



The prevalence of urinary incontinence

I. Milsom & M. Gyhagen

To cite this article: I. Milsom & M. Gyhagen (2019) The prevalence of urinary incontinence, *Climacteric*, 22:3, 217-222, DOI: [10.1080/13697137.2018.1543263](https://doi.org/10.1080/13697137.2018.1543263)

To link to this article: <https://doi.org/10.1080/13697137.2018.1543263>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 21 Dec 2018.



Submit your article to this journal [↗](#)



Article views: 3811



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 4 View citing articles [↗](#)

The prevalence of urinary incontinence

I. Milsom and M. Gyhagen

Department of Obstetrics & Gynaecology, Sahlgrenska Academy at Gothenburg University, Gothenburg, Sweden

ABSTRACT

The reported prevalence of urinary incontinence (UI) among women varies widely in different studies due to the use of different definitions, the heterogeneity of different study populations, and population sampling procedures. Population studies from numerous countries have reported that the prevalence of UI ranged from approximately 5% to 70%, with most studies reporting a prevalence of any UI in the range of 25–45%. Prevalence figures increase with increasing age, and in women aged ≥ 70 years more than 40% of the female population is affected. Prevalence rates are even higher in the elderly-elderly and amongst nursing home patients. There are only a few studies describing progression as well as remission of UI in the general population as well as in selected groups of the population. The mean annual incidence of UI has been reported to range from 1% to 9%, while estimates of remission are more varying, from 4% to 30%. The prevalence of UI is strongly related to the age of the woman and thus, due to the increase in mean life expectancy, the overall prevalence of UI in women is expected to increase in the future.

ARTICLE HISTORY

Received 12 October 2018
Accepted 27 October 2018
Published online 18 December 2018

KEYWORDS

Urinary incontinence;
prevalence; risk factors;
epidemiology; incidence

Introduction

Urinary incontinence (UI) is a highly prevalent condition with a profound influence on well-being and quality of life as well as being of immense economic importance for the health service^{1–4}. Millions of women throughout the world are afflicted^{2,3} and there has been a growing interest in these symptoms as a consequence of the increased awareness of the human and social implications for the individual sufferer. Population-based studies have reported that UI is more common in women than men and that approximately 10% of all adult women suffer from UI^{2,3}. Prevalence figures increase with increasing age, and in women aged ≥ 70 years more than 40% of the female population is affected. Prevalence rates are even higher in the elderly-elderly and amongst nursing home patients.

Inappropriate leakage of urine is perceived by many women but is not always reported to the doctor. However, an increasing awareness of the problem has in recent years attracted more patients to seek advice. In elderly women, UI may lead to possible rejection on the part of a relative and may be an important factor in the decision of whether or not to institutionalize an elderly person. UI not only causes personal suffering for the individual afflicted but is also of considerable economic importance for the health service⁴. The annual cost of UI in Sweden, for example, has been reported to account for approximately 2% of the total health-care budget¹.

Prevalence studies

Prevalence is defined as the probability of experiencing a symptom or having a condition or a disease within a defined

population and at a defined time point. The concept is important for establishing the distribution of the condition in the population and for projecting the need for health and medical services. The reported prevalence of UI among women varies widely in different studies due to the use of different definitions, the heterogeneity of different study populations, and population sampling procedures. In addition, different definitions of UI have been applied. Studies of disease frequency should rely on a specific definition of the condition under investigation. The absence of a unifying definition for the condition reviewed is a fundamental problem which has not been resolved.

UI has been defined in the joint report from the International Urogynecological Association/International Continence Society as any involuntary leakage of urine⁵. However, some authors have chosen to restrict prevalence figures according to the frequency of involuntary urinary leakage – for example, based only on daily, weekly, monthly, or annual urinary leakage. Thus, for the reasons given, it is difficult to compare the results of different population studies. However, when reviewing the literature, there is considerable evidence to support the theory that the prevalence of UI in women increases with age, but there are divergent opinions regarding the pattern of this increase³.

The prevalence of urinary incontinence

In a review³ of population studies from numerous countries, the prevalence of UI ranged from $\sim 5\%$ to 70%, with most studies reporting a prevalence of any UI in the range of 25–45%. This enormous variation between studies is seen

Table 1. Population-based prevalence rates for female urinary incontinence (UI) in studies sampling more than one country.

| Study | Method | Age (years) | Country | Sample | UI | Prevalence (%) | | | |
|------------------------------------|-----------|-------------|---------------------------------|-------------------------------|--------|----------------|--------|--------|------|
| Hunskaar et al., 2004 ⁶ | Postal | 18+ | France | 3881 | All UI | 44 | | | |
| | | | | | SUI | 13.6 | | | |
| | | | | | UUI | 11.9 | | | |
| | | | Germany | 3824 | All UI | 41 | | | |
| | | | | | SUI | 16.4 | | | |
| | | | | | UUI | 6.6 | | | |
| | | | Spain | 6444 | All UI | 23 | | | |
| | | | | | SUI | 9.0 | | | |
| | | | | | UUI | 4.8 | | | |
| | | | UK | 2931 | All UI | 42 | | | |
| | | | | | SUI | 17.2 | | | |
| | | | | | UUI | 6.7 | | | |
| | | | Irwin et al., 2006 ⁷ | Direct or telephone interview | 18+ | Sweden | 19,165 | All UI | 29.5 |
| | | | | | | | | Italy | 9.3 |
| | | | | | | | | Canada | 13.0 |
| Germany | UK | All UI | | | | 11.4 | | | |
| | | All UI | | | | 14.9 | | | |
| | | All UI | | | | 14.9 | | | |
| Coyne et al., 2009 ⁸ | Web based | 40+ | | | | USA | 10,584 | All UI | 67.0 |
| | | | | | | | | SUI | 23.1 |
| | | | | | | | | UUI | 6.7 |
| | | | | | | UK | 3983 | All UI | 21.1 |
| | | | | | | | | All UI | 69.0 |
| | | | | | | | | SUI | 28.6 |
| | | | | | | Sweden | 1293 | All UI | 7.1 |
| | | | | | | | | UUI | 19.6 |
| | | | | | | | | SUI | 67.1 |
| | | | | | SUI | 26.9 | | | |
| | | | | | UUI | 7.9 | | | |
| | | | | | MUI | 16.2 | | | |

UUI, urge urinary incontinence; MUI, mixed urinary incontinence; SUI, stress urinary incontinence.

both within and between countries. Few studies report age-standardized rates, which largely precludes a meaningful comparison between countries. If there is a variation in true prevalence rates between countries, it may have been obscured by cultural differences in the perception of UI, a varying willingness to report UI, as well as methodological differences such as the use of different case definitions.

Few studies have used the same survey tools and methods to report the prevalence of female UI in the general population in more than one country (Table 1). Three studies have assessed the relative prevalence in western nations^{6–8}. Across all countries surveyed, all three studies reported stress UI to be the most common subtype, followed by mixed UI and then urge UI. Hunskaar et al.⁶ surveyed 29,500 women in France, Germany, the UK, and Spain. By demonstration of similar age trends across all countries, they suggested both lower overall prevalence of incontinence in Spain and a relative excess of urge UI in France. The Epidemiology of Incontinence (EPIC)⁷ and the Epidemiology of Lower Urinary Tract Symptoms (EpiLUTS)⁸ studies used similar questionnaire items explicitly based on standard definitions. However, there was inconsistency between the studies. The EpiLUTS study found similar prevalence of each UI subtype in the USA, the UK, and Sweden, while the EPIC study reported a more than three-fold variation in prevalence between countries, with Sweden having a prevalence of 29.5% and Italy only 9.3%. The disparity in results could be explained by differences in sampling methods, or different response rates (58%, 33%, and 59%, respectively).

Figure 1 illustrates the results from two independent studies of UI in women from the same country. In both studies, prevalence was restricted to women who had urinary leakage at least once per week. Although the study performed by Samuelsson et al.⁹ was undertaken in a rural area and that by Simeonova et al.¹⁰ was carried out in an inner city, there are strong similarities between the results of the two studies, with a linear increase in the prevalence of UI which continues over the perimenopausal years.

The prevalence of UI in women has been compared with the prevalence in men of the same age in two large Swedish studies^{11,12}. As can be seen from the results illustrated in Figure 2, there is a higher prevalence of UI in women than in men in all of the age groups studied. In general, the prevalence of UI is approximately three times more common in women than in men.

In several studies, attempts have been made to determine the proportion of women suffering from the different types of urinary leakage (i.e. stress UI, urge UI, and mixed UI). In the literature³, stress urinary leakage tends to dominate among younger women while the numbers of women with urge incontinence and mixed incontinence increase with age.

UI is not static, however, but dynamic and many factors may contribute to the incidence, progression, or remission. There are only a few studies describing progression as well as remission, in the short term, of UI in the general population as well as in selected groups of the population. The mean annual incidence of UI seems to range from 1% to 9%,

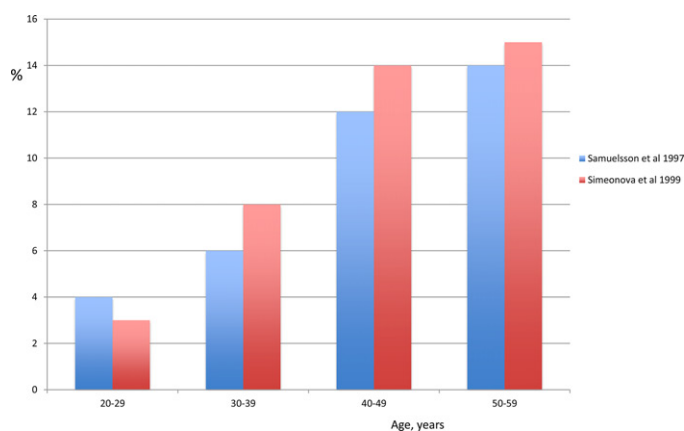


Figure 1. Comparison of the prevalence of urinary incontinence in two population-based studies of Swedish women. The study by Samuelsson et al.⁹ was performed in a rural area and the study by Simeonova et al.¹⁰ was performed in an inner city.

while estimates of remission are more varying, from 4% to 30%¹³⁻¹⁵.

Wennberg et al.¹³ studied the prevalence of UI in the same women (aged ≥ 20 years) over time in order to assess possible progression or regression. A self-administered postal questionnaire with questions regarding UI, overactive bladder, and other lower urinary tract symptoms was sent to a random sample of the total population of women in 1991. The same women who responded to the questionnaire in 1991 and who were still alive and available in the population register 16 years later were reassessed using a similar self-administered postal questionnaire. The overall prevalence of UI increased from 15% to 28% ($p < 0.001$) from 1991 to 2007 and the incidence rate of UI was 21%, while the corresponding remission rate was 34%.

Factors influencing the prevalence of urinary incontinence

Risk factors described in the literature are shown in Table 2. For the majority of these risk factors, there are at present no controlled trials demonstrating that intervention reduces the incidence, prevalence, or degree of severity of UI.

Several studies suggest that the risk of UI 'runs in the family'^{3,16-19}. Family history studies have found a two-fold to three-fold greater prevalence of stress UI among first-degree relatives of women with stress UI compared to first-degree relatives of continent women. In the Norwegian Nord-Trøndelag health survey (EPINCONT), daughters of mothers with UI had an increased risk of stress UI, mixed UI, and urge UI¹⁶. In general, the risk was somewhat higher for sisters of a woman with UI than for her daughters.

Studies from the Swedish twin register indicated that heritability contributes to the liability of developing UI. The authors presented evidence that genetic and non-shared environmental factors equally contributed 40% of the variation in liability^{18,19}. Although the study methodology and the magnitude of the risk estimates vary, studies on familial transmission of incontinence are in agreement^{3,16-19}: having a first-degree female family member with stress UI increases

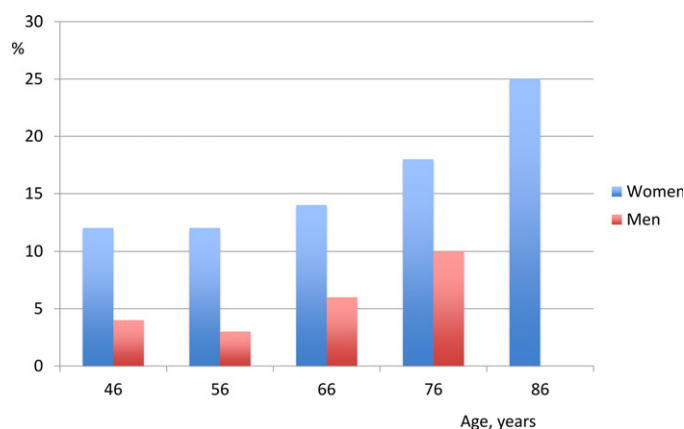


Figure 2. Comparison of the prevalence of urinary incontinence in women and men of the same age resident in the same urban population. Data from two population-based studies which included 7459 women¹¹ and 7763 men¹².

the risk for an individual becoming afflicted by the same disorder.

The prevalence of UI in nulliparous women of childbearing age has been reported to be 10-15%²⁰⁻²². Al-Mukhtar Othman et al.²³ studied the prevalence of UI in a large cohort of non-pregnant, nulliparous women aged 25-64 years. The overall prevalence of UI was 16.7%. UI increased more than five-fold from 9.7% in the youngest women with a body mass index (BMI) $< 25 \text{ kg/m}^2$ to 48.4% among the oldest women with a BMI $\geq 35 \text{ kg/m}^2$. The prevalence of bothersome UI almost tripled from 2.8% to 7.9% and the proportion with bothersome UI among incontinent women increased to 32.3% in the age group 55-64 years. Mixed UI increased from 22.9% to 40.9% among the oldest nullipara women (0-para) with incontinence, whereas stress UI alone decreased inversely from 43.6% to 33.0%. In the total cohort, surgical treatment for UI occurred in 3 per 1000 cases.

Many studies³ have assessed the influence of pregnancy, and in particular vaginal delivery, on the risk of developing UI. UI preceding pregnancy in nulliparous women has been shown to be a strong indicator for increased prevalence of UI 4-12 years postpartum^{24,25}. Pregnancy in itself, independent of labor and delivery practices, seems to be a risk factor for postpartum UI^{26,27}, especially if the incontinence started during the first trimester²⁸. During pregnancy, the prevalence of UI increases with gestational age²⁹ so that more than half of all women report UI during the third trimester³⁰⁻³². Stress UI and mixed UI increased most during pregnancy compared to before pregnancy whereas urge UI did not change during the same period³³. During the first 3 months, the postpartum UI prevalence was 30% and most women had stress UI³⁴. In uncomplicated courses of pregnancy and labor, UI usually declines rapidly during the first 3 months following childbirth, indicating that most symptoms are part of a normal pregnancy and delivery²⁶. Several studies have also demonstrated that postpartum UI is a risk factor for UI after longer (7 months-6 years) terms of follow-up^{27,35-37}.

The first delivery is considered to increase the prevalence of UI the most, and recent studies have demonstrated a further increase for each delivery^{11,38-41}. Several cross-sectional

Table 2. Risk factors for urinary incontinence.

| Risk factor |
|--------------------------|
| Age |
| Parity |
| Hereditary factors |
| Pregnancy |
| Hysterectomy |
| Delivery mode |
| Concurrent prolapse |
| Anal sphincter rupture |
| Irritable bowel syndrome |
| Postmenopausal |
| Ethnicity |
| Multiple sclerosis |
| Dementia |
| Parkinson's illness |
| Obesity |
| Physical activity |
| Neurological illnesses |
| Diabetes mellitus |
| Urinary tract infections |

Table 3. Estimated number of individuals with urinary incontinence by year and sex.

| Urinary incontinence | Male | | | Female | | |
|----------------------|------|------|------|--------|------|------|
| | 2008 | 2013 | 2018 | 2008 | 2013 | 2018 |
| Any | 98 | 109 | 120 | 250 | 275 | 301 |
| Urge | 22 | 25 | 27 | 27 | 30 | 33 |
| Mixed | 11 | 12 | 14 | 43 | 47 | 52 |
| Stress | 10 | 12 | 13 | 127 | 140 | 153 |
| Other | 55 | 61 | 66 | 53 | 58 | 64 |

Based on data from Irwin et al.².

and several longitudinal studies show a protective effect of Cesarean section for UI^{42–45}. BMI is considered to be an established risk factor for UI⁴⁰, whereas the association between UI and age is complicated by confounders⁴⁶.

Gyhagen et al.^{44,45} studied the prevalence of UI 20 years after a single delivery. The risk of developing UI was found to be 71% higher after vaginal delivery than after Cesarean section and the prevalence of UI >10 years almost tripled after vaginal delivery compared to Cesarean section. There was no difference in the prevalence of UI or UI >10 years between women who delivered by acute Cesarean section or elective Cesarean section, indicating that it is during the later stages of delivery, when the fetus passes through the pelvic floor, when the risk of UI increases. Maternal weight was also an important risk factor and, in the multivariate regression analyses, there was an 8% increased risk of UI per BMI unit increase and the rate of UI was apparent for both modes of delivery. Current BMI was the most important BMI determinant for UI and this finding is important, as BMI is modifiable. For women who delivered vaginally, rates of incontinence increased with increasing infant birth weight but this was not observed after Cesarean section. The prevalence of UI increased with maternal age and there was an annual increase in UI prevalence of 3% per year.

Global prevalence

Irwin et al.² have published data estimating the current and future worldwide prevalence of lower urinary tract symptoms. Age-specific and gender-specific prevalence rates from

Table 4. Global estimates of individuals with urinary incontinence grouped by year and region.

| Region | Urinary incontinence | | |
|---------------|----------------------|------|------|
| | 2008 | 2013 | 2018 |
| World | 346 | 383 | 420 |
| Africa | 33 | 38 | 43 |
| North America | 32 | 34 | 37 |
| South America | 20 | 22 | 24 |
| Asia | 206 | 231 | 256 |
| Europe | 54 | 56 | 57 |

Based on data from Irwin et al.².

the EPIC study⁷ were applied to the worldwide population over 20 years old (4.2 billion), with males and females stratified into 5-year age groups (20–24 years to 80+ years). Projected population estimates for all worldwide regions were based on the US Census Bureau International Database. Estimates were presented for 2008, 2013, and 2018 and are summarized in Tables 3 and 4.

Based on the results of the EPIC study⁷, the global prevalence of UI was estimated to be 8.7% worldwide. To put this into perspective, with over 421 million people affected, the total prevalence of UI is larger than the total population of the USA (329 million). If UI was a country, it would be the third largest country in the world, surpassed only by India and China.

The global prevalence of urge UI has been assessed in a systematic review⁴⁷. This systematic review identified 54 articles (50 studies); 22 were large-scale, population-based surveys. The prevalence estimates for urge UI ranged from 1.8% to 30.5% in European populations, from 1.7% to 36.4% in US populations, and from 1.5% to 15.2% in Asian populations. Prevalence estimates were highly dependent on age and gender.

Mean life expectancy in the world is increasing, and in some countries 25% of all persons are at present ≥ 65 years of age. The prevalence of UI is expected to increase in the future and thus there will be a corresponding increase in the number of women requiring treatment for UI. Another important factor to consider, apart from the numerical increase in the number of elderly women, is the fact that many women of today suffer in silence, accepting UI as a normal part of the aging process. Women who are at present 30 and 40 years of age have other demands on their physical condition and will undoubtedly not accept what their older counterparts accepted later in life. Thus, the demands on the health-care services regarding the management of UI are expected to increase in the future, due in part to the aging population.

Conflict of interest No potential conflict of interest was reported by the authors.

Source of funding Nil.

References

1. Ekelund P, Grimby A, Milsom I. Urinary incontinence. Social and financial costs high. *BMJ* 1993;306:1344

2. Irwin DE, Kopp ZS, Agatep B, Milsom I, Abrams P. Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction. *BJU Int* 2011;108:1132–8
3. Milsom I, Altman D, Cartwright R, et al. Epidemiology of urinary incontinence (UI) and other lower urinary tract symptoms (LUTS), pelvic organ prolapse (POP) and anal (AI) incontinence. In: Abrams P, Cardozo L, Wagg A, Wein A, eds. *Incontinence*. 6th ed. Paris: Health Publications Ltd; 2016:17–24
4. Wagner T, Moore K, Subak L, De Wachter S, Dudding T, Economics of urinary and faecal incontinence, and prolapse. In: Abrams P, Cardozo L, Wagg A, Wein A, eds. *Incontinence*. 6th ed. Paris: Health Publications Ltd; 2016:17–24
5. Haylen BT, de Ridder D, Freeman RM, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Neurourol Urodyn* 2010;29:4–20
6. Hunskaar S, Lose G, Sykes D, Voss S. The prevalence of urinary incontinence in women in four European countries. *BJU Int* 2004;93:324–30
7. Irwin DE, Milsom I, Hunskaar S, et al. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. *Eur Urol* 2006;50:1306–14
8. Coyne KS, Sexton CC, Thompson CL, et al. The prevalence of lower urinary tract symptoms (LUTS) in the USA, the UK and Sweden: results from the Epidemiology of LUTS (EpiLUTS) study. *BJU Int* 2009;104:352–60
9. Samuelsson E, Victor A, Tibblin G. A population study of urinary incontinence and nocturia among women aged 20–59 years. Prevalence, well-being and wish for treatment. *Acta Obstet Gynecol Scand* 1997;76:74–80
10. Simeonova Z, Milsom I, Kullendorff M, Molander U, Bengtsson C. The prevalence of urinary incontinence and its influence on the quality of life in women from an urban Swedish population. *Acta Obstet Gynecol Scand* 1999;78:546–51
11. Milsom I, Ekelund P, Molander U, Arvidsson L, Areskoug B. The influence of age, parity, oral contraception, hysterectomy and menopause on the prevalence of urinary incontinence in women. *J Urol* 1993;149:1459–62
12. Malmsten UG, Molander U, Peeker R, et al. Urinary incontinence, overactive bladder, and other lower urinary tract symptoms: a longitudinal population-based survey in men aged 45–103 years. *Eur Urol* 2010;58:149–56
13. Wennberg A, Molander U, Fall M, et al. A longitudinal population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in women. *Eur Urol* 2009;55:783–91
14. Hagglund D, Walker-Engstrom ML, Larsson G, et al. Changes in urinary incontinence and quality of life after four years. A population-based study of women aged 22–50 years. *Scand J Prim Health Care* 2004;22:112–17
15. Samuelsson EC, Victor FT, Svardsudd KF. Five-year incidence and remission rates of female urinary incontinence in a Swedish population less than 65 years old. *Am J Obstet Gynecol* 2000;183:568–74
16. Hannestad YS, Lie RT, Rortveit G, et al. Familial risk of urinary incontinence in women: population based cross sectional study. *Bmj* 2004;329:889–91
17. Ertunc D, Tok EC, Pata O, et al. Is stress urinary incontinence a familial condition? *Acta Obstet Gynecol Scand* 2004;83:912–16
18. Altman D, Forsman M, Falconer C, et al. Genetic influence on stress urinary incontinence and pelvic organ prolapse. *Eur Urol* 2008;54:918–22
19. Wennberg AL, Altman D, Lundholm C, et al. Genetic influences are important for most but not all lower urinary tract symptoms: a population based survey in a cohort of adult Swedish twins. *Eur Urol* 2011;59:1032–8
20. Alnaif B, Drutz HP. The prevalence of urinary and fecal incontinence in Canadian secondary school teenage girls: questionnaire study and review of the literature. *Int Urogynecol J Pelvic Floor Dysfunct* 2001;12:134–7
21. Brown SJ, Donath S, MacArthur C, et al. Urinary incontinence in nulliparous women before and during pregnancy: prevalence, incidence, and associated risk factors. *Int Urogynecol J* 2010;21:193–202
22. Peyrat L, Haillet O, Bruyere F, et al. Prevalence and risk factors of urinary incontinence in young and middle-aged women. *BJU Int* 2002;89:61–6
23. Al-Mukhtar Othman J, Åkervall S, Milsom I, Gyhagen M. Urinary incontinence in nulliparous women aged 25–64 years: a national survey. *Am J Obstet Gynecol* 2017;216:149.e1–e11
24. Hvidman L, Foldspang A, Mommsen S, et al. Postpartum urinary incontinence. *Acta Obstet Gynecol Scand* 2003;82:556–63
25. Fritel X, Fauconnier A, Levet C, et al. Stress urinary incontinence 4 years after the first delivery: a retrospective cohort survey. *Acta Obstet Gynecol Scand* 2004;83:941–5
26. Foldspang A, Hvidman L, Mommsen S, et al. Risk of postpartum urinary incontinence associated with pregnancy and mode of delivery. *Acta Obstet Gynecol Scand* 2004;83:923–7
27. Schytt E, Lindmark G, Waldenstrom U. Symptoms of stress incontinence 1 year after childbirth: prevalence and predictors in a national Swedish sample. *Acta Obstet Gynecol Scand* 2004;83:928–36
28. Van Brummen HJ, Bruinse HW, Van de Pol G, et al. What is the effect of overactive bladder symptoms on woman's quality of life during and after first pregnancy? *BJU Int* 2006;97:296–300
29. van Brummen HJ, Bruinse HW, van de Pol G, et al. The effect of vaginal and cesarean delivery on lower urinary tract symptoms: what makes the difference? *Int Urogynecol J Pelvic Floor Dysfunct* 2007;18:133–9
30. Dimpfl T, Hesse U, Schussler B. Incidence and cause of postpartum urinary stress incontinence. *Eur J Obstet Gynecol Reprod Biol* 1992;43:29–33
31. Burgio KL, Zyczynski H, Locher JL, et al. Urinary incontinence in the 12-month postpartum period. *Obstet Gynecol* 2003;102:1291–8
32. Eason E, Labrecque M, Marcoux S, et al. Effects of carrying a pregnancy and of method of delivery on urinary incontinence: a prospective cohort study. *BMC Pregnancy Childbirth* 2004;4:4
33. Morkved S, Bo K. Prevalence of urinary incontinence during pregnancy and postpartum. *Int Urogynecol J Pelvic Floor Dysfunct* 1999;10:394–8
34. Thom DH, Rortveit G. Prevalence of postpartum urinary incontinence: a systematic review. *Acta Obstet Gynecol Scand* 2010;89:1511–22
35. Casey BM, Schaffer JI, Bloom SL, et al. Obstetric antecedents for postpartum pelvic floor dysfunction. *Am J Obstet Gynecol* 2005;192:1655–62
36. Viktrup L, Lose G, Rolff M, et al. The symptom of stress incontinence caused by pregnancy or delivery in primiparas. *Obstet Gynecol* 1992;79:945–9
37. MacArthur C, Glazener CM, Wilson PD, et al. Persistent urinary incontinence and delivery mode history: a six-year longitudinal study. *Bjog* 2006;113:218–24
38. Waetjen LE, Liao S, Johnson WO, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: a longitudinal analysis of data: study of women's health across the nation. *Am J Epidemiol* 2007;165:309–18
39. Grodstein F, Fretts R, Lifford K, et al. Association of age, race, and obstetric history with urinary symptoms among women in the Nurses' Health Study. *Am J Obstet Gynecol* 2003;189:428–34
40. Danforth KN, Townsend MK, Lifford K, et al. Risk factors for urinary incontinence among middle-aged women. *Am J Obstet Gynecol* 2006;194:339–45
41. Rortveit G, Hannestad YS, Daltveit AK, et al. Age- and type-dependent effects of parity on urinary incontinence: the Norwegian EPINCONT study. *Obstet Gynecol* 2001;98:1004–10
42. Rortveit G, Daltveit AK, Hannestad YS, et al. Urinary incontinence after vaginal delivery or cesarean section. *N Engl J Med* 2003;348:900–7

43. Press JZ, Klein MC, Kaczorowski J, *et al.* Does cesarean section reduce postpartum urinary incontinence? A systematic review. *Birth* 2007;34:228–37
44. Gyhagen M, Bullarbo M, Nielsen T, *et al.* The prevalence of urinary incontinence 20 years after childbirth: a national cohort study in singleton primiparae after vaginal or caesarean delivery. *BJOG* 2013;120:144–51
45. Gyhagen M, Bullarbo M, Nielsen TF, *et al.* A comparison of the long-term consequences of vaginal delivery versus caesarean section on the prevalence, severity and bothersomeness of urinary incontinence subtypes: a national cohort study in primiparous women. *BJOG* 2013;120:1548–55
46. Tennstedt SL, Link CL, Steers WD, *et al.* Prevalence of and risk factors for urine leakage in a racially and ethnically diverse population of adults: the Boston Area Community Health (BACH) Survey. *Am J Epidemiol* 2008;167:390–9
47. Milsom I, Coyne KS, Nicholson S, *et al.* Global prevalence and economic burden of urgency urinary incontinence: a systematic review. *Eur Urol* 2014;65:1:79–95