal.

The life experiences and circumstances of women now in their 70s and 80s have been different from those of their daughters and grand-daughters. Extrapolation across generations is hazardous. Nevertheless, study of the health of older women, and its social and behavioural determinants, may shed light on likely health trajectories and prevention opportunities for younger women, especially the baby boomer generation.

The ALSWH participants were randomly selected from the Medicare database in 1996. They are a national sample of women from all walks of life chosen with intentional over-sampling of women living in rural and remote areas. The ALSWH collects data by mailed surveys at regular intervals. The 1921-26 cohort completed surveys in 1996, 1999, 2002, 2005 and 2008. Over 12,000 women completed Survey 1 of the 1921-26 cohort, and 5561 of these women completed Survey 5 in 2008. Details can be found on the ALSWH website (www.alswh.org.au).

Between 1996 and 2008, 28% of the 1921-26 cohort had died and a similar proportion withdrawn from the study due to frailty or other reasons or had been lost to follow-up. Of course, deaths in this age group are also common in the general population, but other forms of attrition (e.g., loss to follow-up) could mean that ALSWH participants have become increasingly different from the general population of women in their same age group. Therefore, we examined possible sources of bias and the extent to which they could impact on our findings. The results suggested that attrition is very unlikely to affect the generalisability of ALSWH findings to women living in Australia who were born in the years 1921-26.

Next we examined changes in physical health of women as they move from being in their 70s (70-75 years at Survey 1) to their 80s (82-87 years at Survey 5). Approximately half of the women maintained good physical health throughout this period. A clear finding is that women whose health declined or started low and continued low had lower socio-economic status. They were more likely to be overweight or obese, undertake little physical activity and be current or ex-smokers. They suffered multiple chronic conditions and were heavy users of the health services.

There was a small group of women who reported clear improvements in health which appear to be related to restorative surgery (e.g. of hips or knees) or recovery from acute conditions or events.

Different conditions impacted in different ways on women's health related quality of life and their use of health services. For example, women with Alzheimer's disease needed more help with activities of daily living, had low scores on social functioning and general health, and were likely to die sooner. Women who had stroke or cancer were high users of services and had relatively low scores for all aspects of health related quality of life. In contrast, women who reported bronchitis/emphysema were not high users of health services, but they experienced some reduction in physical but not mental health scores.

Most of the older women in the study were living with at least one chronic condition, and many were living with multiple conditions that are associated with increased risk of physical health decline and other limitations on health-related quality of life. The more conditions a woman reported the higher the probability of poor health-related quality of life and decline in functional ability to perform activities of daily living.

To examine the effects of chronic conditions on the quality of life of older women, we considered four conditions in more detail: arthritis, diabetes, sleep problems and incontinence. These are common conditions which impact on different aspects of women's lives.

In 2005, 63% of ALSWH participants in the 1921-26 cohort reported diagnoses or symptoms of arthritis. Arthritis is associated with pain, physical limitations and greater costs of medications. There is some evidence that walking for leisure may reduce the risk of arthritis.

Data from the ALSWH show that medical management of diabetes fell well short of the guidelines. There is evidence that women who had good knowledge about diabetes management managed their condition better. Therefore greater health literacy and better understanding of their condition could improve the health of the growing population of older women with diabetes, particularly those with Type 2 diabetes.

Sleep problems commonly affect women as they become older. Women with sleeping difficulties reported a range of symptoms that interfere with sleep including pain, difficulty breathing, bad dreams, having to get up to use the bathroom, coughing/snoring, and being too cold or too hot. Use of sleeping medications did not appear to alleviate these problems for many women.

Incontinence is often described as a socially debilitating condition. In our data, incontinence was common and increased with age. The association between incontinence and social limitations, however, appeared to be more a consequence of underlying physical disability rather than the problem of incontinence.

A common risk factor for arthritis, diabetes and incontinence is higher body mass index (BMI). From a public health perspective prevention of overweight and obesity throughout adult life is a key national goal that could reduce disability in old age.

These findings have implications for primary care and the need for health professionals to work with older women patients to improve their understanding and management of common conditions. This includes helping women to improve their capability for self management and greater consideration of the effectiveness of medication, especially for women with multiple chronic conditions.

As women reach their 70s and 80s their health may become affected by risk factors and health behaviours accumulated over their lifetimes. Some of these factors act in conflicting ways. For example, osteoporosis, low BMI, being born in Europe and using medications for both sleep and anxiety were risk factors for height loss in older women. In turn, height loss was associated with increased risk of heartburn/ indigestion and constipation, urinary incontinence and a decline in self-rated health.

Height loss can also affect BMI, as BMI increases as height reduces. Although a high BMI is associated with chronic conditions, a healthy BMI range for older women may be slightly higher than that recommended for younger adults. For example, risk of osteoporosis decreases with increasing BMI. Also, hospital admissions were lowest for women with BMI of 22 to 24 kg/m^2 (classified as healthy weight), and mortality rates were lowest for women with BMI 25 to 27 kg/m^2 (classified as overweight).

Falls are another risk affecting women at older ages, and are associated with common hazards around the home. These hazards include unsecured mats, shiny floors and poor bathroom design. Older women had an average around 9 to 10 potential falls hazards around their homes. Falls and fractures may be prevented through moderate to high levels of physical activity. However, few women in the 1921-26 cohort engaged in sufficient physical activity to prevent falls and fractures.

Smoking is a major risk factor at all ages. The impact of smoking on women in the ALSWH was seen in the earlier mortality for smokers compared with non-smokers in the study. Mortality rates decreased after quitting smoking, however even women who quit smoking more than 20 years ago had an increased mortality rate compared with women who never smoked.

Moderate alcohol intake in keeping with current guidelines may carry some health benefits for older women in terms of survival and quality of life. Around one third of women in the 1921-26 cohort reported regularly drinking alcohol, and most of these women drank 1 or 2 drinks per day on some or most days of the week. Survival rates and health-related quality of life were lowest among women who did not drink and women who rarely drank alcohol. There were no significant differences in outcomes for women in other categories of alcohol consumption providing evidence supporting the current alcohol consumption recommendations.

The preventive implications of these findings for older women are broadly in line with those for all other sectors of the population: for optimal health avoid being overweight or obese, do not smoke, use alcohol in moderation, undertake regular physical activity, and avoid household hazards. The difference for older women is that the opportunities for change may be reduced. For example, arthritis, osteoporosis and other chronic conditions may limit their ability to exercise. Additionally, while some changes may produce short term health benefits (e.g., quitting smoking) for many risk factors, evidence about time lags between behaviour change and risk reductions is weak. From a long-term policy perspective life-time maintenance of low risk is the best prospect for reducing the impact in old age of chronic conditions and their consequences on health care costs and services.

While much of this report is focussed on the physical health of older women we also examined social inclusion, social support, social participation and networks. Evidence for association between older women's health and social factors is weak and inconsistent. By using longitudinal data we showed that poorer health lead to social isolation (e.g., through loss of mobility, having to stop driving, or sensory loss). In contrast, our analyses have not, at this stage, shown that low levels of social connectedness and support lead to ill health. The implication of these findings is that policies or services aimed at increasing older women's social inclusion as a strategy to improve health are not supported by evidence.

Extrapolation from the health of older women to the likely future health of younger women is often inappropriate because social conditions, health-related behaviour and health services differ substantially between generations. However, through careful analysis of major health risk factors across age groups and over time some predictions are possible.

Cigarette smoking was uncommon among women born in 1921-26 yet it has shortened the life expectancy of smokers as well as increasing their risk of respiratory and other chronic conditions. Smoking at some time in their lives has been more common among the middle-aged and younger women and the adverse effects are lively to impact on their health for the rest of their lives. There is good evidence that quitting smoking reduces risk of some conditions (e.g., cardiovascular conditions) quite quickly, but other risks (e.g., lung cancer) more slowly. For adult women who smoke, medical and behavioural help to stop smoking would increase their chances of making this change and reducing the subsequent health risks and costs. For children and young adults the emphasis should be on never smoking.

Among ALSWH participants (and the wider community) younger women (those born in 1973-78) are gaining weight on average faster than mid-aged women (born in 1946-51) who are gaining weight and have higher prevalence of overweight and obesity than older women (born in 1921-26). Based on current understanding of the metabolic effects of excess weight, it is very likely that hypertension, diabetes and cardiovascular disease will increase as consequences of this population-wide weight gain. This will substantially increase health care costs. Evidence for effective methods to avoid weight gain, to increase weight loss and about the time lags between weight change and risk change is weak (in part due to changes in modern diet and levels of energy expenditure). The implications are that weight-related health problems will increase for decades and that while prevention of overweight and obesity among children is important, there is an urgent need for better understanding of how to manage the burden of disease and costs due to excess weight in adults.

Current preventive activities in Australia to reduce overweight and obesity, reduce the prevalence of tobacco smoking, and increase levels of physical activity are all strongly supported by the data presented in this report.

Our data also identify growing needs for the primary care sector to help older women with chronic conditions. This will require improving the understanding of health care providers of older women's circumstances, multiple symptoms and diagnoses. Greater expertise in managing the health of older women and better access to services could improve their quality of life and reduce the costs incurred to the health system.

2. Health of older women in Australia

2.1. Key findings

- As the population ages older women will comprise an increasingly larger proportion of the total Australian population.
- Ischaemic heart disease is the leading cause of death and disability for women aged 65 and older. Among women aged 65-74, type 2 diabetes and breast cancer are the next two highest causes, while dementia and stroke are the next two highest causes among women over age 75.
- Many conditions such as dementia, sensory impairments and falls, do not have a greater age-specific incidence among women, but because women live longer they tend to account for the greatest proportion of people with these condition, particularly at advanced ages.
- Biological differences between the sexes mean that women suffer from different conditions than men (most obviously breast cancer vs. prostate cancer). The epidemiology of common conditions also differs (e.g., the prevalence of osteoporosis and later manifestation of cardiovascular conditions in women) and women respond differently to some treatments than men.
- Social differences between the genders also affect health, e.g., differences in tobacco use results in higher death rates of lung cancer in older men than older women.
- A consequence of women living longer than men is that more older women than older men are widowed, and married women are often carers for frail or ill husbands.
- Women’s roles as carers impact on their own health and use of health services.
- Older women often suffer financial disadvantage, face difficulty in maintaining their homes and with transport. Yet they lead more active social lives than older men.
- While the health of older women now may be indicative of the health of future generations as they reach old age, the patterns are unlikely to be the same due to differences in life experiences, health risk exposures and advances in health care.

2.2. Introduction

This section of the report provides a general introduction to the health of older women within the context of an ageing Australian population. Gender is an important factor in shaping people’s experiences of ageing and in determining the impact of an ageing population. It is important to recognise “older people” not just as heads to be counted, but to acknowledge their individual characteristics, including gender, that help to shape their experiences and needs as they age. At present, 55 out of every 100 people aged 65 years and over are women, and the predominance of women increases with each successive age group. For example, in 2006, women accounted for 51% of people aged 65-74 years, 56% of people aged 75–84 years, and 67% of those aged 85 or over (ABS, 2007a). Moreover, as the population ages older women will comprise an increasingly larger proportion of the total Australian population. The future population of older women will comprise the current younger and mid-age women whose health related behaviours are included in this report.

2.3. Women's life expectancy

Women tend to outlive men, and this trend is accentuated at more advanced ages. Currently in Australia, the life expectancy for a girl born sometime during 2003–2005 is 83.3 years, whereas a boy born during the same period can expect to live 78.5 years (AIHW, 2005). A woman who has already survived to age 65 can expect live another 21.1 years (to 86 years), whereas a man is likely to live another 17.5 years (AIHW, 2006; see Topic 16: Life expectancy, health status and causes of death). The number of older Australians aged 85 years and over has doubled over the past 20 years and is projected to increase more rapidly than other age groups: from 333,000 in 2006 to 1.1 million in 2036 (from 1.6% to 4.2% of the total population) (Older Australia at a Glance (OAAG), 2007). The proportion of people aged 85 years and over is also projected to increase, from 12% in 2006 to 18% in 2036. Over this period, the number of centenarians is projected to increase from fewer than 5,000 to more than 25,000 (ABS, 2006a). On 30 June 2006, there were 1981 females in Australia aged 100 and over (ABS, 2007b). Thus many women who are aged 80 years today can expect to live to over 100 years.

The experiences of women in the last century has been one of profound changes in roles within the family and society, and expanded opportunities with respect to education and participation in the workforce. These changes and increased longevity have resulted in a population of older women with a wide range of life experiences. In the following sections we summarise their health and well-being data across broad age bands.

2.4. Disease and disability among older women

A measure called disability-adjusted life years (DALYs), is used to summarise the burden of disease by combining data on years of life lost due to premature death (YLL) in the population and the years lost due to disability (YLD) for new cases of the health condition (Begg et al., 2007). Older adults experience a disproportionate amount of the DALY burden. In Australia in 2003, adults aged 65–74 years made up 7% of the total population and experienced 16% of the total burden of disease, while those aged 75 years and over accounted for 25% of the total disease burden even though they represented only 6% of the total population (Begg et al., 2007). Women aged 65-74 experienced a greater share of the burden than males aged 65-74 with respect to musculoskeletal conditions but not other conditions, but women over age 75 experienced a greater share of the burden than males overall and for all broad cause groups except chronic respiratory diseases and cancer. Ischaemic heart disease is the leading cause of DALYs for women aged 65 and older. Among women aged 65-74, type 2 diabetes and breast cancer are the next two highest causes of DALYs, while dementia and stroke are the next two highest causes of DALYs among women over age 75.

Despite their higher disease burden, older women are more likely than older men to rate their health as excellent or very good, and the majority (69%) of women aged 65 years or over consider themselves to be in good, very good or excellent health (ABS, 2006b). However, in 2003, over half of all people aged 65 years or over (56% or 1.4 million) had at least one form of disability lasting (or expected to last) at least 6 months and which restricted everyday activities, and there was little difference in disability rates for males and females. Differences in disability between males and females are mainly in terms of the severity of disability, rather than the prevalence, with females being more likely to report severe or profound disability at all ages.

2.5. The importance of sex and gender

The male-female differences in life expectancy and disability arise not only from variations in male and female biology, but also from a complex interplay of social and lifestyle factors. Biology does of course play a big role. As Wizeman and Pardue (2001) note, “every cell has a sex” and gender differences have been identified for a whole variety of physiological and biochemical functions. Biologically, females tend to have an advantage over males. Statistically more boys are born but more girl infants survive. Oestrogen plays a protective role for women with respect to conditions such as cardiovascular disease, although the sudden decline in oestrogen following menopause contributes to the higher rate of bone loss in women and greater risk of osteoporosis (different exposure to physical activity and weight bearing exercise across the lifecourse may also play a part). Osteoarthritis is also more common among women than among men, although the biological mechanisms for this effect are not known.

Men and women are also likely to have different biological responses to toxins and to medications. Women tend to absorb, metabolise and excrete drugs more slowly than men, and they have a smaller volume of distribution for medications (having lower lean body mass). Consequently women have a higher risk of adverse effects from medication use. Mostly, though, and despite the obvious differences, we have a very limited understanding of the biological differences between the sexes and how these should affect how we treat disease (Wizeman &Pardue, 2001).

Some obvious epidemiological manifestations of biological differences between men and women include cancers that are more likely to affect women (such as breast cancer) and those that can only affect men (such as prostate cancer). For the most part, however, the types of conditions which commonly affect people at older ages are similar among men and women. The differences are predominantly in terms of the incidence of these conditions and the peak age of onset, but diseases also sometimes have different manifestations and require different treatments according to gender. For instance, men experience peak incidence of coronary artery disease earlier than women, and there is a tendency to think of cardiovascular disease as a problem that is specific to men. In reality, however, cardiovascular disease is the main cause of death for both sexes (AIHW, 2008).

While biology plays a role, many of the differences in ageing are strongly linked to the social differences between men and women and the influence of “gender” across their lives. These less obvious differences include risks we are exposed to throughout our lives and how these affect our health at older ages, the ways in which we approach health care, and the ways in which we adapt to changes in our selves and in the world around us. For instance, lung cancer is more common among men who have had higher rates of smoking than women, although rates of lung cancer in women increased after women took up smoking in greater numbers. Women have higher prevalence of incontinence than men do, mostly due to the effects of childbirth, although these problems are also important for men particularly those who have had prostate surgery.

Men and women’s reactions to conditions are also different. While women are more likely to develop melanoma, for instance, men are more likely to die from this condition. At least part of the explanation for this effect is that women are more likely to seek help, and are also likely to be the instigator of help for their husbands. Men and women also have different responses to mental health issues. Compared to men, women are more likely to be diagnosed with mental health problems such as depression (partly due to gender-bias in diagnosis), but men are more likely to commit suicide.

Other gender differences in terms of life course, social roles, and access to financial and social resources will also have significant effects on men and women’s health and wellbeing in older age. However, these contextual factors and the differences between men and women are not fixed as women gain increasing levels of education, workforce participation and financial independence. A question of importance for an ageing population in a changing society is whether the differences between women’s and men’s risk factors and disease profile become less significant over time.

2.6. Ageing as women's business

Because of women's greater longevity, many of the major issues of ageing are seen as "women's business". Many conditions such as dementia, sensory impairments and falls, do not have a greater age-specific incidence among women, but because women live longer they tend to account for the greatest proportion of people with these condition, particularly at advanced ages. For example, of the 181,000 people with dementia in Australia in 2006, 65% were women (AIHW, 2007a).

While women will increasingly need care as they age, in general women are more likely to care for others than to receive care themselves. Among primary carers - those providing the most ongoing informal assistance with personal care, mobility or communication – women predominate except at the oldest age ranges (age 85+). (AIHW, 2005). Data from the ALSWH illustrate this phenomenon: prevalence of caring changes with age, with the percentage of women caring rising from 8% in women in their early 20s to 32% for women in their 50s and declining to around 20% when women are aged in their 70s and 80s. Many women care for more than one disabled older person across their lifetime, having cared for parents, older siblings, and friends as well as their husbands. Around 54% of all carers are women, and women predominate among primary carers with over two-thirds (71%) of all primary carers being women (AIHW, 2005). Women take on the caring role at a younger age than men and are more likely to provide care for people other than their own partners (ABS, 2005: Table 19). However, at older ages these sex differences in caring become less apparent.

Most older carers are caring for a spouse or partner (83%), and this carer group is the least likely of all primary carers to seek help (Hales, 2007). Thus they may be at risk of not receiving support when it is needed, with negative consequences to their health and well-being.

Data from the ALSWH show the impact that caring can have on women, an important modifier being where the women live relative to the care recipient. For women aged in their 70s and 80s, those who never provided care typically had better health-related quality of life compared to carers who lived with their care recipients but worse outcomes compared to carers who lived elsewhere. Generally, women who were either starting or stopping providing care for a care recipient who lived with them had higher use of health services and had poorer mental and physical health outcomes. Better mental health was shown in women who were starting or stopping providing care for a care recipient who lived elsewhere (McKenzie et al., 2009). ALSWH data also show that for women aged in their 50s those who care, particularly if they live with the care recipient, have less involvement in the workforce, more involvement with caring for children, less social support, and more negative outcomes in terms of mental health, optimism, stress, sleep problems and physical symptoms. These live-in carers are consequently heavy users of health services (Lucke et al., 2006).

Additionally, when they do need care, many older women will already be widowed and living alone. While widowhood is decreasing with successive age cohorts (for both sexes), in 2006 almost 80% of women and 37% of men aged 85 years and over were widowed, and 42% of women and 12% of men aged 65 years and over were widowed (AIHW, 2007b). As well as the grief and adjustment associated with the loss of their spouse, many of these newly single older women struggle with maintaining their homes and gardens, transport, and managing financially on a single pension or annuity (Byles and Feldman 1999; Feldman et al., 2000; Feldman et al., 2002). For instance, women have greater difficulties getting to places they need to, with 25% of women 65 years and over reporting such difficulty compared with 15% of men (Table 5.1; ABS, 2007c).

Women are also more likely to require aged care than men. In 2006, 284 of every 1,000 women aged 85 years and over were in residential care, compared with 153/1000 men. Women residents also tend to have longer length of stay in residential care, with the average length of stay for women being 167 weeks, compared with 109 weeks for men (AIHW, 2007b).

Under current arrangements older women are particularly financially disadvantaged during retirement and older age. Women's patterns of work-force participation have traditionally not followed the occupational career path of men. Most women have worked at some time in their lives, but participation tends to be intermittent. A consequence of women's patchy and late workforce participation is that they have limited access to superannuation funds (Kelly, 2006). In 2000, an estimated 78% of males and 71% of females in the pre-retired population had some level of superannuation coverage; however, among retired people aged 45 years and over, only 55% (of both sexes) had contributed to a superannuation scheme at some stage (ABS, 2006c). However, even for women who do have superannuation funds, their equity may be minimal and an estimated 50% of females born between 1946 and 1961 have superannuation accounts of $8,000 or less (Kelly, 2006). Women are consequently heavily reliant on government pensions as their main source of income in older age. In June 2006 women made up 58% of all age pensioners and relatively more women than men were on a single rate of payment as opposed to a partnered rate (56% of female pensioners compared with 30% of male pensioners; see Table A13.1). At ages 85 years and over, 74% of aged pensioners were women, consistent with women's greater longevity (FaCSIA unpublished data – OAAG, 2007).

In terms of social contact and participation, women enjoy some advantages. According to the 2006 ABS General Social Survey (GSS), a larger proportion of older women were in face-to-face contact in the previous week with family and friends than men (82% compared with 69%), and this was true for all but the oldest age group (OAAG, 2007). Similar proportions of older men and women reported participating in informal social activities until aged 85 years and over, when men's participation rates declined. However, participation in more formal social or support groups for both genders declines precipitously at these advanced ages; of those over age 85, 61% of women (compared with 50% of men) reported no active involvement in social groups.

2.7. Future generations of older women

Since the experiences of ageing are shaped by circumstances, behaviours and risk factors that are evident at much younger ages, future generations of older women may not experience the same prevalence or incidence of conditions and disability. Changing approaches to illness prevention and management will also alter disease incidence and outcomes for future generations of older women. It is none-the-less worth viewing the current health state of women at younger ages in relation to the patterns of conditions and risk factors exhibited by women in the 1921-26 cohort. Examining the characteristics and activities of the women aged in the 1946-51 cohort as they move from their late 40's, through their 50's and into their 60's may provide insight into the health needs of the next generations of older women, and particularly those on the advancing edge of the post-war baby boom.

2.8. Summary

Women live longer than men and so as the population ages older women will comprise an increasingly larger proportion of the Australian population. Older women who are married may become carers of increasing frail or ill husbands and this may limit their capacity to look after their own health. When the women are widowed they suffer financial disadvantage and may face difficulty maintaining their homes and with transport. Nevertheless, provided they are in good health, they lead more active social lives than older men.

Due to their longer life expectancy, older women make up a majority of the people with dementia, sensory impairment, falls and fractured femurs. They are more likely to need aged care services. Also caring for older women impacts on the lives of middle-aged women, who often become their informal carers, Helping older women to remain healthy and live independently for as long as possible would appear to be the most important long term goal.

The life experiences and circumstances of women now in their 70s and 80s have been different from those of their daughters and grand-daughters. Extrapolation across generations is hazardous.

Nevertheless, study of the health of older women, and its social and behavioural determinants, may shed light on likely health trajectories and prevention opportunities for younger women, especially the baby boomer generation.

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3. Introduction to older women in the Australian Longitudinal Study on Women's Health

3.1. Key Findings

- Between Survey 1 and Survey 5 28% of ALSWH participants in the 1921-26 cohort had died, 16.5% had withdrawn from the study due to frailty or other reasons, 10.4% had been lost to follow-up so only 44.7% remained in the study.
- Compared to women of the same age in the general population, ALSWH participants in the 1921-26 cohort were more likely to be married and to have a tertiary education, and less likely to be widowed. They were also less likely to be current smokers.
- Compared to those still alive at Survey 5, participants who died had reported lower self-rated health at Survey 1.
- While ALSWH participants had a slightly better survival rate than other women the same age, the cohort remains very similar to the general population.
- Cohort attrition is very unlikely to affect the generalisability of ALSWH findings to women living in Australia who were born in the years 1921-26.

3.2. Introduction

The purpose of this section is to describe the current cohort of older women in ALSWH, but particularly to consider the effect of attrition over the study period on how representative older women in ALSWH are of all women of the same age in the Australian population. This representativeness is important because it affects the generalisability of Study findings to the general population.

First we start by looking at how representative the ALSWH participants were at the beginning of the Study in 1996. Next we look at the extent of attrition since 1996. We then consider factors associated with various forms of attrition and how these may have affected representativeness over the Study period. Finally we consider the likely effect of attrition on our ability to extrapolate from the ALSWH participants and their present health needs to those for all women in this age group in Australia.

3.3. How similar were the older women who participated in the first ALSWH survey to women of the same age in the general population?

When the Study began in 1996 we were able to compare ALSWH participants using data from the Australian Census conducted in the same year. We also compared ALSWH data with information about women of the same age who participated in the National Health Survey conducted by the Australian Bureau of Statistics at the same time. Table 3-1and Table 3-2 show these comparisons.

Table 3-1 Comparison of selected demographic characteristics in 1995/6 between the ALSWH participants born in 1921-26, women of the same age who participated in the 1995 national health survey, and women of the same age in the 1996 Australian census

Item	ALSWH N=12,423 %	NHS N=894 %	Australian Census
State or Territory of Residence			
New South Wales	34.9	35.8	
Australian Capital Territory	1.1	0.8	
Queensland	16.3	16.6	
South Australia	10.2	10.0	
Tasmania	2.8	2.5	
Victoria	26.0	25.9	
Western Australia	8.5	8.5	
Marital Status			
Partnered	55.6	49.6	48.9
Separated/ Divorced	6.3	5.6	6.8
Widowed	34.8	42.4	39.9
Never married	3.2	2.4	4.4
Country of Birth			
Australian born	73.5	74.2	66.4
Other English Speaking	13.6	10.9	11.0
Europe	10.1	12.0	12.7
Asia	1.8	1.4	3.3
Other	1.0	1.6	6.5
Highest Educational Qualification			
No Higher Qualification	84.0	79.3	70.4
Trade/Apprentice Certificate/Diploma	11.7	16.7	6.0
University	4.2	2.7	2.4
Inadequately described		1.2	21.2

The ALSWH participants were more likely to be married and less likely to be widowed than women of the same age in the general population. They were also more likely to have a tertiary education. There were more women born in ‘Other English speaking background (ESB)’ countries in the ALSWH cohort and fewer born in Europe.

Table 3-2 Comparison of selected health characteristics in 1995/6 between the ALSWH participants born in 1921-26, women of the same age who participated in the 1995 national health survey, and women of the same age in the 1996 Australian census

Item	ALSWH N=12,423 %	NHS N=894 %
BMI Group		
Underweight, BMI < 18.5	3.2	4.2
Healthy weight, 18.5 ≤ BMI < 25	50.4	52.1
Overweight, 25 ≤ BMI < 30	33.1	29.1
Obese, 30 ≤ BMI	13.2	14.5
Does Your Health Limit You in Walking 100m		
Limited a lot	7.1	11.3
Limited a little	15.4	19.7
Not limited	77.4	68.9
Smoking Status		
Never-smoker	62.1	64.6
Ex-smoker	30.4	24.3
Current smoker	7.6	11.0
Self Rated Health		
Excellent	6.4	7.6
Very good	26.2	23.2
Good	39.4	34.4
Fair	23.6	24.3
Poor	4.3	10.5

For health related behaviours the ALSWH participants were less likely to be current smokers, less likely to report fair or poor self rated health, and not to report that their health limits their ability to exercise (walk 100 metres). Although the differences represent a ‘healthy volunteer’ bias they are not very large and were unlikely to limit the generalisability of ALSWH results.

3.4. Who remains in the Study?

When the ALSWH began the women born in 1921-26 were aged 70-75 so it is not surprising that as the ALSWH continues, more and more of these older women die or become too frail to continue to participate. Each year, ALSWH participant information is linked to the National Death Index by the Australian Institute of Health and Welfare so that we are able to ascertain all deaths (family members and other informants also provide advice of participants' deaths). Participants, their family members or carers also inform the ALSWH team about withdrawals from the study (including reasons for withdrawal) and extensive efforts are made to trace women with whom we lose contact. Table 3-3 summarises the situation up to Survey 5 which was conducted in 2008.

Table 3-3 Attrition across surveys 1 to 5 in the ALSWH for women born in 1921-26.

Survey	Respondent	Dead	Frail	Withdrawn	Lost to Follow Up
1	100.0%	-	-	-	-
2	83.9%	4.5%	0.8%	4.7%	6.1%
3	69.6%	9.9%	2.6%	9.0%	9.0%
4	57.6%	18.4%	4.4%	10.9%	8.7%
5	44.7%	28.4%	5.1%	11.4%	10.4%

Note: Total number of women at each survey is 12,432.

By Survey 5 fewer than half of the original group continued to participate, more than one in four had died, while one in twenty had withdrawn due to fragility and about double that number had withdrawn due to other or unknown reasons. Contact had only been lost with about one in ten of the women. Table 3.3 shows that the main reason for participant loss was death. Of course deaths also occur in the general population of women of this age group.

3.5. Who died?

When ALSWH participants who died were compared to those who were still alive, we found that at Survey 1 they had reported lower self-rated health than survivors (Ford et al., 2007). For this reason we examined death rates (estimated as hazard ratios) for the whole cohort and separately for those who reported 'good', 'very good' or 'excellent' health (the 'healthy' group) at Survey 1. The results are shown in Table 3-4. Women who reported poorer health, those who were older and women who reported lower levels of physical activity, and being current smokers or ex-smokers were at greater risk of dying.

Table 3-4 Predictors of death among older women in the whole cohort and in the 'healthy' cohort: results from a stepwise proportional hazards survival analysis – hazard ratios (HR) and 95% confidence intervals (CI) for all factors that had p-values <0.1 in the univariate analyses.

	Whole cohort		**'Healthy' cohort**	
	HR[b]	**95%CI[b]**	**HR[b]**	**95%CI[b]**
Self-rated health				
Excellent [a]	*1.00*		*1.00*	
Very good	1.04	0.75-1.44	1.09	0.77-1.52
Good	1.18	0.85-1.63	**1.43**	**1.03-1.98**
Fair	**1.65**	**1.16-2.34**	-	**-**
Poor	**2.48**	**1.63-3.77**	-	**-**
Smoking Status				
Non-smoker [a]	*1.00*		*1.00*	
Ex-smoker Quit 20+ yrs	1.07	0.89-1.29	0.95	0.71-1.28
Ex-smoker Quit 11-20 yrs	1.17	0.95-1.43	0.84	0.60-1.18
Ex-smoker Quit 6-10 yrs	**1.41**	**1.10-1.81**	1.18	0.76-1.83
Ex-smoker Quit <5yrs	**1.58**	**1.25-1.99**	1.08	0.69-1.69
Current smoker	**1.95**	**1.62-2.34**	**2.00**	**1.52-2.63**
Exercise				
High	0.93	0.74-1.17	0.92	0.68-1.25
Moderate [a]	*1.00*		*1.00*	
Low	1.12	0.96-1.32	**1.30**	**1.05-1.62**
None	**1.73**	**1.49-2.01**	**1.52**	**1.20-1.92**
BMI				
Underweight	**1.91**	**1.50-2.43**		
Acceptable weight [a]	*1.00*			
Overweight	**0.81**	**0.71-0.92**		
Obese	**0.82**	**0.69-0.97**		
Co-morbidity Score	**1.13**	**1.10-1.16**		
Age	**1.06**	**1.02-1.10**	**1.12**	**1.06-1.19**
Physical health component score	**0.986**	**0.98-0.99**		

[a] Denotes reference category

[b] Bold indicates that the 95% confidence interval does not include unity

We also compared death rates among the ALSWH participants with death rates of women in the same age group in the general population using Australian life tables.

Table 3-5 shows relative survival of the ALSWH cohort compared to the general population of women of the same ages. Relative survival estimates greater than 1.0 indicate better survival of ALSWH participants. Where the confidence limits do not include 1.00 the difference is statistically significant.

Table 3-5 Relative cumulative survival over the period 1996-2008 of participants in the Australian Longitudinal Study on Women's Health 1921-26 cohort by state or territory of residence, accessibility/remoteness index (ARIA) and age at Survey 1.

	Relative Cumulative Survival	95% Confidence Limits	
		Lower	Upper
All women	1.095	1.083	1.107
State or Territory of Residence			
Australian Capital Territory	1.233	1.113	1.321
New South Wales	1.108	1.087	1.127
Northern Territory	1.249	0.791	1.541
Queensland	1.085	1.054	1.113
South Australia	1.063	1.024	1.099
Tasmania	1.106	1.024	1.179
Victoria	1.086	1.063	1.109
Western Australia	1.109	1.068	1.146
Accessibility/Remoteness Index (ARIA)			
Highly Accessible	1.104	1.091	1.116
Accessible	1.042	1.004	1.079
Moderately Accessible	1.064	0.997	1.124
Remote, Very Remote	1.068	0.939	1.173
Age at Survey 1			
70	1.064	1.039	1.087
71	1.060	1.036	1.083
72	1.094	1.068	1.119
73	1.109	1.079	1.138
74	1.129	1.095	1.161
75	1.215	1.145	1.280

Over the 12 year period 1996 to 2008 the ALSWH sample had a relative cumulative survival 9.5% (95% confidence interval, 8.3% - 10.7%) greater than their peers in the general Australian population matched for age and State or Territory of residence. The relative survival per year remained somewhat constant over the period indicating that the survival advantage of the cohort did not diminish over time (data not shown here).

ALSWH participants in all jurisdictions except the Northern Territory had significantly better survival than the general population with the relative cumulative survival advantage being between 6% for South Australia and 11% for Western Australia, but with a markedly higher survival advantage of 23% for the Australian Capital Territory. Across all ARIA groups relative cumulative survival was consistently higher than the general population although in the remote/ very remote areas the difference was not statistically significant. The relative survival advantage increased with initial age. Those women aged 70 in 1996 had only a 6% advantage which increased to 22% for women aged 75 in 1996.

We examined the extent to which this survival advantage compared to other Australian women might be attributable to the slightly more favourable profiles shown in Tables 3.1 and 3.2. The magnitude and direction of the effects suggested the demographic and health behaviour differences could explain the major portion of the survival advantage in the ALSWH cohort (results not shown here).

3.6. Who has been lost from the Study for reasons other than death?

While deaths occur in the general population as well as the Study, losses for other reasons only occur in the Study. Therefore the causes of attrition other than death are potentially a more important threat to the generalisability of the Study results now.

Table 3-6 shows the odds ratios for each of the forms of attrition, relative to respondents, in relation to demographic and health behaviour variables and self rated health at Survey 1. Those women most likely to have died by 2008 had no formal educational qualification, were underweight, did very little or no physical activity, did not drink alcohol, were current smokers, and reported having poor health at baseline. Women most likely to withdraw due to frailty reported having poor health at baseline, and drank alcohol rarely or not at all. Women most likely to withdraw due to reasons other than frailty were born in a non-English speaking country, had no formal educational qualification, and did very little or no physical activity. Women most likely to be lost to follow up were born in a non-English speaking country, did very little or no physical activity, were current smokers, and reported having poor health at baseline.

Table 3-6 Odds ratios from multinomial logistic model for different types of attrition, compared to response, at Survey 5 in 2008 in the ALSWH for women born in 1921-26. In total 8938 women were included in the model, of whom 4327 (48.4%) were respondents. Odds ratio estimates with a 95% confidence interval not including unity are shown in bold.

				Odds Ratio (95% Confidence Interval – bold indicates exclusion of 1)							
				Dead (N=2395) vs. Respondent		**Frail (N=410) vs. Respondent**		**Withdrawn (N=942) vs. Respondent**		**Lost to Follow Up (N=864) vs. Respondent**	
Risk Factor		**N**	**%**								
Country of Birth	Australia	6893	77.1	1.00		1.00		1.00		1.00	
	Other English speaking	1202	13.5	0.98	(0.84,1.15)	0.97	(0.70,1.33)	0.95	(0.76,1.19)	1.18	(0.95,1.47)
	Other	843	9.4	0.95	(0.78,1.16)	1.17	(0.83,1.67)	**1.93**	**(1.55,2.42)**	**2.03**	**(1.62,2.54)**
Highest Qualification	University	377	4.2	1.00		1.00		1.00		1.00	
	Certificate/Diploma	728	8.1	1.24	(0.89,1.72)	1.05	(0.55,2.00)	1.54	(0.89,2.68)	0.81	(0.52,1.27)
	Trade/Apprenticeship	327	3.7	1.12	(0.75,1.66)	1.49	(0.73,3.04)	**2.27**	**(1.25,4.13)**	1.10	(0.66,1.83)
	Any high school	4665	52.2	1.31	(0.99,1.74)	1.19	(0.69,2.05)	**2.28**	**(1.41,3.70)**	1.17	(0.81,1.68)
	No formal qualification	2841	31.8	**1.51**	**(1.13,2.01)**	1.41	(0.81,2.47)	**3.54**	**(2.18,5.76)**	1.20	(0.83,1.75)
BMI Classification	Acceptable	4487	50.2	1.00		1.00		1.00		1.00	
	Overweight	2959	33.1	**0.86**	**(0.76,0.97)**	0.91	(0.72,1.14)	1.07	(0.92,1.25)	1.11	(0.94,1.31)
	Obese	1203	13.5	0.91	(0.77,1.07)	0.79	(0.57,1.10)	**0.62**	**(0.48,0.79)**	1.09	(0.87,1.37)
	Underweight	289	3.2	**2.17**	**(1.62,2.92)**	1.72	(1.00,2.97)	1.04	(0.64,1.70)	0.77	(0.43,1.36)
Physical Activity	Low to very high	6474	72.4	1.00		1.00		1.00		1.00	
	None or very low	2464	27.6	**1.75**	**(1.55,1.97)**	1.08	(0.85,1.38)	**1.34**	**(1.14,1.59)**	1.19	(1.00,1.42)
Alcohol Consumption	Low-risk drinker	3055	34.2	1.00		1.00		1.00		1.00	
	Non-drinker	3007	33.6	**1.38**	**(1.20,1.58)**	**1.34**	**(1.02,1.75)**	1.15	(0.96,1.38)	1.13	(0.93,1.37)
	Rarely drinks	2576	28.8	**1.21**	**(1.06,1.39)**	**1.43**	**(1.09,1.86)**	0.92	(0.76,1.10)	1.13	(0.94,1.37)
	Risky or high-risk drinker	300	3.4	1.02	(0.76,1.37)	1.31	(0.74,2.32)	0.84	(0.54,1.31)	0.74	(0.46,1.18)
Smoking Status	Never smoker	5624	62.9	1.00		1.00		1.00		1.00	
	Ex-smoker	2673	29.9	**1.45**	**(1.29,1.64)**	1.10	(0.87,1.39)	1.00	(0.85,1.19)	**1.25**	**(1.06,1.48)**
	Smoker	641	7.2	**2.73**	**(2.22,3.36)**	1.26	(0.80,1.97)	1.26	(0.92,1.72)	**1.82**	**(1.35,2.45)**
Self-Reported Health	Excellent	578	6.5	1.00		1.00		1.00		1.00	
	Very good	2489	27.9	1.11	(0.86,1.42)	0.93	(0.56,1.55)	0.98	(0.73,1.33)	1.10	(0.79,1.53)
	Good	3516	39.3	**1.57**	**(1.23,2.01)**	1.58	(0.97,2.55)	1.11	(0.83,1.49)	1.29	(0.93,1.78)
	Fair	2014	22.5	**3.25**	**(2.52,4.19)**	**2.88**	**(1.75,4.74)**	**1.41**	**(1.03,1.93)**	**1.94**	**(1.37,2.73)**
	Poor	341	3.8	**11.87**	**(7.92,17.79)**	**7.14**	**(3.54,14.41)**	1.73	(0.95,3.17)	**4.14**	**(2.38,7.20)**

3.7. How does participant loss limit the value of the Study's findings now?

While the survivors who continue to participate in ALSWH were different from the women who died, they may still be reasonably representative of women of their age group in the general population. From the health services perspective this is the most important issue.

We can assess the effects of deaths and other forms of attrition on the representativeness of the survivors by comparisons with data from Australian Censuses and National Health Surveys conducted during the ALSWH study period. Illustrative examples are shown in the following set of figures.

Being born in a non-English speaking country is an example of a risk factor associated with non-death attrition but not the risk of death (i.e. similar to the situation depicted in Figure 3-1below).

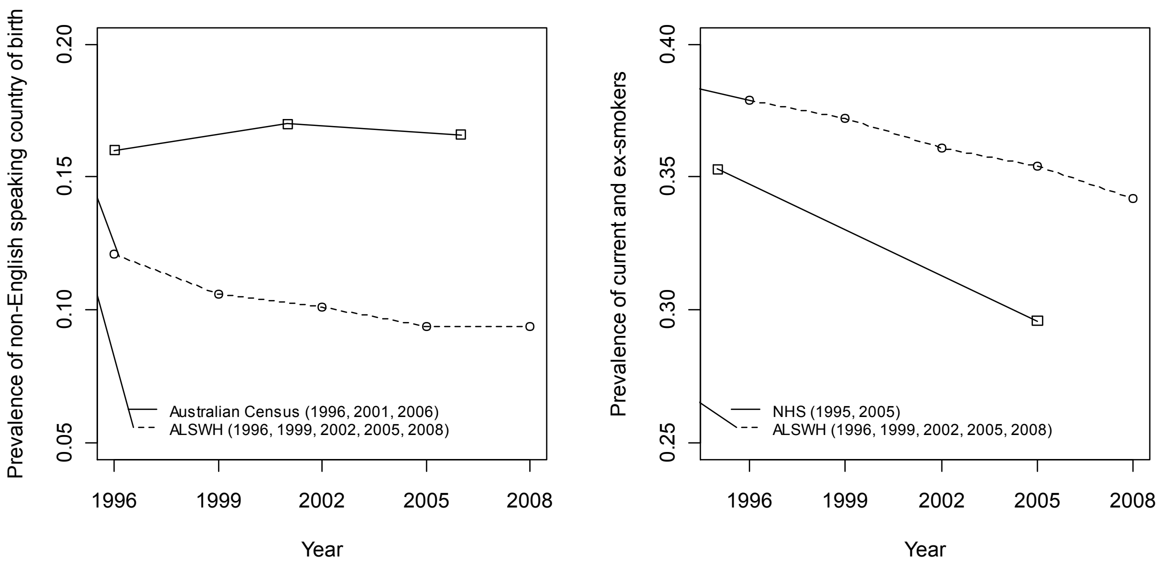

Figure 3-1 Prevalence of a non-English speaking country of birth in the Australian Census and the ALSWH cohort (left panel), and prevalence of current and ex-smokers in the Australian National Health Survey and the ALSWH cohort (right panel).

The left panel of Figure 3-1 shows the change in prevalence of a non-English speaking country of birth in the Australian population of women in this age group and the ALSWH cohort, over approximately the same ten years. This is a variable associated with lower risk of death but higher risk of attrition due to other causes in Table 3-7. Prevalence of a non-English speaking country of birth was lower in the ALSWH cohort at 1996 (0.12 vs. 0.16), 2001/2 (0.10 vs. 0.17) and 2005/6 (0.09 vs. 0.17). This corresponds to a bias of 0.04 in 1996, increasing to 0.07 in 2001/2, and 0.072 in 2005/6.

Smoking is an example of a risk factor associated with both the risk of death and non-death attrition (Table 3.6). The right panel of Figure 3-1 shows the change in prevalence of current or ex-smokers in the target population and the ALSWH cohort. Prevalence of current or ex-smokers was higher in the ALSWH cohort at both 1995/6 (0.38 vs. 0.35) and 2005 (0.35 vs. 0.30). This corresponds to a bias of 0.03 in 1995/6, increasing to 0.06 in 2005.

The extent of differences in other major factors between the surviving ALSWH cohort and the general population of the same age is shown in Table 3-7. Prevalence of no post-high school qualification is almost the same in the ALSWH cohort and the Australian population at 1995/6 (0.797 for the ALSWH vs. 0.793) and 2005 (0.784 for the ALSWH vs. 0.798), and so bias did not change much. In contrast, bias increased in the prevalence of both the underweight BMI classification and poor self reported health. However the biases are remarkably small.

Table 3-7 Prevalence of risk factors in the ALSWH and the target population at 1995/6 and 2005/6, and changes in bias over this time.

	1995/6			2005/6		
Risk Factor : Level	**ALSWH**	**Target Population**	**Bias**	**ALSWH**	**Target Population**	**Bias**
Country of Birth: Non-English speaking background	0.121	0.160	0.039	0.094	0.166	0.072
Smoking Status: Current or ex-smoker	0.379	0.353	-0.026	0.354	0.296	-0.058
Highest Qualification: No post-high school qualification	0.797	0.794	-0.003	0.784	0.798	0.014
BMI Classification: Underweight	0.029	0.042	0.013	0.021	0.059	0.038
Self Reported Health: Poor	0.043	0.105	0.062	0.043	0.132	0.089

3.8. Summary

The Australian Longitudinal Study on Women's Health (ALSWH) is a large nationally representative survey that has been collecting data since 1996. This report on the health of women born in 1921-26 is uniquely able to characterise the health and well-being of older women in Australia at the beginning of the 21st Century.

The study participants were randomly selected from the Medicare database in 1996. They are a national sample of women in all walks of life chosen with intentional over-sampling of women living in rural and remote areas. Between 1996 and 2008, 28% of the 1921-26 cohort had died and similar proportion withdrawn from the study due to frailty or other reasons or had been lost to follow-up. Of course, deaths in this age group are also common in the general population, but other forms of attrition (e.g., loss to follow-up) could mean that ALSWH participants have become increasingly different from the general population of women in their same age group. Therefore, we examined possible sources of bias and the extent to which they could impact on our findings.

Based on this evidence it seems that although just under half of the original participants remain in the cohort, attrition is very unlikely to affect the generalisability of ALSWH findings to women living in Australia who were born in the years 1921-26.

3.9. References

Ford, J., Spallek, M., & Dobson, A. (2007). Self-rated health and a healthy lifestyle are the most important predictors of survival in elderly women. *Age and Ageing, 37,* 194-200.

4. Changes in older women’s physical health

4.1. Key Findings

- Approximately half of the women who remained in the study at Survey 5 maintained good physical health over the period from Survey 1 (when they were aged 70-75 years) to Survey 5 (aged 82-85 years).
- Those women whose health declined, or started low and continued low, had lower socio-economic status and poorer health at Survey 1.
- There was a small group of women who reported clear improvements in health which appear to be related to restorative surgery (e.g., of hips or knees) or recovery from acute conditions or episodes of illness.
- Women in this age group frequently reported having chronic conditions, and symptoms, and they were relatively heavy users of health services.
- Aspects of health related quality of life and use of health services were impacted differently by different conditions.
- Women with Alzheimer’s disease needed more help with activities of daily living, had low scores on social functioning and general health, and were more likely to die.
- Women who had stroke or cancer were high users of services and had relatively low scores for all aspects of health related quality of life.
- Women who reported bronchitis/emphysema were not high users of health services, experienced some reduction in physical health scores, but no impact on mental health aspects.

4.2. Introduction

This section of the report presents an analysis of changes in women’s physical health and the impact of different conditions and co-morbidities on these changes.

Decline in physical function and associated physical health-related quality of life is a common feature of older age, with important consequences in terms of physical health-related quality of life, disability in daily activities, falls, health care use, admission to residential care and mortality (Freeman et al., 2002; Gill & Kurland, 2003). However, among people of similar chronological age, some individuals appear to be resistant to decline in physical function while others appear more vulnerable [Paterson et al., 2004). More information on the patterns and pace of age-associated changes in physical function, and the factors associated with different patterns of change, is important for planning for an ageing population.

4.3. Changes in physical health-related quality of life and physical function

Physical health-related quality of life reflects the extent to which physical activities are limited by health. In the ALSWH, health related quality of life is measured using the Medical Outcomes Study 36-item Short Form Health Survey Version 1 (SF-36 Australian Version) (McCallum, 1995). The SF-36 produces eight subscales each with a score range of 0 to 100. The subscales measure physical function, social function, mental health, pain, role limitations due to physical health, role limitations due to emotional health, vitality and general health. A high score on the physical function subscale reflects the ability to walk various distances, climb stairs, dress/bathe, carry groceries and engage in moderate and vigorous levels of activity (Ware, 1994).

SF-36 scores from Survey 1 to Survey 5 for all women who had completed Survey 5 are presented in Figure 4-1. Scores declined for most sub-scales, and declined more steeply between Survey 4 and Survey 5 than between Survey 1 and Survey 2.

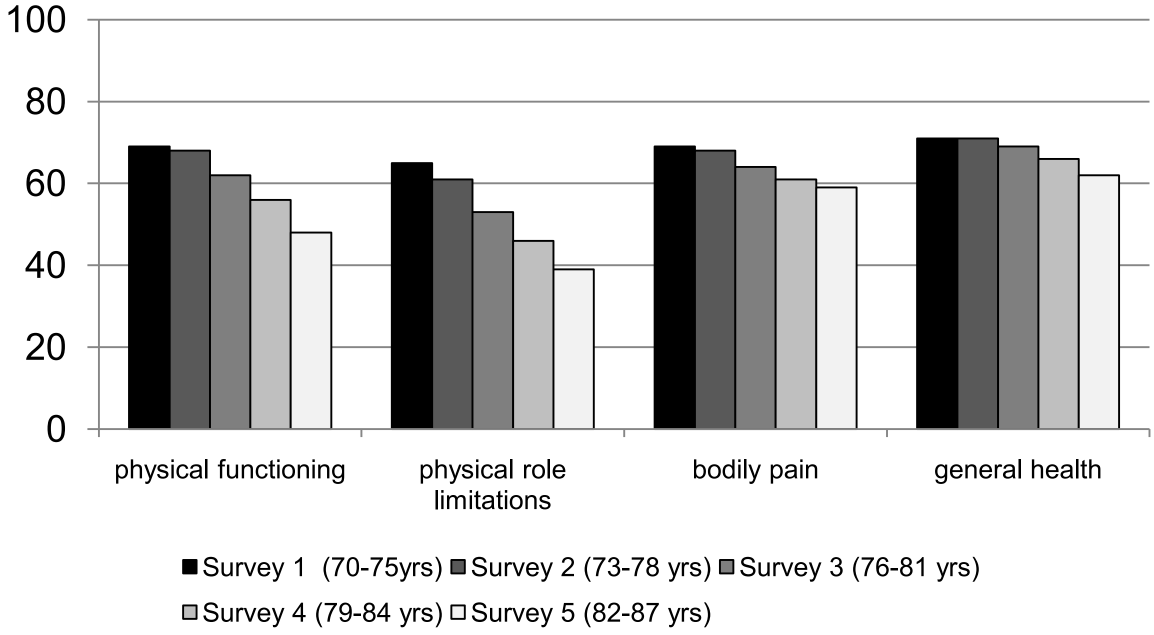

Figure 4-1 Physical health related SF-36 scores for each survey for 5557 women who responded to Survey 5.

While average physical health-related scores for quality of life for the cohort decreased over the five surveys, the pattern of change in scores varied from woman to woman. Overall, most women showed a small decrease in physical function between each survey. However, many had no change in scores, some women showed a large decrease, while others showed large improvements.

An analysis of the change over all five surveys (using latent profile analyses) identified four main patterns in the scores (see Figure 4-2):

1. Consistently higher scores showing relatively stable high scores up to Survey 3 followed by a slow decline between Survey 3 and Survey 5 (50% of women);
2. Declining scores, showing high scores at Survey 1 declining to low scores by Survey 5 (27% of women);
3. Consistently low scores, showing low scores at Survey 1 followed by further decline from Survey 2 onwards (20% of women);
4. Increasing scores, showing low scores at Survey 1 increasing to high scores by Survey 5 (3% of women.)

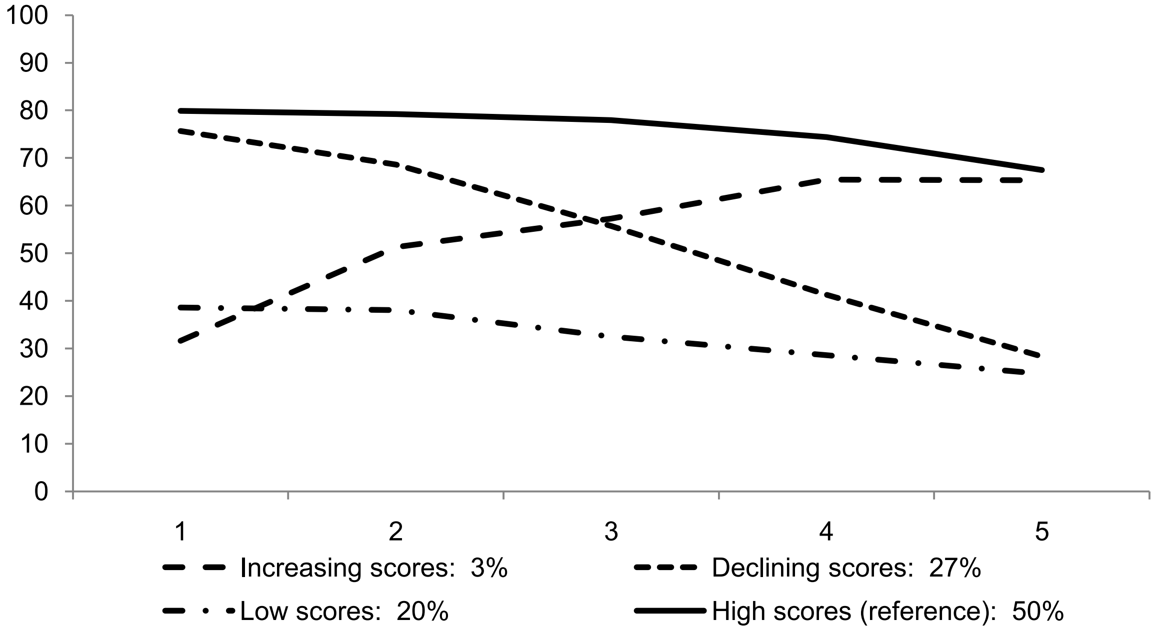

Figure 4-2 Patterns of change in SF-36 physical function scores.

4.3.1. Factors associated with patterns of change in physical function score

Women with different patterns of change in physical function score were compared with women with consistently high scores, whose physical function scores started high and did not change greatly during the 12 years from Survey 1 to Survey 5. Patterns of change were significantly associated with socio-demographic factors such as age, education and marital status, with health risk behaviours such as smoking, body mass index and physical activity, and with a number of conditions, symptoms and health service use (see Table 4-1, Table 4-2 and Table 4-3).

Table 4-1 Socio-demographic factors associated with patterns of change in physical function (compared to women with continuously higher scores): effects adjusted for age; statistically significant effects in bold.

	Declining scores (27%)	**Consistently Poor scores (20%)**	**Increasing scores (3%)**
	Odds ratio (95%CI)		
Age (continuous)	**1.1(1.1-1.2)**	**1.1(1.0-1.1)**	**1.0(0.9-1.1)**
Marital Status#			
Married*	**1**	**1**	**1**
Defacto	0.9(0.4-1.8)	0.2(0.1-1.0)	1.9(0.4-8.0)
Never Married	1.1(0.7-1.6)	0.9(0.6-1.4)	0.3(0.04-2.2)
Separated/Divorced	1.2(0.9-1.5)	1.2(0.9-1.7)	1.2(0.6-2.7)
Widowed	1.1(1.0-1.3)	**1.3(1.1-1.5)**	1.2(0.8-1.7)
Education			
Higher school certificate or higher qualification*	1	1	1
No formal qualifications/School (intermediate) certificate	**1.3(1.1-1.4)**	**1.5(1.3-1.8)**	1.2(0.8-1.8)

* reference category

Table 4-2 Health risks and behaviours associated with patterns of change in physical function (compared to women with continuously higher scores at Survey 1): effects adjusted for age, education and marital status; statistically significant effects shown in bold.

	Declining scores (27%)	**Consistently Poor scores (20%)**	**Increasing scores (3%)**
	Odds ratio (95%CI)		
Smoking			
Never smoker*	1	1	1
Ex-smoker	1.1(0.9-1.2)	**1.2(1.1-1.5)**	1.4(1.0-2.1)
Current smoker	**1.4(1.0-1.9)**	**1.6(1.1-2.3)**	1.5(0.6-3.8)
Body Mass Index			
Healthy*	1	1	1
Underweight	1.0(0.7-1.6)	1.0(0.5-1.8)	0.8(0.2-3.4)
Overweight	**1.8(1.6-2.1)**	**2.7(2.2-3.2)**	1.4(0.9-2.1)
Obese	**2.9(2.3-3.7)**	**10.3(8.2-13.0)**	**4.0(2.4-6.6)**
Physical Activity			
Low-high*	1	1	1
Nil/very low	**1.5(1.3-1.7)**	**4.1(3.5-4.9)**	**1.6(1.1-2.4)**

* reference category

Table 4-3 Health factors associated at Survey 1 with patterns of change in physical function scores (compared to women with consistently higher scores): effects adjusted for age, education and marital status; statistically significant effects in bold.

	Declining scores (27%)	Consistently Poor scores (20%)	Increasing scores (3%)
	Odds ratio (95%CI)		
Conditions			
Arthritis (Survey 2)	**1.7(1.5-2.0)**	**3.9(3.4-4.6)**	**2.8(1.9-4.0)**
Heart disease	**1.7(1.4-2.0)**	**3.7(3.0-4.5)**	**3.1(2.0-4.8)**
Diabetes	**1.6(1.2-2.1)**	**2.3(1.8-3.1)**	**3.2(1.9-5.6)**
Stroke	**1.9(1.3-2.8)**	**3.5(2.4-5.0)**	**3.6(1.7-7.4)**
COPD/asthma	**1.2(1.1-1.5)**	**2.0(1.7-2.3)**	1.2(0.8-1.8)
Cancer	1.3(1.0-1.7)	1.3(1.0-1.8)	1.6(0.9-2.9)
Symptoms:			
Foot problems (Survey 2)	**1.6(1.4-1.9)**	**3.3(2.8-3.9)**	1.5(1.0-2.2)
Vision	**1.2(1.1-1.4)**	**2.4(2.1-2.8)**	**1.9(1.3-2.7)**
Hearing	**1.2(1.1-1.4)**	**1.6(1.4-1.9)**	1.2(0.8-1.8)
Incontinence	**1.4(1.2-1.6)**	**2.5(2.1-3.0)**	1.5(1.0-2.3)
Back pain	**1.4(1.3-1.6)**	**3.3(2.9-4.0)**	**2.5(1.7-3.6)**
Events:			
Fall (Survey 2)	**1.4(1.1-1.6)**	**1.8(1.5-2.2)**	1.5(1.0-2.4)
Fall with injury	1.3(0.9-1.8)	**2.1(1.5-2.9)**	**4.9(2.8-8.4)**
Other injury	1.3(0.9-2.1)	**3.3(2.3-4.8)**	**4.7(2.3-9.4)**
Hip surgery	**2.9(1.6-5.3)**	**8.8(5.2-15.2)**	**12.3(5.4-28.4)**
Eye surgery	1.2(1.0-1.5)	**1.5(1.2-1.9)**	1.3(0.8-2.3)
Knee surgery or arthroscopy	1.5(1.0-2.2)	**3.8(2.7-5.3)**	**4.0(2.0-7.9)**
Hospital past 12 months	**1.3(1.1-1.5)**	**2.6(2.2-3.0)**	**2.8(1.9-4.1)**
Health care:			
Four or less* medications	1	1	1
Five or more prescription medications	**1.8(1.5-2.0)**	**4.6(4.0-5.4)**	**3.3(2.3-4.7)**
Four or less GP visits*	1	1	1
Five or more GP visits	**1.5(1.3-1.7)**	**3.9(3.3-4.5)**	**3.2(3.3-4.5)**

* reference category

Cancers include breast, bowel and lung cancer.

4.3.2. Factors associated with declining physical function scores

Factors associated with declining scores for physical function, compared to continuously higher scores, are shown in the first columns of Tables 4.1, 4.2 and 4.3. Odds ratios for declining physical function scores were higher for women who were older, had lower education, were current smokers, were overweight and obese, and who had no or very low levels of physical activity. For women who were overweight, the odds ratio was 1.8 and for obese women the odds ratio was 2.9 for declining scores compared to maintaining high physical function scores. For women with lower levels of physical activity the odds ratio for declining scores was 1.5.

The odds ratios for declining scores compared to maintaining high scores were 1.2-1.7 for women with self-reported conditions (arthritis, heart disease, diabetes, stroke, chronic obstructive pulmonary disease (COPD) / asthma). Symptoms such as problems with one or both feet, vision and hearing problems, incontinence and back pain were associated with odds ratios of 1.2-1.6 for declining scores. Falls (reported at Survey 2) were associated with an odds ratio of 1.4 for declining scores, and for women reporting hip surgery the odds of declining scores was almost three times higher than for women without hip surgery. Likewise women who had been in hospital in the last 12 months had odds ratios of 1.3 for declining scores. Those who reported five or more prescription medications or five or more GP visits were also more likely to experience declines in subsequent scores in physical function scores.

4.3.3. Factors associated with consistently poor physical function scores

Factors that differentiated women with consistently poor physical function scores and those with consistently higher physical function scores are shown in the middle columns of Tables 4.1, 4.2 and 4.3. These factors were similar to those associated with declining scores. Odds ratios for having consistently poor scores were higher if participants were widowed, had lower education, were ex-smokers or current smokers, overweight or obese, and if they had no or very low physical activity. There was a very strong association between overweight and obesity and having consistently poor scores with overweight women being almost 3 times as likely to have poor scores, and obese women being more than 10 times more likely.

Odds ratios for having consistently poor scores were higher if participants reported arthritis, heart disease, stroke or bronchitis/emphysema/asthma. These effects remained after adjusting for comorbid effects of all other conditions in the model, and after adjustment for education, marital status, and body mass index.

Odds ratios for being in continuously poor health were higher if participants reported foot problems, vision problems, incontinence or back pain. Falls, falls with injury, other injuries, hip, eye and knee surgery, admission to hospital in the past 12 months, five or more medications, and five or more visits to a general practitioner were also associated with consistently poor scores. There was a very strong association between hip surgery and poor scores, with those who reported hip surgery being almost nine times as likely to have poor physical function scores.

4.3.4. Factors associated with increasing physical function scores

A small minority of women showed improving scores, with low scores at Survey 1 and high scores by Survey 5 (3% of women). Factors associated with this pattern are shown in the final columns of Tables 4.1, 4.2 and 4.3. Statistically the factors associated with having increasing scores, rather than consistently high scores, included being obese BMI at Survey 1, no or low physical activity, arthritis, heart disease, diabetes, stroke, vision problems, back pain, fall with injury, other injury, hip surgery, knee surgery, admission to hospital, taking five or more medications and five or more visits to a general practitioner. Hip surgery was very strongly associated with improvement in scores, with those who reported hip surgery having an odds ratio of more than 12.

Examination of comments made by women with this pattern of change in physical function scores indicates that many had experienced an acute event, followed by a recovery, or had restorative surgery such as hip or knee replacement. For example, one woman made the following comments on successive surveys:

> *Survey 1*: 4 weeks ago I had a fall and fractured my arm. Normally I am a very healthy person for my age.
>
> *Survey 2:* I have a bladder problem …
>
> *Survey 3:* My main problem is incontinence …
>
> *Survey 4:* I have recently celebrated my 80th birthday. My health has deteriorated slightly in the last 18 months but has not hampered me in my way of life.

Another woman made the following comments:

> *Survey 1:* My only health problem is arthritis … I have had one successful hip replacement (1991) and have been told I need the other hip replaced…
>
> *Survey 2:* I think I am quite healthy apart from osteoarthritis …
>
> *Survey 3:* I have benefited greatly from my hip replacements …
>
> *Survey 4:* …I mostly feel very well, and able to live my normal life and do the things I enjoy doing.

4.4. The impact of multiple conditions on health-related quality of life, health care use and death

One of the strongest and most consistent factors affecting women's physical health as they age is the type and number of health conditions and symptoms they experience. In this section of this report we look at the association between these conditions and health-related quality of life, health care use and death by the time of Survey 2 in 1999 (Tooth et al., 2008).

The association between chronic conditions and these outcomes is represented in Tables 4-4 and 4-5. In these tables, a tick (√) represents when a chronic condition was associated with (or predictive of) a particular health outcome: The more ticks, the stronger the relationship between the chronic condition and the outcome.

Seven chronic conditions were predictive of death (first column of Table 4-4). The chronic conditions with the strongest relationship with death were cancer and Alzheimer's disease. A large range of chronic conditions were associated with high numbers of GP visits, whereas more serious conditions such as cancer, heart disease and stroke were more likely to be associated with specialist visits or hospitalisations. Stroke, Alzheimer's disease, falls and cancer were also the strongest predictors of need for help with activities of daily living (see Table 4-4).

While many chronic conditions were associated with the SF-36 health-related quality of life subscales, the nature of the associations varied (see Table 4-5). The subscales reflecting the more psychosocial aspect of health-related quality of life, namely role limitations due to emotional problems, mental health, vitality and social functioning, had consistent associations with anxiety and depression. The subscales reflecting the more physical aspects of health-related quality of life, namely physical functioning, role limitations due to physical problems, general health and bodily pain, were associated with a larger range of chronic conditions (i.e. with a more uniform distribution of ticks). Alzheimer's disease was only associated with four of the subscales but had very strong associations with social functioning and general health.

Table 4-4 Chronic conditions and the outcomes (death, GP visits, specialist visits, hospitalisation, help with activities of daily living (ADL) they were related to.

Chronic condition	Deaths	9+ GP visits	Specialist visits	Hospitalisations	Help with ADL
Heart Disease	√	√√	√√	√√	√
Chest Pain		√	√	√	√
Stroke	√	√√	√√	√√	√√
Hypertension		√			
Fall caused serious injury		√	√	√√	
Fall (medical attention)		√	√		
Fall (fractures)				√√	√√
Urinary incontinence		√	√	√	√
Low Iron	√	√√	√	√	√
Arthritis		√	√	√	√
Osteoporosis		√	√		√
Bronchitis/emphysema	√	√	√		√
Asthma		√√		√	
Diabetes	√	√√			√
Other Cancer	√√	√√	√√√	√√	√√
Skin Cancer		√	√√	√	
Depression		√√	√		√
Anxiety		√			√
Alzheimer’s	√√				√√√√

Table 4-5 Chronic conditions and associated SF-36 sub-scales.

Chronic condition	Physical Functioning	Role Physical	Social Functioning	Vitality	General Health	Role Emotional	Bodily Pain	Mental Health
Heart disease	√	√√	√	√	√√		√	
Chest Pain	√	√√	√√	√√	√√	√√	√√	√
Stroke	√√	√√	√√	√√	√√			
Hypertension	√	√		√	√	√	√	
Fall caused serious injury	√		√					
Fall (medical attention)								
Fall (fractures)	√	√√	√√	√	√		√√	√
Urinary incontinence	√√	√√	√√	√√	√√	√	√√	√
Low Iron	√	√√	√√	√√	√√	√	√√	√
Arthritis	√√	√√	√	√√	√	√	√√√	√
Osteoporosis	√	√√	√	√√	√√		√√	√
Bronchitis/emphysema	√	√	√	√	√			
Asthma	√	√		√	√		√	
Diabetes	√	√√	√	√	√	√	√√	√
Other Cancer	√	√√	√√	√√	√√	√√	√	√
Skin Cancer		√		√			√	√
Depression	√	√√	√√	√√	√	√√√√	√√	√√
Anxiety	√	√√	√√	√√	√√	√√√	√	√√
Alzheimer’s disease	√√		√√√√		√√√			√√

4.5. Summary

In this report we examined changes in physical health of women as they move from being in their 70s (70-75 years at Survey 1) to their 80s (82-87 years at Survey 5). Approximately half of the women maintained good physical health throughout this period. A clear finding is that women whose health declined or started low and continued low had lower socio-economic status. They were more likely to be overweight or obese, undertake little physical activity and be current or ex-smokers. They suffered multiple chronic conditions and were heavy users of the health services.

There was a small group of women who reported clear improvements in health which appear to be related to restorative surgery (e.g. of hips or knees) or recovery from acute conditions or events. Different conditions impacted in different ways on women's health-related quality of life and their use of health services. For example, women with Alzheimer's disease needed more help with activities of daily living, had low scores on social functioning and general health, and were likely to die sooner. Women who had stroke or cancer were high users of services and had relatively low scores for all aspects of health-related quality of life. In contrast, women who reported bronchitis/emphysema were not high users of health services, but they experienced some reduction in physical, but not mental health scores.

From a long-term policy perspective the implications of these findings is that reducing socio-economic differentials in health status and health behaviour early in life and throughout adulthood holds the best prospect for reducing the impact in old age of chronic conditions and their consequences on health care costs and services.

4.6. References

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5. Chronic conditions facing older women

5.1. Key Findings

This section provides more information on some of the key conditions that affect women as they age, including arthritis, diabetes, sleep disturbance and incontinence. These conditions were selected because they are common and they impact on women's quality of life in different ways.

Arthritis

- Arthritis is one of the most common conditions affecting older women; it was reported by 63% of respondents to Survey 4 (conducted in 2005 when the women were aged 79-84 years).
- Women who reported arthritis were more likely to be overweight or obese, smoke, and had more co-morbid conditions than women who did not have arthritis.
- Arthritis has a significant impact on women's quality of life in terms of general health, role limitations due to physical health problems, and pain.
- Arthritis also has a significant impact on women's social function and vitality.
- Arthritis is associated with significant increases in health care costs.
- Walking and other moderate intensity physical activities were associated with lower rates of arthritis.

Diabetes

- Among women who responded to Survey 4, 15% had reported on at least one survey that they had diabetes.
- Women with diabetes tended to have lower levels of education.
- Women with diabetes were more likely to also report hypertension, heart disease and eyesight problems.
- Women with diabetes were more likely to be overweight or obese, and less likely to have adequate levels of physical activity than women without diabetes.
- Between 1997-2002, fewer than 60% of women with diabetes had record of having a HbA1C test billed through Medicare, and only 9% of women had tests for HbA1C, microalbuminuria and serum lipids as recommended for good diabetes care.
- A large proportion of older women with diabetes did not engage in appropriate self-management and preventive activities.
- A large proportion of older women with diabetes reported poor outcomes associated with diabetes.

- Women with better knowledge of diabetes care also had better risk behaviours and preventive activities, and better outcomes.
- Women with more knowledge of diabetes had more education, received multidisciplinary diabetes care, nutritional advice from a dietitian, had HbA1c tests and eye tests, and had visited a diabetes education centre.
- Women with Type 1 diabetes were more likely to report better risk and preventive behaviours, receiving care from a specialist and/or multidisciplinary care, receiving nutrition advice and having visited a diabetes education centre.
- Diabetes is associated with substantial increases in health care costs.

Sleep disturbance

- Sleep disturbance is common among older women with 17% of women reporting they often had difficulty sleeping at Survey 1.
- The prevalence of sleeping difficulty increased over time.
- Sleeping difficulty is associated with poorer health-related quality of life on both cross sectional and longitudinal analyses.
- Use of sleeping medication, usually hypnotic sedatives, was reported by 15% of the women who responded to Survey 2.
- Use of sleeping medications was associated with poorer health-related quality of life, falls, more doctor consultations and more days in hospital.
- Sleeping difficulty was a long standing problem for many women.
- Women attributed their sleep disturbance to a number of events and factors including being widowed, periods of illness or an accident, moving house, and to worry or fear.
- Women with sleeping difficulty reported a range of other symptoms that interfere with sleep including pain, difficulty breathing, bad dreams, having to get up to use the bathroom, coughing/snoring, being too cold or too hot.
- Women with sleeping difficulties had poorer survival rates than other women, but not after other factors that affect survival are accounted for.

Incontinence

- Among women who participated in Survey 4, 27% of reported leaking urine ‘sometimes’ or ‘often’.
- Women were almost twice as likely to report leaking urine at Survey 4 as at Survey 2.
- Between Survey 1 and Survey 4, 15% of women developed incontinence.
- Women who reporting of leaking urine at one survey did not necessarily report this condition at other surveys.

- Incontinence was strongly associated with problems such as dementia, reduced physical functioning history of falls to the ground, high BMI, constipation, urinary tract infection, prolapse repair, and history of prolapsed bladder or bowel. Parity, hysterectomy, stroke and number of visits to the GP were less strongly associated with incontinence.
- Incontinence was not significantly associated with area of residence, education, smoking, diabetes or attending social groups or support groups.
- Women with incontinence had lower scores than other women on several health-related quality of life measures. However, for women who reported incontinence for the first time the scores had been lower even before they reported incontinence, indicating that some factor that preceded their incontinence may have contributed to their poorer social and physical functioning.

5.2. Introduction

Many chronic diseases increase in prevalence in older age. These may be non-fatal conditions that people have carried from earlier life or conditions that have been newly diagnosed in older age. In this section of the report we consider some of the more prevalent conditions and symptoms affecting women in older age and explore the impact of these conditions on women's quality of life. The conditions all impact on women's quality of life, but in different ways.

Most of the older women in the study are living with at least one chronic condition, and many are living with multiple conditions. While the presence of one or more chronic conditions does not preclude ageing well, there is an increased risk of physical health decline. The more conditions a woman has, the higher the probability of poor health-related quality of life and functional decline.

Diagnoses and symptoms most commonly reported by women at Survey 1 in 1996 are presented in Figure 5-1 and Figure 5-2. The most common condition was hypertension, which was reported by about half the women in the study. Arthritis was the next most common condition, and diabetes was the 10th most common condition on the list, affecting around 9% of the women at age 70-75 years. Around half of the women reported painful joints, back pain, difficulty sleeping and eyesight problems (see Figure 5-2).

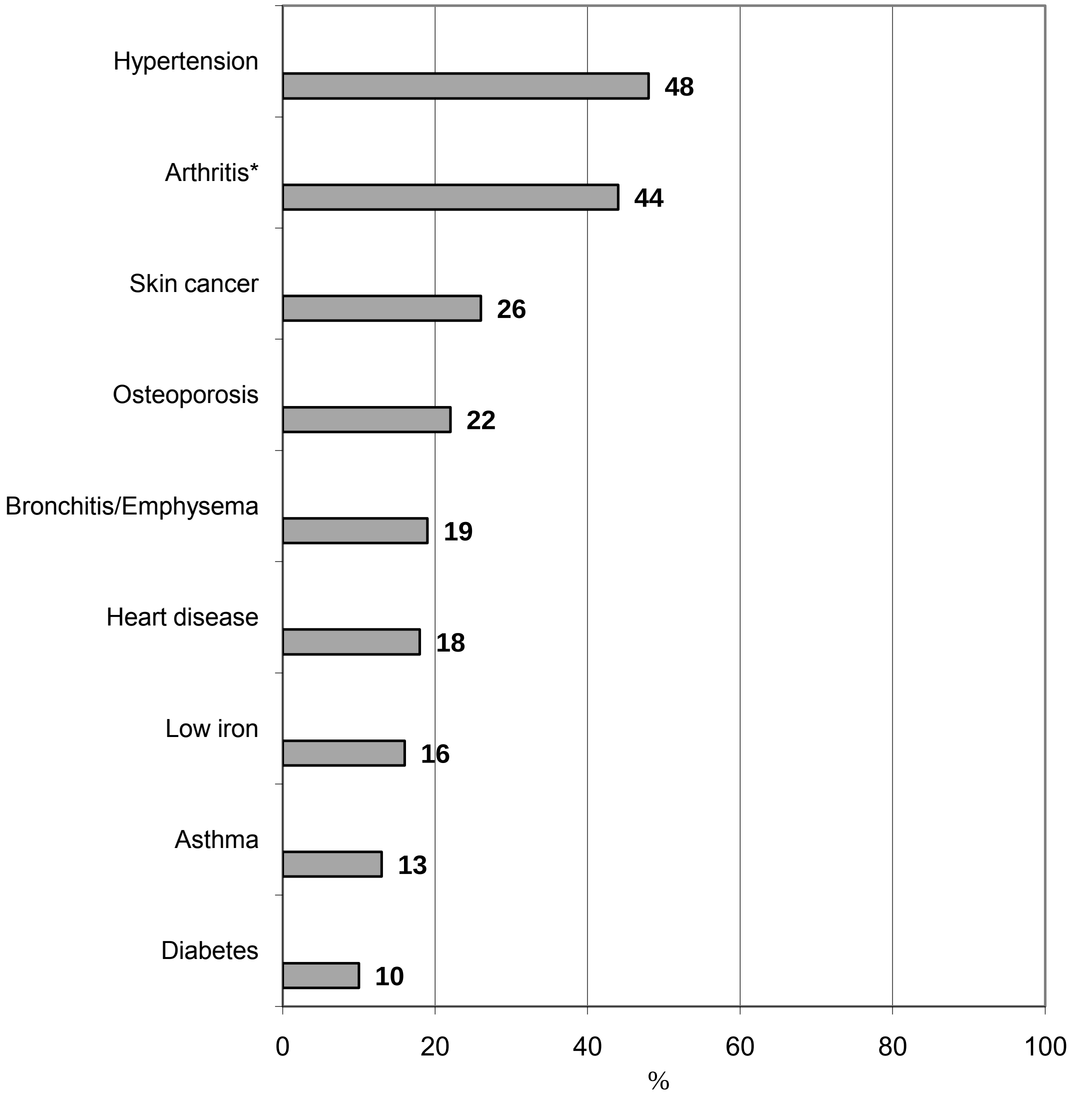


Figure 5-1 Prevalence of common self-reported diagnoses at Survey 1 in 1996, N=12,432 women aged 70-75 years (*arthritis assessed at Survey 2 in 1999).

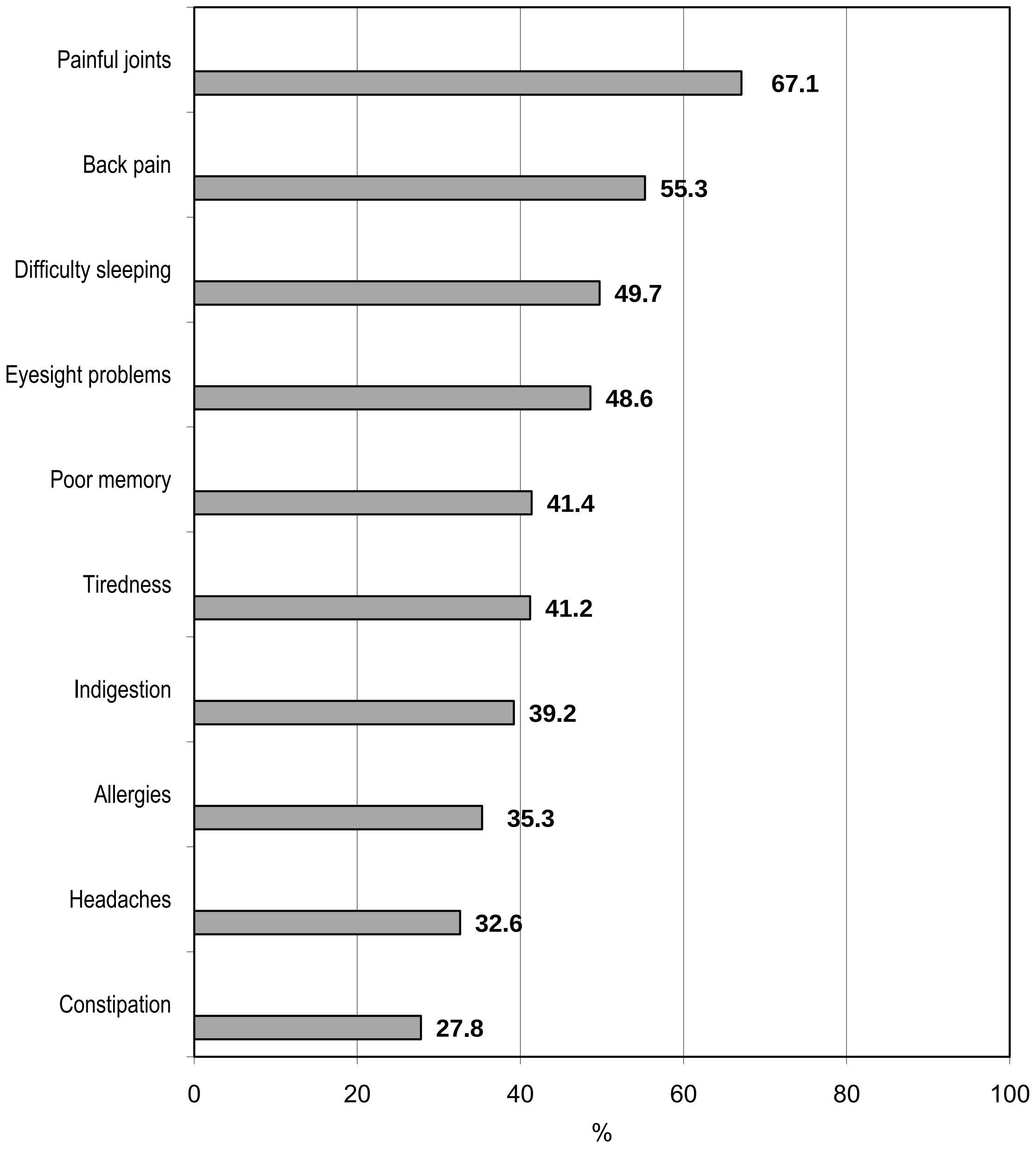


Figure 5-2 Common symptoms reported at Survey 1 in 1996, N=12,432 women aged 70-75 years.

As seen in Section 3 of this report, a number of women died over the course of the study and the existence of chronic conditions at Survey 1 was one of the important predictors of mortality. Among the survivors, there was a significant increase in the prevalence of many of these conditions over time, and these conditions had serious impact on women's quality of life as they aged.

Here we will examine more closely how some common conditions (arthritis, diabetes, sleeping difficulty and incontinence) have affected the quality of life of women who stayed in the study from Survey 1 to Survey 4.

5.3. Arthritis

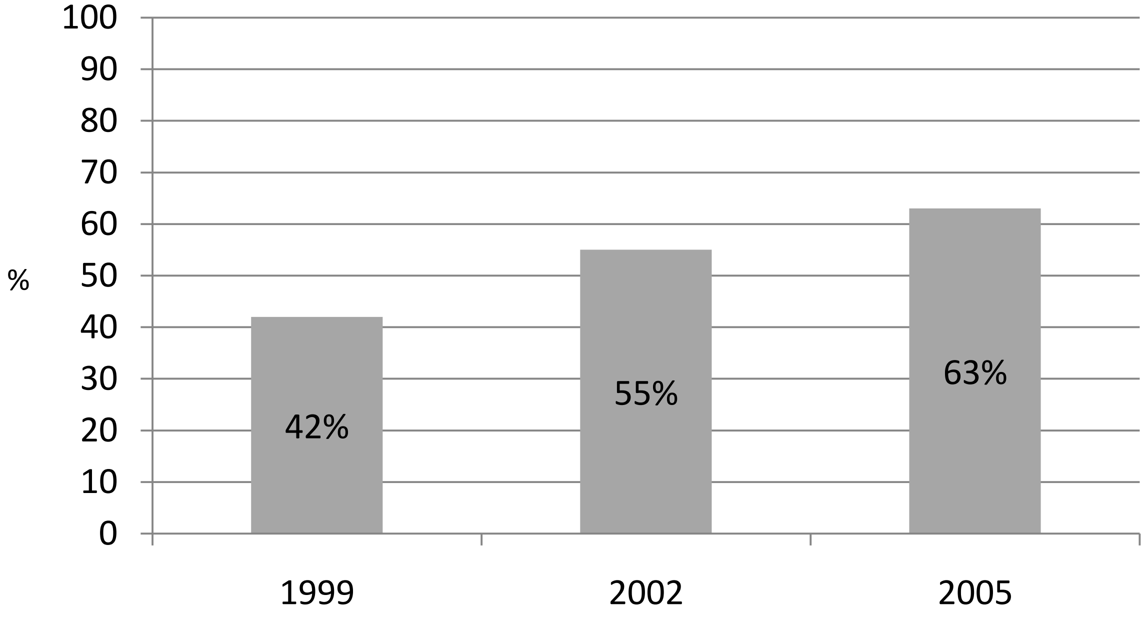
Arthritis is Australia's major cause of disability and chronic pain, and is the most common cause of activity limitation and disability among older women in developed countries. In 2004, arthritis affected around 3.4 million Australians (18.4% of women and 15.1% of men) and it is estimated that over 50% of Australians aged 75 or over have arthritis. It is expected that demographic ageing will increase the proportion and number of Australians with arthritis by 35% to around 4.6 million (to one in every five people) by 2020.

The prevalence of arthritis is significantly higher for women than for men; more than 60% of those with arthritis are women. The negative impact of arthritis has been well described in cross sectional surveys and among clinical populations, but few longitudinal studies have tracked the impact of arthritis on the health of women in the community. Here we show the changes in the prevalence and incidence of arthritis and the cumulative impact of this condition on women's lives.

5.3.1. Self reported doctor diagnosis of arthritis

In Surveys 2, 3 and 4 for the 1921-26 cohort, women were asked: "In the past three years have you been diagnosed or treated for Arthritis?" "Doctor diagnosed arthritis" is an internationally accepted measure of arthritis and is used in World Health Organisation (WHO) surveys (WHO, 2002). Type of arthritis was not asked as self-reported data on arthritis type have been shown to be inaccurate (Wailitt et al., 2008). Women's reports of arthritis could therefore include all arthritis types: osteoarthritis, rheumatoid arthritis, psoriatic arthritis and septic arthritis. Arthritis reported by older women would be expected to be predominantly osteoarthritis.

Figure 5-3 shows the prevalence of self reported doctor diagnosed arthritis across the three surveys (Survey 2, Survey 3 and Survey 4). In 1999 (Survey 2) when the women were aged 73-78 years, 42% reported arthritis, and by 2005 (Survey 4) 63% of these women, then aged 79-84 years, had reported arthritis. The prevalence of arthritis increased with age, as expected; however, the incidence (new cases) declined from 22% at Survey 3 to 18% at Survey 4 (Parkinson et al., 2010).



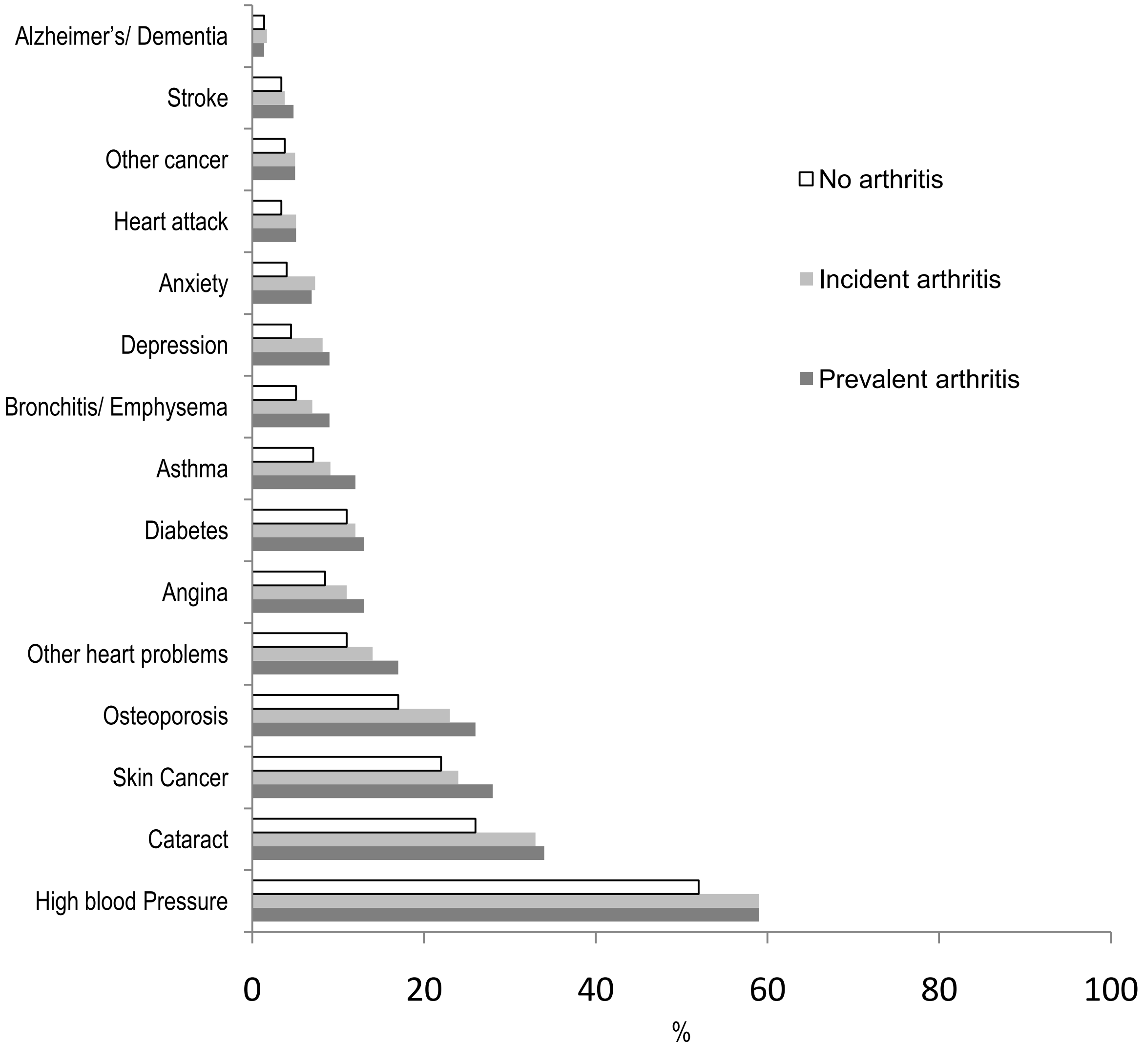
Source: Parkinson et al., (2010). Older women and arthritis: Tracking impact over time. *Australasian Journal on Ageing*

Figure 5-3 Prevalence of Arthritis for 1921-26 cohort across Surveys 2, 3 and 4.

5.3.2. Factors associated with arthritis

There were few demographic differences between women who did and did not report arthritis at any survey, except that those with arthritis were more likely to find it difficult to manage on their income (Parkinson et al., 2010). Women who reported arthritis were also more likely to be overweight or obese, to exercise less, and to be smokers, than women who did not report arthritis. Women with arthritis also reported more co-morbid diagnoses than those without arthritis (see Figure 5-4).

Women with arthritis were less likely to report their health as very good or excellent, more likely to be classified as depressed, and more likely to be categorised as anxious according to scores on the Goldberg Anxiety and Depression scale (Parkinson et al., 2010).



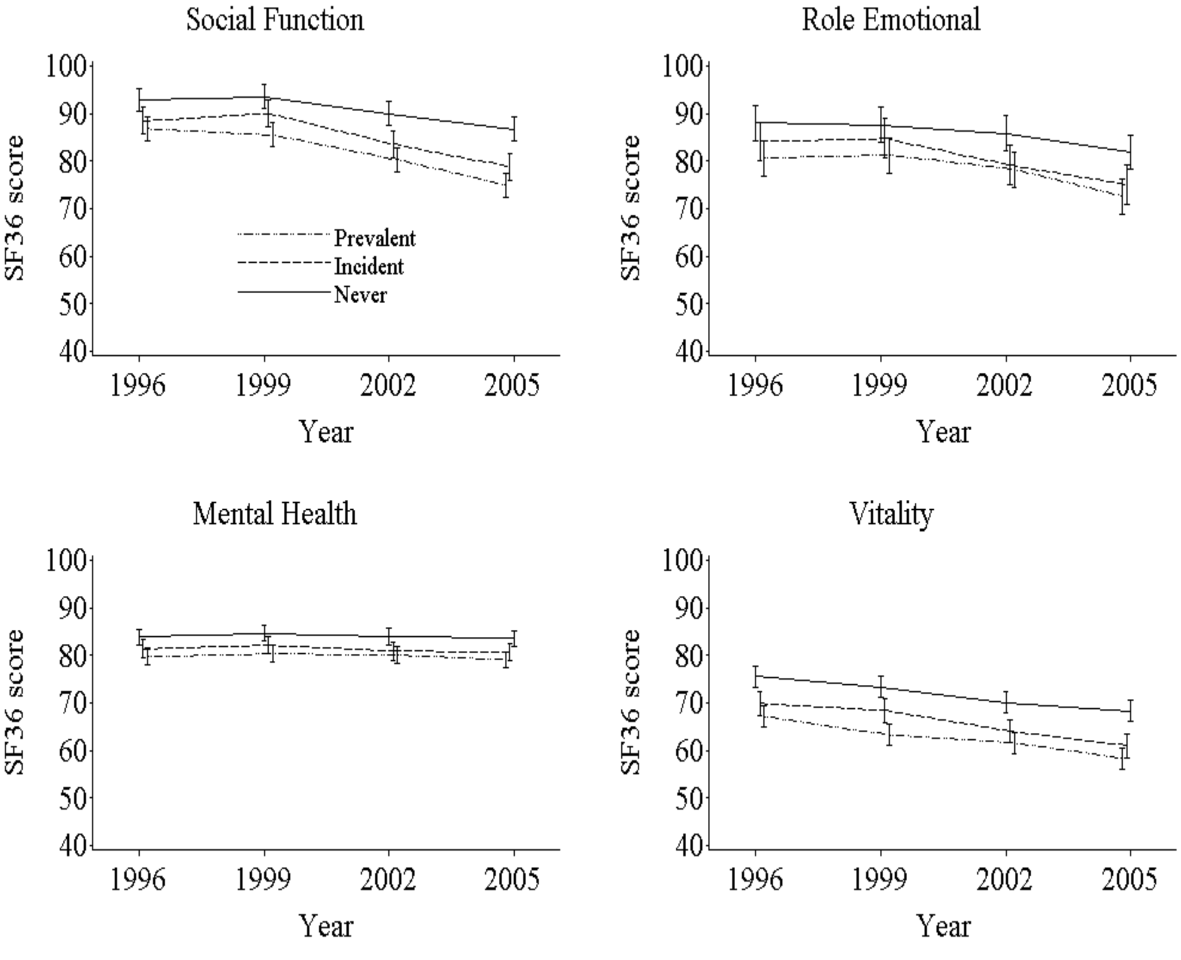
Adapted from: Parkinson et al., (2010). Older women and arthritis: Tracking impact over time. *Australasian Journal on Ageing.*

Figure 5-4 Other conditions reported at Survey 4 by women with prevalent arthritis (arthritis first reported at Survey 2), incident arthritis (arthritis first reported at Survey 3 or 4), and those who had never reported arthritis.

5.3.3. Impact of arthritis on women's health and quality of life

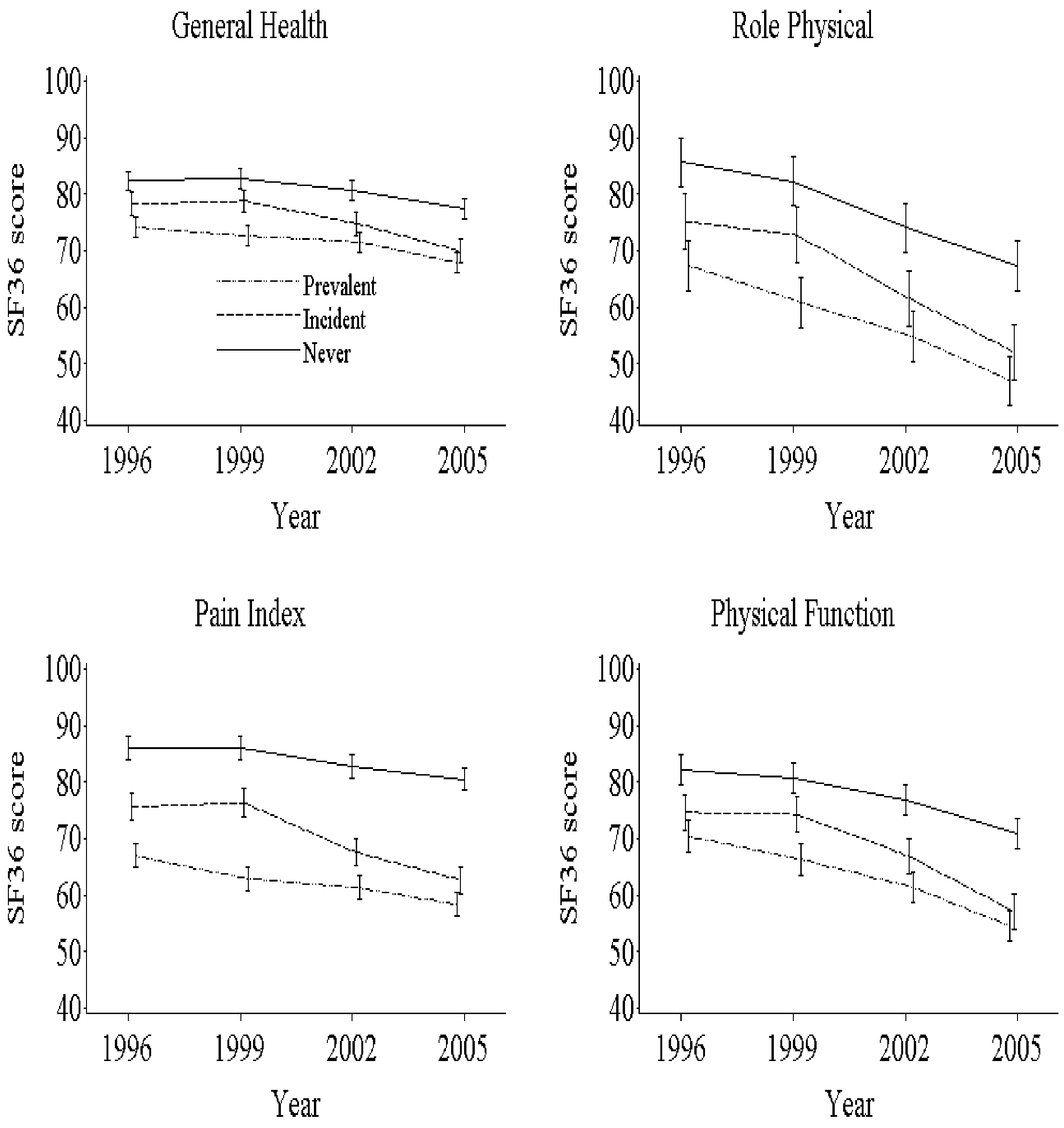
The impact of arthritis on women's health-related quality of life (measured using the SF-36 profile) is shown in **Figure 5-**. Women with prevalent arthritis (arthritis first reported at Survey 2) and women with incident arthritis (arthritis first reported at Survey 3 or 4) started with significantly lower scores for physical function, pain, and the role physical subscale (reflecting role limitations due to physical health problems) than women who never reported arthritis. Women with incident arthritis had a greater decline in all these measures, with their scores at Survey 4 (2005) for physical function, pain, general health, and the role physical subscale reaching those for women with existing arthritis.

Mental health, as measured by the SF-36, appears to be more resilient to the impact of arthritis than the measures of physical-health related quality of life, with only small differences between scores for the three groups of women. The scores for the social function subscale, however, show substantial decline for women with arthritis. Vitality scores declined over time for all groups, with scores for those with arthritis remaining lower than those without arthritis at all time points. Differences in role emotional scores between the groups did not become statistically significant until Survey 4 (2005), and then only for those with prevalent arthritis compared with those with no arthritis.



Source: Parkinson et al.,(2010).Older women and arthritis: Tracking impact over time. *Australasian Journal on Ageing*

Figure 5-5A Health-related quality of life scores for women with prevalent arthritis (arthritis reported at Survey 2) incident arthritis (arthritis first reported at Survey 3 or 4), and those who had never reported arthritis.



General Health

Role Physical

Pain Index

Physical Function

Source: Parkinson et al.,(2010).Older women and arthritis: Tracking impact over time. *Australasian Journal on Ageing*

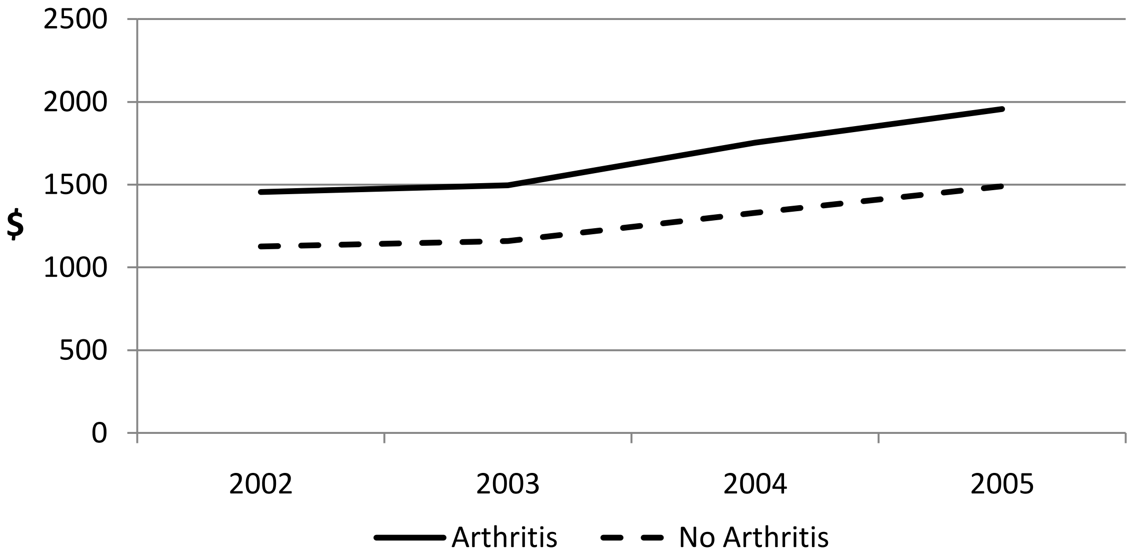
Figure 5-5B Health-related quality of life scores for women with prevalent arthritis (arthritis reported at Survey 2) incident arthritis (arthritis first reported at Survey 3 or 4), and those who had never reported arthritis.

5.3.4. Arthritis and Physical Activity

There is conflicting evidence about the role of leisure-time physical activity (LTPA) in the prevention of arthritis in older women. Data from 3613 women who did not report arthritis at Survey 2 in 1999 were analysed to examine the prospective relationships between both LTPA and walking, with incident arthritis over the next six years. The odds ratios for self-reported arthritis were lowest for women who reported the equivalent of 75-<150 minutes of moderate-intensity LTPA per week. Slightly higher odds of incident arthritis were seen in women who reported higher activity levels. For women whose only activity was walking, there was an inverse dose-response relationship between walking and arthritis. These findings suggest that older women who are able to walk should be encouraged to engage in walking or other moderate-intensity physical activities to decrease the risk of arthritis in old age. (Heesch et al., 2008)

5.3.5. Impact of arthritis on government health care costs

Women who reported arthritis had higher health care use and higher Medicare costs in general, and were likely to have more family doctor and specialist doctor visits per year. In 2005, average (mean) total Medicare costs (to the health system) were $1957 for women with arthritis and $1491 for women without arthritis, making costs for women with arthritis 31% higher than for those without this condition (Parkinson et al., in press). See **Error! Reference source not found.**.



Source: Parkinson et al., *Australian New Zealand Journal of Public Health*, (under editorial review).

Figure 5-6 Medicare costs for women with and without arthritis (2005 Australian Dollars).

5.3.6. Discussion

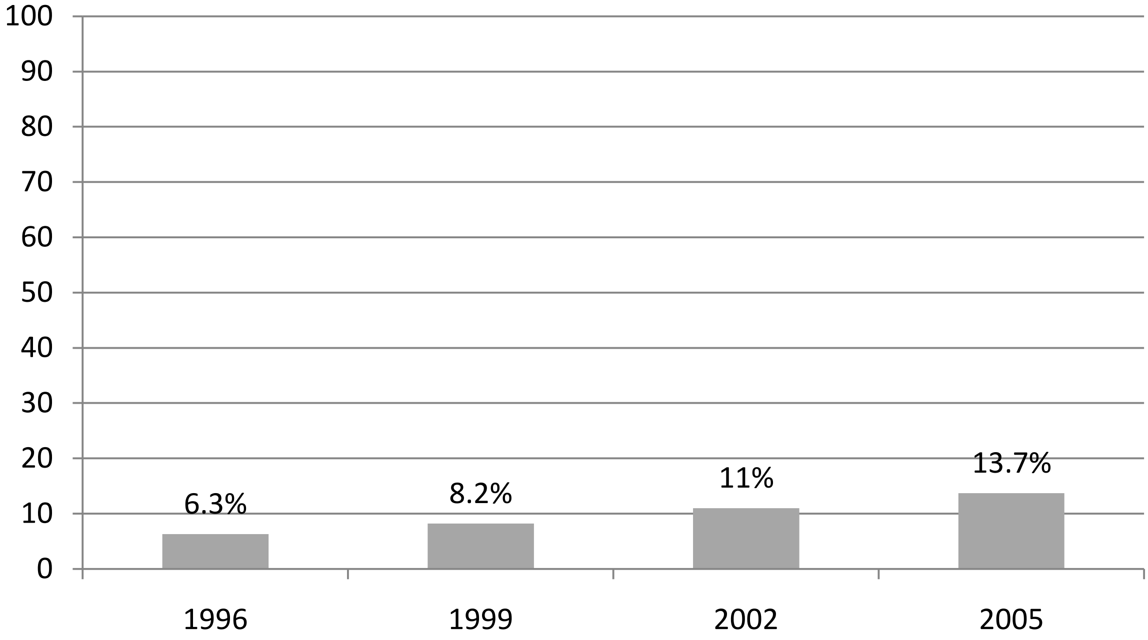
Arthritis is associated with significant negative impact on health and quality of life, and higher health care costs for older women in Australia. Moreover, self-reported arthritis and arthritis symptoms are highly prevalent among Australian women, where 63% of this group of women, aged 77-85 years, reported arthritis in 2005. Obesity is more common among women who report arthritis than those who do not. As obesity may be a risk factor for arthritis, the prevalence and costs of arthritis may also increase as obesity becomes more prevalent among the Australian population. Conversely, arthritis is a risk factor for low rates of physical activity and may therefore predispose older women to obesity and other consequences of sedentary behaviour. The fact that women with arthritis are also likely to have other conditions is an important consideration in the prevention and management of both the arthritis and the associated co-morbidities.

5.4. Diabetes

The ageing of the population, reductions in physical activity and increase in obesity have all contributed to the increased prevalence of diabetes among older people. Diabetes is a costly chronic disease and is associated with a variety of complications and premature mortality. Consistently high blood sugar levels can, over time, lead to blindness, kidney failure, heart disease, limb amputations, and nerve damage. Diabetes is the seventh most common problem managed in general practice and the cost of diabetes has been predicted to rise dramatically over the next decade in Australia unless measures are taken to reduce complications from poorly controlled diabetes and prevent or delay its onset.

5.4.1. Self reported doctor diagnosis of diabetes

In each survey, 7-13% of women in the 1921-26 cohort who stayed in the study at Survey 4 reported they had been told by a doctor that they had diabetes (in the past three years), and 15% reported they had diabetes at any Survey (see Figure 5-7).

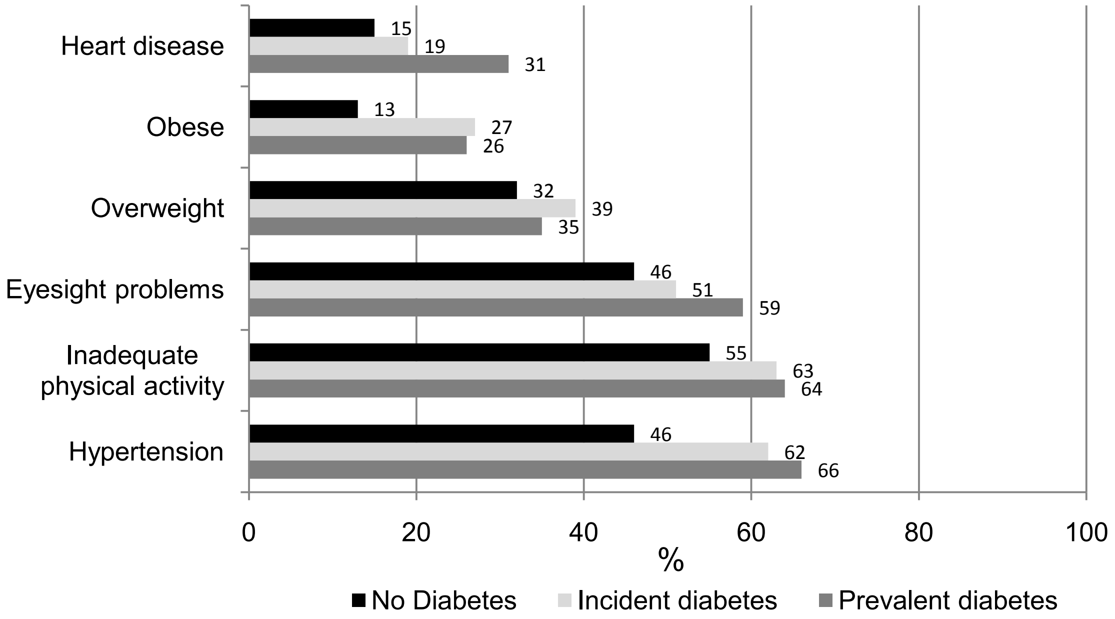


Source: Byles et al. (2008). *Use and costs of medications and other health care resources: findings from the Australian Longitudinal Study on Women's Health*. Report prepared for the Australian Government Department of Health and Ageing, 2 June 2008.

Figure 5-7 Prevalence of diabetes for 1921-26 cohort across Surveys 1, 2, 3 and 4.

5.4.2. Characteristics of women with diabetes

Young et al. (2005) compared the characteristics of women with diabetes at Survey 2 with the characteristics of women who did not have this condition. Women with diabetes tended to have lower levels of education. They were also more likely to have hypertension, heart disease and eyesight problems. There were striking differences in body mass index and physical activity levels between women with and without diabetes with more than 60% of women with diabetes not meeting the current physical activity guidelines (30 minutes of moderate activity /day).



Adapted from: Young et al., (2005). *Australian and New Zealand Journal of Public Health*.

Figure 5-8 Characteristics of women with prevalent diabetes (diabetes first reported in 1996), incident diabetes (diabetes first reported in 1999) and those with no diabetes at Survey 2 (1999).

5.4.3. Quality of care for diabetes management

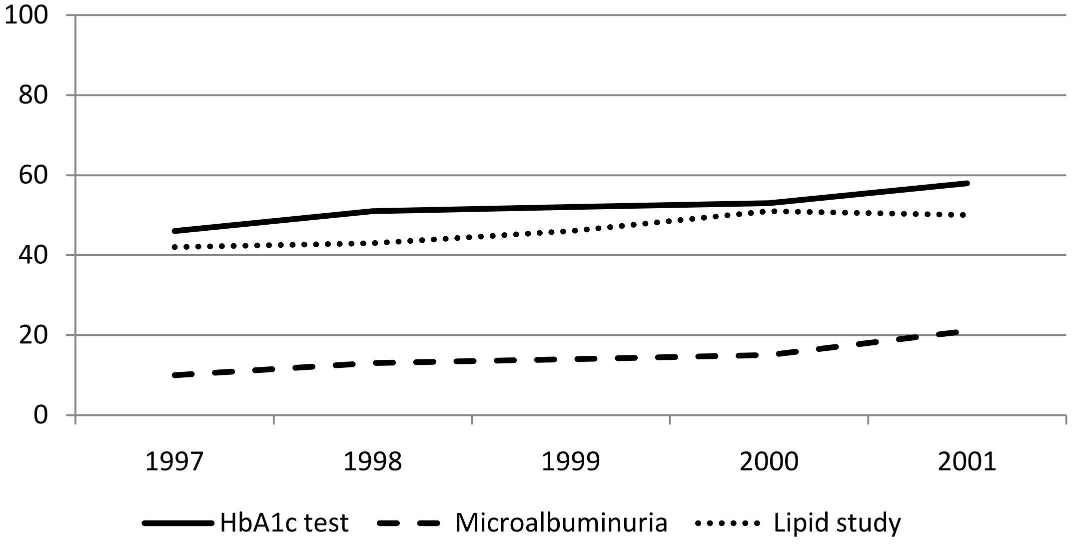
Current Australian guidelines for quality management of diabetes include testing glycosylated haemoglobin (HbA1c) every 3- 6 months for insulin-treated patients and every 6-12 months for non-insulin treated patients, and testing blood lipids and microalbuminuria once a year.

Young et al., (2005) linked survey data for the 10,421 women from the 1921-26 cohort who completed Survey 2 in 1999, with Medicare Australia data on medical practitioner and pathology service use, to describe the use of general practitioner and specialist services, and the compliance with best practice guidelines for testing HbA1c, lipids and microalbuminuria for women with diabetes. Of the 10,421 women in this analysis, 840 women (8.1%) reported they had been diagnosed with diabetes prior to Survey 1 in 1996 and 266 new cases (2.6%) were diagnosed between 1996 and Survey 2 in 1999.

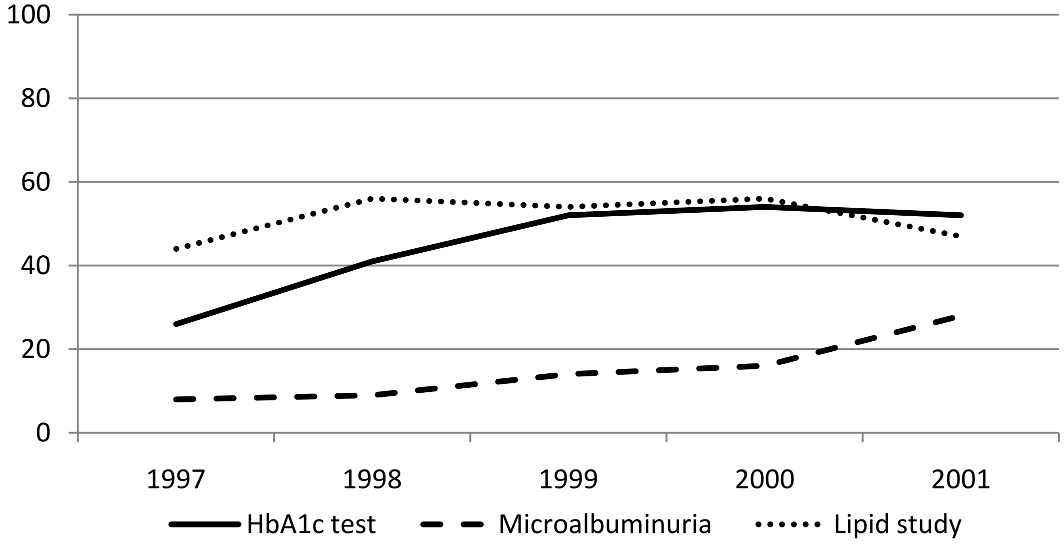
Measures of health service utilisation and diabetes care are shown in Figure 5-9. Use of HbA1c tests was less than the recommended 6-12 monthly, with fewer than 60% of the women with diabetes having a record of this test in each year from 1997 to 2001. However, there was a trend over the five-year period for a greater percentage of women with diabetes to have the test at least once a year. Rates of testing microalbuminuria were low, rising from about 10% in 1997 to 20% in 2001. Similarly, rates of lipids testing increased over the five-year period but were far from conforming to the best practice guidelines of at least annual testing (Young et al., 2005).

In total, only 9.1% of the women had all three tests performed. Having more frequent consultations with a general practitioner was the one variable significantly associated with having all three recommended tests for best practice care (Young et al., 2005).

a) Percentage of women with prevalent diabetes (first reported at Survey 1 in 1996) who had each test



b) Percentage of women with incident diabetes (first reported at Survey 2 in 1999) who had each test

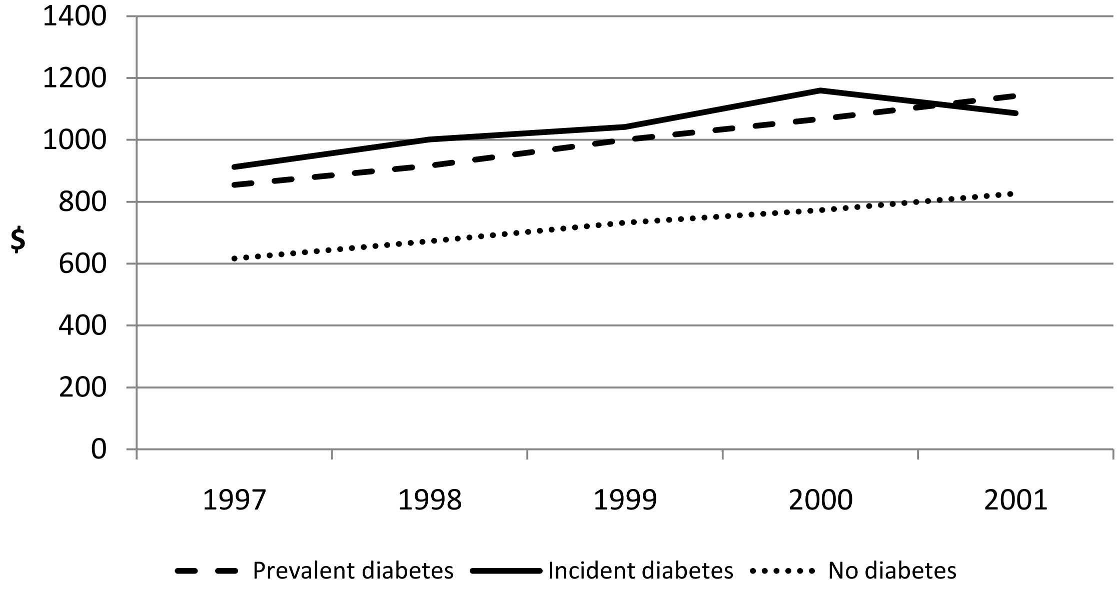


Source: Young et al., (2005) *Australian and New Zealand Journal of Public Health*.

Figure 5-9 Measures of health service utilisation from 1997-2001 according to diabetes status.

5.4.4. Impact of diabetes on government health care costs

Young et al. (2005) also calculated the average amount of money spent each year on medical services subsidised by Medicare (outside hospital) for women with and without diabetes. These costs to government are shown in Figure 5-10. To allow for the effects of inflation, costs for all years were adjusted to 2001 dollar values using the consumer price index published by the Australian Bureau of Statistics for the June quarter of each year. Costs increased each year and were substantially more for women with diabetes than women without diabetes.



Source: Young et al., (2005). *Australian and New Zealand Journal of Public Health*

Figure 5-10 Medicare costs (total costs to the government) for women with diabetes at Survey 2 (2001 Australian Dollars).

5.4.5. Knowledge and self-management of diabetes and impact on diabetes outcomes

Self management of diabetes is an essential component of diabetes care, and to achieve good self-care, people with diabetes should be knowledgeable about the purpose and clinical utility of diagnostic tests and monitoring (Funnell & Anderson, 2004). In 2001 a sub-study was undertaken to identify and describe women's attitudes to diabetes, their knowledge of diabetes, their self management behaviours, and their health outcomes and, to explore the interrelationship between these factors. The study involved analysis of data from 655 women aged 75-80 years participating in the ALSWH, who reported having diabetes (Byles et al., 2010). Among these women, 92% had Type 2 diabetes, 40% had diabetes for more than ten years, and 64% felt that their diabetes was well controlled.

Most women expressed positive attitudes about the impact of diabetes on their lifestyle and their adjustment to having the condition (see Table 5-1). However, 26% of the women believed that the proper control of diabetes involved a lot of sacrifice and inconvenience. Furthermore, 35% of the women in both age groups did not like being told what to eat, when to eat, and how much. One fifth of the women said they tried not to let people know they had diabetes.

Table 5-1 Percentage of women who agree with positive and negative statements about having diabetes.

Statement	%
Positive	
I believe I have adjusted well to having diabetes	86
Diabetes is not really a problem because it can be controlled	85
Having diabetes has encouraged me to improve my lifestyle	71
My diabetic diet does not really spoil my social life	62
Negative	
I try not to let people know about my diabetes	21
Most doctors really don't understand what it's like to have diabetes	19
The proper control of diabetes involves a lot of sacrifice and inconvenience	26
I do not like being told what to eat, when to eat, and how much	35

Source: Byles et al., Nova Science Publishers (in press)

In general, women had less than optimum levels of knowledge, and a large proportion did not engage in appropriate behaviours and preventive activities (see Table 5-2). Although most of the women understood the risk that being overweight had on their health, less than one-third were familiar with the HbA1c test and only half could correctly identify the normal range for blood glucose.

A large proportion of the women reported poor outcomes associated with diabetes including poor glucose control, poor circulation and retinopathy (see Table 5-3).

Table 5-2 Knowledge, behaviours and activities for women with diabetes.

	%
Knowledge	
Heard of HbA1c (long term sugar) test	29
Knew normal range for blood glucose	49
Understood risk of overweight to health	76
Understood good control of diabetes	68
Behaviour	%
Sugar levels tested at least 2-6 times weekly	59
Blood tested by meter at home	78
Taking more than seven medications	24
BMI ≥ 30	24
Preventive activities	%
Feet examined in past year	72
Back of eyes examined in past year	62
Attended a diabetes education centre	66

Source: Byles et al., Nova Science Publishers (in press)

Table 5-3 Selected Health Outcomes among women with diabetes.

Health Outcomes	%
Blood tests mainly 4-10 mmol/L past month	68
More than one hypoglycaemic episode in past year	5
More than 7 days in hospital in last year	16
Currently being treated for hypertension	67
Ever had high cholesterol/triglycerides	50
Poor circulation to the feet/legs	43
Suffered from/treated for retinopathy	25
Had heart bypass surgery	9

Source: Byles et al., Nova Science Publishers (in press)

Knowledge scores for these women were positively correlated with behaviour and outcomes scores, indicating that women with better knowledge of diabetes self-management had better self-management and also had better outcomes (i.e., better diabetes control, fewer complications and hospitalisations). However there was no association between current diabetes care behaviours and health outcomes.

Responses to the Diabetes Care Sub-study were used to derive scores to reflect knowledge of diabetes, self-management behaviours, and outcomes. Higher knowledge scores were associated with having more education, receiving multidisciplinary diabetes care, receiving nutritional advice from a dietitian, having HbA1c tests and eye tests, and having visited a diabetes education centre. Higher behaviour scores (better behaviour) were associated with having Type 1 diabetes, receiving care from a specialist and/or multidisciplinary care, receiving nutrition advice and having visited a diabetes education centre.

5.4.6. Discussion

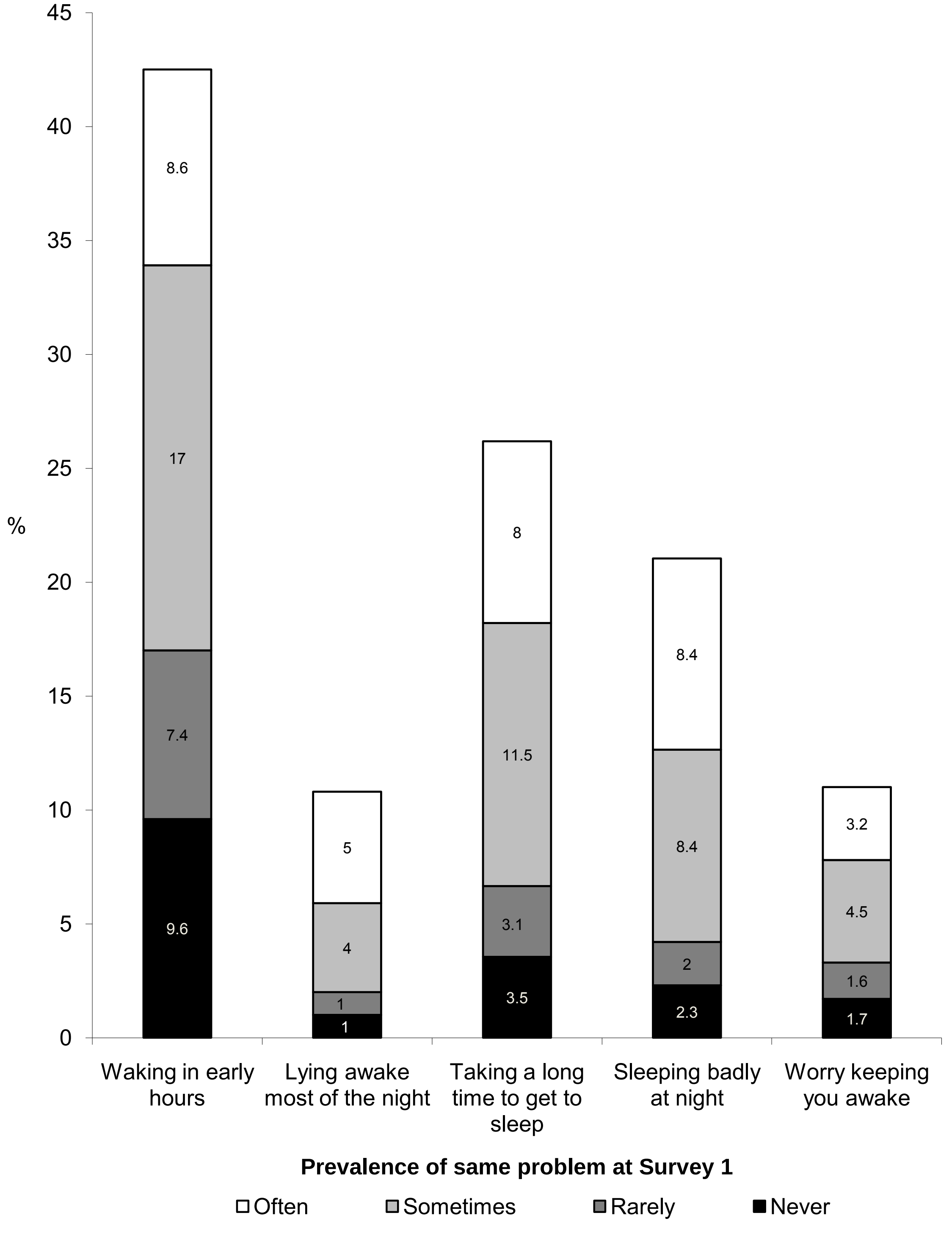
Diabetes is a common and costly condition that is likely to increase as the prevalence of obesity increases (Mishra et al., 2007). Prevention of diabetes in mid-age will result in fewer older people with diabetes. For those who already have diabetes, our results show that at a community level there is a great need to improve knowledge and behaviours among the growing population of women with diabetes, particularly those with Type 2 diabetes. Better knowledge is associated with better behaviours and with better health outcomes. Better knowledge was also associated with having attended a diabetes education centre, providing strong support for the work of these centres.

Women in this older age group have a particular need for diabetes education (American Association of Diabetes Educators, 2003). It has been suggested that proactive management of patients with diabetes requires an interdisciplinary approach with the expertise and cooperation of several healthcare professionals. Only around 25% of older women in the ALSWH studies reported receiving such multi-disciplinary care.

5.5. Sleep Disturbance

It is well known that sleeping difficulty is common among older people, particularly women. At Survey 1 of the ALSWH, when the women were aged 70–75 years, approximately 50% reported some degree of difficulty sleeping, and 17% reported they often had difficulty sleeping. There were also strong statistical associations between self-reported sleeping difficulty and health-related quality of life, and between use of sleeping medications and quality of life (Hasan et al., 2001).

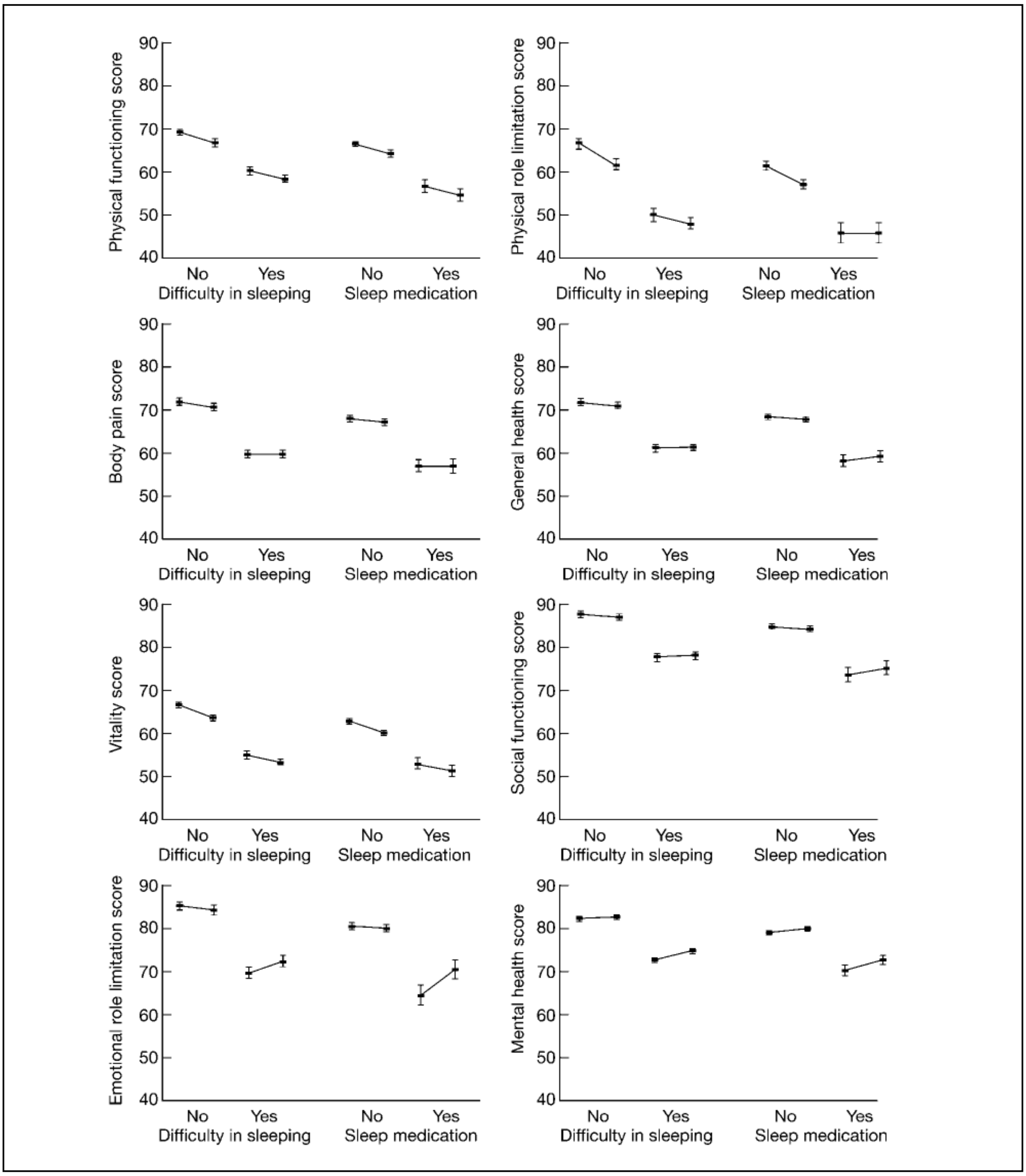
At Survey 2 in 1999, women were asked whether they had any of five sleep related problems. Overall, 63% of women reported at least one sleeping problem: 33% reported one problem only, 16% reported 2 or 3 items, and 14% reported more than 3 items (Byles et al., 2003). Responses to individual items provide more detail on the types of difficulty reported, with 42% of women reporting ‘waking in the early hours’, 26% ‘taking a long time to get to sleep’, 21% ‘sleeping badly at night’, and 11% ‘lying awake most of the night’. Eleven percent of women reported ‘worry keeping you awake’ was a problem for them (See Figure 5-11). Use of sleeping medications was reported by 15% of the women and women were most likely to use medications if they reported they were ‘sleeping badly at night’ or ‘taking a long time to get to sleep’. Women were less likely to use medication for ‘waking in the early hours’.



Source: Byles et al., (2003) *Age and Ageing*.

Figure 5-11 Self-reported prevalence of sleeping difficulty at Survey 2 by prevalence of sleeping difficulty at Survey 1 among Australian women aged between 73-78 years of age at Survey 2.

Women who reported sleeping difficulty at Survey 1 in 1996 had lower mean scores for all the eight dimensions of SF-36 health-related quality of life than those with no sleeping difficulty. Similar trends were also present for those taking sleeping medication (See Figure 5-12). Sleeping medication, but not sleeping difficulty, was also significantly associated with falls, doctor consultations and days in hospital.



Source: Byles et al., (2003) *Age and Ageing*.

Figure 5-12 Means and 95% confidence intervals for eight dimensions of the SF-36 health-related quality of life by sleeping difficulty at Survey 1, and the use of sleeping medications at Survey 1 (line joins the Survey 1 mean to Survey 2 mean).

Given the prevalence, persistence and impact of sleeping difficulty on the lives of older women, a further study was undertaken to explore women's experience of sleeping difficulty and the relationship between this symptom and women's quality of life. This study involved a sample of 1210 women (1011 respondents) who had responded to Survey 2 of the ALSWH. These women were randomly selected from four mutually exclusive groups, stratified according to their reports of sleeping difficulty and use of sleeping medications. Among women with any sleeping problems at Survey 2, the average self-reported duration of problems was approximately 10 years (mean=13.6, median 10, interquartile range 4-20), indicating that the sleeping difficulties experienced by women in the study were often longstanding. Around one-third said that their sleeping problems commenced when they were widowed, and 24% said their problems started during a period of illness. Approximately 8% of women said their problems started after moving house, and roughly 5% said their problems started after an accident. Approximately 10% said their sleeping problems started after some other event, and around 30% could not attribute their problems to a cause. Around 20% to 30% said they are "too worried" to sleep, and 10% said they are "afraid to sleep." Most women with sleeping difficulty agreed that it is harder to sleep when you get older, and less than half of the women felt they were able to get all the sleep they needed.

Because of sampling strategy, a majority of women in the selected sample were using medications to help them sleep. Classification of the medications used by women in the study during the previous month indicated that 87% of the women in the study who reported using medications were using hypnotic sedatives (e.g., temazepam 42%, nitrazepam 12%, oxazepam 21%), with the remainder using over-the-counter medications (8%), herbal remedies (10%), or both.

5.5.1. Symptoms that interfere with sleep.

Women with sleeping difficulty reported a range of other symptoms (see Table 5-4), most notably pain, breathing discomfort or coughing/snoring, and bad dreams that they associated with difficulty sleeping. Having to get up to use the bathroom was reported by a large proportion of women in these groups.

Table 5-4 Percentages of 1011 women who reported experiencing symptoms that may be related to sleeping difficulty at least once a week.

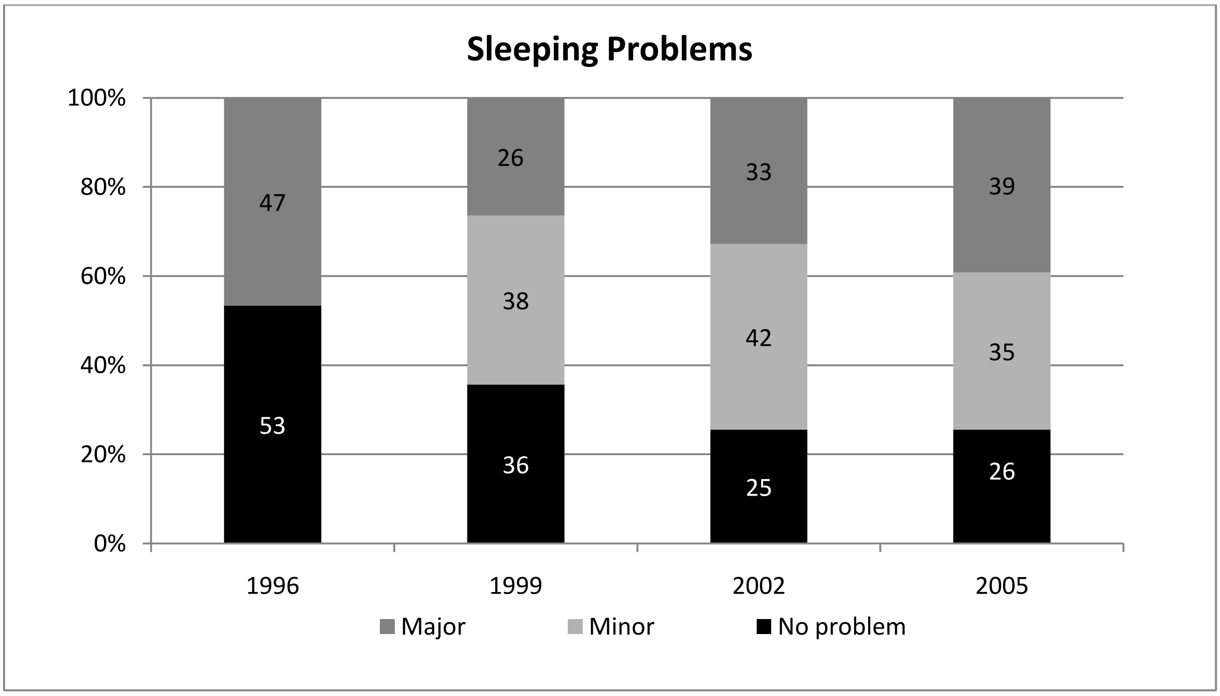
	Group 1	Group 2	Group 3	Group 4
	Sleeping badly: sleeping medications (n=125)	Not sleeping badly; sleeping medications (n=376)	Sleeping badly; no sleeping medications (n=258)	Not sleeping badly; no sleep medications (n=252)
Trouble sleeping because of:				
Pain	40.4	23.3	29.4	10.9
Cannot breath comfortably	9.2	4.0	9.9	2.9
Bad dreams	14.3	4.8	9.9	2.9
Having to get up to go to the bathroom	14.3	4.8	13.1	5.4
Coughing/snoring	12.6	8.5	13.1	6.3
Too hot	3.4	2.8	4.8	2.5
Too cold	10.1	4.8	7.9	5.0
Other	5.0	2.0	2.8	2.9

Source: Byles et al., (2005), *Sleep*.

This study also confirmed our earlier findings of a strong association between sleeping difficulty and quality of life. In this analysis we examined the association between women's scores on the Pittsburgh Sleep Quality Index (Buysse et al., 1989) which has been measured in the substudy, and the change in SF-36 health-related quality of life scores between Survey 1 (in 1996) and the sub-study scores measured four years later (2000). Higher scores for sleeping difficulty were associated with a greater decline in quality of life on all eight SF-36 subscales. Except for the Social Functioning subscale these associations remained statistically significant after comorbid conditions, Geriatric Depression Scale scores, and life-events scores were added to the models, and, after adjusting for the use of sleeping medications in the past month. The association between sleeping difficulty and Physical Functioning was not statistically significant once sleeping medication use was added to the models (Byles et al., Sleep 2005).

5.5.2. Sleep Problems across Surveys 1-4

Further analyses have been undertaken as the women have increased in age (from 70-75 years at Survey 1 to 79-84 years at Survey 4). Figure 5-13 shows the increase in the percentage of women having sleeping problems. The percentage of women having no problems decreased (although there were some differences in the questions between Survey 1 and subsequent surveys). Once women reported sleeping problems they tended to continue to report them.



Source: Fitzgerald (Unpublished data)

Figure 5-13 Increase in sleeping problems from ALSWH Surveys 1 to 4.

These most recent analyses show that sleeping problems at any one survey are associated with decreases in health-related quality of life at the next survey. They also show that women with major sleep problems have a lower survival than other groups of women, however this difference is not significant when other factors that affect survival are accounted for.

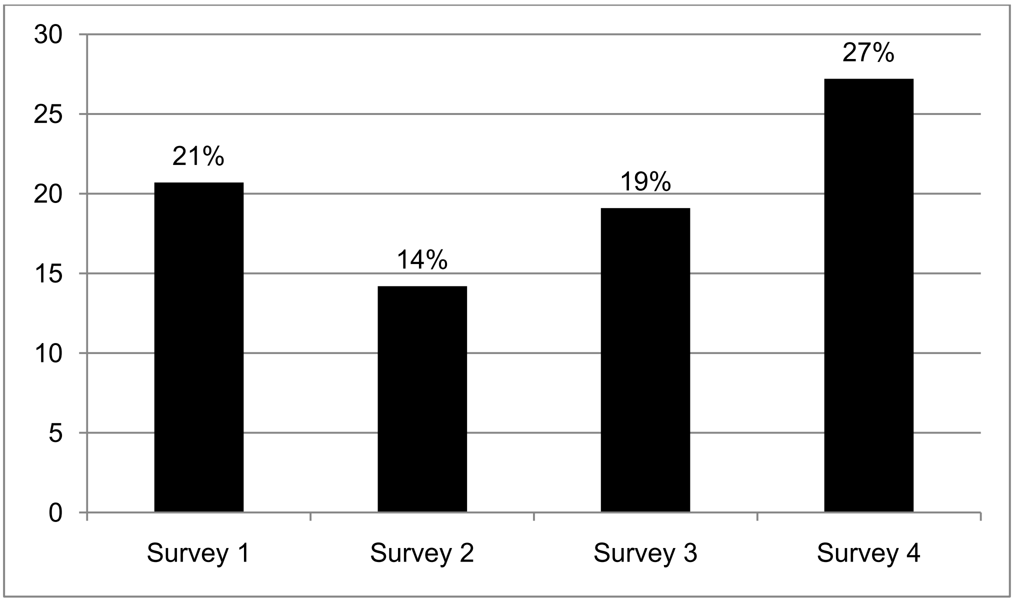
5.5.3. Discussion

Difficulty sleeping was commonly and persistently reported by the older women, with waking in the early hours being the most commonly reported manifestation. This difficulty does not appear to be an entirely benign complaint, as it is associated with significant reduction in the women's quality of life. In longitudinal analyses, reported difficulty sleeping was associated with negative health outcomes as measured by the SF-36 health related quality of life profile. While much of this reduction in quality of life appears to be accounted for by associated symptoms, co-morbidity, age, or life events, the association between sleeping difficulty and the SF-36 subscales 'emotional role limitation' and 'general mental health' remained statistically significant even after adjustment for these factors. However, while sleeping difficulty, per se, appears to have negative impact on quality of life, 'treatment' of this symptom with medication does not appear to be an effective measure.

5.6. Incontinence

Urinary incontinence is a common problem in our community and it is estimated that almost two million community dwelling women in Australia have problems with urinary incontinence (Doran et al., 2001; Chiarelli et al., 2005; Perry et al., 2000). Incontinence is a major factor leading to placement in nursing homes (Smith, 1998). This is not surprising, because urinary incontinence is part of many disease complexes which are common in elderly women and the fact that age-associated changes within the lower urinary tract make a significant contribution to continence status (Resnick et al., 1995; Wagg, 2004). In the 1996 surveys of the ALSWH, 36% of mid-age women (45–50) and 35% of older women (70–75) reported leaking urine 'rarely', 'sometimes' or 'often' (Miller et al., 2003a). An in-depth study of these women has identified cross-sectional associations between incontinence severity and body mass index (BMI), other urinary symptoms, smoking, hormone replacement therapy and hysterectomy (Miller et al., 2003b). This study also showed that many women who had incontinence were employing methods to prevent incontinence that may have other detrimental health outcomes. For example, many women reduced their fluid intake (Miller et al., 2003b) and avoided physical activity (Brown & Miller, 2002) in an attempt to reduce their symptoms.

Among women who participated in Surveys 1 to 4, incontinence continued to be a common problem with 27% of women participating in Survey 4 in 2005 reporting leaking urine 'sometimes' or 'often' (see Figure 5-14).

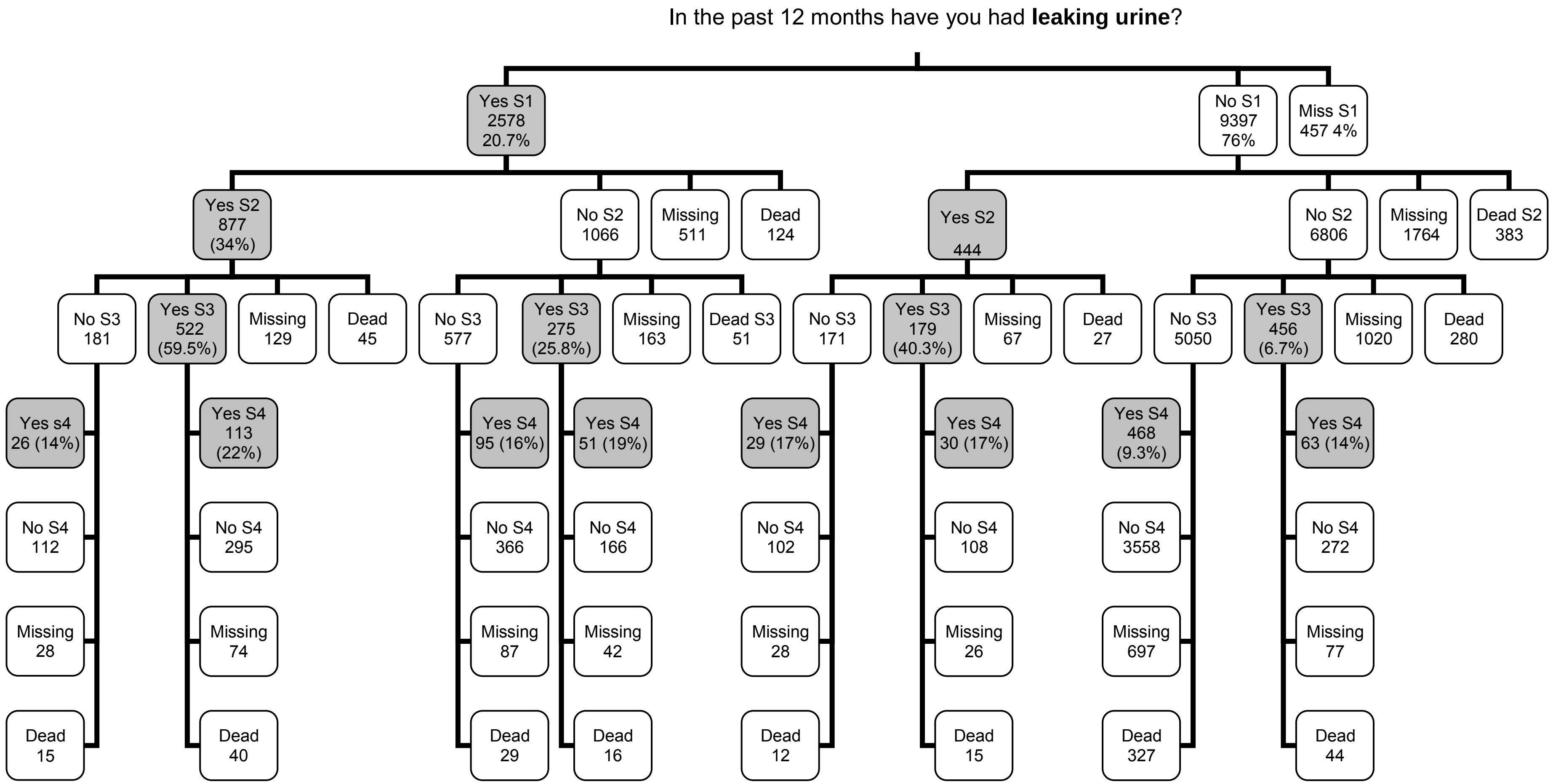


Source: Byles et al., (2009) *Age and Ageing*.

Note: At Survey 2, response options for this question were slightly different to other surveys, however the question remained the same.

Figure 5-14 Prevalence of incontinence (leaking urine "sometimes" or "often") - Surveys 1 to 4.

Between Survey 1 and Survey 4, 15% of the women in the study who had previously reported leaking urine 'rarely' or 'never' developed incontinence. However, reporting of leaking urine was not consistent for all surveys, with some women who reported leaking urine in one survey reporting this was 'rarely' or 'never' a problem in the next one. Only 34% of women who reported leaking urine sometimes or often in the first survey continued to report this problem at Survey 2, and a very small minority of women consistently reported leaking urine at all four surveys (see Figure 5-15).



Source: Byles et al., (2009*), Age and Ageing*.

Figure 5-15 Reports of leaking urine ‘sometimes’ or ‘often’ in the past 12 months. N = 12,432.

The prevalence of incontinence increased with age, and women were almost twice as likely to report incontinence at Survey 4 as they were at Survey 2. Incontinence was also strongly associated with problems such as dementia, reduced physical functioning, history of falls to the ground, high BMI, constipation, urinary tract infection, prolapse repair, and history of prolapsed bladder or bowel. Parity, conditions such as stroke, hysterectomy and number of visits to the GP were less strongly associated with incontinence (Byles et al., 2009).

Incontinence was not significantly associated with area of residence, education, smoking, diabetes or attending social groups or support groups (Byles et al., 2009).

5.6.1. Impact of urinary incontinence on health-related quality of life

The impact of incontinence on the physical and social functioning subscales of the SF-36 health-related quality of life profile is shown in Figure 5-16. In this figure, women are classified as having prevalent, intermittent or incident incontinence, or as having never reported this condition, based on their answers to the question regarding leaking urine at each of Survey 2, Survey 3 or Survey 4. Women who reported leaking urine sometimes or often at Survey 2, and did not subsequently indicate that they rarely or never experienced this symptom, were classified as “prevalent” cases at Survey 2. Women who reported leaking urine at Survey 2 but who subsequently reported that they rarely or never experience this problem were classified as ‘intermittent” cases. Women who reported that they rarely or never experienced leaking urine at Survey 2 and who subsequently reported this problem sometimes or often were classified as “incident” (i.e., new) cases.

Women with incontinence had lower scores than other women on these health-related quality of life measures. However, women with incident incontinence had scores that were lower even before they reported incontinence, indicating that some factor that preceded their incontinence may have contributed to their poorer social and physical functioning.

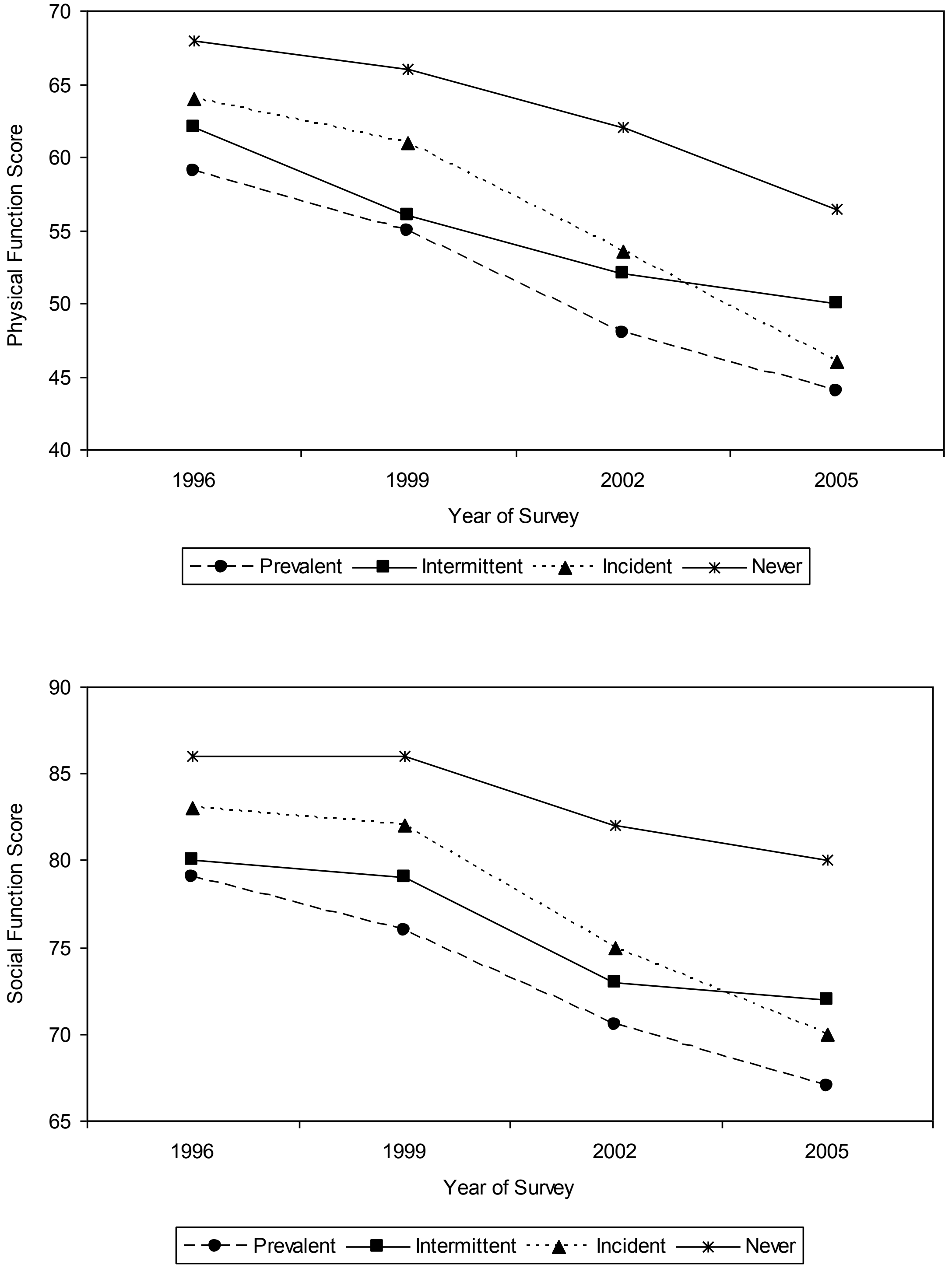


Figure 5-16 SF-36 Physical and Social Function scores for women with and without incontinence.

5.6.2. Discussion

The lack of association between continence and some social factors is of particular significance. Incontinence is frequently described as a socially debilitating condition. However in ALSWH data women, with incontinence were no less likely to provide care for children, care for others, or to undertake volunteer work, and the proportions of women reporting each class of incontinence, among women who engaged in these activities, were similar to the proportions for the cohort overall.

There were differences in social functioning, but these preceded reports of incontinence and probably reflect the impact of underlying physical conditions that not only limit social function but which also contribute to the development of incontinence. The corresponding differences in SF-36 physical function scores support this argument.

5.7. Summary

Most of the older women in the study were living with at least one chronic condition, and many were living with multiple conditions that are associated with increased risk of physical health decline and other limitations on health-related quality of life. The more conditions a woman reported the higher the probability of poor health-related quality of life and functional decline.

To examine the effects of chronic conditions on the quality of life of older women, we considered four conditions in more detail: arthritis, diabetes, sleep problems and incontinence. These are common conditions which impact on different aspects of women's lives.

In 2005, 63% of ALSWH participants in the 1921-26 cohort reported diagnoses or symptoms of arthritis. Arthritis is associated with pain, physical limitations and greater costs of medications. There is some evidence that walking for leisure may reduce the risk of arthritis.

A common risk factor for arthritis, diabetes and incontinence is higher BMI. From a public health perspective prevention of overweight and obesity throughout adult life is a key national goal that could reduce disability in old age.

Data from the ALSWH show that medical management of diabetes fell well short of the guidelines. Women with good knowledge about diabetes management managed their condition better. There is a great need to improve knowledge and behaviours among the growing population of older women with diabetes, particularly those with Type 2 diabetes.

Sleep problems commonly affect women as become older. Women with sleeping difficulties reported a range of symptoms that interfere with sleep including pain, difficulty breathing, bad dreams, having to get up to use the bathroom, coughing/snoring, being too cold or too hot. Use of sleeping medications did not appear to alleviate these problems for many women.

Incontinence is often described as a socially debilitating condition. In our data, incontinence was common and increased with age. The association between incontinence and social limitations, however, appeared to be more a consequence of underlying physical disability rather than the problem of incontinence.

These findings have implications for primary care and the need for health professional to work with older women patients to improve understanding and management of common conditions. This includes helping women to improve their own health literacy and capability for self management. It also includes considering effectiveness of medication, especially for multiple chronic conditions.

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6. Major risk factors affecting older women

6.1. Key Findings

- A woman in her 70’s of average height will lose around 0.19 cm in height each year.
- Height loss was associated with osteoporosis, low BMI, being born in Europe and using medications for both sleep and anxiety.
- Height loss of ≥2% per 3 years was associated with a decline in self-rated health, heartburn/indigestion and constipation, urinary stress-incontinence.
- While rates of conditions such as hypertension and diabetes increased with increasing BMI, rates of osteoporosis were related to BMI in the opposite direction – women who were overweight or obese were at lower risk.
- Hospital admissions were lowest for women with BMI 22 to 24 kg/m2.
- Mortality rates were lowest for women with BMI 25 to 27 kg/m2.
- Women had an average 9 to10 potential hazards for falls around their homes, and these hazards were associated with risk of falls after other health factors were accounted for.
- Only 9% of the women were engaging in high levels of physical activity and another 4% were engaging in very high levels, suggesting that these levels may not be obtainable for most women in this age range.
- Moderate and high levels of physical activity were associated with lower risk of falls among women aged 70-75 years.
- Very high levels of physical activity were associated with reduced odds of fractures among women aged 70-75 years.
- Smoking was strongly associated with mortality rates: the more women smoked the higher the mortality rate.
- Mortality rates decreased after women quit smoking, however even women who quit smoking more than 20 years ago had a higher mortality rate than women who had never smoked.
- Around one-third of women in the 1921-26 cohort were non-drinkers, and slightly less than one-third drank rarely.
- Among women who drank alcohol, most drank 1 or 2 drinks per day, consistent with current alcohol guidelines.
- Survival rates were lower among women who did not drink and women who rarely drank alcohol.
- Women who did not drink and women who rarely drank alcohol had lower health-related quality of life scores after adjustment for smoking, co-morbidity, education, BMI and area of residence.

6.2. Introduction

This section of the report takes a detailed look at some important risk factors including changes in height and weight, physical activity, falls, smoking and alcohol. A number of risk factors affect women's health in older age. In some instances these risk factors may be markers of more complex age-associated pathophysiological changes, while in other cases they may represent opportunities for health promotion in later life. Change in height, for example is indicative of osteoporotic changes to the axial skeleton and can be associated with a number of somatic symptoms as well as being a risk factor for low-impact fractures. Weight loss in older age can be a marker of poor nutrition, frailty or malignancy, and is associated with reduced survival and other adverse health outcomes. Likewise, falls and fall-related injuries can indicate increasing levels of frailty and risk, as well as being adverse health outcomes in their own right. Physical activity, smoking and alcohol represent potentially modifiable health behaviours that are strongly associated with changes in health throughout the life-course including older age.

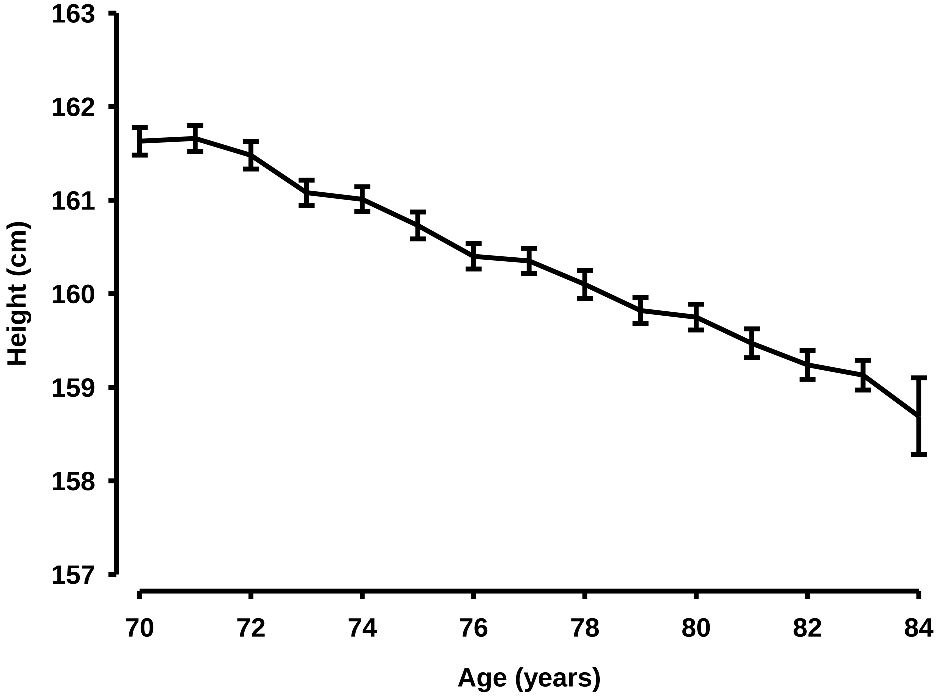
6.3. Height loss in older women

Height loss is a common at older ages. The loss of height is due to loss of skeletal mass and compression fractures, resulting in reduced height of the vertebral bodies, as well as a change in posture called kyphosis. Height loss is an important risk factor in older age because it can be a sign of osteoporosis providing an indirect marker of bone loss, with the associated risks of falls and fracture. Moreover, height loss can have direct effects in older age causing back pain and increased abdominal pressure.

Each survey of the ALSWH asks women to measure their height allowing the age-associated change in self-reported height to be determined, and factors associated with height loss to be explored.

6.3.1. Age-associated change in self-reported height

The data presented here describe the changes in height for women who participated in at least two consecutive ALSWH surveys. Among these women, the average height was 161.4 cm at Survey 1 (when the women were aged 70 to 75 years), 160.7 cm at Survey 2 (73 to 78 years), 160.2 cm at Survey 3 (76 to 81 years) and 159.6 cm at Survey 4 (79 to 84 years). Figure 6-1 shows the decline in self-reported height with increasing age. It would be expected that a woman of average height in her seventh decade of life would lose about 0.19 cm in height per year.



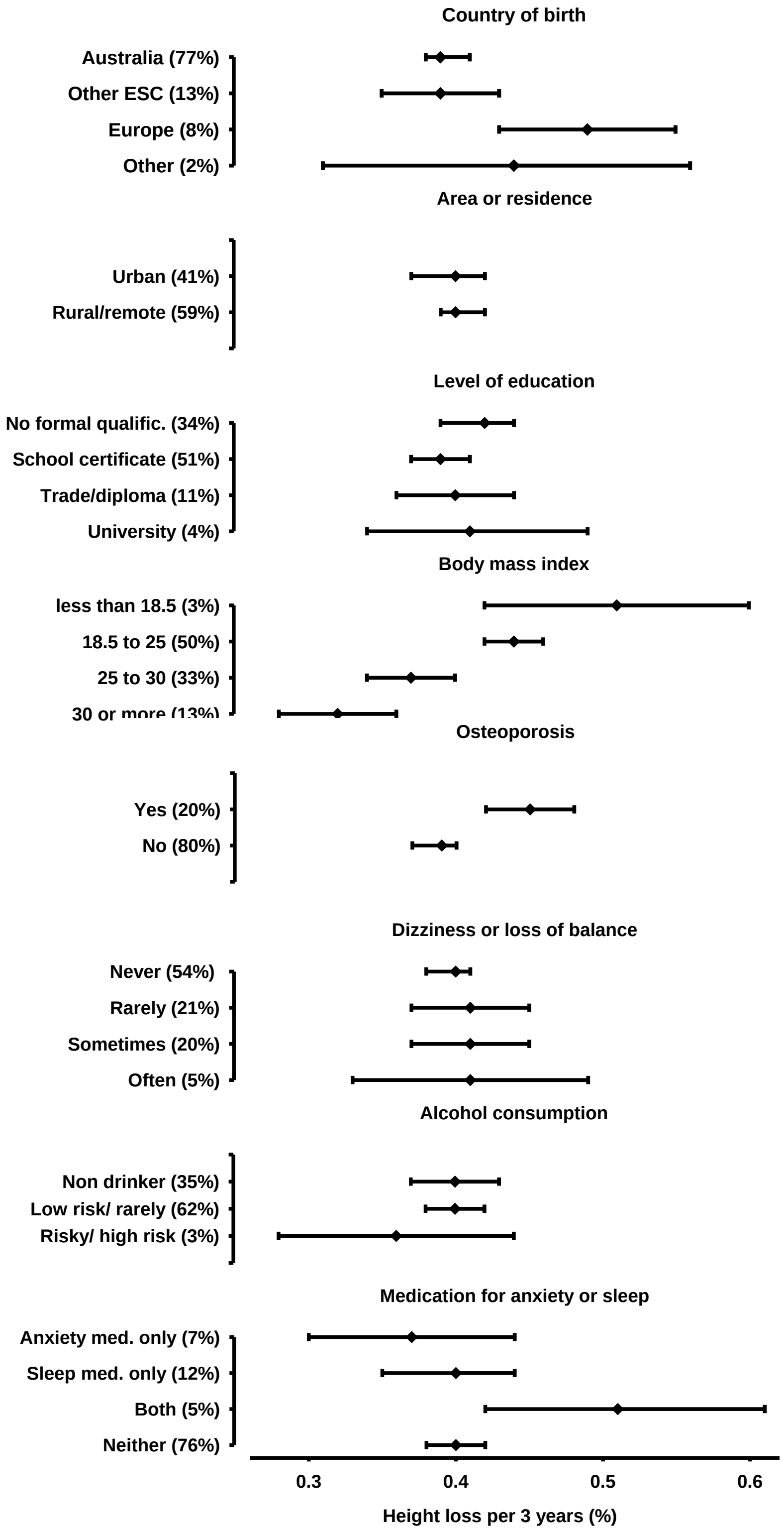
Source: Berecki-Gisolf et al., (2009) *Osteoporosis International*

Figure 6-1 Self-reported height in relation to age over 9 years for women aged 70-75 in 1996. Results of the longitudinal analysis of height: mean and 95% CI.

6.3.2. Factors associated with change in self-reported height

Potential risk factors for height loss which were examined over time included socio-demographic characteristics (e.g. level of education), medical conditions or symptoms such as osteoporosis, and health behaviours such as alcohol use. Results from statistical modelling of potential risk factors for height loss are shown in Figure 6-2. The percentages of women in the various risk factor categories at Survey 1 are also provided in this figure.

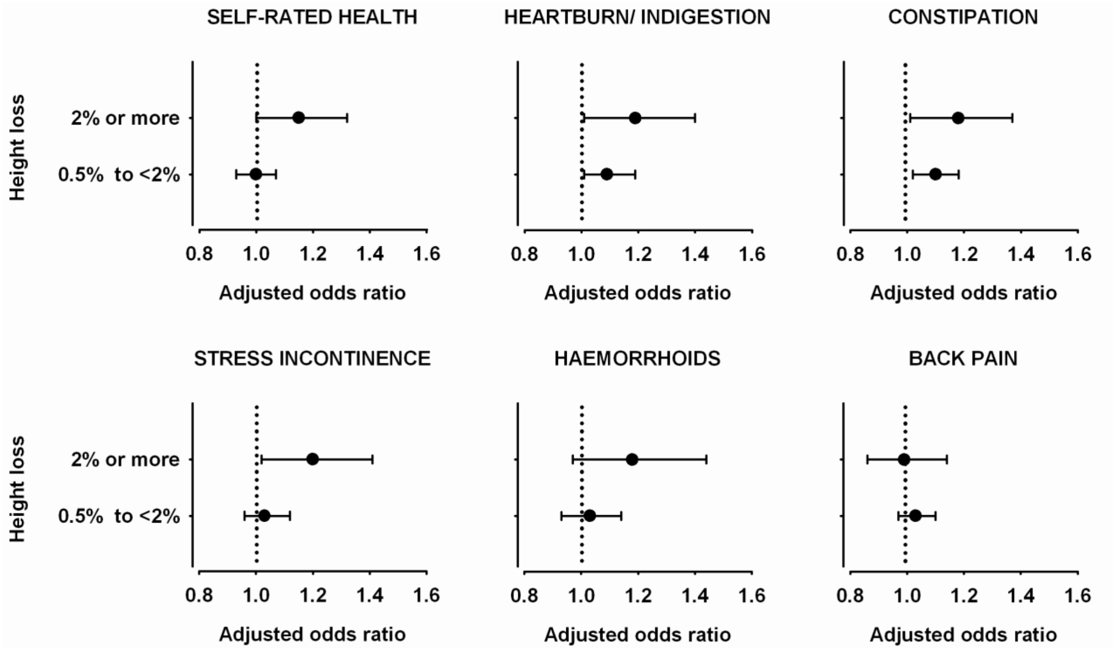
These data demonstrate that height loss was greater among women born in Europe compared with Australian born women; underweight women (compared with women in the healthy weight range); those with osteoporosis; and those taking medications for both sleep and anxiety compared to those taking neither. Height loss was less in overweight or obese women compared to those in the healthy weight range. Dizziness or loss of balance, alcohol intake, level of education and area of residence were not statistically significantly associated with subsequent height change.



Source: Berecki-Gisolf et al., (2009) *Osteoporosis International*

Figure 6-2 Percentage height change between four consecutive surveys (at 3-year intervals): means and 95% confidence intervals for potential predictors of height loss (at the survey preceding height loss). The percentage of women in the various categories at survey 1 is shown in brackets. Each risk factor is adjusted for other factors in the model.

Figure 6-3 illustrates the relationship between self-reported health and height loss as well as various symptoms related to height loss. At each survey women were asked to rate their health as ‘excellent’, ‘very good’, ‘good’, ‘fair’ or ‘poor’. For the analysis of ‘self-rated health’, a decline in health was compared to health remaining the same or improving. For these analyses, height loss over 3 years was categorised as ≥2% (experienced by 435, 331 and 437 women between surveys 1 and 2, Surveys 2 and 3, and Surveys 3 and 4, respectively), 0.5 to <2% (experienced by 3001, 2415 and 1937 women between Surveys 1 and 2, 2 and 3, and 3 and 4, respectively) or <0.5% (experienced by 6383, 5705 and 4499 women between Surveys 1 and 2, 2 and 3, and 3 and 4, respectively).



Source: Berecki-Gisolf et al., (2009) *Osteoporosis International*

Figure 6-3 Decline in overall self-rated health or increase in frequency of self reported symptoms associated with change in height over the same time period.

A decline in self-rated health was reported by 26%, 23% and 33% of women between Surveys 1 and 2, 2 and 3, and 3 and 4, respectively. Increased heartburn/indigestion was reported by 10%, 18% and 30%; increased constipation was reported by 9%, 23% and 34%; increased urinary stress-incontinence was reported by 8%, 18% and 29%; increased haemorrhoids was reported by 5%, 10% and 18%; and increased back pain was reported by 14%, 32% and 35% of women between Surveys 1 and 2, 2 and 3, and 3 and 4, respectively. The relation between self-rated health and height loss was adjusted for age, BMI, and self-reported indigestion, constipation and urinary incontinence. The relation between heartburn/indigestion and height loss was adjusted for country of birth, BMI, smoking and alcohol intake. The relation between constipation and height loss was adjusted for ability to walk 100 m. The relation between urinary (stress) incontinence and height loss was adjusted for BMI and parity. The relation between haemorrhoids and height loss was adjusted for BMI and constipation, and the relation between back pain and height loss was adjusted for BMI and arthritis.

Height loss of ≥2% per 3 years was associated with a decline in self-rated health, with or without adjusting for confounders. Height loss was associated with heartburn/indigestion and constipation with or without adjusting for confounders. Height loss of ≥2% over 3 years was associated with urinary stress-incontinence after adjusting for confounders. The association between height loss of ≥2% over 3 years and haemorrhoids was statistically significant without but not with adjustment for confounders. Height loss was not associated with back pain.

An additional model adjusting for bisphosphonate use (a common medication for osteoporosis which is reported to cause gastrointestinal complaints) showed that height loss >2% vs. ≤2% per 3 years was associated with experiencing subsequent heartburn/indigestion ‘often’ vs. ‘never/rarely/sometimes’ at Survey 4.

In summary, osteoporosis, low BMI, being born in Europe and using medications for both sleep and anxiety were risk factors for height loss in older women living in Australia. Height loss was associated with a slight increase in experienced heartburn/ indigestion and constipation. Height loss of at least 2% in 3 years was also associated with urinary stress-incontinence and a decline in self-rated health. Although the magnitude of the association between height loss and specific symptoms was small, there was a ‘dose-response’ effect suggesting that those with greater height loss were at increased risk.

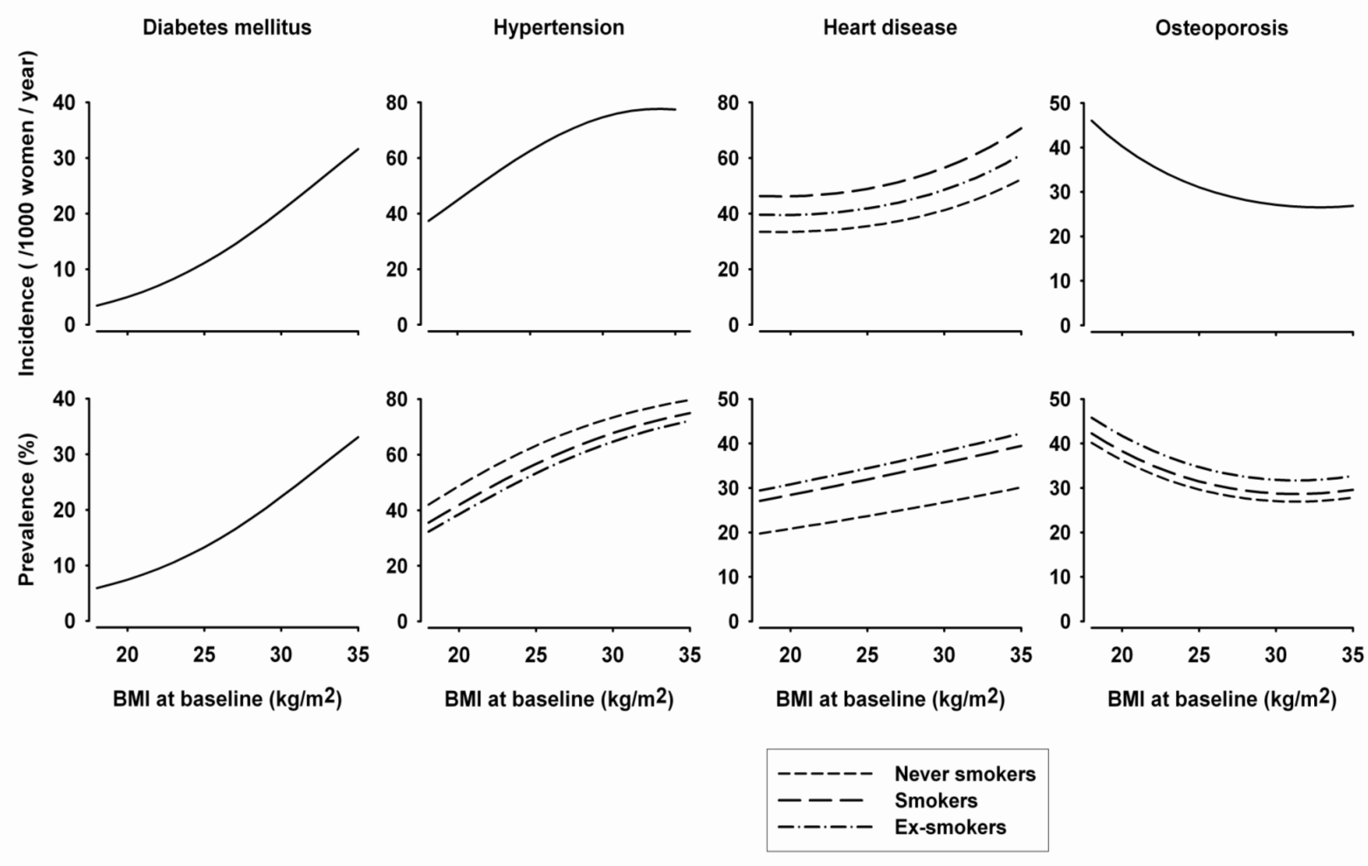
These findings indicate potential benefits in measuring height regularly in women in later life. In those with progressive height loss, bone mineral density measurements should be considered; in the case of established osteoporosis, treatment could be re-evaluated in light of changes in height. Furthermore, symptoms associated with height loss (heartburn/indigestion, constipation and urinary stress incontinence), which may not be presented by women spontaneously, can be explored. Early detection of these symptoms in patients at risk, and targeted lifestyle advice and treatment even of mild symptoms may help to improve quality of life.

6.4. Healthy body mass index for older women

Current WHO recommendations advise a Body Mass Index (BMI) range of 18.5 to 25 kg/m^2 for optimal health in adults aged 18+ years (WHO, 2000). While the WHO guidelines separately address the health consequences of overweight and obesity in childhood and adolescence and in adults, there are no distinctions for young, mid-aged or older adults. As older adults have already survived to a greater age and because older people experience age-associated loss of height, the optimal BMI-range for adults aged 18+ years may be less relevant for older people (Rossner, 2001; Zamboni et al., 2005). Several papers and systematic reviews have recently shown that, in older people, BMI in the range of 25-30 kg/m^2 is not associated with higher mortality risk compared with ‘normal BMI’ (18.5-25 kg/m^2) and may even have a protective effect (Auyeung et al., 2010; Heiat et al., 2001; Janssen & Mark, 2007; Locher et al., 2007; Pischon et al., 2008). However, in other studies, BMI in the ‘overweight’ (25-30 kg/m^2) and ‘obese’ (>30 kg/m^2) range has been shown to be associated with increased risk of frailty and chronic conditions, disability and health complaints in older people (Zamboni et al., 2005; Andreyeva et al., 2007; Hubbard et al., 2009; Imai et al., 2008; Must et al., 1999; Patterson et al., 2004). Therefore, in older adults the patterns of association between BMI and several outcomes that are optimal for good health may not be as clear as in younger populations.

6.4.1. Body mass index and chronic conditions

Incidence and prevalence rates for four conditions (diabetes, hypertension, heart disease and osteoporosis), as a function of BMI in 1996, are shown in Figure 6-4. These graphs also show the effects of BMI according to women’s smoking status which is another major risk factor for these conditions. Higher BMI was associated with higher incidence and prevalence of diabetes, hypertension and heart disease, and lower incidence and prevalence of osteoporosis. While the incidence and prevalence of hypertension flattened out for BMI ≥30 kg/m^2, incidence and prevalence of diabetes increased markedly in women with a BMI ≥30 kg/m^2. For example, diabetes prevalence ranged from 6% to 13% in women in the healthy BMI-range, whereas the prevalence ranged from 20% to more than 30% in women with a BMI of 30 kg/m^2 and higher. The rates for heart disease also increased with increasing BMI, but less sharply, and there were marked differences in rates according to smoking status, with the lowest incidence and prevalence in never smokers. The effect of smoking on hypertension was opposite to that expected, with highest prevalence of hypertension being among non-smokers across the BMI range.



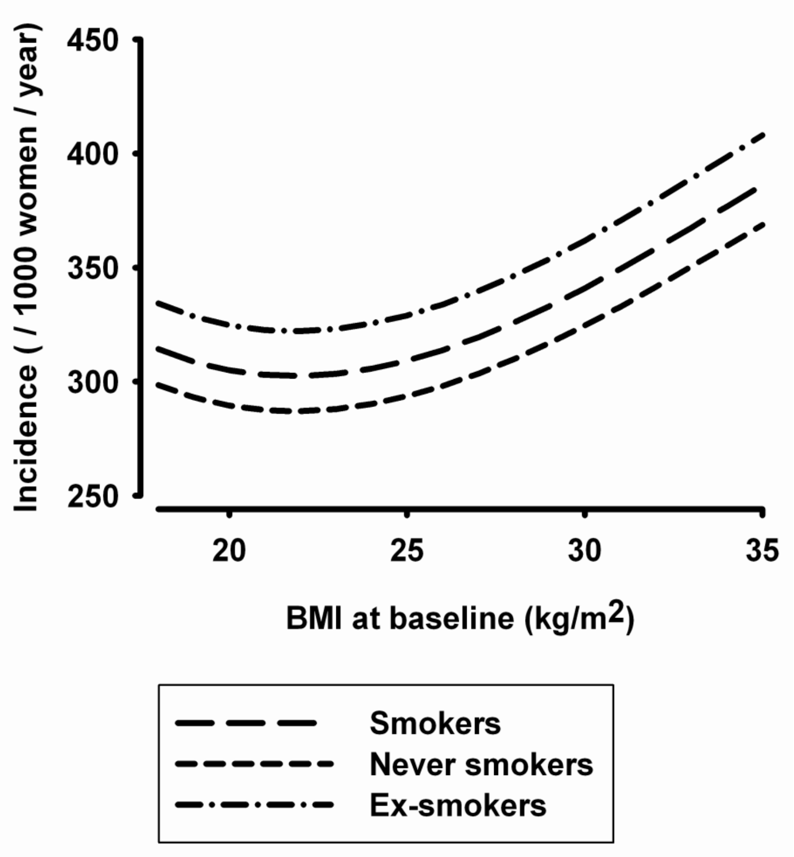
Source: van Uffelen et al. (unpublished)

Figure 6-4. Estimated incidence and prevalence rates per year of chronic conditions in relation to baseline Body Mass Index in women, Australian Longitudinal Study on Women's Health, 1996-2008.

There was an inverse association between BMI and osteoporosis, with the lowest risk of osteoporosis in women with a BMI ≥30 kg/m^2. For example, the incidence of osteoporosis for women with a BMI of 30 kg/m^2 was 27/1000 women/year, compared with 44 to 31/1000 women/year for women with a BMI between 18.5 and 25 kg/m^2. Prevalence of osteoporosis was lower in women who never smoked than in smokers and ex-smokers.

6.4.2. Body mass index and hospital admissions

The association between BMI and hospital admission in the last 12 months was J-shaped, with lowest rates in the BMI range 22 to 24 kg/m^2 (Figure 6-5). The risk of hospital admission was lowest in women in the healthy weight range who never smoked. Regardless of smoking status, hospital stay increased markedly for women with BMI≥25 kg/m^2.

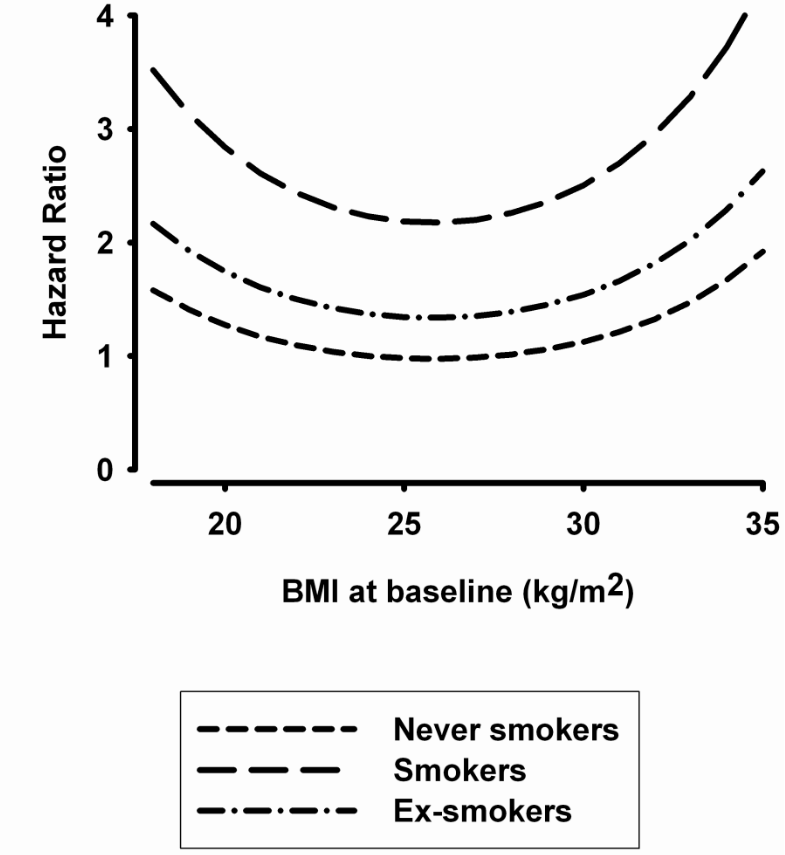


Source: van Uffelen et al. (unpublished)

Figure 6-5 Estimated rates of hospital admission in relation to baseline Body Mass Index in women, Australian Longitudinal Study on Women's Health, 1996-2008.

6.4.3. Body mass index and death

The association between BMI and mortality was U-shaped, with the lowest risk of mortality for BMI between 25 and 27 kg/m^2 (Figure 6-6). Across the range of BMI, smokers were at much higher risk of death than ex-smokers or women who had never smoked.



Source: van Uffelen et al. (unpublished)

Figure 6-6 Hazard Ratios for All-Cause mortality in relation to baseline Body Mass Index in women, Australian Longitudinal Study on Women's Health, 1996-2008. (Reference: Never smokers, BMI=24).

6.4.4. Additional analyses

Excluding women with cancer did not result in changes in the association between BMI and incidence and prevalence of chronic disease, or BMI and mortality, but the higher risk of hospital admission in women in the BMI-range of 18.5 to 22 levelled out. Excluding the first five years of follow-up did not affect the BMI range associated with lowest mortality.

6.4.5. Discussion

It is predicted that there will be marked increases in burden of disease and demands on health care systems as a result of the growing percentage of overweight and obese older women in the population (Rossner, 2001; Arterburn et al., 2004; Bennett et al., 2004; Wang et al., 2007). If this increase is to be prevented, it is important to understand the associations between BMI and health in this age group, and to be clear about the advice given to older women about reducing risk of ill health. Although we found lower risk of three conditions was associated with lower BMI, lower levels of hospitalisation and death were observed for women with BMI a little above the WHO healthy weight range. BMI ranges and health promotion messages for older women should be adjusted accordingly. For high levels of BMI there may be benefits in losing weight at older ages, however, if weight loss advice is warranted, it should be accompanied by treatment for prevention of bone loss and loss of lean muscle mass (McTigue et al., 2006). A more important message is the need to maintain healthy weight across the lifespan to avoid the onset of chronic disease at older ages when weight loss may be inappropriate and/or ineffective.

6.5. Falls

Falls are a major cause of morbidity among older women and can have serious health and social consequences (ABS, 1996; Bergland et al., 2006; Hill et al., 1999; Campbell, Borrie et al., 1990; Campbell, Spears et al., 1990; Lilley et al., 1995; Sattin et al., 1990; Tinetti, 2003) Up to 49% of community-dwelling women aged 65 years and over will experience at least one fall over a 12-month period, and many of these falls will result in injury, including fracture.(Tinetti, 2003). Indeed, falls are the leading cause of injury-related death and hospitalization for people aged over 65 years (Lilley et al., 1995; Bell et al., 2000; Lord et al., 2000) and can lead to placement in residential care (Sattin et al., 1990; Donald & Bulpitt, 1999; Tinetti & Williams, 1997). Falls are estimated to account for 40% of the lifetime injury costs for women Moller, 2002). They may also have psychosocial consequences that result in isolation and loneliness (Lilley et al., 1995).

In Survey 1 of ALSWH, approximately 5% of women reported a fall that had caused serious injury, and these falls were associated with a number of other adverse consequences including decreased self esteem, reduced daily activity and social interaction (MacKenzie et al., 2004) In this section we report on some of the risk factors associated with falls and related events reported over subsequent surveys.

6.5.1. Falls, home hazards and other falls risk factors

Many physical, psychological and environmental factors are associated with falls (Lord et al., 2001; Tinetti et al., 1995). Some risk factors for falls are intrinsic to the individual, such as poor balance or eyesight, whereas others are more strongly related to the persons social and physical environment. A sub-study was undertaken to explore and apply the newly developed International Classification of Functioning and Health (ICF) developed by the World Health Organisation as a way to identify, define and test the multiple risk factors that have been associated with falls and related events. The ICF is a model that integrates how older people function within their environment with different health conditions, their levels of activity and participation, and personal factors. This approach considers an individual as a whole person, where function is the result of the interaction between body systems and structures, activity and participation, environment and personal characteristics. Therefore, the model can be used to investigate global and comprehensive risk factors for falls and the relationships among these risk factors.

To enable this research, additional data were collected from a sub-study of 568 women from the 1921-26 cohort, and these and earlier data collected from these women at Surveys 1-3 were used to predict self-reported falls and related events at Survey 4. The sub-study was undertaken between Survey 3 and Survey 4 and the mean age of the participants at the time of the sub-study was 79.7 years. The prevalence of fall events at the time of the sub-study is shown in Table 6-1, and around 65% of women reported some level of fear of falling.

Table 6-1 Events reported by participants in the previous 6 months (N=568).

Self-reported events	%
Slip/trip/stumble	32
Fall to the ground	19.5
Injury as a result of fall	12.5
Imbalance/dizziness	38
Medical attention for injury from fall	12
Injury from accidents	14
Broken bone	5.5

The sub-study was particularly useful for collecting detailed data on the women's home environment and the prevalence of home hazards that may lead to increased risk of falls. The home hazards were measured using a modified version of the Home F.A.S.T instrument that had been validated for use as a self-report measure. For scoring purposes, the self-report measure is converted to equivalent Home F.A.S.T. hazard items, and the prevalence of these hazards among women in the sub-study is shown in Table 6-2.

Table 6-2 Equivalent HOME F.A.S.T. endorsement rates (N=568).

HOME F.A.S.T. (self-report) items	Hazard present %
Cluttered walkways	41
Floor coverings in poor condition	4
Slippery floors	78
Loose mats	44
Unsafe bed transfers	20
Unsafe chair transfers	64
Poor lighting	21
Inaccessible bedside light	32
Outdoor path not well lit	43
Unsafe toilet transfers	77
Unsafe bath transfers	5
Difficulty using shower recess	32
No grab rail in shower	46
No slip-resistant mat	59
Toilet not in close proximity to bed	15
Difficulty reaching in the kitchen	63
Difficulty carrying meals	13
No indoor step rails	14
No outdoor step rails	13
Unsafe use of steps	19
Unclear stair edges	14
Difficulty with entrance door	38
Unsafe paths around the house	37
Unsafe shoes	48
Hazardous care of pets	22

Source: Afsoon Hassani Mehraban. An application of the International Classification of Functioning, Disability and Health for understanding falls risks among older community-dwelling women in Australia. PhD Thesis. The University of Newcastle, NSW, Australia.

No home was hazard free and a minimum of two home hazards were reported by participants in this study. Out of 25 possible hazards, nine hazards were present in 50% of the sample, and the mean number of hazards was 9.39 (SD=3.15, range=2-23). The question is: what is the critical number of hazards before they lead to falls?

The data suggested that the difference between fallers and non fallers, and those who tripped and those who did not, amounted to a mean of 1–2 HOME F.A.S.T. items (score of 9.1 home hazards for non-fallers and 10.5 for fallers). This difference was statistically significant, but whether or not the difference could be regarded as clinically significant is worthy of further investigation.

At Survey 4, 20% of the sub-study participants reported that they had experienced a fall in the previous six months and more than half the respondents stated they were afraid that they might fall and hurt themselves in the next year. In logistic regression models, falls were predicted by a large number of factors that had been measured in previous ALSWH surveys. Using a step-wise approach, the ICF framework was applied to identify those factors that were predictive of falls in multivariable models. In this process, a sub-model was developed for each ICF domain (including general health, body function, personal factors, activity and participation and environmental factors). This approach revealed that some factors from all domains of the ICF framework were associated with falls.

Results of the final composite model are shown in Table 6-3.

Table 6-3 ICF domains and risk factors associated with falls.

ICF domain/ Risk Factor	Odds Ratio (95% CI)
Health conditions	
Diabetes	0.14 (0.04-0.55)
Low iron level	2.00 (1.03-3.91)
Cataract	2.06 (1.19-3.55)
Body function	
High blood pressure medication	1.71 (1.10–2.88)
Environment	
HOME F.A.S.T. score	1.11 (1.02 – 1.20)
General Health	
Major illness/injury in last three years	2.91 (1.45-5.84)
Most time spent in bed/chair because of ill health	1.99 (1.14-3.49)
Activity and participation	
Lambeth disability score	1.09 (1.01-1.17)

This analysis was the first to assess and demonstrate the appropriateness of the ICF as a model for understanding risk of falls. The project also collected a large amount of information on environmental hazards associated with falls risk in and around the homes of older women. Common hazards included unsecured mats, shiny floors, inaccessible baths and showers, high cupboards, steps without rails, and unsuitable chairs and bed heights.

6.5.2. Association between falls and physical activity

Physical activity is central to most programs designed to reduce falls risk, and may work through improvement of strength and balance and through other physiological and psychological pathways (Gillespie et al., 2006; Latham et al., 2003; Sherrington et al., 2004) However, the role of physical activity in reducing falls risk remains controversial (Karlsson, 2004). There is concern that physical activity may increase falls risk in vulnerable older people (Faber et al., 2006), and it has been reported that older people who engage in vigorous-intensity physical activity have a lower falls rate but a higher risk of injuring themselves if they fall (Speechley & Tinetti, 1991). Here we present information on the relationships between physical activity and risks of falls and fractured bones among women in the 1921-26 cohort of ALSWH.

Table 6-4 presents levels of physical activity according to women's reports of falls and fall-related injury at Survey 2 in 1999. Most respondents (54%) engaged in very low to low physical activity levels that were below Australian and USA recommendations (Australian Government Department of Health and Aged Care, 1999; US Department of Health and Human Services, 1996)

Table 6-4 Physical activity levels among women who reported "no serious fall with injury in the previous year" in 1996 (Overall), and of these women, those who reported a fall to the ground, an injury from a fall, or a fractured bone in 1999.

Variables	Overall %	Had fall to the ground %	Injured from fall %	Fractured bone %
Physical activity				
None/very low	23.6	27.0	25.5	25.4
Low	30.4	30.3	29.4	26.1
Moderate	32.8	31.3	32.8	35.0
High	9.3	8.4	8.2	9.4
Very high	3.9	2.9	4.0	4.1

Source: Heesch et al. (2008). *Journal of Epidemiology and Community Health*.

Note: this table only includes data for women who responded to Survey 2 and who had not reported a fall on Survey 1.

Further statistical modelling of the association between physical activity levels reported in 1996 and falls reported in 1999 and in 2001 showed that respondents in the moderate to very high physical activity categories had lower odds of having a fall in 1999 than those in the none/very low physical activity category, and respondents in the very high category had lower odds of having a fall in 2001 (see Table 6-5). Physical activity levels in 1996 were not associated with reports of injury but very high levels of physical activity were associated with reduced odds of reporting a fracture in 2001.

Table 6-5 Association between physical activity in 1996 and reporting in 1999 and 2001 a fall to the ground within the previous 12 months.

Variable	Fall to the ground reported 1999	Fall to the ground reported 2001
	Odds ratio (95% CI)*	
Physical activity:		
None/very low	1.00	1.00
Low	0.88 (0.75-1.03)	0.89 (0.75-1.07)
Moderate	0.85 (0.73-0.99)	0.92 (0.77-1.11)
High	0.82 (0.65-1.03)	0.80 (0.62-1.04)
Very high	0.67 (0.47-0.95)	0.64 (0.43-0.96)

Source: adapted from Heesch et al. (2008). *Journal of Epidemiology and Community Health*.

Odds ratios and 95% confidence intervals (CI) are adjusted for area of residence to account for oversampling of women from rural and remote areas.

*Odds ratios and 95% CIs also adjusted for country of birth, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, and elder vulnerability score.

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Older women who reported a very high level of physical activity had decreased odds of reporting a fall both 3 and 6 years later compared with women reporting no or very low levels of physical activity. At the 3-year follow-up, the odds for women in the very high physical activity category were reduced by 33% and at the 6-year follow-up, by 36%. We also found that the women reporting a moderate level of physical activity had a 15% reduced risk of reporting a fall to the ground 3 years later. This reduction in falls risk is similar in magnitude to that found for interventions developed to reduce falls risk (18%) by tailoring strategies based on individuals' personal risk assessment profiles (Chang et al., 2004).

In the ALSWH physical activity was not associated with having an injury as a result of a fall, however some other studies indicate that both high and low levels of physical activity put older adults at high risk of falls, (Karlsson, 2004; Speechley & Tinetti, 1991; Gregg et al., 2000). Given the conflicting results, more investigation of these associations is needed.

Our analyses indicated that women in the high/very high physical activity categories had 47% decreased odds of reporting a fractured bone 6 years later compared with those in the none/very low physical activity category. As in our study, Albrand et al. (2003) found in their prospective cohort study that older women who were moderately to vigorously active had decreased odds of fragility fractures compared with sedentary and lightly active women.

6.6. Smoking in older women

The purpose of this section is to examine the effects of smoking on the health of older women. Smoking has been linked to a number of cardiovascular and respiratory diseases such as chronic obstructive pulmonary disease, lung cancer and asthma. There are dose-response relationships between these diseases and cigarette consumption. For example, it has been shown in many studies that lung cancer risk increases with the increasing amount of cigarettes smoked daily, as well as with increased duration of smoking (Akiba, 1994; Doll & Peto, 1978; Freund et al., 1993).

Recent studies have provided contradictory evidence about the susceptibility of women to the effects of smoking. Some have suggested that lung cancer risk is higher in women than men at every level of smoking (Shriver, 2006), while others have concluded that there are no differences in the carcinogenic effects of smoking between women and men (Freedman, 2008).

At Survey 1, women were asked whether they currently smoked and if so how many cigarettes they smoked per day, and if they had ever smoked but did not do so currently, when they had stopped smoking.

6.6.1. Smoking and death

There were 11,686 women for whom we had sufficient data about smoking at Survey 1 to be able to classify their smoking status and for whom we were also able to ascertain their survival at October 2006 (when the most recent cause of death data were available). The numbers of women in each smoking category are shown in Table 6-6 together with the proportion of deaths (from any cause) that had occurred in the group. The corresponding survival curves (Kaplan Meier estimates) are shown in Figure 6-7and Figure 6-8.

Table 6-6 Numbers of women classified by smoking status (current quantity and time since stopping) at survey 1 and proportion alive or dead by October 2006.

Smoking at Survey 1	Alive (%)	Dead (%)	Total (number)
Current quantity			
Never smoked	81.1	18.9	7303
Ex-smoker	75.2	24.8	3486
1-14 cigs per day	67.4	32.6	435
15-24 cigs per day	61.6	38.4	281
25 or more cigs per day	56.9	43.1	181
Time since quitting			
Never smoked	81.1	18.9	7303
Quit more than 20 years ago	79.0	21.0	1325
Quit 11-20 years ago	75.4	24.6	1101
Quit 6-10 years ago	71.6	28.4	517
Quit 0-5 years ago	69.7	30.3	522
Current smoker	63.4	36.6	908

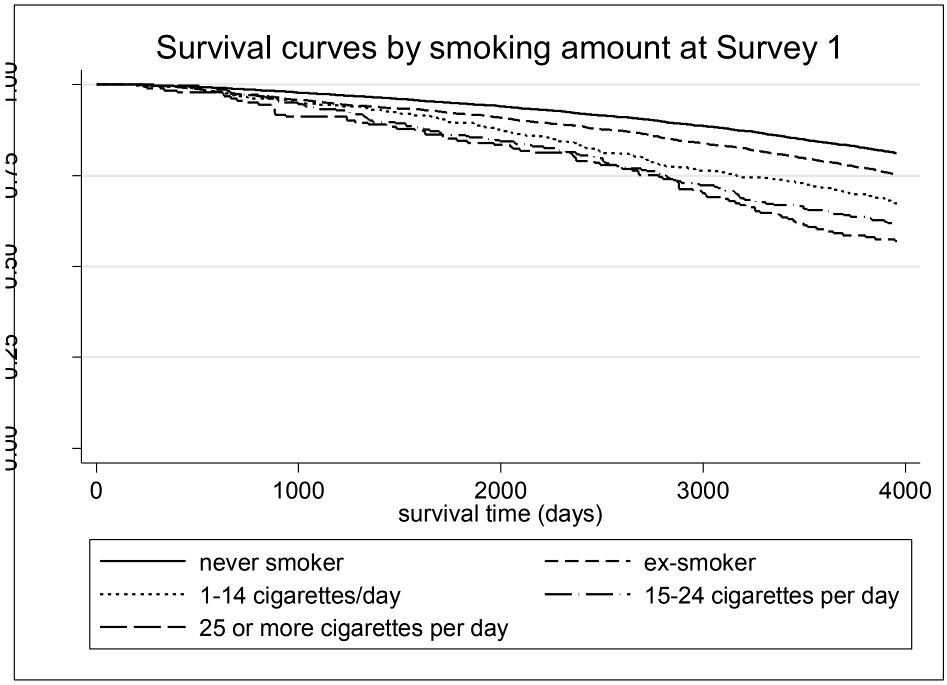

Figure 6-7 Survival curves (Kaplan Meier estimates) for women in the older ALSWH cohort, classified by quantity smoked at Survey 1.

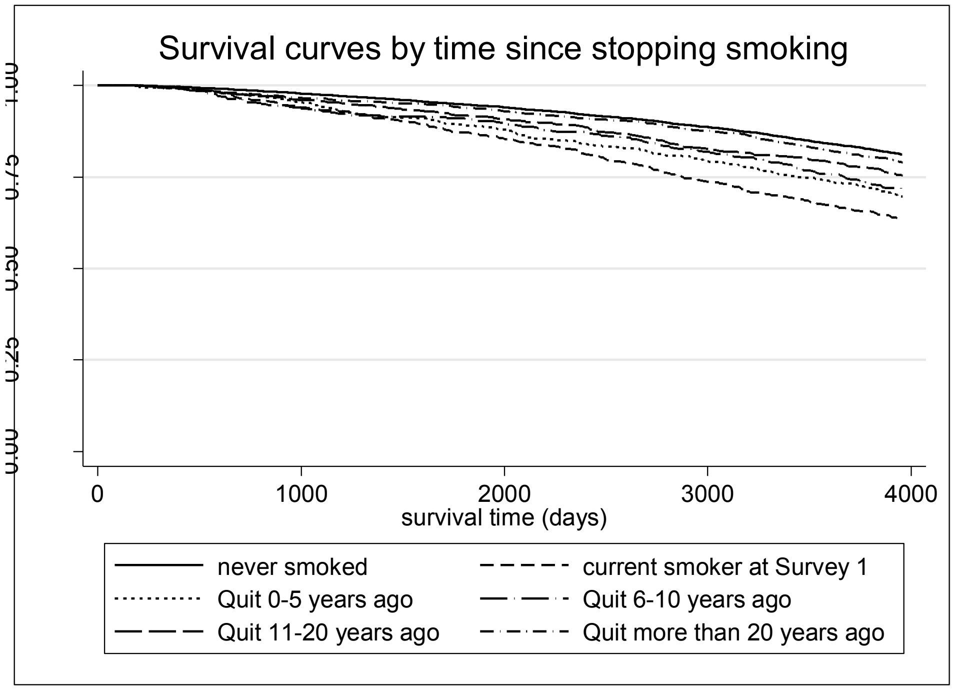

Figure 6-8 Survival curves (Kaplan Meier estimates) for women in the older ALSWH cohort, classified by time since stopping smoking.

These data show that the substantial risk of death increased with amount smoked and decreased with time since quitting although even women who quit smoking more than 20 years ago were at increased risk of death compared to women who never smoked. All these effects were statistically significant.

6.6.2. Discussion

While women generally survive longer than men, part of the underlying reason may be that the pattern of smoking among women differs from that of men. Surveys of smoking habits have indicated that historically, smoking has been significantly less prevalent among females (Staetsky, 2009).

The data from the ALSWH show the risks associated with smoking remained even in this group of older women who were already aged 70-75 when the study started. The implications for the health system are that the adverse effects of smoking on health last for decades. Smoking related disease will continue to impact on the population and health services for years to come – 'the long shadow of smoking'.

Nevertheless the data also show that even for older women who reported quitting less than 5 years before Survey 1 the risk of death was lower. So the preventive health message is 'it's never too late to quit'.

6.7. Alcohol and older women

Women, and particularly older women, are more susceptible to the impact of alcohol consumption than men. For instance, there is a stronger association between alcohol use and risk of injury for women than for men, and there appears to be no threshold effect (Stockwell et al., 2002). Older people also have different biological reactions to alcohol, with a smaller volume of distribution due to reduced lean body mass, reduced hepatic metabolism, potential for interaction with medicines, and a greater susceptibility to falls and injury (Ticehurst, 1990, Atkinson, 1987). Alcohol use has been reported in approximately 10% of patients aged 65 years and over who present to emergency departments (Bell et al., 2000). Alcohol is estimated to be a causal factor for cancers (Corrao et al., 2004) and has been implicated in many other problems of ageing, including dementia (Adams, 1999) and cataract (Cumming & Mitchell, 1997).

Current Australian guidelines for alcohol consumption acknowledge that there is no level of drinking alcohol that can be guaranteed to be completely ‘safe’ or ‘no risk’, and suggest drinking no more than 2 standard drinks on any day reduces the lifetime risk of harm from alcohol-related disease or injury (NHMRC, 2009). While heavy alcohol use by older people is a cause for concern, evidence of the health effects of lower levels of alcohol use by older persons remains equivocal (Fink et al., 2001), with moderate alcohol consumption associated with health benefits in a number of longitudinal studies (Doll et al., 1994, Gaziano et al., 2000). Evidence-based 'sensible' and 'dangerous' alcohol consumption limits for older women are still lacking (Wesson, 1992), with one barrier to developing evidence-based recommendations being the lack of relevant data.

The ALSWH is well placed to provide longitudinal data on health outcomes for a large cohort of older women to assess the relationship between alcohol intake and mortality and to explore the relationship between level of alcohol use and changes in physical and mental health-related quality of life.

6.7.1. Alcohol use

At Survey 1, more than one-third (35%) of the women were non-drinkers, 29% rarely drank and only 3% were in the high intake group who consumed three or more drinks per day 5-7 days of the week. There was little change in reported drinking habits over a six-year follow-up period. One quarter (26%) of the women were perpetual non-drinkers and 69% drank rarely or at low levels of intake at all of the first three surveys.

Table 6-7 Alcohol use among women aged 70-75 at Survey 1.

Category	Definition	%
Non-drinker	Never drink alcohol	35
Rare drinker	Drink rarely or less than every week	29
Low risk 1	1-2 drinks per day on 1-2 days per week	13
Low risk 2	1-2 drinks per day on 3-6 days per week	9
Low risk 3	1-2 drinks per day, every day	8
Higher than rec’d	3 or more drinks per day, 1-4 days per week	2
Risky intake	3 or more drinks per day, 5-7 days per week	3

6.7.2. Alcohol use and survival

Survival rates were lower in women who did not consume alcohol. Compared with the women in the 'low risk 2' reference category, non-drinkers were about twice as likely to die over the six years between Survey 1 and Survey 3 and women who rarely drink were about 1.6 times as likely to die. There was no significant difference in survival for women with other levels of alcohol consumption, although it should be noted that the number of older women who had high alcohol consumption was relatively small.

6.7.3. Alcohol use and health-related quality of life

Women who were non-drinkers and those who rarely drank alcohol had lower scores on the General Health and the Physical Functioning subscales of the SF-36. As well, non-drinkers scored lower on the Mental Health and the Social Functioning subscales. The covariates of smoking and having a chronic condition were associated with lower scores on all eight health-related quality of life subscales of the SF-36 after adjustment for smoking, co-morbidity, education, BMI and area of residence.

6.7.4. Discussion

A study of six year longitudinal data on alcohol consumption, survival and health related quality of life showed that older women in the ALSWH mostly maintained stable levels of alcohol consumption during the study period. In these analyses, women who did not consume alcohol or who drank rarely were more likely to die, or if they survived they had lower health related quality of life compared to women who had 1-2 drinks per day on 3-6 days per week, after adjustment for smoking, co-morbidity, education, BMI and area of residence. There were no significant differences in outcomes for women in other categories suggesting that there is no evidence against applying current alcohol consumption recommendations for women in general to women in these older age ranges. These findings are consistent with and add to previous studies involving men, and/or smaller samples of women (Thun et al., 1997, Simons et al., 2000, Fuchs et al., 1995), and the association with health-related quality of life is similar to cross-sectional studies of younger women (Van Dijk et al., 2004, Gronbaek et al., 1999).

The results of this study indicate that moderate alcohol intake in keeping with current guidelines may carry some health benefits for older women in terms of survival and quality of life. While no evidence was found for poorer outcomes associated with higher intakes, evidence from studies in younger women would suggest that maintaining the recommendation to avoid these higher consumption levels would be prudent. Among non-drinkers, there is no evidence to suggest they should take up drinking, and a common sense case-by-case approach for women with particular medical conditions and medications should still be applied.

6.8. Summary

As women reach their 70s and 80s their health may become affected by risk factors and health behaviours accumulated over their lifetimes. Some of these factors act in conflicting ways. For example, osteoporosis, low BMI, being born in Europe and using medications for both sleep and anxiety were risk factors for height loss in older women. In turn, height loss was associated with increased risk of heartburn/ indigestion and constipation, urinary incontinence and a decline in self-rated health.

Height loss can also affect BMI, as BMI will increase as height reduces. Although a high BMI is associated with chronic conditions, a healthy BMI range for older women may be slightly higher than that recommended for younger adults. For example, hospital admissions were lowest for women with BMI 22 to 24 kg/m^2, and mortality rates were lowest for women with BMI 25 to 27 kg/m^2.

Falls are another risk affecting women at older ages, and are associated with common hazards around the home. These hazards include unsecured mats, shiny floors and poor bathroom design. Older women have an average around 9 to 10 potential falls hazards around their homes. Falls and fractures may be prevented through moderate to high levels of physical activity. However, few women in the 1921-26 cohort engaged in sufficiently high levels of physical activity to prevent falls and fractures.

Smoking is a major risk factor at all ages. The impact of smoking on women in ALSWH was seen in the earlier mortality for smokers compared with non-smokers in the study. Mortality rates decreased after quitting smoking, however even women who quit smoking more than 20 years ago had an increased mortality rate compared with women who never smoked.

Moderate alcohol intake in keeping with current guidelines may carry some health benefits for older women in terms of survival and quality of life. Around one third of women in the 1921-26 cohort reported regularly drinking alcohol, and most of these women drank 1 or 2 drinks per day on some or most days of the week. Survival rates and health related quality of life were lowest among women who did not drink and women who rarely drink alcohol. There were no significant differences in outcomes for women in other categories of alcohol consumption providing no evidence against applying current alcohol consumption recommendations to women in these older age ranges.

The preventive implications of these findings for older women are broadly in line with those for all other sectors of the population: for optimal health avoid being overweight or obese, do not smoke, use alcohol in moderation, undertake regular physical activity, and avoid household hazards. The difference for older women is that the opportunities for change may be reduced. For example, arthritis, osteoporosis and other chronic conditions may limit their ability to exercise. Additionally, while some changes may produce short term health benefits (e.g., quitting smoking) for many risk factors, evidence about time lags between behaviour change and risk reductions is weak. “Lifetime prevention is better than cure”.

6.9. References

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7. Social inclusion and the health of older women

7.1. Key Findings

Social support

- Having a larger social network was associated with
    - being a widow
    - being born in Australia or another English speaking country
    - reporting the major decline in the health of a close family member or friend
    - having adequate mobility (not limited in walking 100 metres)
    - not having a major personal illness; and
    - experiencing better mental health.
- Greater satisfaction with the quality of social interactions was associated with
    - having a partner or being widowed compared with being separated, divorced or never married
    - being born in Australia or another English speaking country
    - not moving house or experiencing a decrease in income recently
    - not being limited in mobility, hearing, eye sight, incontinence, or recent personal illness
    - having better mental health.
- Network size decreased over time, but many of the factors identified as important at Survey 1 remained significantly associated with larger networks.
- Women with partners reported significantly more emotional and instrumental support from their children/spouse/relatives whereas women without partners reported larger network size and higher levels of instrumental support from friends.

Widowed women

- In the first 12 months following the death of their spouse, widows scored lower on SF-36 physical and mental health-related quality of life measures compared with women of the same age who were still married.
- In contrast, women who had been widowed for 12 months or more had scores not significantly different to those of married women.

Women driving themselves

Driving and other forms of transport are crucial for maintaining social connectedness.

- At Survey 3 (when the women were aged 76-81) driving themselves was their main form of transport, especially for women in rural and remote areas.
- Being driven by someone else was the next most common form of transport.
- Even in urban areas few women used public transport.

- While the proportion of drivers decreased slightly by Survey 4, few women who stopped driving used public transport.
- Women who stopped driving between Survey 3 and Survey 4 were more likely to have reported greater use of medications, limited mobility, stroke, arthritis or poorer vision at Survey 3 than those who continued to drive.
- Women who stopped driving subsequently reported loss of independence, considerable restrictions on their social activities and worse self-rated health.

Volunteering

- Among women who completed Survey 4 in 2005, 25% reported they had participated in voluntary activities.
- When women's responses were compared across Surveys 1-4, 16% had reported volunteering on two or more surveys, 8% reported participation in volunteering for the first time at Survey 4, 15% reported volunteering on some surveys and not others, and 35% had never reported volunteering on any survey. The remaining women did not complete all surveys.
- Volunteering was associated with higher quality of life scores and higher levels of social support.
- Women were more likely to continue volunteering over time if they lived in a rural area, had indicators of higher socioeconomic status, and better physical and mental health.

Elder abuse

- At Survey 1 the prevalence of indicators of potential elder abuse were: vulnerability (7.5%), coercion (6.4%), dependence (17.5%) and feeling dejected (21.6%).
- Women who reported any of these characteristics had less education and difficulty managing on their income.
- Widows and women with smaller social networks were more likely to feel dejected.
- Women who reported indicators of elder abuse also reported poorer mental health and more chronic conditions and were more likely to have died during the study period.
- While the data show clear associations between indicators of potential elder abuse and poorer health, the analyses are not adequate to distinguish between direct causation and other factors, such as lower socio-economic status, that may be associated with both elder abuse and poorer health.

7.2. Introduction

This section looks at a number of aspects of social inclusion and how they may impact on women's health and well-being, and their use of health services. It covers various dimensions of social support; the role of transport, especially women's ability to drive themselves; volunteering; and the extent to which some older women experience elder abuse.

7.3. Social networks and support

7.3.1. Social support in older women: cross sectional analysis

It is important to examine social support in older people because they are at risk of declining social support networks due to the death of friends, retirement, declines in physical health and decreased mobility. Social support has an important role in maintaining good health and well being.

However, there are ongoing discussions about how best to ascertain a person's social support. Is social support best reflected by its size (for example, how many people are in a person's social network), or is the quality of a person's social interactions (for example, how satisfied people are with their social interactions) more important?

Additionally, the relationship between mental health and social networks is reciprocal, in that decreases in social network support can result in declines in mental health which may result in further reductions in social connections as affected people withdraw from their communities.

Social support has been measured in the ALSWH using a variety of instruments. Data from Survey 1 of the 1921-26 cohort are shown in Table 7-1. The main factors found to be associated with greater size of social network (i.e. network score) were:

- being a widow
- being born in Australia or another English speaking country
- reporting the major decline in the health of a close family member or friend
- having adequate mobility (not limited in walking 100 metres)
- not having a major personal illness; and
- experiencing better mental health.

Many of the positive factors (e.g., being mobile and not being ill) certainly enhance social networks. However, being widowed was also associated with larger social networks, as social networks are likely to increase in response to the women's increased need for support and assistance. This finding also suggests that women are benefiting from the responsiveness of the social networks they have put into place. However, individuals with poorer mental health have smaller social networks. This may reflect increased resistance to approaches from within their network, or an inability to effectively engage with their networks.

The analyses also showed greater satisfaction with the quality of social interactions to be associated with:

- having a partner or being widowed compared with being separated, divorced or never married
- being born in Australia or another English speaking country
- not moving house or experiencing a decrease in income recently
- not being limited in mobility, hearing, eye sight, incontinence, or recent personal illness
- having better mental health.

Table 7-1 Network and Satisfaction scores at Survey 1 for various baseline characteristics: mean and 95% confidence interval for each level and p-value for variable.

Characteristic	n	Network Score	Satisfaction Score
Marital Status*			
Married/DeFacto	3753	8.79 (8.74, 8.84)	16.98 (16.93, 17.03)
Separated/Divorced/Never Married	550	8.82 (8.68, 8.96)	16.48 (16.29, 16.66)
Widowed in the past year	184	9.20 (8.97, 9.43)	16.81 (16.51, 17.11)
Widowed more than 1 year ago	1861	9.25 (9.18, 9.32)	16.91 (16.83, 16.99)
		<0.0001	***<0.0001***
Moved house			
Yes	379	8.74 (8.57, 8.92)	16.47 (16.25, 16.69)
No	5994	8.95 (8.91, 8.99)	16.94 (16.90, 16.98)
		0.016	***<0.0001***
Country of birth			
Australian born	5006	9.03 (8.99, 9.08)	16.97 (16.92, 17.02)
Other English speaking	870	8.76 (8.64, 8.87)	16.82 (16.70, 16.94)
Europe	397	8.25 (8.08, 8.41)	16.50 (16.29, 16.72)
Asia	64	8.34 (7.88, 8.81)	16.41 (15.93, 16.89)
Other	36	8.28 (7.76, 8.80)	16.72 (16.15, 17.30)
		<0.0001	***<0.0001***
Decreased income in past 12 months			
Yes	1190	8.96 (8.87, 9.06)	16.69 (16.58, 16.81)
No	5183	8.93 (8.89, 8.97)	16.96 (16.92, 17.01)
		0.54	***<0.0001***
Major decline in health of close family member or friend in past 12 months (not spouse)			
Yes	1882	9.09 (9.02, 9.16)	16.82 (16.74, 16.90)
No	4491	8.87 (8.82, 8.92)	16.95 (16.90, 17.00)
		<0.0001	*0.006*
Limited in walking 100m			
Yes	1098	8.62 (8.53, 8.72)	16.48 (16.35, 16.61)
No	5275	9.00 (8.96, 9.04)	17.00 (16.96, 17.05)
		<0.0001	***<0.0001***
Hearing problems in past 12 months			
Yes	2276	8.91 (8.85, 8.98)	16.74 (16.66, 16.81)
No	4097	8.95 (8.90, 9.00)	17.01 (16.96, 17.06)
		0.42	***<0.0001***

Characteristic	n	Network Score	Satisfaction Score
Sight problems in past 12 months			
Yes	4139	8.90 (8.85, 8.95)	16.80 (16.74, 16.86)
No	2234	9.01 (8.94, 9.07)	17.12 (17.06, 17.19)
		0.01	***<0.0001***
Incontinence			
Yes	2127	8.86 (8.79, 8.93)	16.74 (16.66, 16.82)
No	4246	8.97 (8.92, 9.02)	17.00 (16.95, 17.05)
		0.01	***<0.0001***
Major personal illness			
Yes	737	8.77 (8.65, 8.89)	16.58 (16.43, 16.73)
No	5636	8.96 (8.92, 9.00)	16.96 (16.91, 17.00)
		0.003	***<0.0001***
Mental health score			
≥53	5834	9.02 (8.98, 9.06)	17.06 (17.02, 17.10)
< 53	539	8.06 (7.91, 8.20)	15.34 (15.11, 15.58)
		<0.0001	***<0.0001***

* 25 women had missing marital status at Survey 1, but marital transition status could be determined
Adapted from: Pachana et al., *Age and Ageing* 2008.

The results of this cross-sectional analysis provided insights into the factors associated with social network size and satisfaction with social interactions as measured at one survey time point. Whether these associations remain the same over time is examined in the next section.

7.3.2. Social support in the older cohort: longitudinal analysis

It has been suggested that social networks decline over time as people selectively maintain relationships that maximise emotional support (Carstensen, 1991). However, other research suggests that network size remains relatively constant over the lifespan until late in life (Antonucci, 2001) at which time, natural attrition reduces the number of network participants (Lang, 2001), and relationships of longevity and intimacy are not easily replaced. In the previous section we showed a number of factors associated with size and satisfaction with social networks as measured at a single survey time point. These were all factors that may change over time. Other factors may also be important. For example, for many older adults ageing occurs concomitantly with the need to care for a frail or ailing spouse and this is particularly true for older women (Lee, 2002). Adopting a caregiver role, women may subsequently reduce their social activities to concentrate more of their emotional and physical energy on the person they care for, often their partner. After a period of caring which may last for many years, the distress of bereavement can elicit supportive behaviour from friends and family, thus increasing the size of social networks (Scott et al., 2007).

Using data from successive surveys we investigated factors that were significantly associated with changes in the size of the women's social networks. The analyses shown in Table 7-2 were based on data from Survey 2 (1999) when the women were aged 73-78, Survey 3 (2002, aged 76-81) and Survey 4 (2005, aged 79-84). Network size decreased over time (Survey 2-4 effect) and many of the factors identified as important at Survey 1 remained significantly associated with larger networks (i.e., positive regression coefficients). These were: having better mental health, being widowed or separated, experiencing death or decline in the health of a friend or family member, not being limited in walking and being born in Australia. Smaller networks (i.e., negative regression coefficients) were associated with being born in another country (including English speaking countries), having sight problems and moving house.

Table 7-2 Regression coefficients for factors associated with network size from longitudinal model using all available data.

Effect	Regression coefficient	95% Confidence Interval	P- value
Intercept	7.28	(7.03, 7.54)	<.0001
Survey (2-4)	**-0.11**	**(-0.13, -0.09)**	<.0001
Mental Health	**0.02**	**(0.02, 0.02)**	<.0001
Marital Status			
Divorced	0.02	(-0.12, 0.16)	<.0001
Separated	**0.30**	**(0.09, 0.51)**	
Single	0.16	(-0.01, 0.32)	
Widowed	**0.42**	**(0.37, 0.47)**	
Married/Partnered[a]	0.00		
Decline in health of friend or family member			
Yes	**0.12**	**(0.08, 0.17)**	<.0001
No[a]	0.00		
Death of friend or family member			
Yes	**0.09**	**(0.05, 0.13)**	<.0001
No[a]	0.00		
Limited in walking 100m			
Limited a little	**0.12**	**(0.05, 0.20)**	<.0001
Not limited	**0.36**	**(0.28, 0.43)**	
Limited a lot[a]	0.00		
Managing on income			
Difficult always	0.01	(-0.22, 0.24)	0.0006
Difficult sometimes	0.15	(-0.08, 0.37)	
Not too bad	0.19	(-0.04, 0.41)	
Easy	0.22	(-0.01, 0.44)	
Impossible[a]	0.00		
Country of birth			
Asia	**-0.47**	**(-0.75, -0.19)**	<.0001
Europe	**-0.51**	**(-0.62, -0.40)**	
Other	**-0.50**	**(-0.85, -0.16)**	
Other English speaking	**-0.18**	**(-0.26, -0.10)**	

Effect	Regression coefficient	95% Confidence Interval	P- value
Australia	0.00		
Sight problems			
Yes	**-0.10**	**(-0.15, -0.05)**	0.0003
No[a]	0.00		
Moved house			
Yes	**-0.11**	**(-0.17, -0.06)**	<.0001
No[a]	0.00		

[a] Effects for categorical variables are given as differences from the reference category.
Adapted from: Pachana et al., *Age and Ageing* 2008.

7.3.3. Comments from the women about social support

To help contextualise the quantitative results, comments from the women that related to the factors that were significantly associated with the size of the women's social networks over time are included. These comments were drawn from Survey 4 and were based on the final page of the questionnaires sent to the women which was left blank and headed 'Have we missed anything? If you have anything else you would like to tell us, please write on the lines below.'

Network size

The quantitative analysis showed that the size of the women's networks declined from 1999 to 2005. Although the decline was statistically significant, overall it was not substantial. Many of the women in this study reported a decline in social network size because of the increasing loss of close ties through death and ill health and this is consistent with findings reported in previous research (Lang, 2001). As one woman whose network size had reduced considerably commented:

> *In the last two or three years most of my good long term friends, male and female, have passed away. I now only have three or four and some don't drive or go out much. At 81 these gaps are hard to fill and new friends don't happen along.*

Mental health

The statistical analysis showed that better mental health was associated with larger social networks over time for these women. Individuals with poor psychological functioning may be unable to access their networks effectively, or may in fact be resistant to approaches from within their network, particularly if the individual is withdrawing socially due to depression, for example. This is consistent with research suggesting that people with depression may repel social support from existing networks (Pachana et al., 2008). A number of women commented that although they were not particularly happy at the changes wrought by time, they maintained a positive outlook and just got on and 'made the best of it'.

Depression or loneliness were cited by some of the women as being the reason they had few social contacts, as the following quote illustrates:

> *I have no support like many old people. I think loneliness is the biggest problem for old people which is (likely to lead to) depression.*

Although the losses that are concomitant with late adulthood may lead to depression, this is by no means a certain progression. Some women, while acknowledging their grief and sadness, find that loss is also associated with an increase in social support, as members of their social network rally to provide emotional and instrumental support.

Loss and bereavement

Widowhood and bereavement appear to be a time in which women garner greater social support from their networks. The comments from the women reinforce the impact of bereavement and provide evidence for the theory that emotional release that occurs after the physical and emotional burden of caring for a loved one is removed. The illness or death of a loved family member or friend also increased social support, although not to the extent engendered by widowhood. It may be that the women's networks responded to a time of emotional need, providing a level of support consistent with the experienced loss.

> *The major change in my life since you last surveyed me is the long illness and death of my husband. We had a long time to think and talk about it together, but it is worse than I imagined. I am fortunate to have more personal and social resources than many people of my age and I get comfort from them as I always have. I don't think I am unhappy but I find his absence more difficult than I have words for. I do believe I am managing on the whole but it is tougher than I was able to imagine.*

Many women explained how the death of a beloved partner could be interpreted and experienced as a release, as illustrated by this woman's words:

> *My husband was ill (cancer) for a very long time and suffered so much so it was a relief to not see him suffer any more.*

Access to social networks: mobility

An important aspect of social networks is that older women need to have the ability to physically access them. This factor was underscored by the decrease in network size for those women who had limited mobility. Restrictions in mobility caused by increasing frailty or ill health may lead to the relinquishment of driving licences and limit an older woman's ability to access public transport. To be able to walk, drive or easily access public transport is an essential element in maintaining membership in social groups. As these two women explained:

> *Can't walk without a walking stick. Won't go out on public transport.*

> *I have slowed up and do not now go walking, especially on my own. Shopping is now left to family members and activities have been restricted.*

Financial resources

The quantitative data indicated that most of the respondents had little difficulty managing on their income and this lack of financial stress was associated with more extensive social networks. A number of women made comments that indicated that emotional resources were more important than financial ones, as this woman's quote clearly illustrated:

> *As family grew, married I had children I had to learn not to feel guilty about not buying grandchildren, then great grandchildren, Xmas and birthday presents. We can only give our love. Our children in turn give us sensible gifts at gift giving times that help our budget.*

Immigrants

Women from countries other than Australia were likely to have smaller networks than those born in Australia, possibly reflecting the shrinking over time of the cohort of peers from their country of origin. Even women with no language barrier and who have spent the larger part of their life in Australia may find themselves isolated through circumstance: as this woman commented, some old friends have been left behind and new friends have been lost.

> *I have several very dear and kind lifelong friends but they all live in the UK! .... there were two special people locally but both have passed away.*

Access to social networks: sight

The fading of sensory faculties, such as sight, resulted in significantly smaller social networks. Visual impairments caused problems for these women as they struggled to cope with the external world with limited visual acuity. In the words of one woman:

> *I am very limited in my activities on account of my eyesight.*

Families and friends were supportive in providing assistance, as the following quote illustrated:

> *My vision impairment means that I do need help with some shopping and of course, transport, which I get from friends.*

Moving house

A relatively frequent occurrence in later adulthood is relocation, either to a retirement complex or a smaller unit or home closer to family members. Although such a movement can provide some additional instrumental support, leaving behind friends of many years can be emotionally wrenching and making new friends is not always an easy process in later years:

> *Recently paid a deposit on a self-care retirement home for husband and myself. We really don't want to leave our home and wonderful neighbours but some of them are in a similar position and may also be moving.*
>
> *I have just moved to a self-care unit in a retirement village, far from former friends and activities....it is hard to start again at 82.*

These comments complement the quantitative analyses and provide detail that helps contextualise the statistical results. The women who provided the open-ended responses were a self-selected group whose responses may not represent the opinions of all participants. However, their comments are consistent with the themes identified by the quantitative analyses and with earlier research indicating that social networks in late adulthood are affected by a number of psychological and physical variables.

7.3.4. Social support in older women with, and without, partners

In the previous section, a women's marital or partnership status, in particular widowhood, was related to social support. With the death of a partner the bereaved spouse loses one of the most important sources not only of emotional, but also of social, support and must rely on other relationships for support (Ha, 2008). Although much research has examined how social support buffers the distress of spousal loss, little attention has focussed on how widowhood brings changes to different types of social support.

Social support has been categorized in a variety of ways, however instrumental and emotional social support are studied most often. Several theoretical frameworks for social support have been advanced. For example, Litwak's (1985) task-specific model of social support suggests that different sources of support (e.g., friends vs. family) typically provide different types of support (e.g., companionship vs. domestic tasks).

In this analysis we examined the association between women's marital or partnership status and

1. the types of social support (emotional, instrumental) women receive
2. the sources they receive the support from (children, spouse, relatives, friends)
3. the size of their social networks.

The data were from Survey 4 at which time the women were asked more detailed questions about their sources of social support. The results are shown in Table 7-3.

Table 7-3 Sociodemographic and social support variables for women with partners and those without partners at Survey 4.

Variable	Women with partners (n = 1,718)	Women without partners (n = 2,801)	Mean difference	95% CI for the mean difference
Age (in years)	80.97 (0.034)	81.29 (0.027)	**-0.32**	**(-0.40, -0.23)**
Income	0.97 (0.004)	0.95 (0.004)	**0.02**	**(0.01, 0.03)**
Social support (Emotional)				
Children/Spouse/Relatives	5.50 (0.018)	5.31 (0.018)	**0.19**	**(0.14, 0.25)**
Friends	4.91 (0.024)	4.96 (0.019)	-0.05	(-0.11, 0.01)
Social support (Instrumental)				
Children/Spouse/Relatives	4.75 (0.027)	4.35 (0.024)	**0.40**	**(0.32, 0.47)**
Friends	3.58 (0.028)	3.68 (0.022)	**-0.10**	**(-0.17, -0.03)**
Network size	8.8 (0.036)	9.09 (0.029)	**-0.29**	**(-0.38, -0.20)**

Women with partners reported significantly higher levels of emotional and instrumental support from their children/spouse/relatives. On the other hand, women without partners reported higher levels of instrumental support from friends and a larger network size.

Further analyses of these data (details not shown) showed that for older women, the presence of a partner affected the provision of emotional and instrumental support received from family and friends, as well as reducing the size of their social network. Women received less instrumental support from friends which, together with, and emotional support, was provided by family members, who were also able to provide assistance with extended activities of daily living.

7.4. Widowed women

Increasing numbers of women in Australia are living substantial portions of their lives as widowed independent-living women. These women experience significant life events which require differential levels of adjustment and transition beyond the immediate period of grief that follows the death of their husband. The Australian Longitudinal Study on Women's Health provides an important opportunity to explore and understand the changing needs of women as they age, and following the death of their partner.

Cross-sectional analysis of data from the12,624 women aged 70-75 who participated in Survey 1 of the study revealed specific needs for the 35% women who had been widowed, across three major dimensions of life: health, financial, and social circumstances (Byles et al., 1999). These analyses also identified important differences between women who had been widowed for less than 12 months compared with those who had been widowed for more than 12 months. However, there were few differences between women widowed for longer than 12 months and married women of the same age.

Women in the first 12 months following the death of their spouse scored lower on SF-36 physical and mental health-related quality of life measures compared with women of the same age who were still married (see Figure 7-1). In contrast the scores for women who had been widowed for 12 months or more were not significantly different to the scores for married women.

Source: Byles et al., (1999), *Women and Health.*

Figure 7-1 SF-36 subscale scores for married women, those widowed in the previous 12 months, and those widowed longer: Survey 1.

While a reasonably high proportion of all women indicated they had difficulty managing on their income, widowed women were more likely to report this difficulty than married women regardless of the amount of time since the death of their spouse (Byles et al., 1999). Widowed women were also more likely to report stress resulting from relationships with children or other family members, than married women (adjusted OR 1.4; 95% CI: 1.1-.1.7) (Byles et al., 1999).

Many women who were widowed at Survey 1 took the opportunity to write about their lives on the final page of the questionnaire. Some women reflected on how the release from caring responsibilities had a positive effect on their emotional and physical health. A woman widowed for four years commented:

> *My husband had leukemia and was very ill toward the latter part of his life. I found this part of my life very stressful….My life is much better now.*

And another widowed less than two years:

> *My husband passed away in March last year after me looking after him 24 hours a day for 10 years…I was very tired but I am getting much better now.*

Many of the women described the responsibilities that confronted them in the first months following the death of their spouse as daunting and stressful (Feldman et al., 2000). Death of a loved one is a stressful event regardless of age and personal resources.

Further longitudinal qualitative and quantitative data provided by the women in subsequent surveys and sub-studies provided insight into the health and social changes made by widowed women as they re-established themselves following the death of their husband. The data also highlighted the importance of health care providers and other community services in assisting women through this major life transition, as well as the need to maintain social contact and community participation. In-depth study of 250 widowed women quantified a broad range of health and social needs within three years following the husband's death (Feldman et al., 2002). While most widows still lived alone and in their own homes, almost one-fifth of the women had moved house since being widowed for financial or social reasons. The women reported high prevalence of need for health and legal services, assistance with financial matters, and home maintenance. However, most women described themselves as “coping”, some better than others.

Generally, the women felt they had maintained or increased their level of social contact and participation in activities since becoming widowed and these activities were seen to be critical to the emergence of “a new way of life”. Fifty-five percent of women said they did something they really enjoyed most or every day of the week; 37% at least once a week and 5% less than once a week. The most commonly indicated activities were gardening (89%), handiwork (60%), eating out (56%) and going to meetings of clubs or groups (49%). Most women belonged to clubs or organisations, the most common being church or religious groups (39%), Legacy (28%), Returned Services League (19%) and sporting clubs (17%).

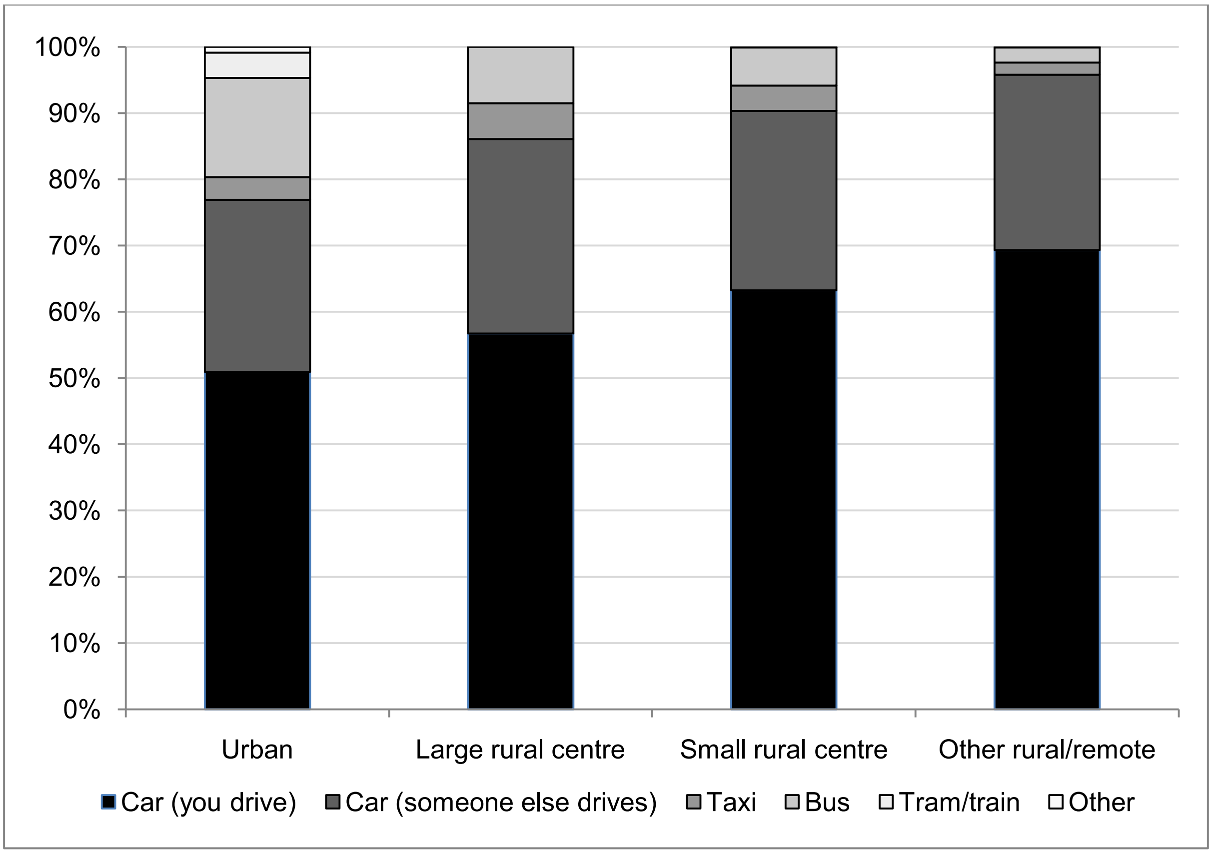
7.5. Driving and other forms of transport

Transport is a major concern for older people. For many, driving is not only a means of transport, but also a means of independence and identity. Moreover, alternative forms of transport may not be acceptable because of difficulties with physical access, availability, convenience or cost. These problems are particularly true in rural areas where subsidized public transport is less frequently available.

In this research we aimed to describe trends in the proportion of women who drive themselves as their main means of transport, identify what alternative means of transport older women adopt when they cease to drive themselves and determine the sociodemographic, health, lifestyle and social factors associated with giving up driving. Data from Surveys 3 and 4 were used for this analysis.

7.5.1. Trends in the proportion of women who drive themselves as their main means of transport and the alternative means of transport older women adopt when they cease to drive themselves

Driving was the main means of transport for most women in the 1921-26 cohort. At the time of Survey 3 when the women were aged 76-81 years, 60% of women in this cohort reported driving themselves as their main means of transport. Figure 7-2 shows how the main means of transport was strongly associated with area of residence with women in more rural and remote areas being more likely to drive themselves at Survey 3, and less likely to use public transport.



Source: Byles et al., (2007) Driving Myself: Main Forms of Transport Among Older Women in Rural and Remote Australia. Refereed paper at the 9th National Rural Health Conference, Albury, 7–10 March, 2007

Figure 7-2 Main means of transport for women aged 76-81 years (Survey 3).

Three years later, at Survey 4, 86% of these women were still driving themselves, but 10% reported they were now being driven by someone else, and a small percentage were using taxis, buses and other options as their main means of transport (see

Table 7-4).

Table 7-4 Change in main means of transport of older women in Australia between Survey 3 (2002) and Survey 4 (2005): results are row percentages.

	Main means of transport at S4					
Main means of transport at Survey 3	**Car (self) %**	**Car (other) %**	**Taxi %**	**Bus %**	**Tram/Train %**	**Other %**
Car (self)	**86**	**10**	**1.0**	**1.6**	**0.38**	**0.56**
Car (other)	5.5	86	3.1	3.3	0.27	2.1
Taxi	1.2	17	72	6.0	0.00	3.6
Bus	2.0	18	7.6	68	0.87	3.5
Tram/Train	4.1	27	4.1	14	49	2.7
Other	2.6	40	13	7.8	0.00	36

Source: Source: Byles et al., (2007) Driving Myself: Main Forms of Transport Among Older Women in Rural and Remote Australia. Refereed paper at the 9th National Rural Health Conference, Albury, 7–10 March, 2007.

7.5.2. Health factors associated with cessation of driving

Women were also more likely to cease driving if they were taking five or more medications; were limited a lot in walking 100 metres; reported stroke, arthritis, or other chronic conditions; or if they had poor vision at Survey 3 – see Table 7-5. Among those who ceased driving 18% reported poor vision at Survey 3, and 9% of those who continued driving had also reported poor vision at Survey 3. Driving cessation was not associated with area of residence, however women with higher levels of education were less likely to cease driving between Survey 3 and Survey 4.

Table 7-5 Association between changes in driving and symptoms and conditions in older women in Australia at Survey 3 and changes in driving between Survey 3 and Survey 4.

Symptom/condition at Survey 3	**N**	**Still Driving at Survey 4 N=2909(86%)**	**Ceased Driving at Survey 4 N=474 (14%)**	**OR(95%CI)****
		N* and % reporting symptom/condition at Survey 3		
Stiff and painful joints	1952	59	64	**1.2(1.1-1.5)**
Back pain	1705	52	52	1.0(0.9-1.1)
Problems with one or both feet	1127	34	37	1.2(0.9-1.4)
5 or more medications	698	20	27	**1.6(1.3-2.0)**
Fall to the ground	501	15	17	1.1(0.9-1.5)
Limited a lot in walking 100m	155	4	11	**2.9(2.0-4.2)**
Hypertension	1895	55	60	**1.2(1.0-1.5)**
Arthritis	1759	51	59	**1.4(1.1-1.7)**
Stroke	172	4.5	8.4	**2.1(1.4-3.0)**
Heart disease	667	19	23	**1.3(1.0-1.6)**
Diabetes	314	8.9	12	**1.3(1.0-1.9)**
Poor vision	347	9	18	Not available

* Denominators (total N) vary due to different amounts of missing data for each item

** Odds of ceasing driving if experienced symptom or condition compared with odds of ceasing driving if not experiencing symptom or condition.

Bolding indicates statistical significance

There was no interaction between area of residence, driving and other variables in Table 7-5.

Source: Byles et al., (2007) Driving Myself: Main Forms of Transport Among Older Women in Rural and Remote Australia. Refereed paper at the 9th National Rural Health Conference, Albury, 7–10 March, 2007.

Cessation of driving was also associated with changes in other characteristics between Survey 3 and Survey 4 (See Table 7-6). Compared with women who continued driving, women who ceased driving as their main means of transport between surveys were more likely to show a change to worse self-rated health, to needing help with daily tasks, and they were less likely to have commenced caring for someone else. Ceasing driving was associated with improvement in vision between surveys, and women with poor hearing at Survey 4 were more likely to report ceasing driving (data not shown). There was no association between ceasing driving and change in marital status, or difficulty in managing on income.

Women who ceased driving by Survey 4 were more likely to report improvement in their rating of the availability of transport than women who continued to drive, perhaps reflecting their greater awareness of transport availability.

Table 7-6 Associations between changes in driving and transitions in other health and lifestyle factors between Survey 3 and Survey 4.

Transition	N	Still Driving at Survey 4 N=2909(86%)	Ceased Driving at Survey 4 N=474 (14%)	OR(95%CI)**
		N* and % with change in health/lifestyle factor		
Change in Marital status	531	7.8	6.4	0.8(0.5-1.2)
Finding managing on income 'easier'	724	10	12	1.2(0.9-1.7)
Finding managing on income 'more difficult'	462	60	6.7	1.2(0.8-1.5)
Transition in self-rated health: improved health	322	9.5	10	1.1(0.8-1.5)
Transition in self-rated health: worse health	454	13	18	**1.5(1.1-1.9)**
Transition to needing help with daily tasks	434	3.1	16	**5.9(4.1-8.1)**
Commence providing care for someone else	840	16	9.7	**0.6(0.4-0.8)**
Cease providing care for someone else	796	15	17	1.2(0.9-1.5)
Vision improved	362	10	16	**1.7(1.3-2.3)**
Vision worsened	826	4.7	6.4	1.5(0.95-2.2)
Availability of public transport: improved from 'none/'a little of the time'	308	4.4	7.8	**2.0(1.4-3.0)**

* Denominators (total N) vary due to different amounts of missing data for each item

** Odds of ceasing driving if experienced symptom or condition compared with odds of ceasing driving if not experiencing symptom or condition.

Bolding indicates statistical significance

There was no interaction between area of residence, driving and other variables in Table 7-6.

Source: Byles et al., (2007) Driving Myself: Main Forms of Transport Among Older Women in Rural and Remote Australia. Refereed paper at the 9th National Rural Health Conference, Albury, 7–10 March, 2007

7.5.3. Social factors associated with cessation of driving

Women who ceased driving were more likely to be limited in their social and leisure activities when compared with women who continued to drive. They were also less likely to be caring for someone else either in their own home or elsewhere, less likely to have been outside their home or outside their immediate neighbourhood, and less likely to have taken part in activities such as going to movies, theatre etc, a sporting event, a restaurant, or attending a class or course.

Women who ceased driving were also more likely to report trouble getting to places at night, getting to shops and services, and getting beyond their local neighbourhood.

Table 7-7 Lifestyle factors for women who were still driving themselves and women who had ceased driving.

Lifestyle factor	N*	Still Driving at Survey 4 N=2909 (86%)	Ceased Driving at Survey 4 N=474 (14%)	OR(95%CI)**
		N and % reporting lifestyle factor at Survey 4		
More than 5 GP visits	1956	58	66	**1.4(1.1-1.8)**
Specialist visits	1572	46	57	**1.6(1.3-1.9)**
Care for someone who lives with you	392	13	7.6	0.6(0.4-0.9)
Care for someone who lives elsewhere	769	26	11	0.4(0.3-0.5)
Trouble getting to places at night	733	23	28	**1.3(1.0-1.6)**
Trouble getting to shops and services	130	2.3	17	**9.2(6.3-13)**
Trouble getting beyond the local neighbourhood	427	12	28	**3.0(2.3-3.8)**
Not been beyond property or apartment building in past month	152	3.7	9.4	**2.9(2.0-4.2)**
Not been outside immediate neighbourhood in past month	362	9.4	19	**2.5(1.9-3.3)**
Not gone to movies, theatres, concerts	2019	59	71	**1.8(1.4-2.2)**
Not gone to a sporting event	2733	81	92	**2.7(1.9-3.9)**
Not eaten at a restaurant	890	26	31	**1.3(1.0-1.4)**
Not attended a religious service	1776	53	57	**1.2(1.0-1.4)**
Not attended a class course	2614	77	88	**2.1(1.6-2.9)**

* Denominators (total N) vary due to different amounts of missing data for each item

** Odds of ceasing driving if experienced symptom or condition compared with odds of ceasing driving if not experiencing symptom or condition.

Bolding indicates statistical significance

There was no interaction between area of residence, driving and other variables in Table 7.7.

7.5.4. Comments from women about driving and other forms of transport

These results suggest that a majority of older women will maintain driving as long as their health will allow it. Conditions such as arthritis and stroke which are associated with physical limitations were strongly associated with driving cessation. Similarly, women who had trouble walking and who had declines in their self-rated health and increases in their need for assistance with daily tasks were more likely to cease driving. These factors may be interrelated as women with arthritis and stroke are also likely to have mobility limitations and disability on activities of daily living.

Poor vision at Survey 3 was also strongly associated with driving cessation. This association with vision has been reported in other research (e.g. Anstey et al., 2006; Ross et al., 2009) and it is noted that vision accounts for 95% of driving capability (Laux & Brelsford, 1990). In their comments the women highlighted the importance of good vision for maintaining driving.

> *My biggest problem is my poor eyesight, because of which I have had to give up driving and rely on my husband and family members and friends.*

A number of women commented on the positive effect of cataract removal in enabling them to continue or resume driving. However, it is notable that 9% of the women who continued driving had indicated they 'could not read a newspaper, even with glasses' at Survey 3. But, we do not have information about these women's distance vision.

While women in more rural and remote areas were more likely to drive themselves than urban women, there were no differences in the probability that these women would cease driving by Survey 4, and there were no significant interactions between health and lifestyle factors, driving cessation and area of residence. Women living in rural and remote areas noted that although driving is essential to their lifestyle, they could often no longer drive the long distances to get to health care and other services. Others noted the frustration and difficulty finding alternative forms of transport in smaller country towns. Mostly women who did not drive had to rely on their husbands, if they were alive and fit to drive, and/or family and friends.

The women's comments highlighted other associations between driving, health and lifestyle. Some women wrote about the interaction between their driving, their health and their husband's health. One urban woman described her need to have her cataract removed because of her need to drive herself and her ill husband. Another woman discussed her lack of social activity with her husband who had dementia

> *'We never go out together anymore as I will not go in the car when he is driving!!'*

As in other research (Johnson, 2003), the women in our study identified driving as a source of concern. This concern is illustrated by one urban woman who said:

> *'I find myself a nervous driver. Should I be driving? Afraid of being housebound though. Only driving locally, avoid freeways. Never drive at night now. Using taxis for unknown destinations in case I get lost'*

One rural woman described 'voluntarily' giving up her licence because of poor vision and how she 'drenched the form in tears'. Another discussed her 'real fear' that she may not be able to continue driving and the threat this would pose to 'my independence that I value'.

As another woman said:

> *…. while I'm still able to drive I feel I have wings.*

Women who ceased driving reported greater difficulties accessing shops and services and had relatively more limited life space and activities with almost one in five women not venturing beyond their local neighbourhood. In their comments, the women also discussed the limits placed on their lives by inability to drive, lack of suitable public transport and inability to afford taxis. These comments were not limited to rural and remote areas, but were more pronounced in these areas where public transport options are limited or non-existent. As one rural woman wrote:

> *'We have no public transport so its legs or car we have to use.'*

Ceasing driving has a significant impact on women's lives, and is a major concern for older women. Importantly, women who are no longer driving are also those who have had major deteriorations in health. So these women have lost not only their main means of transport, but ceasing driving is also a marker of decline in other capacities and an increase in need for care and assistance. There is a need for greater understanding of how we can respond to the changing needs of older women around this important life change, as well as considering the safety of other road users and members of the community.

7.6. Volunteering and older women: Psychosocial and health predictors of participation.

7.6.1. Introduction

Staying active and socially connected has been shown to have positive health benefits in later life (Corporation for National and Community Service, 2007) and one important way that older people stay active and involved in their communities is through volunteering - defined as willingly giving unpaid help in the form of time, service or skills, through an organisation or group (Australian Bureau of Statistics (ABS), 2008). Participation in volunteering generally declines with age, however significant proportions of people over 70 years continue to take part in voluntary work and older volunteers tend to volunteer more hours on average than younger volunteers (Goddard, 1994; Warburton & Cordingley, 2004; ABS, 2006).

The majority of older volunteers are women (because women are more likely to volunteer than older men and because there are more women than men at older ages) and it is estimated that over 30% of Australian women aged 55 to 85 years undertake volunteer work (ABS, 2006). In this analysis of ALSWH data from Surveys 1-4 we had two aims:

1. to explore the prevalence of volunteering and identify the sociodemographic and health-related factors associated with volunteering over time; and
2. to analyse the associations between volunteer status (continuing volunteer, intermittent volunteer, new volunteer, never a volunteer) and health-related quality of life and social support over time.

7.6.2. The prevalence of volunteering and the sociodemographic and health-related factors associated with volunteering over time

Around one in four (25%) of the women who completed Survey 4 reported that they engaged in volunteer activities. When women's responses were compared across Surveys 1 to 4, around 16% of women had reported volunteering on at least two surveys, around 8% reported participation in volunteering for the first time at Survey 4, 15% reported volunteering on some surveys but not others, and 35% never reported volunteering. Results were missing for the remainder of the participants who had died or otherwise did not provide data on these items.

On longitudinal analysis across Surveys 2 to 4 (results not shown here), women who participated in volunteering were more likely to be living in a rural area than in urban areas, have higher education level, and speak English. They were also more likely to have private health insurance, more visits to health care professionals, and better physical and mental health related quality of life. Social factors associated with being a volunteer included living alone, using your own car as the main means of transport, and having better social support (measured by the Duke Social Support Index). The likelihood of a woman participating in volunteer activities decreased over time.

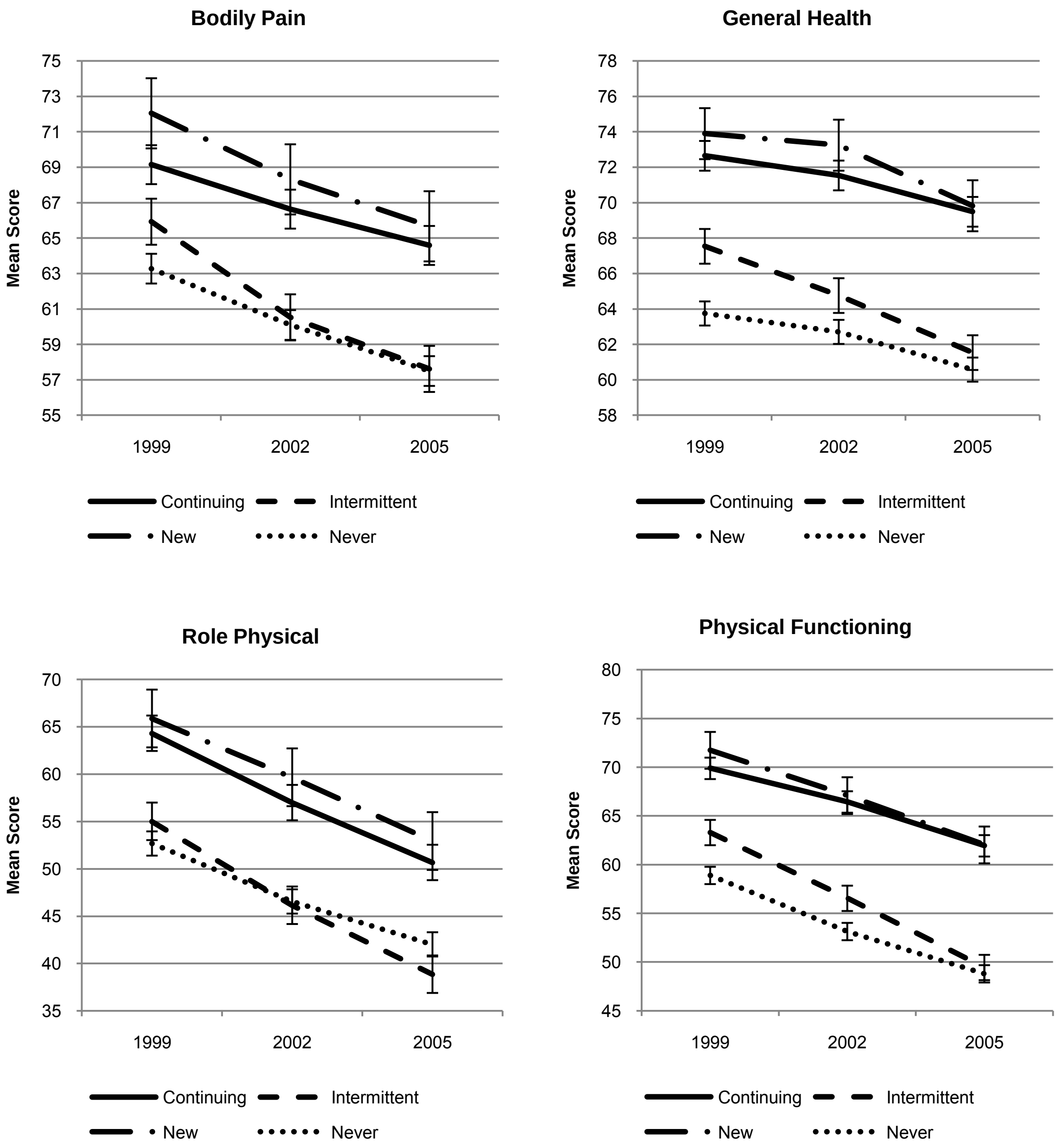
7.6.3. Associations between volunteer status (continuing volunteer, intermittent volunteer, new volunteer, never a volunteer) and health-related quality of life over time

Figure 7-3 and Figure 7-4 describe trends in quality of life scores (mean and 95% Confidence Intervals for the eight SF-36 subscales) according to women's volunteer status across three surveys, Survey 2 to Survey 4 (1999, 2002, 2005). In these Figures, women who reported undertaking volunteer work for any community or social organization 'every day' 'every week' or 'every month' on Survey 2, Survey 3 and Survey 4 were classified as Continuing volunteers; women who reported volunteering for the first time at Survey 3 and again at Survey 4 were classified as New volunteers; and other women who reported volunteering on at least one survey (but not all surveys) were called

Intermittent Volunteers. Women who answered ‘less than once a month’ or ‘never’ in response to the question about volunteering on Survey 2 and ‘less than once a month’ or ‘never’ or ‘missing’ on Survey 3 and Survey 4 were classified as Never having been a volunteer.

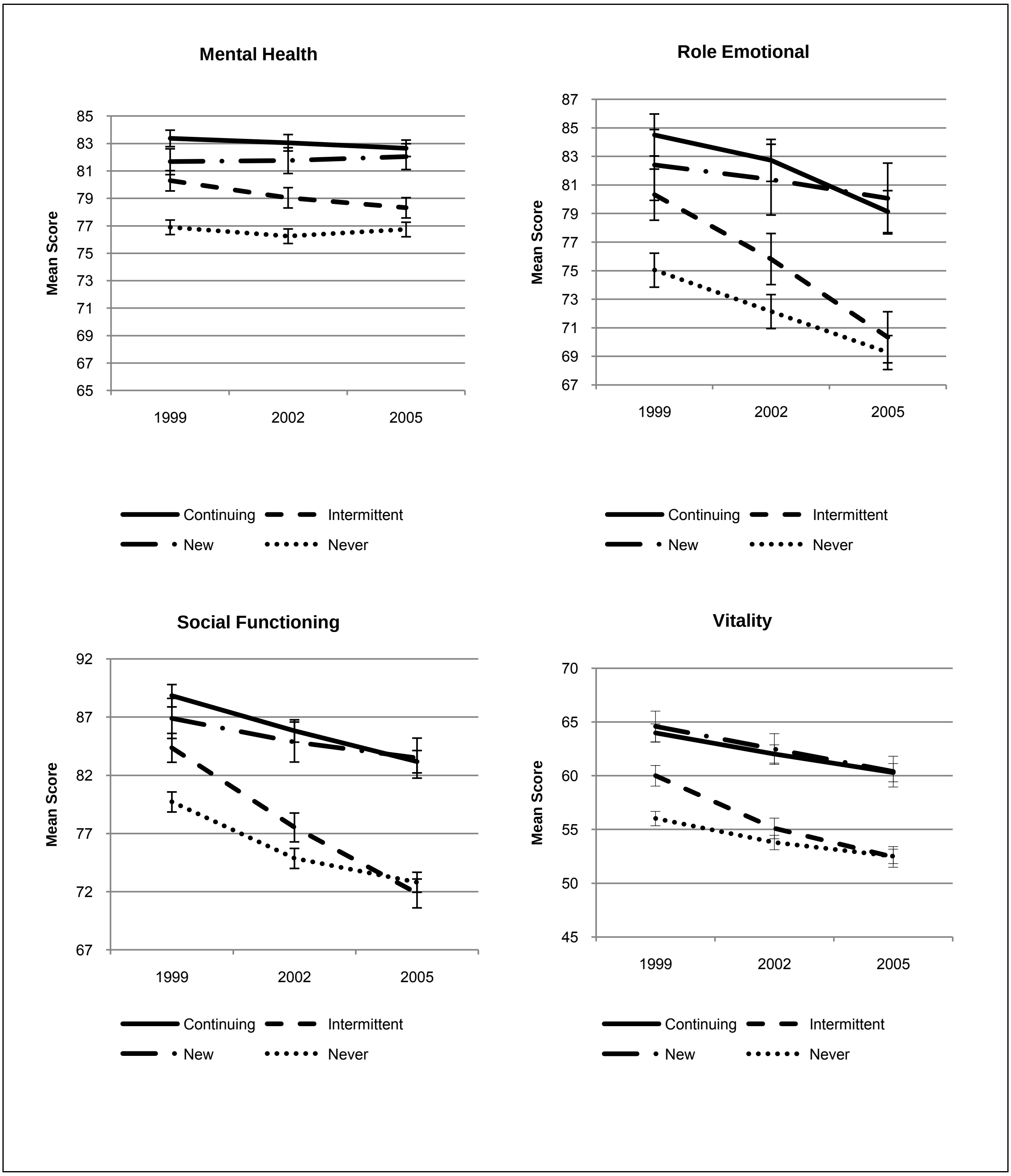
In Figure 7-3 bodily pain, general health, physical functioning and role physical subscales of SF-36 all show a similar pattern, with Continuing and New volunteers having significantly higher scores at all time points, and Intermittent volunteers starting with higher scores at Survey 2 (1999) that declined to become not significantly different to the scores for Never volunteers by Survey 4 (2005).

Figure 7-4 shows scores for mental health, role emotional, social function, and vitality subscales according to volunteer status. Mental health sub-scale scores were relatively stable across time for Continuing, New and Never volunteers, with Never volunteers having significantly poorer mental health than the other three groups (particularly Continuing and New volunteers). Intermittent volunteers started with a similar level of mental health to Continuing and New volunteers, but their scores declined between Survey 3 and Survey 4 to approach the levels of Never volunteers by Survey 4. While role emotional and social functioning scores declined for all women over time, the pattern for these subscales was otherwise similar to that for the mental health subscale, with Continuing and New volunteers having significantly higher scores than other groups at Survey 3 and Survey 4, and scores for Intermittent volunteers decreasing to approximate the scores of Never volunteers over time. The pattern for the vitality subscale was different in that Intermittent volunteers had significantly lower mean scores at Survey 2 compared to Continuing and New volunteers, then decreasing to approximate scores for the Never volunteer category.



Source: Parkinson et al., Volunteering and older people: Pychosocial and health predictors from an analysis of Australian Longitudinal Study on Women's Health data (under editorial review - *Aging and Mental Health*).

Figure 7-3 Mean scores and 95% confidence intervals for SF-36 physical functioning subscales (bodily pain, general health, role physical, physical functioning) according to volunteering status over three surveys.

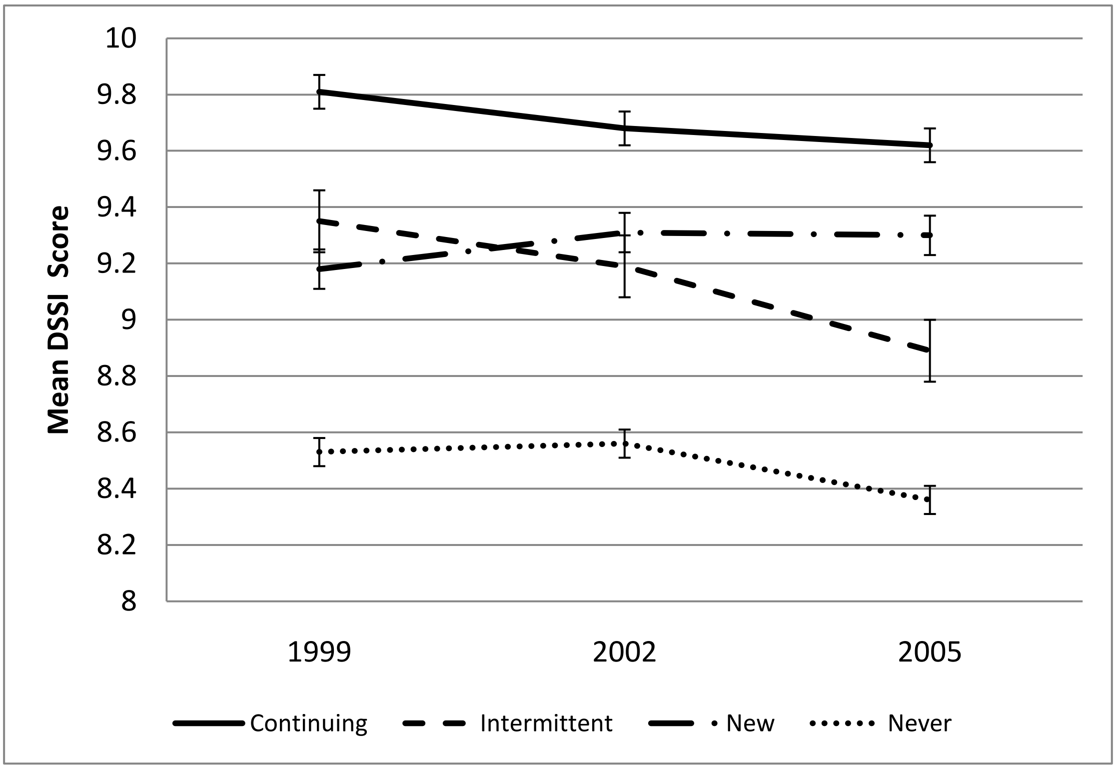


Source: Parkinson et al., Volunteering and older people: Pychosocial and health predictors from an analysis of Australian Longitudinal Study on Women's Health data (under editorial review - *Aging and Mental Health*).

Figure 7-4 Mean scores and 95% confidence intervals for SF-36 mental functioning subscales (mental health, role emotional, social function, vitality) according to volunteer status over three surveys.

7.6.4. Associations between volunteer status (continuing volunteer, intermittent volunteer, new volunteer, never a volunteer) and social support over time.

Figure 7-5 describes the relationship between the women's level of social support and volunteer status across Surveys 3 to 4. A higher mean score on the Duke Social Support Index (DSSI) reflects higher (better) social support. Continuing volunteers had a significantly better social support (higher score) than any other group at all surveys, although the score did decrease slightly over time. While Intermittent and New volunteers were not significantly different in regards to level of social support until Survey 4, New volunteers were on an upward trajectory while Intermittent volunteers were on a downward trajectory. Women who were Never volunteers had a significantly poorer social support than any other group at all surveys, and had a significantly poorer social support at Survey 4 than at Survey 2.



Source: Parkinson et al., Volunteering and older people: Psychosocial and health predictors from an analysis of Australian Longitudinal Study on Women's Health data (under editorial review - *Aging and Mental Health*).

Figure 7-5 Mean scores and 95% confidence intervals for social support (DSSI) according to volunteer status over three surveys.

7.7. Elder Abuse

7.7.1. Introduction

Elder abuse has been recognised as a significant problem for older people. Elder abuse can include physical abuse, psychological abuse, and exploitation or financial abuse (Aged and Community Services Australia (ACSA), 2006; Australian and New Zealand Society for Geriatric Medicine, 2003; Kurrle & Naughtin, 2008; United States National Academy of Sciences, 2003; World Health Organisation (WHO), 2002) and some definitions also include sexual abuse (ACSA, 2006; Kurrle & Naughtin, 2008; WHO, 2002).

In this research we aimed to investigate the prevalence and nature of elder abuse in the 1921-26 ALSWH cohort, determine the sociodemographic and health factors associated with elder abuse and determine the association between elder abuse and survival.

The analyses involved data from Survey 1 and mortality data up to the end of October, 2006.

7.7.2. Prevalence and nature of elder abuse

In the ALSWH, elder abuse has been measured using a 12 item self-report scale which has been developed in the US as a screening tool (Hwalek, 1996; Schofield et al., 2002; Schofield & Mishra, 2003).

Analysis of the women's responses on this self-report scale showed that the items represented four conceptual 'factors' that measured vulnerability, coercion, dependence and dejection (see Table 7-8). Vulnerability to abuse includes aspects of verbal and emotional abuse as well as fear of family members. As shown in Table 7-9, 8% of the women noted at least one aspect of vulnerability to abuse, with name calling and put downs being the most common (6%). Just over 6% indicated some form of coercion, with the most common experience of coercion involving the taking of belongings without consent (4%).

Around 18% of the women participating in Survey 1 reported at least one aspect of dependence. Of these, 9% indicated that they did not trust most of the people in their families and a similar percentage indicated that they had trouble taking their own medication or getting around by themselves. Aspects of the dejection factor were indicted by one in five of the women who participated in Survey 1. Of these women, the majority indicated that they felt sad and lonely often (15%), while 9% reported feeling uncomfortable with someone in their family.

Table 7-8 Components and prevalence of elder abuse scales for 12066 women aged 70-75 years at Survey 1.

Elder abuse scales and items	Prevalence* (%)
Vulnerable	7.5
Has anyone close to you tried to hurt you or harm you recently?	2.2
Has anyone close to you called you names or put you down or made you feel bad recently?	5.9
Are you afraid of anyone in your family?	1.4
Coerced	6.4
Does someone in your family make you stay in bed or tell you you're sick when you know you're not?	0.7
Has anyone forced you to do things you didn't want to do?	2.6
Has anyone taken things that belong to you without your OK?	4.3
Dependent	17.5
Can you take your own medication and get around by yourself?	8.9
Do you trust most of the people in your family?	8.7
Do you have enough privacy at home?	5.8
Dejected	21.6
Are you sad or lonely often?	14.8
Do you feel uncomfortable with anyone in your family?	8.9
Do you feel that nobody wants you around?	3.6

* Weighted for area of residence

7.7.3. The sociodemographic and health factors associated with elder abuse

In this section we examined the sociodemographic correlates of elder abuse among the 12066 women who responded to questions about elder abuse at Survey 1. There were significant associations between sociodemographic factors and abuse. As shown in Figure 7-6, women who had not experienced elder abuse tended to be more educated than those who experienced elder abuse. Women who had not experienced elder abuse were also more likely to indicate that they found managing on their available income to be not too bad or easy when compared with women who had experienced elder abuse (Figure 7-7).

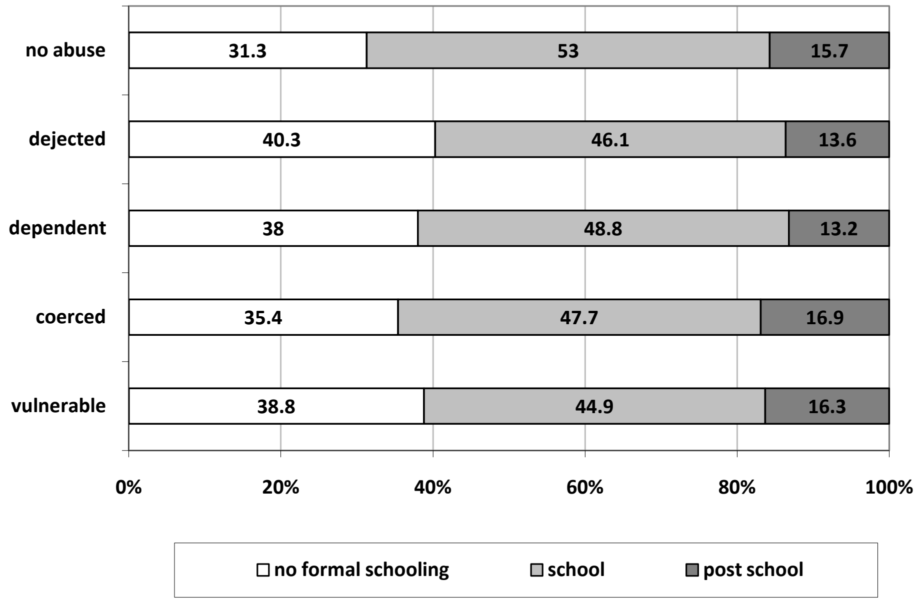


Figure 7-6 Level of education by elder abuse at Survey 1 of the 1921-26 cohort.

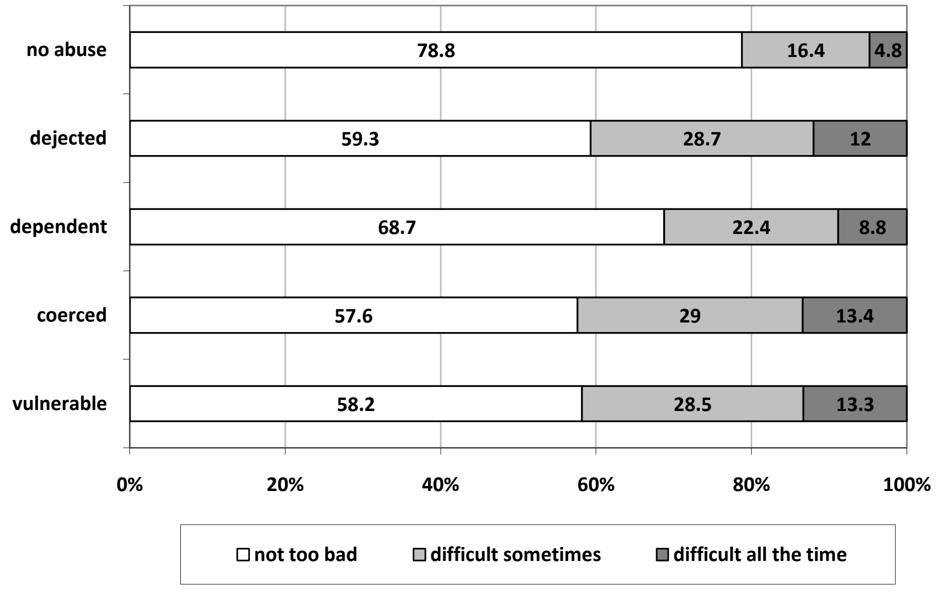


Figure 7-7 Ability to manage on income by elder abuse at Survey 1 of the 1921-26 cohort.

In terms of social support measures, women who had experienced elder abuse were less likely to be partnered (Figure 7-8) and had lower levels of social interaction (Figure 7-9) than women who had not experienced elder abuse.

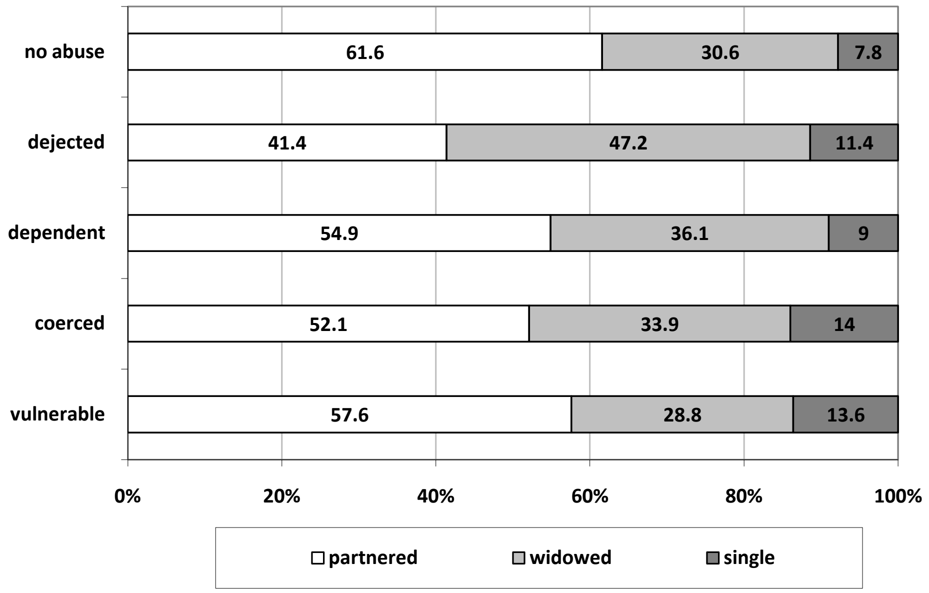


Figure 7-8 Marital status by elder abuse at Survey 1 of the 1921-26 cohort.

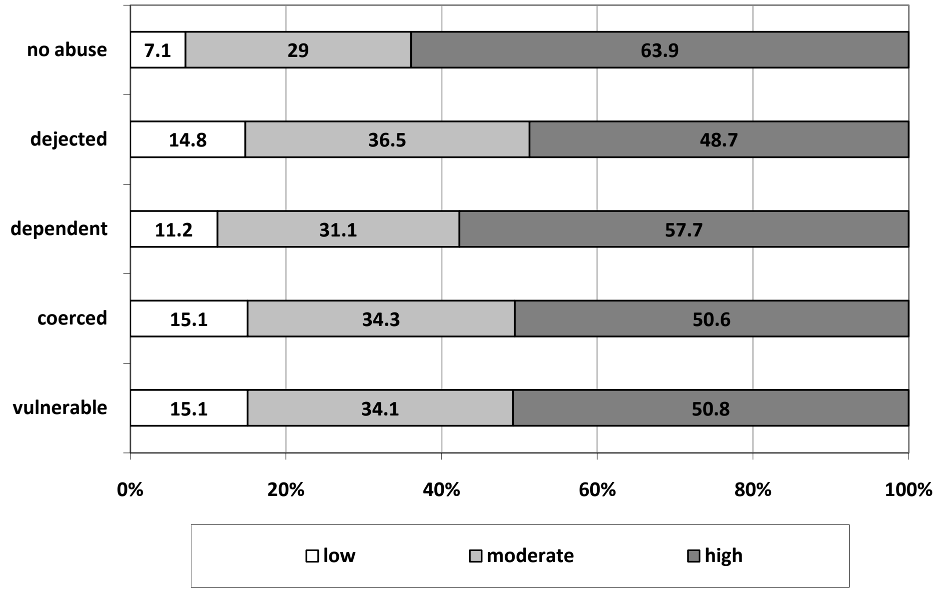


Figure 7-9 Level of social interaction by elder abuse at Survey 1 of the 1921-26 cohort.

Generally, women who had experienced elder abuse were more likely to be smokers or ex-smokers than women who had not experienced elder abuse, although smoking status was similar for women who indicated they were dependent and those who had not experienced abuse (Figure 7-10).

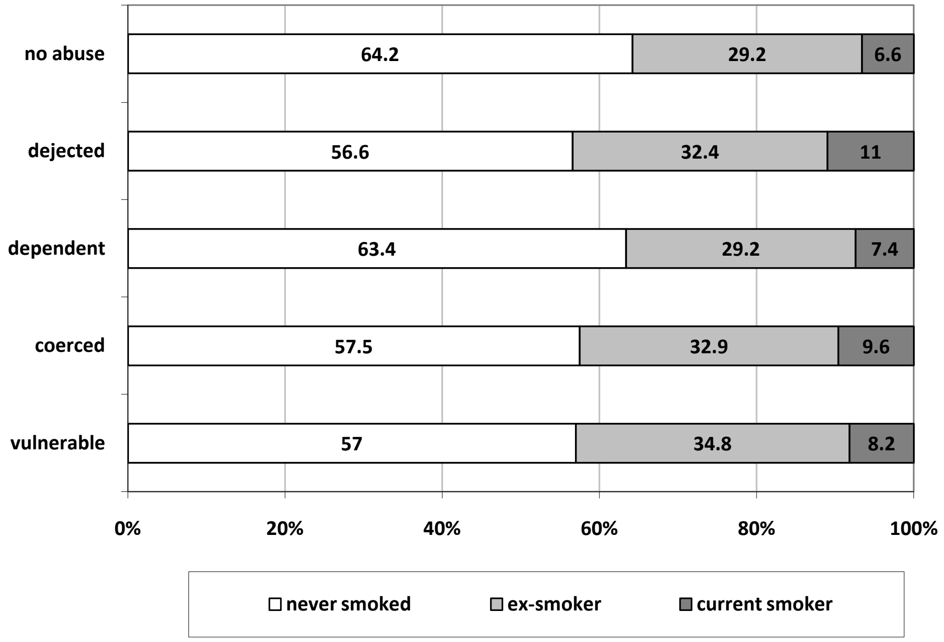


Figure 7-10 Smoking by elder abuse at Survey 1 of the 1921-26 cohort.

A limited body of evidence has suggested that older women who experience abuse also have increased likelihoods of presenting to medical practitioners with physical injuries, gynaecological complaints, gastrointestinal disorders, and general symptoms of fatigue, headache, myalgias, depression, and anxiety (Mouton & Espino, 1999). Results from Survey 1 show that women who have experienced elder abuse had poorer mental health and more chronic conditions (diabetes, heart disease, stroke, osteoporosis, and cancer other than skin cancer) than women who had not experienced abuse. Figure 7-11 shows the number of chronic conditions that women who had and had not experienced elder abuse reported at Survey 1.

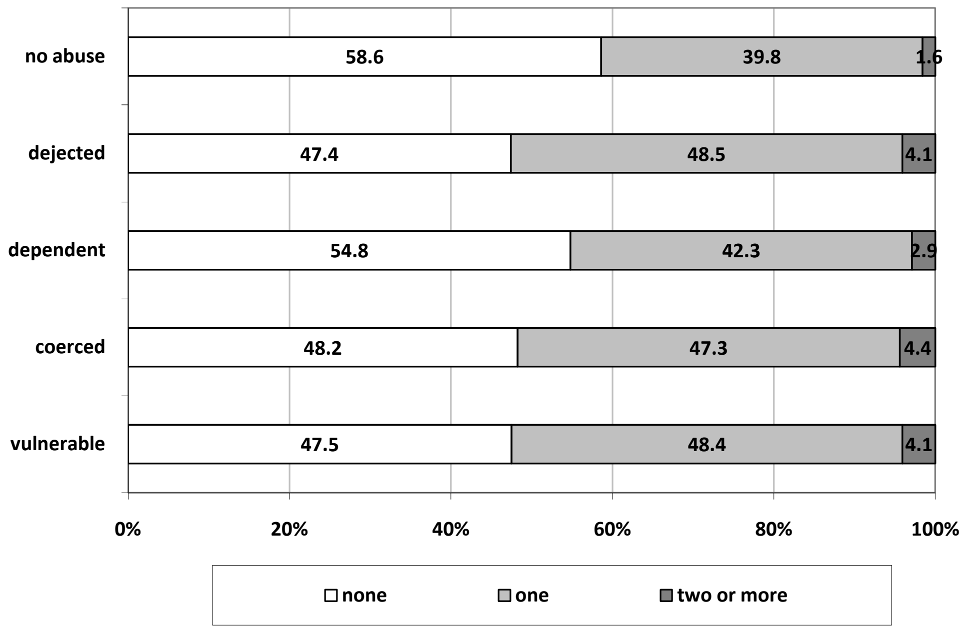


Figure 7-11 Number of chronic conditions by elder abuse at Survey 1 of the 1921-26 cohort.

7.7.4. The association between elder abuse at Survey 1 and survival

Figure 7-12 shows the impact of the four aspects of elder abuse (vulnerability, coercion, dependence, dejection) as measured at Survey 1 on subsequent mortality. Women who had experienced coercion, dependence or dejection as indicated by the ALSWH elder abuse subscales at Survey 1 (Table 7-8) were more likely to die during the study period than women who did not have these experiences. Vulnerability was not associated with increased mortality. After adjusting for demographic and social support measures, dependence was no longer significantly associated with mortality. The effects of coercion and dejection were still significant after controlling for demographic factors, social support measures and health-related factors, but not significant when poor mental health and chronic conditions were included in the models.

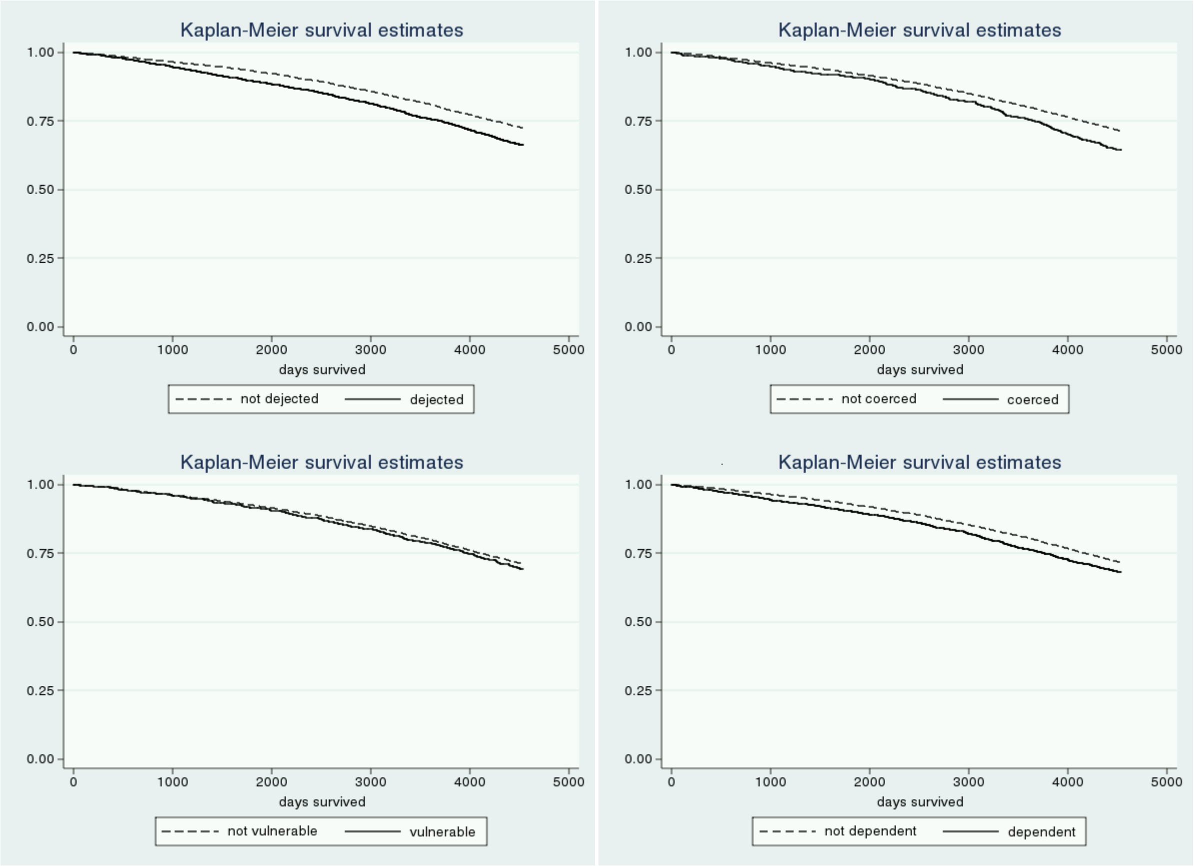


Figure 7-12 Estimated survival of women by coercion, vulnerability, dependence and dejection.

7.7.5. Discussion

These data show clear associations between indicators of potential elder abuse and poorer health but the analyses are not adequate to distinguish between direct causation and other factors, such as lower socio-economic status, that are associated with both elder abuse and poorer health.

7.8. Summary

While much of this report has focussed on the physical health of older women we also examined social inclusion, social support, social participation and networks. Evidence for association between older women's health and social factors is weak and inconsistent. By using longitudinal data we showed that poorer health lead to social isolation (e.g., through loss of mobility, having to stop driving, or sensory loss). In contrast, our analyses have not, at this stage, shown that low levels of social connectedness and support lead to ill health. The implication of these findings is that policies or services aimed at increasing older women's social inclusion as a strategy to improve health are not supported by evidence.

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8. Trends in health across three generations of Australian women

8.1. Key Findings

- Trends in social and demographic factors and health differed across generations (cohorts), as women in any generation became older, and at different historical times. These differences mean that extrapolation from the experiences of one generation to another is often inappropriate.
- Some conditions such as hypertension and diabetes increased with age regardless of cohort.
- Other conditions such as asthma showed different patterns across different generations.
- Overweight and obesity increased among younger and mid-aged women. These trends are likely to cause increases in chronic conditions and greater need for health services well into the future.
- While physical health scores decreased with age, mental health scores tended to improve except at the oldest ages.
- These age-specific differences emphasise the growing needs for health care providers with special expertise in the care of different age groups, in particular the care of older adults as this group becomes a higher percentage of users of health services.

8.2. Introduction

The objective of this section is to explore differences between the three generations of women in the ALSWH in terms of demographic characteristics, health risk behaviour and health status, over a period of 12 years from 1996 to 2008. There are numerous challenges in studies that follow individuals over the lifespan. One of the most important tasks is disentangling age, period and cohort effects when interpreting findings (Yang, 2008). (See Box 1 for definitions.)

In the ALSWH we have attempted to overcome some of the limitations of other longitudinal studies, by simultaneously studying three cohorts of adult women as they age. The purpose of this section is to illustrate differences between these groups of women in trends in selected demographic factors (i.e., marital status and education), health risk factors (i.e. smoking, alcohol consumption, physical activity, and weight), health status indicators (i.e., the common conditions of asthma, hypertension, diabetes and depression), and measures of general health over more than a decade. These indicators were selected because they are important for health across the lifespan and were measured by the ALSWH across all cohorts at three or more times.

Box 8-1 Definition of age, period and cohort effects.

Age effects: Patterns of morbidity and mortality that are due to the biological process of ageing. These effects are reasonably consistent across nations and historical time.

Period effects: Patterns related to the time at which events occur that influence all age groups at about the same time. They may include the impact of historical events and environmental factors such as world wars, economic conditions, pandemics of infectious diseases or new health interventions that influence the health of all members of society at a particular time.

Cohort or generation effects: Represent patterns of morbidity and mortality across groups of individuals born in the same year or years. Cohort effects usually suggest environmental causes possibly occurring early in life and producing later health effects.

Sources: Merrill, 2007; Taylor, Comino & Bauman, 1997; Yang, 2008

8.3. Changing Demography and Risk factors

Demographic characteristics and health risk factors of women who responded at each survey are shown in Table 8-1. During the study period the percentage of women in the 1973-78 cohort who were partnered increased, while the percentage of women who were partnered in the 1946-51 cohort decreased slightly. The dramatic decrease in partnered status among the 1921-26 cohort reflects the number of women who had been widowed. The percentage of post-high school qualifications among the 1973-78 cohort increased over time, with 79% having a post-high school qualification by the time they were aged 28-33 years. In comparison, only 39% of the 1946-51 cohort had post-high school qualifications and this figure was lower still (19%) for the 1921-26 cohort.

Table 8-1 Demographic characteristics and health risk factors of women in each cohort who responded at each Survey.

Characteristic	Cohort	S1	S2	S3	S4	S5
Married/partnered (%)	1973-78	19.2	44.1	60.8	72.8	x
	1946-51	83.0	82.3	81.1	79.6	78.0
	1921-26	58.8	52.6	45.6	38.1	30.3
Post-high school education (%)	1973-78	31.9	70.8	76.2	79.2	x
	1946-51	39.2	-	-	-	-
	1921-26	18.9	-	-	-	-
Current smoker (%)	1973-78	27.2	25.5	21.5	17.1	x
	1946-51	14.4	14.6	12.9	12.5	10.2
	1921-26	5.2	3.7	-	-	-
Risky level of alcohol consumption (%)	1973-78	4.9	3.2	3.3	3.4	x
	1946-51	5.0	5.5	-	6.7	6.5
	1921-26	3.6	4.0	3.0	-	-
Inadequate physical activity (%)	1973-78	-	44.2	44.7	49.9	x
	1946-51	-	-	53.9	44.2	40.6
	1921-26	-	57.8	61.4	66.0	74.8
Overweight or obese (%)	1973-78	20.1	28.3	33.8	39.0	x
	1946-51	44.2	48.9	53.6	58.0	58.8
	1921-26	46.1	47.3	49.4	47.2	46.1

Row percentages are weighted by area of residence
X: Data not yet complete for Survey 5 of 1973-78 cohort
- : Not asked at that survey

Across all three cohorts the percentage of women who smoked decreased over time. The 1973-78 cohort had the highest proportion of smokers, followed by the 1946-51 cohort, with a very low rate of smoking in the 1921-26 cohort. Risky drinking was low for all three cohorts, with percentages remaining fairly stable over time. Of the three cohorts, only those born in 1946-51 showed an improvement in the amount of physical activity being undertaken. The proportion of women who did inadequate physical activity increased among both the 1973-78 and 1921-26 cohorts.

The proportion of women who were overweight or obese increased by 19% over 10 years for the 1973-78 cohort, and by more than 14% over 11 years for the 1946-51 cohort. However, while there was a consistent increase in overweight and obesity in the 1973-78 cohort, for the 1946-51 cohort the increase appeared to plateau, with 58% of women overweight or obese in 2004 and 59% overweight or obese in 2007. In contrast, the 1921-26 cohort showed only small fluctuations in overweight and obesity over time. Trajectories in BMI that further illustrate these findings can be seen in Figure 8-1. Despite changes in overweight and obesity over time, it is important to note that 39% of the 1973-78 cohort, 59% of the 1946-51 cohort and 46% of the 1921-26 cohort were overweight or obese at the most recent survey.

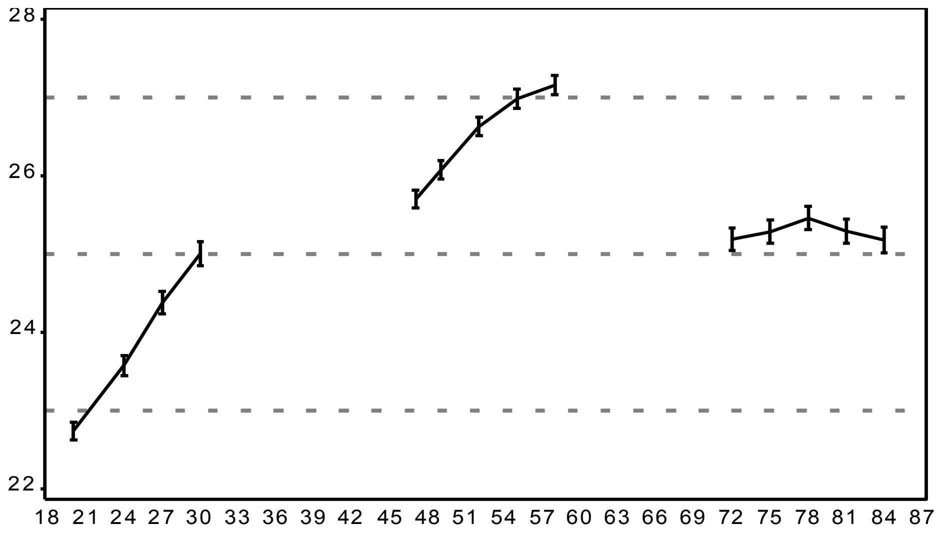

Figure 8-1 Mean BMI by age in the three cohorts.

8.4. Differences in Chronic Conditions

Prevalence of asthma, hypertension, diabetes and depression by age in the three cohorts is shown in Figure 8-2 and Figure 8-3. In 1996 lifetime prevalence of asthma was highest among women born 1973-78 and lowest among women born 1921-26 (i.e., an example of a cohort effect). Since then the prevalence of asthma increased over time, and remained highest in the younger cohort. Results for hypertension and diabetes show age effects rather than cohort effects, that is, increasing lifetime prevalence with age is readily apparent, especially in the 1946-51 and 1921-26 cohorts for hypertension. Prevalence of depression at each survey increased marginally over time in all cohorts with the 1973-78 and 1946-51 cohorts showing higher levels of depression than the 1921-26 cohort.

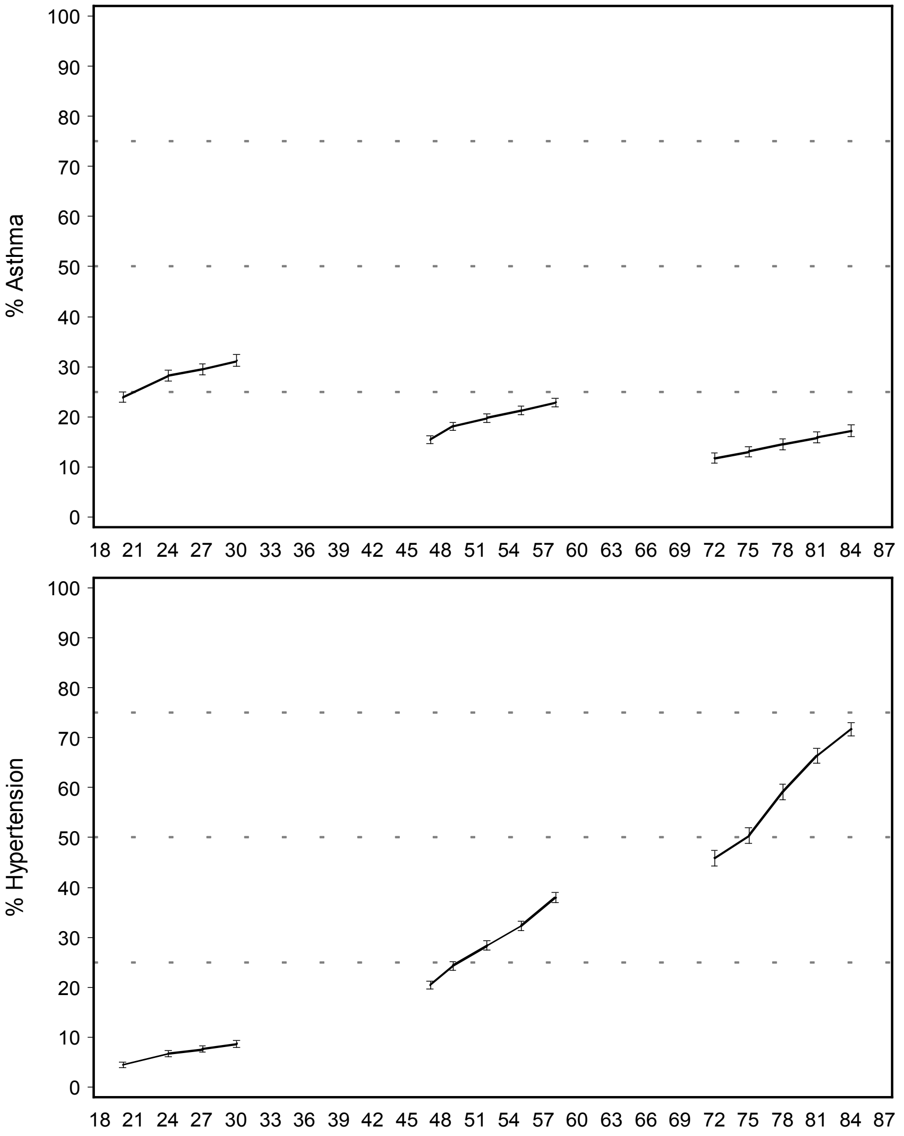

Figure 8-2 Prevalence of asthma and hypertension by age in the three cohorts.

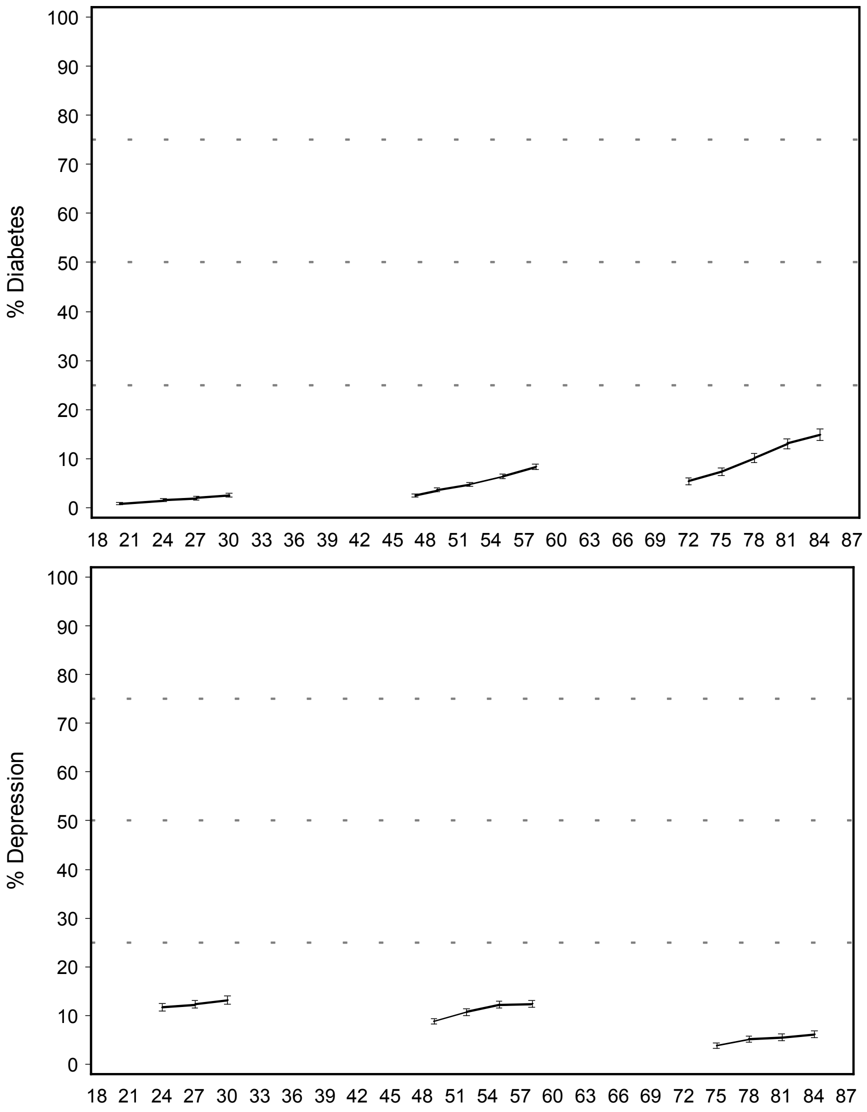

Figure 8-3 Prevalence of diabetes and depression by age in the three cohorts.

8.5. Trends in Physical and Mental Health Scores

Mean scores (with 95% confidence limits) for the PF and MH subscales are shown in Figure 8-4, where higher scores reflect better health. As might be expected, women in the 1973-78 cohort had the best physical functioning which remained steady over time. While women in the 1946-51 cohort showed a steady decrease in physical function as they aged from 45-50 to 56-61 years, the older women experienced a sharp decline in physical function as they aged from 70-75 to 82-87 years. In contrast women in the 1973-78 cohort reported the poorest mental health, followed by those in the 1946-51 cohort, while women in the oldest cohort had the best mental health. For the two younger cohorts mental health improved over time (and with age), but for the 1921-26 cohort mental health declined as women aged from 79-84 to 82-87 years.

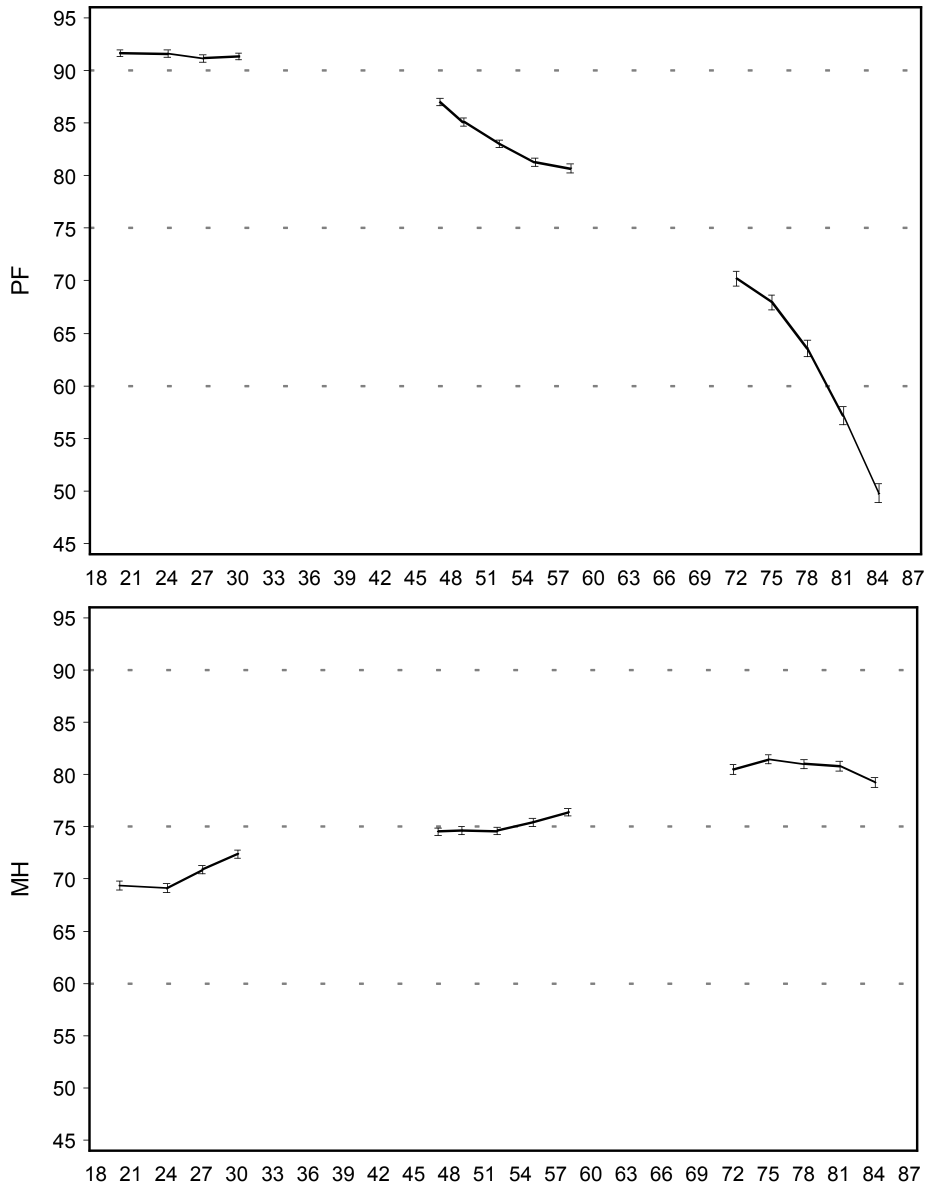

Figure 8-4 Mean physical function and mental health index scores from the SF36 by age in the three cohorts.

8.6. Discussion

In summary, age, cohort and period effects were all illustrated by the data. The pattern of gaining and then losing partners over time is predominantly an example of an age effect, but there was also a cohort effect, as the younger women moved into stable partnerships at a later age than the older women would have done. The social and economic resource implications, as well as heath service utilisation considerations, of young women remaining single for longer, and having children later in life will be considerable. Furthermore, the need for health services to provide additional support for unpartnered older women is also likely to gain increased urgency in the foreseeable future, as the numbers of widowed older women in the population continues to increase. There is evidence that innovative models of care, such as multidisciplinary team targeted home visits for elderly people, particularly those living alone, can improve access and quality of care (Beck et al., 2009).

Differences between the cohorts in education were also apparent, reflecting a period effect with older women having low levels of education compared to the high levels evident among the younger cohort. The impact on the health system is reflected in the different expectations and information requirements of people of different ages, and consequently the wider range of services demanded (Andreassen et al., 2007).

The differences in smoking prevalence suggest strong cohort effects. It is important however, to consider the impact of smoking on morbidity and mortality among the oldest women, and the observation that smokers were more likely to drop out of the study than non-smokers in all three cohorts (Young et al., 2006). This means that population prevalence of smoking may have been underestimated. The health effects of smoking are long-term, not just for risk of lung cancer but also for damage to the respiratory and vascular systems (Erhardt, 2009). Thus the impact of smoking is likely to affect the need for health care of chronic conditions for decades to come.

Patterns in the prevalence of inadequate physical activity and overweight and obesity showed different trajectories for women in the three cohorts. Women in the oldest and youngest cohorts did less physical activity over time, while those in the 1946-51 cohort did more. At the same time, there was a sharp increase in the prevalence of overweight and obesity in both the 1973-78 and the 1946-51 cohorts from 1996 to 2005/2006. In the last survey period this increase may have slowed in the 1946-51 cohort, possibly related to increasing levels of physical activity. These findings mirror the general pattern in Australia, where the prevalence of overweight and obesity has been increasing over at least the past 20-30 years. The implications for health services of the growing levels of overweight and obesity and decreasing physical activity, particularly in younger women are considerable. The age-specific prevalence of chronic conditions is likely to be higher than for older generations (Li, et al., 2006) resulting in greater burden for the health system. It is essential that health services encourage the maintenance of healthy weight for all women, but especially young women who are vulnerable to increased weight at transition times such as moving in with a partner or getting married, starting work, or having children (Bell & Lee, 2005).

The lowest prevalence of asthma was reported by women in the oldest cohort and the highest among the youngest cohort (i.e., cohort effects), but prevalence increased in all cohorts during the study period (i.e., period effects). There is evidence that asthma may be under-diagnosed in older people (Braman & Hanania, 2007). Nevertheless, age-period-cohort modelling has shown that some of the increase in asthma deaths in the mid 1960s, and all of the rise in the late 1980s, was the result of birth cohort effects (Taylor et al., 1997). An estimated 10.3% of the Australian population had asthma in 2004-5, down from 11.6% in 2001 and overall females had a higher prevalence than males (AIHW, 2008). There is evidence that improvement in recognition and treatment of asthma has promoted a decrease in mortality (Comino & Henry, 2001). The implication of this complex pattern is that control of asthma may be improving due to both improvements in health care and changes in the environmental conditions that influence the aetiology of the condition.

Hypertension showed increasing prevalence with age, with the trajectory for women in the 1921-26 cohort following on from the trajectory for women in the 1946-51 cohort. However, the trajectory of the youngest cohort did not indicate an increase in prevalence, consistent with the finding that both prevalence of hypertension and average blood pressure have decreased appreciably since 1980 among urban populations in Australia aged 25-64 years (AIHW, 2008). In contrast, the prevalence of diabetes suggests a steady increase in prevalence with age. In light of the trends for BMI and overweight and obesity, it is likely that there could also be a cohort effect with higher prevalence of diabetes in the younger cohort when they are in their forties, than in women from the 1946-51 cohort at the start of the study. With increasing prevalence of many weight-related chronic diseases there will be a need to plan for managing larger numbers of patients cost effectively across the life span.

The trends for depression show that mental illnesses including depression account for a large proportion of overall disease burden for all age groups up to middle age (AIHW, 2008). The 'healthy survivor' effect may account for the lower depression among older women as women with poor mental health are more likely to drop out of the study as they get older due to increasing disability or earlier death. However, there is other evidence that women's psychological well-being is well maintained into old age (Lee, 1999). Other age-related illnesses may complicate the recognition and treatment of depression, which is more commonly experienced by women than men (Krishnan, 2002). The short-term implications of our findings are that younger women may exhibit co-morbid physical and mental health problems earlier in life than previous generations and these will likely require more management by health service providers with skills in more complex care.

The overall results for physical functioning showed a clear effect of decline with age from the initially high level of physical health in the youngest women, as expected. However, this was balanced to some extent by better mental health with increasing age; which may reflect women's changing expectations of their own health as they age. These age-specific differences emphasise the growing needs for health care providers with special expertise in the mental health of young people, and in the care of older adults as this group becomes a higher percentage of users of health services.

8.7. Summary

Extrapolation from the health of older women to the likely future health of younger women is often inappropriate because social conditions, health-related behaviour and health services differ substantially between generations. However, through careful analysis of major health risk factors across age groups and over time some predictions are possible.

Cigarette smoking was uncommon among women born in 1921-26 yet it has shortened the life expectancy of smokers as well as increasing their risk of respiratory and other chronic conditions. Smoking at some time in their lives has been more common among the middle-aged and younger women and the adverse effects are lively to impact on their health for the rest of their lives. There is good evidence that quitting smoking reduces risk of some conditions (e.g., cardiovascular conditions) quite quickly, but other risks (e.g., lung cancer) more slowly. For adult women who smoke, medical and behavioural help to stop smoking would increase their chances of making this change and reducing the subsequent health risks and costs. For children and young adults the emphasis should be on never smoking.

Among ALSWH participants (and the wider community) younger women (those born in 1973-78) are gaining weight on average faster than mid-aged women (born in 1946-51) who are gaining weight and have higher prevalence of overweight and obesity than older women (born in 1921-26). Based on current understanding of metabolic effects of excess weight, it is very likely that hypertension, diabetes and cardiovascular disease will increase as consequences of this population wide weight gain. This will substantially increase health care costs. Evidence for effective methods to avoid weight gain, increase weight loss and the time lags between weight change and risk change are all weak (in part due to changes in modern diet and levels of energy expenditure). The implications are that weight related health problems will increase for decades and that while prevention of overweight and obesity among children is important, there is an urgent need for better understanding of how to manage the burden of disease and costs due to excess weight in adults.

Current preventive activities in Australia to reduce overweight and obesity, reduce the prevalence of tobacco smoking, and increase levels of physical activity are all strongly supported by the data presented in this report.

Our data also identify growing needs for the primary care sector to help older women with chronic conditions. This requires understanding of their circumstances, and multiple symptoms and diagnoses.

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9. Appendix: Papers

This appendix contains published ALSWH papers used as source materials for selected Tables and Figures included in this Report.

9.1. Changes in older women's physical health: papers

9.2. Chronic conditions facing older women: papers

9.3. Major risk factors affecting older women: papers

9.4. Social inclusion and health of older women: papers

Feldman, S., Byles J., Mishra G., & Powers, J. (2002). The health and social needs of recently widowed older women in Australia. *Australasian Journal on Ageing, 21*(3), 135-140. ....p245

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Weighted multimorbidity indexes predicted mortality, health service use, and health-related quality of life in older women

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Abstract

Objective: To develop indexes of multimorbidity, based on self-reported data, to predict mortality, health service use, help with activities of daily living (ADL), and health-related quality of life (HRQOL) in older women.

Study Design and Setting: Cross-sectional survey of 10,434 women, aged 73−78 years, in the Australian Longitudinal Study of Women's Health in 1999, with mortality follow-up to 2005. For analysis, the sample was equally split into a development and validation sample. Weighted and unweighted multimorbidity indexes were developed and tested.

Results: Outcomes ranged from 14% for mortality to 47% for specialist doctor visits. Mortality was predicted by heart disease, stroke, low iron, diabetes, cancer (nonskin), bronchitis/emphysema, and Alzheimer's disease. Different patterns of morbidities were associated with the other outcomes. Weighted and unweighted multimorbidity index scores were linearly related to increasing risk of each outcome. For each outcome, the weighted scores fitted the data better and had a wider range of possible values.

Conclusion: These multimorbidity indexes predict mortality, health service use, help with ADL, and HRQOL in older women. The indexes could be used as covariates in research with weighted scores having a better chance of discriminating between patient groups than unweighted scores.

Keywords: Comorbidity; Multimorbidity; Mortality; Health services; Quality of life; Women

1. Introduction

The health of older people is characterized by multiple chronic conditions that individually and jointly affect their quality of life, use of health services, morbidity, and mortality [1]. For this reason, there is an increasing interest in the measurement of the joint effects of multiple conditions.

There are three main issues to consider. First, a distinction should be made between comorbidity indexes, which measure the presence of a chronic disease or condition *in addition to* an "index or principal condition" and multimorbidity indexes which measure the occurrence of two or more conditions, without consideration of an index condition [2]. An advantage of comorbidity indexes is the potential to create "disease-specific" measures, which may have high validity in particular patient populations [3]. The disadvantage is the potential lack of generalizability to other populations. The advantage of multimorbidity indexes is that they may have wider applicability.

Second, data on multiple conditions may be obtained from the subjects themselves (i.e., self-reported data) or from medical or administrative records. One of the best-known, valid and reliable multimorbidity indexes, which is based on data collected from administrative databases, is the Charlson index [4]. Developed initially to predict 1-year mortality for hospitalized patients, this index has been adapted for use with diagnoses recorded using International Classification of Disease (ICD) edition 9 codes [5−8] and edition 10 (ICD-10) codes [9] and has also been shown to predict medical complications [5], hospital readmissions and health practitioner visits [10,11], and hospital costs [5,10,11]. Self-reported versions of the Charlson index have also been developed and found to predict mortality [12] and to have moderate correlations with medication use and hospitalizations [13]. Other multimorbidity indexes based on self-reported conditions have also been developed due to increasing support for the validity of self-reported health information [13−15] and to problems with the use of administrative databases [2,13]. The Comorbidity Symptom Scale

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[16] is one such self-reported measure based on 23 chronic conditions scored for prevalence and severity. It was developed on a population of people aged 65 years and older who were undergoing cataract surgery. The scale has been shown to correlate well with activities of daily living (ADL), health status, and anxiety and depression.

Finally, the people for whom the indexes are developed and used may be patient groups (see above) or community-based populations. There is a particular shortage of population-based studies. Fan et al. [17] developed an index on a population of 5,469 patients (plus a validation set of 5,478 patients) drawn from general internal medicine clinics at Veterans Affairs medical centers in the USA. Although this population was predominantly male (>97% in their study), it was not restricted by hospitalization or diagnoses. Seven self-reported chronic conditions (prior myocardial infarction, cancer, lung disease, chronic heart failure, diabetes, pneumonia, and stroke) plus age (in 5-year intervals) and smoking status (current or past) were found to predict mortality and hospitalizations. From this research, the Seattle Index of Comorbidity was created by adding weights for every item; the weights are 1, 2, or 4 depending on the contribution of the item to outcome. More recently, Byles et al. [18] aimed to develop a generic multimorbidity index, based on self-report prevalence and severity of 25 chronic conditions using data from 1,303 Australian veterans or widows of veterans, aged 70 years or older. They found that different weighted indexes were needed to optimally predict each of the different outcomes of mortality, hospital admissions, and health-related quality of life (HRQOL).

The objective of this paper is to develop and test multimorbidity indexes based on self-reported data for use among community samples of older women. By doing this, we aim to complement the work of Fan et al. [17], which was conducted with men, and by using a large database and multiple outcomes substantially extend the work of Byles et al. [18].

2. Methods

2.1. Design

We used data from a cross-sectional survey administered to 10,434 women in 1999 with mortality follow-up until 2005.

2.2. Subjects and setting

The data are from the Australian Longitudinal Study on Women's Health (ALSWH), which is designed to track the health of women over at least 20 years. The study sample was drawn from the database of Medicare Australia, the universal provider of basic health insurance, which involves all people in Australia (including nonresidents). The sample was randomly selected with purposive oversampling in rural and remote areas. There are three age cohorts: younger women who were between 18 and 23 years of age, mid-aged women aged 45–50 years, and older women aged 70–75 years when the study began in 1996. The women complete mailed surveys every 3 years. Further details of the study design and methods have been reported by Lee et al. [19]. In this paper, we only use data from the older cohort. A total of 12,432 older women agreed to participate in the longitudinal study which is estimated to be 37–42% of those invited [20]. The data used here are from Survey 2 conducted in 1999 because it covered more health conditions than the first survey. A total of 10,434 women completed Survey 2—an estimated response of 90% after deaths and withdrawals are taken into account. Data from all of them are used in this paper. The surveys collect data using a wide range of questions covering physical, social, and mental health, sociodemographic information, and health care use. If required, proxies can complete the surveys on the women's behalf. The complete survey can be found at http://www.alswh.org.au/surveys.html.

2.3. Outcomes

Outcomes were mortality, use of health services, assistance with ADL, and HRQOL. Vital status of the participants was obtained by linkage to the National Death Index and information received by the study team, from the subject's family or other sources up to November 30, 2005. For all other outcomes, data collected in Survey 2 were used. The self-reported number of general practitioner (GP) visits in the last 12 months was dichotomized to high users (⩾9 visits) or low users. This cutoff point was chosen so that about 30% of participants were classified as high users. The two other dichotomous outcome variables related to health service use were self-reported visits to a specialist doctor (yes/no) or any hospitalization (yes/no) in the previous 12 months.

HRQOL was measured by the Medical Outcomes Health Survey Short-Form 36 (SF-36) [21]. The eight SF-36 subscales (physical functioning, physical role limitations, vitality, social functioning, mental health, emotional role limitations, bodily pain, and general health) were considered as continuous outcomes. A measure of need for help with ADL was obtained from the single item "Do you regularly NEED help with daily tasks because of long-term illness, disability or frailty" (yes/no).

2.4. Explanatory variables

The self-reported chronic and acute conditions were selected from the survey for possible inclusion in the indexes. Most of these were dichotomous (yes/no), with the exception of chest pain and urinary incontinence, which were reported on ordinal scales which were dichotomized based on perceived severity (chest pain—often or sometimes/rarely or none; urinary incontinence—often/sometimes, rarely, or none). Due to the small numbers of participants reporting particular cancers, all cancers except skin cancer were combined into one condition. Potential explanatory variables were then examined in a univariate analysis to determine the final set of variables to be used in the construction of the indexes.

2.5. Statistical analysis

2.5.1. Outcomes

Time to death (or censorship at November 30, 2005) was a longitudinal outcome. It was analyzed using Cox proportional hazard models, using age as the time to failure according to the method described by Lamarca et al. [22]. The use of age as the time to failure avoids the confounding effects of age. The health service usage and ADL items were considered as binary outcomes and analyzed using logistic regression. The eight SF-36 subscales were continuous outcomes modeled using multiple linear regression.

2.5.2. Index construction

To assess validity of the indexes, the data were divided into two equal-sized random samples (Samples A and B, $n = 5{,}217$ in each). The characteristics of the two samples were compared (using *t*-tests for continuous variables and chi-squared tests for categorical variables). The indexes were developed using Sample A and their performance tested using Sample B. The explanatory variables were selected by a stepwise procedure and scores were constructed using two different methods. In the first method, all morbidities were treated as equally important and the number of morbidities was summed to give an unweighted score. The second method involved producing weights by scaling the regression coefficients and then rounding to the nearest integer value to produce integer weights with one as the smallest weight. The weights for all morbidities present were then summed to give a weighted score.

2.5.3. Assessment of the scores

With the weights derived using Sample A, scores for each outcome were calculated for each subject in both Samples A and B. For the SF-36 subscales, the R^2-values were calculated for each model fitted. For binary outcomes, the adjusted generalized coefficient of determination (generalized R^2) was calculated for each model [23]. To enable comparable assessment of the mortality scores, the equivalent measure was estimated according to the method described by Schemper [24], and will be referred to as pseudo R^2. The R^2-values for each outcome were then compared between the regression models, for weighted and unweighted scores and between Samples A and B.

3. Results

The characteristics of both samples were remarkably similar with respect to demographic and health characteristics, self-reported conditions, and the outcome variables (Tables 1 and 2). The prevalence of the conditions varied from 41.7% for arthritis to 0.5% for Alzheimer's disease and the median (quartiles) number of conditions was 2 (1–3) for both samples.

The outcomes varied from 14% for mortality to 47% for any visit to a specialist doctor (Table 2). There were no significant differences between Samples A and B in any of the outcomes.

3.1. Regression analysis

Seven of the 19 explanatory variables were statistically significant in the stepwise proportional hazards regression analysis of mortality; these were heart disease, stroke, low iron, bronchitis/emphysema, diabetes, cancer other than skin, and Alzheimer's disease (Table 3). This contrasted with the binary outcomes examined where the number of explanatory variables included in the model varied

Table 1
Distributions of demographic and health characteristics and self-reported chronic conditions in the development sample (A) and validation sample (B)

Demographic and health characteristics and self-reported chronic conditions	Sample A ($n = 5{,}217$)	Sample B ($n = 5{,}217$)
Age (mean [SD], yr)	74.9 (1.46)	74.9 (1.45)
Married (%)	50.6	50.5
Residing in metropolitan area (%)	41.0	41.4
High school level education or less (%)	84.4	84.7
Australian born (%)	78.5	78.5
Non–English-speaking background (%)	6.5	6.0
Professional occupation (%)	21.9	19.5
Partner has professional occupation (%)	35.8	35.9
Current smoker (%)	4.8	5.0
Low-risk drinker (%)	34.6	34.5
Obese (%)	14.7	14.3
Self-reported conditions		
Heart disease (%)	14.3	12.5**
Chest pain (sometimes or often) (%)	10.4	9.6
Stroke (%)	2.7	2.9
Hypertension (%)	33.4	34.0
Fall (caused serious injury) (%)	4.9	4.4
Fall (required medical attention) (%)	10.9	11.1
Fall (caused fractures) (%)	5.6	4.9
Urinary incontinence (often) (%)	5.5	4.6*
Low iron (%)	4.3	5.0
Arthritis (%)	41.7	41.8
Osteoporosis (%)	12.5	12.7
Bronchitis/emphysema (%)	6.2	6.4
Asthma (%)	8.8	7.6*
Diabetes (%)	7.3	7.6
Skin cancer (%)	13.3	14.6
Other cancers[a] (%)	4.0	3.9
Depression (%)	7.0	6.4
Anxiety (%)	5.8	5.4
Alzheimer's disease (%)	0.5	0.5
Median (quartiles) number of self-reported conditions	2 (1–3)	2 (1–3)

$^*P \leq 0.05$; $^{**}P \leq 0.01$.

[a] Other cancers—lung, bowel, breast, cervical, and others, except skin.

Table 2
Distribution of outcome measures in the development sample (A) and validation sample (B)

Outcomes	Sample A (n = 5,217)	Sample B (n = 5,217)
Deaths (%)	14.9	14.0
GP visits (9+) (%)	30.0	29.7
Specialist visits (%)	47.0	47.1
Hospital visits (%)	27.9	27.8
Help with ADLs (%)	10.0	10.8
SF-36 physical functioning mean (SD)	62.7 (25.9)	62.9 (25.9)
SF-36 physical role limitations mean (SD)	56.5 (41.6)	56.8 (41.8)
SF-36 general health mean (SD)	66.8 (21.4)	66.9 (21.0)
SF-36 social functioning mean (SD)	82.6 (25.4)	82.9 (24.9)
SF-36 vitality mean (SD)	58.8 (21.1)	59.1 (21.0)
SF-36 mental health mean (SD)	79.1 (16.2)	79.1 (16.2)
SF-36 emotional role limitations mean (SD)	78.8 (34.9)	78.4 (34.9)
SF-36 bodily pain mean (SD)	65.5 (27.2)	66.0 (27.1)

Abbreviations: GP, general practitioner; ADL, activities of daily living; SF-36, Medical Outcomes Health Survey Short-Form 36.

There were no statistically significant differences at $P \leq 0.05$ between both samples on any outcome variable.

from 17 for GP visits to 11 for hospitalizations. Several chronic conditions, namely heart disease, stroke, low iron, and cancer other than skin cancer, were strongly associated with all service use outcomes. For ADL, 14 explanatory variables were statistically significant, with the presence of Alzheimer's disease very strongly associated with needing assistance.

A similar situation was seen for the SF-36 subscales where almost all the models included most of the explanatory variables (Table 4). In particular, the four scales of the SF-36 representing "physical health," that is, physical functioning, physical role limitations, bodily pain, and general health had coefficients of similar magnitude. For the subscales reflecting "mental health," that is, vitality, social functioning, emotional role limitations, and mental health, the individual morbidities "anxiety" and "depression" had the strongest associations, particularly with mental health and emotional role limitations.

3.2. Unweighted and weighted index scores

The regression coefficients from these models were used to produce the weights for each of the outcomes (Table 5). These weights were then used to construct weighted scores. Hazard ratios for observed mortality showed an essentially linear relationship (on a logarithmic scale) with both the weighted and unweighted scores (Fig. 1). Similar relationships were found for each of the other outcomes; these are illustrated by the outcomes of visits to specialists, assistance with ADL, and the SF-36 General Health subscale which are shown in Figs. 2–4 (graphs of other outcomes are available upon request). The scores were not directly comparable for different outcomes due to different scales, but all showed clear linear relationships. Additionally, for each outcome, the weighted scores had a wider range of possible values.

3.3. Validation of the weighted and unweighted scores

The measures of fit of the models derived from Sample A were very similar when the same models were applied to data from either Sample A or B, as would be expected from the similarity of the two samples (shown in Tables 1 and 2).

To assess the validity of the multimorbidity scores, their R^2-values were compared with those for the proportional

Table 3
HR, OR, and 95% CI, from survival analysis for deaths and logistic regression analysis (for the other outcomes) of the development Sample A (n = 5,217)

Morbidities	Deaths HR (95% CI)	9+ GP visits OR (95% CI)	Specialist visits OR (95% CI)	Hospitalizations OR (95% CI)	ADL OR (95% CI)
Heart disease	1.52 (1.27–1.81)	2.07 (1.68–2.54)	2.36 (1.92–2.89)	2.25 (1.84–2.75)	1.39 (1.04–1.87)
Chest pain	ns	1.58 (1.25–2.00)	1.33 (1.05–1.69)	1.65 (1.31–2.07)	1.78 (1.31–2.43)
Stroke	2.06 (1.52–2.78)	2.49 (1.60–3.87)	2.31 (1.46–3.67)	2.71 (1.78–4.13)	3.64 (2.28–5.81)
Hypertension	ns	1.48 (1.28–1.72)	ns	ns	ns
Fall caused serious injury	ns	1.51 (1.08–2.11)	1.45 (1.04–2.01)	2.05 (1.48–2.82)	ns
Fall (medical attention)	ns	1.30 (1.02–1.66)	1.30 (1.04–1.63)	ns	ns
Fall (fractures)	ns	ns	ns	2.17 (1.60–2.94)	2.89 (2.04–4.10)
Urinary incontinence	ns	1.35 (1.01–1.81)	1.46 (1.09–1.94)	1.72 (1.29–2.28)	2.22 (1.56–3.15)
Low iron	1.46 (1.09–1.96)	2.16 (1.56–3.00)	1.69 (1.23–2.33)	1.79 (1.30–2.46)	2.03 (1.36–3.03)
Arthritis	ns	1.35 (1.17–1.56)	1.39 (1.23–1.58)	1.27 (1.10–1.46)	1.65 (1.32–2.06)
Osteoporosis	ns	1.61 (1.31–1.97)	1.69 (1.39–2.06)	ns	1.57 (1.18–2.07)
Bronchitis/emphysema	1.73 (1.38–2.18)	1.50 (1.14–1.98)	1.61 (1.23–2.10)	ns	1.66 (1.16–2.38)
Asthma	ns	2.32 (1.84–2.91)	ns	1.49 (1.19–1.86)	ns
Diabetes	1.42 (1.12–1.79)	2.10 (1.63–2.71)	ns	ns	1.71 (1.20–2.42)
Other cancers	2.75 (2.16–3.50)	2.01 (1.44–2.81)	4.91 (3.34–7.23)	3.66 (2.66–5.04)	2.54 (1.67–3.88)
Skin cancer	ns	1.37 (1.13–1.66)	1.99 (1.66–2.40)	1.37 (1.13–1.66)	ns
Depression	ns	2.04 (1.54–2.71)	1.44 (1.10–1.90)	ns	1.86 (1.32–2.63)
Anxiety	ns	1.68 (1.24–2.25)	ns	ns	1.79 (1.24–2.59)
Alzheimer's disease	4.17 (2.45–7.09)	ns	ns	ns	18.84 (7.12–49.83)

Abbreviations: HR, hazard ratios; OR, odds ratios; CI, confidence intervals; GP, general practitioner; ADL, activities of daily living; ns, 95% CI included unity.

Table 4
Regression coefficients and 95% CI from the multiple regression analysis of the SF-36 scales

Morbidities	Physical functioning β (95% CI)	Role physical β (95% CI)	Social functioning β (95% CI)	Vitality β (95% CI)	General health β (95% CI)	Role emotional β (95% CI)	Pain β (95% CI)	Mental health β (95% CI)
Heart disease	−6.77 (−8.88, −4.66)	−9.29 (−12.93, −5.66)	−3.78 (−5.89, −1.68)	−3.82 (−5.57, −2.08)	−8.58 (−10.31, −6.84)	ns	−4.18 (−6.34, −2.03)	ns
Chest pain	−9.59 (−12.00, −7.17)	−14.56 (−18.72, −10.40)	−9.67 (−12.09, −7.25)	−9.66 (−11.66, −7.66)	−7.98 (−9.96, −6.01)	−11.72 (−14.98, −8.47)	−11.77 (−14.24, −9.30)	−5.34 (−6.73, −3.94)
Stroke	−11.98 (−16.35, −7.62)	−14.77 (−22.40, −7.14)	−8.38 (−12.76, −4.00)	−7.76 (−11.39, −4.13)	−10.72 (−14.28, −7.16)	ns	ns	ns
Hypertension	−4.21 (−5.62, −2.80)	−5.01 (−7.45, −2.57)	ns	−2.61 (−3.78, −1.44)	−3.50 (−4.66, −2.34)	−2.87 (−4.95, −0.80)	−2.36 (−3.80, −0.91)	ns
Fall caused serious injury	−5.07 (−8.44, −1.71)	ns	−5.31 (−8.70, −1.92)	ns	ns	ns	ns	ns
Fall (medical attention)	ns	ns	ns	ns	ns	ns	ns	ns
Fall (fractures)	−5.94 (−9.12, −2.77)	−13.70 (−18.75, −8.64)	−7.70 (−10.89, −4.51)	−4.96 (−7.38, −2.53)	−3.34 (−5.76, −0.93)	ns	−8.61 (−11.61, −5.62)	−2.81 (−4.67, −0.96)
Urinary incontinence	−11.40 (−14.33, −8.47)	−10.38 (−15.40, −5.36)	−10.43 (−13.38, −7.49)	−7.97 (−10.38, −5.56)	−7.49 (−9.84, −5.13)	−5.79 (−10.09, −1.48)	−10.35 (−13.33, −7.37)	−2.81 (−4.65, −0.97)
Low iron	−9.92 (−13.20, −6.64)	−11.79 (−17.44, −6.15)	−7.71 (−11.00, −4.41)	−8.70 (−11.41, −6.00)	−10.77 (−13.45, −8.09)	−5.69 (−10.47, −0.91)	−6.10 (−9.45, −2.75)	−3.19 (−5.26, −1.13)
Arthritis	−11.73 (−13.10, −10.36)	−14.90 (−17.26, −12.54)	−7.37 (−8.74, −6.01)	−6.52 (−7.66, −5.39)	−7.02 (−8.14, −5.89)	−6.54 (−8.54, −4.53)	−18.73 (−20.13, −17.33)	−2.97 (−3.83, −2.11)
Osteoporosis	−6.38 (−8.43, −4.33)	−8.89 (−12.41, −5.37)	−5.11 (−7.17, −3.06)	−5.46 (−7.15, −3.77)	−7.96 (−9.64, −6.28)	ns	−9.77 (−11.87, −7.68)	−2.28 (−3.58, −0.98)
Bronchitis/emphysema	−6.22 (−8.99, −3.45)	−7.10 (−11.88, −2.32)	−5.01 (−7.77, −2.26)	−2.75 (−5.06, −0.44)	−6.91 (−9.21, −4.62)	ns	ns	ns
Asthma	−5.55 (−7.89, −3.21)	−5.27 (−9.30, −1.25)	ns	−2.58 (−4.52, −0.64)	−5.72 (−7.63, −3.82)	ns	−3.35 (−5.71, −0.98)	ns
Diabetes	−8.62 (−11.20, −6.05)	−10.65 (−15.05, −6.24)	−5.43 (−7.98, −2.87)	−5.30 (−7.43, −3.17)	−7.17 (−9.28, −5.05)	−7.76 (−11.54, −3.98)	−6.49 (−9.10, −3.89)	−3.56 (−5.17, −1.94)
Other cancers	−8.25 (−11.62, −4.87)	−9.80 (−15.58, −4.03)	−9.88 (−13.27, −6.50)	−6.22 (−9.01, −3.42)	−8.67 (−11.42, −5.92)	−9.02 (−13.89, −4.15)	−4.53 (−7.98, −1.08)	−3.47 (−5.61, −1.34)
Skin cancer	ns	−3.88 (−7.16, −0.60)	ns	−1.79 (−3.37, −0.22)	ns	ns	−2.39 (−4.34, −0.44)	−1.58 (−2.78, −0.37)
Depression	−5.06 (−7.93, −218)	−10.92 (−15.85, −5.99)	−12.78 (−15.65, −9.90)	−9.61 (−12.00, −7.23)	−7.32 (−9.70, −4.93)	−25.92 (−30.12, −21.73)	−7.70 (−10.63, −4.76)	−14.26 (−16.07, −12.44)
Anxiety	−4.90 (−7.89, −1.91)	−8.29 (−13.44, −3.15)	−13.70 (−16.70, −10.70)	−9.65 (−12.13, −7.18)	−9.91 (−12.39, −7.43)	−19.47 (−23.88, −15.06)	−3.94 (−6.99, −0.89)	−16.62 (−18.51, −14.73)
Alzheimer's disease	−18.09 (−27.46, −8.72)	ns	−29.62 (−39.29, −19.95)	ns	−19.01 (−26.93, −11.08)	ns	ns	−15.03 (−21.09, −8.980

Abbreviations: CI, confidence intervals; SF-36, Medical Outcomes Health Survey Short-Form 36; ns, 95% CI included unity.

Table 5
Weights for multimorbidity indexes related to deaths, health service use, needing help with ADLs and the SF-36 subscales

						SF-36 subscales							
Morbidities	Deaths	9+ GP visits	Specialist visits	Hospitalizations	ADL	PF	RP	SF	Vit	GH	RE	Pain	MH
Heart disease	1	3	3	3	1	−2	−3	−1	−2	−3	—	−2	—
Chest pain	—	2	1	2	2	−2	−5	−3	−5	−3	−3	−5	−2
Stroke	2	4	3	4	4	−3	−5	−3	−4	−4	—	—	—
Hypertension	—	2	—	—	—	−1	−2	—	−1	−1	−1	−1	—
Fall caused serious injury	—	2	1	3	—	−1	—	−2	—	—	—	—	—
Fall (medical attention)	—	1	1	—	—	—	—	—	—	—	—	—	—
Fall (fractures)	—	—	—	3	3	−1	−3	−3	−2	−1	—	−4	−1
Urinary incontinence	—	1	2	2	2	−3	−3	−3	−4	−3	−2	−4	−1
Low iron	1	3	2	2	2	−2	−4	−3	−4	−4	−2	−3	−1
Arthritis	—	1	1	1	2	−3	−5	−2	−3	−2	−2	−8	−1
Osteoporosis	—	2	2	—	1	−2	−3	−2	−3	−3	—	−4	−1
Bronchitis/emphysema	2	2	2	—	2	−2	−2	−1	−1	−2	—	—	—
Asthma	—	3	—	2	—	−1	−2	—	−1	−2	—	−1	—
Diabetes	1	3	—	—	2	−2	−4	−2	−3	−2	−2	−3	−1
Other cancer	3	3	6	5	3	−2	−3	−3	−3	−3	−3	−2	−1
Skin cancer	—	1	3	1	—	—	−1	—	−1	—	—	−1	−1
Depression	—	3	1	—	2	−1	−4	−4	−5	−2	−9	−3	−5
Anxiety	—	2	—	—	2	−1	−3	−4	−5	−3	−7	−2	−5
Alzheimer's disease	4	—	—	—	9	−5	—	−10	—	−6	—	—	−5

Abbreviations: ADL, activities of daily living; GP, general practitioner; SF-36, Medical Outcomes Health Survey Short-Form 36; PF, physical functioning; RP, physical role limitations; SF, social functioning; Vit, vitality; GH, general health; RE, emotional role limitations; Pain, bodily pain; MH, mental health.

hazards, logistic regression, or multiple regression models. For example, for the weighted scores, the relative differences in R^2 measures for Sample A were min = 0.15%, median = 0.85%, and max = 1.29% across the 13 analyses. This suggests that there was very little loss of information in using weighted scores rather than the regression models. However, the unweighted scores had lower R^2-values than the regression models (e.g., for Sample A, the relative differences were min = 4.90%, median = 13.26%, and max = 35.04% across the 13 analyses); these results showed that the unweighted scores were a poorer fit of the data.

4. Discussion

We have developed and validated multimorbidity indexes to predict mortality, visits to GPs and specialists, and hospitalizations, ability to perform ADL without help, and HRQOL in a population-based sample of older Australian women. Like Byles et al. [18], we found that no single index best captured all outcomes.

4.1. Individual morbidities

We found seven morbidities to be significantly associated with risk of mortality. Four of these (stroke, diabetes, heart disease, and lung disease) were identified by both Fan et al. [17] and Byles et al. [18], although Fan et al. also found cancer to predict mortality. On comparing our results with those of other authors, it is necessary to note that males accounted for 97% of the sample in Fan's study and 55% of the sample in Byles' study whereas ours is 100% female. We further identified low iron and in particular Alzheimer's disease to predict mortality, a less common but not unknown finding [25,26]. Low iron and Alzheimer's disease are not routinely included in indexes of multimorbidity. Alzheimer's disease, either by itself [26,27] or as a comorbidity to conditions such as cancer [28], heart failure [29], and stroke [30], has also been linked with higher risk of mortality. There is also emerging evidence of the link between anemia and increased mortality, in both women and men [25]. Although the incidence of self-reported low iron in women in this study was not biologically confirmed, its relationship with mortality could suggest the presence of underlying pathology, for example, malignant neoplasms and infections [25].

For health service use, there is clearly the potential for a circular argument: the more health care visits a person

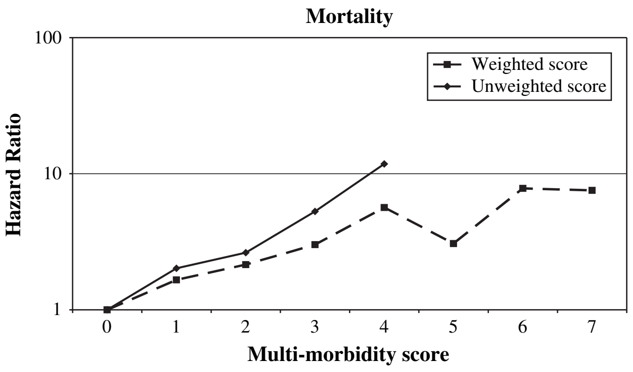

Fig. 1. Graph of hazards ratios for mortality by multimorbidity scores.

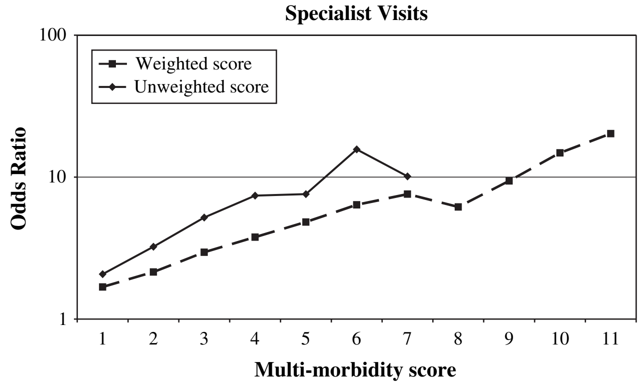

Fig. 2. Graph of logistic regression odds ratios for specialist visits by multimorbidity scores.

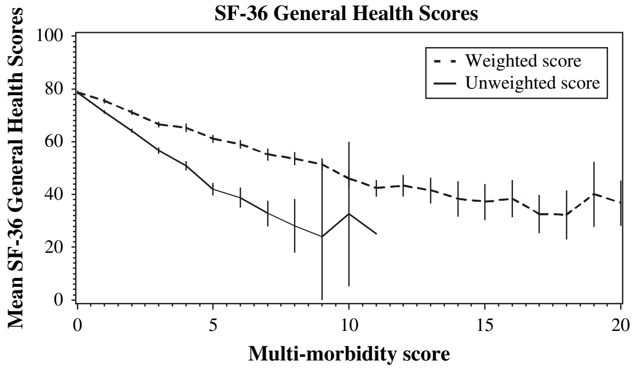

Fig. 4. Graph of mean SF-36 General Health subscale scores (and 95% confidence intervals) by multimorbidity scores.

has, the more diagnoses they will be given [10]. However, we have shown that different types of morbidities are associated with different use of services. A range of morbidities, from more serious conditions such as cancer and stroke to non–life-threatening conditions such as arthritis and urinary incontinence, predicted high GP use. As expected, specialist visits and hospitalizations were strongly associated with serious conditions such as cancer, heart disease, and stroke, although falls, particularly those causing serious injury and fractures, also contributed strongly to hospitalizations. Conditions that were not associated with mortality but were associated with all health care visits were urinary incontinence, chest pain, arthritis, falls causing injury, and skin cancer. Although others have reported that urinary incontinence was not strongly associated with health service use [31], a detailed substudy of 400 older women with frequent incontinence in the ALSWH showed that 73% had sought medical help [32].

Although our only available measure of ADL in these data was crude, the similarity of our findings with others using more extensive measures [33,34] suggests it to be sensitive. The conditions most strongly associated with functional dependency were Alzheimer's disease, stroke, cancer, and falls causing fractures. Wolff et al. [33] found Alzheimer's disease, stroke, and cancer to have a similar magnitude of effect on physical dependency in a cohort of 4,968 older people, 58% of whom were female. The impact of other morbidities, such as arthritis, diabetes, heart disease, depression, low iron, and urinary incontinence, which have been linked with poorer functional ability [35–38] were also confirmed by our study, although their relative contribution was weaker. Alzheimer's disease had the largest impact, possibly reflecting the difficulties individuals with dementia have in managing daily tasks safely and completely, as well as the constant levels of supervision they require. Interestingly, van Dijk et al. [39] showed that although Alzheimer's disease predicted mortality in male and female nursing home residents, it became nonsignificant after controlling for performance in ADLs, suggesting a strong relationship between the two variables.

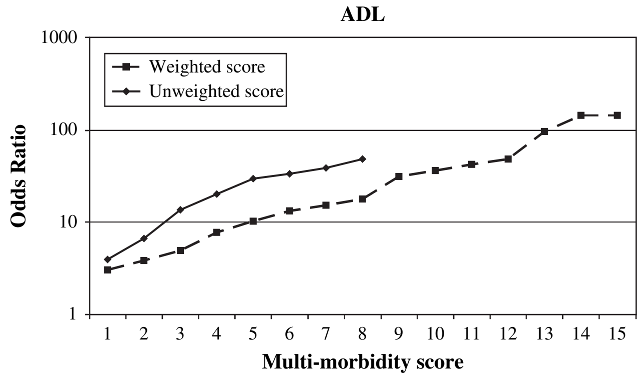

Fig. 3. Graph of logistic regression odds ratios for requiring assistance with ADL by multimorbidity scores.

Although the association between chronic conditions and HRQOL is well established [40,41], the relative contribution of conditions to the different dimensions of HRQOL in older women is a new finding. We measured eight subscales or dimensions of HRQOL and although many conditions were associated with HRQOL, the nature of their associations varied. The subscales reflecting psychosocial aspects of HRQOL, namely role limitations due to emotional problems, mental health, vitality, and social functioning, had consistent associations with anxiety and depression. Also, Alzheimer's disease had a large effect on social functioning and mental health. Morbidities associated with all four psychosocial subscales were chest pain, urinary incontinence, low iron, arthritis, cancer, and diabetes, although the distribution of weights varied. A different pattern of association arose for the dimensions reflecting physical aspects of HRQOL (physical functioning, physical role limitations, bodily pain, and general health), with conditions such as arthritis, low iron, stroke, urinary incontinence, diabetes, and cancer predominating but with a more uniform distribution of weights.

Chest pain, urinary incontinence, low iron, arthritis, diabetes, cancer, depression, and anxiety were associated with all eight subscales of HRQOL. Avery et al. [42] found urinary incontinence associated with the eight subscales of the SF-36. Although Alzheimer's disease was strongly associated with four of the eight dimensions, when it was important it tended to be the strongest explanatory variable. These strong relationships, and the association between Alzheimer's disease and functional status and mortality, reflect the impact of this debilitating condition. Like low iron, Alzheimer's disease is not routinely included in comorbidity or multimorbidity research. This may be due to people with any cognitive disability being excluded from research projects but its inclusion appears to have profound effects, based on our results.

4.2. *Multimorbidity indexes*

The development and use of any composite score involves trade-offs. If it is very specific, for example, calculated directly from regression coefficients obtained from a particular sample, it may lack generalizability to other populations. On the other hand, if it is too generic, such as a count of symptoms or conditions without consideration of their relative importance, it may lack discrimination between groups. Our weighted scores fitted the data almost as well as the regression models but the simpler weights should serve to make them more robust than the regression models when used in other settings. Our simpler unweighted scores also fitted reasonably well but for all outcomes the weighted scores had a wider range of possible values, so that they would probably have a better chance of discriminating between groups of patients.

We have shown that there were morbidities that did not contribute to mortality, health service use, need for assistance with ADL, and HRQOL in this large representative sample of older Australian women. Therefore, use of a simple count of multiple morbidities from a standard list is not valid or clinically credible unless the morbidities are carefully selected in relation to each outcome. We advocate the use of the weighted indexes of multimorbidity developed in this paper. Each of these indexes is designed to be a single covariate, and researchers should include other relevant covariates, for example, age or current smoking behavior, at their discretion.

5. Limitations

The ALSWH questionnaires did not ask the women to indicate the severity of the chronic conditions they reported. Data on severity may have led to stronger relationships being found [16,18]. Alzheimer's disease was found to be a strong predictor; however, as the incidence of Alzheimer's disease in our sample was relatively low at 0.5%, some caution must be applied to the robustness of the results. The potential limitations of self-reported data must also be acknowledged. Although self-reported data can be viewed as a strength, the lack of medical or biological validation may have resulted in inaccurate reporting and misclassification bias, particularly underreporting of health service use. If systematic underreporting occurred in this study, there may have been an underestimation of the strength of associations. Of particular concern is the reliability of survey responses from participants with Alzheimer's disease. However, in ALSWH, if participants are unable to complete the survey, they are asked to have a family member or close friend to answer on their behalf. This is to encourage participation for as long as possible, even in the event of cognitive decline. In this study, 68% of the participants with Alzheimer's disease had a proxy, usually a family member, to complete the survey for them. This compares to use of a proxy by just 10% of all participants. Further, we did not measure personality or mood characteristics of the older women; Rijken et al. [43] have highlighted the possibility that correlation between personality traits and comorbidities may lead to overestimation of the impact of the morbidities.

Although ALSWH is a longitudinal study, the data used for the analysis of all outcomes except mortality were cross-sectional, from one survey conducted in 1999. Other longitudinal analyses were not performed due to substantial age-related loss of data in subsequent surveys due to death (28%) and attrition (15%). Therefore, we have not considered the prospective, predictive validity of our indexes. In a population of almost 5,000 older people, Wolff et al. [33] documented rates of new diagnoses of morbidities to increase from 30% at 12 months to 49% at 24 months and 61% at 36 months. These results highlight the effects of accrual of new morbidities on increasing use of health services or decreasing HRQOL, provided mortality is correctly incorporated into the analysis [44].

6. Conclusion

We have created indexes of multimorbidity to predict mortality, health service use, need for assistance with ADL, and HRQOL in community-based older women using self-reported conditions. We recommend the use of a weighted score of multimorbidity, for example, in outcome research as a covariate to summarize the joint effect of chronic conditions. Additionally, given the consistent relationship between low iron and Alzheimer's disease and the outcomes, we also recommend that these conditions should be included in indexes measuring multimorbidity for predicting outcomes.

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Research

Older women and arthritis: Tracking impact over time

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Aim: *To explore the ongoing impact of arthritis on older community-dwelling women over 9 years of Australian Longitudinal Study on Women's Health data.*
Methods: *National longitudinal surveys (1996–2005) were conducted with a random sample of 12432 Australian women, aged 70–75 years in 1996. Self-report of doctor diagnosis of arthritis was the factor of interest. The main outcome measure was SF-36 health-related quality of life.*
Results: *A total of 7088 women completed the 2005 survey (58% of original cohort): 63% of women aged 77–85 years in 2005 reported doctor diagnosis of arthritis. Women with arthritis were more likely to report comorbid conditions, have poorer health and score as depressed and anxious. Arthritis was associated with decreasing scores for physical function, pain and social function over time.*
Conclusion: *Arthritis was associated with an increasing negative impact on health and quality of life for older women over time.*

Key words: *aged, arthritis, longitudinal survey, quality of life, women.*

Introduction

Chronic arthritis is the most common cause of activity limitation and disability among older women in developed countries [1]. In 2003–2004, 21.6% (46.4 million) of US adults reported having arthritis, with age-adjusted prevalence in women significantly higher than in men (24.4 vs 18.1%) [2]. The 2000 Canadian Community Health Survey found that arthritis and other rheumatic conditions affected approximately one in six Canadians aged 15 years and older, and two-thirds of those with arthritis were women [3]. Among UK adults aged 65–74 years, the prevalence of arthritis for women was twice that for men (22.7 vs 11.3%), in 2003 [4]. In Australia in 2004, 18.4% of Australian women and 15.1% of Australian men reported having arthritis [5]. Demographic ageing is expected to substantially increase the number and proportion of Australians living with arthritis by 2020 [5].

The negative impact of arthritis has been well described in cross-sectional surveys. In Canada, compared with people with other chronic conditions, those with arthritis experienced more pain, activity restrictions and long-term disability, were more likely to need help with daily activities, reported worse self-rated health and more disrupted sleep and depression, and more frequently reported contact with health-care professionals in the previous year [3]. In the US almost 41% (19 million) of the 46 million adults with doctor-diagnosed arthritis reported limitations in their usual activities due to their arthritis. In addition to activity limitations, 31% (8.2 million) of working age adults with doctor-diagnosed arthritis reported being limited in work activities due to arthritis [6]. An Arthritis Australia report exploring the hardships facing those with arthritis [7] found that Australians identified as having arthritis, aged 60 years and older, had high levels of dissatisfaction with physical aspects of their lives such as fitness to do the things that they want to do (56%), the physical impact of arthritis on their life (53%) and their energy levels (45%) [7]. Physical issues were also reported to have the biggest negative impact on day-to-day life, for both men and women, and particularly for those older than 60 years [7]. However, this snapshot of people diagnosed with arthritis was unable to explore the progress of this debilitating condition, and the continuing impacts on physical, mental and social functioning. This paper explores the ongoing impact of arthritis on older community-dwelling women over 9 years from a secondary analysis of Australian Longitudinal Study on Women's Health (ALSWH) data [8].

The ALSWH – widely known as Women's Health Australia [8] – involves women in three age groups (aged 18–23, 45–50 and 70–75 years), who were randomly selected from the database of Medicare Australia in 1996, with deliberate oversampling of women in rural and remote areas (sampled at twice the rate of women in urban areas) to allow comparisons of health and health-care use for women in different parts of Australia. The ALSWH study is uniquely placed to provide longitudinal data on arthritis symptoms and burden among a large cohort of older Australian women who were aged 70–75 years at Survey 1 (1996) and who participated in three follow-up surveys (Survey 2 in 1999, Survey 3 in 2002 and Survey 4 in 2005).

Method

Data for this study were from the 1921–1926 cohort of the ALSWH [8]. Detailed methods for ALSWH have been published elsewhere and are also available from http://www.alswh.org.au [9].

This study conforms to the ethical requirements for research involving humans, and the provisions of the Declaration of

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Conflicts of interest declaration: All authors declare they have no conflicts of interest related to this research.

Helsinki (as revised in Tokyo 2004). Ethical approval was obtained from the University of Newcastle Human Research Ethics Committee.

Measurement and classification of arthritis

The ALSWH surveys 2 (1999), 3 (2002) and 4 (2005) asked older women about doctor-diagnosed medical conditions, including arthritis. This question was framed as: 'In the past three years have you been diagnosed or treated for arthritis?' 'Doctor diagnosed arthritis' is an internationally accepted measure of self-reported arthritis, is used in World Health Organisation (WHO) surveys [10], and has been shown to have good validity and reliability [11]. Arthritis type was not elicited as self-reported data on arthritis type have been shown to be inaccurate [12,13]; however, it would be expected that arthritis in this sample would predominantly be osteoarthritis.

Calculating prevalence of arthritis

The prevalence of arthritis at each survey was based on the number of women who self-reported doctor diagnosis of arthritis at that survey and in each previous survey, divided by the total number of women who replied either yes or no about arthritis diagnosis. Women whose arthritis status was missing at Survey 2 or 3, but subsequently reported not having arthritis at Survey 3 or 4 were considered as not having arthritis at the prior surveys and were included in the denominator. Calculation of prevalence at subsequent surveys assumed arthritis was enduring. Non-respondents and deceased women were removed from both the numerator and the denominator.

Calculating incidence of arthritis

As for prevalence, incidence of arthritis was determined from women's report of doctor diagnosis of arthritis. However, our interest was whether women were reporting arthritis for the first time. Accordingly, women who reported that they had arthritis in Survey 2 were considered to have 'prevalent arthritis'; women who newly reported arthritis at Survey 3 or 4 were considered to have 'incident arthritis' at Survey 3 or 4. In calculating incidence, the total number of women who provided data (excluding those missing, dead or withdrawn) was included in the denominator.

Other measures

All variables were measured at Survey 4 unless otherwise noted.

Demographic, health, health-care and social factors

Demographic factors included education (measured at Survey 1), country of birth (measured at Survey 1), area of residence, difficulty managing on income, and marital status; measured using standard questionnaire items from the Australian Bureau of Statistics [14].

Health factors included the number of comorbid diagnoses, smoking, physical activity, WHO body mass index [15] (calculated from self-reported weight and height), self-rated health, depression and anxiety (Goldberg Anxiety and Depression Scale (GADS) [16]), stiff or painful joints, back pain, and problems with one or both feet.

Health-care variables included family doctor visits and other specialist doctor consultations over the past 12 months.

Social factors included providing care for someone else, living with you and not living with you.

Comorbid medical conditions

Comorbid medical conditions included high blood pressure, osteoporosis, angina, heart attack, other heart problems, diabetes, asthma, bronchitis/emphysema, stroke, cataract, skin cancer, other cancer, depression, anxiety, and Alzheimer's disease or dementia.

Quality of life

All surveys included the Medical Outcomes Study SF-36 Health Survey (SF-36), a widely used, well-validated health-related quality of life self-report measure, extensively reviewed for use with older populations [17].

Deceased or withdrawn

Deaths were ascertained annually from National Death Index matching on name, address and date of birth [18]. All phone calls and correspondence notifying of death or withdrawal from the study were logged and compared with the National Death Index notifications to ensure record completeness.

Analyses

Data analysis was carried out using SAS 9.1 (SAS Institute Inc. Cary, NC 2007) and JMP statistical packages (SAS Institute Inc. Cary, NC 1995).

Only women who completed Survey 4 were included in the analyses.

First, women were classified into 'prevalent', 'incident' or 'never reported' arthritis groups. Then, demographic, social and health factors and report of comorbid conditions were contrasted according to group, with χ^2 tests applied to examine differences.

Longitudinal modelling techniques [19] were used to assess change in health-related quality of life (based on SF-36) [17], according to arthritis status. Arthritis and covariates were fitted as fixed effects and time as a random effect. Manual backward stepwise regression analysis was conducted and variables contributing little to the model ($P > 0.02$) were removed. The change in log likelihood and Akaike information criterion were used to compare models [20]. Adjusted marginal means and 99% confidence intervals were graphed across four time points for the eight SF-36 subscales [17].

Results

Survey response and retention rates

In 1996, 12 432 women aged 70–75 years completed Survey 1. A total of 7088 women completed Survey 4 (58% of original cohort). Between surveys 1 and 4, 1838 women died (death recorded before 30 June 2005), 2101 women withdrew and 1405 were missing at follow up because of other reasons. The relative risk of death over this time was 1.01 (0.94, 1.08; $P = 0.86$) and of withdrawal was 0.98 (0.91, 1.05; $P = 0.54$).

Prevalence and incidence of arthritis

In 1999, at Survey 2, when women were aged 71–79 years, 42% reported arthritis as a health issue. In 2005, 63% of the same group of women, then aged 77–85 years, reported arthritis as a health issue (see Table 1). The prevalence of arthritis increased with age, but incidence rate declined from 22% at Survey 3–18% at Survey 4.

Factors associated with arthritis

Demographic differences were generally not significant between women who reported arthritis and women who did not, except that those with arthritis found it more difficult to manage on their income ($\chi^2 = 28.0$, d.f. = 2; $P < 0.001$).

Women who reported arthritis were more likely to be overweight or obese ($\chi^2 = 129$, d.f. = 6; $P < 0.001$), to exercise less ($\chi^2 = 112$, d.f. = 6; $P < 0.001$), and to be a smoker ($\chi^2 = 10.2$, d.f. = 2; $P = 0.006$) than women who did not report arthritis. Those with arthritis were less likely to rate their health as very good or excellent ($\chi^2 = 416$, d.f. = 8; $P < 0.001$), and more likely to score as depressed ($\chi^2 = 274$, d.f. = 2; $P < 0.001$) and anxious ($\chi^2 = 125$, d.f. = 2; $P < 0.001$) on the GADS [16]. Women with arthritis reported more comorbid diagnoses ($\chi^2 = 215$, d.f. = 6; $P < 0.001$), and having stiff and painful joints ($\chi^2 = 1051$, d.f. = 6; $P < 0.001$), back pain ($\chi^2 = 715$, d.f. = 6; $P < 0.001$) and problems with their feet ($\chi^2 = 364$, d.f. = 6; $P < 0.001$) more often than women without arthritis.

Report of arthritis was associated with more family doctor ($\chi^2 = 214$, d.f. = 2; $P < 0.001$) and specialist doctor ($\chi^2 = 101$, d.f. = 2; $P < 0.001$) visits in 12 months.

Comorbid medical conditions

Prevalent arthritis was associated with higher reporting of all conditions except dementia and other cancer, compared with women who never reported arthritis. Incident arthritis was associated with higher reporting of all conditions except dementia, diabetes, stroke and other cancers (see Table 2).

Impacts over time

Figure 1 describes the progression of women's reported quality of life according to arthritis status across four surveys, 1996–2005, by plotting marginal means (adjusted for the demographic, social and health-care factors previously described) and 99% confidence intervals for the eight SF-36 subscales. In all cases, a higher marginal mean reflects better quality of life.

As seen in Figure 1a, women with existing arthritis and women with incident arthritis over the course of the study

Table 1: Prevalence and incidence of arthritis across three ALSWH surveys (1999–2005)

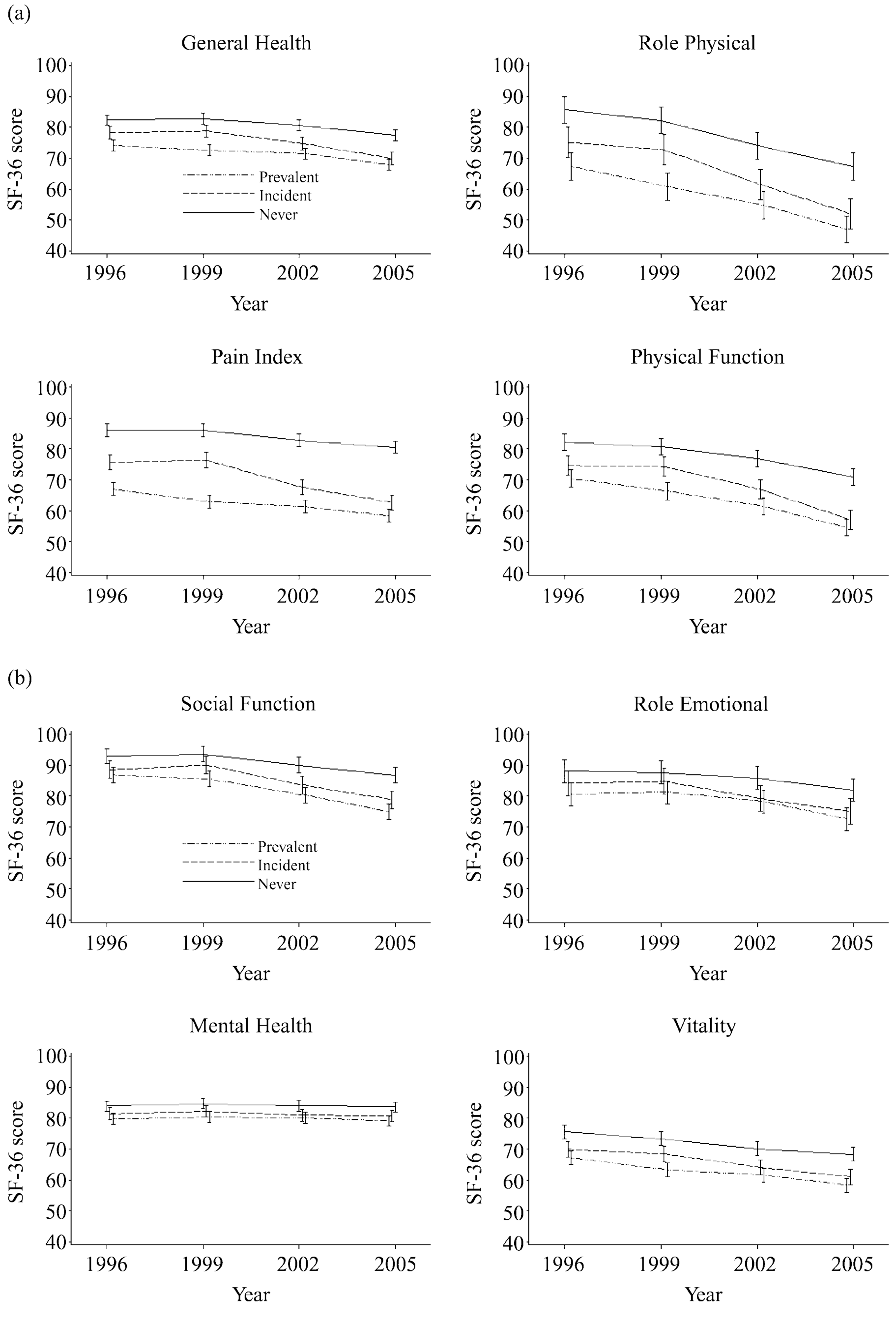
Arthritis status	*n*	Incidence† (%)	Prevalence (%)
Existing case	2895	–	42
Incident surveys 2–3	892	22	55
Incident surveys 3–4	559	18	63
Incident surveys 2–4 unknown when	71	–	–
Never	2538	–	–

†Percentages do not calculate exactly because of weights applied to adjust for the oversampling of rural women. ALSWH, Australian Longitudinal Study on Women's Health.

Table 2: Comorbidities at Survey 4 (2005) according to arthritis status

	Prevalent (*n* = 2863) %	Incident (*n* = 1506) %	Never (*n* = 2591) %	χ^2 (*P*-value)
High blood pressure	59	59	52	32.46 (<0.0001)
Cataract	34	33	26	42.97 (<0.0001)
Skin cancer	28	24	22	24.36 (<0.0001)
Osteoporosis	26	23	17	60.70 (<0.0001)
Other heart problems	17	14	11	42.97 (<0.0001)
Angina	13	11	8.5	27.93 (<0.0001)
Diabetes	13	12	11	5.64 (0.0596)
Asthma	12	9.1	7.1	33.34 (<0.0001)
Bronchitis/emphysema	9.0	7.0	5.1	30.45 (<0.0001)
Depression	9.0	8.2	4.5	44.48 (<0.0001)
Anxiety	6.9	7.3	4.0	27.87 (<0.0001)
Heart attack	5.1	5.1	3.4	11.25 (0.0036)
Other cancer	5.0	5.0	3.8	5.02 (0.0814)
Stroke	4.8	3.8	3.4	7.46 (0.0240)
Alzheimer's disease/dementia	1.4	1.7	1.4	0.82 (0.6621)

Figure 1: Adjusted marginal means and 99% confidence intervals on SF-36 subscales according to arthritis status over four surveys (a) general health, role physical, pain index, physical health. (b) social function, role emotional, mental health, vitality.



started with significantly lower physical function, pain index and role physical subscale scores than women who never reported arthritis. Women with incident arthritis had a greater decline in all these subscales, with their physical function, pain and role physical scores quickly matching those for women with existing arthritis. A similar, but less significant trend can be seen with reported general health, where scores for those with incident arthritis rapidly approached those with existing arthritis.

In Figure 1b, mental health, as measured by the SF-36 subscale, appears to be more resilient to arthritis impact. While the mental health SF-36 scores of women with prevalent and incident arthritis are lower than for those without arthritis, this difference is not significant for those with incident arthritis. The trends for the social function subscale are quite different to those for the mental health subscale. While all groups began with a similar level of social function score, both arthritis groups' social function scores declined significantly more over time than the scores of those without arthritis, showing a similar pattern to the physical function subscale (described in Figure 1a). Vitality scores declined over time for all groups, with scores for those with arthritis remaining lower than those without arthritis at all time points. Differences between role emotional scores between groups did not become significant until Survey 4 (2005), and then only for those with prevalent arthritis compared with those with no arthritis.

Discussion

Arthritis was associated with significant negative impact on health and increasing negative impact on quality of life over 9 years for this cohort of older Australian women. These findings are consistent with and add to previous findings on the impact of arthritis for those living with this chronic condition.

There are limitations to this study. These are self-reported data, so arthritis diagnosis is undifferentiated, although osteoarthritis would be expected to be the predominant diagnosis in this older group. However, self-report of doctor diagnosis is an internationally accepted measure of arthritis [10] and has been shown to be reliable and valid [11]. Furthermore, this is a deliberately biased sample, including women only, and it is unknown how these findings may relate to the broader population. However, women are significantly more affected than men by arthritis, which is the most common cause of morbidity among older women in developed countries [1].

A large study of older people from Latin America, the Caribbean and South Western USA estimated the prevalence of self-reported arthritis in this group ranged from 23.8% in Mexico City to 55.6% in Havana [21]. The prevalence of self-reported pain among arthritic subjects varied from 30.7% in older Mexican Americans to 83.7% in Santiago. Self-reported arthritis and arthritis symptoms were similarly highly prevalent among this sample of Australian women, where 63% of this group of women, aged 77–85 years, reported arthritis in 2005, and report of arthritis was associated with more report of pain and lower SF-36 for bodily pain subscale scores, which decreased over time, indicating increasing pain (see Figure 1b).

In 2002, 35% of US adults with physician-diagnosed arthritis were obese compared with only 21% of those without arthritis [22], and a recent 10-year follow-up study in Norway confirmed the importance of obesity as a risk for osteoarthritis [23,24]. In the current study, women with arthritis were more likely to be overweight or obese than those without arthritis, with 53% of those with prevalent arthritis, compared with 48 and 40% of those with incident arthritis or never reporting arthritis, respectively, being classified as overweight or obese.

A recent Australian Institute of Health and Welfare report noted that 40% of people with arthritis-related disability rated their health as fair or poor [25]. Health Canada noted that those with arthritis experienced more pain, and reported worse self-rated health and more disrupted sleep and depression, compared with people with other chronic conditions [3]. The current study also found that women with arthritis were less likely to rate their health as very good or excellent, and were more likely to report comorbid diagnoses than women without arthritis. While dementia was not associated with report of arthritis, it is acknowledged that people with dementia may have diminished capacity to report other conditions that affect them. Women with prevalent arthritis were more likely to score as depressed and anxious on the Goldberg Anxiety and Depression Scale than were those never reporting arthritis, a finding supported by other research [26–28]. Marks and Allegrante reported that a more substantial burden of major depression related to chronic illness was due to arthritis than to any other condition [27]. A report from the USA looking at the association between arthritis and comorbidities and days out of role concluded that comorbidity was the rule among people with arthritis rather than the exception [26].

A main focus of the current research was the impact of arthritis on quality of life over the course of the disease. While both those with existing arthritis and those who reported incident arthritis started with lower physical function and role physical scores than those who never reported arthritis, these scores also decreased more rapidly for these groups than for those without arthritis. A notable finding was that physical functioning levels for those with incident arthritis quickly deteriorated to meet the levels of those with prevalent arthritis. Arthritis was also associated with increasing pain over time and decreasing social function and role emotional scores. Other studies have demonstrated the association between arthritis and poor quality of life [28,29], and a large cross-sectional Netherlands study using SF-36 concluded that all musculoskeletal diseases involve pain and reduced physical function and have substantial impact on health-related quality of life [30]. The current study adds another dimension to these findings by demonstrating that quality of life continues to decrease and decreases more rapidly with time for those with arthritis than for those who do not report arthritis. These longitudinal findings have some implications for interventions aimed at optimising healthy ageing. Researchers need to be aware that women with arthritis will be at an increasing disadvantage as their quality of life, mental health and physical function decline over time more rapidly than their peers, and interventions will need to account for this decline.

Conclusion

This study described the major and ongoing impact of arthritis on quality of life within a large group of ageing women. The demonstrated reduced and reducing quality of life associated with report of arthritis highlights the importance of careful and ongoing treatment and pain management for these conditions. The association of comorbidities with arthritis, particularly psychological comorbidities, is a major concern. Research is needed to examine this relationship further. Arthritis is not a natural part of ageing, and numerous cost-effective treatments are available for arthritis. From the current data, despite high health-care utilisation, it seems these treatments may be underutilised.

Acknowledgements

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Key Points

- Arthritis was associated with an increasing negative impact on health and quality of life for older women over time.
- Arthritis was associated with higher reporting of comorbid conditions, such as high blood pressure, osteoporosis, angina, heart attack, other heart problems, asthma, bronchitis/emphysema, stroke, cataract, skin cancer, depression and anxiety.
- Physical and social function scores for those with incident arthritis quickly deteriorated to the lower levels of those with prevalent arthritis.
- Arthritis was associated with increasing pain over time.

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Trends in health service use for women in Australia with diabetes

Abstract

Objective: To describe the health, health service use and use of recommended guidelines for care for women in Australia with diabetes.

Methods: Analysis of survey data 1996-99 from the Australian Longitudinal Study on Women's Health, linked with Medicare data for 1997-2001. Participants were 12,338 mid-age women aged 45-50 years in 1996 (1.9% with diabetes) and 10,421 older women aged 70-75 years at Survey 1 in 1996 (8.1% with diabetes). The outcome measures were number of general practice and specialist visits and use of glycosylated haemoglobin (HbA1c), lipids and microalbuminuria tests.

Results: Women with diabetes at Survey 1, and those diagnosed by Survey 2, were more likely to have hypertension, heart disease and eyesight problems, have high rates of polypharmacy (four or more medications: mid age 32%, older 64%) and more consultations with general practitioners and specialists than women without diabetes. During 1997-2001, there was a trend for a greater percentage of women with diabetes to have an HbA1c test at least annually (mid age 44%-52%, older age 46%-58%). Rates of testing microalbuminuria and lipids also increased but were far from conforming to guidelines. Having more frequent consultations with a general practitioner was significantly associated with having all three recommended tests.

Conclusions: There is an increasing use of services by women with diabetes, in part due to an increase in compliance with guidelines for the management of diabetes.

Implications: Linked health and administrative data provide a means to monitor health service utilisation, adherence to principles for best practice care and issues of equity in care.

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Diabetes is a growing problem in Australia. It is estimated that 7% of people aged 25 years or over have diabetes, with half this number unaware they have the condition.[1] According to the National Diabetes Strategy, there has been a lack of data to monitor the processes, outcomes and costs of health care for diabetes.[2] Diabetes is a costly chronic disease and is associated with a variety of complications and premature mortality.[3,4] Consistently high blood sugar levels can, over time, lead to blindness, kidney failure, heart disease, limb amputations, and nerve damage. Diabetes is the seventh most common problem managed in general practice and the cost of diabetes has been predicted to rise dramatically over the next decade in Australia unless measures are taken to reduce complications from poorly controlled diabetes and prevent or delay onset.[2,5]

Current Australian guidelines for quality management of diabetes include testing glycosylated haemoglobin (HbA1c) every 3-6 months for insulin-treated patients and every 6-12 months for non-insulin treated patients, and testing blood lipids and microalbuminuria once a year.[5,6] Although general practitioners have a high regard in principle for the guidelines, many are ambivalent about the utility of the guidelines in everyday practice.[2] Little is known about the general pattern and standard of diabetes care in Australia and there is little evidence of evaluation or monitoring of clinical behaviour or patient outcomes.[2,7] A survey of 115 General Practice Divisions in Australia found that three-quarters were using guidelines on diabetes care in some form, although some health care providers found it difficult to maintain the frequency of surveillance specified by the guidelines.[8] A record audit for 71 patients in an inner-city suburb of Sydney, using guidelines developed by Diabetes Australia, demonstrated poor control and monitoring and also concluded that frequent attenders were no more likely to have had an HbA1c than less frequent attenders.[9]

The Australian Longitudinal Study on Women's Health (ALSWH) provides a unique opportunity to examine the health services provided to women in Australia with diabetes, as well as monitoring changes in their health and well-being, including the

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development of complications of diabetes. The study began in 1996 with a national random sample of more than 40,000 women in three age groups and aims to examine the relationships between biological, psychological, social and lifestyle factors and women's physical health, emotional well-being, and their use of and satisfaction with health care.[10]

Using data obtained from the baseline and first follow-up survey of women in the ALSWH, this paper reports the prevalence of diabetes; factors associated with diabetes (such as inactivity, overweight and obesity); and the health of women with and without diabetes, including new cases diagnosed between the two surveys. National health insurance (Medicare) medical practitioner and pathology service use data were linked to survey data to describe the use of general practitioner and specialist services by women in the ALSWH, and the compliance with best practice guidelines for testing HbA1c, lipids and microalbuminuria for women with diabetes. Factors associated with diabetes management will also be examined, in particular demographic variables of patients and frequency of consultations with general practitioners.

Methods

The Australian Longitudinal Study on Women's Health (ALSWH) data

Three cohorts of women aged 18-23 years, 45-50 years and 70-75 years were enrolled in 1996 and completed a 24-page mailed questionnaire (Survey 1). The participants were randomly selected from the Medicare database, with oversampling of women living in rural and remote areas.[10] Response rates at the recruitment stage cannot be exactly specified as some women selected in the sample may not have received the invitation, for example, if they had died, been travelling or changed their address without notifying Medicare. It has been estimated that 41-42% of the young, 53-56% of the mid age and 37-40% of the older women chose to participate in the longitudinal study.[11] The respondents have been shown to be broadly representative of the national population of women in the target age groups. Women in the mid and older cohorts are the focus of the present study. The first follow-up survey (Survey 2) was completed by 12,338 mid-age women in 1998 and 10,421 older women in 1999, representing response rates of 90% and 88% respectively of non-deceased participants. The University of Newcastle Ethics Committee approved all aspects of the study.

The following variables have been included in this analysis:

Diabetes. Participants were asked in Survey 1 in 1996 whether a doctor had ever told them that they had diabetes. Women who responded 'yes' were classified as having been diagnosed before 1996. At Survey 2, participants were asked whether they had been diagnosed with diabetes since 1996. Women who responded 'yes' in Survey 2 and who had previously responded 'no' in Survey 1 were considered to have been diagnosed between 1996 and 1998 (mid-age women) or 1999 (older women). The remaining women were considered not to have been diagnosed with diabetes.

Comorbidity. Whether they had ever been told by a doctor that they had any of a list of 14 medical conditions, including hypertension and heart disease.

Self-rated health. Women were asked to rate their health, in general, as excellent, very good, good, fair or poor.

Body mass index. Measured as self-reported weight (kg)/height (m^2).

Number of different types of medication used. How many different types of medication used in the last four weeks that were prescribed by a doctor.

Smoking. Current smoker, ex-smoker or non-smoker.

Alcohol. Categorised as non-drinker/rarely drink, drink at no risk or drink at some risk, based on responses to questions on the frequency and quantity of alcohol consumed.

Physical activity. Categorised as adequate (at least five bouts of moderate activity per week, or three bouts of vigorous activity, or any combination of the two) or inadequate based on questions about frequency and intensity of physical activity.[12]

Education. Classified as 'no formal qualifications', 'high school', 'trade/diploma' and 'tertiary' qualifications.

Indigenous status. Whether of Aboriginal/Torres Strait Islander origin.

Marital status. Classified as married/living as married, widowed/separated/divorced, and never married.

Area of residence. Coded as urban or non-urban.[13]

Health Insurance Commission data

The Health Insurance Commission (HIC) processes claims for non-hospital medical services that are subsidised by Medicare and the Department of Veterans' Affairs (DVA). Consent for the linkage of HIC data was obtained from 70% (n=8,506) of the mid-age women and 68% (n=7,125) of the older women in this analysis. Details of the methods used to request consent have been reported elsewhere.[14]

As the Medicare/DVA data does not include the patient's diagnosis, ALSWH survey data were used to identify women with diabetes. Medicare/DVA data for each year from 1997 to 2001 were used to describe patterns of care and to calculate the number of general practice and specialist visits and the use of pathology services such as testing of HbA1c, lipids and microalbuminuria.

Women with diabetes (diagnosed prior to Survey 1 in 1996) were classified as frequent attenders if they were at or above the 90th percentile of the distribution for number of general practice attendances, in each age cohort separately for the year that Survey 2 was completed. This equated for mid-age women with diabetes to 16 or more consultations in 1998 and for older women with diabetes to 23 or more consultations in 1999.

Statistical analysis

Within each age cohort, the demographic characteristics, health status and health service use of women with and without diabetes were compared using chi-square tests. Survey 2 responses were linked to Medicare/DVA data for 1998 in the mid-age cohort and to 1999 data for the older cohort, to match the year that Survey 2 was conducted. Logistic regression analysis was performed to determine the extent to which health and socio-economic variables were associated with having the pathology tests recommended in best practice guidelines.[15] The outcome variable was defined for each woman as whether she had all three of the tests: HbA1c; microalbuminuria and lipids in the year under review. The explanatory variables for the analysis were area of residence, being a frequent attender, education and self-rated health.

Table 1: Profile of respondents at Survey 1 in 1996, according to age group and diabetes status at Survey 2 (1998/99).

	Mid-age			**Older age**		
	Diagnosed before 1996 n=236	**Diagnosed 1997-98 n=141**	**No diabetes by 1998 n=11,853**	**Diagnosed before 1996 n=840**	**Diagnosed 1997-99 n=266**	**No diabetes by 1999 n=9,315**
Demographic characteristics						
% Urban area of residence	35	41	36	37	38	40
% Indigenous[a]	3.9	3.6	0.7	0.5	0.8	0.3
Highest qualification[a,b]						
No formal qualifications	27	24	17	43	41	31
High school	48	51	49	45	46	53
Trade/diploma	18	15	20	10	10	12
Tertiary	6	10	15	2	4	4
	100	100	100	100	100	100
Marital status						
Married/living as married	83	82	84	54	51	58
Separated/divorced/widowed	12	15	13	44	45	39
Single	4	4	3	2	4	3
	100	100	100	100	100	100
Employment status[a]						
Full-time paid work	25	39	35	–	–	–
Part-time paid work	24	25	32	–	–	–
No paid work	52	36	32	–	–	–
	100	100	100	–	–	–
Health characteristics						
Comorbidity						
% with hypertension[a,b]	46	40	20	66	62	46
% with heart disease[a,b]	6	6	2	31	19	15
% with eyesight problems[a,b]	53	54	44	59	51	46
Body mass index (kg/m^2)[a,b]						
≤25	21	20	55	39	34	55
25$^+$–30 (overweight)	31	28	28	35	39	32
30$^+$–35 (obese)	21	26	12	18	21	10
>35 (morbidly obese)	27	26	6	8	6	3
	100	100	100	100	100	100
% Adequate physical activity[b]	43	30	42	36	37	45
Smoking status						
Never smoked	58	46	54	64	64	64
Ex-smoker	25	35	29	31	30	29
Current smoker	17	19	17	5	6	7
	100	100	100	100	100	100
Alcohol[a,b]						
Never/rarely	70	63	45	80	72	61
No risk	24	32	49	19	23	35
Risk	6	4	6	1	5	4
	100	100	100	100	100	100
Taking four or more prescribed medications						
Survey 1[a,b]	25	12	6	54	35	23
Survey 2[a,b]	32	17	6	66	52	33

Notes:
(a) Associated with diabetes status, mid-age group, p<0.005
(b) Associated with diabetes status, older age group, p<0.005

Results

Of the 12,328 mid-age women who completed Survey 1 and Survey 2, 236 women (1.9%) reported being diagnosed with diabetes prior to 1996, and 141 women (1.1%) were diagnosed between 1996 and 1998. There were inconsistent responses given by 107 mid-age women, which may have been due to a history of gestational diabetes, and these women were excluded from further analyses. Of the 10,421 older women in the study who completed Survey 2 in 1999, 840 women (8.1%) had been diagnosed with diabetes prior to 1996 and 266 new cases (2.6%) were diagnosed between 1996 and 1999.

A profile of the demographic and health characteristics of the mid-age and older women, according to their diabetes status, is shown in Table 1. Women with diabetes tended to have lower

Table 2: Measures of health service utilisation from 1997-2001 according to diabetes status and age group (Health Insurance Commission data).

	Mid-age women			Older age women		
	Diagnosed before 1996 n=158	Diagnosed 1996-98 n=94	No diabetes by 1998 n=8,251	Diagnosed before 1996 n=551	Diagnosed 1996-99 n=156	No diabetes by 1999 n=6,418
Mean number of GP visits						
1997	7.2	7.8	4.9	11.6	11.9	8.5
1998	8.0	7.5	4.9	12.1	12.7	8.9
1999	7.6	7.3	5.0	12.4	12.5	9.2
2000	7.9	7.4	5.1	13.0	12.7	9.8
2001	8.2	7.0	5.3	13.3	12.2	9.9
% with more than six GP visits						
1997	47	49	25	72	73	53
1998	42	39	25	76	79	56
1999	47	36	26	74	75	58
2000	46	50	27	78	78	62
2001	52	35	28	76	75	64
% with at least one specialist/consultant physician visit						
1997	54	51	36	70	74	57
1998	58	55	37	74	75	59
1999	58	47	36	76	71	61
2000	57	50	37	75	77	63
2001	57	53	39	79	76	64
% with at least one HbA1c test						
1997	44	23	0	46	26	0
1998	45	27	0	51	41	1
1999	51	27	1	52	52	1
2000	49	29	1	53	54	2
2001	52	27	1	58	52	3
% with at least one microalbuminuria test						
1997	11	9	0	10	8	0
1998	13	5	0	13	9	0
1999	16	7	0	14	14	0
2000	18	9	0	15	16	0
2001	27	12	0	21	28	1
% with at least one lipid study						
1997	38	35	16	42	44	25
1998	39	38	18	43	56	28
1999	46	40	21	46	54	31
2000	47	43	24	51	56	34
2001	49	38	25	50	47	32
Mean amount spent per woman ($A at 2001)						
1997	583	581	376	855	913	617
1998	659	605	399	917	1,002	673
1999	648	616	422	1,000	1,042	733
2000	670	612	425	1,068	1,160	773
2001	710	605	440	1,142	1,086	827

education and, among the mid-age women, were less likely to be employed in paid work and more likely to be of Indigenous origin. Women with diabetes were also much more likely to have hypertension, heart disease and eyesight problems and the prevalence of these conditions was much greater among older women than among mid-age women. There were striking differences in body mass index between women with and without diabetes. Of the mid-age women who were diagnosed with diabetes between the first and second surveys, 80% were overweight at Survey 1, with one-quarter having BMI greater than 35. Less than half the women in this study had adequate levels of physical activity. Among mid-age women, those diagnosed with diabetes between Survey 1 and Survey 2 were least likely to be doing adequate exercise; among the older women those diagnosed with diabetes at any time were least likely to be doing adequate exercise. The majority of women were non-smokers and only a small proportion drank alcohol at levels considered to be harmful to health. At Survey 1, one-quarter of the mid-age women and half the older women with diabetes were taking four or more prescribed medications daily. This percentage increased over the period between Survey 1 and Survey 2, with high rates of polypharmacy among women with diabetes.

Measures of health service utilisation and diabetes care are shown in Table 2. Women with diabetes had more consultations with general practitioners and specialists/consultant physicians and again, the number was higher for older women than mid-age women. Use of HbA1c tests was less than the recommended 6-12 monthly, although there was a trend over the five-year period for a greater percentage of women with diabetes to have the test at least once a year. Rates of testing microalbuminuria were low, rising from about 10% in 1997 to 20% in 2001. Similarly, rates of lipids testing increased over the five-year period but were far from conforming to the best practice guidelines of at least annual testing. Although older women were likely to have more consultations with medical practitioners, the percentage having tests for HbA1c, microalbuminuria and lipids was similar in the two age groups.

The average amount of money spent each year on medical services subsidised by Medicare (outside hospital) for women with and without diabetes is shown in Table 2. To allow for the effects of inflation, costs for all years were adjusted to 2001 dollar values using the consumer price index published by the Australian Bureau of Statistics for the June quarter of each year. Costs increased each year and were substantially more for women with diabetes than women without diabetes.

Of the 151 mid-age women with diabetes diagnosed prior to 1996 who were included in the logistic regression, 10 (6.7%) had all three recommended pathology tests in 1998. Of the 507 older women with complete data, 46 (9.1%) had all three tests performed in 1999. As shown in Table 3, area of residence, education and self-rated health were not significantly associated with having all three tests, but these factors were retained in the model as adjustment factors. After adjustment for these factors, having more frequent consultations with a general practitioner was the one variable significantly associated with having all three recommended tests for best practice care, in each age group.

Conclusions

This paper has described the demographic and health profile of mid-age and older women with diabetes in Australia and presents new findings about their use of health services over a five-year period. Our results confirm the well-known factors associated with the development of diabetes and clearly show the presence of complications of diabetes. Women with diabetes use more health care services and account for a higher proportion of health care spending than women without diabetes. A major finding of this analysis of linked data is that the compliance with the guidelines for best practice care for diabetes that we studied

Table 3: Factors associated with women with diabetes having all three tests (HbA1c, microalbuminuria and lipids) analysed by multiple logistic regression, by age cohort.

	Women aged 47-52 Data for year 1998 (n=151)		Women aged 73-78 Data for year 1999 (n=507)	
	OR	**95% CI**	**OR**	**95% CI**
Area of residence				
Rural	1.0	–	1.0	–
Urban	0.72	(0.17-3.06)	1.04	(0.55-1.98)
Frequency of attendance				
Below 90th percentile	1.0	–	1.0	–
90% percentile and above	5.16	(1.09-24.43)	3.11	(1.42-6.79)
Education				
School only	1.0	–	1.0	–
Post school qualifications	1.08	(0.25-4.63)	1.97	(0.91-4.25)
Self-rated health				
Excellent/very good/good	1.0	–	1.0	–
Fair/poor	0.67	(0.15-2.95)	0.67	(0.35-1.28)

is suboptimal, but the situation appears to be improving. For both the mid-age and the older women, those who consulted general practitioners more frequently were more likely to receive the recommended tests. In this study, living in an urban area and having better education were not associated with our measures of diabetes care, in the multivariate model. This result is important because it shows there is some geographical and socio-economic equity in the provision of care, despite there being fewer services available in rural and underprivileged areas.

A strength of the longitudinal design of this study is that these trends in quality of care can be monitored over the next 15 years of the study. There is also the opportunity to examine the impact of a new diagnosis of diabetes on the health, well-being and use of health services for women in the study. There are few comparable studies with the ability to link longitudinal survey data with health service utilisation data. Overland et al. (2000), in an analysis of Medicare data alone, found 49-57% of people with diabetes had an HbA1c each year. However, in that study, individuals were deemed to have diabetes if they had an HbA1c test anytime in the study period 1993-97.[7] Hence the prevalence of diabetes calculated by Overland et al. would have been underestimated, based on the results of our study, where 19% of the older women with diabetes did not have an HbA1c test at any time in the five-year period 1997-2001.

A further strength of our study is that the results are based on a national random sample of women rather than general practice attenders, and so can be more readily generalised to the population. Much of the previous research on prevalence and correlates of preventive care for adults with diabetes has been conducted in urban and health maintenance organisation settings and has not been based on population samples.[16] However, there are several limitations to this study that should be acknowledged. First, these results are based on women who consented to record linkage, and there is a socio-economic bias in this sample of women.[14] Women who consented to record linkage have higher education and among the older cohort were in better health. Hence the estimated proportion of women who receive investigations may be biased towards those who are better at using the health system. However, this study did not find a relationship between self-rated health and measures of diabetes care. Furthermore, the trends over time showing the increased use of pathology tests for women with diabetes, and the increase over time in costs of services for women with diabetes compared with women without diabetes, would be unaffected by any socio-economic bias in the sample of consenters. Unfortunately, data are unavailable to determine whether these findings are consistent for men in Australia, as the ALSWH was commissioned to explore factors contributing to healthy ageing only among women.

Another potential weakness of this study is that the diagnosis of diabetes is based on self-report. However, Robinson et al. (1997) in Canada demonstrated the validity of self-reported prevalence of chronic diseases, using survey data linked to the health insurance claims database.[17] Using the insurance data as the gold standard, they found specificity was generally very high, especially for people with diabetes and hypertension. Katz et al. (1996) also showed that their questionnaire-based measure of comorbidity was valid and was comparable to medical record assessments.[18] The Australian Diabetes, Obesity and Lifestyle Study (AusDiab) reported 3.8% of an Australia-wide sample of women aged 45-54 had known diabetes compared with 3.0% in total in our mid-age cohort.[1] The same study reported 6.6% of women aged 65-74 and 8.8% of women aged over 75 had known diabetes, compared with 10.7% in total in the older cohort (70-75 years) in our study. This suggests that our study has not underestimated diabetes due to poor self-reporting. It is also important to note that some services provided to the women may not be recorded in the Medicare database; for example, where services are provided while in hospital or at a hospital-outpatient clinic. However, the database has the advantage of being a national collection and its use reduces the burden on participants of self-report. As well, self-reported measures of quality of care of diabetes have been found elsewhere to overstate what has been achieved.[19] Another limitation of this study is that the test results are not available in the Medicare dataset. However, this study has provided evidence of the use of recommended investigations, which is an important first step in a systematic approach to assessing improvements in quality of care.

In order to achieve the national goal that 80% of people with diabetes have care according to guidelines, there needs to be changes in general practice procedures to support compliance with guidelines.[2] Suggested modifications to improve diabetes-related quality of care and to identify potential barriers to quality care include the generation of pre-written automatic annual pathology forms, a patient-held record card, and ongoing education and consultation with both patients and physicians.[2,8] A system of incentives for adequate comprehensive care for people with diabetes has recently been introduced in Australia whereby payment for services is made by the Health Insurance Commission when a cycle of care over a 12-month period is completed.[6]

This study has demonstrated the value of record linkage of longitudinal survey and administrative datasets to describe the impact of diabetes on women's health and use of health services and to help evaluate compliance with quality of care guidelines. It provides a baseline against which to measure the impact of strategies to improve diabetes-related quality of care.

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The problems of sleep for older women: changes in health outcomes

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Abstract

Objective: to identify the continuance of sleeping difficulty and medication use in a cohort of older Australian women from baseline to 3-year follow-up and to explore the relationship between these factors and health-related quality of life scores, falls and other health care use.
Method: a 3-year longitudinal survey of 10,430 Australian women aged 70–75 years at baseline. These women were participants in the Australian Longitudinal Study on Women's Health randomly selected from the Australian Medicare database.
Results: a majority of women (63%) endorsed one or more items related to sleeping difficulty at 3-year follow-up: 33% reported one item only, 16% reported two or three items, and 14% reported more than three items; 4,194 (42.4%) reporting 'waking in the early hours', 2,592 (26.0%) 'taking a long time to get to sleep', 2,078 (21.0%) 'sleeping badly at night', 1,072 (10.8%) 'lying awake most of the night' and 1,087 (11.0%) 'worry keeping you awake'. Total scores on the Nottingham Health Profile sleep sub-scale ranged from 0–100 and were skewed to the right. The median score was 12.57. There was a strong statistical association between reporting sleeping difficulty at baseline and at follow-up. A total of 1,532 (15%) women reported use of sleeping medication at follow-up and women were 6.5 times more likely to report use if they also reported any item of sleep difficulty. There was a moderate level of agreement (88%, $\kappa = 0.56$) between taking sleeping medication within 4 weeks before the baseline survey and within 4 weeks before follow-up. On multivariate analysis, sleeping difficulty at baseline was negatively associated with general health perceptions, emotional role limitations and general mental health sub-scales of the Short-Form-36 Health Survey at follow-up; the use of sleep medication at baseline was negatively associated with physical functioning, bodily pain, vitality, social functioning and general mental health Short-Form-36 sub-scale scores. The use of sleep medication was also significantly associated with falls, accidents, and health care utilisation.
Conclusion: sleeping difficulty is a common and persistent complaint among older women and is strongly associated with use of sleeping medications. Both behaviours are negatively associated with health status.

Keywords: *older women, sleeping difficulty, sleeping medication use, health status*

Introduction

Difficulty sleeping is common in older people [1–5] and frequently attributed to age related physiological changes in circadian rhythms and sleep architecture. Compared with younger adults, older people have less slow-wave sleep (stage 3–4) and less total sleep time [6, 7]. Older people also have more fragmented sleep, waking more frequently and lying awake for long periods.

Although sleep disturbances increase with ageing, changes in sleep pattern do not necessarily lead to symptoms of sleep disturbance and complaints of insomnia [8]. Further, the increased prevalence of comorbidity with ageing, has made the relationship between ageing, *per se*, and sleeping difficulties, unclear [9].

Population studies [9–11] report varied prevalence of sleeping difficulties in a variety of populations, with notable increases in prevalence with age [1, 3, 5]. Morgan *et al.* report that insomnia is experienced by one in three individuals, is more likely among those with mental and physical problems, is particularly common among women, and (in both sexes) is characterised by problems of sleep onset and sleep maintenance [12]. Other research indicates that poor sleep among older adults may be a prodromal symptom for underlying physical and or psychiatric illness [13], as well as a possible precursor [14, 15].

Illness and medication use, psychological symptoms including depression, low levels of physical activity and poor sleep hygiene are the most frequently cited risk factors for insomnia [9]. For example, symptoms such as pain and dyspnoea can interfere with sleep onset and sleep maintenance, and medications such as diuretics and bronchodilators have been shown to trigger insomnia [6].

Poor sleep quality among older people may also lead to increased consumption of sedatives and hypnotics, which may lead to adverse consequences such as drowsiness, confusion, ataxia, dizziness, and impaired motor coordination [17–20]. Increased risk of falling and fall-related fractures are other serious consequences, reported in up to three times more users than non-users of sleeping medication [18, 21]. Older people are particularly predisposed to these adverse effects due to physiological changes associated with ageing which lead to changes in pharmacokinetic processes (absorption, distribution, metabolism, and excretion) [18].

Analysis of baseline data from 12,624 community-dwelling women aged 70–75 years who were participants in the Australian Longitudinal Study on Women's Health (ALSWH) identified strong independent statistical relationships between self-reported sleeping difficulty and health-related quality of life, and between use of sleeping medications and quality of life [22]. Approximately 50% of older women in the ALSWH reported some degree of difficulty sleeping, and approximately 17% reported difficulty sleeping often. The adjusted means for the Short Form-36 (SF-36) health survey sub-scale scores were significantly lower with each category of sleeping difficulty ('often', 'sometimes', 'rarely' and 'never') and were significantly lower among the 18% of women who reported using sleeping medication within 4 weeks prior to study. Similarly, the higher the SF-36 physical and mental health summary scores, the lower the odds of women reporting sleeping difficulty or medication use [22].

The aim of this study is to explore the continuance of sleeping difficulty and medication use in this cohort of women at 3-year follow-up including the relationship between these factors and health-related quality of life scores, falls and other health care use.

Methods

The ALSWH aims to examine the relationships between biological, psychological, social and lifestyle factors and women's physical and emotional health, as well as their use of and satisfaction with health care services [23, 24]. The study is designed to track the health of women over a period of up to 20 years. The three main cohorts were aged 18–23, 45–50 and 70–75 at baseline in 1996. This present study involves those of the 12,624 participants aged 70–75 at 1996 who contributed data to the first follow-up survey undertaken in 1999.

The original ALSWH study sample of women was drawn from the database of the Health Insurance Commission (HIC). The HIC is the universal provider of basic health insurance and, theoretically, involves all women in Australia (including non-residents). The sample was stratified to over-represent women from rural and remote areas; these women are represented in twice their usual proportions. In this study, 40% of the sample were drawn from urban areas, 54% from rural areas, and 6% from remote areas.

Women were sent written invitations to take part in the study in March 1996, beginning with the completion of an omnibus-style questionnaire on a broad range of health issues. The Dillman protocol for postal surveys [25] was followed but without telephone contact (such contact was precluded by the statutory regulations covering the HIC sampling frame).

Similar procedures were employed at follow-up except that women who did not return their surveys after two reminders were telephoned and invited to complete a short telephone interview which consisted of only selected questions from the survey. Systematic approaches were employed to track participants who had changed address between baseline and follow-up [26].

The baseline questionnaire

The baseline questionnaire included 260 items measuring biological, psychological, social and lifestyle factors, along with physical and emotional health, use of, and satisfaction with, health care services. Wherever possible, previously validated items and/or scales were used. Scales included the well-known SF-36 [27] to measure health related quality of life; the Duke Social Support Index [28, 29]; the Australian Nutritional Screening Initiative questionnaire [30] and the Hwalek-Sengstock Elder Abuse Scale [31]. A 21-item scale measured life events over the previous 12 months [32]; co-morbid conditions and symptoms; and, items related to health care use and medication use. Basic demographic data were collected.

To measure sleeping difficulty, women were asked to respond either 'none', 'rarely', 'sometimes', or 'often' to the question: 'In the past 12 months, have you had difficulty sleeping?' To measure sleeping medication use, response categories were 'yes' or 'no' to the question: 'During the past 4 weeks have you taken any medications to help you sleep (e.g. Normison, Mogadon etc.)?'

The follow-up questionnaire

The follow-up questionnaire was similar in format and content to the baseline questionnaire with the exception that the 5-item sleep sub-scale of the Nottingham Health

Table 1. Characteristics of the older women at baseline and follow-up ($n=10{,}421$)

	Minimum no observations	Baseline	Follow-up
Current area of residence – Urban (%)	10,382	40.1	41.3
Marital status (%)	10,239		
Married/defacto		57.5	51.1
Widowed		34.2	41.2
Age in years: median, mean (SD)	10,421	72.0, 72.6 (1.5)	75.0, 75.6 (1.5)
Current cigarette smoking (%)[a]	8,953	6.7	5.3
On hormone replacement therapy	10,150	11.6	10.7
Used medications to help sleep	10,150	16.5	15.3
Weight in kg: median, mean (SD)	9,700	64.4, 66.2 (12.4)	63.5, 65.4 (12.7)
Australian Nutrition Screening Index: median, mean (SD)[a]	9,333	3.0, 4.0 (3.3)	4.0, 4.4 (3.2)
Duke Social Support Index: median, mean (SD)[a]	9,258	29.0, 28.4 (2.9)	29.0, 28.1 (3.1)

[a] Questions were not included in the short version of the follow-up questionnaire.

Profile (NHP) [33] and one other item ('worry keeping you awake at night') were used to further measure sleeping problems. There were additional items relating to falls and accidents within the previous 12 months ('had a fall to the ground', 'been injured as a result of a fall', 'needed to seek medical attention for an injury from a fall', 'had any other injury from an accident at your home', and 'broken or fractured any bone/s').

Statistical analysis

Logistics regression models were used to identify the continuation of sleeping difficulty at 3-year follow-up. Kappa was used to measure agreement between the use of sleeping medications at baseline and follow-up. Due to left skewness of the SF-36 scores, power transformation of 1.5 was applied to make the scores approximately symmetrical. Multiple linear regression models were then used to analyse the relationship between SF-36 scores at follow-up and sleeping difficulty at baseline, while adjusting for baseline SF-36 scores, use of sleeping medications at baseline, symptoms, co-morbidity, life events and age.

Adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated for each item relating to falls and accidents, health care utilisations at follow-up for women who had sleeping difficulty at baseline while adjusting for prior incidence, use of sleeping medications at baseline, symptoms, co-morbidity, life events (except falls) and age. Women who never had sleeping difficulty at baseline formed the reference group for the OR. These analyses were repeated with respect to the use of sleeping medications at baseline while adjusting for the sleeping difficulty at baseline, symptoms, co-morbidity, non-fall life events and age. All analyses were conducted in SAS [34].

Results

A detailed description of the 12,624 participants in the baseline study has been reported elsewhere [24]. A total of 9,510 women completed the full follow-up survey by mail, and 920 women completed the short telephone version. The response rate for the follow-up survey was 90.6% ($n=10{,}430$). Table 1 shows the characteristics of the women in the study.

Scores on the NHP sleep sub-scale ranged from 0–100 and were skewed to the right. The median score was 12.57. Thirty-seven percent of women reported 'no' to all NHP sleep sub-scale items, 33% reported one item only, 16% reported 2 or 3 items, and 14% reported more than 3 items. Responses to individual items provide more detail on the types of difficulty reported with 4,199 women (42.4%) reporting 'waking in the early hours', 2,592 (26.0%) 'taking a long time to get to sleep', 2,078 (21.0%) 'sleeping badly at night', and 1,072 (10.8%) 'lying awake most of the night' (See Figure 1). Although not part of the sleep sub-scale and additional NHP item 'worry keeping you awake' was included for face validity,

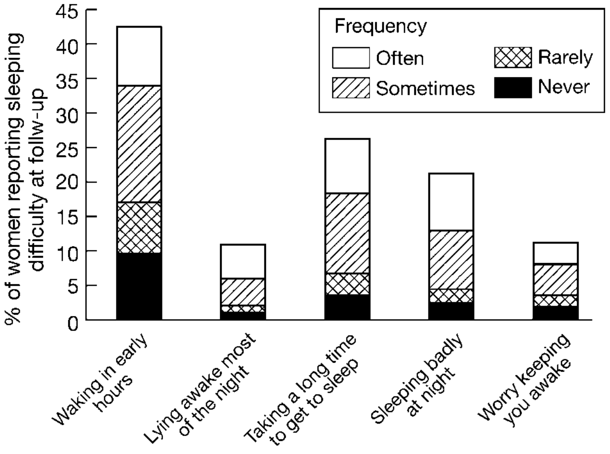

Figure 1. Self-reported prevalence of sleeping difficulty at follow-up by frequency of sleeping difficulty at baseline among Australian women aged between 73–78 years of age at follow-up.

Table 2. Numbers and OR (95% CI) for prevalence of reporting difficulty in sleeping at follow-up, relative to women with no sleeping difficulty at baseline

Frequency of sleeping difficulty at baseline		Number of women reported difficulty in sleeping at follow-up	% of women reported difficulty in sleeping at follow-up	OR (95% CI) reported difficulty at follow-up
		Waking up in early hours		
Never	3,489	950	27.3	1.00
Rarely	1,672	729	43.6	2.1 (1.8–2.3)
Sometimes	3,201	1,672	52.2	2.9 (2.6–3.2)
Often	1,501	843	55.4	3.3 (2.9–3.8)
		Lying awake for most of the night		
Never	3,489	106	3.0	1.00
Rarely	1,672	92	5.5	1.9 (1.4–2.5)
Sometimes	3,201	385	12.0	4.4 (3.5–5.5)
Often	1,530	489	32.0	15.0 (12.1–18.8)
		Taking a long time to get to sleep		
Never	3,489	351	10.1	1.00
Rarely	1,672	309	18.5	2.0 (1.7–2.4)
Sometimes	3,201	1,143	35.7	5.0 (4.4–5.7)
Often	1,530	789	51.6	9.5 (8.2–11.0)
		Sleeping badly at night		
Never	3,489	228	6.5	1.00
Rarely	1,672	186	11.1	1.8 (1.5–2.2)
Sometimes	3,201	835	26.1	5.0 (4.3–5.9)
Often	1,530	829	54.2	16.9 (14.3–20.0)
		[a]Worry keeping you awake at night		
Never	3,489	170	4.9	1.00
Rarely	1,672	156	9.3	2.0 (1.6–2.5)
Sometimes	3,201	443	13.8	3.1 (2.6–3.8)
Often	1,530	318	20.8	5.1 (4.2–6.3)
		Any of the above sleeping problems		
Never	3,489	1,357	38.9	1.00
Rarely	1,672	1,022	61.1	2.5 (2.2–2.8)
Sometimes	3,201	2,634	82.3	7.3 (6.5–8.2)
Often	1,530	1,428	93.3	22.6 (17.7–27.3)

[a]Not part of sleep subscale.

and 1,087 (11.0%) of women reported this was a problem.

Table 2 list the odds of reporting sleeping difficulty at follow-up for each category of frequency of sleeping difficulty at baseline. The strong association indicates that self-reported sleeping difficulty was a persistent condition among women in the cohort. Compared with women who never had sleeping difficulty at baseline, the odds of reporting sleeping difficulty at follow-up increased with the frequency of sleeping difficulty at baseline.

The fifth item of the NHP sleep sub-scale is the use of sleeping medications. In this study 1,532 (15%) women reported use of sleeping medication at follow-up. Of the 1,665 women who reported use of sleeping medication at baseline, 1,005 (60%) women reported use of sleeping medication at follow up. There was a moderate level of agreement (88%, $\kappa = 0.56$) between taking sleeping medication within 4 weeks before the baseline survey and within 4 weeks before follow-up indicating that the use of these medications is a persistent and stable behaviour. Compared with women who had no sleeping difficulty at follow-up, women with sleep difficulty on each of the items of NHP were more likely to take sleeping medication at follow-up (OR between 1.6–3.0). Women who experienced any of the NHP items were 6.5 times more likely to take sleeping medication at follow-up than those who had not experienced any sleeping difficulties (Table 3).

Figure 2 shows the unadjusted means and 95% CI for SF-36 scores at baseline and follow-up. Women with sleeping difficulty at baseline had lower mean scores for all the eight dimensions of SF-36 than those with no sleeping difficulty. Similar trends were also present for those taking sleeping medication at baseline.

Table 4 shows multiple regression models for power transformed SF-36 scores at follow-up. The signs of the coefficients and *P*-values reflect the direction of association and the statistical significance respectively. Sleeping difficulty at baseline was negatively associated with SF-36 scores adjusted for prior SF-36 scores. However when the SF-36 scores were adjusted for prior SF-36 scores, symptoms, co-morbidity, life events and age at baseline, sleeping difficulty at baseline was only negatively associated with general health perceptions, emotional role limitations and general mental health.

Table 3. Numbers and OR (95% CI) for prevalence of reporting the use of sleep medication at follow-up, relative to women with no sleeping difficulty on each item of the Nottingham Health Profile sleep scale at follow-up

Self-reported difficulty on the items of Nottingham Health Profile sleep scale at follow-up.	(a) Number of women with the following sleep difficulty at follow-up	% of women in (a) reported using sleep medication at follow-up	OR (95% CI) for the use of sleep medication at follow-up
Waking up in early hours			
No	5,759	12.4	1.00
Yes	4,190	19.6	1.7 (1.6–1.9)
Lying awake for most of the night			
No	8,872	13.6	1.00
Yes	1,077	30.5	2.8 (2.4–3.2)
Taking a long time to get to sleep			
No	7,339	11.1	1.00
Yes	2,610	27.6	3.0 (2.7–3.4)
Sleeping badly at night			
No	7,853	11.3	1.00
Yes	2,096	31.0	3.5 (3.2–4.0)
[a]Worry keeping you awake at night			
No	8,858	13.7	1.00
Yes	1,091	29.3	2.6 (2.3–3.0)
Any of the above sleeping problems			
No	3,495	4.0	1.00
Yes	6,454	21.6	6.5 (5.5–7.9)

[a]Not part of NHP.

Similarly the use of sleep medication at baseline was negatively associated with all the eight dimensions of SF-36 at follow-up after adjustment for prior SF-36 scores. After adjusting for the other confounding factors physical functioning, bodily pain, vitality, social functioning and general mental health were significantly lower in women who had used sleep medication at baseline.

The adjusted OR and 95% CI for falls, accidents, and health care utilisation, for sleep difficulty and the use of sleep medication at baseline are shown in Table 5. Sleeping medication, but not sleeping difficulty, was significantly associated with falls, doctor consultations and days in hospital after adjustment for confounding factors.

Discussion

This study aimed to identify the prevalence and continuance of sleeping difficulty and medication use among a cohort of older Australian women, and to identify associated health outcomes. The study has the advantages of a large national cohort of women, and collection of data over two time points with very little loss to follow-up. Limitations however, include the single item measure of sleep disturbance at baseline, and a generic self-report measure of sleeping medication use. It is suspected that sleeping medication use may be under-reported by the women in the study. For those women who do report medication use, it is unclear whether they are using long or short acting benzodiazepines, or some other medication with hypnotic or sedative properties. In Australia, however, short acting benzodiazepines are the most commonly used class of hypnotic medications [35].

Difficulty sleeping was commonly and persistently reported by the older women in this study, with waking in the early hours being the most commonly reported manifestation. Further, this difficulty does not appear to be an entirely benign complaint, but associated with significant reduction in the women's quality of life. In longitudinal analyses, reported difficulty sleeping was associated with negative health outcomes as measured by the SF-36 health related quality of life profile. While much of this reduction in quality of life appears to be accounted for by associated symptoms, comorbidity, age, or life events, the association between sleeping difficulty and 'emotional role limitation' and 'general mental health' remained significant event after adjustment for these factors.

However, while sleeping difficulty of itself appears to have negative impact on quality of life, 'treatment' of this symptom with medication does not appear to be an effective measure for the women in the study. A total of 1,532 (15%) of women reported sleeping medication at follow-up and women were most likely to use medications if they reported they were 'sleeping badly at night' (OR 3.5) or 'taking a long time to get to sleep' (OR 3.0). Women were less likely to use medication for 'waking in the early hours'.

While long acting hypnotics should never be prescribed in the elderly, it is recommended that short acting medications (such as benzodiazepines) be prescribed for no more than 4 weeks to avoid problems of tolerance and dependence [36]. However in this study there was strong statistical agreement between use of sleeping medications at baseline and use at follow-up indicating that the women are on these medications for

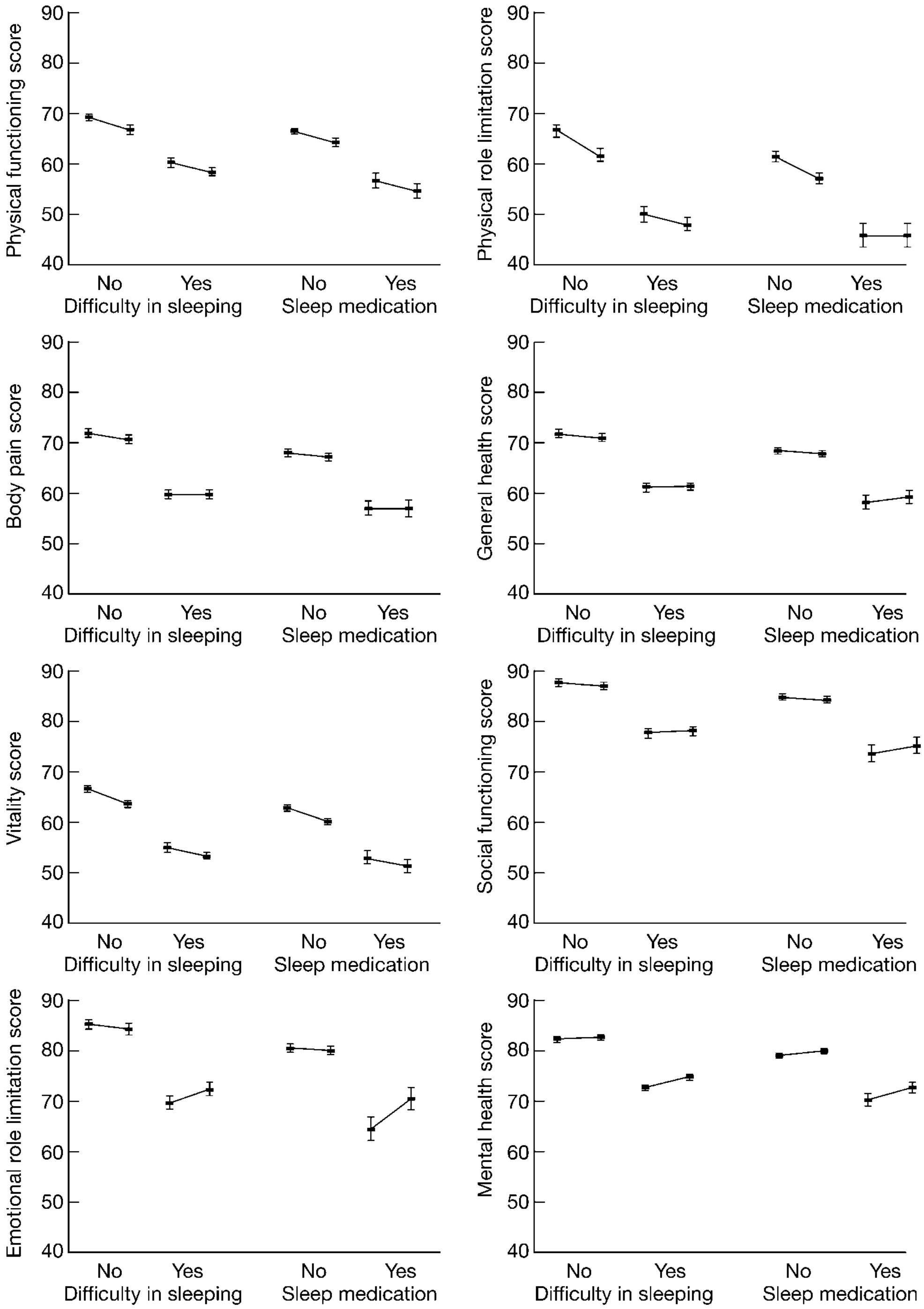

Figure 2. Means and 95% confidence intervals for eight dimensions of the SF-36 by sleeping difficulty at baseline; and the use of sleeping medications at baseline (line joins the baseline mean to follow-up mean).

the long term. This finding of long-term use of sleeping medications has been reported in other studies. In the Netherlands, for example it was found that 17% of older people use psychotropics (mainly benzodiazepines) for longer than 6 months [37]. In Australia, the 1995 National Health Survey found 91.4% of people aged 65 and over who had been taking benzodiazepines had been using for 6 months or more [35]. Morgan and Clarke found that one-third of people studied continued to use hypnotics over 4 years of observation [38].

In this present study, the use of medications at baseline was associated with lower quality of life scores for physical functioning, and general mental health even after adjustment for symptoms, comorbidity, age and life events. One of the more commonly reported life events was ‘fall with injury’ which may in itself have been related

Table 4. Multiple linear regression models for power transformed* SF-36 dimensions at follow-up

	Predictor: Sleeping difficulty at baseline				Predictor: Use of sleeping medications at baseline			
	Model with sleeping difficulty at baseline and prior SF-36 scores only		Model with the use of sleeping medication at baseline, symptoms, co-morbidity, age, and life events added		Model with the use of sleeping medication at baseline and prior SF-36 scores only		Model with sleeping difficulty at baseline, symptoms, co-morbidity, age, and life events added	
Dimensions^a of SF-36 at follow-up	Coefficient (SE)	*P*-value	Coefficient (SE)	*P*-value	Coefficient (SE)	*P*-value	Coefficient (SE)	*P*-value
Physical functioning	−18.4 (4.2)	< 0.0001	8.6 (4.7)	0.1	−28.5 (5.6)	< 0.0001	−20.9 (6.0)	0.0005
Physical role limitation	−59.6 (8.1)	< 0.0001	−7.2 (9.0)	0.4	−36.9 (10.9)	0.0007	−5.3 (11.4)	0.6
Bodily pain	−40.8 (5.4)	< 0.0001	1.4 (5.9)	0.8	−37.6 (7.1)	< 0.0001	−17.6 (7.5)	0.02
General health perceptions	−33.0 (3.9)	< 0.0001	−9.4 (4.2)	0.03	−23.7 (5.2)	< 0.0001	−8.4 (5.4)	0.1
Vitality	−27.5 (3.7)	< 0.0001	−3.4 (4.0)	0.4	−26.8 (4.9)	< 0.0001	−14.0 (5.1)	0.01
Social functioning	−53.9 (5.5)	< 0.0001	−11.8 (6.1)	0.05	−43.9 (7.3)	< 0.0001	−19.3 (7.7)	0.01
Emotional role limitation	−68.9 (7.6)	< 0.0001	−28.6 (8.4)	0.0007	−38.4 (10.1)	0.0002	−3.4 (10.7)	0.9
General mental health	−35.5 (3.6)	< 0.0001	−13.0 (3.8)	0.0003	−29.2 (4.7)	< 0.0001	−15.9 (4.9)	0.001

^{a}Power transformation = $(\text{outcome}^{1.5} - 1)/1.5$.

to the long-term use of sleeping medications. The period prevalence of falls at follow-up was higher for women reporting medication use at baseline, and remained marginally significant after adjustment for symptoms, comorbidity and non-fall life events.

This increased risk in association with falls has been well documented in other studies [18, 21]. In a meta-analysis of the association between benzodiazepine use and falls, for one or more falls the pooled OR was 1.48 (95% CI 1.23–1.77) [21]. Other health risks have also been suggested. For example, Benzodiazepines are most commonly implicated in admissions hospitalisation due to adverse drug reactions and such reactions account for 17% of all geriatric hospital admissions [39]. Use of hypnotics has also been shown to be associated with cognitive decline [17] and excess mortality [40].

Given that sleep disturbance is of itself associated with poor quality of life among older women, and that medication use does not appear to be an ideal solution, what are the treatment alternatives? Appropriate management of sleeping difficulty obviously depends on the underlying cause, and it is important to recognise that chronic insomnia has many causes [41]. Behavioural interventions provide a simple, safe and effective alternative to drug therapy [42–44] and appear to produce more sustained effects [41]. In a recent study, Morin *et al.* [45] demonstrated that older patients with long-term insomnia treated with cognitive behavioural therapy had significant and sustained quality of life gains over a 2-year follow-up period. These gains were not observed in the comparison group treated with short-term benzodiazepines.

Other alternatives to medication include reassurance, sleep hygiene such as limited use of nicotine, caffeine, and alcohol, regular exercise, avoidance of day time naps, avoidance of heavy meals before sleep, and relaxation techniques [13, 46, 47]. Medication review is also a pillar in the effective management of sleep disturbance [48].

Difficulty sleeping is a symptom that should be taken seriously among older women, because of its impact on quality of life, because it may be a prodroma for serious physical and psychological illness, and because of the associated use of sleeping medicines. Indeed insomnia has now been recognised as a global priority by the World Health Organisation who recognise an ongoing need to understand the causes and impacts of insomnia as well as how best to disseminate effective and safe interventions [48].

Older women are the biggest users of sedatives, tranquillisers or hypnotics [49, 50] and, although problems with their use is well recognised within medical literature, benzodiazepines are among the most common inappropriate prescriptions for older people [51] (J. E. Byles *et al.*, unpublished). In Australia, the prevalence of use of benzodiazepines has been stable since 1994 and 1998 [52]. However, a recent Australian study found that health professionals and community members do not believe that the use of benzodiazepines is

Table 5. Logistic regression models for falls, accident, and health care utilisation at follow-up

		Predictor: Sleeping difficulty at baseline		Predictor: Use of sleeping medications at baseline	
		Model with sleeping difficulty at baseline and prior outcome only	Model with the use of sleeping medication at baseline, symptoms, acute conditions, age, and life events added	Model with the use of sleeping medication at baseline and outcome only	Model with sleeping difficulty at baseline, symptoms, acute conditions, age, and life events added
Outcome	*n*	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Falls and accidents at follow-up					
Fall to the ground	1821	1.3 (1.1–1.4)	0.9 (0.8–1.1)	1.3 (1.2–1.5)	1.2 (1.0–1.3)
Injured as a result of a fall	1271	1.4 (1.2–1.6)	1.1 (0.9–1.2)	1.3 (1.1–1.5)	1.1 (0.9–1.3)
Needed to seek medical attention for an injury from a fall	1104	1.4 (1.2–1.6)	1.1 (0.9–1.3)	1.4 (1.2–1.7)	1.2 (1.0–1.4)
Other injury from an accident at home	1095	1.4 (1.2–1.6)	0.9 (0.8–1.1)	1.4 (1.2–1.6)	1.1 (0.9–1.3)
Broken or fractured any bone/s	527	1.3 (1.1–1.7)	1.1 (0.9–1.3)	1.5 (1.2–1.8)	1.2 (0.9–1.5)
Any of the above incidents	3077	1.4 (1.2–1.5)	0.9 (0.8–1.0)	1.4 (1.3–1.6)	1.2 (1.0–1.3)
Health care utilisation at follow-up					
Consulted family doctor or another general practitioner $\geqslant 9$ times	3077	1.4 (1.2–1.5)	1.0 (0.9–1.2)	1.4 (1.2–1.6)	1.2 (1.1–1.4)
Consulted hospital doctor	1639	1.4 (1.3–1.6)	1.1 (0.9–1.2)	1.3 (1.2–1.5)	1.2 (1.0–1.4)
Days spent in hospital $\geqslant 1$ day	2591	1.4 (1.3–1.6)	0.9 (0.8–1.1)	1.7 (1.5–1.9)	1.4 (1.2–1.6)

any longer a problem [53] indicating that there is systematic under-recognition of the problems of sleeping medication use.

Conclusion

This study demonstrates that sleeping difficulty and sleeping medication use are not only common, but also persistent and long-term problems among older women. These two factors are significantly associated with negative health outcomes and should be a key part of health promotion practice and clinical care.

Key points

- Sleeping difficulty is a common complaint among older women.
- Sleeping difficulty can be a persistent complaint among older women.
- Sleeping difficulty for older women is strongly associated with use of sleeping medications.
- Sleeping difficulty and sleeping medication use for older women are both negatively associated with health status.

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The Experience of Insomnia Among Older Women

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Study Objectives: To measure sleeping difficulty and sleep quality among older women, explore experience and attitudes towards sleep, and test for negative association between difficulty sleeping and health-related quality of life.

Design: Four-year longitudinal study.

Setting: Women were participants in the Australian Longitudinal Study on Women's Health.

Participants: Women were sampled according to use of sleeping medication and classified into 4 groups: sleeping badly and using sleeping medications; not sleeping badly, but using sleeping medications; sleeping badly, not using sleeping medications; not sleeping badly, not using sleeping medications.

Interventions: None.

Measurements and Results: Sleeping difficulty and sleeping-medication use were measured at Survey 1, Survey 2 (3 years later), and Survey 3 (4 years later). Survey 3 included: Nottingham Health Profile Sleep Subscale, Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale, Geriatric Depression Scale, Duke Social Support Index, Medical Outcomes Study Short-Form 36-item Health Survey, and a 21-item life events scale. Survey 3 was returned by 1011 women (84%). Sleeping problems were negatively associated with SF-36 subscale scores. Most associations remained significant after comorbid conditions, Geriatric Depression Scale, life events scores, and medication use were added to models. Most women with sleeping problems (72%) sought help from a doctor, and 54% used prescribed sleeping medications in the past month.

Conclusions: Sleeping difficulty is a serious symptom for older women and is associated with poorer quality of life. Some of this effect can be explained by comorbidities, depression scores, life events, and use of sleeping medications.

Keywords: Sleep disturbance, ageing, women, symptoms, behaviours, medications

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INTRODUCTION

SLEEPING DIFFICULTY IS A COMMON COMPLAINT AMONG OLDER WOMEN[1-5] AND IS ASSOCIATED WITH PHYSICAL AND MENTAL PROBLEMS.[6] IN AUSTRALIA, sleeping difficulty has been reported by 18% of women aged 75 years and over and 12% of women aged 65 to 74 years.[1] Morgan and Clarke[6] report that insomnia is experienced by 1 in 3 individuals aged 65 and over in England. Population studies in other countries also report a high prevalence of sleeping difficulty and an increasing prevalence among women as their age increases.[3-5,7,8]

While the prevalence of insomnia among older women is not new or controversial, there is controversy as to whether sleeping problems are a benign issue for older women or whether they are the result of age-related decline in physical health. For example, it has been suggested that sleep disturbance is normal for older people, due to age-related physiologic changes in circadian rhythms and sleep architecture.[9,10] However, this assumption is not supported by the small amount of population data that are available. Although sleep disturbances increase with aging, changes in sleep pattern do not necessarily lead to symptoms of sleep disturbance and complaints of insomnia.[11] Further, some research indicates that poor sleep among older adults may be a prodromal symptom for underlying physical and or psychiatric illness,[12] as well as a possible precursor of these conditions.[13,14] Despite the reported prevalence of sleeping difficulty, very little is known about how this symptom is experienced or responded to by women in the community or about the short- or long-term impact on affected women's quality of life. This study was undertaken to explore women's experience of sleeping difficulty and the relationship between this symptom and quality of life. The study builds on earlier work that described the prevalence and correlates of sleeping difficulty in a cross-sectional analysis of data from 12,624 community-dwelling women aged 70 to 75 years who were participants in the 1996 baseline survey (Survey 1) of the Australian Longitudinal Study on Women's Health (ALSWH).[2,15]

Of the 12,624 participants in Survey 1 ALSWH, 17% reported they "often" experience "difficulty sleeping," and approximately 18% (n=2287) of women reported use of sleeping medication within the previous 4 weeks. Further, there were strong statistical associations between self-reported sleeping difficulty and health-related quality of life.[2] The first follow-up of these women (Survey 2) occurred in 1999, 3 years after collection of baseline data, and obtained responses from 10,430 of the original cohort. Analysis of these longitudinal data demonstrated a relationship between reported sleeping difficulty at Survey 1 and reduced quality of life at Survey 2, even after adjustment for comorbid conditions and symptoms and concurrent use of sleeping medications.[15]

This study collects further data from randomly selected subsamples of women who participated in Survey 2 of ALSWH. Specifically, the aims were (1) to gain more detailed measures of women's sleeping difficulty and sleep quality using psychometrically valid measures, (2) to explore the experience and attitudes toward sleep among women who have difficulty sleeping and/or who use sleeping medication, and (3) to test the hypothesis that

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difficulty sleeping is adversely associated with changes in health-related quality of life.

METHOD

Sampling and Data Collection

Women in this study are participants in ALSWH, which is designed to track the health of women over a period of up to 20 years, and were aged 70 to 75 years at the commencement of the study in 1996. The study sample was drawn from the database of the Health Insurance Commission, the universal provider of basic health insurance, which involves all women in Australia (including nonresidents). All women had completed omnibus-style health surveys in 1996 (Survey 1) and in 1999 (Survey 2). The surveys collected demographic and health data using a wide range of questionnaire items measuring physical, social, and mental health (including symptoms of sleeping difficulty) and healthcare use (including use of sleeping medications).

A specific survey on sleep was distributed to a subsample of women (Survey 3 of this study). Women were randomly selected for this survey from 4 mutually exclusive groups: (1) those who had sleeping difficulty and used sleeping medications, (2) those who had sleeping difficulty but did not use sleeping medications, (3) those who did not have sleeping difficulty but used sleeping medications, (4) those who did not have sleeping difficulty and did not use sleeping medications. These groups were constructed by cross-tabulating responses to Survey 2 items “Have you taken any medication during the PAST 4 WEEKS to help you sleep (yes/no)” and “Do you have problems …sleeping badly at night (yes/no).” The subsample was selected such that there were 605 women who used sleeping medications and 605 women who did not use sleeping medications. The sampling also ensured that prevalence of medication use among the women who reported sleeping difficulty was maintained.

The 1210 women in the combined subsample were mailed Survey 3 (the sleep survey) in June 2000, approximately 12 months after Survey 2 and 4 years after Survey 1. This survey included psychometrically valid epidemiologic measures of sleep disturbance and sleep quality (Nottingham Health Profile sleep subscale [NHP], Pittsburgh Sleep Quality Index [PSQI], Epworth Sleepiness Scale [ESS]) and quality of life, as well as specific items on women’s attitudes toward sleep and sleep-related behaviors. Women were asked to complete the survey and return it in the reply-paid envelope provided. One reminder card was sent after 1 week. and women who had not returned their surveys within 3 weeks were telephoned to encourage their participation.

Measures

The NHP sleep subscale was included in Survey 2 and Survey 3. The subscale consists of 1 item on sleeping-medication use and 4 items measuring sleep: “waking in the early hours of the morning,” “lie awake most of the night,” “takes a long time to get to sleep”, “sleep badly at night.”[16] The items are weighted and added together to yield a subscale score from 0 (“no problem”) to 100 (“Yes” to all items).[17]

The PSQI is a valid reliable measure of sleep quality that can be used to discriminate between good and poor sleepers. The PSQI produces 7 component scores (Sleep Quality, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disturbance, Sleeping Medications, Daytime Dysfunction) and 1 global score and has an overall reliability coefficient (α) of .83 and a test-retest reliability (Pearson) of 0.85.[18] The PSQI was used in Survey 3 only.

The ESS consists of 8 questions and yields a score of 0 to 24. This is a simple self-administered questionnaire that is one of the most widely used subjective tests for sleepiness (Survey 3 only).[19]

The Medical Outcomes Study Short-Form 36-item Health Survey (SF-36) is a widely used tool designed to measure health-related quality of life.[20] The instrument provides an 8-scale health profile and 2 component summary scores representing physical and mental health. The scales measure (1) physical functioning; (2) bodily pain; (3) role limitations due to physical health problems; (4) general health perceptions; (5) vitality, energy, or fatigue; (6) general mental health, covering psychological distress or well-being; (7) role limitations due to emotional problems; and (8) social functioning. Higher scores on each scale represent better quality of life (eg, a high score on the “Physical Functioning” subscale indicates good physical health-related quality of life; a low score on the “Bodily Pain” subscale indicates poorer quality of life due to the presence of pain).

Items to assess sleep attitudes and related behaviors were also included in Survey 3. These items were developed following in-depth qualitative interviews with a separate random sample of 11 women who had reported ”sleeping badly” at Survey 2. This “insider’s view” of sleeping difficulty was used to develop statements describing reasons for not sleeping, attitudes to sleep (with a 5-point Likert scale for responses), help-seeking behaviors, and lists of behaviors that women engage in when they cannot sleep.

Measures of other factors potentially associated with sleep disturbance were collected at Survey 1 and Survey 2. These factors included use of sleeping medications, medical conditions and symptoms, depression, and life events. Medical conditions included arthritis, diabetes, heart disease, hypertension, stroke, thrombosis, low iron, asthma, bronchitis/emphysema, osteoporosis, breast cancer, bowel cancer, other cancer, depression, anxiety, and Alzheimer disease or dementia. Depression was measured using the Geriatric Depression Scale (GDS),[21] and life events were measured using a 21-item life-events scale. Women were also asked to write down the name of sleeping medications used in the previous month. Basic demographic data were collected at Survey 1,[a] and marital status was measured at Survey 1 and Survey 2. Information on smoking status, body mass index, and physical activity was also collected at Survey 1 and Survey 2.

Statistical Analysis

Coding of Responses and Construction of Scores

NHP, ESS, and PSQI scores and subscale scores were calculated according to published methods,[17-19] and the median, mean and standard deviation of each score was calculated for each group. Responses to items measuring sleeping difficulty at Survey 1, Survey 2, and Survey 3 were used to classify women into 4 transition categories relating to stability or change in reported sleeping difficulty: no problem at any time, sleep problem in the past (Survey 1 and/or Survey 2 but not Survey 3), longstanding sleep problem (Survey 3 and Survey 2 and/or Survey 1), and new

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[a] *Urban, rural, remote area of residence was classified from postcode data.*

problem (Survey 3 only).

Responses to items measuring symptoms that women reported as causing trouble sleeping were classified as "less than once a week" or "once or more times a week." Items describing attitudes towards sleep were categorized as disagree/strongly disagree, neutral, or agree/strongly agree. Responses to items about behaviors women engage in when they cannot sleep were dichotomous ("yes" or "no"). Names of sleeping medications used in the last month were coded and classified.

Descriptive Analyses

Data on sleeping difficulty, medication use, symptoms that may interfere with sleep, attitudes to sleep, and behaviors to aid sleep were reported separately for each of the 4 groups. Welch's variance-weighted 1-way analysis of variance (which is robust to the assumption of equal within-group variances) was used to explore the relationships between group and mean scores for sleep indexes (NHP, ESS and PSQI). A χ^2 test was used to assess the relationships between the proportions of women who reported "difficulty sleeping," "use of sleeping medications," items of NHP, and the 4 sampling groups. Posthoc pairwise analyses were performed to identify which groups were significantly different from one another.

Analysis of Association Between Sleeping Difficulty and Change in Health-Related Quality of Life

Sets of nested multiple linear regression models were constructed. In each set of models, the explanatory variable was 1 of the 4 measures of sleeping difficulty (scores for NHP sleep subscale, PSQI, and ESS from Survey 3 or transition categories), and the outcome factors were the SF-36 subscale and component summary scores from Survey 1 to Survey 3. The nested models in each set are listed below.

Model 1

Sleeping difficulty and change in SF-36 subscale and component summary scores, with Survey 1 SF-36 component summary scores, area of residence, cigarette smoking status, body mass index, exercise status, and age were treated as covariates. These covariates were included in this basic model because other analyses involving data from participants in the ALSWH indicate that these factors are strongly associated with quality of life, as measured by the SF-36.[22]

Model 2

The number of comorbid conditions, number of symptoms, GDS, and number of life events were added to model 1 as covariates.

Model 3

The frequency of use of sleeping medications in the past month was added to model 2. All analyses were conducted using SAS Version 8 (SAS Institute, Inc., Cary, NC).[23]

RESULTS

A total of 1011 women returned Survey 3 (84% return rate). The basic demographic characteristics of the women providing data for this study are described in Table 1. However, due to the sampling strategy, it was not expected that women in this study would be representative of the population of women of this age, nor of the parent sample. Data on sleep quality for each of the 4 groups are described in Table 2.

Sleeping Difficulty and Sleep Quality for Women Participating in the Study

There were significant differences between groups in terms of mean scores on NHP sleep subscale, PSQI, and ESS (See Table 2). Using self-reported sleeping difficulty at Survey 1 and report of any of the 4 sleep disturbance items of NHP (excluding medication use) at Survey 2 and Survey 3 as comparable indexes, women were classified into 4 transition categories: (1) no sleep problems at any time (107 women, 11%); (2) problem in the past (Survey 1 and/or Survey 2 but not Survey 3) (142 women, 14%); (3) longstanding problems (Survey 3 and Survey 1 and/or Survey 2) (665 women, 66%); and (4) newly reported sleeping difficulty (Survey 3 only) (60 women, 21%). Data were missing for 37 women.

Among women in the selected stratified samples included in this study with any sleeping problems on NHP on Survey 3, the average self-reported duration of problems was approximately 10 years (mean=13.6, median 10, interquartile range 4-20), indicating that the sleeping difficulties experienced by women in the study were often longstanding.

A majority of women selected because of their use of sleeping medications at Survey 2 (Groups 1 and 2) were still using medications at Survey 3 (76% and 78%), and some women who had not reported medication use at Survey 2 (Groups 3 and 4) reported use at Survey 3 (35% and 14%). Classification of the medications used by women in the study during the previous month in-

Table 1—Basic Sociodemographic Characteristics of 1011 Women in the Study

	No.	%
Area of residence (Survey 2)		
Urban	425	42
Large rural center	125	12
Small rural center	175	18
Other rural/remote	286	28
Marital Status (Survey 2)		
Married/de facto	503	50
Widowed	425	42
Single/separated/ divorced	78	8
Age, y (Survey 3)		
74	62	6
75	227	22
76	225	22
77	195	19
78	180	17
79	120	11
80	2	0.2
Education (Survey 1)		
Did not complete secondary education	292	30
Secondary education	501	52
Tertiary—trade and university	167	18
Country of Birth		
Australia	741	78
Other English speaking	118	13
Other non-English speaking	85	9

dicated that 87% of the women in the study who reported using medications were using hypnotic sedatives (eg, temazepam 42%, nitrazepam 12%, oxazepam 21%), with the remainder using over-the-counter medications (8%), herbal remedies (10%), or both.

Among women in Groups 1 and 3 who had sleeping difficulty at Survey 2, 30% and 33%, respectively, said that their sleeping problems commenced when they were widowed, and 24% in each group said their problems started during a period of illness. Approximately 8% of women said their problems started after moving house, and roughly 5% said their problems started after an accident. Approximately 10% said their sleeping problems started after some other event, and around 30% could not attribute their problems to a cause.

Symptoms That Interfere With Sleep, Attitudes Toward Sleeping Difficulty, and Help-Seeking Behaviors

Women with sleeping difficulty (Groups 1 and 3) reported a range of other symptoms (see Table 3), most notably pain, breathing discomfort or coughing/snoring, and bad dreams that they associated with difficulty sleeping. Having to get up to use the bathroom was reported by a large proportion of women in these groups.

Women's attitudes toward sleep are presented in Table 4. Most women with sleeping difficulty or medication use (Groups 1, 2, and 3) agreed that it is harder to sleep when you get older, and, while 76% of those in Group 4 agreed they get all the sleep they need, only 35% to 52% of women in the other Groups agreed with this statement. Approximately 20% to 30% of the women in Groups 1, 2, and 3 said they are "too worried" to sleep, and 10% of women who sleep badly and use medications said they are "afraid to sleep."

Women had tried a variety of strategies to help them sleep (See Table 5), with the most common being reading and listening to the radio. A minority of women used alcohol to help sleep. Some women used coffee or tea to help them sleep, which is against sleep hygiene advice.

Table 2—Sleep Indexes For Surveys 1, 2, and 3 by Group

Sleep Index	**Group 1 Sleeping badly medications (n=125)**		**Group 2 Not sleeping badly, sleeping medications (n=376)**		**Group 3 Sleeping badly, no sleeping medications (n=258)**		**Group 4 Not sleeping badly, no sleeping medications (n=252)**		**P value <.001†**
Survey 1 Measures									
Self-reported difficulty sleeping	43%	[2,3]	25%	[1,4]	32%	[4]	6%	[1,2,3]	*
Use of sleeping medications	69%	[3,4]	64%	[3,4]	12%	[1,2]	5%	[1,2]	*
Survey 2 Measures									
NHP score									
Mean (SD)	70.1(20.0)		38.1(12.5)						
Median	71.3	[2,3,4]	34.9	[1,3,4]	44.0 (19.3) 37.8	[1,2,4]	10.1(12.6) 12.6	[1,2,3]	#
Survey 3 Measures									
NHP Items									
Waking in early hours	62%	[4]	57%	[4]	66%	[4]	34%	[1,2,3]	*
Taking a long time to get to sleep	51%	[4]	43%	[4]	49%	[4]	18%	[1,2,3]	*
Lying awake most of night	30%	[2,4]	14%	[1,3]	29%	[2,4]	7%	[1,3]	*
Sleeping badly	50%	[2,4]	18%	[1,3,4]	47%	[2,4]	6%	[1,2,3]	*
Sleeping Medications	76%	[3,4]	78%	[3,4]	35%	[1,2,4]	14%	[1,2,3]	*
NHP score									
Mean (SD)	50.4(22.3)		36.2(23.5)						
Median	44.1	[2,3,4]	34.9	[1,4]	41.2(26.6) 38.1	[1,4]	13.3 (18.6) 12.6	[1,2,3]	#
PSQI Subscales, Mean (SD)									
Sleep Quality	1.7(0.8)	[2,4]	1.2(0.6)	[3,4]	1.6(0.7)	[2,4]	0.7(0.7)	[1,2,3]	#
Sleep Latency	1.9(0.9)	[4]	1.6(1.0)	[3,4]	1.9(1.0)	[2,4]	1.0(0.9)	[1,2,3]	#
Sleep Duration	1.9(0.9)	[2,4]	1.5(0.9)	[1,3,4]	1.9(0.9)	[2,4]	1.2(0.9)	[1,2,3]	#
Sleep Efficacy	2.4(0.9)	[2,4]	2.1(1.1)	[1,3,4]	2.4(0.9)	[2,4]	1.5(1.1)	[1,2,3]	#
Sleep Disturbance	1.2(0.6)	[2,4]	1.1(0.4)	[1,3,4]	1.2(0.5)	[2,4]	1.0(0.4)	[1,2,3]	#
Medications	1.8(1.3)	[3,4]	1.7(1.2)	[3,4]	0.7(1.1)	[1,2,4]	0.3(0.8)	[1,2,3]	#
Daytime Dysfunction	0.9(0.6)	[4]	0.9(0.6)	[4]	1.0(0.7)	[4]	0.6(0.5)	[1,2,3]	#
PSQI global score	11.9(3.2)	[2,3,4]	10.1(3.4)	[1,4]	10.6(3.4)	[1,4]	6.4(3.7)	[1,2,3]	#
ESS score	4.6(3.3)		4.3(3.3)	[3]	5.5(4.0)	[2,4]	4.5(3.2)	[3]	#

The groups for assignment of the 1011 women are defined according to sleeping difficulty and medication use at survey 2. PSQI refers to Pittsburgh Sleep Quality Index; NHP, Nottingham Health Profile sleep subscale; ESS, Epworth Sleepiness Scale.

*χ^2 test

†*P*<.001 from a χ^2 test or Welch's analysis of variance to test the hypotheses that percentages/means were equal across the 4 groups

[#] Welch's analysis of variance data reported separately for each of the 4 samples so as to not distort the estimated means and proportions through oversampling. After adjustment for multiple comparisons using Bonferroni corrections, significant differences in means/proportions (*P*<.05) between each group obtained from pairwise comparisons are denoted in square brackets. For example, the proportion of those reporting self-reported difficulty in sleeping in group 1 differs significantly from groups 2 and 3.

Table 3—Percentage of 1011 Women Who Reported Experiencing Symptoms That May Be Related to Sleeping Difficulty at Least Once A Week

Symptom	Group 1 Sleeping badly sleeping medications (n=125)	Group 2 Not sleeping badly, sleeping medications (n=376)	Group 3 Sleeping badly, no sleeping medications (n=258)	Group 4 Not sleeping badly,no sleeping medications (n=252)	χ^2 Statistic (*df*=3)	P value*
Trouble sleeping because of:						
Pain	40.4 [2,4]	23.3 [2]	29.4 [4]	10.9 [1,2,3]	44.2	<.0001
Cannot breath comfortably	9.2	4.0 [3]	9.9 [2,4]	2.9 [3]	15.9	.001
Bad dreams	14.3 [2,4]	4.8 [1,3]	13.1 [2,4]	5.4 [1,3]	21.4	<.0001
Having to get up to use the bathroom	68.1	68.0	74.2 [4]	61.1 [3]	9.6	.02
Coughing/ snoring	12.6	8.5	13.1	6.3	8.3	.04
Too cold	3.4	2.8	4.8	2.5	2.4	.5
Too hot	10.1	4.8	7.9	5.0	6.0	.1
Other	5.0	2.0	2.8	2.9	3.1	.4

*P value from a χ^2 test to test the hypotheses that percentages were equal across the 4 groups.
Data reported separately for each of the 4 samples so as to not distort the estimated means and proportions through oversampling. After adjustment for multiple comparisons using Bonferroni corrections, significant differences in proportions (P<.05) between each group obtained from pairwise comparisons are denoted in square brackets.

Table 4—Percentage of 1011 Women Who Either Agreed or Strongly Agreed to the Attitudes Toward Sleep

Symptom	Group 1 Sleeping badly sleeping medications (n=125)	Group 2 Not sleeping badly, sleeping medications (n=376)	Group 3 Sleeping badly, no sleeping medications (n=258)	Group 4 Not sleeping badly,no sleeping medications (n=252)	χ^2 Statistic (*df*=6)	P value*
Need less sleep when older	49	49	53 [4]	41 [3]	15	.02
Harder to sleep when older	79 [2,4]	67 [1,4]	75 [4]	41 [1,2,3]	102	<.0001
Get all the sleep they need	35 [2,4]	52 [1,3,4]	39 [2,4]	76 [1,2,3]	105	<.0001
Too worried to sleep	29 [4]	22 [4]	20	12 [1,2]	24	.0004
Afraid to sleep	10 [2,3,4]	3 [1]	4 [1]	4 [1]	22	.002
After a night of not sleeping:						
Feel cranky	33	25	29	26	6	.4
Feel like a zombie	50 [4]	38	41	34 [1]	16	.02
Unable to get through the day	26	23	24	20	5	.5

Data reported separately for each of the 4 samples so as to not distort the estimated means and proportions through oversampling.
After adjustment for multiple comparisons using Bonferroni corrections, significant differences in proportions (*P*<.05) between each group obtained from pairwise comparisons are denoted in square brackets.

Association Between Sleeping Difficulty and Health-Related Quality of Life

Multiple regression modeling was undertaken as a stepwise procedure resulting in sets of nested models. In each set, the outcome variable was 1 of the 8 subscales or 1 of the 2 component summary scales of the SF-36, and the explanatory variable was 1 of the measures of sleeping difficulty (Survey 3 NHP sleep subscale, PSQI, ESS, or sleep-transition categories). However, since all sets of models yielded similar results, only the results for PSQI are reported (Table 6). In the simplest model, PSQI was negatively associated with Survey 3 SF-36 subscale scores after adjustment for Survey 1 SF-36 Physical Components Summary Score and Mental Health Components Summary Score, indicating that higher scores for sleeping difficulty are associated with lower quality of life. Except for the Physical Functioning and Social Functioning subscales and the Physical Components Summary Score, these associations remained significant after comorbid conditions, GDS, and life-events scores were added to the models and, in the final model, after adding the frequency of use of medications in the past month. The association between sleeping difficulty and Social Functioning was not significant once the model was adjusted for the number of diagnosed medical and mental health conditions, the GDS, and the number of life events reported at Survey 2 (Model 2). The association between sleeping difficulty and Physical Functioning was significant in Model 2 but was not significant in Model 3 after the addition of sleeping-medication use.

DISCUSSION

The ALSWH provided a prime opportunity to explore women's experience of sleeping difficulty and the relationship between sleep disturbance and quality of life. Participants in ALSWH are broadly representative of the Australian population, with overrepresentation of women in urban, rural, and remote areas. The use of stratified sampling for Survey 3 enabled statistically efficient collection of data on 4 separate selected groups of wom-

Table 5—Percentage of the Sample of 1011 Women Who Responded Affirmatively That They Employed Various Behaviors to Aid Sleep

Symptom	**Group 1 Sleeping badly sleeping medications (n=125)**	**Group 2 Not sleeping badly, sleeping medications (n=376)**	**Group 3 Sleeping badly, no sleeping medications (n=258)**	**Group 4 Not sleeping badly,no sleeping medications (n=252)**
Hot milk	30.6	31.7	29.7	17.4
Herbal Tea	13.5	5.8	12.2	3.9
Tea/ Coffee	12.6	4.6	12.2	6.5
Take a bath	19.8	14.1	14.2	7.8
Read	62.2	62.5	58.1	50.4
Listen to radio	46.9	36.9	44.7	33.0
Watch television	24.3	21.9	22.8	19.1
Alcohol	7.2	4.0	4.1	4.4
Other	5.4	5.5	4.9	5.7
Nothing	9.9	13.3	13.4	24.8

Data reported separately for each of the 4 samples so as to not distort the estimated proportions through oversampling.

Table 6—Multiple Linear Regression Models for Association Between Sleeping Difficulty (PSQI) and Differences in SF-36 Subscale Scores in Survey 3–Survey 1 in 1011 Women

Symptom	**Model with PSQI and baseline SF-36 scores***		**Model with PSQI†, baseline SF-36 scores and conditions, GDS, life events***		**Model with PSQI†, baseline SF-36 scores, symptoms, conditions, GDS life events, and use of sleeping medication the past month (Survey 3)***	
Differences in SF-36 sub-scale scores	β Coefficient (SE)	P value	β Coefficient (SE)	P value	β Coefficient (SE)	P value
Physical functioning	-0.75 (0.19)	<.0001	-0.45 (0.19)	.02	-0.38 (0.23)	.09
Physical role limitation	-1.62 (0.38)	<.0001	-0.81 (0.38)	.03	-1.01 (0.45)	.03
Bodily pain	-1.25 (0.21)	<.0001	-0.90 (0.22)	<.0001	-0.84 (0.26)	.001
General health perceptions	-0.86 (0.16)	<.0001	-0.47 (0.16)	.003	-0.57 (0.19)	.004
Vitality	-0.94 (0.60)	<.0001	-0.61 (0.15)	<.0001	-0.86 (0.18)	<.0001
Social functioning	-1.07 (0.22)	<.0001	-0.38 (0.21)	.07	-0.46 (0.25)	.06
Emotional role limitation	-2.35 (0.38)	<.0001	-1.35 (0.36)	.0002	-1.83 (0.43)	<.0001
General mental health	-0.88 (0.14)	<.0001	-0.57 (0.13)	<.001	-0.63 (0.15)	<.0001
Physical Health Summary Score (PCS)	-0.14 (0.08)	.07	-0.05 (0.08)	.51	-0.04 (0.09)	.7
Mental Health Summary Score (MCS)	-0.72 (0.9)	<.0001	-0.41 (0.07)	<.0001	-0.51 (0.09)	<.0001

*Also adjusted for Area of Residence, Smoking, Body Mass Index, Exercise, Age
†The Medications subscale was omitted from the global Pittsburgh Sleep Quality Index (PSQI) score to avoid colinearity in the analysis

en who varied according to whether they had reported difficulty sleeping and whether they used medications to assist sleep. These data allow comparisons of women across groups; however, they do not provide an overall prevalence of behaviors for women in the community in general, due to the oversampling of women with problems and those who use sleeping medications.

Another limitation is that there is a potential for misclassification of women according to sleeping-medication use if women were temporarily not taking medications at Survey 2. To avoid this potential for misclassification, the final regression models were adjusted for medication use at Survey 3 so that the impact of current medications could be taken into account.

Similarly, there is a potential for misclassification of women with sleeping difficulty. To avoid this problem, a variety of measures of sleep quality and sleep disturbance (such as the PSQI and ESS) were used. The variety of measurements allowed robust assessment of the relationship between sleep and the 4-year longitudinal change in health-related quality of life, as measured by the SF-36 Health Survey. In this paper, we have chosen to report models of the association between sleeping difficulty at Survey 3, as measured by PSQI, and change in quality of life because the PSQI was the most detailed measure of sleep obtained. However, models incorporating other measures of the predictor variable, including those that used sleep data from earlier surveys, produced similar results.

Regardless of the method and the timing of measurement of sleeping difficulty, a consistent result emerged: sleep disturbance was associated with a greater negative change in SF-36 scores (indicating a greater reduction in health-related quality of life). For some domains (role limitations due to physical health problems, bodily pain, general health perceptions, vitality, role limitations due to emotional problems, and general mental health), a statistically significant relationship remained after the effects of associated comorbidities, depression scores, life events, and use of sleeping medications had been adjusted for in the models. While no causal relationship can be inferred, the finding that sleep disturbance is associated with declining health-related quality of life is of importance. This finding is not consistent with the widespread acceptance that sleep disturbance is normal for older people, due to age related physiologic changes in cardiac rhythms and sleep architecture, and has no pathologic significance.[9,10]

It has been suggested that the mechanism for sleep disturbance among older people may be triggered by social and physical situations against a background of physiologic change.[24] In this study, many women with difficulty sleeping attributed their sleeping problems to some event in their lives or to illness, and women commonly reported that they could not sleep because of pain or breathing difficulty. In other studies, symptoms such as pain and dyspnea have been found to interfere with sleep onset and sleep maintenance, and medications such as diuretics and bronchodilators have been shown to trigger insomnia.[9] Medications can also cause bad dreams, a relatively frequent complaint among the women who reported sleeping difficulty in this study.

In the nested models, it was evident that some of the poor health-related quality of life associated with sleeping difficulty can be explained by underlying medical conditions, depression, life events, and use of sleeping medications. This effect was particularly true for the association between sleeping difficulty and social function, and between sleeping difficulty and physical functioning (and the Physical Components Score of the SF-36), and suggests that these underlying factors may be associated with both sleeping difficulty and these quality of life domains. However, for the other domains of SF-36, a statistically significant association remained after the addition of these factors to the model, suggesting that sleeping difficulty may have an effect on these health aspects that is beyond the effect of underlying medical conditions, depression, life events, and sleeping medications.

Sleeping difficulty is common among women in the population1-5 and can have direct or indirect impact on quality of life. Serious consideration of appropriate actions that women can take to assist their sleep is therefore warranted. In this study, a majority of women with sleeping problems had sought help from some source, most often their doctor, and the use of medications was a common response by many women and their doctors.

Overall, there was a trend toward increasing use of sleeping medications over the study period. Even among women classified as not using medications at Survey 2, some women had used sleeping medications at Survey 1, and a greater proportion reported using medications at Survey 3. The consumption of sedatives and hypnotics among women in this age group has been an issue of concern due to the risks of adverse consequences such as drowsiness, confusion, ataxia, dizziness, impaired motor coordination, and increased risk of falls.[25-29] However, newer medications with shorter half-lives may have fewer negative outcomes. Other sleep-aiding strategies commonly tried by women included drinking hot milk and herbal teas. Some women were using drinks such as tea and coffee that contain caffeine to assist their sleep, so these women may benefit from better advice on how to enhance sleep. Also, given the high proportions of women in the groups with sleeping difficulty who listen to the radio, this medium could be explored as a way to deliver health-promotion messages about sleep enhancement.

CONCLUSION

While many older women believe that less sleep is normal with increasing age, they also believe that lack of sleep is a problem. This attitude is reflected in a high probability of seeking help and medication use among those with sleeping difficulty. Moreover, longitudinal data analysis indicated a negative association between sleeping difficulty and change in quality of life. These results underscore the importance of strategies to assist women to find safe methods to deal with sleeping difficulty and to recognize sleeping difficulty as a valid symptom, not just a normal part of aging.

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Living with urinary incontinence: a longitudinal study of older women

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Abstract

Background: urinary incontinence carries major social burden and considerable costs for health care systems.
Objective: the aim of this study was to investigate changes in continence status among a large cohort of older women, and to identify factors associated with incidence of incontinence in later life.
Subjects: participants of the Australian Longitudinal Study of Women's Health (ALSWH), aged 70–75 years in 1996 and who have completed four health surveys over the past 10 years.
Methods: continence status across four survey periods, spanning 9 years, were defined according to women's reports of 'leaking urine' at each survey. Generalised estimating equation (GEE) models were used in longitudinal analyses of the factors associated with changing continence status over time.
Results: this study presents longitudinal data on the prevalence and incidence of incontinence from a large cohort of older women, over 9 years of follow-up. Over this time, 14.6% (95% CI 13.9–15.3) of the women in the study who had previously reported leaking urine 'rarely' or 'never' developed incontinence, and 27.2% (95% CI 26.2%, 28.3%) of women participating in Survey 4 (S4) in 2005 reported leaking urine 'sometimes' or 'often' at that survey, with women being twice as likely to report incontinence at S4 as they were 6 years earlier. Longitudinal models demonstrated the association between incontinence and dementia ($P < 0.001$; OR = 2.34; 95% CI 1.64, 3.34), dissatisfaction with physical ability ($P < 0.001$; OR = 1.70; 95% CI 1.52, 1.89), falls to the ground ($P < 0.001$; OR = 1.23; 95% CI 1.13, 1.33), BMI ($P < 0.001$; OR = 2.18; 95% CI 1.70, 2.80 for obese), constipation ($P < 0.001$; OR 1.46; 95% CI 1.34–1.58), urinary tract infection ($P < 0.001$; OR 2.07; 95% CI 1.89–2.28), history of prolapse ($P \leq 0.001$; OR = 1.53; 95% CI 1.35, 1.74) and prolapse repair ($P = 0.002$; OR = 1.23; 95% CI 1.08, 1.40). Stroke ($P = 0.01$), parity ($P = 0.017$) and hysterectomy ($P = 0.026$) and number of visits to the general practitioner ($P = 0.040$) were less strongly associated with incontinence in the final longitudinal model. Incontinence was not significantly associated with area of residence ($P = 0.344$), education ($P = 0.768$), smoking ($P = 0.055$), diabetes ($P = 0.072$), attending support groups ($P = 0.464$) or attending social groups ($P = 0.022$).
Conclusion: strong associations between BMI, dysuria and constipation indicate key opportunities to prevent incontinence among older women.

Keywords: *incontinence, urinary, longitudinal, women quality of life, elderly*

Introduction

Urinary incontinence is a common problem in our community, and it is estimated that almost two million community-dwelling women in Australia have problems with urinary incontinence [1]. Incontinence is common among older people, and among women [2, 3], and is a major factor leading to placement in nursing homes [4]. This is not surprising in view of the fact that urinary incontinence is an integral part of many disease complexes common in elderly women and the fact that ageing changes within the lower urinary tract make a significant contribution to continence status [5, 6].

In the 1996 baseline surveys of the Australian Longitudinal Study of Women's Health (ALSWH), 36% of mid-age women (45–50) and 35% of older women (70–75) reported leaking urine 'rarely', 'sometimes' or 'often' [7]. More in-depth surveys of these women have identified cross-sectional associations between incontinence severity and body mass index (BMI), other urinary symptoms, smoking, hormone replacement therapy and hysterectomy [8]. These surveys also showed that many women who had incontinence were employing methods to prevent incontinence that may have other detrimental health outcomes. For example, many women reduced their fluid intake [8] and many avoided physical activity [9] in an attempt to reduce their symptoms.

While these findings emphasise the importance of the problem of incontinence, because they are cross-sectional in nature, they provide little detail on the incidence, natural history, risks and adverse health outcomes associated with the problem of incontinence. This current study considers data collected repeatedly over 10 years from the ALSWH. These data provide an opportunity to explore longitudinal changes among women with incontinence and to explore those factors that place women at greatest risk of developing incontinence.

Methods

Women in this study were from the oldest cohort of the ALSWH. The women were aged 70–75 years at baseline (Survey 1) in April 1996 and were randomly sampled from the Australian universal health insurance (Medicare Australia) database. Women from rural and remote locations were deliberately oversampled. These older women have completed four surveys at 3-year intervals (1996, 1999, 2002 and 2005). More details of the study have been published elsewhere [10–12] and are available from www.alswh.org.au. Women provided written informed consent at the time of survey completion for their data to be linked to earlier surveys. This project was cleared by the University of Newcastle Human Research Ethics Committee.

At each of the four surveys (S1–S4), women were asked to report whether they experience leaking urine either ‘never’, ‘rarely’, ‘sometimes’ or ‘often’ in the last 12 months. They were also asked similar questions about other symptoms including urine that burns or stings, constipation and prolapse of vagina, bladder or bowel. Comorbid conditions were measured at S1–S4 as self-reported doctor diagnoses including diabetes, heart disease, hypertension, stroke, thrombosis, low iron level, osteoporosis, cancer, depression, anxiety and Alzheimer’s/dementia. Past gynaecological procedures including hysterectomy, oophorectomy and prolapse repair were assessed at each survey. BMI was calculated from self-reported weight and height. Other variables used to measure health and social circumstances included area of residence (urban, rural or remote and classified according to postal code), education (dichotomised as primary education only; secondary and higher), marital status, parity (categorised as none, once, twice and three times or more), provision of care for children and/or for others with disability (yes, no), need for help with daily tasks (yes, no) and the number of visits to a general practitioner in the past 12 months (dichotomised as less than 5, and 5 or more). Full questions are available at www.alswh.org.au

Deaths were ascertained annually from the National Death Index with matching on name, address and date of birth information [14]. All phone calls and correspondence notifying of death or withdrawal from the study were also logged by the study office and compared with the National Death Index notifications to ensure completeness of follow-up for mortality.

Statistical analyses

Data analysis was performed using SAS V9.1 [15]. Generalised estimating equations (GEE) [16] were used to identify the longitudinal association between incontinence and other covariates and across time. In these analyses, the dependent variable was the report of leaking urine at each survey (sometimes/often vs. rarely/never), and explanatory variables were health and social factors as measured at each survey. Since a large number of factors of interest were not measured at S1, only data for S2, S3 and S4 were included in the models reported. However, separate analyses that included S1 data for those variables measured at S1 were also undertaken. Explanatory variables were selected after bivariate analyses of each factor of interest at each time point, and by selecting those with a P-value of 0.05 or less. The P-value was set to 0.005 for determining significance in the final model (this P-value was chosen due to the influences of the large sample size and power on statistical significance) [17].

Where explanatory variables were highly correlated with each other, the item with the strongest association with incontinence was selected for multivariate analysis. Data for women who died or withdrew were included in the GEE models up to the point of censorship. An unstructured correlation structure was used to adjust for the correlation between repeated measurements.

Results

In 1996, 12,432 women aged 70–75 years completed S1 and 7,158 of these women completed S4 in 2005 (58% of original cohort); however, 257 of these 7,158 women could not be classified according to their continence status. Between S1 and S4, 1,864 women died, and a further 3,410 women withdrew from the study.

Figure 1 shows women’s reports of leaking urine ‘sometimes’ or ‘often’ in the past 12 months at each survey (S1–S4). At S1, 20.7% (95% CI 20.1%, 21.5%) of women reported that they had experienced leaking urine ‘sometimes’ (14.3%; 95% CI 13.8%, 15.0%) or ‘often’ (6.4%; 95% CI 6.0%, 6.8%). The overall prevalence of leaking urine for the 9,488 surviving women who responded to S2 was 14.2% (95% CI 13.5–14.9%), and the proportions reporting this problem among surviving respondents at S3 and S4 was 19.1% (95% CI 18.3%, 20.01%) and 27.2% (95% CI 26.2%, 28.3%), respectively. However, of the 2,578 women who reported leaking urine at S1, only 34% continued to report this problem

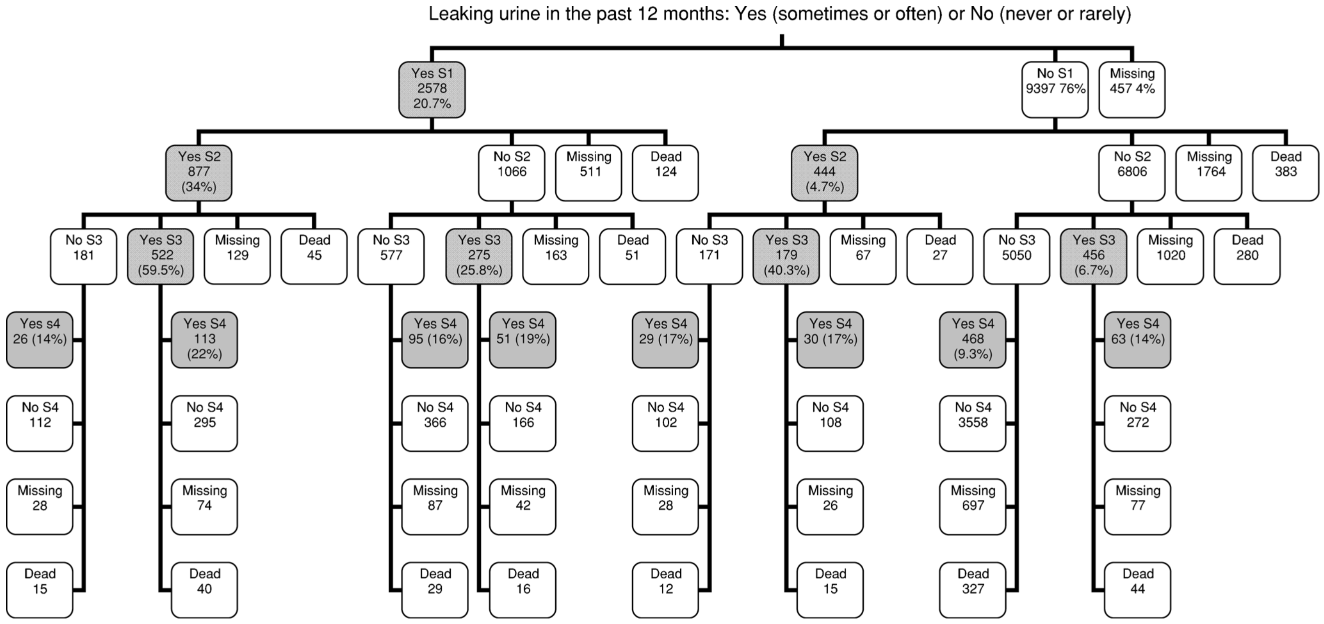

Figure 1. Reports of leaking urine 'sometimes' or 'often' in the past 12 months; $N = 12{,}432$.

at S2 and only 113 women consistently reported leaking urine on every survey (S1–S4).

The proportion reporting a new (incident) case of incontinence (leaking urine 'sometimes' or 'often' in the past 12 months among women who had reported leaking urine 'never' or 'rarely' on all previous surveys) was 4.7% (95% CI 4.3–5.1) at S2, 6.7% (95% CI 6.1–7.3) at S3 and 9.3% (95% CI 8.48–10.1) at S4 (see Figure 1). In total, 14.6% (95% CI 13.9–15.3) of the 9,397 women who reported leaking urine 'never' or 'rarely' at S1 subsequently reported leaking urine 'sometimes' or 'often' at S2, S3 or S4.

The results of the GEE model (odds ratios and 95% CI) are shown in Table 1. In this multivariable model, women were almost twice as likely to report incontinence at S4 as they were at S2 ($P < 0.001$; OR 1.94; 95% CI 1.79–2.09). In the final model, incontinence was strongly associated with physical conditions such as dementia ($P < 0.001$; OR = 2.34; 95% CI 1.64, 3.34), physical ability ($P < 0.001$; OR = 1.70; 95% CI 1.52, 1.89 for dissatisfied), falls to the ground ($P < 0.001$; OR = 1.23; 95% CI 1.13, 1.33), BMI ($P < 0.001$; OR = 2.18; 95% CI 1.70, 2.80 for obese), constipation ($P < 0.001$; OR 1.46; 95% CI 1.34–1.58), urinary tract infection (UTI, $P < 0.001$; OR 2.07; 95% CI 1.89–2.28), history of prolapsed bladder or bowel ($P \leq 0.001$; OR = 1.53; 95% CI 1.35, 1.74) and prolapse repair ($P = 0.002$; OR = 1.23; 95% CI 1.08, 1.40). Stroke ($P = 0.01$), parity ($P = 0.017$) and hysterectomy ($P = 0.026$) and number of visits to the general practitioner ($P = 0.040$) were less strongly associated with incontinence in the final longitudinal model. Incontinence was not significantly associated with area of residence ($P = 0.344$), education ($P = 0.768$), smoking ($P = 0.055$), diabetes ($P = 0.072$), attending support groups ($P = 0.464$) or attending social groups ($P = 0.022$). The alternative GEE model including S1 data provided similar results for those predictor variables that were measured at S1 (data not shown).

Discussion

This study presents longitudinal data on the prevalence and incidence of incontinence from a large cohort of older women, over 9 years of follow-up. Around 27% of women participating in S4 reported leaking urine 'sometimes' or 'often' at that survey, with women being twice as likely to report incontinence at this survey as they were 6 years earlier. However, while the prevalence of incontinence tended to increase as women aged, the reporting of leaking urine was not consistent for all surveys with some women who reported leaking urine on one survey reporting that this was 'rarely' or 'never' a problem on the next survey. This was particularly true for women who reported leaking urine at S1. These longitudinal changes could reflect inconsistencies in reporting, or true variation in the continence status over time.

Few previous studies have investigated changes in reports of incontinence over time. The MRC incontinence study reported an annual incidence rate of 6.3% among men and women aged 40 years and over [18]. A Viennese study involving a wider age range (ages 20–84 years) reported a mean annual incidence of urinary incontinence of 3.9% over 6.5 years of follow-up, with the highest rate (7.3%) reported among those aged 70 years or older. The study also reported a remission rate of 2.9% per year, with no clear age dependence [19]. Similarly, a Swedish study of women aged 65 years and below reported a baseline prevalence of urinary incontinence of 23.6%, a mean annual incidence rate of 2.9% and an annual remission rate of 5.9% [20]. A Danish longitudinal

Table 1. Factors associated with leaking urine (final longitudinal model)^{a}

Explanatory variable (reference)		Odds ratio	95% CI		*P*-value
Time	2002 (1999)	1.26	1.17	1.35	
	2005 (1999)	1.94	1.79	2.09	<0.001
Area of residence	Rural/remote (urban)	1.05	0.95	1.15	0.344
Diabetes	Yes (no)	1.13	0.99	1.28	0.073
Dementia	Yes (no)	2.34	1.64	3.34	<0.001
Stroke	Yes (no)	1.29	1.07	1.55	0.013
Fall to the ground	Yes (no)	1.23	1.13	1.33	<0.001
Number of visits to a general practitioner in the past 12 months	Five times or more	1.15	1.01	1.31	
Three or four times or more (none, one or two)		1.05	0.92	1.21	0.040
BMI category	Obese	2.18	1.70	2.80	
	Overweight	1.62	1.27	2.05	
	Underweight (acceptable weight)	1.39	1.10	1.75	<0.001
Satisfaction with physical ability	Dissatisfied to some degree	1.70	1.52	1.89	
	Somewhat satisfied (completely/ very satisfied)	1.39	1.26	1.53	<0.001
Urine that burns or stings	Yes (no)	2.06	1.86	2.28	<0.001
Constipation	Yes (no)	1.46	1.34	1.58	<0.001
Parity	Three or more births	1.09	0.91	1.31	
	Twice (none)	0.98	0.80	1.19	
	Once (none)	0.83	0.65	1.06	0.017
Prolapse	Yes (no)	1.53	1.35	1.74	<0.001
Prolapse repair	Yes (no)	1.23	1.08	1.40	<0.002
Hysterectomy	Yes (no)	1.12	1.01	1.24	0.027

BMI = body mass index.

[a] Only data for S2, S3 and S4 were included in the models since a large number of factors of interest were not measured at S1.

study reported an incontinence prevalence of 28.5%, and a remission rate of 27.8% within 1 year of follow-up [21]. The authors of these studies conclude that urinary incontinence is not necessarily progressive and can be dynamic.

GEE models indicate strong longitudinal associations between incontinence and physical conditions such as dementia, physical ability, falls to the ground, constipation, UTI, history of prolapsed bladder or bowel and prolapse repair ($P = 0.002$; OR = 1.23; 95% CI 1.08, 1.40). Falls to the ground may be a consequence of incontinence (due to rushing to reach the toilet in time) but are likely to also be related to a common underlying cause such as general weakness, conditions such as stroke, dementia, arthritis and Parkinson's disease or other aspects of frailty. Other studies have also noted a relationship between the onset of incontinence and falls and between incontinence and chronic conditions and functional impairment, and suggest that understanding the relationship between functional impairment and urinary incontinence is important for the prevention, treatment and management of urine loss [22, 23].

Strong associations between BMI, dysuria and constipation have also been found in other studies [24] strengthening the fact that they might indicate key opportunities to prevent incontinence. Dysuria is a non-specific symptom that may indicate UTI. An intensive study of the association between microbiologically confirmed UTI and urinary incontinence found that, after adjustment for the acute period, incontinence was higher among women who experienced UTIs compared with those who did not [25].

Unlike the findings from cross-sectional studies involving younger women, parity was not strongly associated with the development of incontinence among older women in this study. At these older ages, other gynaecological factors, including gynaecological surgery, appear to be stronger predictors of later continence problems.

A major strength of this study was the use of a large, national sample of community-dwelling, relatively healthy women. Previous studies of continence have tended to be in defined populations [26], involving younger cohorts of women and conducted over shorter periods of time [18–21, 27, 28].

Using a cohort of older women allowed us to focus on a population which is growing in size as the population as a whole ages. A further strength is the use of longitudinal data which has allowed us to determine new cases of incontinence (incident cases) and to identify temporal relationships between incontinence and associated disability.

A major limitation of this study is the use of a single item to report leaking urine. It is also a problem that, although S1 respondents were fairly representative of Australian women, those who continued in the study were healthier and of higher socioeconomic status than the general population and than respondents who dropped out [29], suggesting that our prevalence and incidence estimates may be low.

Key points

- Urinary incontinence in women is common.
- The prevalence of urinary incontinence increases with age.
- Urinary incontinence is a dynamic condition.
- Urinary incontinence is associated with increased BMI, so it might be modifiable.
- Continence promotion should be considered within falls prevention interventions.

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Conflicts of interest

No author declares a conflict of interest with this research.

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ORIGINAL ARTICLE

Height loss in elderly women is preceded by osteoporosis and is associated with digestive problems and urinary incontinence

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Abstract

Summary This study explores risk factors for height loss and consequences in terms of health and wellbeing, in older women. Osteoporosis, low body-mass index, being born in Europe and using medications for both sleep and anxiety were risk factors for height loss. Height loss was associated with digestive problems; excessive height loss was also associated with urinary stress-incontinence and a decline in self-rated health.

Introduction Height loss is associated with osteoporosis, but little is known about its consequences. We aimed to examine the risk factors for height loss and the symptoms associated with height loss.

Methods Elderly participants of the Australian Longitudinal Study on Women's Health (aged 70–75 in 1996) who provided data on height at any two consecutive surveys (held in 1996, 1999, 2002, and 2005) were included (N=9,852). A regression model was fitted with height loss as the outcome and sociodemographics, osteoporosis, and other risk factors as explanatory variables. Symptoms related to postural changes or raised intra-abdominal pressure were analyzed using height loss as an explanatory variable.

Results Over 9 years, average height loss per year was −0.12% (95% confidence intervals [95% CI]=−0.13 to −0.12) of height at baseline. Height loss was greater among those with osteoporosis and low body mass index and those taking medications for sleep and anxiety. After adjusting for confounders, symptoms associated with height loss of ≥2% were heartburn/indigestion (odds ratio [OR]=1.19, 95% CI=1.01 to 1.40), constipation (OR=1.18, 95% CI=1.01 to 1.37), and urinary stress incontinence (OR=1.20, 95% CI=1.02 to 1.41).

Conclusion These findings highlight the importance of monitoring height among the elderly in general practice and targeting associated symptoms.

Keywords Abdominal pressure · Aging · Gastroesophageal reflux disease · Height loss · Osteoporosis · Stature

Introduction

Height generally declines in old age. Height loss with aging is largely due to osteoporosis-induced vertebral changes [1]. Vertebral deformities or fractures are associated with a decrease in height: repeated height measurements can even be used to detect vertebral deformities [2]. Common vertebral deformities are compression, wedging, and concavity [3]. These deformations are likely to occur even without trauma due to postural stresses alone [4]. Factors associated with height loss are similar to factors associated with osteoporosis: both high body weight and estrogen treatment are protective against height loss [5].

In the present study, we first addressed risk factors for excessive height loss, hypothesizing that not only osteoporosis and low body mass index (BMI) but also falls are related to subsequent height loss. Falls increase the risk of vertebral fractures. Because falls could not be assessed

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directly, risk factors for falls such as reports of frequent dizziness or loss of balance, high levels of alcohol intake, and use of anxiety and sleeping medications were included as risk factors. We then addressed general health status and symptoms associated with excessive height loss. Kyphosis due to wedging of osteoporotic vertebrae contributes to loss of height. Kyphosis and subsequent raised intra-abdominal pressure could well explain the relation between hiatus hernia and vertebral fractures reported in Japanese women [6]. We, therefore, hypothesized that height loss is associated with symptoms related to raised intra-abdominal pressure, such as heartburn/indigestion, urinary stress incontinence, and hemorrhoids. We also hypothesized that height loss is associated with constipation because postural changes related to osteoporosis of the spine may lead to increased pelvic floor muscle tone. Knowledge of symptoms associated with height loss can provide an incentive for general practitioners to regularly measure height in elderly patients. For patients with excessive height loss, targeted lifestyle advice and treatment of even mild symptoms associated with height loss may help to improve quality of life.

This study is limited to women: osteoporosis is more common in women, and older women lose height more rapidly than older men [7]. We analyzed survey data of elderly women participating in the Australian Longitudinal Study on Women's Health (ALSWH) [8] over 9 years. To our knowledge, this is the first epidemiological study aiming to identify risk factors for excessive height loss in women and to determine symptoms and general health status associated with height loss.

Materials and methods

Participants

The ALSWH is a prospective study of factors affecting the health and well-being of three cohorts of women aged 18 to 23 years (“younger” cohort), 45 to 50 years (“middle-aged” cohort), and 70 to 75 years (“older” cohort) at the time of survey 1 in 1996. The focus of this paper is the cohort of older women. Subsequent surveys were carried out in 1999 (survey 2, when the women were aged 73 to 78 years), 2002 (survey 3, when the women were aged 76 to 81 years), and 2005 (survey 4, when the women were aged 79 to 84 years). The study sample was selected randomly from the Medicare Australia database (which covers all citizens and permanent residents of Australia, including refugees and immigrants). Details of the recruitment methods and response rates have been described elsewhere [8] and further details of the study can be found at http://www.alswh.org.au.

Measures

Data were collected by mailed questionnaires every 3 years.

Height loss

At every survey, women were asked to report their height.

Potential risk factors for height loss

Potential risk factors for height loss were osteoporosis, BMI, and risk factors for falls (dizziness or loss of balance, alcohol intake, and anxiety or sleep medication); socio-demographics (education level, area of residence, and country of birth) were also included in the model. Education level, based on the highest qualification achieved, was categorized as: “no formal qualification,” “school certificate” (school or higher school certificate), “trade” (trade, certificate, or diploma), and “university” (completed a university degree). Area of residence (urban or rural/remote) was derived from residential postcode. Country of birth was classified as “Australia,” “other English-speaking country,” “Europe,” or “other.” Self-reported weights and heights at each survey were used to derive BMI (weight in kilograms divided by the square of height in meters). BMI in kilograms per square meter was categorized as underweight (less that 18.5), healthy weight (18.5 to 25), overweight (25 to 30), or obese (30 or more). At each survey, women were asked whether they had been told by a doctor that they had osteoporosis. Women were also asked at each survey if they experienced dizziness or loss of balance “never,” “rarely,” “sometimes,” or “often” in the preceding 12 months. Based on responses to questions about frequency and quantity of alcohol intake [9], women were grouped as “nondrinker,” “low-risk drinker/rarely drinks,” or “risky/high-risk drinker.” At each survey, women were also asked if during the past 4 weeks they had used medication to help them sleep or medication for anxiety.

Symptoms potentially associated with height loss

We investigated the association between height loss and overall self-rated health and a range of symptoms: heartburn/indigestion, constipation, urinary stress incontinence, hemorrhoids, and back pain. At each survey, women were asked whether they experienced heartburn/indigestion, constipation, stress incontinence (urinary), hemorrhoids, and back pain “never,” “rarely,” “sometimes,” or “often.” They were also asked to rate their health, with possible responses of “excellent,” “very good,” “good,” “fair,” or “poor.” This will be referred to as self-rated health. Women were also asked if they had been told by a doctor that they had arthritis (osteoarthritis or rheumatoid arthritis) and if they were limited in walking 100 m (“limited a lot,” “limited a little,” or “not at all limited”). Changes in this variable between consecutive surveys were categorized as “more limited,” “less limited,” or “same.” Parity was derived from a question in survey 1: “how many times have you given birth to a live child?”

Models for each of the symptoms were adjusted for possible confounders. The self-rated health model was adjusted for age, BMI, and self-reported symptoms of heartburn, constipation, and urinary incontinence, which could all contribute to a decline in the subjective rating of health. The heartburn/indigestion model was adjusted for country of birth (as an indicator of potential differences in diet and rates of *Helicobacter pylori* infection); BMI because obesity increases the risk of gastroesophageal reflux symptoms [10]; and smoking and alcohol because both are risk factors for gastroesophageal reflux disease [11, 12]. The constipation model was adjusted for limitations in walking 100 m, as limited mobility increases the risk of constipation. The hemorrhoids model was adjusted for BMI and constipation because elevated intra-abdominal pressure (such as in straining) can contribute to the development of hemorrhoids [13]. The stress incontinence model was adjusted for BMI (obesity is associated with raised intra-abdominal pressure and possibly with overactive bladder) and parity [14]. The back pain model was adjusted for BMI, as obesity can lead to back pain in absence of height loss, and arthritis, which can also cause back pain.

Statistical analysis

All analyses were conducted using SAS software, version 9.

Longitudinal analysis of height loss

To characterize the extent of height loss over the 9-year period from surveys 1 to 4, the data were analyzed longitudinally using a mixed model with height as the outcome variable with random intercept and slope using MIXED procedure in SAS. Age (in whole years) was used as a categorical covariate.

Risk factors for height loss

To examine the risk factors for height change, the data were analyzed longitudinally using a mixed model with percentage height change between consecutive surveys as continuous outcome variable using MIXED procedure in SAS. Using potential risk factors determined at the survey preceding height change, a multivariable model was fitted. Means and 95% confidence intervals (95% CI) for percentage height change associated with each factor were estimated at mean levels of other variables using the observed margins least squares means option in the SAS MIXED procedure.

Symptoms associated with height loss

To examine the association between increase in symptom frequency and height loss, data were analyzed longitudinally using generalized linear models with repeated measures (GENMOD procedure in SAS with a logit link function). The repeated measures referred to the intervals between surveys 1 and 2, surveys 2 and 3, and surveys 3 and 4. The outcomes were increases in symptom frequency between consecutive surveys, compared to symptoms remaining the same or decreasing. A similar analysis was conducted for self-rated health with the outcome of a decline in health compared to health remaining the same or improving. The main explanatory variable was height loss between the same consecutive surveys. Separate models were fitted for each symptom.

Bisphosphonate use and heartburn/indigestion

Bisphosphonates are commonly used to treat osteoporosis, and oral bisphosphonates are associated with gastrointestinal disturbances. Therefore, an extra logistic regression model was used to test the association between heartburn/indigestion symptoms and height loss, adjusting for bisphosphonate use. Current use of medications was asked only at survey 4. Reported medications were classified according to the Anatomical Therapeutic Chemical code. Women taking bisphosphonates (M05BA) were identified. Those who reported experiencing heartburn/indigestion “often” at survey 1 were excluded. The outcome of the model was heartburn/indigestion symptoms reported “often” at survey 4. The main explanatory variable was percentage height loss between surveys 1 and 4 (a 9-year interval).

Results

In 1996, there were 12,432 women in the older cohort who responded to survey 1. Of these women, 6,721 (54%) participated in all four surveys, 2,055 (17%) participated in any three surveys, 1,966 (16%) participated in any two surveys, and 1,690 (14%) participated in the first survey only. Those who provided data on height at any two consecutive surveys were included (N=9,852). Attrition due to death, frailty, withdrawal from the study, or nonparticipation for other reasons is summarized in Table 1.

The average height was 161.4 cm (standard deviation [SD]=6.7) at survey 1 (ages 70 to 75 years), 160.7 cm (SD=6.6) at survey 2 (ages 73 to 78 years), 160.2 cm

Table 1 Attrition in the older cohort between 1996 and 2005: numbers and percentages of women at each survey

Survey (year)	Respondent, *n* (%)	Nonrespondent, *n* (%)			
		Frail	Withdrawn	Deceased	Did not do survey/no contact
1 (1996)	12,432 (100)				
2 (1999)	10,434 (84)	106 (1)	573 (5)	529 (4)	790 (6)
3 (2002)	8,647 (70)	370 (3)	1,162 (9)	1,098 (9)	1,155 (9)
4 (2005)	7,158 (58)	750 (6)	1,552 (12)	1,867 (15)	1,105 (9)

(SD=6.6) at survey 3 (ages 76 to 81 years) in 2002, and 159.6 cm (SD=6.7) at survey 4 (ages 79 to 84 years). Figure 1 shows height loss with increasing age. Height decreased almost linearly over time; therefore, a simpler model assuming linearity was used to determine mean height loss (−0.12%, 95% CI=−0.13 to −0.12 per year). For a woman of average height, this is equivalent to a height loss of 0.19 cm/year.

Results from modeling of potential risk factors for height loss are shown in Fig. 2; the model was adjusted for all potential risk factors. The percentages of women in the various categories at survey 1 are also given in this figure. Height loss was greater among women born in Europe (vs. Australian born); among underweight women (vs. healthy weight range); those with osteoporosis; and those taking medications for both sleep and anxiety compared to those taking neither. Height loss was less in overweight or obese women compared to those in the healthy weight range. Dizziness or loss of balance, alcohol intake, level of education, and area of residence were not statistically significantly associated with subsequent height change.

Table 2 shows symptoms related to height loss. Height loss over 3 years was categorized as ≥2% (experienced by 435, 331, and 437 women between surveys 1 and 2, surveys 2 and 3, and surveys 3 and 4, respectively), 0.5% to <2% (experienced by 3,001, 2,415, and 1,937 women between surveys 1 and 2, surveys 2 and 3, and surveys 3 and 4, respectively), or <0.5% (experienced by 6,383, 5,705, and 4,499 women between surveys 1 and 2, surveys 2 and 3, and surveys 3 and 4, respectively). A decline in self-rated health was reported by 26%, 23%, and 33% of women between surveys 1 and 2, surveys 2 and 3, and surveys 3 and 4, respectively. Increased heartburn/indigestion was reported by 10%, 18%, and 30%; increased constipation was reported by 9%, 23%, and 34%; increased urinary stress incontinence was reported by 8%, 18%, and 29%; increased hemorrhoids was reported by 5%, 10%, and 18%; and increased back pain was reported by 14%, 32%, and 35% of women between surveys 1 and 2, surveys 2 and 3, and surveys 3 and 4, respectively.

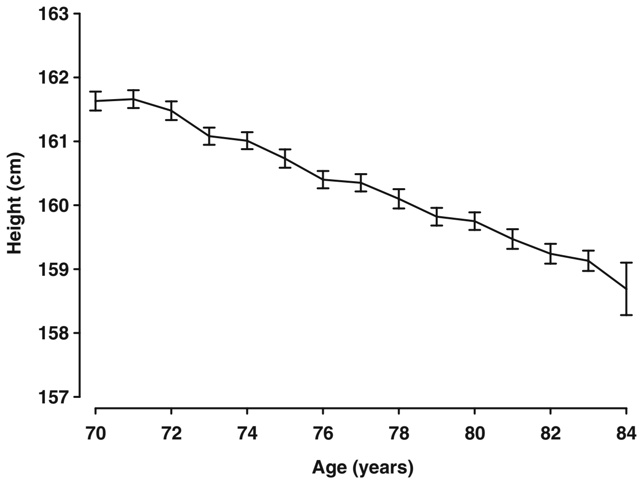

Fig. 1 Self-reported height in relation to age over 9 years for women aged 70–75 in 1996. Results of the longitudinal analysis of height using a mixed model with random intercept and slope: mean and 95% CI

Height loss of ≥2% per 3 years was associated with a decline in self-rated health in the univariate as well as the fully adjusted model. Height loss was associated with heartburn/indigestion and constipation in the univariate and in the fully adjusted analyses. Height loss of ≥2% over 3 years was associated with urinary stress incontinence in the fully adjusted model. The association between height loss of ≥2% over 3 years and hemorrhoids was statistically significant in the univariate analysis but no longer significant in the fully adjusted model. Height loss was not associated with back pain (Table 2).

An additional model adjusting for bisphosphonate use showed that height loss >2% vs. ≤2% over 9 years was associated with experiencing subsequent heartburn/indigestion "often" vs. "never/rarely/sometimes" at survey 4 (OR=1.35, 95% CI=1.01 to 1.80), adjusting for concurrent bisphosphonate use (OR=0.92, 95% CI=0.63 to 1.35), country of birth, BMI, smoking, and alcohol intake.

Discussion

Osteoporosis, low BMI, being born in Europe, and using medications for both sleep and anxiety were risk factors for height loss in elderly women living in Australia. Symptoms associated with height loss were heartburn/indigestion and

Fig. 2 Results of multivariable model of percentage height change between four consecutive surveys (at 3-year intervals): least square means and 95% CI for potential predictors (at the survey preceding height loss). The percentage of women in the various categories at survey 1 is shown in *brackets*

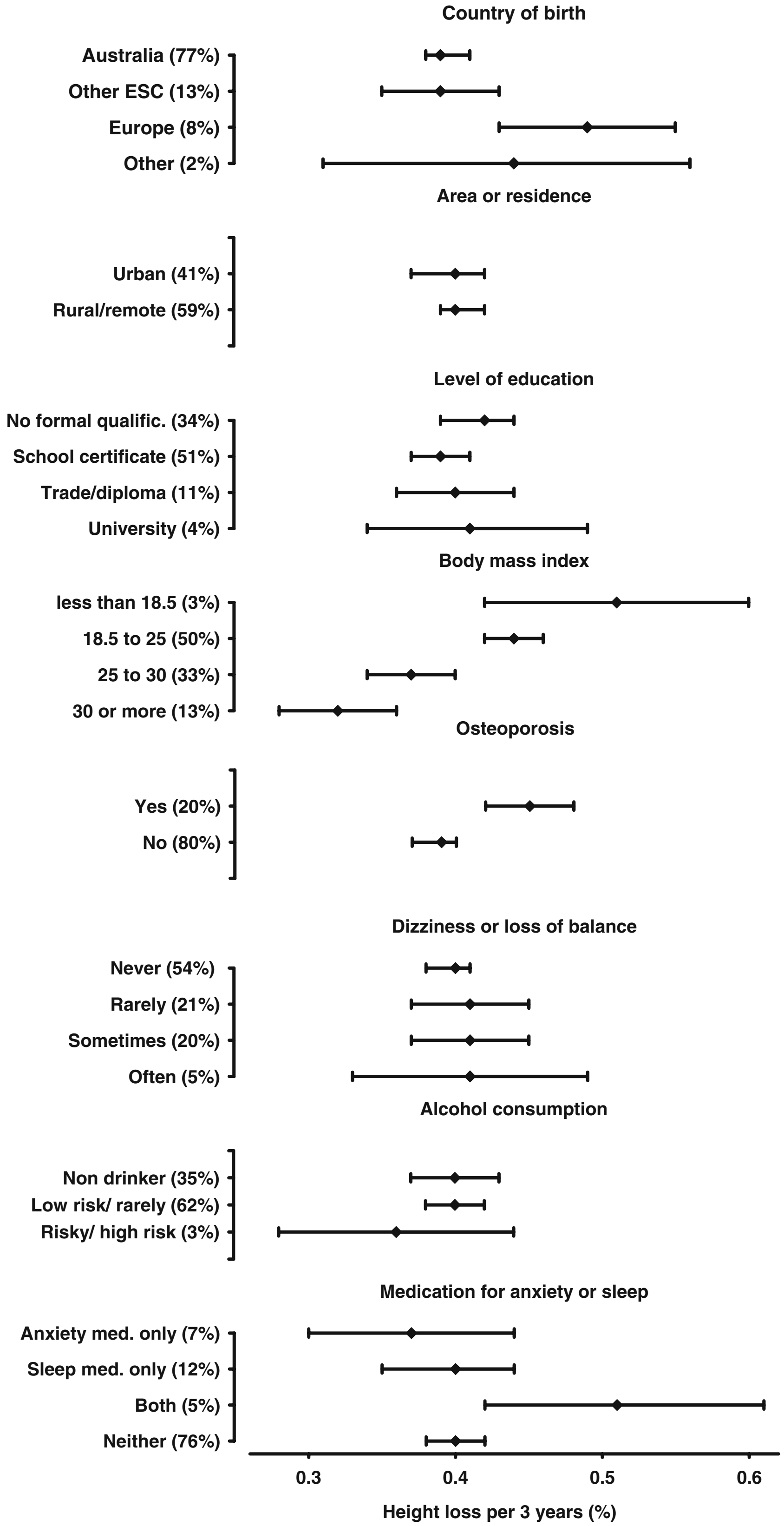

Table 2 Decline in overall self-rated health or increase in frequency of self-reported symptoms associated with change in height over the same time period. At each survey, women were asked to rate their health as "excellent," "very good," "good," "fair," or "poor"; for the "self-rated health" model, a decline in health was compared to health remaining the same or improving. OR and 95% CI of separate logistic regression models with repeated measurements for three periods between surveys

	Crude		Fully adjusted	
		95% CI		95% CI
Self-rated health[a]				
Height loss (ref. = <0.5%)	1		1	
0.5 to <2%	1.02	0.96 to 1.09	1.00	0.93 to 1.07
≥2%	1.14	1.00 to 1.29	1.15	1.00 to 1.32
Heartburn/indigestion[b]				
Height loss (ref. = <0.5%)	1		1	
0.5 to <2%	1.09	1.01 to 1.18	1.09	1.01 to 1.19
≥2%	1.18	1.00 to 1.39	1.19	1.01 to 1.40
Constipation[c]				
Height loss (ref. = <0.5%)	1		1	
0.5 to <2%	1.10	1.03 to 1.19	1.10	1.02 to 1.18
≥2%	1.19	1.02 to 1.38	1.18	1.01 to 1.37
Urinary stress incontinence[d]				
Height loss (ref. = <0.5%)	1		1	
0.5 to <2%	1.03	0.95 to 1.11	1.03	0.96 to 1.12
≥2%	1.19	1.02 to 1.40	1.20	1.02 to 1.41
Hemorrhoids[e]				
Height loss (ref. = <0.5%)	1		1	
0.5 to <2%	1.05	0.96 to 1.16	1.03	0.93 to 1.14
≥2%	1.22	1.01 to 1.48	1.18	0.97 to 1.44
Back pain[f]				
Height loss (ref. = <0.5%)	1		1	
0.5 to <2%	1.03	0.97 to 1.10	1.03	0.97 to 1.10
≥2%	1.00	0.87 to 1.15	0.99	0.86 to 1.14

[a] Model adjusted for age, BMI, and self-reported indigestion, constipation, and urinary incontinence

[b] Model adjusted for country of birth, BMI, smoking, and alcohol intake

[c] Model adjusted for ability to walk 100 m

[d] Model adjusted for BMI and parity

[e] Model adjusted for BMI and constipation

[f] Model adjusted for BMI and arthritis

constipation. Height loss of at least 2% in 3 years was also associated with urinary stress incontinence and a decline in self-rated health. Although the magnitude of the association between height loss and specific symptoms was small, there was a "dose–response" effect, suggesting that those with greater height loss were at increased risk.

Compared to other longitudinal studies where heights of participants were measured repeatedly over time, mean height loss in the present study was slightly lower. Sorkin et al. found 0.18%/year decrease in height in women aged 70–79 years at baseline [7], and Droyvold et al. reported 0.14%/year decrease in women in the same age group [15]; results of the present study show 0.12%/year height reduction over 9 years in women initially aged 70–74 years. The difference may be due to underestimation of height loss based on self-reported data in our study.

Women with low BMI are known to be at increased risk of osteoporosis [16]: BMI has a positive effect on bone mineral density, and high BMI seems to be protective against low bone mineral density and osteoporosis. We found both osteoporosis and lower BMI to be predictive of height loss in a multivariable model: this may be due to women with low BMI having proportionally lower bone mineral density and proportionally more height loss, regardless of whether they had been diagnosed with osteoporosis. Women born in Europe were likely to lose more height than women born in Australia. Although the finding is (marginally) statistically significant, it has to be interpreted with caution. These women are a heterogeneous group who are not a representative sample of their countries of birth as they are a selection who decided to migrate to Australia. Dietary differences (with lower calcium intake) might explain the greater height loss.

The present results show heartburn/indigestion to be significantly associated with height loss, adjusting for confounders including bisphosphonate use. Oral bisphosphonates are generally associated with an increased risk of upper gastrointestinal symptoms. Whether bisphosphonates really cause gastrointestinal symptoms, however, has been disputed: among postmenopausal women, gastrointestinal complaints have not been found to be reported more often with bisphosphonate treatment compared to placebo [17, 18]. The present results, indicating an association between heartburn/indigestion and height loss, may explain the high prevalence of upper gastrointestinal symptoms in older women with osteoporosis, regardless of bisphosphonate use.

The main limitation of this study is the use of self-reported heights, which have been reported to be over-estimated in shorter people and the accuracy of which may decrease sharply with aging [19]. While consistent over-reporting of height [20] should not bias estimates of change in a longitudinal setting, in our study of older women, we cannot be sure that the accuracy and reliability of self-reported height remained unchanged over time. We believe that, in this study, longitudinal changes in self-reported height are distorted primarily by women not knowing their current height: in these women, progressive height loss will not be detected. Furthermore, women who did not continue to participate in the study may have been less healthy and may also have had more height loss. The present findings may, therefore, underestimate overall height loss in the population and its associations with risk factors and consequences. A further limitation is the use of lay terms for symptoms. “Heartburn/indigestion” is a term that may include dyspeptic symptoms, gastric discomfort, and gastroesophageal reflux disease.

The results of this study provide an incentive to measure height regularly, in general practice, in elderly women. In those with progressive height loss, bone mineral density measurements should be considered; in the case of established osteoporosis, treatment could be re-evaluated. Furthermore, symptoms associated with height loss (heartburn/indigestion, constipation, and urinary stress incontinence), which may not be presented spontaneously, can be explored. Early detection of these symptoms in patients at risk and giving targeted lifestyle advice and treatment even of mild symptoms may help to improve quality of life.

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Conflicts of interest None.

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Prospective association between physical activity and falls in community-dwelling older women

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ABSTRACT

Objective: To explore associations between physical activity and the risk of falls and fractured bones in community-dwelling older women.

Design, setting and participants: A prospective observational survey with three and six-year follow-ups. The sample included 8188 healthy, community-dwelling women, aged 70–75 years in 1996, who completed surveys as participants in the Australian Longitudinal Study on Women's Health. Women who reported a recent serious injury from falling were excluded. Outcomes were reports of a fall to the ground, injury from a fall, and a fractured bone in 1999 and 2002. The main predictor variable was physical activity level in 1996, categorised on the basis of weekly frequency as none/very low, low, moderate, high and very high. Covariates were demographic and health-related variables. Logistic regression models were computed separately for each outcome in 1999 and 2002.

Main results: In multivariable models, very high physical activity was associated with a decreased risk of reporting a fall in 1999 (odds ratio (OR) 0.67; 95% CI 0.47 to 0.95) and in 2002 (OR 0.64; 95% CI 0.43 to 0.96). High/very high physical activity was associated with a decreased risk of a fractured bone in 2002 (OR 0.53; 95% CI 0.34 to 0.83). No significant association was found between physical activity and injury from a fall.

Conclusions: The results suggest that at least daily moderate to vigorous-intensity physical activity is required for the primary prevention of falls to the ground and fractured bones in women aged 70–75 years.

Falls are a major cause of morbidity among older women and can have serious health and social consequences.[1–8] Up to 49% of community-dwelling women aged 65 years and over will experience at least one fall over a 12-month period,[3] and many of these falls will result in injury, including fracture.[8] Falls are the leading cause of injury-related death and hospitalisation for people aged over 65 years[6 9 10] and can lead to placement in residential care.[7 11 12] Falls are estimated to account for 40% of the lifetime injury costs for women.[13] They may also have psychosocial consequences, such as decreased self-esteem, daily activity and social interaction, which result in isolation and loneliness.[6]

Many physical, psychological and environmental factors are associated with falls.[10 14] Therefore, multifactorial strategies are required to reduce the risk of falls.[15] Physical activity is central to most programmes designed to reduce the risk of falls and may work through the improvement of strength and balance and through other physiological and psychological pathways.[15–17] The role of physical activity in reducing the risk of falls, however, remains controversial.[18] There is concern that physical activity may increase the risk of falls in vulnerable older people,[19] and it has been reported that older people who engage in vigorous-intensity physical activity have a lower falls rate but a higher risk of injuring themselves if they fall.[20]

Although studies have examined risk factors for falls,[21] few[22–24] have recruited large, national samples of healthy, community-dwelling older women. The Australian Longitudinal Study on Women's Health recruited such a sample. The aim of this analysis was to explore prospective associations between physical activity and the risk of falls and fractured bones in this study's cohort of older women.

MATERIALS AND METHODS

Participants

The study sample included 8188 women, aged 70–75 years, who completed mailed surveys for the Australian Longitudinal Study on Women's Health. Surveys were first administered in 1996 with follow-ups in 1999 and 2002. Women were randomly selected from the Medicare national health insurance database, which includes all permanent residents and citizens of Australia.[25 26] Women from rural and remote areas were intentionally oversampled. Women who reported in 1996 that they had had a fall with a serious injury within the previous year were excluded. Respondents in 1996 were reasonably representative of Australian women aged 70–75 years although married women were overrepresented.[26] Written informed consent was obtained from all participants, and the study protocol was approved by the University of Newcastle Ethics Committee.

Assessment of outcome variables

Respondents were asked whether they had experienced "a fall to the ground (does not include stumbles, trips)", "been injured as a result of a fall" or "broken or fractured any bone/s" in the past 12 months. Response options to each item were "yes" and "no". Items were adapted from those developed by the Australian Department of Veterans' Affairs' Preventive Care Trial with adults aged 70 years and older.[27]

Assessment of physical activity

Moderate to vigorous-intensity physical activities were assessed with two items developed by the National Heart Foundation of Australia and Australian Institute of Health[28] and known to have acceptable test–retest reliability.[29] The items asked for the number of times in a normal week

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Table 1 Characteristics of a national Australian sample of older community-dwelling women who reported "no serious fall with injury in the previous year" in 1996 (whole sample), and of these women, those who reported a fall to the ground, an injury from a fall, or a fractured bone in 1999

Variables	Whole sample n = 8188%	Had fall to ground n = 1427%	Injured in fall n = 975%	Fractured bone n = 394%
Physical activity				
None/very low	23.6	27.0	25.5	25.4
Low	30.4	30.3	29.4	26.1
Moderate	32.8	31.3	32.8	35.0
High	9.3	8.4	8.2	9.4
Very high	3.9	2.9	4.0	4.1
Education				
No secondary	29.2	30.8	29.2	30.5
Some secondary	38.4	37.1	37.2	35.3
Completed secondary	12.3	10.4	12.0	13.5
Trade certificate/university degree	15.9	17.3	16.8	16.5
Missing	4.2	4.3	4.7	4.3
Country of birth				
Australia	74.5	73.7	74.3	74.9
Other English speaking	12.5	11.9	10.6	10.2
Non-English speaking	7.8	9.7	9.4	10.2
Missing	5.2	4.8	5.7	4.8
Medication for nerves				
No	90.3	87.9	88.2	89.8
Yes	8.9	11.4	11.0	9.4
Missing	0.8	0.6	0.8	0.8
Medication for sleep				
No	83.7	80.2	81.1	78.7
Yes	15.4	18.8	18.3	20.8
Missing	0.9	1.1	0.6	0.5
Leaking urine				
Never/rarely	77.4	71.1	72.9	76.4
Sometimes	14.8	18.9	16.3	16.0
Often	5.6	8.0	8.1	5.6
Missing	2.2	2.0	2.7	2.0
Number of stressful life events				
0	31.2	26.6	27.1	30.7
1	28.2	28.0	26.1	26.4
2	19.8	20.5	21.4	18.3
3	11.9	14.2	14.6	14.0
4 or more	8.9	10.7	10.9	10.7
Number of chronic conditions				
0–1	37.5	27.5	28.8	28.9
2	25.0	26.1	25.4	26.6
3	17.7	20.5	20.2	18.5
4	19.6	25.8	25.2	25.9
Missing	0.3	0.2	0.3	0.0
Eyesight problems				
Never	33.6	27.7	26.3	25.4
Rarely	18.7	19.1	20.0	19.5
Sometimes	30.7	32.0	32.8	32.5
Often	13.6	18.6	17.4	19.0
Missing	3.4	2.7	3.5	3.6
Use of hormone replacement therapy				
Never used	76.2	73.3	74.2	75.4
<1 year	7.7	9.1	8.6	7.9
1–4 years	7.6	8.0	7.5	9.9
5–10 years	4.0	4.1	3.8	2.8
>10 years	3.9	4.7	4.9	3.0
Missing	0.6	0.8	1.0	1.0
Alcohol use				
Low risk	62.8	61.0	62.9	61.7
Non drinker	31.1	33.0	30.4	32.0
High risk	3.4	3.2	3.7	3.3
Missing	2.7	2.8	3.1	3.0

Continued

Table 1 Continued

Variables	Whole sample n = 8188%	Had fall to ground n = 1427%	Injured in fall n = 975%	Fractured bone n = 394%
Elder vulnerability score				
0	66.4	60.8	61.0	63.7
1	20.7	23.8	21.7	22.1
2	7.0	8.3	8.7	6.9
3 or more	5.6	6.5	7.9	6.6
Missing	0.3	0.6	0.6	0.8
Body mass index (kg/m^2)				
<20	7.5	6.0	7.7	11.2
⩾20 and <25	44.4	42.3	42.2	44.2
⩾25 and <30	30.7	32.3	33.1	31.0
⩾30	11.9	13.7	11.6	9.4
Missing	5.6	5.7	5.4	4.3

that respondents engaged in vigorous exercise ("which makes you breathe harder or puff and pant") and in less vigorous exercise ("which does not make you breathe harder or puff and pant") for at least 20 minutes. Examples were provided. As reported elsewhere,[30] the six response options were recoded (never, 0; once a week, 1; two to three times per week, 2.5; four to six times per week, 5; once a day, 7; more than once a day, 10). In the analysis sample, 21% of the women reported engaging in vigorous exercise at least once a week, and 85.4% reported engaging in non-vigorous exercise at least once a week. A total score was created by weighting the vigorous exercise score by 5.0 (metabolic equivalents) and the less vigorous exercise score by 3.0 (metabolic equivalents) and summing the vigorous and less vigorous scores. With a possible range of zero to 80, scores were categorised as none/very low (<5); low (5 to <15); moderate (15 to <25); high (25 to <40); and very high (⩾40). Respondents in the moderate, high, and very high categories were considered to be meeting US and Australian physical activity recommendations.[31 32]

Assessment of confounders

Variables found in previous studies to be associated with at least one of the outcomes and in initial univariate analyses for this study (data not shown) to be potential confounders of the association between physical activity and at least one of the outcomes were included in the analyses reported here. They included education, country of birth, medication for nerves, medication for sleep, leaking urine, number of stressful life events in the past 12 months (selected from a list of 24 events; eg, death of spouse or partner, death of a child, moving house, being robbed, natural disaster or house fire), number of diagnosed chronic conditions (selected from a standard list), eyesight problems, years of hormone replacement therapy use, alcohol intake, a validated modified version of the Hwalek–Sengstock Elder Abuse Screening Test,[33] body mass index (kg/m^2).

Statistical analysis

Logistic regression models were used to examine associations between physical activity in 1996 and outcomes (fall to the ground, injury as a result of a fall, and a fractured bone) in 1999. Model 1 examined univariate associations between physical activity and each outcome. For model 2, demographic variables were added, and for model 3, health-related variables were added. Model 4, a parsimonious model, included variables from model 3 that were significantly associated with the outcome. Interactions between physical activity and covariates were tested. Odds ratios were computed for all models. Significance was set at $p<0.05$.

For examining associations between physical activity in 1996 and the outcomes in 2001, the first three models were computed as discussed above. Model 4 added a composite of responses to the outcome variables in 1999: having reported a fall, an injury, or a fractured bone ("yes" or "no"). Because a previous fall has been identified as a major risk factor for future falls and fractures[34] and altered gait,[35] reporting an outcome in 1999 was hypothesised to play a mediating role between physical activity in 1996 and outcomes in 2001. Model 5 was the parsimonious model.

RESULTS

Table 1 presents characteristics of respondents. Most respondents (n = 4426, 54%) engaged in very low to low physical activity levels, indicating that respondents were insufficiently active to achieve health benefits according to recommendations.[31 32] The proportion of respondents who reported each outcome in 2001 was similar to that in 1999. Of the 2001 sample (n = 6468), 17% (n = 1126) reported a fall, 12% (n = 769) reported an injury and 5% (n = 325) reported a fracture.

Table 2 shows the results of modelling the association between physical activity in 1996 and falls reported in 1999. In model 1, respondents in the low ($p = 0.03$), moderate ($p = 0.01$), high ($p = 0.02$), and very high ($p<0.01$) physical activity categories had lower odds of having a fall than those in the none/very low physical activity category. Results were largely unchanged in model 2. Only respondents in the very high physical activity category had lower odds of reporting a fall in model 3 ($p = 0.03$), and only respondents in the moderate ($p = 0.04$) and very high categories ($p = 0.02$) had lower odds of reporting a fall in model 4. No significant interactions were found between physical activity and any covariate ($p>0.05$).

To examine associations between physical activity and the other outcomes (an injury, a fractured bone), the top two categories of physical activity were collapsed because of small numbers for these events. Univariate logistic regression models indicated that physical activity in 1996 was not associated with reporting an injury ($p = 0.41$) or a fractured bone in 1999 ($p = 0.27$); therefore, no other models were computed for these outcomes in 1996.

Table 3 shows results of the analysis of physical activity in 1996 and falls reported in 2001. In model 1, only respondents in the very high ($p = 0.02$) physical activity category had decreased odds of having a fall compared with those in the none/very low

Table 2 The association between physical activity in 1996 and reporting in 1999 a fall to the ground within the previous 12 months among a sample of older Australian women (n = 8188)

Variable	Model 1 Univariate model Odds ratio (95% CI)	Model 2* Demographic model Odds ratio (95% CI)	Model 3† Confounders model Odds ratio (95% CI)	Model 4‡ Parsimonious model Odds ratio (95% CI)
Physical activity				
None/very low	1.00	1.00	1.00	1.00
Low	0.84 (0.72 to 0.98)	0.85 (0.73 to 0.99)	0.89 (0.76 to 1.05)	0.88 (0.75 to 1.03)
Moderate	0.80 (0.69 to 0.93)	0.81 (0.69 to 0.94)	0.87 (0.75 to 1.02)	0.85 (0.73 to 0.99)
High	0.76 (0.60 to 0.95)	0.76 (0.60 to 0.95)	0.84 (0.67 to 1.06)	0.82 (0.65 to 1.03)
Very high	0.61 (0.43 to 0.86)	0.60 (0.42 to 0.84)	0.69 (0.48 to 0.97)	0.67 (0.47 to 0.95)

The sample size was the same for all models. Odds ratios and 95% CI are adjusted for area of residence to account for oversampling of women from rural and remote areas.
*Odds ratios and 95% CI also adjusted for education and country of birth.
†Odds ratios and 95% CI also adjusted for education, country of birth, use of medication for nerves, use of medication for sleep, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, use of hormone replacement therapy, alcohol use, elder vulnerability score, and body mass index.
‡Odds ratios and 95% CI also adjusted for country of birth, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, and elder vulnerability score. Odds ratios and 95% CI for these covariates are presented in table 1 published online only on the journal's website.

physical activity category. The strength of association was slightly changed in model 2, and respondents in the high (p = 0.03) and very high (p = 0.01) physical activity categories had decreased odds of having a fall. In model 3, the strength of association was weaker, and there was a trend towards an association between the very high physical activity category and decreased odds of having a fall (p = 0.05). The odds were lower only among respondents in the very high physical activity category in models 4 (p = 0.04) and 5 (p = 0.03). No significant interactions were found between physical activity and any covariate (p>0.05).

As found in the examination of the association between physical activity in 1996 and reports of an injury from a fall in 1999, physical activity in 1996 was not associated with reporting an injury in 2001 (p = 0.31) in model 1; therefore, no other models were computed for this outcome.

In model 1 of the analysis of the association between physical activity and a fractured bone in 2001 (table 4), respondents in the high/very high physical activity category had decreased odds of reporting a fractured bone compared with those in the none/very low physical activity category (p<0.01). As shown in table 4, the significance and strength of this association remained almost unchanged in models 2 (p<0.01), 3 (p = 0.01), 4 (p = 0.01), and 5 (p = 0.01). No significant interactions were found between physical activity and any covariate (p>0.05).

DISCUSSION

Our findings indicate that older women who reported a very high level of physical activity (more than daily vigorous-intensity physical activity for at least 20 minutes or almost twice daily moderate-intensity physical activity for at least 20 minutes) had decreased odds of reporting a fall both three and six years later compared with women reporting no or very low levels of physical activity (one or less 20-minute session of vigorous-intensity physical activity per week or two or less 20-minute sessions of moderate-intensity physical activity per week). At the three-year follow-up, the odds for women in the very high physical activity category were reduced by 33% and at the six-year follow-up by 36%. We also found that the women reporting a moderate level of physical activity (three to five sessions of vigorous-intensity physical activity per week or five to eight sessions of moderate-intensity physical activity per week, at least 20 minutes per session) had a 15% reduced risk of reporting a fall to the ground three years later. This reduction in the risk of falls is similar in magnitude to that found for interventions developed to reduce the risk of falls (18%) by tailoring strategies on the basis of individuals' personal risk assessment profiles.[36] The association between a moderate level of physical activity and the risk of falls in our study was not, however, found at the six-year follow-up.

The findings of an inverse association between very high levels of physical activity and the risk of falls to the ground support those from several prospective observational studies showing

Table 3 The association between physical activity in 1996 and reporting in 2001 a fall to the ground within the previous 12 months among a sample of older Australian women (n = 6468)

Variable	Model 1 Univariate model Odds ratio (95% CI)	Model 2* Demographic model Odds ratio (95% CI)	Model 3† Confounders model Odds ratio (95% CI)	Model 4‡ Mediator model Odds ratio (95% CI)	Model 5§ Parsimonious model Odds ratio (95% CI)
Physical activity					
None/very low	1.00	1.00	1.00	1.00	1.00
Low	0.88 (0.74 to 1.06)	0.87 (0.73 to 1.04)	0.91 (0.76 to 1.09)	0.91 (0.75 to 1.09)	0.89 (0.75 to 1.07)
Moderate	0.92 (0.77 to 1.09)	0.89 (0.75 to 1.06)	0.95 (0.79 to 1.13)	0.94 (0.78 to 1.12)	0.92 (0.77 to 1.11)
High	0.78 (0.61 to 1.01)	0.76 (0.59 to 0.98)	0.81 (0.63 to 1.06)	0.81 (0.62 to 1.05)	0.80 (0.62 to 1.04)
Very high	0.63 (0.42 to 0.94)	0.61 (0.41 to 0.91)	0.67 (0.45 to 1.00)	0.65 (0.43 to 0.97)	0.64 (0.43 to 0.96)

The sample size was the same for all models. Odds ratios and 95% CI are adjusted for area of residence to account for oversampling of women from rural and remote areas.
*Odds ratios and 95% CI also adjusted for education and country of birth.
†Odds ratios and 95% CI also adjusted for education, country of birth, use of medication for nerves, use of medication for sleep, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, use of hormone replacement therapy, alcohol intake, elder vulnerability score, and body mass index.
‡Odds ratios and 95% CI also adjusted for education, country of birth, use of medication for nerves, use of medication for sleep, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, use of hormone replacement therapy, alcohol use, elder vulnerability score, body mass index, and previous fall, injury from fall or fractured bone at S2.
§Odds ratios and 95% CI also adjusted for education, use of medication for nerves, leaking urine, number of chronic conditions, eyesight problems, elder vulnerability score, and previous fall, injury from fall or fractured bone at S2. Odds ratios and 95% CI for these covariates are presented in table 2 published online only on the journal's website.

Table 4 The association between physical activity in 1996 and reporting in 2001 a fracture within the previous 12 months among a sample of older Australian women (n = 6468)

Variable	Model 1 Univariate model Odds ratio (95% CI)	Model 2* Demographic model Odds ratio (95% CI)	Model 3† Confounders model Odds ratio (95% CI)	Model 4‡ Mediator model Odds ratio (95% CI)	Model 5§ Parsimonious model Odds ratio (95% CI)
Physical activity					
None/very low	1.00	1.00	1.00	1.00	1.00
Low	0.82 (0.61 to 1.11)	0.83 (0.62 to 1.13)	0.85 (0.63 to 1.16)	0.85 (0.63 to 1.16)	0.84 (0.62 to 1.13)
Moderate	0.87 (0.65 to 1.16)	0.89 (0.66 to 1.19)	0.92 (0.68 to 1.24)	0.91 (0.68 to 1.23)	0.88 (0.66 to 1.19)
High/very high	0.50 (0.32 to 0.78)	0.52 (0.34 to 0.82)	0.55 (0.35 to 0.87)	0.55 (0.35 to 0.86)	0.53 (0.34 to 0.83)

The sample size was the same for all models. Odds ratios and 95% CI are adjusted for area of residence to account for oversampling of women from rural and remote areas.
*Odds ratios and 95% CI also adjusted for education and country of birth.
†Odds ratios and 95% CI also adjusted for education, country of birth, use of medication for nerves, use of medication for sleep, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, use of hormone replacement therapy, alcohol intake, elder vulnerability score and body mass index.
‡Odds ratios and 95% CI also adjusted for education, country of birth, use of medication for nerves, use of medication for sleep, leaking urine, number of stressful life events, number of chronic conditions, eyesight problems, use of hormone replacement therapy, alcohol use, elder vulnerability score, body mass index, and previous fall, injury from fall or fractured bone at S2.
§Odds ratios and 95% CI also adjusted for country of birth, number of chronic conditions, eyesight problems, body mass index, and previous fall, injury from fall or fractured bone at S2. Odds ratios and 95% CI for these covariates are presented in table 3 published online only on the journal's website.

physical activity to be associated with significant reductions in the risk of falls.[18] Other studies, in contrast, indicate that both high and low levels of physical activity put older adults at a high risk of falls,[18, 21] and the results from physical activity intervention trials have been mixed. Some have found significant reductions in the risk of falls among participants, whereas others have found no significant differences between intervention and control groups in the risk of falls.[15, 18, 37, 38]

Physical activity was not associated with having an injury as a result of a fall in this study. This finding supports those from another large prospective study of community-dwelling older adults,[14] which found no significant association between physical activity and the risk of injury. Two small prospective studies have, however, shown a significantly increased risk of injury among community-dwelling older adults participating in high levels of physical activity compared with those participating in low levels.[20, 39] Given the conflicting results, more investigation of these associations is needed.

Our analyses also indicated that women in the high/very high physical activity categories had a 47% decreased odds of reporting a fractured bone six years later compared with those in the none/very low physical activity category. As in our study, Albrand *et al*[40] found in their prospective cohort study that older women who were moderately to vigorously active had decreased odds of fragility fractures compared with sedentary and lightly active women. Although we did not have information about the site of fracture, our results support findings from prospective and case–control studies showing significant reductions in hip or vertebral fractures among women who were physically active compared with those who were sedentary.[22, 24, 41, 42]

Strengths

A major strength of this study was the use of a large, national sample of community-dwelling, relatively healthy adults. This is in contrast with most previous studies in this area,[22–24] which have tended to be in defined populations of women.[22, 24] Using a cohort of older women allowed us to focus on a population that is growing in size as the population as a whole ages and that is at a high risk of falls and fractured bones.

Limitations

We did not assess mechanisms by which physical activity influences risks of the injuries examined. Although results from intervention studies suggest that physical activity may protect against fractures by preventing bone loss, the effects of physical activity on bone mineral density in older adults are small and are not likely to be biologically significant.[42] Other ways by which physical activity may decrease the risk of falls and subsequently fractured bones are by improving balance, coordination, muscle strength, reaction time and mobility.[18]

Other limitations include the use of self-report data, which are prone to recall bias, and the limited generalisability of the findings. Respondents whose data were included in these analyses were community-dwelling women, aged 70–75 years in 1996, who had not reported a fall resulting in serious injury within the previous year. Ideally, our findings should be tested in other populations. Furthermore, although respondents were fairly representative of Australian women at the first survey, those who continued in the study were healthier and of higher socioeconomic status than the general population and than respondents who dropped out,[43] suggesting that our prevalence estimates may be low. By limiting our analyses to women who reported that they had not had a serious injury from falling within the previous year, we introduced selection bias. In a sensitivity analysis, however, we also included women who had reported having had a recent fall and found the main findings to hold true (the main findings of this analysis are available in this

What is already known on this subject

- Falls are a major cause of morbidity among older women
- Physical activity is central to many interventions designed to decrease the risk of falls
- Concerns about the role of physical activity in reducing the risk of falls remain because physical activity has been shown to increase the risk of falls in some older adults

What this paper adds

- For older women who have not had a recent fall resulting in injury, only the highest level of physical activity decreased the risk of falls to the ground. Moderate levels of physical activity may reduce the risk of such falls but the decrease in risk is much smaller
- For these older women, the highest levels of physical activity also decreased the risk of a fractured bone

Policy implications

The results indicate that for the primary prevention of falls, healthy older women who are able should be encouraged to engage in moderate-intensity physical activities for 20 minutes twice a day

paper's web supplement on the journal's website). The major differences between the results reported here and those from the sensitivity analysis were that a moderate level of physical activity was not associated with a decreased risk of falls to the ground in the next three years in the sensitivity analysis, and the inverse association between a high/very high level of physical activity and risk of fractured bones six years later was stronger in the findings reported here than in the results from the sensitivity analysis. It should be noted that the measure of physical activity did not allow for computations of total time each week in all physical activities.

CONCLUSIONS

Our findings indicate that very high levels of physical activity (more than daily vigorous-intensity physical activity for at least 20 minutes or almost twice daily moderate-intensity physical activity for at least 20 minutes) are associated with reduced odds of falls among community-dwelling older women aged 70–75 years. The highest levels of physical activity are also associated with reduced odds of a fractured bone among these older women. Together, these findings suggest that the highest levels of moderate and vigorous-intensity physical activity reduce the risk of falls to the ground and fractured bones in women aged 70–75 years. Only 9% of the women in this sample were, however, engaging in high levels and another 4% were engaging in very high levels, suggesting that these levels may not be obtainable for most women in this age range.

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For Richer, for Poorer, in Sickness and in Health: Older Widowed Women's Health, Relationships and Financial Security

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ABSTRACT. *Aim*: This study contrasts the health and social needs of widowed older women with needs of married older women.

Method: 12,624 women aged 70-75 years across Australia completed baseline questionnaires for the Australian Longitudinal Study on Women's Health: 34.5% of the women were widowed, and 13.5% of these widowed women had lost their spouse within the past 12 months (recently widowed).

Results: Recently widowed women had particular physical and mental health needs as well as financial and practical needs relating to managing on their income. They had the lowest self-rated health, were most likely to report they were stressed about their health, and scored significantly lower than married women on all 8 sub-scales of the SF-36. Women were more likely to say they make their own decisions

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about their life if they were widowed than if they were married. However, stress with relationships with children or other family members was more likely to be reported by widows than other women. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: getinfo@haworthpressinc.com]*

KEYWORDS. Widows, health, financial, social support

INTRODUCTION

For many people, older age is a time of great change and adjustment. For women, who have longer life expectancy than men (Australian Bureau of Statistics, 1994), older age can often mean change in marital status: from married to widowed. The 1991 census showed that on average Australian women are living up to eight years longer than their male counterparts and that 80% of widowed persons are women. The census also revealed that 73% of women aged 85 years and over were widowed (Australian Bureau of Statistics, 1994).

The social consequences of this change in status are likely to be considerable, and yet often overshadowed in health and social research. Much research has focussed on bereavement (Bowling, 1988; Lund, 1989; Mendes de Leon et al., 1994; Parkes, 1970; Prigerson et al., 1995) with little emphasis on the broader needs of these women, nor their longer term adaptation to the new demands and challenges in their lives.

Widows are stereotyped as "women who have lost their spouse" (Gee and Kimball, 1987). Consequently, widowhood is often considered synonymous with grief and associated with physical and mental ill health (Lund, 1989). Loss of spouse has been linked with depression (Lund, 1989), premature mortality (Bowling, 1988; Mendes de Leon et al., 1994) and suicide (Guohua, 1995).

Many challenges confronting older women as widows may relate not to bereavement, but to their single status. Unmarried older women are more likely to be impoverished than couples or single men (Crystal and Shea, 1990). Not only do these women have to live on one annuity, but many (particularly widows) have little experience of financial matters (Morgan, 1991).

Social isolation and loneliness are also frequently associated with widowhood (Burnette and Nui, 1996; Longino and Lipman, 1981) and with single status (Burnette and Mui, 1996; Henderson, Scott and Kay, 1986). Henderson, Scott and Kay (1986) found that persons who lived alone had fewer close relationships and were more likely to report loneliness. Nonetheless, these people had just as much social interaction as other people their age.

Indeed, while marital status is often used as a single item proxy for social support, research shows that the relationship between marital status and social support is poor (Berkman and Syme, 1979; Goodger et al., University of Newcastle, unpublished data, 1997).

Research suggests a direct correlation between the level of social support and positive adjustment to widowhood (Hansson et al., 1986; Vachon et al., 1980) and to other life events (Brown, 1978). Widows have lost the support of their husbands, but this need not necessarily lead to social isolation. Widows are likely to turn to family members (Harris and Harvey, 1987; Lopata, 1979) and friends (Morgan, 1989). Allowing for a period of adjustment, widows may enjoy new freedom to explore a wider and richer range of friendships than their married counterparts (Beaumont, 1997, unpublished manuscript).

These broader views of widowhood suggest a need for a more comprehensive understanding of the experience of widowed women. We conceptualise that death of a spouse impacts on three major life domains. The first is mental and physical health (Bowling, 1988; Lund, 1989; Mendes de Leon et al., 1994) with consequent reduction in health-related quality of life and increased use of health services and medication. The second domain relates to structural support including women's material resources (Crystal and Shea, 1990; Morgan, 1991). The third domain includes social isolation and loneliness (Burnette and Mui, 1996; Longino and Lipman, 1981) with social support having an important influence on women's transition through this most stressful life event (Hansson et al., 1986; Vachon et al., 1980).

The baseline survey of the Australian Longitudinal Study on Women's Health (Women's Health Australia, WHA) provides an opportunity to explore the relationship between marital status and these three life domains among older women in Australia. The Women's Health Australia (WHA) study is designed to track the health of several cohorts of women over a period of up to twenty years. The project, which was established as a result of an Australian government initiative to conduct a longitudinal cohort study on women's health (Brown et al., 1996), aims to clarify cause-effect relationships between a range of biological, psychological, social and lifestyle factors and women's physical health, emotional well-being, and use of and satisfaction with health care services. To date, baseline data have been collected from three large cohorts of women, aged 18-23, 45-50 and 70-75 years.

This component of the study compares baseline data for women widowed within 12 months preceding the baseline survey with those widowed longer than 12 months, and those who are still married. The hypothesis is that recently widowed women will display poorest health and greatest structural and social need, but that these needs will be less pronounced for women widowed in the longer-term. The goal of the research is to provide a profile of widowed older women, to highlight the needs of these women, and to contrast these with the needs of ageing women in general.

METHODS

Sample

Details of the recruitment methods and baseline measures have been reported elsewhere (Brown et al., 1997). Briefly, 39,000 women aged 70-75 years were randomly selected by the Health Insurance Commission (the agency which administers Medicare on behalf of the Federal Government of Australia), with deliberate over-representation of women from rural and remote areas. Women from these geographical areas were selected in twice the proportion which exists in the Australian rural and remote population in each age group (54% of the sample were from rural areas, and 3% were from remote areas). Women from capital cities and other metropolitan areas made up the balance of the samples.

Surveys were sent to the selected women by mail during June and July 1996, using a modified Dillman protocol (Dillman, 1978). Telephone follow-up to encourage response was not permitted because statutory regulations prohibited the release of selected women's names to the researchers until the women themselves had given consent to participate.

Measures

The baseline measures included 260 questions on a wide range of issues designed to explore the social and environmental aspects of women's lives as well as the psychological and biological determinants of health. Only those questions that were hypothesised to be related to marital status, and to have important policy implications for widowed older women were included in these analyses.

In addition to basic demographic factors (country of birth, language spoken at home, education, most recent occupation) these questions included items about marital status, loss of spouse in the last 12 months and variables related to health, quality of life (Short Form-36) (Ware and Sherbourne, 1992) and health care utilisation, financial and structural issues, relationships and social support (Duke's Social Support Inventory) (Koenig et al., 1993).

The Short Form-36 (SF-36) is a widely-used tool to measure health-related quality of life (Ware and Sherbourne, 1992). The instrument provides an eight-scale health profile and two component summary scores representing physical and mental health. The scales measure: (1) physical functioning, (2) bodily pain, (3) role limitations due to physical health problems; (4) general health perceptions, (5) vitality, energy or fatigue, (6) general mental health, covering psychological distress or well-being, (7) role limitations due to emotional problems, and (8) social functioning. The 11-item version of the Duke Social Support Index (DSSI) (Koenig et al., 1993) contains two sub-scales. The first sub-scale measures social interaction including the number of people who can be relied upon, number of social contacts and participation in group activities. The second sub-scale involves subjective evaluation of the quality of the social support available.

A final open question asked women to add to or expand on issues covered in the survey.

Statistical Analyses

To correct for over-sampling of women from rural and remote areas, all responses were weighted (area adjusted) so that the study population was representative of the Australian population for women of this age group. Applying these weights, characteristics of married women, women who were recently widowed (within the past 12 months), and women widowed for 12 months or more, were compared using 95% confidence intervals (CI).

Using multiple logistic regression, adjusted odds ratios (OR) and 95% confidence intervals (CI) were estimated for selected health care, financial and structural issues, and relationships and social support variables that were significantly associated with marital status on univariate analyses. All the ORs were adjusted for education level which was categorised as did not complete secondary school, and secondary school or higher qualification.

Means and CIs for the eight sub-scales and the two summary scales of the SF-36 were also calculated for each of the marital status categories, using the least squares mean option of the generalised linear models procedure of SAS. All means were adjusted for variables such as smoking (current, ex and never smoker), body mass index (continuous variable), area of residence (urban, rural, remote) and education level. Bonferroni corrections were used to reduce the effects of inflated type 1 errors due to multiple comparisons.

RESULTS

Participants and Their Marital Status

The baseline WHA survey was completed and returned by 12,624 women aged 70-75 years (35% of the sample). Demographic characteristics of the respondents were compared with corresponding data from the latest available national census, which was conducted in 1996 (Australian Bureau of Statistics, 1996). These results have been reported elsewhere (Brown et al., 1997) and suggest that the participants are fairly representative of the national population of women in this age group in terms of these characteristics. Married women were slightly over-represented with 55.5% of respondents reporting they were married or in a defacto relationship compared with 48.9% expected from the census. It would appear also that women with post-school qualifications may be over-represented. However, comparisons are difficult due to the large proportion (21.2%) in the census data whose education status is unknown.

Of the study participants, 4106 were widowed, and 13.5% of these widowed women had lost their spouse within the past 12 months. There was a statistically significant association between being widowed and women's level of education ($?^2 = 410.37$; df = 6; $p < 0.001$). Of women who were widowed, 42.2% did not complete secondary school and had no formal post-school qualifications. For married women this proportion was 31.6%.

Open-Ended Responses

Over 700 women commented on their experiences of widowhood. These comments were reviewed and subjected to thematic analysis (Luborsky, 1993). A fuller account of this qualitative analysis is provided elsewhere (Feldman, Byles and Beaumont, 1998).

The major themes strongly reinforced the initial conceptual framework derived from the literature, with women emphasising the impact of the death of their spouse on their health, the importance of health and community services, considerable material burden maintaining homes and cars and managing financially, and changes in social relationships and support. Women also placed a strong emphasis on change and of developing new skills and identities as single older women.

Self-Rated Health and Health Care Utilisation

Self-rated health and health care use for widows and married women are presented in Table 1 (Proportions and 95% CI). As hypothesised, women widowed less than 12 months had the lowest self-rated health. These women were also more likely to report they were stressed about their health, and more likely to be taking medications to help them sleep than married women and women widowed more than twelve months. There were no significant differences between widows and married women on other measures of health care utilisation.

TABLE 1. Characteristics of Widowed and Married Women Aged 70 to 75 Years

	Married/Defacto n = 6640		Widowed less than 12 months n = 540		Widowed longer than twelve months n = 3493	
Self-rated health and health care utilisation	%	95% CI	%	95% CI	%	95% CI
Self-rated health:						
Excellent/Very Good	32.7	(31.6-33.9)	23.7	(20.2–27.4)	34.3	(32.7-35.9)
Good	40.9	(39.7-42.1)	40.8	(36.7-45.1)	37.1	(35.5-38.7)
Fair/Poor	26.4	(25.4-27.4)	35.5	(31.5-39.5)	28.6	(27.1-30.1)
Stressed about own health	46.1	(44.9-47.3)	56.5	(52.1-60.6)	46.45	(44.0-48.9)
Admission to Hospital in past year	22.0	(21.0-23.0)	22.3	(18.9-25.7)	24.2	(22.8-25.6)
7 or more visits to a GP in past year	29.9	(27.5-32.3)	34.9	(26.4-43.4)	33.5	(30.2-36.8)
4 or more prescribed medications	27.1	(24.6-29.6)	31.5	(23.0-40.0)	29.2	(26.2-32.2)
Taking medication for nerves	11.5	(9.2-13.8)	18.0	(10.3-25.7)	11.6	(8.5-14.7)
Taking medication to help sleep	18.4	(16.2-20.6)	24.9	(21.2-28.6)	17.1	(14.3-19.9)
Structural and financial issues						
Stressed about money	20.5	(18.4-22.7)	31.1	(23.9-38.3)	29.4	(26.7-32.2)
Impossible/difficult to manage on income	23.1	(22.1-24.1)	33.6	(29.7-37.5)	31.4	(29.9-32.9)
Decreased income over past 12 months	16.1	(13.9-18.3)	40.6	(34.0-47.3)	16.9	(13.9-19.9)
Private health insurance:						
Hospital cover	53.2	(51.6-54.9)	35.3	(28.4-42.0)	38.0	(35.5-40.5)
Ancillary cover	34.3	(32.4-36.3)	22.5	(15.0-30.0)	24.7	(21.8-27.5)
Stressed with living arrangement	8.9	(6.6-11.2)	14.8	(6.7-22.9)	12.7	(9.5-15.6)
Relationship issues						
Live alone	5.6	(3.1-8.2)	84.5	(80.9-88.1)	80.9	(78.9-82.9)
Stressed by relationships with children or other family members	19.4	(18.4-20.4)	25.5	(21.8-29.3)	23.1	(21.7-24.5)
Make own decisions	92.9	(92.3-93.6)	98.2	(97.1-99.4)	98.2	(97.8-98.6)
Like less time alone	3.4	(0.1-6.6)	16.3	(5.7-26.9)	14.6	(10.6-18.6)
Rarely or never have time on hands	81.9	(80.9-82.9)	60.8	(55.5-66.1)	72.9	(71.5-74.3)

Financial and Structural Issues

Widows were more likely to be stressed about money than married women, and more likely to say they found it difficult or impossible to manage on their income. Predictably, women widowed in the past 12 months were most likely to report a decrease in their income within the past 12 months. Widowed women were less likely to have private health insurance (hospital or ancillary) than married women.

Relationships and Social Support

Widowed women were more likely to live alone than married women, and more likely to report they would like less time alone. Similarly, these women were more likely to have time on their hands.

Overwhelmingly, women felt they made their own decisions about their lives. Widows were more likely to report they made their own decisions than married women. Widows were also more likely to report stress with a relationship with children or other family members than married women.

Scores of the DSSI were shifted towards high levels of social support, and did not vary with marital status. The median score on the Social Networks sub-scale was 9 for all three groups of women (interquartile range 8-10) and the Satisfaction sub-scale score was 20 for all three groups (IQ range 19-21, 7-21, 18-21 for married women, and for each group of widowed women, respectively).

Health-Related Quality of Life Profile

Quality of life (SF-36) sub-scale and summary scores are reported in Table 2. Adjusted means for all sub-scales (except bodily pain) and the mental health component summary scale were significantly lower for women widowed within the past twelve months compared to married women. For women widowed longer than twelve months the scores were not significantly different from the scores for married women.

Multiple Logistic Regression Models

Women Widowed Less than Twelve Months

Selected variables entered into the model are presented in Table 3. Variables were omitted if they were highly correlated with another predictor variable in the model. The observations were area adjusted.

TABLE 2. Adjusted Means with 95% Confidence Intervals of the Eight Dimensions and Two Summary Scores of the SF-36 Scales

SF-36 (N)	Marital status category	Mean	95% confidence interval	P-value*
Physical Functioning (8990)	Married/ defacto	62.0	60.6-63.3	–
	Widowed = 12 months	56.1	53.4-58.8	0.0001
	Widowed > 12 months	61.3	59.9-62.8	0.2551
Role Physical (8907)	Married/ defacto	56.2	53.8-58.5	–
	Widowed = 12 months	47.9	43.1-52.6	0.0003
	Widowed > 12 months	55.7	53.2-58.2	0.6391
Bodily Pain (9220)	Married/ defacto	64.2	62.8-65.6	–
	Widowed = 12 months	61.7	58.9-64.5	0.0615
	Widowed > 12 months	65.0	63.5-66.5	0.1447
General Health (9070)	Married/ defacto	65.1	64.0-66.3	–
	Widowed = 12 months	60.5	58.2-62.9	0.0001
	Widowed > 12 months	65.0	63.7-66.3	0.7806
Vitality (9296)	Married/ defacto	58.8	57.7-59.9	–
	Widowed = 12 months	55.2	53.0-57.4	0.0006
	Widowed > 12 months	59.8	58.6-61.0	0.0226
Social Functioning (9421)	Married/ defacto	81.0	79.8-82.4	–
	Widowed = 12 months	72.9	70.3-75.5	0.0001
	Widowed > 12 months	80.7	79.3-82.2	0.5027
Role Emotional (8823)	Married/ defacto	74.0	72.0-76.0	–
	Widowed = 12 months	57.1	53.1-61.2	0.0001
	Widowed > 12 months	73.6	71.5-75.8	0.6700
Mental Health (9269)	Married/ defacto	75.5	74.6-76.4	–
	Widowed = 12 months	67.5	65.7-69.2	0.0001
	Widowed > 12 months	76.2	75.3-77.2	0.0507
Physical Component Scale (8372)	Married/ defacto	50.9	50.4-51.4	–
	Widowed = 12 months	50.1	49.1-51.1	0.1197
	Widowed > 12 months	50.6	50.1-51.2	0.2531
Mental Component Scale (8372)	Married/ defacto	50.7	50.2-51.2	–
	Widowed = 12 months	46.3	45.2-47.3	0.0001
	Widowed > 12 months	51.0	50.5-51.6	0.0816

* Significance levels for p-values for pairwise comparisons between women were set at 0.01, after Bonferroni correction for the multiple comparisons (i.e., multiplying the pairwise p-value by 2).

TABLE 3. The Percentage of Women Widowed in the Last Twelve Months, and Odds Ratio (OR) for Selected Health Care, Financial and Structural Issues, Relationships and Social Support Factors Associated with Being Widowed in the Last Twelve Months

	N*	Category	Percentage	OR**	95% CI
Health and Health Care Use					
Self-rated health	129	Excellent/Very Good	5.6	reference	
	221	Good	7.5	1.3	1.0-1.8
Financial and Structural Issues					
Manage on income available	367	No difficulty	6.4	reference	
	186	Difficulty	11.1	1.6	1.1-2.2
Stress with living arrangement	280	Not stressed	6.1	reference	
	74	Stressed	11.1	0.7	0.5-1.1
Health insurance	331	None	10.0	reference	
	199	Hospital/Ancillary	5.0	0.7	0.5-0.9
Relationships and Social Support					
Live alone	72	No	1.37	reference	
	392	Yes	55.8	76	54.4-106.2
Would like less time alone	393	No	8.0	reference	
	83	Yes	27.6	1.8	1.1-2.8
Rarely or never have time on hands	213	No	14.8	reference	
	330	Yes	5.6	0.7	0.5-1.0

* N refers to the number of women widowed in the last twelve months in each category.
** OR reflect relative likelihood of being widowed and are adjusted for educational level.
Women widowed for more than one year were not included in the analysis.

The model revealed significant associations between being widowed in the past twelve months and self-rated health, ability to manage on income available, private health insurance, living alone, the amount of time "on hands" and satisfaction with the amount of time spent alone.

Women Widowed More than Twelve Months

In the second model (Table 4), self-rated health and stress with living arrangements were no longer associated with widowed status. There were still significant associations between being widowed and ability to manage on income available, private health insurance, living alone, and satisfaction with the amount of time spent alone. Stress with relationships with children or other family members was also associated with being widowed. Women who reported they made their own decisions were six times as likely to be widowed as women who reported someone else made decisions for them.

TABLE 4. The Percentage of Women and Odds Ratio (OR) for Selected Health Care, Financial and Structural Issues, Relationships and Social Support Factors Associated with Being Widowed more than Twelve Months.

	N*	Category	Percentage	OR**	95% CI
Area of residence	1470	Urban	35.1	reference	
	2009	Rural	32.8	0.7	0.6-0.9
Health and Health Care Use					
Medicine to Sleep	2920	No	34.3	reference	
	573	Yes	32.4	0.6	0.5-0.8
Financial and Structural Issues					
Manage on income available	2441	No difficulty	30.9	reference	
	1143	Difficulty	42.7	1.8	1.4-2.2
Private Health Insurance	2139	None	39.8	reference	
	1382	Hospital/Ancillary	27.2	0.6	0.5-0.7
Relationships and Social Support					
Live alone	546	No	9.4	reference	
	2567	Yes	88.8	93	77-113
Less time alone	2860	No	38.3	reference	
	468	Yes	68.5	2.4	1.7-3.3
Stress by relationships with children or other family members	2185	No	33.3	reference	
	739	Yes	37.1	1.4	1.1-1.7
Make own decisions	53	No	9.8	reference	
	3475	Yes	36.4	6.0	3.2-11.0

* N refers to the number of women widowed in the last twelve months in each category.
** OR reflect relative likelihood of being widowed and are adjusted for educational level.
Women widowed within the past twelve months were not included in the analysis.

Women who used drugs to help them sleep were less likely to be widowed more than 12 months.

DISCUSSION

The study reveals important differences between older widows and women of the same age who are married. Women who were recently widowed, expressed a range of health, financial and social needs across the domains examined. These women had the lowest self-rated health, and the lowest health-related quality of life scores. Not only did these women score lower than married women on mental and emotional health-related quality of life sub-scales, but they also scored lower on the physical sub-scales. These differences persisted even when socio-demographic and basic physical differences (e.g., Body Mass Index and smoking) were taken into account.

Other researchers have also found that physical health is affected immediately after the death of a spouse, but that differences between widows and married women disappear in the long term (Wan, 1984). In this study, women widowed for longer than 12 months had quality of life scores that were no different from married women. These results are consistent with the hypothesis that the poor health experienced by recent widows resolves with time. However, it is not possible to make an assertion to this effect from this cross-sectional study. For instance, women who were widowed at an age younger than 70 years may have different needs and make different adjustments from women widowed later in life. Survivor bias is another limitation in interpreting the results of this present study; women who have maintained their physical and mental health following the death of their spouse would be more likely to be able to participate in the study. The findings do, however, provide a sound framework for exploring changes in widowed women's health-related quality of life in the longitudinal study.

Interestingly, despite poorer health, widows did not display greater use of health care services. Over 20% of widows had been admitted to hospital in the previous year, but this event was unrelated to marital status. The only significant difference in health care use was a greater use of sedative medications. Overall, the use of anxiolytic and sedative medications was alarming, and the longitudinal study will provide useful data on whether these women remain on these medications and the related health outcomes.

Women who reported difficulty managing on their income were more likely to be widowed than women who reported no difficulty managing. This association was true for both women widowed within twelve months and women widowed for longer, a result that suggests women do not overcome their financial difficulties with time. Indeed, one woman commented on her questionnaire that these difficulties are cumulative and that widows face the double front of single status and older age: *A single pension is obviously more difficult to manage a home and ageing car (essential in this locality– shops, etc.) than a couple–alike; with a lower pension each . . . Most 'pensioners' . . . have lived through long difficult times–child rearing up (sic), during the Depression, War service, etc.–so would not have much to fall back on now.*

Widows may also have difficulties with financial management independent of the amount of money available. Many widows have little experience of financial matters (Morgan, 1991). As another woman wrote: *I had not banked, shopped or driven the car for many years and had to learn the lot . . . I am still nervous of it all but managing.*

In other research (O'Bryant and Morgan, 1989), only one-third of widows had held a bank account in their own name during the time they were married. Further, only 43% of couples had discussed the wife's financial survival in the event of the husband's death.

Housing is another structural issue for widowed women. While many women may be motivated to move house for practical reasons (Bradsher et al., 1992; Macunovich et al., 1995), others chose to remain in their own homes (Jones Porter, 1994). However, in this study, while some women wrote comments about the difficulties maintaining their home, widowed women were no more likely to be stressed with their living arrangements than married women.

The data on social support suggest that support for widows is as high as support for other women. There is, however, a suggestion that the nature of women's relationships changes when they are widowed. Widows were more likely to say they want less time alone and were less likely to say they rarely or never have time on their hands they don't know what to do with.

For many older widowed women, friends and family retain the significance that they always had. Some older widows speak of the increased drive to keep 'busy' even though, in reality, life contains far fewer commitments and engagements after the death of their spouse. Being busy is also seen as a means of escaping the reality of living alone–greater social isolation and the loss of intimacy. In comparison, some widows describe an improvement in their lives, widowhood allows them greater flexibility and freedom with their time and encourages a greater emphasis on the 'self' and development of self identity. Some widows find their 'singleness' makes them more aware and sensitive to the outside world (Unpublished report to Vic Health & Community Services, Older Women as Widows Project. *Alma Unit on Women and Ageing*, November 1996).

Compared to married women, widows were more likely to say they make their own decisions about their life. Interpretation of these data is complex. While the result may imply a degree of liberation and autonomy it may also relate to the loneliness women express following the loss of their spouse.

Difficulties with children or other relatives may reflect conflict over their autonomy, and stereotyping of the single parent as infirm. For older women, widowhood may present problems in relation to the roles and responsibilities to, and expectations of, their family members. Many older widows resent the automatic assumptions made by family that their age and singleness mean they are either available and willing to work as (unpaid) child carers, domestic help, etc., or that they are incompetent in terms of maintaining independent living, managing their own time, responsibilities and conflict. Nevertheless, the relationship with family, particularly with children and grandchildren, is important to older widowed women. Older widows can contribute positively to families, giving emotional and financial support, but this contribution needs to be balanced with a recognition of their autonomy and desire for rich, fulfilling lives outside of the family unit (Finch, 1989; Lopata, 1979; Morgan, 1989).

While this quantitative analysis highlights some negative implications of widowhood for the health and social needs of this cohort of women, it must be remembered that the qualitative data provided by the same cohort suggest a reality for older widowed women which is not dominated by loss and deprivation. A fuller analysis of these comments is reported elsewhere (Feldman, Byles and Beaumont, 1998). Other researchers have noted that such in-depth analysis reveals 'the extraordinary variability that characterises the experience of widowhood' (Martin Mathews, 1991).

CONCLUSIONS

This study identifies women widowed in the last 12 months as having particular physical and mental health needs that are beyond those of other older women. These differentials may resolve over time as women adjust to their bereavement. This hypothesis is supported by the women's comments. Further research within the longitudinal study will help clarify this process, as well as those factors that promote or inhibit positive outcomes.

The study also supports the view that women's needs are not restricted to health but include financial, social and practical issues. These needs may resolve over time, or they may worsen as women age and have less physical, financial and social resources. Further research will allow these outcomes to be separated from the effects of ageing.

Further research is also required to explore the women's needs in detail, to obtain women's views on appropriate services, support and information and to determine if the health differentials resolve over time. Further analysis of comments provided by the women completing the questionnaires may also provide further insight for the provision of appropriate health care and community support.

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Driving myself: main forms of transport among older women in rural and remote Australia

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Abstract

Transport is a major concern for older people. For many, driving is not only a means of transport, but also a means of independence and identity. Moreover, alternative forms of transport may not be acceptable because of difficulties with physical access, availability, convenience or cost. These problems are particularly true in rural areas where subsidised public transport is less frequently available.

Among older women in the Australian Longitudinal Study on Women's Health, driving is the major form of transport, especially for those in rural and remote areas. In this paper we will describe the trends in the proportion of women who drive themselves as their main means of transport, what factors are associated with giving up driving, and what alternative transport means older women adopt.

Introduction

With the ageing of the Australian population, the wellbeing and safety of older drivers is becoming of increasing importance (1). Ageing is associated with many changes in physical and cognitive function that may interfere with people's capacity to drive. Older drivers have been shown to have high prevalence of conditions such as vision and hearing problems that can hinder driving abilities (2, 3). Musculoskeletal problems such as weakness, joint pain and stiffness may also affect driving ability (4, 5). Other chronic health conditions such as heart disease, diabetes and stroke have been associated with reduced driving ability (6) and drivers who have cognitive impairment or dementia have been shown to have an increased risk of car accidents (7, 8). Further, many drugs that are commonly used by older people (including antihypertensives, ophthalmic agents, and analgesics) can have adverse effects on driving skills and responses (9).

While older drivers account for a small proportion of motor vehicle accidents, they do have a proportionally higher risk of accidents when compared with younger age groups (10). Predictors of driving accidents among older people include back pain, musculoskeletal problems (7, 11), foot problems and difficulty walking (12) and falls (13).

Because of the risk of accidents, Australia has stringent guidelines outlining medical disorders and age-related conditions that render an individual unfit to drive (14). Many older drivers voluntarily reduce their driving (15), avoid driving at night or in rain (16, 17, 18), or cease driving altogether, or they may be forced to give up their driver licence following an assessment of their fitness to drive. Driving cessation has been shown to be associated with poor vision and hearing, with decline in cognitive and motor skills, and decline in general health (19). It has also been noted that women are more likely to cease driving than men of the same age (20, 21), and that rural drivers are less likely to cease driving than urban drivers (18). Among women, those who cease driving tend to be older, have more chronic conditions (including angina, diabetes, and poor vision), and have lower cognitive ability scores (18). Lower income and availability of alternative transport have been associated with driving cessation in urban areas (15) and being involved in a previous road accident has been shown to be a significant predictor of driving cessation in rural areas (22).

Johnson (23) points out that most older adults are very unwilling to make the decision to stop driving, and that many regret the decision once it is made. Giving up driving has been associated with depression, loneliness and isolation (22, 24). Driving may be an important source of independence and identity for many older people (23), and continuing driving may help older people have a more positive view of their own ageing (25). Many older drivers feel that driving is very important for their well being (25) and, driving may be the only available means of transport and autonomy, especially for older people in rural areas (26).

Among the older cohort of women in the Australian Longitudinal Study on Women's Health, driving is the major form of transport, especially for women in rural and remote areas. In this paper we will describe the trends in the proportion of older women who drive themselves as their main means of transport, what factors are associated with giving up driving, transport alternatives, and some of the restrictions on life activities experienced by older women who have ceased driving.

Method

The Australian Longitudinal Study on Women's Health (ALSWH) is a population-based study of changes in the health of a national sample of Australian women. The women were randomly sampled from three age-cohorts from Medicare Australia, with deliberate over-sampling of women living in rural and remote parts of Australia. The details of the survey have been published elsewhere (27) and overviews of the survey, its rationale and methods, can be located on the Study's web site: http://www.alswh.org.au

Women in the older cohort were aged 70–75 years at the time of the first postal survey in 1996 and have since been invited to complete three follow-up surveys—Survey 2 in 1999, Survey 3 in 2002, and Survey 4 in 2005 (when the women were aged 79–84 years). Each Survey included a large number of questions about the women's health and lifestyle, and women have an option to write qualitative comments at the end of the survey. Withdrawals and reasons for withdrawal are recorded by study staff, and deaths are ascertained through the National Death Index.

Main measures

Area of residence

Residential postcode at each survey was used to classify the women as living in an `urban', `large rural', `small rural' or `other rural and remote' areas according to an Australian government classification scheme (28).

Main means of transport

At Surveys 3 and 4 women were asked: "What is your main (most common) means of transport", with response options being "car (you drive)", "car (someone else drives)", "taxi", "bus", "tram or "train", "other". Women were also asked "Is public transport available when you need it?" Options were classified as good if women answered "all of the time" "most of the time" or "some of the time", and poor if women answered "a little of the time" or "none of the time".

Health

Self-rated health was measured at all surveys and reported as "excellent", "very good", "good", "fair" or "poor" and these responses were dichotomised as "excellent–good" and "fair or poor" to assess change in health between Survey 3 and Survey 4. Survey 3 responses were used to identify women with common symptoms that may affect driving (such as stiff and painful joints, back pain, problems with feet), and conditions such as heart disease (angina and heart attack), diabetes, hypertension, arthritis, and stroke. Survey 3 responses were also used to identify women with a history of falls (reporting "yes" they had a fall to the ground in the last year), and those who reported difficulty walking 100 metres.

Disability

In Surveys 3 and 4, women were asked if they had difficulty reading newspaper print, even with glasses, and in Survey 4 women were asked if they had difficulty hearing a conversation, even with a hearing aid. In all surveys women were also asked whether they needed help with daily tasks because of long-term illness, disability or frailty, and also whether they regularly provided care to another person.

Health service use

Health service use in the last year was evaluated at Survey 4 using the number of visits to a general practitioner (0–4, 5 or more), and consultations with specialist medical practitioners (yes or no).

Socio-demographic factors

At Survey 1, information was sought on highest educational qualification (classified as up to school certificate, and higher school certificate and beyond). Marital status was ascertained at each survey. At each survey, women were also asked: "How do you manage on the income you have available?" with options ranging from "impossible" to "easy".

Analysis

An initial analysis was undertaken to assess the percentage of women in each area of residence classification who identified "car (you drive)" as their main means of transport and the proportions reporting the other options. Further analyses assessed the change in women's main means of transport between Survey 3 and Survey 4. Women were then classified as "still driving" (answering "car (you drive)" at Survey 3 and Survey 4) or as "ceased driving" (answering "car (you drive)" at Survey 3 and any of the other options at Survey 4). Chi-square analyses were then undertaken to explore associations between ceasing driving and symptoms and conditions at Survey 3, and changes in responses to other survey items between Survey 3 and Survey 4. The third phase of the analysis compared some relevant lifestyle factors for women who were still driving themselves and those who had ceased driving. All analyses were stratified by area of residence and Chi-square tests were used to assess associations between variables and to test for trends and interactions across area of residence strata.

A key word search was used to identify women's qualitative comments about "driving" and "transport" that illustrated some of the issues faced by women living in urban and rural areas.

Results

In 1996, 12432 women aged 70–75 years agreed to participate in the ALSWH and completed Survey 1. A total of 8647 women completed Survey 3 (69.6% of the original cohort), and 7153 women completed Survey 4. Between Surveys 3 and 4, 579 women died and a further 519 women withdrew from the study due to poor health or other reasons. Based on their reported residential postcode in Survey 3, 42% of women lived in urban areas, 12% lived in areas classified as `large rural', 15% lived in `small rural' and 31% lived in areas classified as `other rural/remote'. There was a strong association between main means of transport and area of residence at Survey 3 (X^2=454.45; df=15; P<0.0001) with women in more rural and remote areas being more likely to drive themselves at Survey 3, and less likely to use public transport (See Table 1).

Table 1 **Main means of transport for women aged 76–81 years, living in urban areas, large rural centres, small rural centres, and other rural and remote areas of Australia in 2002 (Survey 3)**

Area	Car (you drive) %	Car (someone else drives) %	Taxi %	Bus %	Tram or train %	Other %
Urban (N=2622)	51	26	3.4	15	3.8	0.88
Large rural centre (N=752)	56	29	5.3	8.4	0.00	1.5
Small rural centre (N=948)	63	27	3.8	5.7	0.11	1.5
Other rural/ remote (N=1908)	68	26	1.8	2.2	0.10	2.5
Total (N=6230)	3638	1635	201	559	102	95

A total of 5657 women completed the transport item for both Survey 3 and Survey 4 and 3383 (60%) of these women reported driving themselves as their main means of transport at Survey 3. The majority of these women (2909, 86%) also reported driving themselves as their main means of transport at Survey 4, but 10% reported they were now being driven by someone else, and a small percentage were using taxis, buses and other options as their main means of transport (see Table 2). Change in main means of transport was not associated with Survey 3 area of residence (X^2=0.33; df=3; P=0.95), however women with higher levels of education were less likely to cease driving (OR:0.7; 95%CI:0.6–0.9). There was an association between ceasing driving and Survey 3 reports of taking five or more medications and being limited a lot in walking 100 metres (See Table 3). Ceasing driving was also associated with stroke and arthritis.

Table 2 **Change in main means of transport of older women in Australia between Survey 3 (2002) and Survey 4 (2005)**

Survey 4	Car (self)		Car (other)		Taxi		Bus		Tram/train		Other		Total
Survey 3	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	
Car (self)	2 909	(86)	352	(10)	35	(1.0)	54	(1.6)	13	(0.38)	20	(0.59)	3 383
Car (other)	83	(5.5)	1 282	(86)	47	(3.1)	50	(3.3)	4	(0.27)	32	(2.1)	1 498
Taxi	2	(1.2)	29	(17)	119	(72)	10	(6.0)	0	(0.00)	6	(3.6)	166
Bus	9	(2.0)	84	(18)	35	(7.6)	311	(68)	4	(0.87)	16	(3.5)	459
Tram/train	3	(4.1)	20	(27)	3	(4.1)	10	(14)	36	(49)	2	(2.7)	74
Other	2	(2.6)	31	(40)	10	(13)	6	(7.8)	0	(0.00)	28	(36)	77
Total	3 008		1 798		249		441		57		104		5 657

There was no association between ceasing driving and change in marital status, or transitions in difficulty in managing on income (See Table 4). Compared with women who continued driving, women who ceased driving as their main means of transport between Surveys were more likely to show a transition to worse self-rated health and to needing help with daily tasks, and were less likely to have commenced caring for someone else. Ceasing driving was associated with improvement in vision between surveys, but women were also more likely to cease driving if they had worse vision at Survey 3 (18% of those who ceased driving had poor vision at Survey 3, and 9% of those who continued driving had poor vision at Survey 3—X^2=32.0; df=1; P<0001). Women with poor hearing at Survey 4 were also more likely to report ceasing driving (OR:1.3; 95%CI: 1.1–1.6). Women who ceased driving by Survey 4 were more likely to report improvement in their rating of the availability of transport than women who continued to drive.

Table 3 **Association between symptoms and conditions of older women in Australia at Survey 3 and transitions in driving between Survey 3 and Survey 4**

Symptom/condition at Survey 3	N	Still Driving Survey 4 N=2909 (86%)	Ceased Driving Survey 4 N=474 (14%)	OR (95% CI)**
		N* and % reporting symptom/condition at Survey 3		
Stiff and painful joints	1 952	59%	64%	1.2 (1.1–1.5) P=0.03
Back pain	1 703	52%	52%	1.0 (0.9–1.1) NS
Problems with one or both feet	1 127	34%	37%	1.2 (0.9–1.4) NS
5 or more medications	698	20%	27%	1.6 (1.3–2.0)***
Fall to the ground	501	15%	17%	1.1 (0.901.5) NS
Limited a lot in walking 100m	155	4.2%	11%	2.9 (2.0–4.2)***
Hypertension	1 895	55%	60%	1.2 (1.0–1.5)
Arthritis	1 759	51%	59%	1.4 (1.1–1.7)
Heart Disease	667	19%	23%	1.3 (1.0–1.6)
Diabetes	314	8.9%	12%	1.3 (1.0–1.9)
Stroke	172	4.5%	8.4%	2.1 (1.4–3.0)

* Denominators (total N) vary due to different amounts of missing data for each item
** Odds of ceasing driving if experience symptom or condition compared with odds of ceasing driving if not experiencing symptom or condition.
** Significant association in Chi-square analysis P<0.001
NS: No significant association in Chi-square analysis P>0.05
There was no interaction between area of residence, driving and other variables in Table 3.

Table 4 **Association between transitions in driving and transitions in other health and lifestyle factors between Survey 3 and Survey 4**

Transition	N	Still Driving Survey 4 N=2909 (86%)	Ceased Driving Survey 4 N=474 (14%)	OR (95% CI)**
		N* and % with change in health/lifestyle factor		
Change in Marital Status (married/defacto to widowed/divorced/ separated)	531	7.8%	6.4%	0.8 (0.5–1.2) NS
Transition to finding managing on income "easier"	724	10%	12%	1.2 (0.9–1.7) NS
Transition to finding managing on income "more difficult"	462	60%	6.7%	1.2 (0.8–1.9) NS
Transition in self-rated health: improved health	322	9.5%	10%	1.1 (0.8–1.5) NS
Transition in self-rated health: worse health	454	13%	18%	1.5 (1.1–1.9) p=0.005
Transition to needing help with daily tasks	434	3.1%	16%	5.9 (4.1–8.1)***
Commence providing care for someone else	840	16%	9.7%	0.6 (0.4–0.8)***
Cease providing care for someone else	796	15%	17%	1.2 (0.9–1.5) NS
Vision improved	362	10%	16%	1.7 (1.3–2.3)***
Vision worsened	826	4.7%	6.4%	1.5 (0.95–2.2) NS
Availability of public transport: Improved from "none"/ "a little of the time"	308	4.4%	7.8%	2.0 (1.4–3.0)***

* Denominators (total N) vary due to different amounts of missing data for each item
**Odds of ceasing driving if experience transition in health/lifestyle compared with odds of ceasing driving if not experiencing transition in health and lifestyle.
*** Significant association in Chi-square analysis P<0.001
NS: No significant association in Chi-square analysis P>0.05
There was no interaction between area of residence, driving and other variables in Table 4.

At Survey 4, women who ceased driving were more likely to report having made five or more GP visits, and to have made at least one specialist visit (Table 5). They were less likely to be caring for someone else either in their own home or elsewhere. Women who ceased driving were also more likely to report troubles getting to places at night, getting to shops and services, and getting beyond their local neighbourhood. They were more likely to report that they had not been outside their home or outside their immediate neighbourhood, and that they had not been to movies, theatre etc, a sporting event, a restaurant, or attended a class or course.

Table 5 **Lifestyle factors for older women who were still driving themselves and those who had ceased driving**

Lifestyle factor	N*	Still Driving Survey 4 N=2909 (86%)	Ceased Driving Survey 4 N=474 (14%)	OR (95% CI)**
		N and % reporting lifestyle factor at Survey 4		
More than 5 GP visits	1956	58%	66%	1.4 (1.1–1.8) ***
Specialist visits	1572	46%	57%	1.6 (1.3–1.9) ***
Care for someone who lives with you	392	13%	7.6%	0.6 (0.4–0.9) ***
Care for someone who lives elsewhere	769	26%	11%	0.4 (0.300.5) ***
Trouble getting to places at night	733	23%	28%	1.3 (1.0–1.6) ***
Trouble getting to shops and services	130	2.3%	17%	9.2 (6.3–13) ***
Trouble getting beyond local neighbourhood	427	12%	28%	3.0 (2.3–3.8) ***
Not been beyond property or apartment building in past month (eg. To shops, services, neighbours)	152	3.7%	9.4%	2.9 (2.0–4.2) ***
Not been outside immediate neighbourhood in past month	362	9.4%	19%	2.5 (1.9–3.3) ***
Not gone to movies, theatre, concerts etc.	2019	59%	71%	1.8 (1.4–2.2) ***
Not gone to a sporting event	2733	81%	92%	2.7 (1.9–3.9) ***
Not eaten at restaurant	890	26%	31%	1.3 (1.0–1.4) p=0.02
Not attended a religious service	1776	53%	57%	1.2 (1.0–1.4) NS
Not attended a class/course	2614	77%	88%	2.1 (1.6–2.9) ***

* Denominators (total N) vary due to different amounts of missing data for each item
** Odds of ceasing driving if reporting lifestyle factor compared with odds of ceasing driving if not reporting lifestyle factor.
*** Significant association in Chi-square analysis P<0.001
NS: No significant association in Chi-square analysis P>0.05
There was no interaction between area of residence, driving and other variables in Table 5.

Discussion

While this study is limited by a lack of detailed information on driver licensing, driving behaviours and driving habits, it does provide a significant amount of information about older women drivers across Australia and the factors that affect whether they drive themselves as their main means of transport.

In this study, the majority of women aged 76–81 years (at Survey 3) who reported driving as their main means of transport were still driving themselves when re-surveyed three years later. The study suggests that a majority of older women will maintain driving while ever their health will allow it. Conditions such as arthritis and stroke which are associated with physical limitations were strongly associated with driving cessation. Similarly, women who had trouble walking and who had negative transitions in their self-rated health and their need for assistance with daily tasks were more likely to cease driving. These factors may be interrelated in that women with arthritis and stroke are also likely to have mobility limitations and disability on activities of daily living.

Poor vision at Survey 3 was also strongly associated with driving cessation. This association with vision has been reported in other research (eg. 19) and it is noted that vision accounts for 95% of driving capability (4). In their comments the women highlighted the importance of good vision for maintaining driving.

> My biggest problem is my poor eyesight, because of which I have had to give up driving and rely on my husband and family members and friends. (Rural woman, Survey 3)

A number of women commented on the positive effect of cataract removal in enabling them to continue or resume driving. However, it is notable that 9% of the women who continued driving had indicated they "could not read a newspaper, even with glasses" at Survey 3. But, we do not have information about these women's distance vision.

While women in more rural and remote areas were more likely to drive themselves than urban women, there were no differences in the probability that these women would cease driving by Survey 4, and there were no significant interactions between health and lifestyle factors, driving cessation and area of residence. The rural and remote dwelling women themselves noted that although driving is essential to their lifestyle, they could often no longer drive the long distances to get to health care and other services. Others noted the frustration and difficulty finding alternative forms of transport in smaller country towns. Mostly women who did not drive had to rely on their husbands, if they were alive and fit to drive, and/or family and friends.

The women's comments highlighted other associations between driving, health and lifestyle. Some women wrote about the interaction between their driving, their health and their husband's health. One urban woman described her need to have her cataract removed because of her need to drive herself and her ill husband. Another woman discussed her lack of social activity with her husband who had dementia "We never go out together anymore as I will not go in the car when he is driving!!"

As in other research (23), the women in our study identified driving as a source of concern. This concern is illustrated by one urban woman who said:

> I find myself a nervous driver. Should I be driving? Afraid of being housebound though. Only driving locally, avoid freeways. Never drive at night now. Using taxis for unknown destinations in case I get lost. (Urban, Survey 3)

One rural woman described "voluntarily" giving up her licence because of poor vision and how she "drenched the form in tears". Another discussed her "real fear" that she may not be able to continue driving and the threat this would pose to "my independence that I value".

As another woman said:

> …. while I'm still able to drive I feel I have wings. (Rural, Survey 3)

Women who ceased driving reported greater difficulties accessing shops and services and had relatively more limited life space and activities with almost one in five women not venturing beyond their local neighbourhood. In their comments, the women also discussed the limits placed on their lives by inability to drive, lack of suitable public transport and inability to afford taxis. These comments were not limited to rural and remote areas, but were more pronounced in these areas where public transport options are limited or non-existent. As one rural woman wrote:

> We have no public transport so its legs or car we have to use.

Conclusion

These analyses show that older women in more rural and remote areas are more likely to drive than urban women. However, women in these areas are vulnerable to the same factors that limit driving as women in other areas. Ceasing driving appears to have a major impact on women's lives, and is a major concern for older women. Importantly, women who are no longer driving are also those who have had major negative health transitions. So these women have lost not only their main means of transport, but ceasing driving is also a marker of decline in other capacities and an increase in need for care and assistance. There is a need for greater understanding of how we can respond to the changing needs of older women around this important life transition, as well as considering the safety of other road users and members of the community.

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'Is Anybody Listening?' The Experiences of Widowhood for Older Australian Women

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ABSTRACT. This paper discusses preliminary findings from participants in the baseline survey of the Australian Longitudinal Study on Women's Health (Women's Health Australia: WHA) who reported their marital status as widowed. A total of 12624 women, aged 70-75 years, completed a self-administered 260-item questionnaire, and 4335 of these women were widowed. Many of these women provided additional qualitative comments about their health, social and financial circumstances after the death of their spouse. This paper presents a thematic analysis of the qualitative comments and builds on the findings of the quantitative analysis of baseline data. The aims of this part of the study are to examine the short- and long-term effects of widowhood on the health and wellbeing of older women and to explore the process of

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change they experience after the death of a spouse. Preliminary findings suggest that, as a key life event, widowhood has an initial negative impact on the health and wellbeing of older women, but in the long term it may be accompanied by a positive shift into a new life phase.

KEYWORDS. Widows, health, financial, social support

INTRODUCTION

While the aging of the world's population is a key global issue, it is less well recognized as primarily a female concern. At the turn of the century the average life expectancy for both women and men in developed countries was less than sixty years, but by 1994 women, on average, were living beyond eighty years and had exceeded the average male life expectancy by approximately seven years (United Nations & Statistical Office Department of International Economic & Social Affairs, 1991). Australia is the sixth largest country in the world with a small population of approximately 18.3 million persons, the bulk being concentrated on the south east coast extending from Melbourne in the south, to Sydney and on up north in a coastal plume of townships. The most recent Australian demographic data reflects the global picture and confirms that Australian women outlive men by approximately seven years, with women comprising 57 per cent of the population aged sixty-five years and over (Australian Bureau of Statistics, 1997). This trend is expected to extend well into the next century resulting in a significant population of older women for whom widowhood will mark a 'normal' transitional phase in their life-cycle.

However for many women widowhood is a transitory period, from 'wife' to that of a single older woman, providing them with the opportunities for development and re-establishment within their particular communities (Lieberman, 1997; Walker-Birckhead, 1985). Friedan (1993) argues that in the past, researchers have resisted confronting the fact that there is potential for further growth in old age. Rather, the focus is on deterioration, loss and decline, a trend that Friedan insists must be overcome before it is possible to envisage new possibilities for ourselves or our society. The women in our study have confirmed that the social consequences of the death of a spouse, of moving from being married to widowed, are likely to be considerable, and yet widowhood has largely been overlooked in health and social research. These women tell of their experiences, of new directions and alternative possibilities that this stage of life presents to them, as well as the external factors that impact on their health and well being.

LITERATURE REVIEW

The relatively small body of American, European and Australian social research concerned with the experience of widowhood consistently identifies the death of a spouse as one of the most stressful and disruptive events in the human life-cycle, with little attention being paid to the complex interaction of the social, physical, cultural or economic changes that take place in the longer term. Canadian and American writers are concerned that widowed women are stereotyped as little more than women who have lost their spouses (Gee & Kimball, 1987; Silverman, 1986), and that widowhood has been constructed within the context of crisis and personal affliction (Barrett & Schneweis, 1980; Wenz, 1977), as a gateway to profound bereavement and long-term mental health problems (Kirshling & Barron McBride, 1989; Lund, 1989; Prigerson, Frank & Kasl, 1995; Stein & Susser, 1969). Other studies associate widowhood with premature mortality (Bowling, 1988; Mendes de Leon, Kasl & Jacobs, 1994) and suicide (Guohua, 1995). Yet, little attention has been paid to the complex interaction of social, physical, cultural and economic changes that take place over time for older women who have lost their spouses.

Facing life as a single older woman is often accompanied by the increased importance of social networks, family relationships and financial security. A number of American studies have focussed on the challenges confronting older women after the death of a long term marital partner, exploring changes that accompany the experience of widowhood beyond bereavement (Lopata, 1987; Patterson & Carpenter, 1994; Silverman, 1986; Wenz, 1977). These studies have identified the potential for social stigmatization that is often associated with widowhood and which can impact directly on the quality of health and wellbeing of these women. In contrast, Australian writers (Harrison, 1983; McCallum, 1986) argue that widowhood is a central event of aging which is the process of moving through life transitions that have been socially constructed. Harrison argues that the perception of women fulfilling roles intrinsically linked to the family, leaves many widowed women vulnerable to the negative stereotypes of older women as unproductive, isolated and without meaningful roles in society. Older single women are more likely to be impoverished than couples or single men and the threats to income security after the death of a spouse are considerable, often leading to the experience of poverty (Bound, Duncan, Laren & Olemick, 1991; Rosenman, 1982). Not only do they have to adjust to living on one annuity, but many older women in this generation have had little past experience of financial matters (Morgan, 1991).

The shift from the status of married to widowed is often accompanied by a freedom from the responsibilities of caring for an infirm spouse or the restrictive conventions of marriage (George, 1980; Lopata, 1987). In such cases, the challenges faced by older women after the death of a husband may ''comprise a new and uncharted journey'' (Lieberman, 1997: 3). Walker-Birckhead's studies (1985, 1997) of Australian rural women have also provided a positive view of widowhood as a time that has been anticipated as empowering and liberating, whilst Alston (1995) also describes the period of widowhood for Australian women as ''. . . the most powerful time in a farm woman's life, because it may be the only time she achieves autonomy in her productive life'' (Alston, 1995: 60). The perspective offered by these studies is of widowhood as a process of change, but importantly they introduce a level of theoretical analysis to a body of work which has in the past been largely policy driven, descriptive and 'atheoretical' (Arber & Ginn, 1995; Gee & Kimball, 1987; Martin-Matthews, 1991).

TRANSITION NOT ADJUSTMENT

In our discussion of widowhood we acknowledge the growing body of international work which adopts a developmental theory perspective on life events (Bernard & Meade, 1993; Cole, Achenbaum, Jakobi & Kastenbaum, 1993; Heaven, 1992). Contemporary research on adult development has allowed for both a better understanding of the changes that take place across the human life-cycle (Erikson, Erikson & Kivnick, 1986; Gutmann, 1987; Wainrib, 1992) as well as more realistic expectations of the aging process (Heaven, 1992). In the main, a life span perspective acknowledges that people change throughout their lives and the subsequent role transitions that they experience ''are normal parts of life, not crises to be resolved'' (Murrell, Norris & Grote, 1988: 97). Fahey and Holstein (1993), for example, describe life stages as ''increasingly fluid'' and argue that studies of specific life events should be undertaken within the context of past experiences.

Feminist researchers argue for the life-cycle perspective in studies of aging generally and widowhood specifically (Finch, 1989; Harrison, 1983; Jones Porter, 1995; Martin-Mathews, 1987). Theoretical or methodological approaches which emphasize or assume a male orientation to life are often used to measure and assess the predominantly female experience of widowhood (Gilligan, 1982). In her extensive work on older Canadian widowed women Martin-Matthews argues that a woman's past life greatly influences her attitude to and experience of widowhood; ''no single stage of a person's life can be understood or viewed apart from its antecedents and consequences'' (Martin-Matthews, 1991: 113). Markson (1983) also identifies the aging experience as a life stage and argues that for American women, this stage is often dominated by social and cultural expectations of appropriate behavior that do not reflect the realities of their lives. Markson claims that the lives of many older American women, particularly after the death of a spouse, may no longer fit a predictable pattern or an expected norm. This perspective is supported by the work of Daly (1997) in her work on Australian women's experience of menopause.

By locating any analysis of widowhood within a life-cycle framework, it becomes possible to avoid a negative perspective of this normal life experience, whilst still capturing the significance of the loss for the individual. A life course approach provides a more useful framework for understanding the changes that accompany the death of a spouse. The personal commentaries of the women in this study reveal much of the emotional, psychological and social impact of widowhood on their lives and their emergence from the 'crisis' of bereavement.

THE STUDY

The Australian Longitudinal Study on Women's Health, otherwise known as Women's Health Australia (WHA), is the first national longitudinal study of women's health. In contrast to other international longitudinal studies, which have focused on women from specific geographical areas (Steinmetz, Kushi, Bostick, Folsom & Potter, 1994; Avis & McKinlay, 1995), or from particular occupation groups (Barton et al., 1980), this study was designed to explore the factors which promote or reduce good health in women who are broadly representative of the whole Australian population in the study age groups. To achieve this aim, the Australian Medicare database was chosen as the sampling frame, because it is believed to be the most complete and up to date population list. Almost all women in Australia, including immigrant and refugee women, are registered with this government health insurance agency. Few other American or European studies have attempted to recruit from such a wide geographic area. For example, the Netherlands Longitudinal Study of Socio-Economic Health Differences (LS-SEHD) drew from population registers in the area around the city of Eindhoven (Mackenbach, Van de Mheen & Stronks, 1994); the Iowa Women's Health Study used the Iowa register of women drivers' license holders as a sampling frame (Steinmetz et al., 1994); and the Massachusetts Women's Health Study recruited from census registries in 38 cities and towns in Massachusetts (Avis & McKinlay, 1991).

The only other major cohort study of women's health to have recruited from an extensive geographic area is the Nurses' Health Study, which includes women from 11 America states (Barton et al., 1980). However, as the name implies, the Nurses' Health Study does not include women from all walks of life, and it was initially funded to examine fairly specific women's health issues (for example, the relationships between contraceptive use, smoking and the risk of major illness) among married nurses (Colditz, 1995). Similarly, the Iowa Women's Health Study has a strong focus on a particular health issue (associations between diet and cancer) (Steinmetz et al., 1994), and the Massachusetts Women's Health Study focused predominantly on menopause and the health of mid-age women (Avis & McKinlay, 1995).

The WHA project was established as a result of an Australian government initiative to conduct a longitudinal study on women's health (Brown et al., 1996) and is designed to track the health of three cohorts of women over a period of up to twenty years. To date, baseline data have been collected from more than 40,000 women, aged 18-23, 45-50 and 70-75 years (Brown et al., 1998). Women from rural and remote areas were deliberately over-represented in the sample and were selected in twice the proportion which exists in the Australian rural and remote population in each age group (54 per cent of the sample were from rural areas and 3 per cent were from remote areas). Women from capital cities and other metropolitan areas made up the balance of the samples. While there was some over-representation of women born in Australia and other English speaking countries in all three groups, women from Europe and Asia were well represented. (For example, 10.6 per cent of the older cohort were born in a non-English speaking European country, compared with 7.9 per cent of women in this age group in the last Australian census.)

The baseline measures included a 260 item questionnaire on a wide range of issues designed to explore the social and environmental aspects of women's lives as well as the biological and psychological determinants of health. Analysis of the WHA cross-sectional data (Byles, Feldman & Mishra, 1999) revealed important differences between women who have been widowed for less than 12 months from those who have been widowed for more than 12 months. It also identified three major dimensions integral to the quality of life of women, 70-75 years, after the death of their spouse as being those associated with health, financial and social circumstances. As would be expected, women in the first 12 months following the death of a spouse scored poorer on physical and mental health measures when compared to women widowed for 12 months or more. These recently widowed women also had the lowest self rated health and were more likely to report that they were stressed about their health. The recently widowed women were also more likely to be taking medication for 'nerves' (18% reported use of these medications) or medications to help them sleep (25% reported use) than women widowed for longer than 12 months. The second dimension was related to anxiety about financial and practical issues. There was an association between having difficulty managing on the money available and being widowed for less than 12 months, but other women also revealed anxiety about money. Women widowed for less than 12 months were more likely to classify themselves as stressed regarding a range of practical issues including housing. Not surprisingly the third dimension to emerge from the quantitative analysis was concern about living alone, the importance of relationships with children, other family members and the broader social community (Byles et al., 1999).

Whilst the results of the quantitative study do highlight the negative implications of widowhood for this cohort of women, particularly in the first 12 months of bereavement, the study also provides a valuable framework for comparing the short and longer-term experiences of widowhood. Building on these results we now turn to the qualitative data to add another dimension to the empirical data, to provide a picture of the impact of the three dimensions that are central to the quality of life for older women after the death of a spouse.

Data Analysis

Of the 12,624 women in the 70-74 age cohort, 4,355 (34.5%) defined themselves as 'widowed.' The final question in the 260 item mailed survey asked women "is there anything that we have missed or that you would like to add." Over 700 of the women provided qualitative accounts that specifically referred to their experiences of widowhood. It is these comments that provide a more detailed picture, of 'the extraordinary variability that characterizes the experience of widowhood' (Martin-Mathews, 1991). We recognized the importance of "integrating" (Reinharz & Rowles, 1988: 14) "the experience of women themselves into any account of their lives" (Daly 1997: 1) and we did so by utilizing qualitative methodologies in tandem with a quantitative study. Gubrium and Sankar (1994) advocate the integration of qualitative methodologies in aging research, arguing that qualitative data may highlight significant aspects of older people's health and wellbeing that are not clearly identified by quantitative methodologies alone.

We turn now to the women for what Luborsky (1993) calls an 'insider's view' of widowhood. It is not our intention to contradict the quantitative conclusions, but rather to "shed new light on the meaning of the results obtained" (Pillemer, 1988: 262). Widowhood is a process of change and ". . . one cannot interpret the nature of those experiences by mechanically assigning subjects to groups such as . . . male or female, young or old, married or widowed" (Gubrium & Sankar, 1994: viii). To enhance the categorical comparisons of women in the quantitative analysis, we reviewed the women's own comments. The women provided us with extensive accounts of "the multifaceted and complex nature of human experience" (Gubrium & Sankar, 1994: ix) from their perspective. We applied a thematic analysis to their written qualitative comments, reading and re-reading them so as to understand their concerns and perceptions about the experience of widowhood, specifically in relation to the three major dimensions identified in the base-line cross-sectional data. Thematic analysis is a "subjective and interpretative process" (Kellehear, 1993: 39) and described by Luborsky as being about "the speaker's experience of the past, present, and anticipated future set within an extended dialogue with its own history . . ." (Luborsky, 1993: 207). Not only is a thematic analysis conducive to coding and systematic comparison (Luborsky, 1993) but it is a complementary methodology in relation to the findings of the baseline study, and provided us with a cohesive picture of the women's experiences. The quotes which we present were selected to illustrate the major concerns of the women.

THE STORIES THAT WOMEN TELL

The comments made by the women in the 70-74 aged cohort underline the strong desire of older widowed women to express their needs and concerns. Through their qualitative accounts, the women provided a retrospective view of life after the death of their husband. Their comments reminded us of the complex and integral relationship between health and wellbeing, financial and social circumstances. Whilst most women looked towards a positive future, their stories also tell of the ongoing struggles of daily life. Here we suggest that to adopt a negative/positive split in relation to their observations is simplistic and does not take account of the fact that as with other experiences of life, widowhood is positioned somewhere on a continuum, with "some good days and some bad days."

Throughout the comments there is an attitude of courage, strength and stoicism. Many women used humor as a coping mechanism and gave the impression of being tough survivors: "life wasn't meant to be easy, but I find it interesting, challenging and surprising, and worth living a day at a time."

The women do not place time limits on the process of learning to live alone, to managing relationships or coping with failing health. They describe the period immediately after the death of a spouse as a time of shock, of bewilderment, that it takes time to re-establish a life and tell of how much time has passed since the event. They talk about what they do with their time now and emphasize that in time "things will be better." Whilst the death of a long-term partner is accompanied by "a sadness and loneliness that I thought would never pass" (woman widowed two and a half years), women spoke of the following years as being accompanied by positive changes and a sense of future. One woman puts it this way:

> I felt so desolate and despairing (at the time of his death) . . . I have managed to survive and lead a comfortable and quite interesting (albeit at times a rather lonely) life. I am pleased that I have moved, settled and adjusted and handle all of my affairs. I shall never get over the loss but I have lived to see the day. (widowed four years)

HEALTH

Many of the women described the responsibilities that confronted them in the first months following the death of their spouse as daunting and stressful. As one woman, widowed less than two years, reflected: "coping with my health, my home, and the area surrounding it is always very stressful."

Death of a loved one is a stressful event regardless of age and personal resources. However older women face particular challenges and a participant recalls her response to the sudden and unexpected death of her husband and the complex nature of the issues that she now faces. But despite the dramatic events in her life, she says that "life goes on" because succumbing to depression and anxiety would impact on her social relationships leading to a poor quality of life. Her ongoing financial circumstances continue to provoke anxiety, particularly as she grows older and without the support from her family life would be a difficult struggle. Like many of the women in the study issues of financial security are a major source of concern. She puts it this way:

> Until seven years ago, my life was running smoothly and reasonably successful. My husband and myself were always very happy with our two children and felt we had achieved a good comfortable life. Then came the result of the recession and the sudden death of my husband. My life was reversed so far as money was concerned and only for the help of my daughter and her husband I would have to be renting. It was a great shock but I realized life goes on and who cares if you become nervous and refrain from mixing with friends and become morose so I have made the best

> of it all. Many times I feel I will never get in front of it all and after the comfortable lifestyle I was used to I have found it very hard to exist on the old age pension.

And the following insight sums up the impact of the death of a partner for one woman:

> Since my husband passed away two years ago my whole life has changed not for the better. I have also found I have difficulty coming to terms with his illness and death. Over the years I have enjoyed good health but now find that minor ills seem to be major.

By way of contrast the next story assures us that despite the physical and emotional changes that may accompany both aging and the death of a spouse, we must not assume that some degree of ill health will lead automatically to a substantial decrease in the quality of life for these women. What follows is from a woman who was younger than seventy years of age when her husband died, but despite suffering from a chronic health problem, she continues to be an active member of her rural community:

> I just want you to know that I have been widowed for ten years. I have lived alone all this time and although I have no immediate family living within 100 miles from me I live a full and active life. Although suffering from osteo-arthritis I manage to lead an active life, doing all my own gardening and housework as well as some charity work. I drive a car and take my friends out to social activities.

Talking about the interconnectedness of health and wellbeing and her ability to maintain an active and engaged life another woman, widowed more than two years, reports: “I guess my attitude to health is I have to look after myself (or everyone else suffers). If I have anything wrong I get it fixed as quickly as possible and get on with living.”

This woman is pragmatic about the importance of good health and provides us with a subtle reminder that caring for a sick older woman may be a burden on others or lead to a decrease in her independence, something that she does not accept at this stage of her life. Older women continue to be active members of their community with responsibilities to family and community alike and as this woman points out if she does not maintain good health "everyone else suffers." Even in the presence of a serious health event one participant reminds us that these women are resilient, that they are survivors who have outlived others. As one woman widowed for less than 18 months puts it, they are women who are used to "getting on with life."

> I have been in Peter MacCallum Cancer hospital last week and enter the same hospital again during the coming week, hence I have not been able to attend my usual activities or can't speak at the moment. All should be well in a few weeks.

Another theme threaded throughout the qualitative data is stoicism in the face of the death of a husband and an increasing array of health problems. One woman has experienced it all and yet tells us that she can't complain about life:

> I am seventy-two years of age. Osteoporosis problems started ten years ago . . . Three crushed vertebrae. I have a lot of back pain problems–so I am careful lifting, etc. My doctor calls to see me regularly. I have high blood pressure, rapid heart beat and a mild form of epilepsy, all of which are being treated and so far with good results. Up until 1986, I led a very active life. I worked until I was sixty and raised my family. My husband died very suddenly three years ago. My two children (boy and girl) are very good and I mainly look after myself at home. Someone takes me shopping every week. I have nothing to complain about.

From these commentaries comes a varied picture of experiences and circumstances, and of the integral relationship between health and overall wellbeing which in the longer term effects the capacity of these women to make the transition from married to widowed.

Health Practitioners

The insights offered by the women conveyed the importance of the relationship with their health practitioners, particularly after the death of a spouse. The participants talk of their support needs during the bereavement process being broader than those related to physical health. This woman widowed for five years highlights her social and emotional needs at that time and her ability to cope with the substantial life changes that she faced: ''My husband died after forty-eight years of a good marriage. I felt desolate and despairing. The medical profession were helpful generally speaking–they didn't solve the problems that arose. The organization 'Solace' was helpful. . . .''

Although her doctor was helpful the woman found that assistance from a bereavement support service helped her cope with the emotional despair that she experienced at that time. Nevertheless other women tell of the importance of continuing care and support of their local doctor, hospital and health services particularly in the rural areas. As one woman, widowed less than one year, stated:

> I suffered a very bad fall in the shower six months ago, resulting in a wedge fracture of L vertebrae. Could have been a lot worse and I am mending slowly. We have had five deaths of close family members in the last nine months, including my husband and several more close friends. Not exactly the best of years but I live in a close knit rural area and the support of family and friends (particularly church friends) has been absolutely wonderful! I have a very caring, wonderful doctor (country GP) who never seems to be in a hurry and a country hospital with a marvelous, caring staff. It would be an absolute disaster if it were ever to be closed as is happening to so many now.

SOCIAL RELATIONSHIPS AND SUPPORT

The relationship to family, neighbors, and wider social groups is especially important after the death of a spouse. The women spoke of family life as integral to their sense of wellbeing. Their comments confirmed that few women grow old or experience widowhood in total isolation. However, for many it may be a time when they live alone for the first time in years, having outlived a spouse or siblings or because children have moved away: ''. . . Naturally my problem is mainly loneliness. I do not put myself on people. I would hate to be a nuisance to anyone.''

Despite the difficulty of facing the loss of a partner, a substantial number of the women emerged as an articulate and assertive group who are not willing to accept a passive, declining role in society. There is sadness and grief associated with their loss, and the importance of social relationships and support dominates the commentaries. A woman widowed for less than twelve months takes a pragmatic view of her future:

> At present I am trying to cope with the loss of my husband however caring relatives and friends are always near . . . I have always been a very active person however just at present things have slowed down, but expect to come good as time goes by.

Another common thread was the need to keep busy. It is difficult to ascertain whether this is a direct response to the death of a long term partner or whether the women take the opportunity to make new social relationships and to explore new experiences. As this woman, widowed less than two years, puts it:

> My husband died nearly two years ago so my lifestyle has changed. I cope by being very busy in the community, i.e., I am president of two organizations and I still do some relief teaching. I sew and paint. I have very little spare time!

Reflected in the following segment is the return to 'normal' and a sense of picking up where one leaves off as life goes on:

> My husband passed away in April of this year and of course it brought with it a great deal of stress and sadness. However with the support of a wonderful family and friends, I have been able to now resume my normal activities. I do the gardening with some assistance, play golf in the events and bowls in the summers. I do hope to do this and keep my own home as long as possible.

Caring Relationships

Although some older widows face diminished family responsibilities, others continue to be the prime carers of parents or other family members including young children. Typical of the comments about their caring roles were these: "I have one daughter–divorced with two girls–I try to help out with the girls, as she works shift work–I feel this is getting harder for me as I get older but they are all I have" (widowed more than two years). "Daughter only forty-four years when she died in two weeks with cancer. I've had her daughter to finish school living with me. She's in year 12 and is eighteen years now" (widowed more than ten years).

What is not generally clear is whether these caring roles are a burden for these older women. Two women related how the release from caring responsibilities has had a positive effect on their emotional and physical health. Release from the pressures of caring for an ill husband, particularly over a prolonged period of time, provides the women with a sense of relief from the stresses and strains that accompany this most difficult role. A woman widowed for four years comments: "My husband had leukemia and was very ill toward the latter part of his life. I found this part of my life very stressful . . . My life is much better now." And another widowed less than two years: "My husband passed away in March last year after me looking after him twenty-four hours a day for ten years . . . I was very tired but I am getting much better now."

FINANCIAL AND STRUCTURAL

Of the three major themes to emerge from analysis of the base-line data, women widowed for less than twelve months were most likely to report worries related to the decrease in their income, coupled with anxiety and depression about ensuing financial insecurity. How they manage their finances and whether they can continue to live in their own homes was cause for great concern. A woman widowed for less than twelve months explains: "So far I've managed to keep the garden tidy and the house also. My worries are when I need a plumber or painter or carpenter, I have to pay for help and that is my worry."

The following detailed account presents a complex picture of past difficulties, including the lack of financial independence or control, and the impact of these on this woman's current and future circumstances:

> Widowed two years ago, I am finding the house and garden too much to manage. My husband left nothing but debts (unknown to me, he had been gambling heavily–and his superannuation had been used up consequently). I can't afford help in the house cleaning department. That's what worries me most–trying to do all the housework and the garden, and knowing I can't do it–even

> though I'm very healthy for my age. My children all live in other cities the nearest being three hours away–and I have no immediate family living near me. So being alone worries me at times.

Rural and Remote Women

Currently the Australian rural community is experiencing profound economic hardship accompanied by the inevitable close and rationalizing of health and other services. The women in our study who live beyond the urban centers, on farms or in towns, in the rural and remote areas, voiced their concerns about how they are to manage in the future. While some of the women were unable to continue their former lives, often being forced to move away from the country areas, other women described how they intend to continue their farming responsibilities after the death of their husband even though other family members are often scattered around the country: "There are thousands of women like me in Australia. I walk around my farm (500 acres) each day approximately ten to twelve kilometers. My husband died five years ago and I am now the owner of the farm."

The comments from yet another woman, widowed for nearly ten years, is typical of the resilience of many of the women who were determined to carry on with their rural life even in the face of geographical isolation and compromised health.

> I just want you to know that I have been widowed for ten years. I have lived alone all this time and although I have no immediate family living within 100 miles from me I live a full and active life. Although suffering from osteo-arthritis I manage to lead an active life, doing all my own gardening and housework as well as some charity work. I drive a car and take my friends out to social activities.

CHANGE

The comments from the women convey a sense of change, of a new life evolving. This notion is reflected nicely in the contribution of a woman widowed just three months, but who already looks toward her future: "I am still trying to adjust to losing my husband after almost forty-nine years of a marriage. I moved in with one of my sons less than two months ago so have not as yet joined any local clubs.'' And from a woman widowed fifteen years: ''Adjusting to life without him has been very difficult but by keeping busy and with support from a loving family circle and friends another way of life evolves.''

For many of the women the death of their spouse brought about dramatic lifestyle changes. A rural woman, widowed for more than two years, tells of the anxiety that accompanied the learning of new skills in the transition to another way of life. However, her reflections convey the message that she has no choice but to meet the challenge: ''I had not banked, shopped or driven the car for many years and had to learn the lot . . . I am still nervous of it all but managing.''

However many women described how they 'cope' with change and how change makes them 'stronger.' Their resilience is reflected in many of the comments: ''Today I enjoy my little corner of content. Thanks to life's ups and downs I value each day. Life's trifles don't upset me. I look forward to a reasonably healthy happy life at ninety.''

DISCUSSION

The picture that has emerged from our study is that the social consequences of the shift in status from married to widowed are likely to be considerable, a factor that has been overshadowed in much health and social research. The study also confirmed that the concerns of these older women are not only restricted to the experience of bereavement and loss, but are also related to the challenges of daily life that include their health, financial, and social circumstances. The qualitative comments revealed, as might be expected, the complex nature of the changes that accompany the experiences of widowhood, particularly in the first twelve months after the death of a spouse. Analysis of the data has shown significantly differing needs and concerns for women who have been widowed in the short-term, that is, under two years to those of longer-term widows.

Many of the women related that in the short term there were negative consequences associated with the death of their husband, but overall they viewed their life as one of transition and change. The women described the months and years ahead of them as a time where they would expect to establish other relationships, meet new challenges and take up opportunities that may not have been possible before the death of their husband, particularly if they had in the past the responsibility of caring for an ill spouse. However the women did talk of the stresses and anxiety related to managing their own personal finances or coping with financial hardship. Although the women nominated good health as being central to their lives, the women reminded us that it is incorrect to assume that some degree of ill health would necessarily result in a dramatic loss in independence or quality of life for them. For these women health, relationships, social activities and maintaining a positive attitude to life are of prime importance, each element effecting the other.

Also of prime importance is the passage of time allowing healing, and other things to move into the space left in their lives by the death of their spouse. However while the pain of the loss diminishes over time, the death of their husband never loses it saliency for these women. Even women whose husbands had died thirty years earlier still wanted to talk about the experience of becoming widowed and their new lives as single older women.

The women generously provided us with insight into their daily life and talked of their overall health and wellbeing. Daly, in discussing experiences of menopause, argues that "It is important to note that women cannot be located within one or other of these experiences in any static way since their experiences can change radically over a relatively short period of time" (Daly, 1997: 164). Similarly, Martin-Mathews (1991) advocates that widowhood be viewed as a process of transition. Because this study incorporated methods of inquiry, "to highlight the multiple dimensions" (Blieszner, 1993) of the changes associated with the death of a spouse and on 'becoming' a widow, we have been able to present a detailed view of an important event in the lives of these older women. Their comments have strengthened our findings by providing us with a window into the process associated with the changes of widowhood, as well pinpointing those factors that promote or inhibit positive outcomes for them after the death of their spouse. The stories from these women challenged the dominant underlying assumptions about the impact of widowhood on their lives by telling us how they make sense of the ongoing changes that confront them. The richness of the qualitative data demonstrates the ability and desire of these older women to contribute to our understanding about their experiences. Their stories tell of their expectations about what the future may hold for them as they face the challenges of life.

This study sought a broad understanding about the health, financial and social circumstances of older Australian women who have experienced the death of their spouse. While this analysis has not addressed specific cultural sub groups within the Australian community, we recognize that there is a clear need to undertake such an analysis in future research. Following on from this preliminary analysis, Women's Health Australia and The Alma Unit for Women and Ageing will undertake a national study on the health and social experiences and service use patterns of 430 widowed women 70-75 years, who will have been widowed for approximately eighteen months. Participants will be asked to complete a 51-item mailed survey that combines both quantitative and qualitative methodologies, and includes questions about health, family and social relationships, and economic circumstances. The purpose of this further longitudinal study is to help clarify the process of transition and change over time, and to elicit the factors that are central to the lives of older women who have experienced the death of a spouse. The study will aim to clarify whether there are specific issues for this group of women that may take on added importance as they age and experience changes in their physical, financial and social circumstances, particularly those related to life-styles, cultural and ethnic norms. Through our study we will be able to alert health practitioners and policy makers to the key factors that impact the health and wellbeing of a significant group of rural and urban older Australian women, and to provide a basis for further research both in Australia and overseas.

And finally in the words of one woman: "Modern medicine is wonderful in prolonging our lives, but we still have battles with which to contend. Is anyone listening?"

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The health and social needs of recently widowed older women in Australia

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Objective: *To identify women's health and social needs immediately following the death of their husband.*
Method: *A cross-sectional survey of 430 widowed women participating in the Australian Longitudinal Study on Women's Health was undertaken.*
Results: *Surveys were returned by 340 women (79%) and 231 of these women had been widowed three years or less. While 82% of the 231 women still lived in their own homes, 19% had moved house since being widowed for financial or social reasons. There were needs for legal services (44%), and home maintenance (55%). Assistance from medical practitioners included understanding (64%), support (38%) and information (23%). Thirty percent said they had received medication to assist their bereavement, and 30% had taken medication to help them sleep or "for their nerves" within the four weeks prior to survey. Most women (85%) felt they had maintained or increased their level of social contact since becoming widowed.*
Conclusion: *Widowed women have broad needs for practical help and advice. Appropriate services for widowed women need to encompass the social context in which widowed women are attempting to reconstruct their lives.*

Introduction

For a large population of older women widowhood will mark a 'normal' phase in their life cycle. Australian demographic data show that women, who now comprise 57% of the population aged 65 years and over, outlive their male counterparts by approximately seven years [1].

While the social consequences of the death of a husband are likely to be considerable [2] most research has focused only on the psychological, physical and medical impact of bereavement [3-6]. Widowed women are stereotyped as women who have lost their spouses [7] and widowhood has been constructed as crisis and personal affliction [8, 9], bereavement and long-term mental health problems [10, 4, 6].

Little emphasis has been given to the broader needs of these women or their capacity to construct a meaningful life and to undertake new demands and challenges. The majority of older widowed women do continue to engage socially with family, peers and the wider community and to access our society's political, economic and social institutions [7, 11-12]. This ability to get on with the business of their daily lives is fundamental to their health and wellbeing.

Death of a spouse is one of the most stressful and disruptive events in the human life cycle [13]. There are no norms for "*recovery*" [7, 14, 15] and the majority of widows must make the transition from being married to being single and the subsequent changes in their lives [16, 7]. The challenges faced by older women after the death of a husband "*comprise a new and uncharted journey*" [7, 17, 18] and are more complex than just coping with the grief and painful loss of a partner.

The purpose of this study is to identify and quantify the immediate health needs and the social circumstances of recently widowed women. The study is one component of the Australian Longitudinal Study on Women's Health and builds on previous analysis of cross-sectional data provided by women aged 70-75 years when the cohort was established in 1996 [19].

From exploratory analysis of the baseline data, it was hypothesised that, as a key life event, widowhood has an initial negative impact on the health and wellbeing of older women, but in the long term it may be accompanied by a positive shift into a new life phase [19]. In the baseline analysis, women widowed within 12 months prior to data collection had worse scores on physical and mental health measures when compared to married women and women widowed for 12 months or more. These recently widowed women also had the lowest self rated health and were more likely to report that they were stressed about their health. The recently widowed women were also more likely to be taking medication for 'nerves' (18% reported use of these medications) or medications to help them sleep (25% reported use) than women widowed for longer than 12 months.

Analysis of qualitative data collected at baseline reflected these needs, and provided a greater breadth of

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understanding of the women's circumstances and experiences. Women described the importance of health care providers and other community services in assisting them through the transition from married to single life, as well as the need to keep busy and active within their communities [20]. This present study attempts to quantify needs of these women, and to measure changes in health-related quality of life over time.

Method

The sample was drawn from participants of the Australian Longitudinal Study on Women's Health (Women's Health Australia), a large-scale nationally representative study of factors effecting the health of women [21]. The sample includes 430 participants aged 70-75 years at baseline in 1996 who indicated that their marital status was "widowed" and that their spouse had died within the previous year.

Eighteen months after the baseline survey, the selected women were posted a questionnaire on the "health and well-being of older widows in Australia". The Dillman protocol for postal surveys was followed with the exception of telephone follow-up [22].

The questionnaire was developed through previous qualitative analysis [20]. The questionnaire included items about the time since the husband's death, circumstances regarding his death, the women's expressed and perceived needs and their social interaction since the death of the husband. Both closed and open-ended questions were used to allow quantification and qualification of the women's needs and experiences as widows. Comments in response to the open-ended questions were content analysed.

Women were asked to indicate social activities they took part in during the two weeks prior to completing the survey. An activity score was calculated by allocating one point for each type of activity, expressed as a percentage of the highest possible total.

Quality of life was measured at baseline and again at follow-up using the Short Form 36 (SF-36) Health Survey [23] an eight-scale health profile with two component summary scores representing physical and mental health. There is substantial documentation of good internal and test re-test reliability (>0.8 in both instances for all sub-scales), correlation with other health measures such as the Sickness Impact Profile and the EuroQol (correlation coefficients ranging from 0.5-0.85) and sensitivity to change [23].

Changes in SF-36 scores were examined using paired t-Tests with a negative change reflecting a decline in scores and a deterioration in health.

Results

Of the 430 recently widowed women selected for the study, 340 (79%) returned completed questionnaires. Of these women, 96 indicated that their husband had been dead for more than three years, and a further 13 women failed to answer this question. These women were excluded from further analysis.

The 231 women included in the analysis were similar to the main sample in terms of the proportion living in rural and remote areas, country of birth, level of education, and type of housing.

Over half (n=133, 58%) had been widowed within two years prior to follow-up and 98 (42%) were widowed two to three years prior to follow-up. 195 women (84%) said that their husband was ill or incapacitated before he died, and the median length of illness or incapacity was two years (Inter-quartile range = 4.5 years; Maximum = 50 years). Women cared for their husbands for most of this period of illness (Median duration of care = 1.5 years; Inter-quartile range = 3.9 years; Maximum = 50 years).

Stated income sources included the aged pension (n=117, 51%), war widows' pension (n=70, 30%) and superannuation (n=36, 16%)[1]. Forty percent (n=92) of the women declared their gross income to be $12,000 per annum or less, and a further 17% (n=38) declared their income at between $12,001 and $16,000 before tax. Most (n=167, 72%) held a pensioner health benefits and concession card, and 87 (38%) held a Department of Veterans' Affairs' card that entitled them to free and comprehensive health care cover.

While most widows still lived alone (n=176, 76%) and in their own homes (n=188, 82%), almost one-fifth (n=42, 19%) of women had moved house since being widowed. The most common reason given for this move was "due to the cost of rent or mortgage being too high" (n=41, 18%). Commonly cited contributing factors were "to be closer to family or friends" (n=24, 10%), because the dwelling was too large (n=20, 49%), "due to cost of upkeep and repairs" (n=10, 4%) and "to access services" (n=9, 4%).

Most of these widowed women drove their own cars (n=138, 60%) or were driven by someone they knew (n=47, 20%) only a minority used taxis or some other form of public transport. Some women commented that public transport was just not an option because it was not available in the local area or because they *"can't climb the step of the bus"*.

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[1] *These income sources are not mutually exclusive.*

Needs (see Table 1)

Many women turned to friends and relatives for help. For some women this need arose from an unfamiliarity with financial matters:

> *My husband did all this.*

Despite the low income of most of these women, they mainly described their "money situation" as "comfortable", although a large proportion (n=98, 43%) described their finances as worse now than when their husband was alive. The women wrote about how they had to be careful, watching how they spend their money after the death of their spouse "...only buying what you cannot do without."

> *Being solely responsible for maintenance and upkeep of a home, all services such as lawn mowing, fertilising, etc., larger shrubs trimmed, windows cleaned, gutters cleared on top of rates excess water bills, a car to maintain. Leaves little to spend...*

A majority of women (n=127, 55%) reported they had difficulty with minor house repairs and home maintenance, and almost half (n=96, 42%) reported difficulty with gardening.

There was a high need for legal services with almost half (n=101, 44%) of the women having contacted a lawyer in private practice or a community legal centre. The most common type of advice women reported needing was for "*making a will*" (n=102, 44%), "*pensions or benefits*" (n=71, 31%), "taxes" (n=57, 25%), "*power of attorney*" (n=50, 22%) "*financial decision-making*" (n=34, 15%) and banking (n=29, 13%).

Nearly all women had contacted a general practitioner since the death of their husband and assistance for their bereavement was mostly in the form of understanding, support and information. A high percentage (n = 69, 30%) said they had received medication to assist their bereavement, and (n=69) 30% had taken medication to help them sleep or "for their nerves" since the death of their husband.

Many (n=75, 33%) said their sleeping habits were worse since the death of their spouse and around one-third (n=69, 30%) said they often had trouble falling asleep or waking during the night.

Only a minority (six percent) of women said their doctor had a change of attitude since the woman was widowed. On the contrary, many women described their doctor as caring, listening, understanding and a "*tower of strength.*"

More than half of the women (n=123, 53%) reported they did not have any form of private health insurance.

Table 1: Needs of older women widowed within 3 years of follow-up survey N=231*

Area of Need	N	%
General		
Contacted friend for help	35	15
Contacted relative for help	89	39
Finance and legal		
Money situation		
I can't make ends meet	8	3
Just enough to get along on	122	53
I am comfortable	98	42
Missing response	4	2
Change in finances since widowed		
Better now	25	11
About the same	111	48
Worse now	92	40
Contacted lawyer	101	44
Daily living		
Have you needed regular help with daily tasks (eg personal care, mobility, meals etc.)	26	11
Difficulty with		
Shopping	44	19
Meal preparation	27	12
Housework	60	26
Gardening	96	42
Minor house repairs	127	55
Home maintenance	124	54
Home security	48	21
Personal safety	39	17
Social and emotional		
Difficulty with		
Fear	51	22
Loneliness	112	49
Seeking help	42	18
Intimacy	51	22
Self image	45	20
External image	51	22
Medical		
Contacted general practitioner and received bereavement assistance in the form of:	222	96
Information	45	20
Support	73	32
Understanding	124	54
Referral	13	6
Medication	69	30
Counselling	8	4
Taken medications to help sleep or for nerves	69	30
Health		
Change in sleeping habits		
Better now	35	15
About the same	119	52
Worse now	75	32
Missing Response	2	1
Sleeping difficulty		
Most of the time	69	30
Sometimes	112	49
Rarely/never	47	20
Missing response	3	1
Change in eating habits		
More healthy now	32	14
About the same	166	72
Less healthy now	31	13
Missing Response	2	1
General health		
Excellent/very good	49	21
Good	98	42
Fair/poor	82	36
Missing Response	2	1

Table 2: Change in social contact for women widowed within 3 years of follow-up survey

	More (%)	Same (%)	Less (%)
Amount of time "rushed, pressured, too busy"	17	47	36
Amount of time "on hands"	28	45	27
Contact with family and friends	32	58	10
Socially active	30	55	15

Some of the women wrote that private health insurance was too expensive to maintain. Others no longer needed private insurance because of their war widow status.

Social contact

Most women felt they had maintained or increased their level of social contact and participation in activities since becoming widowed (See Table 2). Further, 55% (n=126) of women said they did something they really enjoyed most or everyday of the week; 37% (n=85) at least once a week and five percent (n=12) less than once a week (nine women did not answer this question). The mean number of activities was 4.6 out of the 12 options (SD=2.06); the mean activity score was 38% (SD=17.18). The most commonly indicated activities were gardening (n=205, 89%), handiwork (n=137, 60%), eating out (n=130, 56%) and going to meetings of clubs or groups (n=112, 49%). Most women belonged to clubs or organisations, the most common being church or religious groups (n=91, 39%) legacy (n=65, 28%), Returned Services League (n=44, 19%) and sporting clubs (n=40, 17%).

Changes over time

In their open comments, some women wrote that they had not changed at all since the death of their husband, except for being "*sadder and sometimes lonely*". Other women talked about being more independent, having more time, feeling stronger, more confident, outgoing and self-sufficient, being able to do what they want when they want, and no longer having to look after a sick spouse. Others described loneliness, tiredness and depression, feelings of isolation and vulnerability. Some said they were becoming increasingly selfish, feeling older, had to make their own decisions, were frightened, and lacked a reason for living.

The only statistically significant changes in SF-36 scores were a decrease in Physical Functioning, and an improvement in the Role Emotional sub-scale that measures the extent to which emotional health limits social roles, and a higher Mental Health summary score.

Discussion

This quantitative study provides a retrospective view of some of the many issues that effect women after the death of their spouses. These needs encompass financial security, practical assistance in maintaining homes and managing income, social support, staying busy and active, and professional assistance from health professionals. While these needs may be common to married older women, widowed women are more likely to live alone, and these needs often arise from new demands from roles previously filled by their spouse.

Given that the majority of women live alone, and in their own homes, it is of importance that the highest ranking needs included minor house repairs (63.2%), home maintenance (62.6%) and gardening (45.3%). In the earlier analysis of qualitative data [20] the issues of housing and home maintenance were nominated by the participants as of prime importance, as factors which have a great impact on their quality of life and central to their health and wellbeing. It must be recognized that some widowed women live in older homes that require maintenance and/or repair. For the many women who live in their own homes and wish to remain so the question may be whether the continued costs and effort of maintaining a large home or garden will be too great

Table 3: SF-36 health-related quality of life scores at baseline and follow-up

	Women widowed within three years of follow-up survey			
	N	Mean (SD) at baseline	Mean at Follow-up	Mean difference (95% CI)
Physical functioning	211	60.0 (25.8)	57.9	-2.6 (-5.2; 0.0)*
Role physical	195	52.5 (41.7)	53.8	-0.9 (-7.4; 5.5)
Bodily pain	224	65.4 (26.3)	64.3	-1.1 (-4.1; 1.8)
General health	198	66.5 (19.6)	65.0	-1.2 (-3.1; 0.8)
Vitality index	214	57.4 (20.9)	57.4	-0.6 (-3.0; 1.9)
Social functioning	229	76.0 (26.8)	78.0	1.8 (-2.0; 5.5)
Role emotional	193	61.0 (43.6)	69.2	6.3 (0.2; 12.4)*
Mental health	212	71.0 (18.4)	72.2	1.3 (-0.9; 3.5)
Physical Component Summary Scale	168	50.7 (9.2)	50.1	-1.0 (-2.1; 0.1)
Mental Component Summary Scale	168	46.0 (12.1)	47.9	1.8 (0.1; 3.6)*

*P < 0.05 (paired t test). N sizes vary due to missing data on some items.

to allow independent living following the death of their husband [24]. The women identified that one key reason for moving from the family home, often into a smaller location, was because of financial insecurity.

For many of the women there was a need for easily accessible and affordable legal and financial advice. It has been argued that legal and community agencies need to consider the total situation of their older clients and that the cost of services and the incomprehensible language employed by many professionals in this area are major impediments to service use. In the absence of competent independent assistance, older people may need to rely on their extended family for decision making, further eroding their independence and exposing them to exploitation [25].

"Loneliness" was a prevalent perceived need, and also evident in the women's written comments. However, the study also found that many women were socially active, belonging to a variety of clubs and groups, with some feeling they had had an increase in their activities after the death of their spouse. It would seem not only that social activity can counteract the loneliness the women [26] but that widowed women actively seek new activities and social contact [27].

The lives of older women, particularly after the death of a spouse, are both enhanced and restricted by their capacity to participate in and enjoy valued aspects of their physical, emotional and spiritual lives [7]. Most widowed women are determined to continue accessing community resources, such as social support and health and information services, keep up with past activities and associations, and maintain their independence and community participation at all costs: [12, 11] and have been shown to have similar levels of social support [19] and community integration [27] to other women of their age. An important element to achieving this goal of social participation is ensuring that older women are able to continue developing their relationships with families, neighbours and wider social groups [27, 28].

As an adjunct to their social participation, many of the women in this study did drive their own cars and were not dependent upon public transport to get them out and about. In other research, access to efficient, appropriate transport, was found to be essential for optimal interaction with the social world of family, friends and community [12, 26, 29] and in mitigating against dependency on others [30].

Nearly all women surveyed had contacted a general practitioner since the death of their husband and many had received some form of assistance, mostly in the form of understanding, support and information. A high percentage (35%), however, said they had received medication to assist their bereavement, and 35% had taken medication to help them sleep or "for their nerves" within four weeks of the survey. This pattern of medication use is of concern, since these drugs have the capacity to effect women's quality of life negatively [31, 32] and are associated with a higher risk of falls and injury [33].

Beyond prescribing drugs, health professionals must consider the broader implications of the death of a spouse in relation to family life, organisation of work and retirement, and the planning of housing and financial resources. The construction of being "widowed", as a period of change and transition rather than an illness, is supported by the evidence of change in mental health-related quality of life. In this study, however, it is not possible to disentangle the effects of ageing from the effects of being widowed, due to the lack of a married comparison group. For example, in other analyses, a decrease in Physical Functioning scores has been observed across the cohort (unpublished data). Future research which includes comparison between groups of women of the same age who are still married, and women who have been widowed for many years will assist in separating these issues, particularly since pre-widowed data can be included in the analysis.

Conclusion

What has emerged from our study is the identification of persistent and recurring themes of coping and transition, particularly in relation to expressed needs about support, networks and resources. While at baseline the widowed women had lower SF-36 scores than married women in the cohort, these data suggest an increase in scores in some domains which may indicate a narrowing of this health difference. However, the needs of widowed women go beyond health. They commonly extend into more practical and social arenas and policy and services for widowed women need to encompass more than bereavement.

Key Points

- Most widowed women lived in their own homes.
- Widowed women had high need for legal services, and home maintenance services.
- Many widowed women received medication to assist their bereavement and many took medication *'to help them sleep'*.

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Responsiveness of the Duke Social Support sub-scales in older women

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Abstract

Objective: an abbreviated form of the Duke Social Support Index (DSSI) as used in a large longitudinal study of older Australian women was examined with respect to factors that might be expected to affect social support for older women over time.
Methods: in this large cohort study two sub-scales of the DSSI, one describing the size and structure of the social network (four items) and the other perceiving satisfaction with social support (six items), were analysed in relation to outcome and exploratory variables.
Results: over a 3-year period, the network score increased among women whose life circumstances meant that they were likely to receive more support (e.g. recent widowhood). Likewise, those women at risk of becoming more socially isolated (e.g. those with sensory loss) became less satisfied with their social support. Changes in both measures were tempered by women's mental health and optimism.
Conclusions: although the sub-scales of the DSSI may not fully reflect the complexity of social support paradigms, they are responsive to changes in the lives of older women and can be useful in community-based epidemiological studies.

Keywords: *social support; women's health; longitudinal studies; Duke Social Support Index; elderly*

Introduction

Social support is an inherently broad construct which has been described in terms of one's social network (commonly estimated by the number of persons within the network) and the quality of interactions between an identified person and their social contacts. As social support has an important role in health and well-being, especially in older people, there is a need for brief instruments that can be used to measure this construct in large-scale epidemiological studies. For longitudinal studies, the measure should be responsive, that is, able to detect changes over time.

Examining social support in older adults is important because they are at increased risk of declining social support networks due to a number of factors, including the deaths of friends, retirement, declines in physical health and decreased mobility. Other variables which may impact on social support include gender and mental health. Women extend and in turn receive more support over their life than men [1] and experience greater benefits from their social networks [2]. Although much research supports the view that women in general possess social support networks which may be more extensive and robust than those of men, these can come at a price (for example, the need to continue to provide support in such an extended network) [3]. These gender differences also appear to decrease beyond age 70 [4]. Some studies have found a negative relationship between depression and social support, suggesting that depressed individuals may repel potential sources of support or that lack of social support may be a factor in the development of poor mental health [5]. Other research suggests that women who may require more support (for example, recently bereaved or those with physical illness) may both attract more support and potentially drive away support if depressive symptoms develop [6]. As women are more vulnerable to depression than men throughout the lifespan [7], aspects of mental health functioning are of particular interest when considering social support among women.

Although researchers categorise types of social support in various ways, instrumental and emotional social support are the most studied. Several theoretical frameworks for social support have been advanced. For example, Litwak's [8] task-specific model of social support suggests that different sources of support (e.g. friends vs. family) typically provide different types of support (e.g. companionship vs. domestic tasks). Several models specifically address changes to social support later in life. Carstensen's [9] socioemotional selectivity theory proposes that older adults actively prune their social networks to maintain optimal support in the face of limitations such as physical declines and what may be perceived as a limited amount of time remaining. Thus, while the number of people in an older individual's social support network may decline, the amount of support derived remains fairly stable, with numbers of close relationships remaining comparable to younger cohorts [10].

This paper considers the Duke Social Support Index (DSSI) [11] sub-scales in relation to factors that might be expected to affect social support for older women over time. An abbreviated form of the DSSI has been used in the Australian Longitudinal Study on Women's Health, which explores factors that promote or reduce health in a large sample of women who are broadly representative of the whole Australian population. The psychometric properties of the DSSI and cross-sectional relationships with socio-demographic and health characteristics among older women in this large longitudinal study have been previously described [12].

The current study aims to evaluate the responsiveness of the two DSSI sub-scales in relation to demographic and psychological factors that might be expected to lead to changes in social support over time.

Methods

Participants

Participants were drawn from the Australian Longitudinal Study on Women's Health. This analysis is based on data from the first and second surveys of the older cohort conducted in 1996 and 1999 when the women were aged 70–75 and 73–78 respectively. A detailed description of the study and participants [13] is contained in Appendix 1 in the supplementary data on the journal website http://www.ageing.oxfordjournals.org.

For both Survey 1 and Survey 2, a total of 6,373 women had completed all 10 items of the DSSI and additionally had provided information on all the explanatory variables described below.

Measures

Outcome variables

The DSSI consists of two sub-scales. The first measures the size and structure of the social network (hereafter Network) and consists of four items. The second is a six-item sub-scale which measures the perceived satisfaction with the behavioural or emotional support obtained from this network (hereafter Satisfaction). These sub-scales are analysed separately in this study. A list of all items in both sub-scales, the response options and scoring system is contained in Appendix 2 in the supplementary data on the journal website http://www.ageing.oxfordjournals.org.

Network scores ranged from 4 to 12 with higher scores indicating more social contacts. The Network scale had a moderate but acceptable value of 0.6 for Cronbach's α at both Survey 1 and Survey 2. Satisfaction scores ranged from 6 to 18 with higher scores indicating a greater level of satisfaction with social support. The Satisfaction scores had a Cronbach's α of 0.8 at both Survey 1 and Survey 2. Changes in the Network and Satisfaction scores were calculated by subtracting the Survey 1 score from the Survey 2 score so that a positive value for change in Network score indicates an increase in social contacts and a positive value for change in Satisfaction score indicates an improvement in satisfaction with social support.

Explanatory variables

Factors hypothesized to impact on Network scores were demographic variables, including marital status, recency of widowhood, moving house, country of birth, income and a major decline in the health of a close family member or friend. Factors hypothesized to impact on Satisfaction scores included limited mobility, difficulties in hearing or seeing, incontinence and major personal illness. Psychological characteristics which might mediate the impacts of these variables on Network and Satisfaction scores included mental health as measured by the five-item Mental Health sub-scale (MH) of the SF-36 [14]; hardiness as determined by the control sub-scale of the Health-Related Hardiness Scale [15] and dispositional optimism assessed by the Life Orientation Test—Revised [16]. Scores on the SF-36 MH scale were categorised into <53 or ≥ 53, where the lower range of scores is regarded as indicative of probable psychiatric disorder. Change groups were defined for time varying categorical variables; for example, four categories were determined for change in the MH score between Survey 1 and Survey 2: unchanged at ≥ 53, unchanged at <53, changed from <53 to ≥ 53 and changed from ≥ 53 to <53. The explanatory variables hardiness and optimism were only measured at Survey 2, but were included in the model as these traits have been described as stable over time and are characteristics that influence attitudes and behaviour [17].

Statistical analyses

One-way analyses of variance were used to investigate the association between all categorical explanatory variables and Network and Satisfaction scores at Survey 1 and change in Network and Satisfaction scores between Surveys 1 and 2.

The general linear model (GLM) procedure in the SAS statistical package was used to perform multiple linear regression with change in Network or Satisfaction score, the dependent variable. A backward selection process was used to determine the variables included in each model. Variables were removed from the model one at a time, using a conservative significance level of 0.005, until all variables in the model were statistically significant. The OM option within least-squares means (LSMEANS) was used to adjust

Table 1. Univariate analysis of variance: Network and Satisfaction scores at Survey 1 against various baseline characteristics: mean and 95% confidence interval for each level and *P*-value for variable

Marital status[a]	*n*	Network score	Satisfaction score
Married/de facto	3,753	8.79 (8.74, 8.84)	16.98 (16.93, 17.03)
Separated/divorced/never married	550	8.82 (8.68, 8.96)	16.48 (16.29, 16.66)
Widowed in the past year	184	9.20 (8.97, 9.43)	16.81 (16.51, 17.11)
Widowed more than 1 year ago	1,861	9.25 (9.18, 9.32)	16.91 (16.83, 16.99)
		<0.0001	<0.0001
Moved house			
Yes	379	8.74 (8.57, 8.92)	16.47 (16.25, 16.69)
No	5,994	8.95 (8.91, 8.99)	16.94 (16.90, 16.98)
		0.0157	<0.0001
Country of birth			
Australian born	5,006	9.03 (8.99, 9.08)	16.97 (16.92, 17.02)
Other English speaking	870	8.76 (8.64, 8.87)	16.82 (16.70, 16.94)
Europe	397	8.25 (8.08, 8.41)	16.50 (16.29, 16.72)
Asia	64	8.34 (7.88, 8.81)	16.41 (15.93, 16.89)
Other	36	8.28 (7.76, 8.80)	16.72 (16.15, 17.30)
		<0.0001	<0.0001
Decreased income in past 12 months			
Yes	1,190	8.96 (8.87, 9.06)	16.69 (16.58, 16.81)
No	5,183	8.93 (8.89, 8.97)	16.96 (16.92, 17.01)
		0.5374	<0.0001
Major decline in health of a close family member or friend in past 12 months (not spouse)			
Yes	1,882	9.09 (9.02, 9.16)	16.82 (16.74, 16.90)
No	4,491	8.87 (8.82, 8.92)	16.95 (16.90, 17.00)
		<0.0001	0.0060
Limited in walking 100 m			
Yes	1,098	8.62 (8.53, 8.72)	16.48 (16.35, 16.61)
No	5,275	9.00 (8.96, 9.04)	17.00 (16.96, 17.05)
		<0.0001	<0.0001
Hearing problems in past 12 months			
Yes	2,276	8.91 (8.85, 8.98)	16.74 (16.66, 16.81)
No	4,097	8.95 (8.90, 9.00)	17.01 (16.96, 17.06)
		0.4158	<0.0001
Sight problems in past 12 months			
Yes	4,139	8.90 (8.85, 8.95)	16.80 (16.74, 16.86)
No	2,234	9.01 (8.94, 9.07)	17.12 (17.06, 17.19)
		0.0102	<0.0001
Incontinence			
Yes	2,127	8.86 (8.79, 8.93)	16.74 (16.66, 16.82)
No	4,246	8.97 (8.92, 9.02)	17.00 (16.95, 17.05)
		0.0117	<0.0001
Major personal illness			
Yes	737	8.77 (8.65, 8.89)	16.58 (16.43, 16.73)
No	5,636	8.96 (8.92, 9.00)	16.96 (16.91, 17.00)
		0.0028	<0.0001
Mental health score			
≥53	5,834	9.02 (8.98, 9.06)	17.06 (17.02, 17.10)
<53	539	8.06 (7.91, 8.20)	15.34 (15.11, 15.58)
		<0.0001	<0.0001

[a] 25 women had missing marital status at Survey 1, but marital transition status could be determined.

for different sample sizes among levels of the categorical variables.

The explanatory variables included were the categorical variables described in Table 1 and the continuous variables optimism and hardiness. The score at Survey 1 of the sub-scale of interest (Network or Satisfaction) was also included to adjust for possible regression to the mean.

Results

Explanatory variables statistically associated with Network and Satisfaction scores at Survey 1 are presented in Table 1. A greater Network size was significantly associated with widowhood, being born in Australia or another English-speaking country, major decline in the health of a close family member or friend, adequate mobility, not having a major personal illness and having a higher MH score. Satisfaction with social support was significantly positively associated with being widowed or in a married or de facto relationship, remaining in the same house, being Australian born or from another English-speaking country, stable income, adequate mobility, no hearing or sight difficulties or incontinence, no major personal illness and having a better MH score.

Explanatory variables statistically associated with change between Survey 1 and Survey 2 in Network score or Satisfaction score in univariate analyses are shown in Table 2. An increase in Network size was significantly associated with recent widowhood, decreased income, good or improved mobility and improved mental health. Most women became less satisfied with their social support, with the largest decreases associated with being born in another country, ongoing problems with sight and a reduction in mental well-being.

After adjusting for all other explanatory variables in the model and regression to the mean, increases in Network scores from Survey 1 to Survey 2 were associated with being widowed, especially recently, and not experiencing major mobility limitations. Network size was also positively associated with optimism scores. A reduction in Network size was associated with being born in another country and declining or ongoing poor mental health (Table 3).

After adjusting for all other explanatory variables, decreases in Satisfaction scores from Survey 1 to Survey 2 were associated with women being single (never married, separated or divorced), being born in another country, ongoing or new hearing difficulties, continuing sight difficulties and continued poor or decreasing mental health. Higher optimism scores were associated with a greater level of satisfaction with social support.

Discussion

The results show that the two sub-scales of the DSSI ('social network characteristics' and 'satisfaction with social support') were responsive to changes in older women's life situations and characteristics in the hypothesised directions. Social networks appear to increase in women likely to require help or assistance, especially those recently widowed. These individuals, due to their circumstances and current needs, may attract increased attention from their existing social network. This is congruent with age- and gender-related models of social support (e.g. Litwak's [8] task-specific model of social support), suggesting that these women are benefiting from the responsiveness of the social networks they have put in place. Litwik's model matches social support tasks with appropriate providers; future research could examine what specific types of providers are of significance to those recently widowed.

Social networks appeared to decrease for women less able to access their network, either physically (e.g. those with limited mobility) or psychologically (e.g. those with lower MH or optimism scores). These individuals may be unable to access their networks effectively, or may in fact be resistant to approaches from within their network, particularly if the individual is withdrawing socially due to depression, for example. Again, this is congruent with research suggesting that those with depression may repel social support from existing networks. This reduction in the social network may reflect adaptation to a perceived lack of social support from some quarters of their existing network, with the individual disengaging from those whose support is not adequate for their needs, resulting in a smaller social network. This is congruent with Carstensen's [9] socioemotional selectivity theory and may be considered adaptive at this stage in the women's life course. However, in the case of depression in older women, further research is warranted to ascertain if such pruning of relationships is by design, as well as whether or not having a smaller but more responsive network is indeed of greater utility.

Satisfaction with social support was similar in women who were married or in a de facto relationship and widows; this may be a function of the increased amount of social interaction the widowed group attracts from their social network. Satisfaction with social support in women with a hearing or sight impairment was low, possibly due to unwillingness or inability to participate in social interactions or their decreased ability to derive pleasure from such contact. Other studies of older women have indeed found lower rates of social participation associated with sensory loss [18].

Finally, optimism was higher in women who were more satisfied with their social support. So-called existential variables such as optimism have previously been found to be associated with an individual's ability to overcome difficulties [19]. It is possible that women with more optimistic outlooks are better able to utilise their social support networks, thus deriving greater satisfaction from them.

Women from non-English-speaking countries were less satisfied with their social network, possibly reflecting a shrinking over time of a cohort of peers from their country of origin who share similar experiences. This may explain why women from English-speaking countries other than Australia experience similar dissatisfaction; changes in community composition or acculturation may be at work in such cases. However, in other research, social support was found not to differ significantly by age among immigrant groups although the emotional distress reported among immigrant groups increased with increasing age [20]. Social support and satisfaction with social support in immigrant groups, particularly as these people age, is an area which requires further study.

A possible limitation of the present study is the small range of values obtained on the Satisfaction scale. Many women scored the maximum value, perhaps reflecting an unwillingness to acknowledge inadequacies of social support. At Survey 2, average scores were lower as improvements could not be adequately measured due to this ceiling effect. Consequently, this scale may not be as responsive to perceived change in social support as other measures which give a wider range of observed values. The absence of questions about negative aspects of social support is another shortcoming of the DSSI. Other measures of social support that

Table 2. Univariate analyses of variance: change in Network and Satisfaction scores between Surveys 1 and 2 against categorical explanatory variables: mean and 95% confidence interval for each level and *P*-value for variable

Marital status	*n*	Change in network	Change in satisfaction
Married/de facto at both	3,302	0.07 (0.02, 0.12)	−0.34 (−0.39, −0.28)
Separated/divorced/never married at both	489	0.04 (−0.08, 0.17)	−0.51 (−0.68, −0.34)
Widowed at both	2,039	0.07 (0.01, 0.13)	−0.35 (−0.43, −0.28)
Recent widow	417	0.71 (0.57, 0.85)	−0.33 (−0.49, −0.16)
Other change	126	−0.08 (−0.32, 0.16)	−0.57 (−0.88, −0.27)
		< 0.0001	0.1551
Moved house			
Yes at both surveys	109	0.15 (−0.18, 0.48)	−0.33 (−0.80, 0.14)
No → Yes	551	0.11 (−0.01, 0.24)	−0.50 (−0.66, −0.34)
Yes → No	270	0.22 (0.05, 0.40)	−0.39 (−0.59, −0.20)
No at both surveys	5,443	0.10 (0.06, 0.14)	−0.34 (−0.39, −0.30)
		0.5756	0.2196
Country of birth			
Australian born	5,006	0.09 (0.06, 0.13)	−0.31 (−0.36, −0.26)
Other English speaking	870	0.12 (0.02, 0.22)	−0.53 (−0.64, −0.41)
Europe	397	0.23 (0.09, 0.37)	−0.60 (−0.81, −0.40)
Asia	64	0.42 (0.01, 0.84)	−0.16 (−0.63, 0.32)
Other	36	−0.28 (−0.70, 0.15)	−0.86 (−1.52, −0.20)
		0.0544	0.0001
Decreased income in past 12 months			
Yes at both surveys	426	0.21 (0.07, 0.35)	−0.42 (−0.61, −0.24)
No → Yes	423	0.33 (0.19, 0.47)	−0.23 (−0.38, −0.08)
Yes → No	764	0.11 (0.01, 0.21)	−0.43 (−0.55, −0.31)
No at both surveys	4,760	0.08 (0.04, 0.12)	−0.35 (−0.40, −0.31)
		0.0023	0.2109
Major decline in the health of a close family member or friend in past 12 months (not spouse)			
Yes at both surveys	550	0.12 (0.01, 0.23)	−0.42 (−0.55, −0.29)
No → Yes	580	0.14 (0.03, 0.26)	−0.41 (−0.54, −0.28)
Yes → No	1,332	0.05 (−0.03, 0.13)	−0.33 (−0.42, −0.24)
No at both surveys	3,911	0.12 (0.08, 0.16)	−0.35 (−0.41, −0.30)
		0.4154	0.6349
Limited in walking 100m			
Not limited at both	4,644	0.15 (0.11, 0.19)	−0.32 (−0.37, −0.28)
Limited → not limited	387	0.16 (0.01, 0.31)	−0.39 (−0.58, −0.20)
Not limited → limited	631	−0.08 (−0.20, 0.03)	−0.42 (−0.57, −0.28)
Limited at both	711	−0.04 (−0.15, 0.07)	−0.53 (−0.69, −0.37)
		< 0.0001	0.0149
Hearing problems in past 12 months			
Yes at both surveys	593	0.11 (−0.01, 0.23)	−0.53 (−0.69, −0.38)
No → Yes	77	0.03 (−0.32, 0.37)	−0.62 (−1.11, −0.14)
Yes → No	1,683	0.10 (0.03, 0.17)	−0.36 (−0.44, −0.27)
No at both surveys	4,020	0.11 (0.07, 0.15)	−0.33 (−0.38, −0.28)
		0.9599	0.0259
Sight problems			
Yes at both surveys	1,011	0.12 (0.03, 0.22)	−0.64 (−0.76, −0.51)
No → Yes	209	0.04 (−0.15, 0.23)	−0.40 (−0.61, −0.19)
Yes → No	3,128	0.13 (0.08, 0.18)	−0.30 (−0.36, −0.24)
No at both surveys	2,025	0.08 (0.02, 0.14)	−0.31 (−0.38, −0.25)
		0.5489	< 0.0001
Incontinence			
Yes at both surveys	949	0.08 (−0.02, 0.17)	−0.49 (−0.61, −0.36)
No → Yes	309	0.14 (−0.02, 0.31)	−0.48 (−0.67, −0.30)
Yes → No	1,178	0.13 (0.05, 0.22)	−0.34 (−0.43, −0.24)
No at both surveys	3,937	0.10 (0.06, 0.15)	−0.33 (−0.38, −0.28)
		0.7944	0.0348
Major personal illness			
Yes at both surveys	210	0.06 (−0.14, 0.27)	−0.50 (−0.79, −0.21)
No → Yes	522	0.02 (−0.11, 0.14)	−0.44 (−0.59, −0.29)
Yes → No	527	0.08 (−0.05, 0.21)	−0.54 (−0.71, −0.37)
No at both surveys	5,114	0.12 (0.08, 0.16)	−0.33 (−0.37, −0.28)
		0.4125	0.0142
Mental health			
≥53 unchanged	5,569	0.11 (0.08, 0.15)	−0.32 (−0.36, −0.28)
<53 unchanged	206	−0.01 (−0.24, 0.21)	−0.99 (−1.36, −0.62)
Changed to ≥53	333	0.27 (0.10, 0.44)	−0.01 (−0.25, 0.23)
Changed to <53	265	−0.13 (−0.32, 0.07)	−1.15 (−1.43, −0.86)
		0.0043	< 0.0001

Table 3. Fully adjusted general linear model: change in Network and Satisfaction scores between Surveys 1 and 2 against various categorical and continuous scale explanatory variables significant at $P<0.005$: mean and 95% confidence interval for each level

	Change in Network	Change in Satisfaction
Marital status		
Married/de facto at both	−0.01 (−0.05, 0.03)	−0.33 (−0.38, −0.28)
Separated/divorced/never married at both	0.01 (−0.10, 0.12)	−0.68 (−0.82, −0.54)
Widowed at both	0.23 (0.18, 0.28)	−0.34 (−0.41, −0.27)
Recent widow	0.58 (0.46, 0.69)	−0.27 (−0.42, −0.12)
Other change	−0.05 (−0.26, 0.16)	−0.46 (−0.74, −0.19)
Country of birth		
Australian born	0.14 (0.10, 0.17)	−0.30 (−0.34, −0.26)
Other English speaking	0.01 (−0.07, 0.09)	−0.60 (−0.70, −0.50)
Europe	−0.00 (−0.13, 0.12)	−0.58 (−0.74, −0.43)
Asia	0.22 (−0.07, 0.52)	−0.27 (−0.65, 0.11)
Other	−0.47 (−0.87, −0.07)	−0.63 (−1.14, −0.13)
Limited in walking 100 m		
Not limited at both	0.16 (0.13, 0.20)	
Limited → not limited	0.08 (−0.04, 0.21)	
Not limited → limited	−0.02 (−0.12, 0.07)	
Limited at both	−0.11 (−0.20, −0.02)	
Mental health		
≥ 53 unchanged	0.14 (0.11, 0.17)	−0.29 (−0.33, −0.25)
<53 unchanged	−0.32 (−0.49, −0.14)	−1.42 (−1.65, −1.20)
Changed to ≥ 53	0.05 (−0.08, 0.18)	−0.28 (−0.45, −0.11)
Changed to <53	−0.21 (−0.36, −0.06)	−1.15 (−1.34, −0.96)
Hearing Problems in past 12 months		
Yes at both surveys		−0.56 (−0.69, −0.44)
No → Yes		−0.61 (−0.95, −0.26)
Yes → No		−0.35 (−0.43, −0.28)
No at both surveys		−0.33 (−0.38, −0.28)
Sight problems		
Yes at both surveys		−0.63 (−0.72, −0.53)
No → Yes		−0.38 (−0.59, −0.17)
Yes → No		−0.31 (−0.37, −0.26)
No at both surveys		−0.30 (−0.37, −0.23)
Optimism	0.27 (0.21, 0.33)	0.43 (0.36, 0.50)
Network score at Survey 1	−0.48 (−0.50, −0.46)	–
Satisfaction score at Survey 1	–	−0.39 (−0.41, −0.36)

capture instrumental and emotional types of social support from different sources (e.g. family members as distinct from friends) may offer additional levels of insight on social support. For example, the social support questions used in the MacArthur Studies of Successful Aging include items assessing the frequency of receipt of emotional and instrumental support, as well as the frequency of negative interactions involving conflict or excessive demands, from three sources (spouse, children and friends and family) [21].

Conclusions

In summary, the DSSI, a brief social support measure, captures components of both social network and perceived emotional satisfaction. In a large longitudinal study of older women, both of these measures were found to change in the expected directions as the women's lives changed over a 3-year period, providing evidence of their construct validity and responsiveness to change over time.

Key points

- The DSSI, a brief social support scale, captures components of both social network and perceived emotional satisfaction.
- Social network size and structure appears to increase among women whose life circumstances call for more support (e.g. recent widowhood).
- Over time, women at possible risk of becoming more socially isolated (e.g. those with sensory loss) become less satisfied with their levels of social support.

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Conflicts of interest

There are no conflicts of interest.

Supplementary data

Supplementary data for this article are available online at http://ageing.oxfordjournals.org.

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