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## **Living with Urinary Incontinence: A longitudinal Study of Older Women**

### **Abstract**

#### **Purpose**

Urinary incontinence carries major social burden and considerable costs for health care systems. 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, and with improvements in continence status in later life.

#### **Methods**

Women are 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. Transitions in continence status were defined according to women's reports of "leaking urine" at each survey. General Estimating Equation models were 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 six years of follow-up. Over this time, 20% of the women in the study developed incontinence, and only a minority of women (2.3%) reported incontinence that was not present at later surveys. Around one-third of women reported incontinence on at least one survey; and 27% of women participating in Survey 4 in 2005 reported leaking urine sometimes or often at that survey, with women being twice as likely to report incontinence at this survey as they were six years earlier. Incontinence was clearly associated with lower physical and social functioning, but these differences also preceded the reporting of leaking urine. Parity was not strongly associated with incontinence, but other factors in the gynaecological history including prolapse, prolapse repair, and hysterectomy were. Constipation and dysuria were also strongly associated with incontinence in the longitudinal models.

#### **Conclusion**

The findings have important implications for prevention and management of incontinence at older ages.

### **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 (Doran 2001). Incontinence is common among older people, and among women (Millard 1996), and is a major factor leading to placement in nursing homes (Smith 1998).

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 (Miller *et al.* 2003a). 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 (Miller *et al.* 2003b). 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 (Miller *et al.* 2003b) and many avoided physical activity (Brown and Miller 2002) in an attempt to reduce their symptoms.

While these findings emphasise the importance of the problem of incontinence in our community, 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. Since these findings have been published more data have been gathered on the women participating in the Australian Longitudinal Study on Women's Health. 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 Health Insurance Commission (HIC) database. Women from rural and remote locations were deliberately over sampled. These older women have completed four surveys at three year intervals (1996, 1999, 2002 and 2005). More details of the study have been published elsewhere (Brown *et al.* 1996; Brown *et al.* 1998; Lee *et al.* 2005) and are available from [www.alswh.org.au](http://www.alswh.org.au) .

At each Survey (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 (dichotomised as less than three, and three 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 five, and five or more). Full questions are available at [www.alswh.org.au](http://www.alswh.org.au) .

The Medical Outcomes Study SF-36 Health Survey (SF-36) (Ware and Sherbourne 1992) was included in S1-S4 and is the main measure of health-related quality of life. This generic profile measure examines eight dimensions of quality of life including physical, mental and social well-being (Ware *et al.* 1994). The instrument is widely used and well validated and has been extensively reviewed for use with older populations (Haywood *et al.* 2005).

Deaths were ascertained annually from the National Death Index with matching on name, address and date of birth information (Powers *et al.* 2000). 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 (SAS Institute 2003). Women were classified as having prevalent, intermittent, incident incontinence or as having never reported this condition based upon their answers to the question regarding leaking urine at each survey S2-S4. Women who reported leaking urine sometimes or often at S2 and at S3 were classified as “prevalent” cases at S2\*.

Other women who reported leaking urine at S2 but who subsequently reported they rarely or never experience this problem were classified as “intermittent” cases. Women who reported they rarely or never experience leaking urine at S2 and who subsequently reported this problem sometimes or often were classified as “incident” cases. Women who consistently reported they rarely or never had this problem at all surveys were classified as “never” cases. Frequency tables and Chi-square were used to describe the association between variables at S1 and these classifications of incontinence.

Generalized Estimating Equations (GEE) (Liang and Zeger 1986) 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. Explanatory variables were selected after bivariate analyses of each factor of interest at each time point, and by selecting those with p-value 0.005 or less. 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. The analyses were performed with Proc Genmod in SAS V9.1.

### **Results**

In 1996, 12,432 women aged 70-75 years completed S1 and 7158 of these women completed S4 in 2005 (58% of original cohort), however 257 women could not be classified according to their continence status: leaving 6901 women for this analysis. Between S1 and S4, 1864 women died, a further 3410 women withdrew from the study.

At S1, 2578 (21%) women reported they had experienced leaking urine “sometimes” (14%) or “often” (6.4%). The proportion reporting this problem among surviving respondents at S2, S3, S4 was 13%, 18% and 27% respectively. A large number of women (1066, 41%) who reported leaking urine at S1 reported that they experience this problem “rarely” or “never” at S2. For this reason, S1 prevalence of incontinence was considered to be anomalous and was not used in the definition of caseness.

According to responses to S2, S3 and S4, 738 (11%) women were classified as having prevalent incontinence at S2, 162 (2.3%) women were classified as having intermittent incontinence, and 1389 (20%) women were classified as having incident incontinence that was not reported at S2

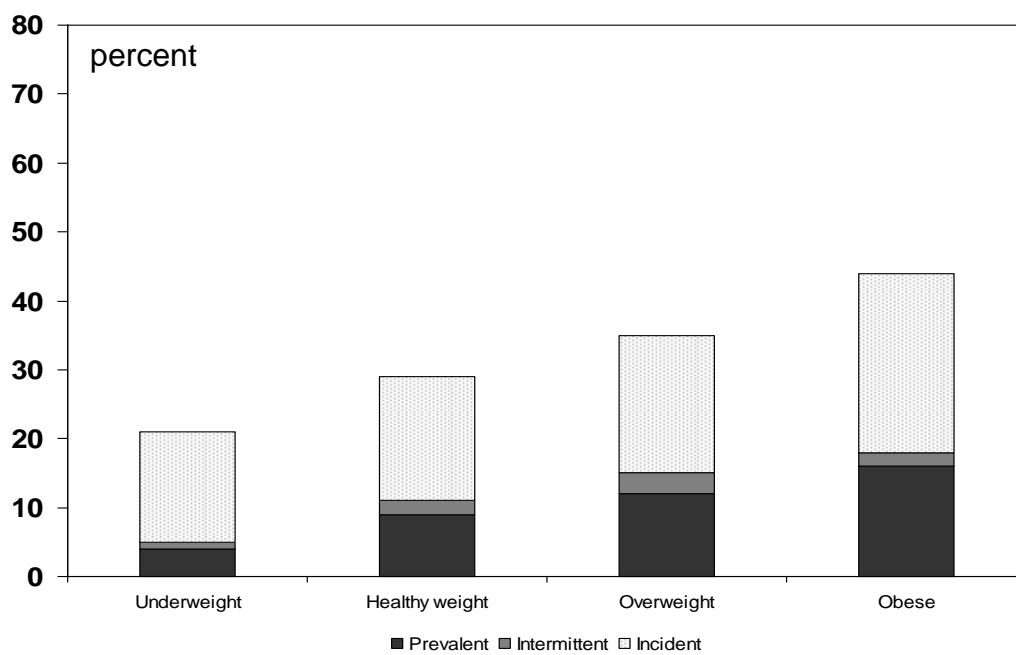
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\* Regardless of what they reported at S3.

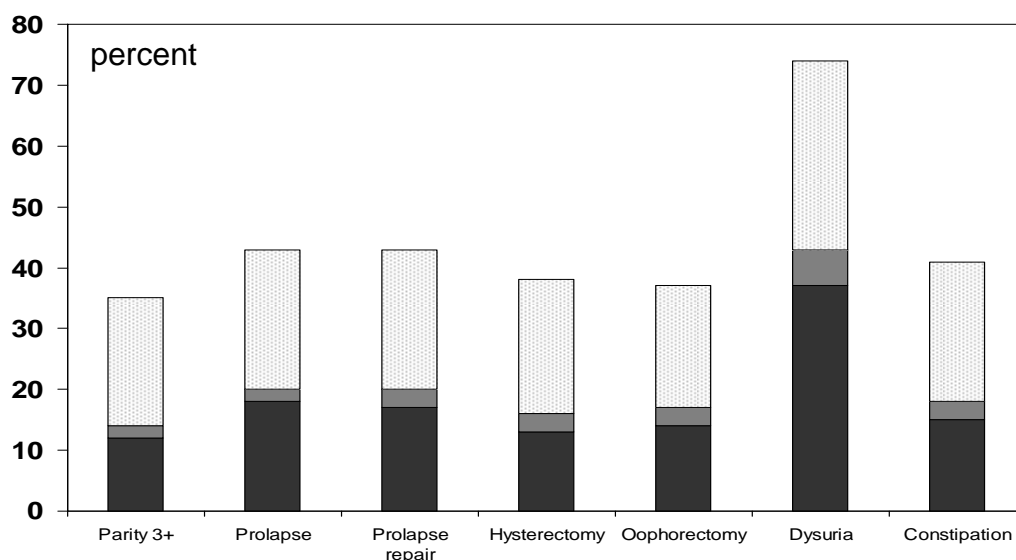
but reported at either S3 or S4. At total of 4612 (67%) women never reported leaking urine sometimes or often at any of the three surveys (classified as never incontinent). There were no significant associations between incontinence classification and area of residence, education, marital status, caring for children, or undertaking unpaid voluntary work.

Significant positive associations were observed between these classifications and Survey 1 reports of diabetes ( $p=0.009$ ), stroke ( $p=0.008$ ), current smoking ( $p<0.023$ ), need for help with daily tasks ( $p<0.001$ ), and making five or more visits to a general practitioner ( $p<0.001$ ), and BMI ( $p<0.001$ ); and Survey 2 reports of falls to the ground in the past 12 months ( $p<0.001$ ) and dissatisfaction with physical ability ( $p<0.001$ ). Figure 1 shows the strong trend between proportions of women classified as having prevalent, intermittent, or incident incontinence and increasing BMI as classified at Survey 1.

Parity three or higher at Survey 1 was also strongly associated with incontinence ( $p<0.001$ ), as also was prolapse and prolapse repair, hysterectomy, oophorectomy, urine that burns or stings and constipation ( $p<0.001$  for all conditions and procedures). Figure 2 shows the prevalence of incontinence among women reporting these conditions and procedures.

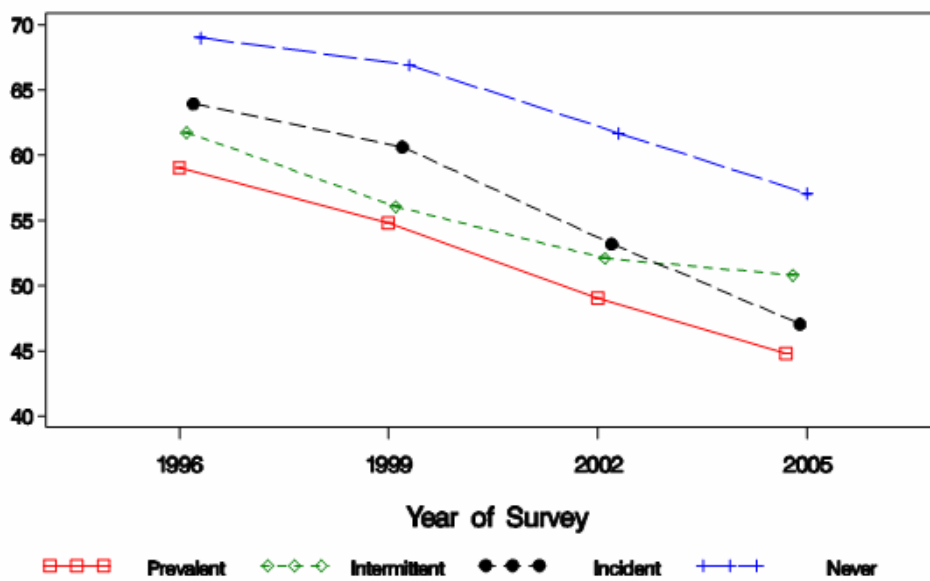


**Figure 1: Prevalence of incontinence among women according to BMI reported at Survey 1**

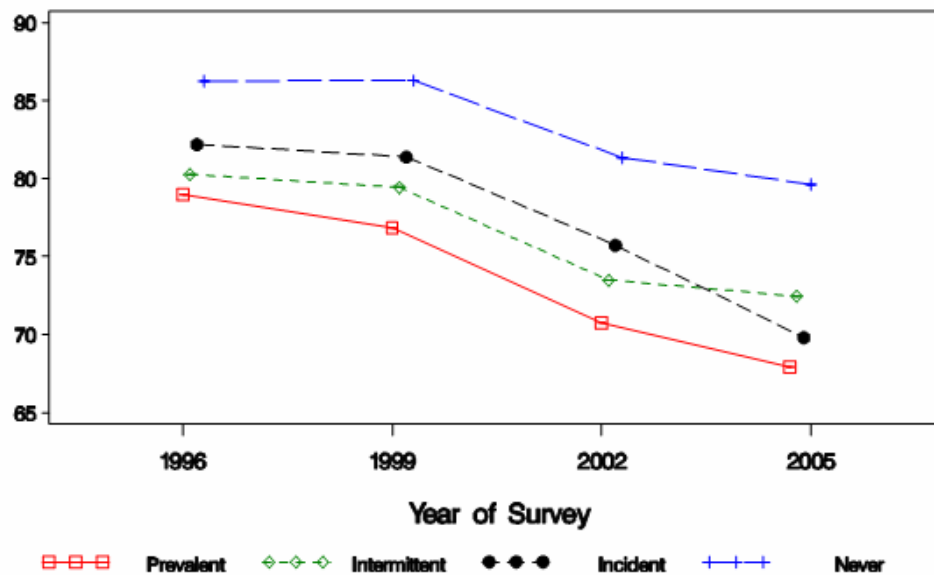


**Figure 2: Prevalence of incontinence among women according to urogynaecological conditions and procedures reported at Survey 1**

SF-36 sub-scale scores for physical and social functioning are shown in Figure 3 and Figure 4 respectively. In both cases, women with incontinence have lower scores than other women. However, for women with incident incontinence the scores 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 3. SF-36 Physical Function scores for women with and without SF-36 Social Function scores**



**incontinence**

**Figure 4. SF-36 Social Function scores for women with and without incontinence**

The results of the GEE model is shown in Table 1. In this model, incontinence increased with time. At Survey 4, women were almost twice as likely to report incontinence as they were at Survey 2. Incontinence was strongly associated ( $p < 0.005$ ) with physical conditions such as stroke, dementia, physical ability, falls to the ground, and five or more general practice visits in 12 months. Incontinence was not associated with area of residence, smoking or education. Diabetes was significant in the model, but the Odds Ratio includes 1.0 and the association with incontinence was not strong. Parity was also not strongly associated with incontinence in the longitudinal model, but other factors in the gynaecological history including prolapse, prolapse repair, and hysterectomy were.

**Table 1. Longitudinal association between health and social factors and leaking urine**

<b>Explanatory variable</b>	<b>Outcome (reference)</b>	<b>Odds Ratio Estimate</b>	<b>Lower CL</b>	<b>Upper CL</b>
Time	2005 (1999)	1.94	1.79	2.09
	2005 (1999)	1.94	1.79	2.09
Area of residence	rural/remote (urban)	1.05	0.95	1.15
Diabetes	yes (no)	1.13	0.99	1.28
Dementia	yes (no)	2.34	1.64	3.34
Stroke	yes (no)	1.29	1.07	1.55
Fall to the ground	yes (no)	1.23	1.13	1.33
Number of visits to a general practitioner	five times or more	1.15	1.01	1.31
	three or four times or more	1.05	0.92	1.21
In the past 12 months	(none, one or two)			
	obese	2.18	1.70	2.80
BMI category	overweight vs acceptable weight	1.62	1.27	2.05
	underweight vs acceptable weight	1.39	1.10	1.75
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
Urine that burns or stings	yes (no)	2.06	1.86	2.28
Constipation	yes (no)	1.46	1.34	1.58
	three or more births	1.09	0.91	1.31
Parity	twice vs none	0.98	0.80	1.19
	once vs none	0.83	0.65	1.06
Prolapse	yes (no)	1.53	1.35	1.74
Prolapse repair	yes (no)	1.23	1.08	1.40
Hysterectomy	yes (no)	1.12	1.01	1.24

## **Discussion**

This study presents longitudinal data on the prevalence and incidence of incontinence from a large cohort of older women, over six years of follow-up. Over this time, 20% of the women in the study developed incontinence, and only a minority of women (2.3%) reported incontinence that was not present at later surveys. Around one-third of women reported incontinence on at least one survey; and 27% of women participating in Survey 4 reported leaking urine sometimes or often at that survey, with women being twice as likely to report incontinence at this survey as they were six years earlier. Incontinence was clearly associated with lower physical and social functioning, but these differences also preceded the reporting of leaking urine.

GEE models indicate a strong longitudinal association between incontinence and physical conditions such as stroke, dementia, physical ability, and falls to the ground.

Falls to the ground may be a consequence of incontinence (due to rushing to reach the toilet in time) but is likely to also be related to a common underlying cause such as general weakness, connective tissue integrity, or other aspects of frailty. The strong associations between BMI, dysuria and constipation may point to key opportunities to prevent incontinence.

A novel finding of this study is the lack of association between continence and parity. Cross-sectional studies involving younger women show that incontinence is strongly associated with parity. The lack of association in these data may suggest that parity is of greater importance in the development of incontinence at younger ages. At these older ages, other gynaecological factors, including gynaecological surgery appear to be stronger predictors of later continence problems.

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 these data women with incontinence were no less likely to provide care for children, provide 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 was 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 physical function support this case.

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 (Byles *et al.* 2003). 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 and which is at high risk of falls and fractured bones. A further strength is the use of longitudinal data which has allowed us to determine new cases of incontinence (incidence) 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 Survey 1 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 (Young *et al.* 2006), suggesting that our prevalence and incidence estimates may be low.

## **Conclusion**

Prevalent and incident incontinence is common among women at older ages, and may be particularly associated with underlying gynaecological and physical conditions. Some conditions such as dysuria and constipation may exacerbate incontinence at older ages and the management of these conditions would seem important for improving health outcomes for women at older ages.

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