CHAPTER 5

Committee 1

Epidemiology of Urinary (UI) and Faecal (FI) Incontinence and Pelvic Organ Prolapse (POP)

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REFERENCES

Epidemiology of Urinary (UI) and Faecal (FI) Incontinence and Pelvic Organ Prolapse (POP)

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A. INTRODUCTION

In this report we focus on the epidemiology (distribution and determinants) of faecal incontinence (FI), urinary incontinence (UI), and pelvic organ prolapse (POP). We also discuss important topics such as differences between epidemiological and clinical approaches to health problems, help seeking behaviour, and methodological issues for this research.

The review includes the epidemiology of faecal incontinence and pelvic organ prolapse, topics that are parts of the Consultation for the first time. Overactive bladder (OAB) is an evolving concept with close relationship to UI, and we have included the urge incontinence part of OAB (OAB with incontinence). Other lower urinary tract symptoms (LUTS)[1] like nocturia and various pain syndromes have not been included.

The epidemiological population under study for this review will mainly be community dwelling noninstitutionalized persons. The review will include discussion of the prevalence, incidence, natural history, and presence of racial and ethnic differences. We also review correlates and potential risk factors that have been revealed in epidemiological studies. Progress has clearly been made during the 3 years since our previous report. [2] Some important areas have been studied with increasing regularity and quality. We have searched the literature for relevant new articles, thus reviewing a large number of high-quality and population based studies, as well as clinical trials that might include relevant epidemiological data. Because of an abundant number of studies, only a small fraction can be presented in a text like this. Other studies not presented here may have equally useful information, but lack of space precluded their inclusion.

SUMMARY POINTS :

- This review includes discussion of the prevalence, incidence, natural history, and presence of racial and ethnic differences in the epidemiology of UI, FI and POP.
- Correlates and potential risk factors that have been revealed in epidemiological studies are also reviewed.

B. BASIC EPIDEMIOLOGICAL CONSIDERATIONS

Epidemiology is the scientific study of the distribution and determinants of disease in people. ***Descriptive epidemiology*** is the description of disease prevalence, incidence, (and mortality) by persons, place and time, while the term ***analytical epidemiology*** describes the search for determinants of disease risk. The discovery of risk factors and protective factors may then in turn lead to primary or secondary prevention.

In order to collect knowledge about risk factors or natural history, observational studies are needed. Cohort studies and case-control studies are the most common. However, caution is always needed when interpreting the results from such studies, as associations found in epidemiological studies may not be the same as causes. Longitudinal study designs and appropriate control for confounding are preferred, as these increase the validity of epidemiologic studies..

For practical and ethical reasons, experimental designs are seldom used.

Recommendations and conclusions should always be based on the best available evidence. Studies of interventions, and studies of risk factors generally cannot be randomized because they relate to inherent human characteristics or practices, and exposing subjects to harmful risk factors is unethical. No uniform guidelines for assessing the results of observational studies exist, and the level of evidence for risk factors from observational studies should be judged on the soundness of the exclusion of alternative explanations by statistical and other controls. But some initiatives for how to report meta-analyses of observational studies have been taken. [3]

Studies of disease frequency should rely on a very specific definition of the condition under investigation. The absence of unifying definitions for the conditions reviewed here is a fundamental problem which is not resolved. Definitions used and problems associated with them are discusssed in the subsections for the particular populations below.

- **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.
- **Incidence** is defined as the probability of developing the condition under study during a defined time period. Incidence is usually reported for one, two- or five-year time interval.

Even in many of the recent studies reviewed analyses are very simple. Often only proportions or percentages are used to describe differences in different subgroups. Many analyses do not control for confounders (by stratification or multivariate analysis techniques). There is an obvious need for more advanced epidemiological analyses of risk factors and comorbidity, and strength of associations should be determined by relative risks and odds ratios.

- **The relative risk (RR)** estimates the magnitude of an association between exposure and a condition, and indicates the likelihood of having the condition in the exposed group relative to those who are not exposed (e.g. do not have the risk factor). An RR of 1.0 indicates that the rates in the exposed and nonexposed groups are identical and thus that there is no association between the exposure and the condition in that specific dataset. A value greater than 1.0 indicates a positive association or an increased risk. An RR of 2.5 for UI indicates that there is a 2.5 times increased risk or that the persons in question are 150 percent more likely to have incontinence than those without the risk factor.
- **The odds ratio (OR)** is the odds for having a risk factor in persons with a condition divided by the odds among those without the condition. An OR of 2.5 for UI my be interpreted as meaning that in this sample the odds in favour of having incontinence are 2.5 times higher among those with the risk factor than among those without.

For a condition with high prevalence, like UI or POP, OR and RR will not be identical, but in practice the results can be interpreted similarly. Results should always be given with a 95% confidence interval (CI).

Words like well established and established may be used about risk factors and findings with a high level of evidence in the literature. For less documented findings words like " indications of" or " data are suggestive" may be used.

SUMMARY POINTS :

- Descriptive epidemiology reports disease incidence, prevalence (and mortality) by persons, place and time.
- Analytical epidemiology searches for determinants of disease risk. There is a need for good longitudinal cohort studies.
- Variations in definitions and measurement issues are fundamental, and lead to problems with assessing the findings in epidemiological studies.
- There is a need for more advanced epidemiological analyses of risk factors and comorbidity using multivariable techniques, and strength of associations should be determined by relative risks and odds ratios.

C. EPIDEMIOLOGY OF ENURESIS AND UI IN CHILDREN

I. GENERAL COMMENTS AND DEFINITIONS

Only isolated bedwetting should be termed enuresis, according to the recommendations issued by the ICCS (International Children's Continence Society) [4]. The reason is that isolated bedwetting, ***nocturnal enuresis*** (NE), is a strictly defined type of incontinence characterised by complete bladder emptying during sleep without any symptoms pointing to bladder dysfunction. NE is caused by relative nocturnal polyuria [5] and/or nocturnal bladder over-activity, combined with the lack of arousal at the time when the bladder needs to be emptied. The most important cause is, of course, the lack of arousal, otherwise the child would have had nocturia.

Any other leakage of urine in children during both the day and night is referred to as ***incontinence,*** just as it is in the adult population. UI with no obvious cause, i.e. without neurological or congenital anatomic alterations, is referred to as ***functional incontinence*** and the term ***non-neurogenic bladder-sphincter dysfunction*** (NNBSD) is used to describe the entire spectrum of bladder disturbances. Several sub-classifications have been used for children who present with varying degrees of "functional" urinary symptoms (frequency, urgency, incontinence and infections). Some are based on urodynamic patterns, others on clinical presentation.

On the basis of urodynamic studies, the functional dysfunctions can be termed unstable or overactive bladder, sphincter dyscoordination, lazy bladder and occult neurogenic bladder. According to recent definitions by the International Children's Continence Society [4], based on symptoms and flow-residual studies rather than invasive urodynamic investigations, incontinence as a result of a filling-phase dysfunction (mainly bladder instability) is called "urge syndrome" and "urge incontinence". The term ***overactive bladder*** for all filling-phase dysfunction, as suggested by the ICS, is probably even better,. When incontinence is the result of a voiding-phase dysfunction, it is called ***dysfunctional voiding*** and is subdivided into staccato voiding, fractionated voiding and lazy bladder syndrome.

NE without bladder dysfunction should be referred to as ***mono-symptomatic nocturnal enuresis*** (MNE), i.e. without any symptoms other than night wetting. If night wetting is combined with day bladder symptoms, such as UI, the wetting during the night is referred to as incontinence and is regarded as part of the bladder dysfunction complex (NNBSD). In these latter cases, the night wetting is often referred to as ***polysymptomatic nocturnal enuresis*** (PNE). Despite this difference in the definition of MNE and PNE, epidemiological studies rarely differentiate between the two.

NE and UI due to NNBSD are the wetting problems addressed in this paper. Both can be either primary (the child has not been dry for more than six months) or secondary (the wetting has recurred after a dry period lasting more than six months). If the complaints are secondary, they may signify psychological, neurological or even structural anomalies and therefore require careful consideration.

The healthy infant is socially incontinent but physiologically continent, because micturitions (about once every hour) are discrete and there is no leakage of urine between micturitions [6]. Bladder control develops during the first four to six years of life and is a highly complex process which is still not fully understood. Most children are toilet trained by the age of three years, although there is huge social and cultural variation. By the age of five years, the child is normally able to void at will and to postpone voiding in a socially acceptable manner. By this age, night-time and daytime involuntary wetting becomes a social problem and a cause for therapeutic intervention.

II. PREVALENCE OF NOCTURNAL ENURESIS (NE)

As bladder control is something that develops over time, longitudinal studies are the best way of defining the dynamics of this process. Studies giving us the prevalence for all children between five and 15 years of age, for example, are not appropriate or meaningful, as all the developmental stages are clustered together. It is therefore better to give the prevalence for an age cohort, such as seven-year-olds. Furthermore, random sampling should preferably be used in order to be able to say anything about the population. These problems associated with understanding epidemiology were summarised by Krantz [7], who also reviewed the epidemiological studies that had been published by 1993.

One explanation for the variation in prevalence in different studies is the fact that they include not only MNE but also what is currently defined as night incontinence, i.e. wetting during the night, together with daytime symptoms (PNE). According to recent definitions, the latter should be included in the prevalence figures for UI due to NNBSD. Another explanatory factor is that the frequency of enuretic episodes is not taken into account in some studies. Moreover, most epidemiological studies link primary and secondary enuresis together.

1. Prevalence of all night wetting (MNE + PNE) according to age

Longitudinal cohort studies should be the ideal when analysing epidemiology in childhood NE, as there is a successive reduction in prevalence. Only a few of these studies are available[8-12] and cross-sectional studies at different ages therefore have to be used.

Most studies investigate cohorts of children in an age span of six to 12 years of age, for example, and give the prevalence for the entire group. Some of them also give the age-related prevalence [10, 13-18], which is naturally more relevant as prevalence decreases with age. Age-related prevalence from these studies is summarised in **Table 1** and **Figure 1**, in which cross-sectional studies of a specific age are also included [19-23], as well as the results from longitudinal studies [10].

In most studies, the prevalence for seven- year-olds is between 5% and 10%. In two studies, the prevalence is higher; 15.1% and 16.4% for Turkish [17] and Korean [18] children respectively, despite the fact that the inclusion criteria are very similar in all the studies dealing with seven-year-olds (NE=night wetting once/month or more), apart from the studies by Hellström [19] (once/3 months or more) and Järvelin [20] (once/6 months or more).

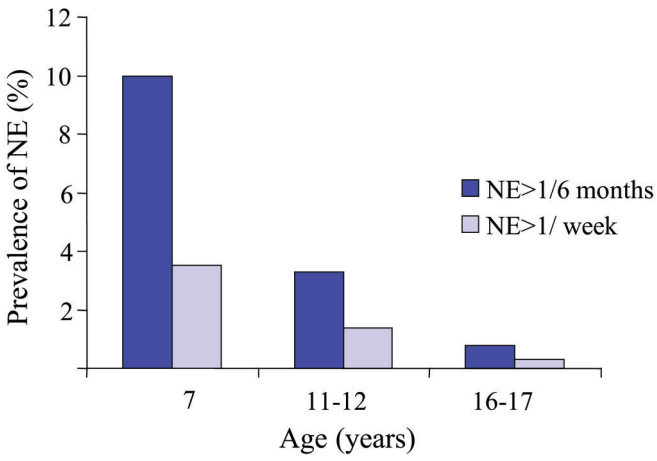


Figure 1. Prevalence of nocturnal enuresis (NE) by frequency of enuretic episodes and age. The data were obtained from metaanalyses of the epidemiological studies included in table III.1. NE>1 episode/ 6 months : at 7 years [13, 16, 18-20, 24], 11-12 years [13, 16, 18, 22] and 16-17 years [21, 23]. NE>1 episode/week : at 7 years [19, 20], 11-12 years [22] and 16-17 years [21, 23].

In six of the studies included in Table III.1 at age seven years [10, 13, 16, 18-20], the numbers of both non-enuretic and enuretic children are given and the definitions for enuresis are similar (MNE and PNE, wetting once/1-3 months or more). When mixing these studies the prevalence becomes 10% (cohort of 12,089 seven-year-old children, of whom 1,214 were enuretic). Of these studies, only three include groups of children that were chosen at random from the population [13, 18, 20]

At age 11-12 years, the prevalence of NE has decreased and the prevalence from the studies shown in Table III.1 varies between 1.2% and 4.7%. In four of the studies, the number of non-enuretics and enuretics is available and the definition of NE is similar (once/month or more), apart from Swithinbank's [22] study (once/3 months or more). In these studies,

Table 1. Prevalence of NE (MNE+PNE together) according to age

Author and year	Prevalence of NE (%)		
	7 years	11-12 years	16-17 years
Chiozza [13]	6.8	2	
Järvelin [20]	8		
Spee-van der Wekke [15]	8	4.6	
Cher [16]	9.3	1.7	
Hellström [19, 21]	9.5		0.5
Ferguson [10]	10.3	3.3	
Kanaheswari [24]	10.3	4	
Serel [17]	15.1	4.5	
Lee [18]	16.4	4.5	
Swithinbank [22, 23]		4.7	1.1

the total number of children included was 6,436, while the number of children with NE was 210, giving a prevalence of 3.2%. So, of those children with NE at age seven years, almost 15% spontaneously grow out of the wetting every year.

The variation in the prevalence of NE at 11-12 years between the studies is less than that seen at age seven years. The study from Hong Kong still has the lowest prevalence (1.2%), but the highest is no longer found in Turkey or Korea, as was the case at age seven years, but instead comes from a non-randomised cross-sectional study of 11- to 12-year-old schoolchildren (n=1,145) in the UK (4.7%). It can therefore be suggested that the high prevalence seen in the studies from Turkey and Korea at age seven is not due to differences in genetic predisposition, but rather to phenotypic differences, such as the age of toilet training and the subsequent attainment of bladder control, socio-economic status, or cultural differences.

At age 16-17, two cross-sectional studies show a further reduction in prevalence to 0.5-1.1%. Both these studies re-investigate children who had previously been studied; at age seven years [21] and 11-12 years [22] respectively. The prevalence when the cohorts are added together is 0.8% (cohort=1,528, NE=13), which also for this period gives a spontaneous cure rate of 15% a year among those who still wet at age 11-12 years.

In a study of 13,081 adults randomly sampled in the Netherlands [25], an overall prevalence of NE of 0.5% was found. There was no significant difference between age groups. Primary NE was reported by 50% of the men and 19% of the women, indicating that a small group of the enuretic children remain enuretic as adults.

2. Prevalence of monosymptomatic enuresis (MNE)

Very few studies make a distinction between MNE and PNE and it is therefore difficult to obtain relevant figures for MNE (**Table 2**). In two studies from Scandinavia dealing exclusively with seven-year-olds, there is agreement between the studies; 6.4% [20] and 7.4% [19]. When it comes to studies in which all the ages are mixed (5-12 years), there are four studies in which those without daytime voiding problems can be identified. However, the difference in the prevalence of MNE varies in these studies; 3.5% [14], 6.9% [26], 9.4% [18] and 15% [27].

Table 2. Prevalence of MNE at age seven years and overall (including all ages)

Author and year	Prevalence of MNE (%)	
	Age 7 years	All ages included
Järvelin [20]	6.4	
Hellström [19]	7.4	
Kanaheswari [24]	9.0	6.2
Lee [18]	13.6	9.4
Yeung [14]		3.5
Neveus [26]		6.9
Bower [27]		15.0

3. Prevalence of NE by gender

Almost all the epidemiological studies of NE report a higher prevalence in boys than in girls, with a ratio of 2 : 1 in western countries [13-20, 22, 26-28]. It appears that the gender difference diminishes with age and becomes less visible and less proven among older children (**Figure 2**) [21, 23, 29].

4. Prevalence of NE by ethnicity

In a study from The Netherlands, a higher prevalence is reported in the Turkish/Moroccan group (14%) than in the Dutch children (6%) (OR 3.76 (95%CI 1.98-7.12)). In a Turkish study [17] included in Table 1 at age seven years, the prevalence is also higher (15.1%) than in most of the other studies, except for a study from Korea [18], in which the same high prevalence at this age was found (16.4%). However, other studies from South-East Asia [16] had comparable or even lower levels of prevalence to those in western countries [14]. In fact, two Chinese studies

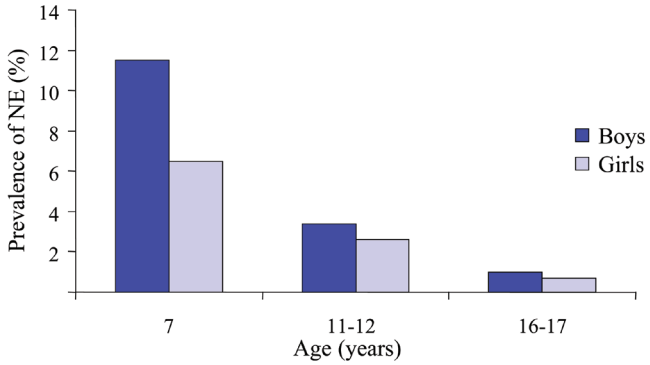


Figure 2. Prevalence of nocturnal enuresis (NE) >1 episode/ 6 months, by gender and age. The prevalence data were obtained from metaanalyses of the following epidemiological studies; at age 7 [13, 19, 20], age 11-12 [13, 22] and age 16-17 [21, 23].

have shown a low prevalence of nocturnal enuresis [14, 30], 3.6% and 4.3% for children aged 4-12 and 6-16 respectively, which they attribute to earlier nocturnal urinary control in Chinese children, due to earlier toilet training.

III. POTENTIAL RISK FACTORS FOR NE

Several risk factors have been established or suggested by epidemiological studies and the most important ones will be discussed here.

1. Family history

NE is a hereditary disorder and this has been demonstrated in many studies (for example, [13, 14, 17, 20, 26, 27, 31]. The mode of inheritance appears to be autosomally dominant. Järvelin [20] showed that, if both parents were enuretics as children, the RR (95% CI) for the child to have NE was 16 (6.3-20.1), while if only one was enuretic, the RR was 7.8 (5.1-9.8). Using molecular genetic methods, foci have been found on chromosomes 13, 12, 8 and 22 [32, 33]. A picture of pronounced heterogeneity for both genotype and phenotype emerges [34].

2. Psychopathology

There are evident connections between childhood enuresis and mental well-being [11, 12, 30, 31, 35-37]. Evidence is accumulating to show that psychological consequences are probably caused by the enuresis and not a cause of primary NE, which has been thought for a long time [36]. The findings presented by Feehan [12] support this latter statement, as he only found an association between psychopathology and secondary NE, while children with NE did not display a connection of this kind.

3. Developmental delay and mental retardation

Children with developmental delay and mental retardation have been shown to have a higher prevalence of NE [10, 15, 20, 38]. Spee-van der Wekke [15] found that children who were given special education, including both those with and without mental retardation, had an OR of 3.74 (95%CI 2.32-6.03) for NE.

Perinatal events such as toxaemia and low birth weight, possibly involving an increased risk of minor neurological dysfunction, have also been shown to be associated with NE [10, 20, 31]. A connection between NE and minor neurological dysfunction of this kind has also been shown by Lunsing [39] in 12-year-old enuretic children. Furthermore, children with attention deficit hyperactivity disorders (ADHD) are more likely to have enuresis than the general child population [37, 40, 41].

4. Sleep and arousal

The main pathology behind NE in children is the inability to wake up to the sensation of a full bladder. Parents often say that their enuretic child " sleeps very deeply". Some recent studies support this view. By using auditory signals [42], computerised EEG [43] or questionnaires [26], a defect in arousal has been largely validated. In the study by Neveus [26], the odds ratios were significantly high for a high arousal threshold (2.7), pavour nocturnus (2.4) and confusion when awoken from sleep (3.4). Computerised EEG energy analysis has indicated both greater depth of sleep and impaired arousal in enuretics [44].

5. Socio-cultural factors

Differences in the prevalence of NE [14, 17, 18, 30, 45] at early ages in different parts of the world are probably partly due to socio-cultural differences and not to differences in genetic predisposition [15]. It has been suggested that socio-economic status correlates with NE in some studies [13, 37], whereas in others no correlation was found [10].

6. Other risk factors

Sleep apnoea has been associated with enuresis in some patients [46]. Upper airway obstruction due to large adenoids or tonsils also appears to be a cause of NE, as it has been reported that the removal of these obstructions significantly reduced or cured NE [47]. Constipation may cause secondary NE or make primary NE persist [48]. Sexual abuse must also be included among the factors that may lead to NE [49]. Organic conditions such as infravesical obstruction and neuropathic bladder may also present as NE. In most cases, however, additional symptoms are present to make detection possible.

IV. PREVALENCE OF FUNCTIONAL INCONTINENCE IN CHILDREN

In children with functional NNBSD the overactive bladder is far more common than dysfunctional voiding. This has been demonstrated in urodynamic stu-

dies, but it varies from one study to another due to variability in the inclusion criteria. In a study of 1,000 patients with functional NNBSD, approximately two-thirds had an overactive bladder and one-third had dysfunctional voiding [50]. Based on clinical information, another study comprising 226 children revealed that 76% were considered to have an overactive bladder and only 1% dysfunctional voiding, again illustrating the divergent figures when different selection and inclusion criteria are used [51].

The prevalence data reported for involuntary day wetting are sparse and sometimes difficult to interpret because of different definitions (in terms of frequency of UI) and classifications. Furthermore, the incidence of UI appears to decrease with age. The following conclusions can be drawn based on available studies.

The variation in prevalence between different studies is probably dependent on several factors. One important issue appears to be the frequency of UI episodes. When considering the total prevalence of UI (all frequencies of UI included) (**Table 3**), there is agreement between different studies at the age of seven years (3.2-6.7%) and at 15-17 years (1.2-3.0%). However, at 11-13 years (1.2-12.5%), there is a large difference between Swithinbank's [22] (12.5%) and Lee's [18] (1.6%) studies and this can probably be explained in part by the fact that the former study did not give precise limits for frequency (occasionally) and the latter gave precise information about what should be included (once / month or more). The fact that the studies were performed in different parts of the world is also a possible explanatory factor (UK and Korea).

When examining subjects with frequent episodes of UI (> 1/week), on the other hand, only one cross-sectional study is available for each age group and diversity between studies cannot therefore be assessed (**Figure 3**).

Table 3 . Day UI (including mixed day/night)

Author (ref)	**Sample size**	**Prevalence (%)**			
		<1/week	**>1/week**	**Total day+night**	**Day only**
Children 7 years:					
Järvelin [20]	Total: 2,892			3.2*	1.8
	Boys – 1,444			2.7	1.3
	Girls –1,445			3.7	2.3
Hellström [19]	Total: 3,555	2.3	2.5	4.9**	2.7
	Boys – 1,834	1.7	2.1	3.8	1.7
	Girls – 1,721	2.9	3.1	6.0	3.7
Bloom [52]	Total: 101			5.0§	
Lee [18]	Total: 1,325			6.7$	3.9
Children aged 11-13 years:					
Bloom [52]	Total: 165			1.2§	
Swithinbank	Total: 1,171	11.9	0.6	12.5#	
[22]	Boys – 510	7.0	0.2	7.2	
	Girls – 661	15.7	0.9	16.6	
Lee [18]	Total: 913			1.1$	0.9
Children aged 15-17 years:					
Bloom [52]	Total: 81			1.2§	
Hellström [21]	Total: 651	1.5	0.3	1.8**	1.8
	Boys – 344	0.3	0.0	0.3	0.3
	Girls – 307	2.9	0.7	3.6	3.6
Swithinbank	Total: 940			3.0**	
[23]	Boys – 411			0.9	
	Girls – 529			4.7	

Episodes of UI: * >1/6 months, ** >1/3 months, $ > 1/ month, § >1/2 weeks, # occasionally

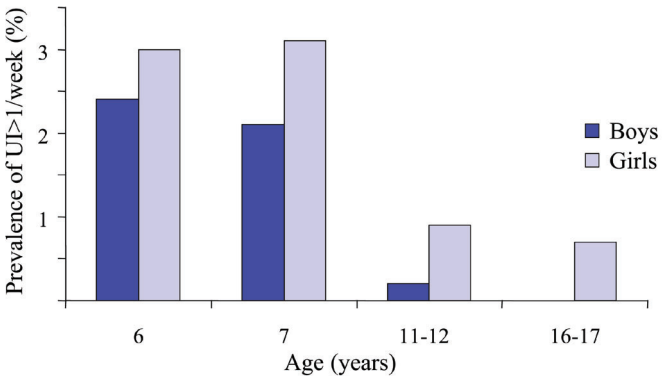


Figure 3. Prevalence of day UI (including mixed day and night) >1 episode/week, by age and gender. Data are from: at age 6 years [53], 7 years [19], 11-12 years [22] and 16-17 years [21].

The frequency of UI decreases with age (Table 3), which is clearly demonstrated in those subjects with frequent episodes of UI (>1/week). The prevalence at 7 years, 11-13 years and 15-17 years is 2.5%, 0.5% and 0.3% respectively. There are only two authors who have investigated the same cohort of children on two occasions; Hellström [19, 21] in Sweden and Swithinbank [22, 23] in the UK.

According to the studies by Hellström, the reduction from seven years to 17 years is 0.2% per year in those with wetting at least once a week and 0.3% when including all kinds of wetting. Swithinbank reported a far higher frequency for all kinds of wetting at age 11-12 years but not at 15-16 years and the reduction in his cohort of children is therefore approximately 2% per year.

UI is more common in girls, all age groups (**Table 3**). From the prevalence found in the different studies, it can be suggested that daytime UI is 1.5 times more common in girls than in boys at age seven years, whereas at age 16 years the difference is even more pronounced; 5-10 times more common in girls than in boys (**Table 3**)

V. POTENTIAL RISK FACTORS FOR DAY WETTING

1. Family history

Day wetting, also including those subjects with mixed day and night wetting, has been shown to be correlated to hereditary factors, in parallel to what is known about children with NE. However, the number of studies are limited (**Table 4**).

Table 4. Day wetting vs family history (including mixed day/night wetting)

Author	RR (95%CI)	OR (95%CI)	Positive history (%)
Järvelin [31]			
-enuresis in mother	10.1 (3.4-29.3)		
-enuresis in father	5.9 (1.9-17.8)		
Sureshkumar [53] daytime wetting in			
-male sibling		5.3 (1.6-18.2)	
-paternal lineage		9.3 (3.2-27.3)	
Chiozza [13]*			
-enuresis in parents		12.3	
Bower [27]			
-family history of enuresis			70**
Neveus [26]			
-family history		2.0 (1.1-3.7)	

** Only children with mixed day and night wetting, **compared with 45% in dry children

2. Socio-cultural factors and psychopathology

Children under stress as a result of marital separation, for example, have a higher incidence of diurnal or mixed UI, according to some authors [13, 31, 53]. Moreover, psychopathology investigated by Järvelin [31] using the Children's Apperception Test (CAT) revealed a significant increase in the signs of repression, including an inability to express one's emotions and feelings (p=0.027), when comparing day wetters with controls). Neveus [26] found that day-wetting children had more difficulty falling asleep (OR 2.4, CI 1.4-4) and he interpreted them as "anxious children". Lettgren [54] found a significant increase in attention problems and delinquent behaviour in a certain form of day-wetting children (voiding postponement) using the Child Behaviour Check List (CBCL, Achenbach).

3. Minor neurological dysfunction and developmental delay

Children with minor neurological dysfunction have also been shown to have an increased rate of day wetting. Duel [40] found that children with ADHD are three times more likely to have day UI than controls (p<0.0005). Also in children with delayed maturation or with mental retardation, the risk of day

wetting is increased (OR 1.9 and 4 respectively), according to studies by Järvelin [20]. Perinatal events, which can also be suggestive of minimal brain dysfunction, have also been shown to be over-represented in day-wetting children. For example, Järvelin [31] found that the children of mothers who had suffered from toxaemia had an RR of 8.5 (CI1.4-51.9) for day UI.

4. Other risk-factors for day UI

Sometimes, functional day UI is difficult to distinguish from UI due to organic anomalies. The most prominent examples are the adolescent form of posterior urethral valves in boys and epispadias in girls.

In many papers, UTI is regarded as a risk factor for day UI. Järvelin [31] found an RR of 8.6 (2.3-32.3) for UTI in day UI children. Neveus [26] was able to demonstrate similar connections; OR 2.3 (1.3-3.9). However, these infections should probably be regarded as a consequence of the functional bladder disturbance with UI and not the other way round as a cause of the UI.

Summary points

Nocturnal enuresis (NE)

- The prevalence of NE at age 7 seems to be around 8% for Western countries. Including studies from Southeast Asia and Turkey the incidence seems to be around 10%. The prevalence at age 11-12 years is around 3% and at age 16 around 0.8%.
- The spontaneous cure rate seems to be around 15% annually between 7 and 16 years.
- In an adult population the prevalence of NE seems to be 0.5%. The prevalence was 0.1% when including only those with a history of NE during childhood. Thus the risk for NE as adult if having the condition at 7 years of age can be calculated to 1%.
- Potential risk factors for NE in children include family history, psychopathology, developmental delay, mental retardation, socio-cultural factors, sleep and arousal, sleep apnoea, constipation, sexual abuse and organic conditions such as infravesical obstruction.

Functional incontinence

- Children who are and remain dry in the day seem to attain their diurnal continence already between age 4 and 5 years
- Diurnal UI, or combined diurnal and nocturnal UI, in children is caused by overactive bladder in the great majority of cases.
- Prevalence for functional UI decrease with age. At age 7 years prevalence figures varies between 3.2% and 6.7%. At age 15-17 years the corresponding prevalence figures are 1.2-3%.
- Variation in prevalence figures is mainly dependant on difference in frequency of incontinence episodes in the studies.
- Potential risk factors for diurnal UI in children include family history, psychopathology, socio-cultural factors, minor neurological dysfunction, developmental delay, organic anomalies such as infravesical obstruction in boys and sexual abuse.

D. EPIDEMIOLOGY OF UI IN WOMEN

I. GENERAL COMMENTS AND DEFINITIONS

UI is a common symptom that may affect women of all ages, and there is a wide range of severity and nature of symptoms. UI is not a life-threatening disease, but the symptoms may seriously influence the physical, psychological, and social well being of the affected individuals.

Prevalence estimates naturally differ in different settings; in the general population, among patients seeking help for other complaints in general practice or gynaecological clinics or in other more selected groups of women. But even across population-based studies using comparable definitions of incontinence, prevalence estimates vary. [55-57] Some population-based surveys include institutionalised women, others not, and this may influence prevalence as well as distribution of severity. The interpretation and awareness of symptoms of UI, as well as the tendency to report symptoms, may also vary between subgroups of women.

Most epidemiological studies of UI have been performed on all Caucasian populations. Modern genetics have undermined the biological concepts of race, and health differences between ethnic groups found in epidemiological studies, may be due to underlying cultural and socio-economic differences. [58]

Many epidemiological studies have investigated potential risk factors. The design of most of these studies has been cross-sectional or case-control, and there are thus limitations regarding conclusions about causality. Few studies have a longitudinal design, and few intervention studies have been conducted. Several factors are regarded as established risk factors for incontinence, in spite of unknown aspects regarding temporal relationships and actual underlying mechanisms, because they have been found to be strongly associated with incontinence in several studies, and a plausible biological foundation for the association has been found. [59]

II. PREVALENCE IN GENERAL POPULATION

A large number of epidemiological studies of UI prevalence in women have been published, including early, 'ground-breaking' studies by Milne in 1972, Thomas in 1980, and Yarnel and Vetter in 1981. [60-63]Some studies have included a wide age span while others are surveys of a single age cohort. Most have been cross-sectional studies of community dwelling women. Other have focused on specific groups such as pregnant women or women in long-term care. While white, European or North American women have been the most studied, increasing number of studies have been conducted in other countries and/or have included sufficient numbers of women of other racial/ethnic groups to allow estimation of prevalence.

Differences in populations sampled, definition and measurement of UI, and survey methodology continue to make summarizing prevalence studies a challenge, as evidenced by the wide range of prevalence estimates. [55, 56, 63-105] Prevalence estimates for the most inclusive definitions of UI ('ever' 'any' or 'at least once in the past 12 months') in the general population range from 5% among women 15 years and older in Belgium [106] to 69% among women 19 years and older in Wales, [73] with most studies in the range of 25% to 45%. [61, 63, 69, 74, 103, 107] The measured prevalence of UI is sensitive to how the survey is conducted (e.g., mail, telephone or in-person interviews), the exact wording of the question, and the context in which the question is asked. [55, 68] Interestingly, there is less variation in the estimates of daily UI in the general population, with 3 studies having reported prevalences of 4%, 5% and 7% in women under 60 years of age, [77, 102, 108] 4 studies reported prevalences from 4% to 14% (median=9%) among women over 65 years of age and older and 1 study reported a prevalence of 17% in women 85 years of age and older. [81, 109, 110] While one reason for the consistency of these findings may be that there have been fewer studies measuring daily UI, it is also likely that the reporting of daily UI is less dependent on exact wording and context of the question. **Table 5** provides examples of population-based studies reporting prevalence of any UI from around the world. For the USA and Britain, only larger studies (N >1000) with response rates above 80% are included. As can be seen, UI is relatively common in all countries. The wide range of estimates make it difficult to make meaningful comparisons between countries.

Several investigators have noted that the prevalence of any UI appears to increase up to middle age, with a leveling off or even a slight decrease between ages 50 and 70, followed by a steady increase among the aged. [74, 124] A recent study by Hannestad and her colleagues [74] of women of all ages exemplifies this latter pattern. The study finds a gradual increase of prevalences across adulthood until age 50 when prevalence reaches 30%, a stabilization or even slight decline until age 70 when prevalences start rising again (**Figure 4**).

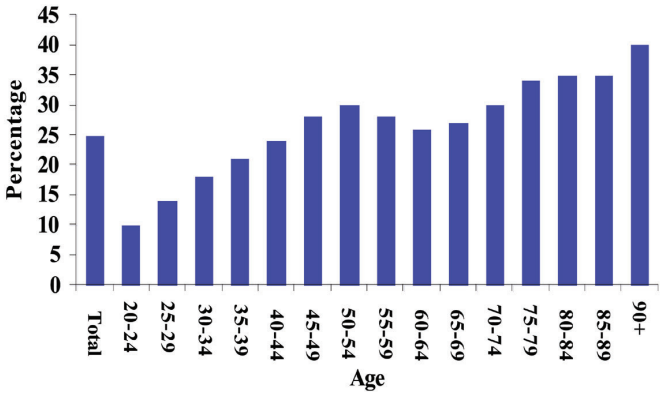


Figure 4. Prevalence of UI (any leakage) in women 20 years+. Data from the EPINCONT study [74]

III. PREVALENCE IN SPECIFIC POPULATIONS

There are subpopulations with a higher prevalence of UI. Here we review women living in long term care facilities, pregnant women, women of different race/ethnicity, and cross-country comparisons.

Table 5. Examples of prevalence of "any' 'current' or 'ever' incontinent UI in the general population

First author	Year	Country	Response Rate (%)	Ages (years)	N (women)	Prevalence of any UI (%)
Thomas [61]	1980	Britain	89	15+	7,767	27
Yarnell [63]	1981	Wales	95	17+	1,022	44
Iosif [98]	1984	Sweden	75	61	902	29
Hording [111]	1985	Denmark	85	45	515	22
Hols t[69]	1988	New Zealand	76	18+	851	20
Elving [100]	1989	Denmark	85	30-59	2,631	26
Rekers [107]	1992	Netherlands	68	35-79	1,299	26
Brocklehurst [71]	1993	Britain	not reported	30+	2,124	14
Milsom [112]	1993	Sweden	75	46-86	7,459	21
Lar a[103]	1994	New Zealand	54	18+	556	34
Wetle [110]	1995	USA	85	65+	2,360	44
Seim [104]	1995	Norway	77	20+	1,820	29
Nygaard [113]	1996	USA	85	65+	2,025	55
Nakanishi [81]	1997	Japan	95	65+	842	10
Holtedahl [85]	1998	Norway	73	50-74	507	47
Damian [78]	1998	Italy	71	65+	363	16
Koyama [114]	1998	Japan	76	65+	1120	11
Swithinbank [73]	1999	Britain	80	19+	2,075	69
Dolan [115]	1999	Ireland	66	35-74	689	58
Hagglund [116]	1999	Sweden	88	18-70	3,076	26
Chiarelli [88]	1999	Australia	48	18-23	14,761	13
			54	45-50	14,070	36
			41	70-75	12,893	35
Moller [77]	2000	Denmark	71	40-60	2,860	72
Hannestad [74]	2000	Norway	80	20+	27,936	25
Bortolotti [76]	2000	Italy	>99	40+	2,797	11
Iglesias [79]	2000	Spain	95	65+	486	42
Tseng [82]	2000	Taiwan	80	65+	256	28
Maggi [80]	2001	Italy	89	65+	1531	22
Muscatello[117]	2001	Australia	68	41+	262	61
Sampselle [118]	2002	USA	Not reported	42-52	3,302	57
Van Oyen [106]	2002	Belgium	60	15+	3,804	5
Nygaard [119]	2003	USA	82	50-69	5,701	16
Nuotio [120]	2003	Finland	93	70+	227	59
Blanco [121]	2003	Spain	82	40-65	485	15
Zunzunequi Pastor [122]	2003	Spain	75	65+	567	30
Chen [123]	2003	Taiwan	79	20+	1,247	54
Hunskaa r[124]	2004	France	60	18+	3,881	44
		Germany	59		3,824	41
		Spain	64		6,444	23
		Britain	45		2,931	42

1. Long term care facilities

Several studies have documented a higher prevalence of UI in women residing in long-term care facilities compared to community dwelling women. In addition to being more frequent, UI in long term care residents tends to be more severe, costly, and have greater burden on caregivers compared to UI in the community. [125] Estimating the prevalence of UI women in institutions is complicated by the variety of definitions of long term care, ranging from supervised residential living facilities to nursing homes specializing in patients with advanced dementia. Some facilities offer a mixture of levels of care. Because UI is associated with dementia, limited mobility and other co-morbid conditions, prevalence of UI is generally higher in facilities with residents requiring a higher level of care.

Several studies from around the world[89-96, 114, 126] - some of which sampled multiple institutions - suggest a median UI prevalence of around 55% (see **Table 6**). One study which examined UI in women enrolled in a home health care program found a prevalence of 52% - similar to the median prevalence in long-term care facilities. [127] The higher prevalence of UI among women in long term care compared to the general population of community-dwelling women reflects several factors, including the older average age and higher level of frailty (even adjusted for age) found in long term care residents compared to community dwelling women. Other factors probably contribute as well. [86] One possible contributing factor may be that incontinence in and of itself creates an additional burden on caregivers, leading to an increased propensity for women with UI to be institutionalized. One study showed that existing urinary incontinence more than doubles the risk of admission into nursing homes for women, independent of age or the presence of any co-morbid condition. [97]

2. Pregnant women

Another special population with a high prevalence of incontinence is pregnant women. Incontinence during pregnancy can be described in terms of period prevalence (the proportion of women who report ever being incontinent during pregnancy), point prevalence (the proportion of women reporting incontinence at specific a gestational age during pregnancy), and cumulative incidence (the proportion of previously continent women who report onset of incontinence at some point in their pregnancy). Studies can be prospective, allowing ascertainment of point prevalences, or based on recall after delivery. Some studies have examined stress incontinence only (the most common type of pregnancy-related UI), while others reported all incontinence. While most studies include women with prior pregnancies, several studies have been limited to primagravidas, or have examined women in their first pregnancy separately (see **Table 7**).

Studies of UI during pregnancy have reported period prevalences of 32% to 64% for all UI and 40% to 59% for stress (including mixed) UI (**see Table 7**). Period prevalence is higher in parous than in nulliparous women, [128-132] whereas new onset of UI (cumulative incidence) during pregnancy is higher in primagravida. [129, 132] Point prevalence of UI is low in the first trimester, rising rapidly in the second trimester and increasing further, though less rapidly, in the 3rd trimester. [129, 130, 133-138] Severity of incontinence appears to increase during pregnancy as well. [133]

3. Racial and ethnic differences

Most epidemiological studies of UI have been conducted on white populations in the US and Europe. While several studies of women in Asian countries have been reported, [81, 82, 103, 146-153] the variation in prevalence makes comparison with studies of predominately Caucasian women difficult. A handful of population-based studies have compared the prevalence of UI among white women and women from one or more racial or ethnic groups. [102, 103, 118, 119, 154, 155]

As can be seen from **Table 8**, these studies have found a lower prevalence of UI in Black women, Hispanic and Asian compared to white women. Studies comparing pelvic physiology have attempted to explain the lower prevalence of UI in Black compared to Caucasian women. Howard and colleagues[156] report clinical data suggesting that African-American women have higher ureteral closure pressure, larger urethral volume, and greater vesical mobility.

More needs to be learned about differences in UI risk factors between different racial and ethnic groups, whether risk factor differences can explain differences in UI prevalence between groups, and the impact of incontinence by race or ethnicity. Ideally, UI among racial/ethnic groups should be evaluated within the same study, to avoid spurious differences in prevalence estimates due to study differences.

Table 6. Summary of UI prevalence among women in long-term care (LTC) institutions

First Author	Year	Country	Number of institutions	Description of institution(s)	Definition of UI	N (women)	Prevalence (%)
Palmer [126]	1991	USA	8	nursing homes	unknown	332	39
Borrie [93]	1992	Canada	1	LTC hospital	≥ 1/week	121	65
Toba [92]	1996	Japan	not stated	LTC hospital	any	965	72
Brandeis [90]	1997	USA	270	nursing homes	≥ 2/week	1541	50
Sgadari [91]	1997	Denmark				3,424	52
		France				256	65
		Iceland				667	57
		Italy	not stated	nursing homes	≥ 2/week	1,078	54
		Japan				1,255	43
		Sweden				708	62
		USA				271,778	46
Koyam a[114]	1998	Japan	8	nursing homes	any	328	23
Aggazotti [89]	2000	Italy	14	9 nursing homes, 2 residential, 3 mixed	≥ 2/month	621	60

Table 7. Summary of UI prevalence during pregnancy

First Author	Year	N	Measure	Timing of survey	Prevalence (%)
Stanton [138]	1980	181	Point prevalence at 38 weeks	Prospective from 16 weeks	All UI : 51% Stress UI : 40%
Mellier [139]	1990	265	Period prevalence during pregnancy	"immediately post partum"	All UI : 46%
Viktrup [140]	1992	305*	Period prevalence during pregnancy	3-5 days postpartum	All UI : 32%*
Dimpfl [128]	1992	350	Period prevalence in final 3 months	6 weeks postpartum	Stress UI : 54%
Burgio[133]	1996	523	Period prevalence during pregnancy	2-3 days postpartum	All UI : 60% Stress UI : 52%
Wilson[141]	1996	607*	Period prevalence during pregnancy	3 months postpartum	All UI : 36%*
Chiarelli [142]	1997	290	Period prevalence in final month "postnatal"		All UI : 64% Stress UI : 57%
Marshall [129]	1998	7771	Period prevalence during pregnancy	3 days postpartum	All UI : 69%
Marshall [129]	1998	7771	Cumulative incidence during pregnancy	2-3 days postpartum	All UI : 50%* All UI : 41%**
Mason [143]	1999	717	Period prevalence during pregnancy	8 weeks postpartum	Stress UI : 59%
Morkved [130]	1999	144	Period prevalence during pregnancy	8 weeks postpartum	All UI : 42%
Thorp [144]	1999	123	Period prevalence in 3rd trimester	Prospective from 1st or 2nd trimester	Stress UI : ~40%
Di Stefano [134]	2000	150	Period prevalence during pregnancy	2 days postpartum	All UI : 48%
Spellacy[145]	200	1 50	Period prevalence during pregnancy	4-6 weeks postpartum	All UI : 62%
Kristiansson [136]	2001	175	Point prevalence at 36 weeks	Prospective from early pregnancy	Stress UI : 26%

*primagravidas only **parous and mulitparous women only

Table 8. Prevalence (%) of UI by Race/Ethnicity in Women

First author	Year	Definition of UI	White	Black	Hispanic	Asian
Nygaard [119]	2003	Any in prior 12 months	17	9	10	-
Grodstein [155]	2003	≥1/week	18	10	16	13
Sampselle [118]	2003	Any	66	50	42	52*

* Chinese and Japanese combined

4. Cross-country comparisons

There is no hard evidence for different incidence and prevalence of UI between Western countries and the published differences may relate to social, culture, economic or until now undetermined factors. Because of the heterogeneity of published studies the results are difficult to compare, and most of the studies do not lead themselves easily to cross-cultural or cross-national comparisons.

One large cross-country study using a validated instrument to investigate the prevalence of UI has recently been published. [124] The study revealed that the prevalences of UI and the distribution of different types in France, Germany and UK were quite similar, while the prevalence was lower in Spain. The same questionnaire and methodological approach were used in the four countries, and the responders were of similar age. The overall prevalence of UI for these four European countries was about 35%; this figure lies in the typical result span for many studies performed previously.

IV. TYPE

In surveys based on questionnaires or interviews, only symptoms can be registered. Typically stress incontinence is identified when the respondent reports it to occur with physical activity, urge incontinence when it occurs in the context of a sudden urge to urinate. Determination of the pathophysiologic basis of the incontinence – urethral insufficiency for stress incontinence or detrusor instability for urge incontinence- requires the use of urodynamic equipment and thus cannot be made based on data from questionnaires or interviews alone. The question has been raised about the use of self-reports in epidemiological studies. [157] Sandvik and coauthors[104] validated diagnostic questions used in a survey against a final diagnosis made by a gynecologist after urodynamic evaluation. The percentage of stress only incontinence increased from 51% to 77%, mixed incontinence was reduced from 39% to 11% and the proportion with urge only UI remained virtually the same (10% vs. 12%). However, there are also limitations in the use of urodynamics in documenting the presence of involuntary detrusor contractions, with both false positives and false negatives occurring. Thus, while self-report and urodynamic definitions of UI type differ, it is not clear which is the most valid and for what purpose. Despite the uncertainty in determining type of incontinence, the differences in the epidemiology of urge and stress incontinence are potentially important given the presumed differences in underlying pathophysiology. Differences in the association of stress and urge UI (based on self-report) with respect to age, race/ethnicity, and risk factors [56, 158, 159] suggest that questionnaire-based determination of UI type is useful and should be included in all epidemiologic studies of UI.

Proportions of types of UI differ by age. [56] Surveys of older women suggests that mixed and urge incontinence predominates[83, 84, 87, 160] while surveys of young and middle-aged women have generally found a predominance of stress incontinence. [69, 74, 99, 102, 105] Overall, approximately half of all incontinent women are classified as stress incontinent. A smaller proportion is classified as mixed incontinent, the smallest one as urge incontinent. A recent study which included the entire age range by Hannested et al. [74] demonstrates a fairly regular increase in prevalence of mixed incontinence across the age range, and a decrease in prevalence of stress incontinence from the 40-49 year old age group through the 60-69 year old group (**Figure 5**).

There is relatively little data on the prevalence of overactive bladder (OAB), defined as the presence of urgency and frequency with or without UI. Not all studies distinguish overactive bladder with urge UI

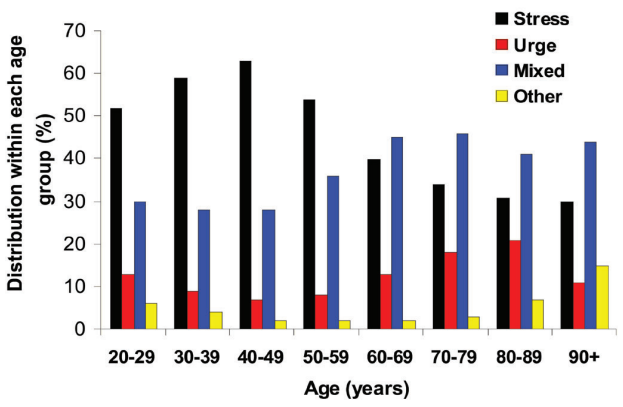


Figure 5. Distribution of different types of UI in age groups. Data from the EPINCONT study [74]

('wet' OAB) from overactive bladder without incontinence ('dry' OAB). The NOBLE telephone survey found an overall prevalence of overactive bladder with urge incontinence of 9.6% in women 18+, increasing with age from less than 5% in age group 18-44 to 19% in age group 65+. [161] Several studies have reported the prevalence of urge UI and urgency (with or without UI) separately (Table 9). On average, urgency with or without UI appears to be about twice as common as urge UI.

V. SEVERITY AND IMPACT

Severity of incontinence can be defined based on frequency, typical quantity of urine lost, or a combination of these factors. [72, 74, 79, 83, 118, 165] For example, the Sandvik's Severity index[72, 165] is calculated by multiplying the reported frequency (four levels) by the amount of leakage (dichotomized to two levels). The resulting index value is further categorized into slight, moderate and severe. Typically, slight incontinence denotes leakage of drops a few times a month, moderate incontinence daily leakage of drops, and severe incontinence larger amounts at least once a week. The severity index has been validated against a 48 hour pad weighing test. According to this test, slight incontinence means a leakage of 6 g/24 hours (95% CI 2-9), moderate incontinence means a leakage of 17 g/24 hours (95% CI 13-22) and severe incontinence means a leakage of 56 g/24 hours (95% CI 44-67). The severity index is thus a semi-objective and quantitative measure, and does not include the woman's subjective perception of her leakage as being a problem or not. A recent validation from Scotland concludes that the Severity index is a short, simple, valid, reliable, and sensitive measure of urinary incontinence in women, and that it can be recommended for routine use. [166] Other questionnaires recommended to assess symptoms and impact on quality of life are reviewed and assessed in other chapters of this book.

The impact of UI can be measured in terms of "bothersomeness" or actions taken to ameliorate the incontinence, such as wearing pads, reducing activities, or seeking medical attention. Not surprisingly, women with more severe UI tend to report a greater impact of UI. [77, 102] Several scales have been developed to measure UI impact, [167-175] but have been used mostly in clinical trials. Use of such scales in large epidemiologic studies is limited by their length. Nonetheless, including a measure of impact, in addition to severity, in epidemiologic studies is useful for characterizing the importance of the incontinence to the patient. [123]

Reporting prevalence by severity or impact provides more information and reduces variability in prevalence estimates. Prevalence estimates for severe UI range between 3% and 17% with a cluster between 6-10%. [60, 71, 72, 74, 76, 77, 80, 83, 86, 102, 105] The lesser variance among these estimates suggests that severe incontinence, like daily incontinence, is less easy to deny and better understood by partici-

Table 9. Prevalence (%) of urgency and urge UI in community-dwelling women

First Author	Year	Age	N	Definition of urgency or urge UI	Prevalence of urgency	Prevalence of urge	UI Ratio
Swithinbank [73]	1999	19+	2,075	Any	61	46	1.3
Lapitan [162]	2001	18+	5,502	Any	35	11	3.2
Milsom [163]	2001	40+	16,776	Current	54	36	1.5
Van Der Vaart [164]	2002	20-45	1,393	Any	45	15	3.0
Chen [123]	2003	20+	1,253	Any	13	9 Median	1.4 2.1

pants than 'any' 'ever' or 'current' incontinence and thus may represent a more reliable figure. Sandvik[72] found that nearly half of incontinence cases had slight incontinence and only 27 % severe. If only those with moderate or severe incontinence are considered, and including only those who are bothered by their leakage, the findings from that study indicate that approximately one fifth of incontinent women suffer from severe, bothersome incontinence. These results have recently been confirmed in the EPINCONT study [74] (**Figures 6 and 7**). The severity of incontinence varies by type of UI. The fraction of severe incontinence is much lower in the stress group compared to the urge and mixed groups. In the EPINCONT study, [74] slight incontinence was found in 53% in the stress group, 39% in the urge group and 31% in the mixed group (**Figure 8**). Several studies found that the prevalence of significant incontinence tended to increase with advancing age. [63, 70, 74, 79] In the EPINCONT study the percentages were 2.6, 6.5, 8.6, and 13.0 for age groups 20-39, 40-54, 55-69, and 70+, respectively, as shown in **Figure 6** [74].

VI. INCIDENCE AND REMISSION

There is less data on incidence and remission than on prevalence of UI. Incidence and remission of UI are higher when defined as moving between 'no UI and 'any UI' then when defined as moving than between 'no UI' and 'weekly' or 'daily' UI. **Table 10** summarizes incidence and remission in community-dwelling women from several studies using. Annual incidence for women less than 60 years old ranged from 1 to 3%, while for those 60 and older, incidence ranged from 5-11%. A study of women in nursing homes reported an annual incidence of 22%. [126] Incidence and remission were virtually identical for stress and urge UI in the 2 studies that reported data by UI type. [113, 176] Remission is often higher than incidence, because of the smaller pool of women with moderate or severe incontinence compared to those who are continent. Thus, if equal numbers of women moved from continence to incontinence as moved from incontinence to continence, the remission would be larger than the incidence because of the small denominator.

In summary, longitudinal studies of incidence, remission and natural history are scarce and should be encouraged because these types of studies provide information about the course of UI and are best suited to investigate its causes and consequences. Incidence is substantial, but it has proven difficult to establish predictors for incident UI. It is also well documented that remission can take place, but again predictors are not well understood. Remission may be related to natural recovery or to medical care, but variation due to unreliable measurements cannot be excluded either.

VII. POTENTIAL RISK FACTORS

Epidemiological and clinical studies conducted in various populations reveal a number of variables related to UI including several possible risk factors or contributing variables (**Table 11**). Most of the data regarding risk factors for the development of UI have been derived from cross sectional studies of volunteer and clinical subjects. Risk factors like smoking, menopause, restricted mobility, chronic cough, chronic straining for constipation, and urogenital surgery have not been as rigorously studied as age, parity, and obesity. This provides us with information of limited generalizeability and restricts the level of inference regarding causality.

Well-controlled analyses of potential risk factors and predictors are limited. Little is known about their relative and absolute value. Risk factors or causes of UI need to be investigated in a prospective or longitudinal design in order to establish the temporal ordering between risk factors and onset of UI. Unfortunately, very few longitudinal studies of UI have been conducted. Therefore this review of health-related factors is based primarily on cross-sectional studies and can only identify correlates.

1. AGE

Because UI is so common among older women, it is often regarded as a normal and inevitable part of the aging process. Most studies indicate that UI is indeed correlated with age. [63, 74, 80, 88, 89, 104, 107, 112, 113, 115, 178-182] In one well-known study, a random sample of 842 women 17-64 years of age were interviewed. [63] The prevalence increased steadily with age. In another large survey, prevalence of UI in women 46-86 years old increased progressively over seven birth cohorts (1900 - 1940) from 12 % to 25 %. [112] More recent studies have yielded similar results in large samples of women. One study of 27,936 women 20+ years of age replicated the significant association between age and incontinence **(see Figure 4)**. [74] Another study

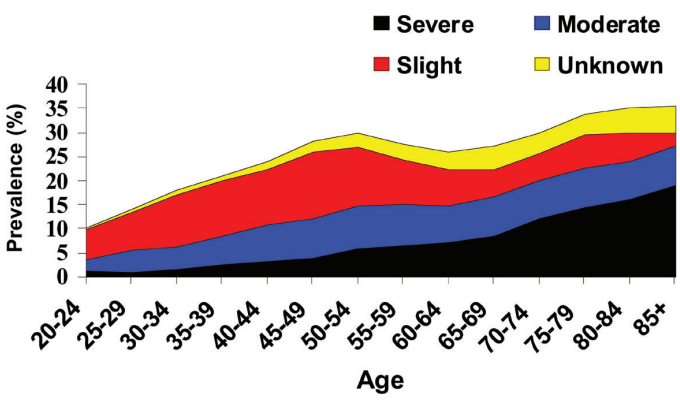


Figure 6. Prevalence of UI by age group and severity. Data from the EPINCONT study [74]

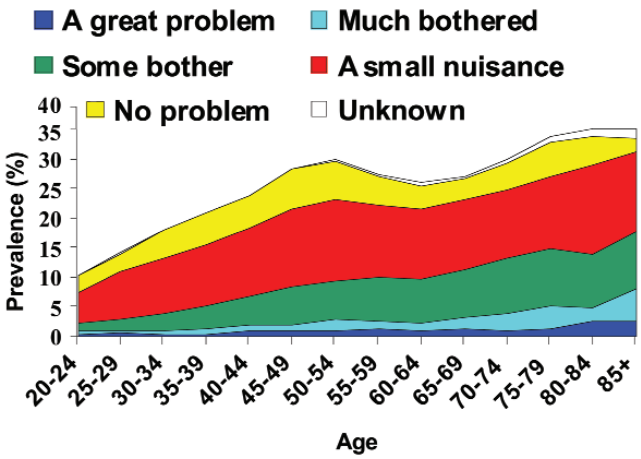


Figure 7. Prevalence of UI by age group and impact. Data from the EPINCONT study[74]

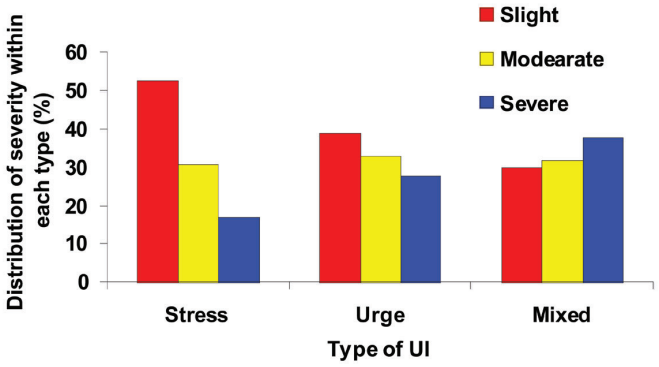


Figure 8. Severity of the different types of UI. Data from the EPINCONT study[74]

Table 10. Incidence and remission of UI in community-dwelling women

First author	Year	Age	Definition of UI	Length of study (years)	Incidence		Remission*	
					N (no UI at baseline)	Average annual incidence	N (UI at baseline)	Average annual rate of remission
Herzog[177]	1990	60+	Any UI	2	719	5%	435	10%
Burgio[102]	1991	42-50	≥1/month	3	206	3%	not stated	not stated
Nygaard [113]	1996	65+	≥ some of the time	6	1,290 1,209	7% stress 8% urge	735 816	9% stress 9% urge
Holtedahl [85]	1998	50-74	≥2/month	1	249	1%	59	11%
Samuelsson [108]	2000	20-59	any	5	292	3%	90	6%
Liu[176]	2002	65+	≥occasional	2	733 604	11% stress 11% urge	300 429	5% stress 5% urge

*With or without treatment

Table 11. Established and suggested risk factors for UI in women reviewed in this text

Age
Pregnancy
Parity
Obstetrical factors
Menopause and reproductive hormones
Hysterectomy
Obesity
Lower urinary tract symptoms
Functional impairment
Cognitive impairment
Smoking
Family history and genetics
Other factors

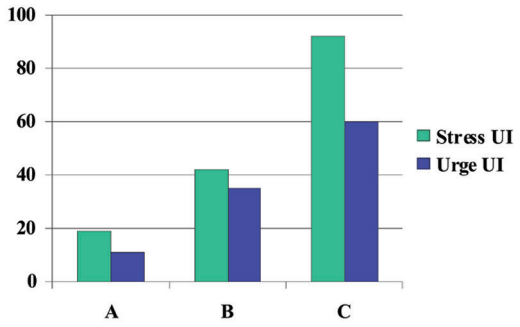
found a significant effect for age in a study of 40,155 women in three age groups : young (18 - 23), middle-aged (45 - 50), and older (70 - 75). Though age was significant, there were no differences between the middle-aged and older women. [88]

Some studies have found that age was a significant risk factor for both urge incontinence and stress incontinence, [182] while others have demonstrated the association for urge incontinence, but not for stress incontinence. [74, 109, 113] Studies that have reported a nonsignificant relationship between incontinence and age generally have had smaller sample size and more narrow age range perhaps restricting the ability to detect this effect. [56, 85, 87] In frail older adults, the relationship with age may be different. For example, an inverse relationship between age and UI has been reported in nursing home residents. [183]

Incontinence is not to be considered normal with aging; however, there are changes in the bladder and the pelvic structures that occur with age and which can contribute to UI. [184, 185] Further, UI is often attributable to medical problems or diseases that can disrupt the mechanisms of continence (e.g., diabetes mellitus, cognitive impairment), many of which are more common among older adults.

2. Pregnancy

UI in women is often assumed to be attributable to the effects of pregnancy and childbirth. UI is common among pregnant women (see Table 7). UI during pregnancy is a self-limiting condition for many women. Viktrup et al found a prevalence of 28% who developed stress incontinence during pregnancy, and 16% became free of symptoms in the puerperium. [140] Similarly, in a cohort of 523 women, Burgio et al found a drop in the prevalence from 60% during pregnancy to 11% by 6 weeks postpartum. [186] Incontinence during pregnancy has been shown to be a predictor of postpartum incontinence, [135, 186] as well as a risk factor for incontinence at 5 years past delivery (**Figure 9**). [187] Thus, there is evidence that women who are incontinent during pregnancy may be predisposed to experiencing UI at later times in their lives, such as during a subsequent pregnancy or as they age. However, it is still questionable whether pregnancy itself contributes to UI in later life or whether it is attributable to factors associated with childbirth.



A. No UI before or 3 months after 1st delivery
B. Onset of UI during 1st pregnancy or puerperium, but remission 3 months after delivery
C. Onset of UI during 1st pregnancy or puerperium, but no remission 3 months after delivery

Figure 9 . Percentage of women with stress and urge incontinence 5 years after first pregnancy and delivery (Data from ([187]), with permission)

3. Parity

The role of childbearing in predisposing women to UI is supported by several studies that have demonstrated a link between UI and parity. [69, 70, 88, 100, 101, 133, 158, 159, 181, 182, 188-195] There are several explanations that may be offered. [196] First, childbirth may result in pelvic floor laxity as a consequence of weakening and stretching of the muscles and connective tissue during delivery. Second, damage may occur as a result of spontaneous lacerations and episiotomies during delivery. The result of these events can be impaired support of the pelvic organs

and alteration in their positions. A third possibility is that the stretching of the pelvic tissues during vaginal delivery may damage the pudendal and pelvic nerves, as well as the muscles and connective tissue of the pelvic floor, and can interfere with the ability of the striated urethral sphincter to contract promptly and efficiently in response to increases in intra-abdominal pressure or detrusor contractions.

In an early study, Thomas and colleagues reported that UI was most likely to occur in parous rather than nulliparous women at all ages (15-64 years) and that UI was most common in women who had four or more children. [61] Some studies have reported a threshold effect at one delivery and little or no additional risk with increasing parity. [69, 158, 195, 197] However, other studies suggest that increasing parity increases the risk of UI and that the relationship may even be linear. [158, 159, 189, 198, 199] In one study, the odds ratio increased with parity from 2.2 in primiparous women to 3.9 in Para II to 4.5 in Para III. [159]

The association between parity and UI appears to diminish and even disappear with age. [88, 158, 192] A large study in Australia found that parity was strongly associated with UI for young women (18-23 years). For women 45-50 years there was only a modest association, and for old women (70-75 years) the association disappeared. [88]

In a Norwegian study, [158] the relationship was significant for younger women (age 20-34 years), weaker in middle-aged women, (35-64) and absent in older women (> 65years) (Figure10 compares the two studies). In addition, two studies of middle-aged women have found no association between parity and UI. Hording and colleagues found that frequency of UI in 45-year-old women was not associated with frequency of births. [99]

Similarly, Burgio and colleagues found that healthy perimenopausal women with UI were not any more likely to have delivered more children than continent women. [102] Nevertheless, the literature shows that age is a stronger risk factor than parity.

Also there has been done little research whether time since delivery or age at delivery will influence the effect of parity. Foldspang et al found increased risk of UI with increasing age at the last childbirth for women aged 30-44 years. [192] One study found that women over 30 years old at their first delivery were at higher risk, [197] while another found that increasing age at the first delivery had an influence on UI. [193]

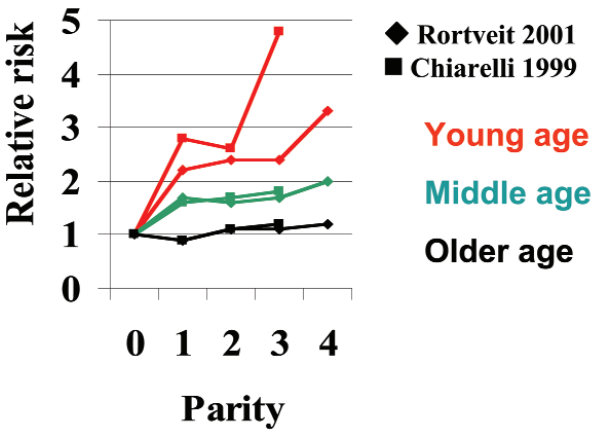


Figure 10. Relative risk of UI by age groups and parity. Data from Rortveit 2001 and Chiarelli 1999. [88, 158]

The effect of parity on the severity of UI has been little investigated. Kuh et al found a statistically significant trend for increasing severity with increasing parity, [197] while Rortveit et al found no effect on severity. [158]

Few studies have made a distinction based on type of UI. In some studies, there was predominately a relationship between parity and stress UI, [158, 159, 197] but in others, the relationship was significant both for stress and urge UI. [182, 199]

4. Obstetrical and Fetal Factors

Several obstetric and fetal factors have been explored as possible contributors to the development of incontinence. In particular, there is growing evidence that vaginal delivery may predispose a woman to incontinence, more so than a Cesarean section. [135, 140, 141, 181, 182, 186, 200-206] Vaginal delivery is believed to cause pelvic neuropathy that could instigate UI. [197, 207, 208] Viktrup et al compared continent women who delivered vaginally to women who underwent a cesarean section and found a difference in favor of cesarean. However, three months after delivery, the difference became statistically insignificant. [140] One study of incontinence in pregnancy investigated the role of prior deliveries and found that having had a prior vaginal delivery increased by 5.7 the risk of incontinence in a subsequent pregnancy compared to having no prior deliveries, but having had a Cesarean section did not increase the risk. [200] In a large study of over 15,000 women under the age of 65 years, Rortveit et al demonstrated that women who had undergone a

cesarean section were at increased risk of stress or mixed UI compared to nulliparous women (OR = 1.5). [205] Further, those who had undergone a vaginal delivery were at even greater risk of stress UI compared to those who had a cesarean section (OR = 2.4). Other studies have shown a similar results with odds ratios (or RR) ranging from 1.77 to 2.8. [181, 182, 186, 203]

Data on other obstetric techniques and complications are inconsistent. One factor that has been associated with incontinence is the use of forceps. [186, 203, 209] In one study, forceps delivery carried a relative risk of 1.5 compared to spontaneous delivery and 3.1 compared to cesarean section. [203] Interpretation of the effect of forceps can be confounded by its association with complications during labor. However, in another study, it nearly doubled the odds of incontinence, even while controlling for complications and lacerations. [183] Foldspang et al [210] found strong associations between incontinence and forceps delivery/vacuum extraction, episiotomy, and perineal suturing in bivariate analyses. However, the effects of these variables were insignificant in multivariate analyses possibly suggesting that they may simply have been markers for having had a vaginal delivery.

Induced labor has also been implicated as a factor contributing to incontinence. [154, 199] Thom and colleagues[154] found an increased risk of UI with increased exposures to oxytocin (OR = 1.9 for one exposure, 3.1 for two exposures). Similarly, Pregazzi et al reported that intravaginal dinoprostaglandins increased the risk of postpartum UI. [199] Other methods of speeding delivery may also cause UI. A study of 3,963 Nigerian women reported that pushing on the fundus during labor was associated with UI as well as pelvic organ prolapse. [211]

Two studies suggest that the birth weight of the infant may predispose the mother to UI. [179, 200]

In one study, 11 obstetric variables were explored. [200] Only birth weight > 4,000g and mediolateral episiotomy were associated with incontinence in subsequent pregnancy (OR=1.9 and 1.9). Other studies have reported no relationship between incontinence and a number of obstetric variables, including episiotomy, sphincter lesion, forceps delivery, vacuum extractions, perineal and vaginal lacerations, epidural anesthesia, oxytocin stimulation, length of 2nd stage labor, and fetal birth weight. [135, 154, 159, 186, 193, 198-200, 212-214]

Vesico-vaginal fistula is an important cause of disastrous UI in developing countries, usually due to obstetric trauma. [215] Differences in birthing practices world wide (including route of delivery and availability of obstetric care) should be investigated to determine potential relationship to continence status.

5. Menopause and reproductive hormones

Clinically, it has long been understood that urinary symptoms are an integral part of the transition from the premenopausal to the post-menopausal state. The atrophic changes increase susceptibility to urinary tract infections and can cause storage symptoms (such as urinary frequency and urgency), dysuria, vaginal dryness, and dyspareunia. Given the evidence that atrophy of these tissues can be reversed with estrogen, and that estrogen replacement reduces UI in some cases, it seems reasonable to propose that estrogen loss contributes to the problem.

However, the literature is inconsistent in describing the role of menopause and estrogen loss as significant contributors to UI. Positive findings were reported by Rekers and colleagues, who compared premenopausal women (N=355) with postmenopausal women (N=858) and found no significant difference in the prevalence of UI between the two groups (25% versus 26%). [107] However, there were significant differences in the frequency of incontinence episodes, indicating that postmenopausal women had more severe incontinence. Postmenopausal women were more likely to have UI on a daily basis or more frequently (7 %), compared to the premenopausal women (3 %). They were also much more likely to have urgency and nocturia. Postmenopausal women were less likely, however, to have large volume accidents, and there were no differences in the types of UI. These investigators also examined the time frame between menopause and the onset of UI. A significant increase in the incidence of UI occurred 10 years before the menopause, and an even larger increase was found at menopause. Among postmenopausal women with UI, 28% had onset before menopause, 18% around the time of menopause, and 54 % after menopause. Finally, women who experienced a surgical menopause had a higher prevalence of UI (36 %) compared to those who experienced a natural menopause (22 %). It has also been reported that peri-menopausal women have greater severity of incontinence compared to pre-menopausal women. [118]

Other studies have found no significant differences between postmenopausal and premenopausal women

in the prevalence or the frequency of incontinence. [98, 115, 197] Some studies have even reported significantly lower prevalence among postmenopausal women than among premenopausal women, [101, 189, 197] though in one, the effect was significant for stress incontinence but not for urge incontinence. [197] Further, recent studies of risk factors have found that incontinence is not associated with the number of years since menopause, [109] age at menopause, [85] nor mean age of natural menopause. [154]

Related to menopause is the issue of estrogen replacement therapy. While one might expect lower rates of incontinence in women taking hormone replacement therapy, research does not support this. Some studies have shown no effect for hormone use[113, 159] while other have found an increased risk of incontinence in women taking hormones for menstrual disorders (OR = 2.7)[216] and in older women taking estrogen. [105, 154, 198, 209, 217] In an intervention study (HERS study), women randomized to receive estrogen/progestin experienced worsened UI compared to the controls. [218]

6. Hysterectomy

When asked about the onset of UI, many women will report that it began immediately following hysterectomy. A hysterectomy with oophorectomy puts a woman into surgical menopause, which could indicate a hormonal mechanism. Alternatively, the development of post-hysterectomy UI might be caused by nerve damage during the procedure or to disturbances of musculo-fascial attachments of the bladder to the surrounding pelvic wall. [219]

There are few well-controlled prospective studies investigating the role of hysterectomy and results are mixed. In studies utilizing univariate analyses, some have shown significant associations between UI and hysterectomy, [88, 112, 181, 220] as well as oophorectomy. [88] Milsom and colleagues, in a survey of 3,896 women, reported that those who had a hysterectomy were more likely to report UI than those who had not (21% vs. 16 %), and this trend occurred across five birth cohorts from 1900 to 1920. [112] Some studies have reported no association between hysterectomy and UI in general[99] and stress incontinence in particular. [197] Others have found a significant relationship in univariate analyses but nonsignificant results after controlling for other variables in multivariate analyses. [154, 197, 220]

Studies using multivariate analysis models also yielded inconsistent results, but tend to support an association between UI and hysterectomy. Four studies found a positive association between hysterectomy and incontinence with odds ratios of 1.5 to 2.6. [159, 178, 209, 221] One study found no association between UI and hysterectomy (OR = 1.07), [85] and another found that women who had a hysterectomy (without concomitant prolapse repair) were less likely to have UI. [187]

In a review of the clinical literature on the effects of hysterectomy, Thom and Brown[219] concluded that most studies did not find an increase in UI in the first two years after surgery. Also, UI was decreased after surgery in some studies. A subsequent study of the clinical effects of hysterectomy examined the prevalence of stress and urge incontinence before and one year after hysterectomy and found no detrimental changes. [222]

Thus, there is evidence to suggest that hysterectomy may place a woman at risk for UI and contradictory information to suggest that hysterectomy may not contribute to the development of UI. Therefore, the role of hysterectomy remains controversial. [178, 223] Further study of the relationship of hysterectomy to UI could clarify the issue and potentially yield surgical techniques that would minimize the risks of UI.

7. Obesity

Obesity is well established as a factor that can cause UI or contribute to the severity of the condition. It is believed that the added weight of obesity, like pregnancy, may bear down on pelvic tissues causing chronic strain, stretching and weakening of the muscles, nerves, and other structures of the pelvic floor.

Data from several studies indicate that UI in women is associated with higher body mass index and greater weight **(Figure 11)**. [76, 85, 88, 102, 109, 118, 132, 154, 159, 178-180, 182, 186, 188, 190, 193, 194, 197, 209, 216, 220, 224-226] In one study, a significant relationship was found between UI and body mass index such that women with regular UI had the highest mean body mass index and those who had never been incontinent had the lowest mean body mass index. [102] Dwyer and colleagues found that obesity was significantly more common among women with detrusor instability, as well as among those with stress incontinence, compared to continent women. [227] One study found a positive "almost linear association" between BMI and both

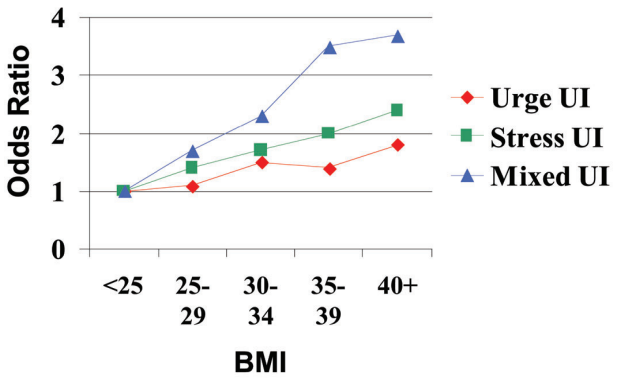


Figure 11. The association between UI increasing Body Mass Index (BMI). Data from[74]

stress incontinence and urge incontinence[159]. The highest BMI quartile had a 4.2 times greater risk of stress incontinence and a 2.2 times greater risk of urge incontinence. Although some studies have shown a relationship between BMI and both stress UI and urge UI, [159, 182] others have found that increased BMI was a risk factor for stress incontinence, but not for urge incontinence. [109, 197] The relationship between BMI and UI has been reported in studies of younger women, [88] middle aged women, [88, 118, 194, 209] older women, [88] women in the postpartum period, [186] and nuns. [220] The possibility that the effect is dependent on a threshold value was reflected in the results of another study that found an association between UI during pregnancy and pre-pregnancy BMI > 35 (OR=2.5), but a lack of significance with BMI >30 (OR=1.7). [200]

In addition to the associations found between obesity, body mass index, and UI, confirmatory results have been reported from intervention studies. Bariatric surgery was used in one study to drastically reduce weight in a group of morbidly obese women, resulting in subjective and objective resolution of stress as well as urge incontinence. [228] In another study, weight reduction by bariatric surgery resulted in reduction of stress incontinence from 61% to 12% of the group. [229] Thus, there is strong evidence to support the causal role of excess weight in the development of UI.

8. Lower urinary tract symptoms (LUTS)

Urinary tract infection has long been considered a contributor to UI, a condition to be resolved as a transient cause of UI. Several studies support this by reporting an association between UI and history of UTI, recurrent UTI, or symptoms of cystitis (e.g. urine that burns or stings). [88, 89, 109, 127, 194, 195, 197, 209, 220, 224, 230, 231] Regardless of whether they are caused by infection, disease, normal processes, or unknown factors, several urinary tract symptoms have proven to be correlated with UI. Symptoms such as blood in the urine, cloudiness or foul smell in urine, burning with urination, trouble starting urine flow, inability to shut off urine flow, needing to push and strain while urinating, or needing to urinate more than once to empty bladder have emerged as one of the most critical set of correlates and potential precursors of UI from the MESA and other studies. [83, 159] In a study of postpartum women, self-reported frequency of urination was the strongest predictor of UI. [186]

9. Functional impairment

Another set of health-related correlates that have been substantiated in several studies are functional impairments, particularly mobility limitations. [80, 83, 86, 89, 90, 113, 127, 179, 183, 225, 232-234] Odds ratios from a study of 839 nursing home residents demonstrated the increasing likelihood of incontinence with worsening level of mobility from requiring no help with mobility to needing support (1.8), depending on care providers (5.63), and being wheelchair or bed-bound (7.38). [89] A study of 2025 older women indicated that several measures of mobility impairment were associated with UI including inability to walk 0.5 mile (OR=2.15), inability to move heavy objects (OR=1.89) and inability to climb stairs (OR=1.66). [113] In addition improvement in ADLs was associated with 3-year remission rates of urge incontinence (OR=0.5). Mobility problems include having experienced a fall during the last 12 months, being diagnosed with arthritis, currently using equipment to get around, being restricted from going out, and several performance measures of lower body physical functions.

Other large studies of older adults have shown that UI was associated not only with mobility impairment, but also with sensory impairment (impaired vision), which may contribute to mobility limitations. [183, 225] Environmental barriers that limit mobility can also contribute to UI. For example, studies of nursing home residents and home care patients have documented higher prevalence of UI associated with the use of physical restraints (OR = 3.2, 2.5) and other environmental barriers (OR = 1.53). [127, 183]

These effects are also observed in acute care settings. For example, in a study of 6,516 older women admitted to the hospital following hip fracture, the odds of developing UI during the hospitalization was increased by pre-fracture use of a wheelchair or walking device or dependence on others to walk (OR = 1.53, 2.51). [234]

The exact interpretation of the relationship between functional impairment and UI, however, is still being debated. At issue is whether UI is a direct consequence of difficulties in getting to the bathroom and removing clothing, or whether UI is a predictor of frailty as shown in a study of 1531 older women. [80] Longitudinal information is needed to sort out the direction of causation between functional impairments and UI. Alternatively, mobility limitations and UI may both be consequences of general frailty in older age or of an underlying systemic illness such as a stroke. There is evidence of an association between UI and stroke[88, 113, 183, 225] as well as Parkinson's disease. [80, 113] UI may be a direct consequence of neurological damage caused by these diseases or an indirect result of the physical limitations they impose.

10. Cognitive impairment

Research on UI in nursing home residents has consistently supported a causal role for dementia. [89, 90, 93, 183, 235, 236] In studies using multivariate analyses, patients lacking mental orientation had a 3.6 times greater risk of being incontinent than those with normal mental status;[89] and the presence of dementia increased the odds of UI by 1.5 to 2.3. [90, 183] A link between incontinence and mental status has also been demonstrated in the acute care setting. In a sample of women admitted to the hospital for hip fracture, presence of confusion increased the odds of developing UI during the hospitalization (OR = 3.44). [234]

In the Canadian Study of Health and Aging a strong association was found between severity of dementia and UI in elderly women. [86] Odds ratios were 1.2, 4.0, and 12.6 for mild, moderate and severe dementia, respectively, after controlling for age, residence, and ambulatory function. However, in a community sample, no relationship was found between mental status and difficulty holding urine. [110]

A systematic review of 11 studies examining UI in persons with dementia concluded that UI is common in patients with dementia and is more prevalent in demented than in nondemented older individuals. [237]

11. Smoking

Smoking has been implicated as a risk factor for incontinence in women. Although the mechanism is unknown, but it is thought that smoking may contribute to chronic coughing or interfere with collagen synthesis. The research has yielded inconsistent results, but several studies now suggest a link between UI and smoking. [105, 118, 186, 198, 209, 226, 238] In a case control study of 606 women, those who currently smoked had a 2.5 fold higher risk of stress incontinence. [238] In the Study of Women's Health Across the Nation (SWAN; women age 42-52), current smoking was a significant predictor of UI severity (OR = 1.38) in a model that controlled for several variables including menopause status, parity, and BMI. [118] In other studies, smoking was a risk factor for incontinence in young women, and women in the 12-month postpartum period. [186, 209]

In some studies, smoking was significant in univariate analyses, but not in multivariable models controlling for such variables as age and caffeine. [200, 239] No association between smoking and UI or an inverse relationship have been reported by other studies. [76, 85, 109, 179, 195, 212]

Differences in the findings of these studies may be partially explained by differences in the ages of the samples. In most of the studies with positive findings participants were young or middle aged, [105, 118, 186, 198, 209] while some of the negative studies focused on older cohorts[85, 109, 195] or included older respondents. [179] In the Australian Longitudinal Study of Women's Health, for example, investigators found that heavy smoking ($\geq$20 per day) was an independent risk factor for UI in young women (OR = 3.34), but not in their middle aged or older groups. [209] It is possible that older individuals may stop smoking due to medical problems. Thus, in older cohorts, nonsmokers could be a frailer group, with increased risk of urinary incontinence due to disability.

12. Family history and genetics

Parallel to the developments in genetics and molecular biology, there is an interest in investigating many medical conditions for genetic components. Little is known about a genetic component for UI. Although twin studies are the best genetic studies, only one has been identified in the incontinence literature. [240] The inheritability was significant for urge, but not for stress UI in a study of 161 MZ and 249 DZ twins aged 75+. Data suggests that about half the risk for urge incontinence is inherited in this age group.

Family studies may find evidence for familial clustering. One study found that family history was associated with stress UI. [241] Relative risks for mothers, sisters, and daughters of women with stress incontinence were 2.8, 2.9, and 2.3, respectively. A recent large study of sisters, daughters, mothers and grandmothers found an association between incontinence status in first-degree relatives. [242] The investigators found an increased risk of any incontinence and of severe symptoms for women whose mothers or older sisters were incontinent. There was an increased recurrence risk for all three types of incontinence, but the increase was not statistically significant for urge incontinence. There was no apparent recurrence from a woman to her granddaughter, but if women in both previous generations had incontinence, the risk to a woman in the third generation was substantially increased. In general the recurrence risk was somewhat higher from sister to sister than from mothers to daughters.

13. Other factors

Other published articles have reported correlations between UI and several other variables, including diabetes, [88, 109, 113, 118] fasting blood glucose, [180] previous gynecological surgery, [85, 101, 180, 189, 194, 216] constipation, [88, 159, 183, 194] fecal incontinence, [83, 89] use of diuretics, [159, 188] benzodiazepines, [243] other drugs, [113, 244, 245] caffeine consumption, [239] perineal suturing, [135, 189] exercise, [246, 247] genital prolapse, [99, 198] radiation, [248] impaired function of the levator muscles, [85, 99, 198] childhood enuresis, [197, 216, 249] respiratory problems, [80] depression, [119, 220] and sleep disturbance. [80, 179] An observational study[97] reviewed the medical records of 5986 members aged 65+ of a large health maintenance organization in California. There was an increased risk of UI associated to the diagnoses of Parkinson's disease, dementia, stroke, depression, and congestive heart failure. Currently there is a dearth of knowledge to aid medical providers in advising their patients about occupational factors that promote either the onset or recurrence of urinary incontinence.

Summary points

- The prevalence estimates of at least some degree of UI show a wide range. The variability may be explained by factors such as variations in the definition of UI, in collection of the study samples, or variation in survey procedures, or effects of intervention. Several new studies from a variety of countries have recently been published.
- The median level of prevalence estimates gives a picture of increasing prevalence during young adult life (prevalence 20-30%), a broad peak around middle age (prevalence 30-40%), and then a steady increase in the elderly (prevalence 30-50%).
- The prevalence of severe or "significant" incontinence (depending on frequency and amount of leakage, soaking of clothes, use of pads etc.), is rather consistent, and ranges between 3% and 17%, with most studies reporting between 6% and 10%.
- Proportions of types of UI are difficult to estimate, and estimates vary considerably. Approximately half of all incontinent women are classified as stress incontinent. A smaller proportion is usually classified as mixed incontinent, and urge incontinence is the smallest category.

  Little is known about the risk factors and demographic correlates of the different types, but the types probably reflect different pathologies and etiologies.
- Several recent studies indicate that urgency, with or without urge incontinence, is approximately twice as common as urge incontinence.
- Incidence studies are scarce and should be encouraged. Remission can occur, but we know little about the rates of remission or its predictors. Such studies will also give a better understanding of the dynamics between risk factors and the onset of UI.
- The available data suggests higher prevalence of UI among Caucasian women that may be due primarily to racial differences in the prevalence of stress UI. While at least four population-based studies comparing UI prevalence between white women and one or more other racial/ethnic group have been published since 2003, there remains a paucity of published information regarding UI in non-Caucasian women world wide.
- A number of medical correlates of UI have been identified, but need to be investigated in a prospective, longitudinal, well-controlled design in order to establish the temporal ordering between risk factors and onset of UI.
- Well-controlled analyses of potential risk factors and predictors are limited. Age, childbearing, obesity, urinary symptoms, and functional impairment remain the best established risk factors.

E. EPIDEMIOLOGY OF UI IN MEN

I. GENERAL COMMENTS AND DEFINITIONS

The epidemiology of UI in men has not been investigated to the same extent as for females. However, progress has been made during the 3 last years, particularly in the reporting of population-based studies of urinary incontinence among men and more specifically also after prostatectomy. In almost all community based studies, the prevalence rates of UI continue to be reported to be less in men than in women by a 1 : 2 ratio. The type and age distribution are much different between the sexes, and risk factors, although less investigated in men, seem to be different. It is also important not to consider UI as an isolated problem in men, but rather as a component of a multifactorial problem. Often other urogenital symptoms (LUTS) such as weak stream, hesitancy, and dribbling, or erectile dysfunction, exist.

Post-prostatectomy incontinence has been studied and reported with increasing regularity in the last few years. Since radical prostatectomy is being performed with increased frequency, and incontinence is one of the main complications of the procedure, we decided to do an indepth analysis of the post-prostatectomy patient population. Brachytherapy, high intensity focused ultrasound treatment (HIFU) and cryotherapy were not included. In addition to epidemiological studies, we included clinical trials if the report had relevant data on incontinence. Minimum follow-up and time of assessment for continence should be at 12 months from the time of surgery.

For a general discussion about UI definitions and the implications for the interpretation of the studies, we refer to other subsections of this chapter.

II. PREVALENCE

Several surveys from the general population have been conducted to determine the prevalence of UI in men (**Table 12**). Prevalences ranging from 3 – 39% have been published. The wide results span is probably explained by differences in the population studied, definition of incontinence used and the methods used in the surveys. A systematic review of 21 studies reported a prevalence of UI in older men ranging from 11-34% (median = 17, pooled mean = 22%). In the same review, the prevalence of daily UI in men ranged from 2-11% (median = 4%, pooled mean = 5%). [56] Studies that use a broad definition of UI, include older and institutionalized men, and/or use self-reporting methods tend to report higher prevalence. [56, 114]

For any definition of UI, there is a steady increase in prevalence with increasing age (**Table 13**).

Due to differences in pathological anatomy and pathophysiology of UI in men and women, there is a different distribution in incontinence subtypes. Recent studies confirmed previous reports of the predominance of urge incontinence (40-80%), followed by mixed forms of UI (10-30%), and stress incontinence (<10%). [55, 78, 83, 152, 256] The increasing prevalence of any UI by age in men is largely due to the contribution of urge incontinence rather than stress incontinence. One study demonstrated an increasing rate of urge UI from 0.7% between ages 50 and 59, 2.7% between 60-69 and 3.4% for 70 years and older respondents. Stress UI was steady at 0.5%, 0.5% and 0.1% for the above groups respectively. [152] On the other hand, Maral and coworkers reported increasing prevalence also of SUI with age, from 0.9% between age 35-44, to 1.2% between 45-54, 3.8% between 55-64, and 4.9% at age 65 and older. [252]

Most studies have a large fraction of other/unclassified types. One study reported that a majority of men with UI had overflow and functional types of incontinence, [76] while another found constant dribbling in 7% of their respondents. [78] Terminal dribbling or postvoid dribbling is another type of leakage in men that is difficult to assign to the conventional subtypes of UI. In an Australian survey, 12% of respondents reported frequent terminal dribbling. [261]

When it comes to severity, the sex differences do not seem to be different from those for any incontinence. Estimates for severe UI in older women tend to be about twice as high as for older men. [55]

A recent study presented data on possible racial or ethnic difference in the prevalence of UI in men. [250] There were lower prevalences of reported UI among men from Korea (4%) and France (7%) than in men from Britain (14%) and Denmark (16%). On the other hand, unpublished data from the MESA study did not indicate differences in prevalence

Table 12. Examples of prevalence studies of UI among men

Author and year [ref]	N	Response rate (%)	Population (age)	Prevalence (%)
Boyle 2003[250]	4 979	-	40-79	7 (France), 16 (The Netherlands), 14 (UK), 4 (Korea)
Engstrom 2003 [251]	2 217	86	40-80	2 (SUI)
Van Oyen 2002 [106]	7 266	-	≥ 15	1
Schmidbauer 2001 [180]	1 236	-	Mean 49	5
Maral 2001 [252]	1 000	90	≥ 15	1 (SUI), 3 (UUI)
Stoddart 2001 [253]	1 000	79	> 65	23
Aggazzotti 2000 [89]	893	90	Community and residential homes	39
Bortolotti 2000 [76]	2 721	-	≥ 50	32 (last year), 14 (weekly)
Gavira-Iglesias 2000 [79]	827	-	≥ 65	29
Smoger 2000 [254]	840	-	25-93, VA clinic	32
Ueda 2000 [152]	3 500	53	> 40	11 (UUI)
Roberts 1999 [255]	778	-	≥ 50	26
Roberts 1998 [87]	2 150	-	≥ 40	18
Damian 1998 [78]	589	78	≥ 65	15
Schulman 1997 [256]	2 499	-	≥ 30	5
Malmsten 1997 [257]	10 458	74	≥ 45	9
Umlauf 1996 [258]	1 490	53	Elderly	29
Nuotio 2003 [160]	171	-	≥ 70	2 (SUI), 17 (UUI), 6 (MUI)
Nuotio 2002 [120]	171	-	≥ 70	24 (UUI)

SUI : Stress UI, UUI : Urge UI, MUI : Mixed UI

Table 13. Examples of prevalence of UI across age spectrum in men

Author and year [ref]	N	Distribution by age	Prevalence (%)
Yarnell, 1979 [259]	169	65	9
		70 – 80	8
		80+	22
Thomas, 1980 [61]	8 761	45 – 54	5
		55 – 64	9
		65 – 74	15
		75+	18
Diokno,1986 [83]	805	60+	19
Malmsten, 1997 [257]	10458	45 – 60	4
		70	7
		80	20
		90+	28
Schulman, 1997 [256]	2499	50 – 54	5
		60 – 64	6
		70+	14
Bortolotti, 2000 [76]	2721	51 – 60	2
		61 – 70	3
		70+	7
Ueda, 2000 [152]	3500	40 – 59	2
		60 – 69	4
		70+	4
Aggazzotti, 2000 [89]	839	<65	19
		65 – 74	23
		75 – 84	52
		85+	53
Temml, 2000 [260]	1236	20 – 39	2
		40 – 59	4
		60 – 69	8
		70+	12
Smoger, 2000 [254]	840	≤40	25
		41 – 60	31
		61 – 70	36
		71 – 80	33

among white male respondents compared to African American respondents.

Literature on the incidence of male UI is very scarce. The MESA study [177] found a one-year incidence rate for elderly men at 9%. Substantial remission rates were also obtained, higher among men (27%) than women (11%). Malmsten [257] analysed the age of onset for each age cohort. Mean debut age for all men was 63 years, mean duration was about 8-10 years in the cohorts.

One possible explanation for the various results published in men, is the predominance of urge type incontinence among men, and its close relation to overactive bladder with and without incontinence. Another factor is the close association between urge UI and prostate gland disease, infections, or bowel dysfunction, all of which are relatively amenable to treatment or may improve even without treatment.

Another problem closely associated with urinary incontinence is that of the overactive bladder. Three large surveys done in three major regions of the world have studied the prevalence of this problem, using the definition of frequency, urgency and urge incontinence, occurring singly or in combination. Milsom and coworkers demonstrated a 16% overall prevalence of OAB among men in 6 European countries. [163] Similarly, Stewart and colleagues found a 16% prevalence among American men. [161] Across 11 Asian countries, a 30% prevalence of OAB in men was established by Moorthy and coworkers. [262] The prevalence rates for OAB in men seem to be similar to those in women. [163, 263] Increasing prevalence was noted with increasing age in all surveys. However, the prevalence of OAB with and without urge incontinence differs in men and women. In women about half of the OAB population has urge incontinence, while among men this proportion is only about 15-20%. Also, the steep increase in prevalence in OAB with incontinence does not occur until age 65 years.

III. POTENTIAL RISK FACTORS

There is relative little research concerning conditions and factors that may be associated with UI in men, and clear risk factors are more seldom scientifically documented (Table 14). However, a few available studies have identified potential risk factors which are described below.

Table 14. Risk factors for UI in men reviewed in this text

Age
Lower urinary tract symptoms (LUTS) and Infections
Functional and cognitive impairment
Neurological disorders
Prostatectomy

1. Age

As for women increasing age is correlated with increasing prevalence of UI (Table 13). However, there seems to be a more steady increase in prevalence with increasing age, than for women.

2. Lower Urinary Tract Symptoms (LUTS) and Infections

In postal and telephone surveys of community-living incontinent men a majority have experienced a variety of other medical conditions, many of which may cause or aggravate UI. LUTS like urgency, nocturia, feeling of incomplete voiding and reduced flow are typically associated with UI. [83, 180, 258, 264] In one study UI was reported by 15% of men without voiding symptoms, frequency or urgency and by 34% of those with such symptoms. [83]

Studies have also reported that urinary tract infections and cystitis are strongly associated with male UI, [78, 152] with an odds ratio of 3.7 for UI in men reporting cystitis[152] and an odds ratio of 12.5 among men with recurrent infections. [76]

3. Functional and cognitive impairment

Mobility problems such as use of a wheelchair or aids to walking, as well as diagnosed arthritis or rheumatism or having a fall the last year, were significantly greater among incontinent than continent men. [78, 265] A recent report noted that UI are more likely among men whose activities of daily living (ADL) are impaired, specifically those who are unable to change clothes and unable to walk outside, with odds ratio of 17.4 and 4.36 respectively. [152] A Canadian study found odds ratios of 1.8 and 6.4 for partially and totally immobile men aged 65+, respectively, for daily UI compared to normal ambulatory function. [86] A survey of elderly, hospitalized men and women in hospital identified dementia and poor ADL as risk factors for the occurrence of UI. [92] In general, most studies find similarities between men and women (see subsection on women) for functional and cognitive impairment as risk factors for UI.

4. Neurological disorders

Many specific neurological diseases may lead to UI. [76, 266] Detrusor hyper-reflexia is seen commonly in mengingo-myelocele patients and in spinal injuries, Parkinson's disease and multiple sclerosis. Areflexic bladder dysfunction due to a cauda equina lesion or diabetes might cause overflow or a paralysed pelvic floor and hence stress incontinence. Men who had suffered a stroke were at increased risk for incontinence with an odds ratio of 7.1, [152] the occurrence of UI correlated with motor weakness (OR 5.4), visual defects (OR 4.8, and dysphagia (OR 4.0) in a study of 235 stroke patients. [267]

5. Prostatectomy

A well known iatrogenic cause of male incontinence is prostatectomy, but we do not know the attributable risk for this factor in the population of men with UI. In a Norwegian survey of elderly men with UI almost a third had undergone prostatectomy. [264]

• **TURP** seems to be followed by an incidence of stress incontinence of about 1%. An RCT comparing TURP, laser prostatectomy and evaporization of the prostate for benign disease showed comparable incontinence rates immediately and up to 12 months postoperatively. [268]

• **Radical prostatectomy** seems to induce UI at a much higher rate than TURP. The overall prevalence of post- radical prostatectomy incontinence ranges from 2 to nearly 60% (Table 15). This wide range may be explained by many factors, including differences in study characteristics, population characteristics, study site, and the definition used. Median value seems to be from 10-15% when most studies are taken into account. The era in development of the procedure has also been found to be associated to the prevalence, [269] as well as the various surgical techniques of surgery (see Table 15).

Incontinence rates elicited from symptoms reported by patients are generally 2-3x higher than those from physicians' observations. Studies that have performed both assessments in the same population confirm this observation that doctors underestimate postprostatectomy incontinence by as much as 75%. [277, 292-294]

Incontinence rates seem to steadily decline with time and plateaus 1 - 2 years after surgery, emphasizing the need of a long follow-up period. [271, 281, 286, 288, 289, 291]

The ***technique of radical prostatectomy*** has impact on UI rates. Modifications associated with lower UI rates include the perineal approach[285, 287] and preservation of neurovascular bundle. [295-297] Bladder neck preservation affords earlier return to continence compared with bladder neck resection, but with similar UI rates after one year. [282, 298]

Table 15. Prevalence of post-prostatectomy incontinence

Author/ Ref	Procedure	N	Follow up (months)	Definition	Prevalence (%)
Salomon 2003 [270]	RRP	205	12	Use of pads	34
Moinzadeh 2003 [271]	RRP	200 1	2	Use of pads	2
Maffezzini 2003[272]	RRP	300	29		11
Hu 2003 [273]	RP	12 079	> 36		4-20
Deliveliotis 2002 [274]	RRP	149	12		6-8
Augustin 2002 [275]	RP		12	Any protection	27
Sebesta 2002 [276]	RP	674	> 24	Use of pads	32
Olsson 2001 [277]	Lap RP	228	12	Use of pads	22
Potosky 2000 [278]	RP		24		10
Benoit 2000 [279]	RRP	25 651	12		8
La Fontaine 2000 [280]	Lap RP	522	Mean 31	Use of pads	15
Walsh 2000 [281]	RRP	64	12-18		7
Poon 2000 [282]	RRP	220	Mean >12		3-7
Catalona 1999 [283]	RRP	1 870	>12		8
Arai 1999 [284]	RP	60	12	Use of pads	3-19
Gray 1999 [285]	RRP/RPP	209	Median 32		25
Horie 1999 [286]	RRP	104	12	Use of pads	22
Bishoff 1998[287]	RP	907			
Goluboff 1998[288]	RRP	480	12	Any UI Daily or pad use Continuous	57 7 1
Weldon 1997 [289]	RRP	220	18		5
Egawa 1997[290]	RP	94	18	Use of pads	27
Lowe 1996[291]	RRP	180	12	Any protection	12.

RRP : radical retropubic prostatectomy RP : radical prostatectomy Lap RRP : laparoscopic retropubic prostatectomy

One study showed earlier recovery of UI after tennis racquet reconstruction and bladder neck preservation compared with bladder neck preservation with puboprostatic ligament preservation, but with similar UI rates after one year. [299] UI after laparoscopic procedures seems to be similar to open surgery, but no studies directly compare both techniques.

Older age at time of surgery has been found to be associated with a higher prevalence of post-prostatectomy UI, [285, 288, 296, 297] and one study showed a doubled risk for every 10 years of age beginning at age 40. [283] Another study suggested that rather than absolutely affecting final continence prevalence, elderly men need a longer time to achieve continence after surgery. [286] Two studies found no relation between age at surgery and UI. [292, 300]

Other factors have been found to be associated with a higher prevalence of post-prostatectomy, although not consistently. Such factors include prior TURP, preoperative lower urinary tract symptoms, obesity and advanced clinical stage. [296, 297] Adjuvant radiotherapy has not been found to affect post-prostatectomy incontinence rates when assessed beyond 1 year. [301]

SUMMARY POINTS :

- The epidemiology of UI in men has not been investigated to the same extent as for females. But it appears that UI is at least twice as prevalent in women as compared with men. There seems to be a more steady increase in prevalence with increasing age than for women.
- Most studies find a predominance of urge incontinence, followed by mixed forms of UI and stress incontinence the least. Most studies have a large fraction of other/unclassified types.

- Literature on incidence of male UI is still very scarce.
- Clear risk factors are more seldom scientifically documented, but several medical correlates have been reported. Established risk factors predisposing men to UI include increasing age, lower urinary tract symptoms (LUTS), infections, functional and cognitive impairment, neurological disorders, and prostatectomy.
- Studies have demonstrated a prevalence of OAB among men in the range of 15-30%, similar to that on women. Only 15-20% of men with OAB have urge incontinence. Increasing age is consistently associated with increasing prevalence of OAB in men.
- UI after radical prostatectomy is frequent, ranging from 2-57%, but with a median value about 10-15%. More comparative studies of surgical procedures and their various modifications should be performed.
- Some gains have been achieved on the study of the epidemiology of OAB and UI in men since the 2001 report. We have more community-based data on prevalence and better analyses of post-prostatectomy incontinence.

F. EPIDEMIOLOGY OF FAECAL INCONTINENCE

I. GENERAL COMMENTS AND DEFINITIONS

Faecal Incoontinence (FI) is the involuntary loss of faeces – solid or liquid. Anal Incontinence (AI) includes these events as well as the involuntary loss of flatus, which is felt, especially in young adults to be an equally disabling disorder. The discussion below will therefore focus on the broader definition: AI. Not included in this definition is anal mucoid seepage, a condition that cannot be deferred by an able sphincter and intact cognition, most often caused by an organic colonic disease or dietary sensitivity. Older reports of AI prevalence have come from single institutions, and the patients described therein have been subject to referral bias when demographics and etiology are discussed. The accuracy of AI prevalence estimates may also be diminished by difficulty in ascertaining those figures due to the common underreporting of AI and patients' reluctance to report symptoms or to seek treatment. [302, 303] It has been shown that women are more willing to report AI than men. [304]

In addition, the character (incontinence of solid faeces, diarrhea, or flatus, or merely anal seepage) and frequency (daily versus episodic) of reported AI varies greatly in each report, and indeed between individuals. So, prevalence depends heavily on the definition of AI.

II. PREVALENCE

1. Adults

In an effort to resolve the widely varying reported prevalence figures, a systematic review of the published frequencies has been done (MacMillan et al., in press). But a summary frequency was not calculated because of the marked clinical heterogeneity between reports (**Table 16**). The three reports that the authors judged most free of potential biases had frequencies between 11% and 15%, though only one of these three used a validated assessment instrument. The degree of disability present in these 11%-15% is not known, nor even if a portion of them had only anal seepage, a condition quite separate from incontinence. These high prevalences were obtained in surveys that employed anonymous self-administered surveys, which routinely provide high numbers but do not allow objective confirmation of AI or assessment of degree of disability associated with AI.

2. Children

The reported prevalence of AI in children can be broadly dividedinto two facets: in those children born with congenital anomalies of the anus and rectum – either congenital aganglionosis (Hirschprung's Disease) or imperforate anus – and those children without congenital anomalies. Among those children and adults who were born with defects, despite surgical correction of the defect, life long defecation difficulties are common, occurring in roughly half of affected children. [305-307] Problems with psychological health and development because of the defecation disorder is also common in this group, as is a generally depressed quality of life. [308] These

disorders are not horribly rare, occurring in 3 to 5 per 10,000 live births. [309]

Among children without congenital defects of the anal canal, bowel control has been found to be complete in one Swiss cohort in 33% by age 1 year, 75% by age two and 97% by age three. Nevertheless in this longitudinal study, one fourth of the boys and one tenth of the girls had a major period of incomplete bowelor bladder control btween the ages of 6 and 18. At least annual encopresis occurred in 2-3% of these children, boys more frequently than girls. [310] The common disorder for all children and then adults inthis discussion is fecal retention with overflow and seepage.

3. Incidence

Clinical trials have provided incidence data after a therapeutic interventions, but usually without a preliminary continence assessment. This is best seen in two Cochrane reviews of therapy for anal fissure (See Cochrane library, 2004). AI incidence rates varied widely from 0% to 30%, to flatus only, and the duration was unspecified in the trials. Medical therapy was less likely than surgery to cause AI (0.23, 0.02-2.1), and certain operations (anal stretch) were more likely to cause AI than others (sphincterotomy) (4.2, 1.9-9.4).

4. Potential Risk Factors

a) Gender

Most discussions of the etiology of AI have been based upon the assumption that women, particularly for individuals under the age of 65 years, are far more at risk for AI than men. Injury to the pudendal nerve or sphincter muscle from prior obstetric trauma is described as the primary risk factor, [311, 312] followed by irritable bowel syndrome (a disease thought to be more prevalent in women), [313] and other etiologies such as diabetes a distant third. [314] Yet each population based-survey of the prevalence of AI has shown a surprisingly high prevalence in males (**see Table 16**). Clearly, etiologies other than childbirth must be sought.

b) Childbirth and mode of delivery

A meta-analysis of published reports that assessed anal sphincter integrity after ***vaginal*** delivery and correlated this with continence stated that 77%-83% (depending on parity) of AI in parous women was due to sphincter disruption. [338] Three things are implied by this conclusion : first, that incontinence in men, children, of elderly onset (or even in middle aged women) and in nulliparous women, or women having Cesarean section has a completely different cause than in women who have ever delivered vaginally, since apparently so few vaginally delivered women have incontinence of any other cause. Second it is implied that sphincter repair would be effective treatment for AI in almost all parous women. Third, if trauma to the anal sphincter were the major cause of AI, then Cesarean section should be effective in preventing incontinence.

Yet comparative studies of women having Cesarean section versus vaginal delivery have not shown a significant difference in continence between the two modes of delivery, i.e., that avoidance of sphincter rupture by C. section does not prevent AI (**Table 17**). Thus incontinence occurs after pregnancy regardless of the method of delivery. This implies that other mechanisms cause incontinence during pregnancy, perhaps trauma in the pelvic inlet. Overall, the epidemiological studies in this area seem to be in somewhat conflict with each other.

Indirect evidence for the possibility that injury higher in the pelvis may be related to AI in pregnant women can be found in the association of hysterectomy with AI, an association seen more prominently with abdominal hysterectomy (TAH) than vaginal hysterectomy (VH), and for flatus only (Odds Ratio of TAH vs. VH for faeces : 1.2, 0.3-4.7, Odds Ratio for gas : 18.9, 1.1-327). [341] Pelvic nerve injury during surgery is the postulated reason for this difference.

c) Nursing home residence

The most prominent association with AI by far is nursing home residence. Whereas the prevalence of AI is probably around 2% to 5% for community-dwelling persons, and may rise with increasing age to greater than 10%, among nursing home residents the prevalence approaches 50%. [93, 336, 337] This is partly explained by FI being one of the most common reasons for nursing home admission. In a large survey of 18,000 Wisconsin nursing home residents, risk factors for faecal incontinence (FI) were directly observed by nursing home personnel. [337] Urinary incontinence (UI) was the greatest risk factor for FI (OR = 12.6, 11.5-13.7), followed by the loss of ability to perform daily living activities (6.0, 4.7-7.7), tube feeding (7.6, 5.6-10.4), physical restraints (3.2, 4.7-7.7), diarrhea (3.3, 2.7-4.2), dementia (1.5, 1.4-1.7), impaired vision (1.5, 1.4-1.7), constipation (1.4, 1.3-1.6), faecal impaction (1.5, 1.1-2.1), stroke

Table 16. Population-based Surveys of Prevalence of Anal Incontinence

COUNTRY [ref]	POPULATION	N	PREVALENCE
U.K. [303]	Community Service	4 844	1.9%
France[315]	All >45 years	1 100	11%, 6% to faeces, 60% are women
U.S.A. [316]	Market mailing	5 430	7% soiling, 0.7% to faeces
U.S.A. [304]	Wisconsin households	6 959	2.2%, 63% women
Australia[202]	Household survey	3 010	6.8% in men, 10.9% in women >age 15
Germany[317]	>18 years	500	4.4%-6.7% (by health)
Australia[318]	>18 years	651	11.3%
New Zealand[319]	>18 years old	717	8.1% for solid and higher for gas
U.K. [320]	>40 years	10 116	1.4%
U.K. [212]	Postpartum women	549	5.5%
Canada[321]	Postpartum women	949	3.1% solid, 25.5% flatus
Denmark[322]	Postpartum women	1 726	8.6% in past year, 0.6% to solid stool
Nigeria[323]	Gynecology patients	3 963	6.9%, 2.3% to solid stool
United Arab Emirates[324]	Women multips	450	11.3%, 5.5% to solid stool
Canada[325]	Teenage females	228	3.5% flatus, 3% FI
Czech Republic[326]	Gynecology patients	2 212	5.6%, 4.4% in the community
Japan[327]	Cystectomy patients	28	60.7% post ureterosigmoidostomy
Sweden[328]	Prostate cancer	864	RR 1.3-4.5
Australia[329]	Diabetics	8 657	Increased risk
New Zealand[330]	> 65 years old	559	3.1%
Holland[331]	Women >60 years	719	4.2% to 16.9% with rising age
U.S.A. [332]	>65 years at home	328	3.7% (M >F)
Japan[81]	>65 years at home	1 405	6.6-8.7% (by age).
U.S.A. [333]	>50 years	1 440	11.1 – 15.2% (F > M)
U.K. [334]	>65 years at home	2 818	3%
Holland[335]	>60 years	3 345	6%, (M = F)
Czech Republic[336]	Nursing homes	1 162	54.4%
U.S.A[337]	Nursing homes	18 170	47% FI
Canada[93]	Nursing homes	447	46% FI, 44% both UI and FI

Table 17. Cesarean Section versus Vaginal Delivery and Faecal Incontinence

Study Design [ref]	Number FI C-section	Vaginal	Risk&	(95% CI)	Comment
RCT [204]	5/619	9/607	0.54	0.2-1.6	Faeces at 3 months post partum
	66/616	59/606	1.1	08-1.5	Gas
Cohort [321]	2/114	22/681	0.5	0.01-2.3	Faeces at 3 months
	26/114	163/681	1.0	0.7-1.4	Gas
			0.8	0.6-1.2	Adjusted for gas and stool*
Survey [202]	4/100	33/718	0.68	0.3-3.2	Faeces; household survey
	9/100	91/718	0.86	0.3-2.6	Gas
			0.78	0.2-2.6	Adjusted for faeces
			0.77	0.4-1.5	Adjusted for gas #
Survey [339]			1.1	0.4-3.0	Gas
			0.8	0.3-2.1	Loose stool
Survey [340]	9/184	8/100	0.61	0.3-1.5	Faecal incontinence

& Relative Risk for the Randomized Trial (RCT) and Cohort Study, Odds Ratio of the two Cross Sectional Surveys
* Adjusted for multiple labor related variables # Adjusted for age and parity

(1.3, 1.2-1.5) male gender (1.2, 1.1-1.3), age and body mass index. Inverse associations were noted with heart disease, arthritis and depression.

d) Diarrhea

The importance of diarrhea of liquid stool in FI cannot be overemphasized. One case series noted that 51% of individuals with chronic diarrhea were incontinent. [302] In the Wisconsin Family Health Survey of AI (1993), 10 of the 25 subjects with FI lived in Milwaukee when the city experienced an outbreak of waterborne disease. Non-infectious causes of diarrhea must also be considered, including those initiated by leisure activities such as running. [342]

e) Surgery

AI originating from surgery would seem fairly insignificant in the general population, since prior anal surgery has not been an apparent risk factor in the larger surveys. Several operations nonetheless frequently can result in AI. Examples are midline internal sphincterotomy, lateral internal sphincterotomy, fistulectomy, fistulotomy, ileo-anal reservoir reconstruction, low anterior rectal resection, total abdominal colectomy, and ureterosigmoidostomy. The risk of lateral internal sphincterotomy for anal fissure causing AI was previously thought to be insignificant when compared to midline sphincterotomy, but a recent reappraisal of this operation has shown an AI risk may be 8%. [343] The risk of AI after fistulotomy has been reported to be as high as 18% to 52%. [344] New approaches to fissure and fistula have recently been developed specifically to lower this risk. [344, 345] However incontinence after hemorrhoidectomy has also been reported to be as high as 33%, an operation in which no sphincer is divided. [346] This suggests either that division of the snoderm, not the sphincter may be affecting continence, or that the method of ascertainment used in published surveys is not accurate. Mixing urine and stool has been found to have a predictable effect on anal sphincter control, as does diarrhea, in patients having ureterosigmoidostomy after urinary bladder resection. [323]

f) Specific Neurological and other Diseases

Several specific diseases have been anecdotally associated with AI in case series, and mechanisms to explain the associations have been investigated. [347] Examples are diabetes, stroke, multiple sclerosis, Parkinson's disease, systemic sclerosis, myotonic dystrophy, amyloidosis, spinal cord injury, imperforate anus, Hirschsprung's disease, retarded or interrupted toilet training, procidentia, and any illness causing diarrhea (HIV, IBD, radiation, infection). Many of these conditions directly affect patient mobility and ability to perform daily living activities or they cause diarrhea or faecal impaction.

g) Other Factors

• Prospective Assessment of Risk Factors

Because of a paucity of clinical trials that specifically address risk factors and prevention of AI, the strongest available data to identify risk come from cohorts that collected data on potential risk factors prior to the onset of incontinence. The only prospectively collected risk assessments for FI have occurred in three nursing home cohorts. Porell combined UI and FI into a single outcome variable and found many positive associations in a cohort of 60,000 nursing home residents in Massachusetts. [348] Age, African American race, cognitive and ADL impairments predicted the outcome, though specific relative risks for incidence are not presented. Chassange followed 234 previously non-FI residents in France for 10 months, during which 20% had FI episodes, but only 7.5% developed long lasting FI. [349] The others had acute episodes due to diarrhea or impaction. The factors associated with the development of long lasting FI were urinary incontinence (UI) (2.9, 1.8-4.6), decreased mobility (1.8, 1.1-3.0), and cognitive defects : either as seen in an MMSE score <15 (2.5,1.4-4.4) of history of dementia (2.1, 1.2-3.5). Neither gender nor age were risk factors. Nelson reported, in a cohort of 18,000 nursing home residents in Wisconsin, a subgroup of 3,850 continent to both urine and faeces in 1992 and were assessed one year later (unpublished). 15% developed FI. Positive associations were seen for ADL loss (3.4, 2.4-4.5), trunk restraints (2.5, 1.7-3.6), dementia (1.7, 1.4-2.0), African American race (2.1, 1.3-3.4) and age (1.02, 1.0-1.0). UI was not investigated as a risk factor because it was felt to be a co-morbid condition.

Lastly, in a broadly based cross sectional survey, it was apparent that factors that affect an individual's general health or physical capabilities, independent of age and gender, place that individual at greatest risk for AI, [316] though all four are significantly associated with AI. [304] Among obstetrical patients age has also been a consistent association, with less consistent associations noted for chronic bronchitis (OR =6.5, 1.1-38), symptoms of pelvic prolapse (5.0, 3.0-8.7) and obesity (3.0, 1.0-3.4). [340]

SUMMARY POINTS

- Anal and urinary incontinence commonly coexist, particularly in the elderly and in nursing home residents.
- The prevalence of anal incontinence increases with age, but is present in all age groups and both genders varying from 1.5% in children to more than 50% in nursing home residents.
- AI is almost as common in men as in women.
- Conflicting data exist for the role of childbirth and mode of delivery as risk factors.
- As populations age, co-morbid disease becomes a significant component of faecal incontinence risk. Surgery, neurological diseases, and stroke are examples.
- Cognitive and ADL impairment are associated with faecal incontinence.
- Several population based prevalence surveys have recently been published, with more analyses comparing AI after Cesarean section and vaginal delivery.
- Risk factors for AI in each age group are still poorly defined, and prevention research is therefore still difficult to perform.

G. EPIDEMIOLOGY OF POP

I. GENERAL COMMENTS AND DEFINITIONS

Pelvic organ prolapse (POP) is defined as the downward descent of the pelvic organs, which results in a protrusion of the vagina and/or the uterine cervix, and does not include rectal prolapse. The condition may occur at rest and is often aggravated by increases in intra-abdominal pressure during daily activities. Until recently, epidemiologic studies of POP have been limited by the lack of a standard definition of the condition. The International Continence Society first developed a standardized definition for the condition of POP in 1996. [350] The ICS Pelvic Organ Prolapse Quantification (POPQ) exam defines prolapse by measuring the descent of specific segments of the reproductive track during valsalva strain relative to a fixed point, the hymen. Validation of this system has shown it to be highly reliable. [351] Studies done prior to this specific definition of the exam use multiple different grading systems, none of which have been validated for reproducibility or clinical relevance.

The POPQ system describes the anatomic findings of pelvic organ prolapse without consideration for symptoms and bother perceived by the woman. The distress experienced by the woman is most relevant clinically, but there is insufficient evidence at present to define POP by symptoms, as the symptoms of POP are non-specific, and overlap with many other pelvic floor disorders. “Feeling a bulge in the vagina”, the most common symptom attributed to prolapse, has shown a moderate correlation with the severity of prolapse in an affected population, [352] but has not been validated in community-based populations. Other symptoms, like urinary and faecal incontinence, voiding and defecatory difficulty, and sexual dysfunction frequently coexist, but correlate weakly at best with the severity or site of POP in an affected population. [352] The gradual onset of symptoms, the inconsistency in symptoms, and the variability among women regarding the perception of bother, thus greatly limit the use of symptoms in the epidemiologic definition of prolapse.

The stages of prolapse severity are arbitrarily defined, and there is no clear differentiation between normal anatomic variation and mild conditions of POP. Further, the importance of asymptomatic prolapse as a precursor to development of symptomatic prolapse is unknown. A clinician may consider degree of “bother” to determine whether the prolapse is significant enough to warrant therapeutic intervention but for research purposes there is consensus for use of the POPQ system until further evidence might clarify the distinction between normal and mild prolapse. [353]

At present, there have been no epidemiological studies of POP in community-based populations. The inconsistency of symptoms and the requirement of an intimate physical exam have severely limited such studies, but some information is available as ancillary findings of other epidemiological studies. The majority of published studies are from clinical populations, especially from registers of surgical procedures that are specific for prolapse. However, identifying POP by surgical intervention is likely to identify only the most severe degrees of prolapse, thus identifying only the “tip of the iceberg”.

Pelvic organ prolapse is frequently co-exists with other pelvic floor disorders, such as urinary and fecal incontinence. [354] Thus it is difficult to study pelvic organ prolapse as an isolated condition and to understand the interrelationships between prolapse and other pelvic floor disorders. For example, in studies that use surgery as an indicator, colposuspensions are usually considered incontinence surgeries, without considering the fact that a colposuspension will also correct mild-moderate anterior wall prolapse. The POPQ exam is designed as sensitive tool for measuring prolapse, but without considering symptoms, it cannot be a specific tool for studying prolapse. Several investigators have studied pelvic floor disorders as a global condition. [202, 355]

II. PREVALENCE

There are very few prevalence studies of POP. Table 17 gives examples of reported prevalence of POP, defined by symptoms or examination. The only study of prevalence using the ICS definition of prolapse showed a very high prevalence of prolapse in an ambulatory clinical population, with 94% women having Stage 1 prolapse or greater. Considering only women with prolapse of Stage 2 or greater, the prevalence by POPQ exam was measured at 51%. In the Women's Health Initiative, which used a non-validated physical exam to measure prolapse in post-menopausal women, the overall presence of prolapse was 41% for women with a uterus, and 38% of women after hysterectomy. Prior surgery other than hysterectomy was not assessed in this study, and this result likely represents many women who have undergone surgical therapy for prolapse. In a younger, more community based population in Sweden, the overall prevalence was lower, 31%, and the condition milder, with only 1.6% having descent to the introitus, and none beyond the introitus.

The prevalence of prolapse based on symptoms was much lower, varying between 7 and 23%. The lower prevalence probably represents both asymptomatic anatomic changes, and the lack of correlation between prolapse symptoms and measured pelvic prolapse.

Prolapse occurs most frequently in the anterior compartment, next most frequently in the posterior compartment, and least in the apical compartment. The majority of prolapse cases are mild to moderate, measured as Stage 1 and 2.

III. INCIDENCE

Studies of the incidence of POP are limited to studies of the surgical treatment of the condition. Cases are defined by the codes for diagnoses and procedures developed by the International Classification of Diseases (ICD). The decision for surgery is affected by other variables, such as patient and surgeon attitudes, financial concerns, and access to health care. The incidence of surgical intervention has clinical relevance as this represents the most morbid and costly form of treatment.

Table 19 shows that the annual incidence of surgery for pelvic organ prolapse is within the range of 1.5 to 4.9 cases/per 1000 women years. The incidence of surgery rises with age, with a greater rise occurring after the common age of menopause. [357, 360] The age-adjusted incidence of surgery for prolapse increased from 2.7 to 3.3 per 1000 from 1979 to 1997 in the US surgical database. The incidence of surgery for women < 50 declined, while the incidence for women > 50 increased.

IV. POTENTIAL RISK FACTORS

In this text we discuss a variety of proposed risk factors for POP (**Table 20**). The literature of risk factors for POP is not very advanced or rich, but in the recent years some well-performed and analytical studies have identified possible risk factors for POP (**Table 21**).

1. AGE

Studies of prevalence and incidence show a rise in both as women advance in years (**Tables 18 and 19**). Surgery for prolapse is uncommon in women under age 30 and over age 80, and there is a steady rise in incidence in between. In their study of prolapse defined by physical exam, Hendrix et al. demonstrated an OR of 1.16 (1.0-1.3) for women age 60-69 and an OR of 1.36 (1.2-1.6) for women aged 70-79 compared to women aged 50-59 for uterine prolapse. [357] In a cross-sectional study of 21,449 Italian women attending menopause clinics, the risk of having uterine prolapse (Baden Walker classification) rose similarly with age. In comparison to women aged 51 or less, the OR for uterine prolapse was 1.3 (1.1-1.5) for women aged 52-55 and 1.7 (1.5-2.0) for women aged 56 or greater. [364] Similar increases in risk

Table 18. Examples of prevalence of pelvic organ prolapse, stratified by age, type or stage

Author [ref]	Population and design	Definition	N	Age (years)	Prevalence (%)
Eva[354]	Community, Sweden. Postal questionnaire	Any symptom of pelvic heaviness, genital bulge, or use of the fingers in the vaginal or perineum by defecation	641 663	40 60	23 28
Kumari [356]	Community, India. House-to-house screening interview	Symptoms : "A mass of flesh in the vagina," or an equivalent question using local terminology for prolapse	2 990	15-24 25-34 35-44 45-54 55-64 65+	5 10 8 6 9 3
MacLennan [202]	Community, Australia. Omnibus survey, interviews in respondents' homes	Symptom : A feeling of something coming down in the vagina	1546	15-97	8
Hendrix [357]	USA. Healthy postmenopausal women enrolled in a large RCT of estrogen therapy (The Women's Health Initiative)	Not validated genital exam (not POPQ) Previous surgery not excluded	27 342	50-79 Mean 63	Cystocele : 34 Rectocele : 19 Uterine : 14
Samuelsson [358]	Sweden. Women in public health district invited for gynecologic exam every third year	Not validated genital exam (not POPQ).	487	20-59 Mean 39.0	any prolapse : 31 to introitus : 1.6 prior surgery : 0.4
Swift [359]	Gynecologic clinic, USA. Women attending for annual exam	POPQ exam	497	18-82 Mean 44	Stage 0 : 6 Stage 1 : 43 Stage 2 : 48 Stage 3 : 3 Stage 4 : 0

Table 19. Incidence of surgery for pelvic organ prolapse

Author [ref]	Population and design	Period	N	Procedures	Age (years)	Incidence per 1000 women/ years
Boyles[360]	USA. National Hospital Discharge Survey. Trend for 1979-97. Age-adjusted rates were calculated using the	1979-97	Approx. 270 000 discharges per year	Colporrhaphy (rate 1.5-1.0) and vaginal hysterectomy (rate 1.0-0.7) most common and stable. Vaginal suspension increased (0.013 to 0.161)	All <50 ≥50	2.2 – 1.5 1.9 – 0.8 2.7 – 3.3
Mant [361]	UK. Annual survey of a cohort in the Oxford Family Planning Association study	1968-94	17 032	Colporrhaphy 37%, vaginal hysterectomy 24%. Hysterectomy for prolapse rose by a factor of 1.95 between 1979 and 1990, the rate of repair by 1.37	25-39 at inclusion, majority < 45 at conclusion	1.62 2.27
Brown [362]	USA. National Hospital Discharge Survey	1997	300 000	Vaginal hysterectomy most common < age 50, colporrhaphy was more common ≥ age 50. Vaginal fixations more common in women aged 60-79 years.	20-80+ Mean 54.6	
Olsen [363]	USA. Managed care.	1995	149 554	11% lifetime risk for surgery for prolapse and/or urinary incontinence by age 80. Sixty-one percent of these surgeries were done for prolapse with or without incontinence, giving an approximate lifetime risk of 7% for prolapse surgery.	Mean 58 20-29 30-39 40-49 50-59 60-69 70-79 80+	0.04 0.53 1.46 2.07 3.64 4.91 1.17

Table 20. Risk factors for prolapse reviewed in this text

Age
Pregnancy, Parity, and Obstetric Factors
Obesity
Race and Hereditary factors
Menopause and Reproductive Hormones
Smoking
Bowel Dysfunction
Gynecologic Surgery
Other factors

Table 21. Risk factors for pelvic organ prolapse, from multivariate analyses

Author [ref]	Population and Design	N	Definition	Strata	OR (95% CI)
Age					
Hendrix[357]	USA. Healthy postmenopausal women enrolled in a large RCT of estrogen therapy	27 342	Uterine prolapse, non-validated exam	50-59 60-69 70-79	1.0 1.2 (1.0-1.3) 1.4 (1.2-1.6)
Progetto Menopausa[364]	Cross-sectional study of women attending menopausal clinic	21 449	Uterine prolapse, Baden Walker	<51 52-55 ≥56	1.0 1.3 (1.1-1.5) 1.7 (1.5-2.0)
Mant[361]	UK. Annual survey of a cohort in the Oxford Family Planning Association study	17 032	Hospital diagnosis of prolapse	25-34 55-59	1.0 1.9 (1.3-3.0)
Parity					
Hendrix[365]	USA. Healthy postmenopausal women enrolled in a large RCT of estrogen therapy	27 342	Uterine prolapse	0 1 2 3 4+	1.0 2.1 (1.7-2.7) 3.2 (2.7-3.9) 4.3 (3.8-5.0) 5.4 (4.8-6.2)
Mant[361]	UK. Annual survey of a cohort in the Oxford Family Planning Association study	17 032	Hospital diagnosis of prolapse	0 1 2 4+	1.0 4.4 8.4 10.9 (4.7-33.8)
Progetto Menopausa[364]				0 1 >3	1.0 2.6 (1.8-3.8) 3.0 (2.1-3.7)
Chiaffarino[366]	Italian case-control,	Cases-108 Controls 100	Surgery for POP with grade II-III, Baden Walker	0 1 2+ Route of delivery Spontaneous Forceps Cesarean	1 3.0 (1.0-9.5) 4.5 (1.6-13.1) 1.0 1.3 (0.6-3.1) 0.3 (0.1-1.0)
Moalli[367]	USA. Case control	Cases-80 Controls-176	Surgery for POP/UI	Route of delivery Cesarean Spontaneous Forceps	 1.0 2.9 (0.9,10.0) 5.4 (1.6, 18.4)
Obesity					
Hendrix[357]	USA. Healthy postmenopausal women enrolled in a large RCT of estrogen therapy	27 342	Uterine prolapse	BMI <25 25-30 >30	1.0 1.3 (1.2-1.5) 1.4 (1.2-1.6)
Race					
Hendrix[357]	USA. Healthy postmenopausal women enrolled in a large RCT of estrogen therapy	27 342	Uterine prolapse	Caucasian African-American Hispanic	1.0 0.6 (0.5-0.8) 1.2 (1.0-1.5)
Hysterectomy					
Mant[361]	UK. Annual survey of a cohort in the Oxford Family Planning Association study	17 032	Hospital diagnosis of prolapse	Hyst not for POP Hyst for POP	1.0 5.5 (3.1-9.7)

were reported for cystocele and rectocele. Mant demonstrated a crude RR of 8.8 for women aged 55-59 compared to 25-34, but this risk dropped to 1.9 after adjustment for parity and calendar period. [361] We have found no multivariable analyses across the adult lifespan.

2. Pregnancy, Parity, and Obstetric Factors

Several studies have shown an association of prolapse with parity. This risk factor is crucial to understand because of the potential to modify obstetric practice in order to prevent disease. There are many aspects of childbirth to consider in assessing risk : The potential effects of pregnancy, of vaginal delivery, instrumented delivery, episiotomy, birth weight, time and management of the second stage, type of anesthesia, and others.

Pelvic floor descent measured by POPQ changes during pregnancy. In a case-control study comparing 21nulliparous, non-pregnant and 21 nulliparous pregnant women, all of the non-pregnant women were Stage 0 or 1, and whereas 47.6% of the pregnant subjects had POPQ stage 2 (P <.001). [368] Overall POPQ stage was significantly higher in the third trimester than in the first (P=0.001). [369]

Mant found that parity was the strongest risk factor for the development of prolapse in women under age 59. [361] The relative risk of developing prolapse was 8.4 for a woman with 2 children and 10.9 (4.7-33.8) for a woman with ≥4 children compared to nulliparous women, after adjusting for age and calendar period. Hendrix et al. found that a parity of 1 was associated with an OR of 2.1 (1.7-2.7) compared to nulliparous women for uterine prolapse, and an additional OR of 1.1 (1.0-1.2) for each subsequent birth up to a parity of 4 (OR 5.4) in post-menopausal women. [357] There were no data descriptors for the parameters of birth. For rectocele and cystocele, respectively, parity of 1 was associated with an OR of 2.2 (1.8-2.7) and 1.9 (1.7-2.2), with an additional OR of 1.2 (1.2-1.3) and 1.2 (1.2-1.2) for each subsequent birth up to 4. The Progetto Menopausa Italia Study also showed that a parity of 1 compared to nulliparity was associated with an OR of 2.6 (1.8-3.8) and a parity of ≥3 was associated with an OR of 3.0 (2.1-3.7). [364]

An Italian case-control study with 108 women with grade II or III prolapse (Baden-Walker classification) and 100 controls evaluated risk factors for undergoing surgery for prolapse in 1995-96. In comparison with women reporting no vaginal delivery, the OR was 3.0 (1.0-9.5) for 1 vaginal delivery and 4.5 (1.6-13.1) for women with 2 or more vaginal deliveries. Women who delivered with forceps had an OR of 3.6 (1.0-13.5) in comparison to those reporting no forceps, but the OR decreased to 1.3 (0.6-3.1) when the confounding effect of vaginal delivery was accounted for. Women who delivered with Cesarean section had an OR for genital prolapse of 0.3 (0.1-1.0). [366]

Moalli conducted a case-control study comparing 80 women undergoing surgery for prolapse and incontinence with 176 control women, all who had undergone a first obstetric delivery within the same health system. Obstetric variables were abstracted directly from the medical record, in contrast to the usual methods of relying on patient recall for obstetric data. Compared to Cesarean section, the odds ratio for undergoing POPUI surgery was 2.9 (0.9-10.0) for spontaneous vaginal delivery and OR of 5.4 (1.6-18.4) for forceps delivery. [367]

3. Race and Hereditary factors

US data support a protective effect of African American race compared to white race for POP. Hendrix et al. [357] found an OR of 0.6 (0.5-0.8) for uterine prolapse, 0.5 (0.4-0.6) for rectocele, and 0.7 (0.6-0.7) for cystocele. Hispanic women had a slightly higher risk of uterine prolapse, OR 1.2 (1.0-1.5) and cystocele, OR 1.2 (1.0-1.4), but not for rectocele. For surgery there are much higher rates for white women (1.96 per 1000 women/years) compared to African American women (0.64 per 1000 women/years). [370].

There are indications of a heritable or intrinsic connective tissue abnormality in the etiology of POP. One study showed a higher risk of prolapse in women with a mother (OR 3.2) or a sister (OR 2.4) reporting prolapse. [366] Another showed that women with joint hypermobility had a significantly higher prevalence of cystocele, rectocele, and uterine or vault prolapse compared to women with normal joint mobility. [371] Connective tissue disorders, such as Ehlers-Danlos syndrome, are suspected to predispose to prolapse at a younger than expected age. In a case series of 8 women with a mean age of 46, the prevalence of surgically treated prolapse was 38%. This can be compared prevalence of surgically treated prolapse in a community population of 16% by age 45-54. [202]

4. Obesity

One study has shown an increased risk for uterine prolapse for overweight and obese women (BMI 25-

30 : OR 1.3 (1.2-1.5); BMI >30 : OR 1.4 (1.2-1.6)). Similar increases were found for rectocele and cystocele. [357] Others have consistently found similar increases. [202, 364, 366]

5. Menopause and reproductive hormones

A few studies have investigated a possible association between prolapse and the use of oral contraceptives or postmenopausal hormones, but no consistent pattern has been demonstrated. Mant found no difference in risk of prolapse associated with oral contraceptives after 8 years of use. [361] In the Women' Health Initiative study of post-menopausal women, past use of hormone therapy was associated a slightly decreased risk in uterine prolapse, 0.84 (0.74-0.96) and cystocele, 0.92 (0.86-0.99) at the enrollment evaluation. [357] Prospective data from this randomized trial of hormone therapy should be available soon. In Moalli's case-control study of POPUI surgery, use of hormone therapy for >5 years was associated with decreased risk, 0.1 (0.03-0.3), but there was no difference for shorter duration of therapy. [367] Both Chiaffarino and Progetto Italia found no association with the age of menopause. [364, 366] Studying the risks associated with hormone exposure are inherently complex, because of inconsistencies in the age at menopause, age at assessment, the variability of the perimenopausal period, and the multiple regimens of hormone use.

5. Smoking

Smoking is often posited as a risk factor for prolapse, but several studies have shown no association with POP. [361, 364, 366]

6. Bowel Ddysfunction

Chronic constipation with repeated prolonged defecatory straining efforts has been shown to contribute to progressive neuropathy, pelvic floor dysfunction, and prolapse. In one case control study, constipation and straining at stool as a young adult before the onset of recognized POP was significantly more common in women who subsequently developed POP (61%) than in women who did not develop PFD (4%). [371] Bowel dysfunction as a young adult, defined as straining with bowel movements or a bowel frequency of <2 times per week was associated with uterovaginal prolapse in a case-control study, [372] but the symptom of constipation was only weakly associated with rectocele, OR 1.1 (1.0-1.2) and cystocele, OR 1.1 (1.0-1.2) in the US Women's Health Initiative. [357]

7. Gynecologic surgery

Hysterectomy is often suggested as a risk factor for later development of prolapse. Mant's longitudinal cohort included 2233 women who underwent hysterectomy. The incidence of admission for prolapse was 3.6 (2.7-4.6) per 1000 women/years for women following hysterectomy compared to 2.0 for the entire cohort. If the woman had a hysterectomy for prolapse, her risk of subsequent prolapse surgery was 5.5 (3.1-9.7) times higher than if she underwent a hysterectomy for other reasons. [361]

Hendrix reported the prevalence of rectocele and cystocele in 10 726 post-menopausal women who had undergone hysterectomy compared to 16 616 women who had not. [357] The rates were slightly higher in the women with an intact uterus, but this may reflect previous prolapse that was repaired at the time of hysterectomy. After hysterectomy, women are uniquely at risk of prolapse of the vaginal cuff. As the prevalence of hysterectomy at mid-life is high, this may place a large number of women at risk for later development of vaginal vault prolapse. Marchionni reported a 4.4% occurrence of vaginal vault prolapse after hysterectomy measured at pelvic exam (Baden Walker) after a mean follow-up of 11 years. When the indication for the hysterectomy was prolapse, the occurrence of vaginal vault prolapse was 11.6% compared to 1.8% when the hysterectomy was performed for non-prolapse indications. [373]

Repair of prolapse in one site seems to predispose to prolapse in another anatomic site. After retropubic colposuspension, Wiskind reported a 29% risk of reoperation for apical defects [374] and Kjolhede reported a 27% risk of reoperation for prolapse in the apical and posterior compartments. [375] In a longitudinal cohort of 276 women undergoing surgery for prolapse and incontinence, Clark reported the 13% rate of reoperation for prolapse and incontinence after 6 years. [376] In 32% of these reoperations, the anatomic site was different than in the previous surgery.

8. Other factors

The variables discussed above represent large studies in which multivariate analyses are possible. For a number of risk factors with high biologic plausibility, there is limited data, often from small case control studies examining a single variable. These factors represent an important area for future epidemiologic study of prolapse.

Pelvic floor muscle dysfunction has been associated

with prolapse. The Swedish prolapse study provided evidence for progressive decreases in pelvic floor muscle strength with increasing age and parity. This decrease in pelvic floor muscle strength was a significant independent determinant of the risk of POP (**Figures 12 A, B**). [358] Electrophysiologic testing of the pubococcygeus has shown an association between pelvic neuromuscular dysfunction and prolapse. [207] Vaginal childbirth and aging have been implicated as a major inciting event for pelvic neuropathy. [207]

Occupational physical stress has been examined as a contributing factor for POP. One report has implicated the extreme stress associated with airborne training (including parachute jumps) with pelvic floor dysfunction and prolapse in women previously subjected to laparoscopic uterosacral ligament transection. [377] A study using the Danish National Registry of Hospitalized Patients included over 28,000 assistant nurses (who are traditionally exposed to repetitive heavy lifting) aged 20-69 and compared their risk of surgery for POP and herniated lumbar disc (a condition associated with heavy lifting at work) to the risk in over 1.6 million same-aged controls. [378] The odds ratio for the nurses compared to controls was 1.6 (1.3-1.9) for POP surgery and 1.6 (1.2-2.2) for disc surgery, suggesting that heavy lifting may contribute to POP. An Italian study demonstrated an increased risk of prolapse with lower levels of education, a possible indicator of harder physical labor, although this was not specifically investigated. [364]

Skeletal abnormalities have been associated with increased surgery for pelvic organ prolapse. A higher degree of thoracic kyphosis, [379] a smaller angle lumbar lordosis, and a more vertical orientation of the pelvic inlet [380] are associated with a greater risk of undergoing surgery for pelvic organ prolapse.

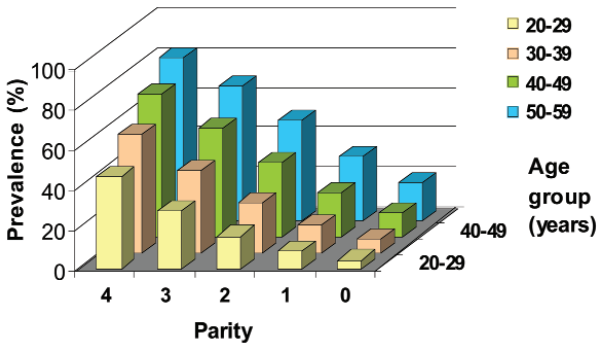


Figure 12 A . Prevalence of genital prolapse in relation to age and parity in women with good pelvic floor muscle strength (scored 4).

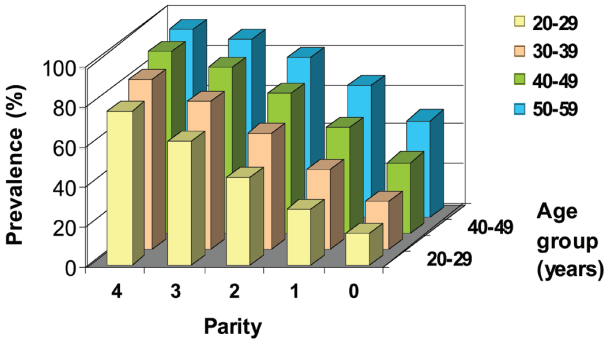


Figure 12 B. Prevalence of genital prolapse in relation to age and parity in women with no ability to contract the pelvic floor (pelvic floor muscle strength score 1). From Samuelsson[358], figure based on data from the author.

Summary points

- Pelvic organ prolapse is defined by measuring the descent of specific segments of the reproductive track during valsalva strain, described by the ICS Pelvic Organ Prolapse Quantification exam.
- Pelvic organ prolapse is a common condition affecting women, with a 7% lifetime risk of undergoing surgery for prolapse by age 80.
- The prevalence of prolapse measured by physical exam is higher than the prevalence of symptoms of prolapse.
- Prolapse coexists with other pelvic floor disorders.
- The reported incidence of surgery for prolapse varies between 1.5 and 4.9 cases/per 1000 women years.
- Hysterectomy for prolapse and increasing age, parity and body mass index are consistent risk factors associated with the condition.
- For a condition that is so common and frequently requiring costly and invasive surgical therapy, very little epidemiologic research has been conducted.
- Research efforts should be focused on understanding modifiable risk factors for prevention of the condition.

H. WHY DO PREVALENCE ESTIMATES DIFFER?

The discussion here relates to UI only, as data and literature for FI and POP are very scarce. However, many of the principal arguments will we relevant to these conditions as well.

I. GENERAL PROBLEMS IN SURVEY RESEARCH

The well documented variation in prevalence estimates is thought to result at least in part from several confounders common to survey and epidemiologic research. Herzog and Fultz, [55] in a review of the prevalence and incidence of UI in community-dwelling populations, proposed that past investigations were plagued by sampling and non-response issues, by self selection and attrition, by definitional, conceptual, and measurement issues. Comprehensive reviews about measurements and methodological aspects of investigating UI are provided. [56, 64, 381] It is clear that there are large methodological challenges to rigorous research in this field. In general, quality of recent large studies has undoubtly improved, but the scientific community must continous deal with methodological challenges in order to achieve progress.

II. DIFFERENT DEFINITIONS AND MEASUREMENT

A major problem in research on UI has been the use of different definitions and measurements, and this might contribute to the wide range of reported prevalence estimates. The former ICS definition of UI – as a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable - included objective demonstration of urine loss as one critical component. This aspect limited the ICS definition for communitybased epidemiologic investigations, because objective demonstration of UI is difficult to achieve outside of the clinical setting, and studies which were able to include this aspect in their assessment might have produced different prevalences. In addition, a social or hygienic aspect of the definition was problematic in epidemiologic studies because it added a subjective aspect to an objectively defined condition and therefore confounded the investigation of prevalence, incidence, and risk factors. In our previous report[2] we argued for reconsideration of the definition of UI, and we emphasized that the core of the definition should be ”any involuntary loss of urine”. In accordance with this view, ICS changed its definition in 2001 to UI being ”the complaint of any involuntary leakage of urine”. [1]

The new definition makes epidemiological research easier. But three consequences should be adressed :

1. Epidemiological studies should not be based on this definition alone, and all studies should include a minimal additional data set, standard confounders, and questions specific to the aim of the study. This is discussed in Section K on Recommendations for further research.
2. The number of persons fulfilling the definition will increase. This should not be interpretated as an increase in the number potential of patients. This is discussed in Section J on Epidemiology and clinical work.
3. Public awareness, case finding of health care personel, and help seeking behaviour may be affected of a new and more extensive definition. This is discussed in Section I on Help seeking behaviour

Studies have used different severity levels and time frames for defining UI. A further factor complicating the conceptualization and measurement of UI in epidemiologic studies lies in the nature of the condition. UI is a chronic condition (or set of conditions) that often starts slowly and comes and goes for a considerable time period before it become fully established. [381] If people get used to their UI or notice it less, this can interfere with valid assessment.

Ideally self-report measures are validated by clinical evaluations. However, clinical and even urodynamic investigations should be regarded as other measures, not necessarily as gold standards, because it is known to be difficult to demonstrate all urinary symptoms in the clinical setting.

Holtedahl[85] calculated prevalence estimates using different definitions of UI for the same sample of 50 to 70 year old women. The prevalence of any self-reported leakage was 47%. Self-reported regular UI with or without objective demonstration was found for 31% of women, regular incontinence according to the former full ICS definition for 19%. Another study found prevalences of 69% and 30% for any UI and the former ICS definition, respectively. [73] The

results indicate that the former ICS definition was rather restrictive.

Low response rates may further bias prevalence estimates. [381] Known differences between responders and non-responders can be compensated during the analysis. The major problems is unknown differences in response rates and other characteristics. Incontinent women may not answer (or deny UI) because of embarrassment or related handicaps. But incontinent women may also find the subject particularly relevant and therefore respond to a greater extent than continent women. At present, we do not know much about how these factors may affect the comparision between incontinent and continent women.

One paper explored the problem of underreporting incontinence and how it can be altered with the use of an introduction to the incontinence questions and probing. [68] Another paper explored the issue of selection bias in mailed surveys. The first wave had higher prevalence of incontinence than follow-up mailings, and thus individuals with UI tended to respond on the first wave. [382] In an English mailed survey on incontinence and other urinary symptoms, a sample of non-responders were traced, and those eligible were asked questions from the survey. [383] Comparing with the responders, the non-responders overall showed little differences in reporting of urinary symptoms. However, non-responders >70 tended to be of poorer general health, and they reported certain urinary symptoms more frequently.

SUMMARY POINTS :

- The lack of epidemiological data from populations underrepresented in research limits the world wide application of the present information.
- Many investigations are plagued by sampling and non response issues, by self selection and attrition. Many early studies were obtained from sampling patients seeking care.
- A major problem is the use of different definitions of incontinence. The new ICS definition makes epidemiological research easier.
- There are large methodological challenges to research in the field of UI. Unless the scientific community deals with these issues, progress will be difficult to make.

I. HELP SEEKING BEHAVIOUR

I. URINARY INCONTINENCE

A majority of people with UI have not sought help, [69, 107, 256, 384-386] and this is confirmed also in recent publications. [124, 387-389] Reasons given by people for not seeking help include : not regarding incontinence as abnormal or serious, [69, 390, 391] considering incontinence to be a normal part of ageing, [391, 392] having low expectations of treatment[69, 390] and thinking they should cope on their own. [392, 393] Some studies also confirm the notion that embarrassment may be an important reason for not seeking help. [386, 393, 394] There is an association between help seeking and condition-specific factors like duration, frequency and amount, and people's perceptions of the impact of incontinence, [69, 87, 107, 256, 387] but other more personal characteristics like individual health care behaviour and attitudes may also play a role.

In a Norwegian study 4.4 % of all women >20 years old in a community consulted their general practitioner for UI during a 3 year period. [395] But mentioning the symptoms to a physician may not be enough. There are reports of doctors not responding, either by ignoring the statement of symptoms or by providing a dismissive explanation, [396] and people interpreting a lack of response from the doctor as an indication that no treatment is available. [397] In a study of management of incontinence in general practice, 30% of the women who had told their doctor about their symptoms perceived that they were offered no help. [392] It is probable that many primary health care providers lack confidence in managing UI, and that this contributes to undertreatment in those seeking help. [398]

Only a small proportion of incontinent community-residing women have used surgery, medication, or exercise regimens. [124, 384, 389, 399, 400] In addition to seeking help from the formal health care system, common responses to symptoms of illness are self-management and self-treatment behaviour. The major method of actively managing UI among community residents is the use of absorbent products. [256, 399, 401-403]

It is obvious that millions of men and women suffer from their UI, and that for many of them good treat-

ment options are available. However, for many persons with very mild or occasional UI it is probably adequate not to seek help for the health care system. Others are satisfied with just information and understanding about the causes and in many cases selfcare may be quite appropriate. A Danish study has shown that simple information and advice was adequate " treatment" for 23% of the women seeking an open access incontinence clinic. [404] A Swedish study found that among 136 women with UI, 36% wanted clinical evaluation, and only 24% subsequently started treatment. [105]

Both epidemiological and qualitative research in this field should be encouraged in order to understand cultural, religious, and personal factors for help seeking behaviour world wide. [386, 391, 397] Specifically, other than condition-specific factors should be further explored, e.g. persons' health care behaviour, perceptions and attitudes.

II. FAECAL INCONTINENCE AND PELVIC ORGAN PROLAPSE

There are indications of underreporting also of FI and patients' reluctance to report symptoms or to seek treatment. [302, 303, 324] It has been shown that women are more willing to report FI than men. [304] For POP we have no information.

SUMMARY POINTS :

- Recent publications confirm that a majority of people with FI, UI, and POP have not sought help.
- Only a small proportion of urinary incontinent community-residing people have used surgery, medication, or exercise regimens.
- Increasing severity, increasing duration, and urge/mixed type of UI are related to consulting a health care provider.
- Other than condition-specific factors should be further explored in future research, e.g. persons' health care behaviour, perceptions and attitudes.
- Health care personnell should be encouraged to approach persons at risk for FI, UI and POP. People with such symptoms should be assessed so services and treatment can be offered and targeted. The patient's view of management, even denial, should be respected.

J. EPIDEMIOLOGY AND CLINICAL WORK : FROM RESPONDENT TO PATIENT

We have emphasized some major and important differences between epidemiology and clinical work. These differences may have several implications. A selection process is most often accomplished first by self-selection (help seeking), then a referral system, which provides specialist physicians with a patient population with higher prevalence of disease, more severe disease, and often skewed type distribution, thus obtaining test results with fewer false positives, better diagnostic accuracy, and more efficient use of resources. However, such intended and purposeful selection bias has its drawbacks. There is growing evidence that this selection process introduces bias into research and hampers our ability to generalize hospital based research back to general or primary care populations. Furthermore, it may result in recommendations and guidelines for diagnosis or therapy derived from tertiary care centres that are inappropriate at the primary care level. [405] Often guidelines, review articles or teaching material do not take into account the varying prevalence and variation in clinical picture between community and hospital. They may also emphasize use of tests or equipment that are not appropriate or relevant for primary health care, thus leading to overutilization of referrals. Data from hospitals or specialist level may also overestimate level of burden, costs and number of persons in need of treatment if such data are used for extrapolation back to community level. Therefore it is important that this Consultation uses different algorithms for for initial and specialized care (see other relevant chapters).

One study provides substantial empirical evidence to support the existence of selection bias for UI. [405] The analyses were based on three populations of incontinent women : Community level (epidemiological survey), primary care level (prospective study), and secondary care level (university hospital, prospective study). The general practice patients were older and the hospital patients younger than those in the community. From community via general practice to hospital, there was an increase in duration, frequency of leakage, amount of leakage, severity and perceived impact of incontinence. Help-seeking at the primary care level was associated with increasing age and severity, and with urge symptoms and

impact. Referral from general practice to hospital was only associated with (lower) age and urge symptoms.

Under the subtitle Severity and impact we have given examples of how the prevalence estimates for women change dramatically when botherness and severity are considered. Taken together with selection bias, this emphasizes caution when epidemiological data are used in a clinical context. It concerns " level of care" in several ways; there is a large transitional zone from healthy to diseased, there is a danger of medicalization, and there is a danger of treating patients at a higher level than necessary. Risk factors, predictors and correlates discovered in epidemiological studies are probabilistic of nature and may not be decisive in the clinical assessment of an individual patient. In addition, the attributable risk due to some known risk factors may be statistically but not clinically significant.

SUMMARY POINTS :

- The spectrum of severity of anal and urinary incontinence, as well as pelvic organ prolapse, and the symptom profile of patients referred to specialist centres do not necessarily reflect the spectrum of disease seen in the community.
- The selection and referrral process may introduce bias into research and hamper the ability to generalize hospital based research back to primary care populations.
- One should be very careful with calculating numbers of patients in need of therapy based on epidemiological data.

K. RECOMMENDATIONS FOR FURTHER RESEARCH

I. URINARY INCONTINENCE

It is recommended to perform more sustained research on measurement of UI, its types and severity to move the research ahead. Longitudinal study designs are needed to estimate incidence of UI and describe the course of the condition and its different forms and to investigate its risk factors and possible protective factors.

There is still little knowledge as regarding prevalence, incidence, and other epidemiological data in developing countries. It is recommended that fundamental research regarding prevalence, incidence and other epidemiological data in developing countries should be encouraged, and tailored to the cultural, economic and social environment of the population under study.

Crude prevalence studies (descriptive epidemiology) from USA and Europe are abundant, and further studies should be done only with recommended and validated questionnaires or in order to combine data from the prevalence study with studies of co-factors and predictors (analytical epidemiology). Control for confounders, stratification, and multivariate techniques should be increasingly used because of the need for more advanced epidemiological analyses of risk factors and comorbidity. Strength of associations should be determined by relative risks and odds ratios, and confidence limits should be given. We have still very little knowledge of the absolute and relative importance of several risk factors, and almost no informations about the attributable risk of the factors in the society.

Some potential risk and protective factors deserve more attention. For example, the role of pregnancy and childbirth in the development of UI must be studied in a fashion that links population-based methods to clinical assessment of pregnancy, delivery and and the birth trauma and follows women over many years. Such a design is necessary because the effect of pregnancy and childbirth may become clear only years later when the woman is older and because the woman will not be able to report the exact nature of the tear and episiotomy, etc. There should be more emphasis on the associations between UI and specific diseases like stroke, diabetes, psychiatric disease and genital prolapse. Genetic components should be investigated.

Primary prevention is the main goal in the management of human disease. An important strategy would thus be to identify the individuals at risk, and then take measures to reduce the risk among those individuals or in certain risk groups. Based on current knowledge there are no well documented efforts that can be done in order to avoid the occurrence of UI in large populations. Primary prevention studies should be encouraged, but the epidemiological basis for choosing appropriate interventions is weak.

In surveys based on questionnaires or interviews symptoms can be registered.There are convincing

data suggesting that the different types may reflect quite different pathologies and risk factors. Differentiating the types in future research might therefore prove very fruitful. Methodological work has still to be done in this area, but typical type descriptions should be included in new studies. Likewise, studies of risk factors should include important and known confounders as age, parity, and weight.

Variations in definitions and measurement issues are fundamental and lead to problems with assessing the findings in epidemiological studies. We need to improve epidemiological studies by including variables that better characterize UI, so that more advanced and informative analyses may be conducted. It is therefore recommended that all epidemiological studies include a minimum data set (**Table 22**), including elements of screening question, frequency measure, quantity of urine loss, duration, type, and severity. In addition, it is recommended to include validated measures of bother/quality of life and urinary symptoms other than UI. We here also refer to the chapter from the committee on symptom and quality of life assessment.

Table 22. Elements in a minimum data set recommended for all epidemiological studies

Screening question for any involuntary urine loss
Frequency measure. For example, classification into categories of none, less than once a month, one/several times a month, one/several times a week, every day/nigth, all the time
Quantity of urine loss for a typical episode. For example, classification into categories of none, drops, small amounts, moderate amounts, much/a great deal
Duration. For example months, years
Type. Based on typical description; stress, urge, mixed and other
Severity. Either by combining excisting questions or by a validated index

In addition, it is recommended to include validated measures of bother/quality of life and urinary symptoms other than UI.

II. FAECAL INCONTINENCE AND PELVIC ORGAN PROLAPSE

In these areas there is a need for more epidemiological research in all areas; prevalence, incidence, and risk factors. Many of the fundamental methodological issues relevant to UI discussed above are highly relevant to the fields of FI and POP.

The committee will emphasize that uniform definitions of FI and POP should be used in studies, and there should be a move towards a standardization of measurement instruments in community surveys that can be used worldwide. Developing definitions is a scientific process requiring careful conceptualization of the condition in light of its many clinical presentations and underlying mechanisms. This will require a multi-method approach and consideration of issues such a reliability and validity.

REFERENCES

1. Abrams, P., Cardozo, L., Fall, M., Griffiths, D., Rosier, P., Ulmsten, U. et al. : The standardisation of terminology in lower urinary tract function : report from the standardisation sub-committee of the International Continence Society. Urology, 61 : 37, 2003
2. Hunskaar, S., Burgio, K., Diokno, A., Herzog, A., Hjälmås, K., Lapitan, M. : Epidemiology and natural history of urinary incontinence (UI). In : Incontinence, 2 ed. Edited by P. Abrams, L. Cardozo, S. Khoury, A. Wein. Plymouth : Health Publication Ltd, pp. 165, 2002
3. Stroup, D. F., Berlin, J. A., Morton, S. C., Olkin, I., Williamson, G. D., Rennie, D. et al. : Meta-analysis of observational studies in epidemiology : a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA, 283 : 2008, 2000
4. Nörgaard, J. P., van Gool, J. D., Hjälmås, K., Djurhuus, J. C., Hellström, A.-L. : Standardization and definitions in lower urinary tract dysfunction in children. Br J Urol, 81, suppl. 3 : 1, 1998
5. Rittig, S., Knudsen, U., Nörgaard, J., Pedersen, E., Djurhuus, J. C. : Abdorminal diurnal rhythm of plasma vasopressin and urinary output in patients with enuresis. Am J Physiol, 25 : 664, 1989
6. Holmdahl, G., Hanson, E., Hanson, M., Hellström, A.-L., Hjälmås, K., Sillén, U. : Four-hours voiding observation in healthy infants. Scand J Urol Nephrol, 156 : 1808, 1996
7. Kranz, I., Jylkäs, E., Ahlberg, B. M., Wedel, H. : On the Epidemiology of Nocturnal Enuresis - A critical rewiew of methods used in descriptive epidemiological studies on nocturnal enuresis. Scand J Urol Nephrol Suppl, 163;75, 1994
8. McGree, R., Makinson, T., Williams, S., Simpson, A., Silva, P. A.: A longitudinal study of enuresis from five to nine years. Aust Paediatr J, 20 : 39, 1984
9. Forsythe, W. I., Redmond, A. : Enuresis and spontaneous cure rate - study of 1129 enuretics. Arch Dis Child, 49 : 259, 1974

10. Fergusson, D. M., Horwood, L. J., Shannon, F. T. : Factors Related to the Age of Attainment of Nocturnal Bladder Control : An 8-Year Longitudinal Study. Pediatrics, 87 : 884, 1986
11. Fergusson, D. M., Horwood, L. J. : Nocturnal enuresis and behavioral problems in adolescence : a 15-year longitudinal study. Pediatrics, 94 : 662, 1994
12. Feehan, M., McGree, R., Stanton, W., Silva, P. A. : A 6 year follow-up of childhood enuresis : Prevalence in adolescence and consequences for mental health. J. Paediatr. Child Health, 26 : 75, 1990
13. Chiozza, M., L, Bernadinelli, L., Caione, P., Del Gado, R., Ferrara, P., Giorgi, P. L. et al. : An Italian epidemiological multicentre study of nocturnal enuresis. Br J Urol, 81.suppl.3 : 86, 1998
14. Yeung, C. K. : Nocturnal Enuresis in Hong Kong : Different Chinese Phenotypes. Scand J Urol Nephrol, suppl.31 : 17, 1996
15. Spee- van der Wekke, J., Hirasing, R. A., Meulmeester, J. F., Radder, J. J. : Childhood nocturnal enuresis in the Netherlands. Urology, 51 : 1022, 1998
16. Cher, T.-W., Lin, G.-J., Hsu, K.-H. : Prevalence of nocturnal enuresis and associated familiar factors in primary school children in Taiwan. J Urol, 168 : 1142, 2002
17. Serel, T., Akhan, G., Koyuncouglu, H. R., ÖZtürk, H. R., Dogruer, K., Ünal, K. : epidemiology of enuresis in Turkish children. Scand J Urol Nephrol, 31 : 537, 1997
18. Lee, S. D., Sohn, D. W., Lee, J. Z., Park, N. C., Chung, M. K. : An epidemiological study of enuresis in Korean children. BJU Int, 85 : 869, 2000
19. Hellström, A.-L., Hanson, E., Hansson, S., Hjälmås, K., Jodal, U.: Micturition habits and incontinence in 7-year-ola Swedish school entrants. Eur J Pediatr, 149 : 434, 1990
20. Järvelin, M. R., Vikeväinen-Tervonen, L., Moilanen, I., Huttunen, N. P. : Enuresis in Seven-Year-Old Children. Acta Paediatr Scan, 77 : 148, 1988
21. Hellström, A.-L., Hanson, E., Hansson, S., Hjälmås, K., Jodal, U. : Micturition habits and incontinence at age 17 - reinvestigation of a cohort studied at age 7. Br J Urol, 76 : 231, 1995
22. Swithinbank, L. V., Carr, J. C., Abrams, P. H. : Longitudinal Study of Urinary Symptoms in Children. Scand J Urol Nephrol, Suppl 163 : 163, 1994
23. Swithinbank, L. V., Brookes, S. T., Shepherd, R. B., Abrams, P. : The natural history of urinary symtoms during adolescence. Br J Urol, 81, Suppl 3 : 90, 1998
24. Kanaheswari, Y. : Epidemiology of childhood nocturnal enuresis in Malaysia. J Paediatr Child Health, 39 : 118, 2003
25. Hirasing, R. A., van Leerdam, F. J. M., Bolk-Bennink, L., Janknegt, R. A. : Enuresis Nocturna in Adults. Scan J Urol Nephrol, 31 : 533, 1997
26. Neveus, T., Hetta, J., Cnattingius, S., Tuvemo, T., Läckgren, G., Olsson, G. et al. : Deepth of sleep and sleep habits among enuretic and incontinence children. Acta Paediatr, 88 : 748, 1999
27. Bower, W. F., Moore, K. H., Shepherd, R. B., Adams, R. D., 1996: The epidemiology of childhood enuresis in Australia. Br J Urol, 78 : 602, 1996
28. Gümüs, B., Vurgun, N., Lekili, M., Iscan, A., Müzzinoglu, T., Büyüksu, C. : Prevalence of nocturnal enuresis and accompanying factors in children aged 7-11 years in Turkey. Acta Paediatr, 88 : 1369, 1999
29. Watanabe, H., Kawauchi, A. : Nocturnal Enuresis : Social Aspects and Traetment in Japan. Scan J Urol Nephrol, suppl. 163: 29, 1994
30. Liu, X., Sun, Z., Uchiyama, M., Li, Y., Okawa, M. : Attaining Nocturnal Urinary Control, Nocturnal Enuresis, and Behavioral Problems in Chinese Children Aged 6 Through 16 Years. J Am Acard Child Adolesc Phychiatry, 39 : 1557, 2000
31. Järvelin, M. R., Moilanen, I., Kangas, P., K., M., Vikeväinen-Tervonen, L., Huttunen, N. P. et al. : Aetiological and Percipitating Factors for Childhood Enuresis. Acta Paediatr Scan, 80 : 361, 1991
32. Eiberg, H. : Nocturnal enuresis is linked to a specific gene. Scan J Urol Nephrol, Suppl.173 : 15, 1995
33. Arnell, H., Hjälmås, K., Jägervall, K., Läckgren, G., Stenberg, A., Bengtsson, B. : The genetics of primary nocturnal enuresis : inheritance and suggestion of a second major gene on chromosome 12q. J Med Genet, 34 : 360, 1997
34. von Gontard, A., Eiberg, H., Hollman, E., Rittig, S., Lehmkuhl, G. : Molecular genetics of nocturnal enuresis : clinical and genetic heterogeneity. Acta Paediatr, 87 : 571, 1997
35. Moilanen, I., Tirkkonen, T., Järvelin, M. R., Linna, S., Almqvist, F., Piha, J. et al. : A follow-up of enuresis from childhood to adolescence. Br J Urol, 81,suppl.3 : 94, 1998
36. Schulpen, T. : The burden of nocturnal enuresis. Acta Paediatr, 86: 981, 1997
37. van Hoecke, E., Baeyens, D., Vande Walle, J., Hoebeke, P., Roeyers, H. : Socioeconomic Status as a Common Factor Underlaying the Association Between Enuresis and Psychopathology. J Dev Behav Pediatrics, 24 : 109, 2003
38. Kawauchi, A., Tanaka, Y., Y., Y., Inaba, M., M., K., Ukimura, O. et al. : Follow-up study of bedwetting from 3 to 5 years of age. Urology, 58 : 772, 2001
39. Lunsing, R. J., Hadders-Algra, M., Touwen, B. C. L., Huisjes, H. J. : Nocturnal enuresis and minor Neurological dysfunction at 12 years : A follow-up study. Dev Med Child Neuro, 33 : 439, 1991
40. Duel, B. P., Steinberg-Epstein, R., Hill, M., Lerner, M. : A survey of voiding dysfunction in children with attention deficit-hyperactivity disorder. J Urol, 170 : 1521, 2003
41. Robson, W. L. M., Jackson, H. P., Blackhurst, D., Leung, A. K. C. : Enuresis in childraen with attention deficit hyperactivity disorder. Sout Med J, 90 : 503, 1997
42. Wolfish, N., Pivik, R., Busby, K. : Elevated sleep arousal thresholds in enuretic boys : clinical implications. Acta Paediatr, 86: 381, 1997
43. Kawauchi, A., Imada, N., Tanaka, Y., Watanabe, H., Shirakawa, S. : Changes in the structure of sleep spindles and delta waves on electroencephalography in patients with nocturnal enuresis. Br J Urol, 81, suppl. 3 : 72, 1998
44. Hunsballe, J. M. : Increased delta component in computerized sleep electroencephalographic analysis suggest abnormally deep sleep in primary monosymptomatic nocturnal enuresis. Scan J Urol Nephrol, 34 : 294, 2000
45. Osungbade, K. O., Oshiname, F. O. : Prevalence and perception of nocturnal enuresis in children of a rural community in southwestern Nigeria. Trop Doc, 33 : 243, 2003
46. Baruzzi, A., Riva, R., Cirignotta, F., Zucconi, M., Capelli, M., Lugaresi, E. : Atrial natriuretic peptide and catecholamines in obstructive sleep apnoea. Sleep, 14 : 83, 1991
47. Weider, D. J., Sateia, M. j., West, R. p. : Nocturnal enuresis in children with upper airway obstruction. Otolaryngol Head Neck Surg, 105 : 427, 1991
48. Loening-Baucke, V. : Urinary Incontinence and Urinary Tract Infection and Their Resolution With Treatment of Chronic Constipation of Childhood. Pediatrics, 100 : 228, 1997
49. Forbes, F. C. : Children with enuresis. Nowdays, a strong suspicion of sexualabuse would prompt full investigation. BMJ, 316 : 777, 1998
50. Hoebeke, P., van Laecke, E., van Camp, C., Raes, A., van de Walle, J. : One thousend video-urodynamic studies in children with non-neurogenic bladder sphincter dysfunction. BJU International, 87 : 575, 2001
51. Hellerstein, s. : Voiding Dysfunction in Pediatric Patients. Clin Pediatr (Phila), 42 : 43, 2003

52. Bloom, D. A., W., S. W., Ritchey, M. L., McGuire, E. J. : Toilet habits and continence in children : An opportunity sampling in search of normal parameters. J Uro, 149 : 1087, 1993
53. Sureshkumar, P., Craig, J., Roy, l. p., Knight, J. F. : Daytime urinary incontinence in primary school children : A population-based survey. Pediatrics, 137 : 814, 2001
54. Lettgren, B., von Gontard, A., Olbing, H., Heiken-Löwenau, C., Gaebel, E., Schmitz, I. : Urge incontinence and voiding postponement in children : somatic and phsychosocial factors. Acta Paediatr, 91 : 978, 2002
55. Herzog, A. R., Fultz, N. H. : Prevalence and incidence of urinary incontinence in community-dwelling populations. J Am Geriatr Soc, 38 : 273, 1990
56. Thom, D. : Variation in estimates of urinary incontinence prevalence in the community : effects of differences in definition, population characteristics, and study type. Am Geria Soc, 46 : 473, 1998
57. Hunskaar, S., Arnold, E. P., Burgio, K., Diokno, A. C., Herzog, A. R., Mallett, V. T. : Epidemiology and natural history of urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunct, 11 : 301, 2000
58. Bhopal, R. : Revisiting race/ethnicity as a variable in health research. Am J Public Health, 92 : 156, 2002
59. Hellström, L., Ekelund, P., Milsom, I., Mellström, D. : The prevalence of urinary incontinence and use of incontinence aids in 85-year-old men and women. Age Ageing, 19 : 383, 1990
60. Vetter, N. J., Jones, D. A., Victor, C. R. : Urinary incontinence in the elderly at home. Lancet, ii : 1275, 1981
61. Thomas, T. M., Plymat, K. R., Blannin, J., Meade, T. W. : Prevalence of urinary incontinence. Br Med J, 281 : 1243, 1980
62. Milne, J. S., Willliamson, J., Maule, M. M., Wallace, E. T. : Urinary symptoms in older people. Modern Geriatrics, 2 : 198, 1972
63. Yarnell, J. W., Voyle, G. J., Richards, C. J., Stephenson, T. P. : The prevalence and severity of urinary incontinence in women. J Epidemiol Community Health, 35 : 71, 1981
64. Fultz, N. H., Herzog, A. R. : Epidemiology of urinary symptoms in the geriatric population. Urol Clin North Am, 23 : 1, 1996
65. Hampel, C., Wienhold, D., Benken, N., Eggersmann, C., Thuroff, J. W. : Prevalence and natural history of female incontinence. Eur Urol, 32 : 3, 1997
66. Hampel, C., Wienhold, D., Benken, N., Eggersmann, C., Thuroff, J. W. : Definition of overactive bladder and epidemiology of urinary incontinence. Urology, 50 : 4, 1997
67. Cheater, F. M., Castleden, C. M. : Epidemiology and classification of urinary incontinence. Baillieres Best Pract Res Clin Obstet Gynaecol, 14 : 183, 2000
68. Fultz, N. H., Herzog, A. R. : Prevalence of urinary incontinence in middle-aged and older women : a survey-based methodological experiment. J Aging Health, 12 : 459, 2000
69. Holst, K., Wilson, P. D. : The prevalence of female urinary incontinence and reasons for not seeking treatment. N Z Med J, 101 : 756, 1988
70. Sommer, P., Bauer, T., Nielsen, K. K., Kristensen, E. S., Hermann, G. G., Steven, K. et al. : Voiding patterns and prevalence of incontinence in women. A questionnaire survey. Br J Urol, 66: 12, 1990
71. Brocklehurst, J. C. : Urinary incontinence in the community - analysis of a MORI poll. BMJ, 306 : 832, 1993
72. Sandvik, H., Hunskaar, S., Seim, A., Hermstad, R., Vanvik, A., Bratt, H. : Validation of a severity index in female urinary incontinence and its implementation in an epidemiological survey. J Epidemiol Community Health, 47 : 497, 1993
73. Swithinbank, L. V., Donovan, J. L., Du Heaume, J. C., Rogers, C. A., James, M. C., Yang, Q. et al. : Urinary symptoms and incontinence in women : relationships between occurrence, age, and perceived impact. Br J Gen Pract, 49 : 897, 1999
74. Hannestad, Y. S., Rortveit, G., Sandvik, H., Hunskaar, S. : A community-based epidemiological survey of female urinary incontinence : the Norwegian EPINCONT study. Epidemiology of Incontinence in the County of Nord-Tr?ndelag. J Clin Epidemiol, 53 : 1150, 2000
75. Temml, C., Haidinger, G., Schmidbauer, J., Schatzl, G., Madersbacher, S. : Urinary Incontinence in Both Sexes : Prevalence Rates and Impact on Quality of Life and Sexual Life. Neurourol Urodyn, 19 : 259, 2000
76. Bortolotti, A., Bernardini, B., Colli, E., Di Benedetto, P., Giocoli Nacci, G., Landoni, M. et al. : Prevalence and risk factors for urinary incontinence in Italy. Eur Urol, 37 : 30, 2000
77. M?ller, L. A., Lose, G., J?rgensen, T. : The prevalence and bothersomeness of lower urinary tract symptoms in women 40-60 years of age. Acta Obstet Gynecol Scand, 79 : 298, 2000
78. Damiâan, J., Martâin-Moreno, J. M., Lobo, F., Bonache, J., Cerviäno, J., Redondo-Mâarquez, L. et al. : Prevalence of urinary incontinence among Spanish older people living at home. Eur Urol, 34 : 333, 1998
79. Gavira Iglesias, F. J., Caridad y Ocerâin, J. M., Pâerez del Molino Martâin, J., Valderrama Gama, E., Lâopez Pâerez, M., Romero Lâopez, M. et al. : Prevalence and psychosocial impact of urinary incontinence in older people of a Spanish rural population. J Gerontol A Biol Sci Med Sci, 55 : M207, 2000
80. Maggi, S., Minicuci, N., Langlois, J., Pavan, M., Enzi, G., Crepaldi, G. : Prevalence rate of urinary incontinence in community-dwelling elderly individuals : the Veneto study. J Gerontol A Biol Sci Med Sci, 56 : M14, 2001
81. Nakanishi, N., Tatara, K., Naramura, H., Fujiwara, H., Takashima, Y., Fukuda, H. : Urinary and fecal incontinence in a community-residing older population in Japan. J Am Geriatr Soc, 45 : 215, 1997
82. Tseng, I. J., Chen, Y. T., Chen, M. T., Kou, H. Y., Tseng, S. F. : Prevalence of urinary incontinence and intention to seek treatment in the elderly. J Formos Med Assoc, 99 : 753, 2000
83. Diokno, A. C., Brock, B. M., Brown, M. B., Herzog, A. R. : Prevalence of urinary incontinence and other urological symptoms in the noninstitutionalized elderly. J Urol, 136 : 1022, 1986
84. Molander, U., Milsom, I., Ekelund, P., Mellström, D. : An epidemiological study of urinary incontinence and related urogenital symptoms in elderly women. Maturitas, 12 : 51, 1990
85. Holtedahl, K., Hunskaar, S. : Prevalence, 1-year incidence and factors associated with urinary incontinence : a population based study of women 50-74 years of age in primary care. Maturitas, 28: 205, 1998
86. Hunskaar, S., Ostbye, T., Borrie, M. J. : Prevalence of urinary incontinence in elderly Canadians with special emphasis on the association with dementia, ambulatory function, and institutionalization. Norwegian J Epidemiol, 8 : 177, 1998
87. Roberts, R. O., Jacobsen, S. J., Rhodes, T., Reilly, W. T., Girman, C. J., Talley, N. J. et al. : Urinary incontinence in a community-based cohort : prevalence and healthcare-seeking. J Am Geriatr Soc, 46 : 467, 1998
88. Chiarelli, P., Brown, W., McElduff, P. : Leaking Urine : Prevalence and Associated Factors in Australian Women. Neurourol Urodyn, 18 : 567, 1999
89. Aggazzotti, G., Pesce, F., Grassi, D., Fantuzzi, G., Righi, E., De Vita, D. et al. : Prevalence of urinary incontinence among institutionalized patients : a cross-sectional epidemiologic study in a midsized city in northern Italy. Urology, 56 : 245, 2000
90. Brandeis, G. H., Baumann, M. M., Hossain, M., Morris, J. N., Resnick, N. M. : The prevalence of potentially remediable urina-

ry incontinence in frail older people : a study using the Minimum Data Set. J Am Geriatr Soc, 45 : 179, 1997

91. Sgadari, A., Topinkovâa, E., Bj?rnson, J., Bernabei, R. : Urinary incontinence in nursing home residents : a cross-national comparison. Age Ageing, 26 : 49, 1997
92. Toba, K., Ouchi, Y., Orimo, H., Iimura, O., Sasaki, H., Nakamura, Y. et al. : Urinary incontinence in elderly inpatients in Japan : a comparison between general and geriatric hospitals. Aging (Milano), 8 : 47, 1996
93. Borrie, M. J., Davidson, H. A. : Incontinence in institutions : costs and contributing factors. Can Med Assoc J, 147 : 322, 1992
94. Ouslander, J. G., Palmer, M. H., Rovner, B. W., German, P. S. : Urinary incontinence in nursing homes : incidence, remission and associated factors. J Am Geriatr Soc, 41 : 1083, 1993
95. Fonda, D. : Improving management of urinary incontinence in geriatric centres and nursing homes. Victorian Geriatricians Peer Review Group. Aust Clin Rev, 10 : 66, 1990
96. Peet, S. M., Castleden, C. M., McGrother, C. W. : Prevalence of urinary and faecal incontinence in hospitals and residential and nursing homes for older people. BMJ, 311 : 1063, 1995
97. Thom, D. H., Haan, M. N., Van den Eeden, S. K. : Medically recognized urinary incontinence and risks of hospitalization, nursing home admission and mortality. Age Ageing, 26 : 367, 1997
98. Iosif, C. S., Bekassy, Z. : Prevalence of genito-urinary symptoms in the late menopause. Acta Obstet Gynecol Scand, 63 : 257, 1984
99. Hørding, U., Pedersen, K. H., Sidenius, K., Hedegaard, L. : Urinary incontinence in 45-year-old women. An epidemiological survey. Scand J Urol Nephrol, 20 : 183, 1986
100. Elving, L. B., Foldspang, A., Lam, G. W., Mommsen, S. : Descriptive epidemiology of urinary incontinence in 3,100 women age 30-59. Scand J Urol Nephrol, 125 (suppl) : 37, 1989
101. Harrison, G. L., Memel, D. S. : Urinary incontinence in women : its prevalence and its management in a health promotion clinic. Br J Gen Pract, 44 : 149, 1994
102. Burgio, K. L., Matthews, K. A., Engel, B. T. : Prevalence, incidence and correlates of urinary incontinence in healthy, middle-aged women. J Urol, 146 : 1255, 1991
103. Lara, C., Nacey, J. : Ethnic differences between Maori, Pacific Island and European New Zealand women in prevalence and attitudes to urinary incontinence. N Z Med J, 107 : 374, 1994
104. Sandvik, H., Hunskaar, S., Vanvik, A., Bratt, H., Seim, A., Hermstad, R. : Diagnostic classification of female urinary incontinence : an epidemiological survey corrected for validity. J Clin Epidemiol, 48 : 339, 1995
105. 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, 76 : 74, 1997
106. Van Oyen, H., Van Oyen, P. : Urinary incontinence in Belgium; prevalence, correlates and psychosocial consequences. Acta Clin Belg, 57 : 207, 2002
107. Rekers, H., Drogendijk, A. C., Valkenburg, H., Riphagen, F. : Urinary incontinence in women from 35 to 79 years of age : prevalence and consequences. Eur J Obstet Gynecol Reprod Biol, 43 : 229, 1992
108. Samuelsson, E. C., Victor, F. T., Svardsudd, K. F. : Five-year incidence and remission rates of female urinary incontinence in a Swedish population less than 65 years old. Am J Obstet Gynecol, 183 : 568, 2000
109. Brown, J. S., Grady, D., Ouslander, J. G., Herzog, A. R., Varner, R. E., Posner, S. F. : Prevalence of urinary incontinence and associated risk factors in postmenopausal women. Heart & Estrogen/Progestin Replacement Study (HERS) Research Group. Obstet Gynecol, 94 : 66, 1999
110. Wetle, T., Scherr, P., Branch, L. G., Resnick, N. M., Harris, T., Evans, D. et al. : Difficulty with holding urine among older persons in a geographically defined community : prevalence and correlates. J Am Geriatr Soc, 43 : 349, 1995
111. Hørding, U., Pedersen, K. H., Sidenius, K., Hedegaard, L. : Urin-inkontinens blandt 45-årige kvinder. En epidemiologisk undersøgelse. Ugeskr Læger, 147 : 1359, 1985
112. 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, 149 : 1459, 1993
113. Nygaard, I. E., Lemke, J. H. : Urinary incontinence in rural older women : prevalence, incidence and remission. J Am Geriatr Soc, 44 : 1049, 1996
114. Koyama, W., Koyanagi, A., Mihara, S., Kawazu, S., Uemura, T., Nakano, H. et al. : Prevalence and conditions of urinary incontinence among the elderly. Meth Inform Med, 37 : 151, 1998
115. Dolan, L. M., Casson, K., McDonald, P., Ashe, R. G. : Urinary incontinence in Northern Ireland : a prevalence study. BJU Int, 83 : 760, 1999
116. Hèagglund, D., Olsson, H., Leppert, J. : Urinary incontinence : an unexpected large problem among young females. Results from a population-based study. Fam Pract, 16 : 506, 1999
117. Muscatello, D. J., Rissel, C., Szonyi, G. : Urinary symptoms and incontinence in an urban community : prevalence and associated factors in older men and women. Intern Med J, 31 : 151, 2001
118. Sampselle, C. M., Harlow, S. D., Skurnick, J., Brubaker, L., Bondarenko, I. : Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. Obstet Gynecol, 100 : 1230, 2002
119. Nygaard, I., Turvey, C., Burns, T. L., Crischilles, E., Wallace, R. : Urinary incontinence and depression in middle-aged United States women. Obstet Gynecol, 101 : 149, 2003
120. Nuotio, M., Tammela, T. L., Luukkaala, T., Jylha, M. : Urgency and urge incontinence in an older population : ten-year changes and their association with mortality. Aging Clin Exp Res, 14 : 412, 2002
121. Nieto Blanco, E., Camacho Pâerez, J., Dâavila Alvarez, V., Ledo Garcâia, M. P., Moriano Bejar, P., Pâerez Lorente, M. et al. : Epidemiologâia e impacto de la incontinencia urinaria en mujeres de 40 a 65 aänos de edad en un âarea sanitaria de Madrid. Aten Primaria, 32 : 410, 2003
122. Zunzunegui Pastor, M. V., Rodrâiguez-Laso, A., Garcâia de Yâebenes, M. J., Aguilar Conesa, M. D., Lâazaro y de Mercado, P., Otero Puime, A. : Prevalencia de la incontinencia urinaria y factores asociados en varones y mujeres de mâas de 65 aänos. Aten Primaria, 32 : 337, 2003
123. Chen, G. D., Lin, T. L., Hu, S. W., Chen, Y. C., Lin, L. Y. : Prevalence and correlation of urinary incontinence and overactive bladder in Taiwanese women. Neurourol Urodyn, 22 : 109, 2003
124. Hunskaar, S., Lose, G., Sykes, D., Voss, S. : The prevalence of urinary incontinence in women in four European countries. BJU Int, 93 : 324, 2004
125. Ouslander, J. G., Schnelle, J. F. : Incontinence in the nursing home. Ann Intern Med, 122 : 438, 1995
126. Palmer, M. H., German, P. S., Ouslander, J. G. : Risk factors for urinary incontinence one year after nursing home admission. Res Nurs Health, 14 : 405, 1991
127. Landi, F., Cesari, M., Russo, A., Onder, G., Lattanzio, F., Bernabei, R. : Potentially reversible risk factors and urinary incontinence in frail older people living in community. Age Ageing, 32 : 194, 2003
128. Dimpfl, T., Hesse, U., Sch : ussler, B. : Incidence and cause of postpartum urinary stress incontinence. Eur J Obstet Gynecol Reprod Biol, 43 : 29, 1992

129. Marshall, K., Thompson, K. A., Walsh, D. M., Baxter, G. D. : A survey of the incidence of urinary incontinence and constipation during pregnancy and post-partum. Neurourol Urodyn, 17 : 429, 1998

130. M?rkved, S., B?, K. : Prevalence of urinary incontinence during pregnancy and postpartum. Int Urogynecol J Pelvic Floor Dysfunct, 10 : 394, 1999

131. Hvidman, L., Foldspang, A., Mommsen, S., Bugge Nielsen, J. : Does urinary incontinence occurrence depend on the menstrual cycle phase? Acta Obstet Gynecol Scand, 81 : 347, 2002

132. Hvidman, L., Foldspang, A., Mommsen, S., Bugge Nielsen, J. : Correlates of urinary incontinence in pregnancy. Int Urogynecol J Pelvic Floor Dysfunct, 13 : 278, 2002

133. Burgio, K. L., Locher, J. L., Zyczynski, H., Hardin, J. M., Singh, K. : Urinary incontinence during pregnancy in a racially mixed sample : characteristics and predisposing factors. Int Urogynecol J Pelvic Floor Dysfunct, 7 : 69, 1996

134. Di Stefano, M., Caserta, D., Marci, R., Moscarini, M. : Incontinenza urinaria in gravidanza e prevenzione delle complicazioni perineali del parto. Minerva Ginecol, 52 : 307, 2000

135. Hvidman, L., Foldspang, A., Mommsen, S., Nielsen, J. B. : Postpartum urinary incontinence. Acta Obstet Gynecol Scand, 82 : 556, 2003

136. Kristiansson, P., Samuelsson, E., von Schoultz, B., Svardsudd, K. : Reproductive hormones and stress urinary incontinence in pregnancy. Acta Obstet Gynecol Scand, 80 : 1125, 2001

137. Thorp, J. J., Norton, P. A., Wall, L. L., Kuller, J. A., Eucker, B., Wells, E. : Urinary incontinence in pregnancy and the puerperium : a prospective study. Am Obste Gynecol, 181 : 266, 1999

138. Stanton, S. L., Kerr, W. R., Harris, V. G. : The incidence of urological symptoms in normal pregnancy. Br J Obstet Gynaecol, 87 : 897, 1980

139. Mellier, G., Delille, M. A. : Les troubles urinaires de la grossesse et du post-partum. Rev Fr Gynecol Obstet, 85 : 525, 1990

140. Viktrup, L., Lose, G., Rolff, M., Barfoed, K. : The symptom of stress incontinence caused by pregnancy or delivery in primiparas. Obstet Gynecol, 79 : 945, 1992

141. Wilson, P. D., Herbison, R. M., Herbison, G. P. : Obstetric practice and the prevalence of urinary incontinence three months after delivery. Br J Obstet Gynaecol, 103 : 154, 1996

142. Chiarelli, P., Campbell, E. : Incontinence during pregnancy. Prevalence and opportunities for continence promotion. Aust N Z J Obstet Gynaecol, 37 : 66, 1997

143. Mason, L., Glenn, S., Walton, I., Appleton, C. : The experience of stress incontinence after childbirth. Birth, 26 : 164, 1999

144. Thorp, J. M., Jr., Norton, P. A., Wall, L. L., Kuller, J. A., Eucker, B., Wells, E. : Urinary incontinence in pregnancy and the puerperium : a prospective study. Am Obste Gynecol,181 : 266, 1999

145. Spellacy, E. : Urinary incontinence in pregnancy and the puerperium. J Obstet Gynecol Neonatal Nurs, 30 : 634, 2001

146. Ju, C. C., Swan, L. K., Merriman, A., Choon, T. E., Viegas, O. : Urinary incontinence among the elderly people of Singapore. Age Ageing, 20 : 262, 1991

147. Shershah, S., Ansari, R. L. : The frequency of urinary incontinence in Pakistani women. Jpma, 39 : 16, 1989

148. Lee, K. S., Chan, C. J., Merriman, A., Tan, E. C., Osborn, V. : Clinical profile of elderly urinary incontinence in Singapore : a community-based study. Ann Acad Med Singapore, 20 : 736, 1991

149. Brieger, G. M., Mongelli, M., Hin, L. Y., Chung, T. K. : The epidemiology of urinary dysfunction in Chinese women. Int Urogynecol J Pelvic Floor Dysfunct, 8 : 191, 1997

150. Kato, K., Kondo, A. : Prevalence of urinary incontinence in working women. Jap J Urol, 77 : 1501, 1986

151. Fukui, J. : [Urinary incontinence in women : results of questionnaires]. Nippon Hinyokika Gakkai Zasshi, 77 : 707, 1986

152. Ueda, T., Tamaki, M., Kageyama, S., Yoshimura, N., Yoshida, O. : Urinary incontinence among community-dwelling people aged 40 years or older in Japan : prevalence, risk factors, knowledge and self-perception. Int J Urol, 7 : 95, 2000

153. Miles, T. P., Palmer, R. F., Espino, D. V., Mouton, C. P., Lichtenstein, M. J., Markides, K. S. : New-onset incontinence and markers of frailty : data from the Hispanic Established Populations for Epidemiologic Studies of the Elderly. J Gerontol A Biol Sci Med Sci, 56 : M19, 2001

154. Thom, D. H., van den Eeden, S. K., Brown, J. S. : Evaluation of parturition and other reproductive variables as risk factors for urinary incontinence in later life. Obstet Gynecol, 90 : 983, 1997

155. Grodstein, F., Fretts, R., Lifford, K., Resnick, N., Curhan, G. : Association of age, race, and obstetric history with urinary symptoms among women in the Nurses' Health Study. Am J Obstet Gynecol, 189 : 428, 2003

156. Howard, D., Miller, J. M., Delancey, J. O., Ashton-Miller, J. A.: Differential effects of cough, valsalva, and continence status on vesical neck movement. Obste Gynecol, 95 : 535, 2000

157. Kirschner-Hermanns, R., Scherr, P. A., Branch, L. G., Wetle, T., Resnick, N. M. : Accuracy of survey questions for geriatric urinary incontinence. J Urol, 159 : 1903, 1998

158. Rortveit, G., Hannestad, Y. S., Daltveit, A. K., Hunskaar, S. : Age- and type-dependent effects of parity on urinary incontinence : the Norwegian EPINCONT study. Obstet Gynecol, 98 : 1004, 2001

159. Alling Moller, L., Lose, G., J?rgensen, T. : Risk factors for lower urinary tract symptoms in women 40 to 60 years of age. Obstet Gynecol, 96 : 446, 2000

160. Nuotio, M., Jylhèa, M., Luukkaala, T., Tammela, T. L. : Urinary incontinence in a Finnish population aged 70 and over. Prevalence of types, associated factors and self-reported treatments. Scand J Prim Health Care, 21 : 182, 2003

161. Stewart, W. F., Van Rooyen, J. B., Cundiff, G. W., Abrams, P., Herzog, A. R., Corey, R. et al. : Prevalence and burden of overactive bladder in the United States. World J Urol, 20 : 327, 2003

162. Lapitan, M. C., Chye, P. L. : The epidemiology of overactive bladder among females in Asia : a questionnaire survey. Int Urogynecol J Pelvic Floor Dysfunct, 12 : 226, 2001

163. Milsom, I., Abrams, P., Cardozo, L., Roberts, R. G., Thèuroff, J., Wein, A. J. : How widespread are the symptoms of an overactive bladder and how are they managed? A population-based prevalence study. BJU Int, 87 : 760, 2001

164. van der Vaart, C. H., de Leeuw, J. R., Roovers, J. P., Heintz, A. P. : The effect of urinary incontinence and overactive bladder symptoms on quality of life in young women. BJU Int, 90 : 544, 2002

165. Sandvik, H., Seim, A., Vanvik, A., Hunskaar, S. : A severity index for epidemiological surveys of female urinary incontinence : comparison with 48-hour pad-weighing tests. Neurourol Urodyn, 19 : 137, 2000

166. Hanley, J., Capewell, A., Hagen, S. : Validity study of the severity index, a simple measure of urinary incontinence in women. BMJ, 322 : 1096, 2001

167. Wyman, J. F., Harkins, S. W., Fantl, J. A. : Psychosocial impact of urinary incontinence in the community-dwelling population. J Am Geriatr Soc, 38 : 282, 1990

168. Lubeck, D. P., Prebil, L. A., Peeples, P., Brown, J. S. : A health related quality of life measure for use in patients with urge uri-

nary incontinence : a validation study. Qual Life Res, 8 : 337, 1999

169. DuBeau, C. E., Kiely, D. K., Resnick, N. M. : Quality of life impact of urge incontinence in older persons : a new measure and conceptual structure. J Am Geriatr Soc, 47 : 989, 1999
170. Jackson, S., Donovan, J., Brookes, S., Eckford, S., Swithinbank, L., Abrams, P. : The Bristol Female Lower Urinary Tract Symptoms questionnaire : development and psychometric testing. Br J Urol, 77 : 805, 1996
171. Kelleher, C. J., Cardozo, L. D., Khullar, V., Salvatore, S. : A new questionnaire to assess the quality of life of urinary incontinent women. Bri J Obste Gynaecol, 104 : 1374, 1997
172. Lee, P. S., Reid, D. W., Saltmarche, A., Linton, L. : Measuring the psychosocial impact of urinary incontinence : the York Incontinence Perceptions Scale (YIPS). J Am Geriatr Soc, 43 : 1275, 1995
173. Uebersax, J. S., Wyman, J. F., Shumaker, S. A., McClish, D. K., Fantl, J. A. : Short forms to assess life quality and symptom distress for urinary incontinence in women : the Incontinence Impact Questionnaire and the Urogenital Distress Inventory. Continence Program for Women Research Group. Neurourol Urodyn, 14 : 131, 1995
174. Wagner, T. H., Patrick, D. L., Bavendam, T. G., Martin, M. L., Buesching, D. P. : Quality of life of persons with urinary incontinence : development of a new measure. Urology, 47 : 67, 1996
175. Yu, L. C. : Incontinence stress index : measuring psychological impact. J Gerontol Nurs, 13 : 18, 1987
176. Liu, C., Andrews, G. R. : Prevalence and incidence of urinary incontinence in the elderly : a longitudinal study in South Australia. Chin Med J (Engl), 115 : 119, 2002
177. Herzog, A. R., Diokno, A. C., Brown, M. B., Normolle, D. P., Brock, B. M. : Two-year incidence, remission, and change patterns of urinary incontinence in noninstitutionalized older adults. J Gerontol, 45 : M67, 1990
178. Brown, J. S., Seeley, D. G., Fong, J., Black, D. M., Ensrud, K. E., Grady, D. : Urinary incontinence in older women : who is at risk? Study of Osteoporotic Fractures Research Group. Obstet Gynecol, 87 : 715, 1996
179. Roe, B., Doll, H. : Lifestyle Factors and Continence Status : Comparison of Self-Report Data from a Postal Survey in England. J WOCN, 26 : 312, 1999
180. Schmidbauer, J., Temml, C., Schatzl, G., Haidinger, G., Madersbacher, S. : Risk factors for urinary incontinence in both sexes. Analysis of a health screening project. Eur Urol, 39 : 565, 2001
181. Peyrat, L., Haillot, O., Bruyere, F., Boutin, J. M., Bertrand, P., Lanson, Y. : Prevalence and risk factors of urinary incontinence in young and middle-aged women. BJU Int, 89 : 61, 2002
182. Goldberg, R. P., Kwon, C., Gandhi, S., Atkuru, L. V., Sorensen, M., Sand, P. K. : Urinary incontinence among mothers of multiples : the protective effect of cesarean delivery. Am J Obstet Gynecol, 188 : 1447, 2003
183. Nelson, R., Furner, S., Jesudason, V. : Urinary incontinence in Wisconsin skilled nursing facilities : prevalence and associations in common with fecal incontinence. J Aging Health, 13 : 539, 2001
184. Diokno, A. C., Brown, M. B., Brock, B. M., Herzog, A. R., Normolle, D. P. : Clinical and cystometric characteristics of continent and incontinent noninstitutionalized elderly. J Urol, 140 : 567, 1988
185. Staskin, D. R. : Age-related physiologic and pathologic changes affecting lower urinary tract function. Clin Geriatr Med, 2 : 701, 1986
186. Burgio, K. L., Zyczynski, H., Locher, J. L., Richter, H. E., Redden, D. T., Wright, K. C. : Urinary incontinence in the 12-month postpartum period. Obstet Gynecol, 102 : 1291, 2003
187. Viktrup, L., Lose, G. : The risk of stress incontinence 5 years after first delivery. Am J Obstet Gynecol, 185 : 82, 2001
188. Simeonova, Z., Bengtsson, C. : Prevalence of urinary incontinence among women at a Swedish primary health care centre. Scand J Prim Health Care, 8 : 203, 1990
189. Jolleys, J. V. : Reported prevalence of urinary incontinence in women in a general practice. Br Med J, 296 : 1300, 1988
190. Yarnell, J. W., Voyle, G. J., Sweetnam, P. M., Milbank, J., Richards, C. J., Stephenson, T. P. : Factors associated with urinary incontinence in women. J Epidemiol Community Health, 36 : 58, 1982
191. Crist, T., Shingleton, H. M., Koch, G. G. : Stress incontinence and the nulliparous patient. Obstet Gynecol Clin North Am, 40 : 13, 1972
192. Foldspang, A., Mommsen, S., Lam, G. W., Elving, L. : Parity as a correlate of adult female urinary incontinence prevalence. J Epidemiol Community Health, 46 : 595, 1992
193. Persson, J., Wolner-Hanssen, P., Rydhstroem, H. : Obstetric risk factors for stress urinary incontinence : a population-based study. Obstet Gynecol, 96 : 440, 2000
194. Sherburn, M., Guthrie, J. R., Dudley, E. C., O'Connell, H. E., Dennerstein, L. : Is incontinence associated with menopause? Obstet Gynecol, 98 : 628, 2001
195. Faâundes, A., Guarisi, T., Pinto-Neto, A. M. : The risk of urinary incontinence of parous women who delivered only by cesarean section. Int J Gynaecol Obstet, 72 : 41, 2001
196. Handa, V. L., Harris, T. A., Ostergard, D. R. : Protecting the pelvic floor : obstetric management to prevent incontinence and pelvic organ prolapse. Obstet Gynecol, 88 : 470, 1996
197. Kuh, D., Cardozo, L., Hardy, R. : Urinary incontinence in middle aged women : childhood enuresis and other lifetime risk factors in a British prospective cohort. J Epidem Community Health, 53 : 453, 1999
198. Samuelsson, E., Victor, A., Svardsudd, K. : Determinants of urinary incontinence in a population of young and middle-aged women. Acta Obstet Gynecol Scand 79 : 208, 2000
199. Pregazzi, R., Sartore, A., Troiano, L., Grimaldi, E., Bortoli, P., Siracusano, S. et al. : Postpartum urinary symptoms : prevalence and risk factors. Eur J Obstet Gynecol Reprod Biol, 103 : 179, 2002
200. H?jberg, K. E., Salvig, J. D., Winsl?w, N. A., Lose, G., Secher, N. J. : Urinary incontinence : prevalence and risk factors at 16 weeks of gestation. Br J Obstet Gynaecol, 106 : 842, 1999
201. Mason, L., Glenn, S., Walton, I., Appleton, C. : The prevalence of stress incontinence during pregnancy and following delivery. Midwifery, 15 : 120, 1999
202. MacLennan, A. H., Taylor, A. W., Wilson, D. H., Wilson, D. : The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. BJOG, 107 : 1460, 2000
203. Farrell, S. A., Allen, V. M., Baskett, T. F. : Parturition and urinary incontinence in primiparas. Obstet Gynecol, 97 : 350, 2001
204. Hannah, M. E., Hannah, W. J., Hodnett, E. D., Chalmers, B., Kung, R., Willan, A. et al. : Outcomes at 3 months after planned cesarean vs planned vaginal delivery for breech presentation at term : the international randomized Term Breech Trial. JAMA, 287 : 1822, 2002
205. Rortveit, G., Daltveit, A. K., Hannestad, Y. S., Hunskaar, S. : Urinary incontinence after vaginal delivery or cesarean section. N Engl J Med, 348 : 900, 2003
206. Chaliha, C., Digesu, A., Hutchings, A., Soligo, M., Khullar, V. : Caesarean section is protective against stress urinary incontinence : an analysis of women with multiple deliveries. BJOG, 111 : 754, 2004

207. Smith, A. R., Hosker, G. L., Warrell, D. W. : The role of partial denervation of the pelvic floor in the aetiology of genitourinary prolapse and stress incontinence of urine. A neurophysiological study. Br J Obstet Gynaecol, 96 : 24, 1989

208. Snooks, S. J., Swash, M., Henry, M. M., Setchell, M. : Risk factors in childbirth causing damage to the pelvic floor innervation. Int J Colorectal Dis, 1 : 20, 1986

209. Miller, Y. D., Brown, W. J., Russell, A., Chiarelli, P. : Urinary incontinence across the lifespan. Neurourol Urodyn, 22 : 550, 2003

210. Foldspang, A., Mommsen, S., Djurhuus, J. C. : Prevalent urinary incontinence as a correlate of pregnancy, vaginal childbirth, and obstetric techniques. Am J Public Health, 89 : 209, 1999

211. Okonkwo, J. E., Obionu, C. O., Obiechina, N. J. : Factors contributing to urinary incontinence and pelvic prolapse in Nigeria. Int J Gynaecol Obstet, 74 : 301, 2001

212. Chaliha, C., Kalia, V., Stanton, S. L., Monga, A., Sultan, A. H. : Antenatal prediction of postpartum urinary and fecal incontinence. Obstet Gynecol, 94 : 689, 1999

213. Arya, L. A., Jackson, N. D., Myers, D. L., Verma, A. : Risk of new-onset urinary incontinence after forceps and vacuum delivery in primiparous women. Am J Obstet Gynecol, 185 : 1318, 2001

214. Rortveit, G., Daltveit, A. K., Hannestad, Y. S., Hunskaar, S. : Vaginal delivery parameters and urinary incontinence : the Norwegian EPINCONT study. Am J Obstet Gynecol, 189 : 1268, 2003

215. Danso, K. A., Martey, J. O., Wall, L. L., Elkins, T. E. : The epidemiology of genitourinary fistulae in Kumasi, Ghana. Int Urogynecol J Pelvic Floor Dysfunct 1977-1992. 7 : 117, 1996

216. Hvidman, L., Foldspang, A., Mommsen, S., Bugge Nielsen, J. : Menstrual cycle, female hormone use and urinary incontinence in premenopausal women. Int Urogynecol J Pelvic Floor Dysfunct, 14 : 56, 2003

217. Grodstein, F., Lifford, K., Resnick, N. M., Curhan, G. C. : Postmenopausal hormone therapy and risk of developing urinary incontinence. Obstet Gynecol, 103 : 254, 2004

218. Grady, D., Brown, J. S., Vittinghoff, E., Applegate, W., Varner, E., Snyder, T. et al. : Postmenopausal hormones and incontinence : the Heart and Estrogen/Progestin Replacement Study. Obstet Gynecol, 97 : 116, 2001

219. Brown, J. S., Sawaya, G., Thom, D. H., Grady, D. : Hysterectomy and urinary incontinence : a systematic review. Lancet, 356 : 535, 2000

220. Buchsbaum, G. M., Chin, M., Glantz, C., Guzick, D. : Prevalence of urinary incontinence and associated risk factors in a cohort of nuns. Obstet Gynecol, 100 : 226, 2002

221. van der Vaart, C. H., van der Bom, J. G., de Leeuw, J. R., Roovers, J. P., Heintz, A. P. : The contribution of hysterectomy to the occurrence of urge and stress urinary incontinence symptoms. BJOG, 109 : 149, 2002

222. Weber, A. M., Walters, M. D., Schover, L. R., Church, J. M., Piedmonte, M. R. : Functional outcomes and satisfaction after abdominal hysterectomy. Am J Obstet Gynecol, 181 : 530, 1999

223. Thakar, R., Manyonda, I., Stanton, S. L., Clarkson, P., Robinson, G. : Bladder, bowel and sexual function after hysterectomy for benign conditions. Br J Obstet Gynaecol, 104 : 983, 1997

224. Mommsen, S., Foldspang, A. : Body mass index and adult female urinary incontinence. World J Urol, 12 : 319, 1994

225. Fultz, N., Herzog, A. R., Raghunathan, T. E., Wallace, R. B., Diokno, A. C. : Prevalence and Severity of Urinary Incontinence in Older African And Caucasian Women. J Geront 54A : M299, 1999

226. Hannestad, Y. S., Rortveit, G., Daltveit, A. K., Hunskaar, S. : Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. BJOG, 110 : 247, 2003

227. Dwyer, P. L., Lee, E. T., Hay, D. M. : Obesity and urinary incontinence in women. Br J Obstet Gynaecol, 95 : 91, 1988

228. Bump, R. C., Sugerman, H. J., Fantl, J. A., McClish, D. K. : Obesity and lower urinary tract function in women : surgically induced weight loss. Am J Obstet Gynecol, 167 : 392, 1992

229. Deitel, M., Stone, E., Kassam, H. A., Wilk, E. J., Sutherland, D. J. : Gynecologic-obstetric changes after loss of massive excess weight following bariatric surgery. J Am Coll Nutr, 7 : 147, 1988

230. Molander, U., Arvidsson, L., Milsom, I., Sandberg, T. : A longitudinal cohort study of elderly women with urinary tract infections. Maturitas, 34 : 127, 2000

231. Hvidman, L., Foldspang, A., Mommsen, S., Bugge Nielsen, J. : Correlates of urinary incontinence in pregnancy. Int Urogynecol J Pelvic Floor Dysfunct, 13 : 278, 2002

232. Herzog, A. R., Fultz, N. H., Brock, B. M., Brown, M. B., Diokno, A. C. : Urinary incontinence and psychological distress among older adults. Psychol Aging, 3 : 115, 1988

233. Tinetti, M. E., Inouye, S. K., Gill, T. M., Doucette, J. T. : Shared risk factors for falls, incontinence, and functional dependence. Unifying the approach to geriatric syndromes : JAMA, 273 : 1348, 1995

234. Palmer, M. H., Baumgarten, M., Langenberg, P., Carson, J. L. : Risk factors for hospital-acquired incontinence in elderly female hip fracture patients. J Gerontol A Biol Sci Med Sci, 57 : M672, 2002

235. Ouslander, J. G., Morishita, L., Blaustein, J., Orzeck, S., Dunn, S., Sayre, J. : Clinical, functional, and psychosocial characteristics of an incontinent nursing home population. J Gerontol, 42 : 631, 1987

236. Ouslander, J. G., Uman, G. C., Urman, H. N., Rubenstein, L. Z.: Incontinence among nursing home patients : clinical and functional correlates. J Am Geriatr Soc, 35 : 324, 1987

237. Skelly, J., Flint, A. J. : Urinary incontinence associated with dementia : see comments : . J Am Geriatr Soc, 43 : 286, 1995

238. Bump, R. C., McClish, D. K. : Cigarette smoking and urinary incontinence in women. Am J Obstet Gynecol, 167 : 1213, 1992

239. Arya, L. A., Myers, D. L., Jackson, N. D. : Dietary caffeine intake and the risk for detrusor instability : a case-control study. Obstet Gynecol, 96 : 85, 2000

240. Rohr, G., Kragstrup, J., Gaist, D., Christensen, K. : Genetic and environmental influences on urinary incontinence: a Danish population-based twin study of milddle-aged and elderly women. Acta Obstet Gynecol Scand,83: 978, 2004

241. Mushkat, Y., Bukovsky, I., Langer, R. : Female urinary stress incontinence—does it have familial prevalence? Am J Obstet Gynecol, 174 : 617, 1996

242. Hannestad, Y. S., Lie, R. T., Rortveit, G., Hunskaar, S. : Familial risk of urinary incontinence in women: population based cross sectional study. BMJ, 329:889, 2004

243. Landi, F., Cesari, M., Russo, A., Onder, G., Sgadari, A., Bernabei, R. : Benzodiazepines and the risk of urinary incontinence in frail older persons living in the community. Clin Pharmacol Ther, 72 : 729, 2002

244. Montella, J., Wordell, C. J. : The effects of drugs on the lower urinary tract. In : Urogynecology and urodynamics. Edited by D. Ostergard,A. Bent. Baltimore : Williams and Wilkins, 1996

245. Movig, K. L., Leufkens, H. G., Belitser, S. V., Lenderink, A. W., Egberts, A. C. : Selective serotonin reuptake inhibitor-induced urinary incontinence. Pharmacoepidemiol Drug Saf, 11 : 271, 2002

246. Nygaard, I. E., Thompson, F. L., Svengalis, S. L., Albright, J. P.: Urinary incontinence in elite nulliparous athletes. Obstet Gynecol, 84 : 183, 1994

247. Nygaard, I., DeLancey, J. O., Arnsdorf, L., Murphy, E. : Exercise and incontinence. Obstet Gynecol, 75 : 848, 1990

248. Parkin, D. E., Davis, J. A., Symonds, R. P. : Urodynamic findings following radiotherapy for cervical carcinoma. Br J Urol, 61 : 213, 1988

249. Foldspang, A., Mommsen, S. : Adult female urinary incontinence and childhood bedwetting : see comments : J Urol, 152 : 85, 1994

250. Boyle, P., Robertson, C., Mazzetta, C., Keech, M., Hobbs, F. D., Fourcade, R. et al. : The prevalence of male urinary incontinence in four centres : the UREPIK study. BJU Int, 92 : 943, 2003

251. Engstrom, G., Walker-Engstrom, M. L., Loof, L., Leppert, J. : Prevalence of three lower urinary tract symptoms in men-a population-based study. Fam Pract, 20 : 7, 2003

252. Maral, I., Ozkardes, H., Peskircioglu, L., Bumin, M. A. : Prevalence of stress urinary incontinence in both sexes at or after age 15 years : a cross-sectional study. J Urol, 165 : 408, 2001

253. Stoddart, H., Donovan, J., Whitley, E., Sharp, D., Harvey, I. : Urinary incontinence in older people in the community : a neglected problem? Br J Gen Pract, 51 : 548, 2001

254. Smoger, S. H., Felice, T. L., Kloecker, G. H. : Urinary incontinence among male veterans receiving care in primary care clinics. Ann Intern Med, 132 : 547, 2000

255. Gill, E. J., Elser, D. M., Bonidie, M. J., Roberts, K. M., Hurt, W. G. : The routine use of cystoscopy with the Burch procedure. Am J Obstet Gynecol, 185 : 345, 2001

256. Schulman, C., Claes, H., Matthijs, J. : Urinary incontinence in Belgium : a population-based epidemiological survey. Euro Urol, 32 : 315, 1997

257. Malmsten, U. G., Milsom, I., Molander, U., Norlen, L. J. : Urinary incontinence and lower urinary tract symptoms : an epidemiological study of men aged 45 to 99 years. J Urol, 158 : 1733, 1997

258. Umlauf, M. G., Sherman, S. M. : Symptoms of urinary incontinence among older community-dwelling men. J Wound Ostomy Continence Nursl, 23 : 314, 1996

259. Yarnell, J. W. G., St. Leger, A. S. : The prevalence, severity and factors associated with urinary incontinence in a random sample of the elderly. Age Ageing, 8 : 81, 1979

260. Temml, C., Haidinger, G., Schmidbauer, J., Schatzl, G., Madersbacher, S. : Urinary incontinence in both sexes : prevalence rates and impact on quality of life and sexual life. Neurourol Urodyn, 19 : 259, 2000

261. Sladden, M. J., Hughes, A. M., Hirst, G. H., Ward, J. E. : A community study of lower urinary tract symptoms in older men in Sydney, Australia. Aust N Z J Surg, 70 : 322, 2000

262. Moorthy, P., Lapitan, M. C., Quek, P. L., Lim, P. H. : Prevalence of overactive bladder in Asian men : an epidemiological survey. BJU Int, 93 : 528, 2004

263. Stewart, W. F., Van Rooyen, J. B., Cundiff, G. W., Abrams, P., Herzog, A. R., Corey, R. et al. : Prevalence and burden of overactive bladder in the United States. World J Urol, 20 : 327, 2003

264. Hunskaar, S. : One hundred and fifty men with urinary incontinence. I. Demography and medical history. Scand J Prim Health Care, 10 : 21, 1992

265. Diokno, A. C., Brock, B. M., Herzog, A. R., Bromberg, J. : Medical correlates of urinary incontinence in the elderly. Urology, 36 : 129, 1990

266. Resnick, N. M., Yalla, S. V. : Detrusor hyperactivity with impaired contractile function. An unrecognized but common cause of incontinence in elderly patients. JAMA, 257 : 3076, 1987

267. Patel, M., Coshall, C., Rudd, A. G., Wolfe, C. D. : Natural history and effects on 2-year outcomes of urinary incontinence after stroke. Stroke, 32 : 122, 2001

268. van Melick, H. H., van Venrooij, G. E., Eckhardt, M. D., Boon, T. A. : A randomized controlled trial comparing transurethral resection of the prostate, contact laser prostatectomy and electrovaporization in men with benign prostatic hyperplasia : analysis of subjective changes, morbidity and mortality. J Urol, 169: 1411, 2003

269. Hu, J. C., Gold, K. F., Pashos, C. L., Mehta, S. S., Litwin, M. S.: Temporal trends in radical prostatectomy complications from 1991 to 1998. J Urol, 169 : 1443, 2003

270. Salomon, L., Saint, F., Anastasiadis, A. G., Sebe, P., Chopin, D., Abbou, C. C. : Combined reporting of cancer control and functional results of radical prostatectomy. Eur Urol, 44 : 656, 2003

271. Moinzadeh, A., Shunaigat, A. N., Libertino, J. A. : Urinary incontinence after radical retropubic prostatectomy : the outcome of a surgical technique. BJU Int, 92 : 355, 2003

272. Maffezzini, M., Seveso, M., Taverna, G., Giusti, G., Benetti, A., Graziotti, P. : Evaluation of complications and results in a contemporary series of 300 consecutive radical retropubic prostatectomies with the anatomic approach at a single institution. Urology, 61 : 982, 2003

273. Hu, J. C., Gold, K. F., Pashos, C. L., Mehta, S. S., Litwin, M. S.: Temporal trends in radical prostatectomy complications from 1991 to 1998. J Urol, 169 : 1443, 2003

274. Deliveliotis, C., Protogerou, V., Alargof, E., Varkarakis, J. : Radical prostatectomy : bladder neck preservation and puboprostatic ligament sparing—effects on continence and positive margins. Urology, 60 : 855, 2002

275. Augustin, H., Pummer, K., Daghofer, F., Habermann, H., Primus, G., Hubmer, G. : Patient self-reporting questionnaire on urological morbidity and bother after radical retropubic prostatectomy. Eur Urol, 42 : 112, 2002

276. Sebesta, M., Cespedes, R. D., Luhman, E., Optenberg, S., Thompson, I. M. : Questionnaire-based outcomes of urinary incontinence and satisfaction rates after radical prostatectomy in a national study population. Urology, 60 : 1055, 2002

277. Olsson, L. E., Salomon, L., Nadu, A., Hoznek, A., Cicco, A., Saint, F. et al. : Prospective patient-reported continence after laparoscopic radical prostatectomy. Urology, 58 : 570, 2001

278. Potosky, A. L., Legler, J., Albertsen, P. C., Stanford, J. L., Gilliland, F. D., Hamilton, A. S. et al. : Health outcomes after prostatectomy or radiotherapy for prostate cancer : results from the Prostate Cancer Outcomes Study. J Natl Cancer Inst, 92 : 1582, 2000

279. Benoit, R. M., Naslund, M. J., Cohen, J. K. : Complications after radical retropubic prostatectomy in the medicare population. Urology, 56 : 116, 2000

280. Fontaine, E., Izadifar, V., Barthâelâemy, Y., Desgrippes, A., Beurton, D. : Urinary continence following radical prostatectomy assessed by a self-administered questionnaire. Eur Urol, 37: 223, 2000

281. Walsh, P. C., Marschke, P., Ricker, D., Burnett, A. L. : Patient-reported urinary continence and sexual function after anatomic radical prostatectomy. Urology, 55 : 58, 2000

282. Poon, M., Ruckle, H., Bamshad, B. R., Tsai, C., Webster, R., Lui, P. : Radical retropubic prostatectomy : bladder neck preservation versus reconstruction. J Urol, 163 : 194, 2000

283. Catalona, W. J., Carvalhal, G. F., Mager, D. E., Smith, D. S. : Potency, continence and complication rates in 1,870 consecutive radical retropubic prostatectomies. J Urol, 162 : 433, 1999

284. Arai, Y., Okubo, K., Aoki, Y., Maekawa, S., Okada, T., Maeda, H. et al. : Patient-reported quality of life after radical prostatectomy for prostate cancer. Int J Urol, 6 : 78, 1999

285. Gray, M., Petroni, G. R., Theodorescu, D. : Urinary function after radical prostatectomy : a comparison of the retropubic and perineal approaches. Urology, 53 : 881, 1999

286. Horie, S., Tobisu, K. I., Fujimoto, H., Doi, N., Kakizoe, T. : Urinary incontinence after non-nerve-sparing radical prostatectomy with neoadjuvant androgen deprivation. Urology, 53 : 561, 1999

287. Bishoff, J. T., Motley, G., Optenberg, S. A., Stein, C. R., Moon, K. A., Browning, S. M. et al. : Incidence of fecal and urinary incontinence following radical perineal and retropubic prostatectomy in a national population. J Urol, 160 : 454, 1998

288. Goluboff, E. T., Saidi, J. A., Mazer, S., Bagiella, E., Heitjan, D. F., Benson, M. C. et al. : Urinary continence after radical prostatectomy : the Columbia experience. J Urol, 159 : 1276, 1998

289. Weldon, V. E., Tavel, F. R., Neuwirth, H. : Continence, potency and morbidity after radical perineal prostatectomy : see comments : . J Urol, 158 : 1470, 1997

290. Egawa, S., Minei, S., Iwamura, M., Uchida, T., Koshiba, K. : Urinary continence following radical prostatectomy. Jpn J Clin Oncol, 27 : 71, 1997

291. Lowe, B. A. : Comparison of bladder neck preservation to bladder neck resection in maintaining postrostatectomy urinary continence. Urology, 48 : 889, 1996

292. Donnellan, S. M., Duncan, H. J., MacGregor, R. J., Russell, J. M. : Prospective assessment of incontinence after radical retropubic prostatectomy : objective and subjective analysis. Urology, 49 : 225, 1997

293. Ojdeby, G., Claezon, A., Brekkan, E., H : aggman, M., Norl : en, B. J. : Urinary incontinence and sexual impotence after radical prostatectomy. Scand J Urol Nephrol, 30 : 473, 1996

294. McCammon, K. A., Kolm, P., Main, B., Schellhammer, P. F. : Comparative quality-of-life analysis after radical prostatectomy or external beam radiation for localized prostate cancer. Urology, 54 : 509, 1999

295. Wei, J. T., Dunn, R. L., Marcovich, R., Montie, J. E., Sanda, M. G. : Prospective assessment of patient reported urinary continence after radical prostatectomy. J Urol, 164 : 744, 2000

296. Eastham, J. A., Kattan, M. W., Rogers, E., Goad, J. R., Ohori, M., Boone, T. B. et al. : Risk factors for urinary incontinence after radical prostatectomy. J Urol, 156 : 1707, 1996

297. Van Kampen, M., De Weerdt, W., Van Poppel, H., Feys, H., Castell Campesino, A., Stragier, J. et al. : Prediction of urinary continence following radical prostatectomy. Urol Int, 60 : 80, 1998

298. Srougi, M., Nesrallah, L. J., Kauffmann, J. R., Nesrallah, A., Leite, K. R. : Urinary continence and pathological outcome after bladder neck preservation during radical retropubic prostatectomy : a randomized prospective trial. J Urol, 165 : 815, 2001

299. Noh, C., Kshirsagar, A., Mohler, J. L. : Outcomes after radical retropubic prostatectomy. Urology, 61 : 412, 2003

300. Kao, T. C., Cruess, D. F., Garner, D., Foley, J., Seay, T., Friedrichs, P. et al. : Multicenter patient self-reporting questionnaire on impotence, incontinence and stricture after radical prostatectomy. J Urol, 163 : 858, 2000

301. Formenti, S. C., Lieskovsky, G., Skinner, D., Tsao-Wei, D. D., Groshen, S., Petrovich, Z. : Update on impact of moderate dose of adjuvant radiation on urinary continence and sexual potency in prostate cancer patients treated with nerve-sparing prostatectomy. Urology, 56 : 453, 2000

302. Leigh, R. J., Turnberg, L. A. : Faecal incontinence : the unvoiced symptom. Lancet, 1 : 1349, 1982

303. Thomas, T. M., Egan, M., Walgrove, A., Meade, T. W. : The prevalence of faecal and double incontinence. Community Med, 6: 216, 1984

304. Nelson, R., Norton, N., Cautley, E., Furner, S. : Community-based prevalence of anal incontinence. JAMA, 274 : 559, 1995

305. Bai, Y., Chen, H., Hao, J., Huang, Y., Wang, W. : Long-term outcome and quality of life after the Swenson procedure for Hirschsprung's disease. J Pediatr Surg, 37 : 639, 2002

306. Javid, P. J., Barnhart, D. C., Hirschl, R. B., Coran, A. G., Harmon, C. M. : Immediate and long-term results of surgical management of low imperforate anus in girls. J Pediatr Surg, 33 : 198, 1998

307. Rintala, R. J., Lindahl, H. : Is normal bowel function possible after repair of intermediate and high anorectal malformations? J Pediatr Surg, 30 : 491, 1995

308. Hartman, E. E., Oort, F. J., Aronson, D. C., Hanneman, M. J., van der Zee, D. C., Rieu, P. N. et al. : Critical factors affecting quality of life of adult patients with anorectal malformations or Hirschsprung's disease. Am J Gastroenterol, 99 : 907, 2004

309. Forrester, M. B., Merz, R. D. : Descriptive epidemiology of anal atresia in Hawaii, 1986-1999. Teratology, 66 : S12, 2002

310. Largo, R. H., Gianciaruso, M., Prader, A. : Die Entwicklung der Darm- und Blasenkontrolle von der Geburt bis zum 18. Lebensjahr. Longitudinale Studie. Schweiz Med Wochenschr, 108 : 155, 1978

311. Small, K. A., Wynne, J. M. : Evaluating the pelvic floor in obstetric patients. Aust N Z J Obstet Gynaecol, 30 : 41, 1990

312. Madoff, R. D., Williams, J. G., Caushaj, P. F. : Fecal incontinence. N Engl J Med, 326 : 1002, 1992

313. Drossman, D. A. : What can be done to control incontinence associated with the irritable bowel syndrome? Am J Gastroenterol, 84 : 355, 1989

314. Schiller, L. R., Santa Ana, C. A., Schmulen, A. C., Hendler, R. S., Harford, W. V., Fordtran, J. S. : Pathogenesis of fecal incontinence in diabetes mellitus : evidence for internal-anal-sphincter dysfunction. N Engl J Med, 307 : 1666, 1982

315. Denis, P., Bercoff, E., Bizien, M. F., Brocker, P., Chassagne, P., Lamouliatte, H. et al. : Etude de la prâevalence de l'incontinence anale chez l'adulte. Gastroenterol Clin Biol, 16 : 344, 1992

316. Drossman, D. A., Li, Z., Andruzzi, E., Temple, R. D., Talley, N. J., Thompson, W. G. et al. : U.S. householder survey of functional gastrointestinal disorders. Prevalence, sociodemography, and health impact. Dig Dis Sci, 38 : 1569, 1993

317. Giebel, G. D., Lefering, R., Troidl, H., Blèochl, H. : Prevalence of fecal incontinence : what can be expected? Int J Colorectal Dis, 13 : 73, 1998

318. Kalantar, J. S., Howell, S., Talley, N. J. : Prevalence of faecal incontinence and associated risk factors; an underdiagnosed problem in the Australian community? Med J Aust, 176 : 54, 2002

319. Lynch, A. C., Dobbs, B. R., Keating, J., Frizelle, F. A. : The prevalence of faecal incontinence and constipation in a general New Zealand population; a postal survey. N Z Med J, 114 : 474, 2001

320. Perry, S., Shaw, C., McGrother, C., Matthews, R. J., Assassa, R. P., Dallosso, H. et al. : Prevalence of faecal incontinence in adults aged 40 years or more living in the community. Gut, 50 : 480, 2002

321. Eason, E., Labrecque, M., Marcoux, S., Mondor, M. : Anal incontinence after childbirth. Cmaj, 166 : 326, 2002

322. Sangalli, M. R., Floris, L., Faltin, D., Weil, A. : Anal incontinence in women with third or fourth degree perineal tears and subsequent vaginal deliveries. Aust N Z J Obstet Gynaecol, 40 : 244, 2000

323. Okonkwo, J. E., Obionu, C. N., Okonkwo, C. V., Obiechina, N. J. : Anal incontinence among Igbo (Nigerian) women. Int J Clin Pract, 56 : 178, 2002

324. Rizk, D. E., Hassan, M. Y., Shaheen, H., Cherian, J. V., Micallef, R., Dunn, E. : The prevalence and determinants of health care-seeking behavior for fecal incontinence in multiparous

United Arab Emirates females. Dis Colon Rectum, 44 : 1850, 2001

325. Alnaif, B., Drutz, H. P. : 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, 12 : 134, 2001
326. Faltin, D. L., Sangalli, M. R., Curtin, F., Morabia, A., Weil, A. : Prevalence of anal incontinence and other anorectal symptoms in women. Int Urogynecol J Pelvic Floor Dysfunct, 12 : 117, 2001
327. Ishigooka, M., Hashimoto, T., Izumiya, K., Sasagawa, I., Nakada, T. : Incidence of anal incontinence after long-term follow-up of patients treated by ureterosigmoidostomy. Int Urol Nephrol, 25 : 455, 1993
328. Adolfsson, J., Helgason, A. R., Dickman, P., Steineck, G. : Urinary and bowel symptoms in men with and without prostate cancer : results from an observational study in the Stockholm area. Eur Urol, 33 : 11, 1998
329. Bytzer, P., Talley, N. J., Leemon, M., Young, L. J., Jones, M. P., Horowitz, M. : Prevalence of gastrointestinal symptoms associated with diabetes mellitus : a population-based survey of 15,000 adults. Arch Intern Med, 161 : 1989, 2001
330. Campbell, A. J., Reinken, J., McCosh, L. : Incontinence in the elderly : prevalence and prognosis. Age Ageing, 14 : 65, 1985
331. Kok, A. L., Voorhorst, F. J., Burger, C. W., van Houten, P., Kenemans, P., Janssens, J. : Urinary and faecal incontinence in community-residing elderly women. Age Ageing, 21 : 211, 1992
332. Talley, N. J., O'Keefe, E. A., Zinsmeister, A. R., Melton, L. J., 3rd : Prevalence of gastrointestinal symptoms in the elderly : a population-based study. Gastroenterology, 102 : 895, 1992
333. Roberts, R. O., Jacobsen, S. J., Reilly, W. T., Pemberton, J. H., Lieber, M. M., Talley, N. J. : Prevalence of combined fecal and urinary incontinence : a community-based study. J Am Geriatr Soc, 47 : 837, 1999
334. Edwards, N. I., Jones, D. : The prevalence of faecal incontinence in older people living at home. Age Ageing, 30 : 503, 2001
335. Verhagen, T. E., Lagro-Janssen, A. L. : Fecale incontinentie bij zelfstandig wonende ouderen : onderzoeksresultaten naar vâoâorkomen, hulpvraaggedrag, psychosociale aspecten en behandeling. Ned Tijdschr Geneeskd, 145 : 741, 2001
336. Topinkovâa, E., Neuwirth, J., Stankovâa, M., Mellanovâa, A., Haas, T. : Inkontinence moci a stolice v geriatrickâych zarâizenâich v Ceskâe Republice. Cas Lek Cesk, 136 : 573, 1997
337. Nelson, R., Furner, S., Jesudason, V. : Fecal incontinence in Wisconsin nursing homes : prevalence and associations. Dis Colon Rectum, 41 : 1226, 1998
338. Oberwalder, M., Connor, J., Wexner, S. D. : Meta-analysis to determine the incidence of obstetric anal sphincter damage. Br J Surg, 90 : 1333, 2003
339. Lal, M., C, H. M., Callender, R., Radley, S. : Does cesarean delivery prevent anal incontinence? Obstet Gynecol, 101 : 305, 2003
340. Uustal Fornell, E., Wingren, G., Kj?lhede, P. : Factors associated with pelvic floor dysfunction with emphasis on urinary and fecal incontinence and genital prolapse : an epidemiological study. Acta Obstet Gynecol Scand, 83 : 383, 2004
341. Altman, D., Zetterstrèom, J., Lâopez, A., Pollack, J., Nordenstam, J., Mellgren, A. : Effect of hysterectomy on bowel function. Dis Colon Rectum, 47 : 502, 2004
342. Sullivan, S. N., Wong, C. : Runners' diarrhea. Different patterns and associated factors. J Clin Gastroenterol, 14 : 101, 1992
343. Pernikoff, B. J., Eisenstat, T. E., Rubin, R. J., Oliver, G. C., Salvati, E. P. : Reappraisal of partial lateral internal sphincterotomy. Dis Colon Rectum, 37 : 1291, 1994
344. Del Pino, A., Nelson, R. L., Pearl, R. K., Abcarian, H. : Island flap anoplasty for treatment of transsphincteric fistula-in-ano. Dis Colon Rectum, 39 : 224, 1996
345. Gorfine, S. R. : Treatment of benign anal disease with topical nitroglycerin. Dis Colon Rectum, 38 : 453, 1995
346. Jâohannsson, H. O., Graf, W., Pêahlman, L. : Long-term results of haemorrhoidectomy. Eur J Surg, 168 : 485, 2002
347. Wald, A. : Systemic diseases causing disorders of defecation and continence. Semin Gastrointest Dis, 6 : 194, 1995
348. Porell, F., Caro, F. G., Silva, A., Monane, M. : A longitudinal analysis of nursing home outcomes. Health Serv Res, 33 : 835, 1998
349. Chassagne, P., Landrin, I., Neveu, C., Czernichow, P., Bouaniche, M., Doucet, J. et al. : Fecal incontinence in the institutionalized elderly : incidence, risk factors, and prognosis. Am J Med, 106 : 185, 1999
350. Bump, R. C., Mattiasson, A., B¢, K., Brubaker, L. P., DeLancey, J. O. L., Klarskov, P. et al. : The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfuntion. Am J Obstet Gynecol, 175 : 10, 1996
351. Hall, A. F., Theofrasous, J. P., Cundiff, G. W., Harris, R. L., Hamilton, L. F., Swift, S. E. et al. : Interobserver and intraobserver reliability of the proposed International Continence Society, Society of Gynecologic Surgeons, and American Urogynecologic Society pelvic organ prolapse classification system. Am J Obstet Gynecol, 175 : 1467, 1996
352. Ellerkmann, R. M., Cundiff, G. W., Melick, C. F., Nihira, M. A., Leffler, K., Bent, A. E. : Correlation of symptoms with location and severity of pelvic organ prolapse. Am J Obstet Gynecol, 185: 1332, 2001
353. Weber, A. M., Abrams, P., Brubaker, L., Cundiff, G., Davis, G., Dmochowski, R. R. et al. : The standardization of terminology for researchers in female pelvic floor disorders. Int Urogynecol J Pelvic Floor Dysfunct, 12 : 178, 2001
354. Eva, U. F., Gun, W., Preben, K. : Prevalence of urinary and fecal incontinence and symptoms of genital prolapse in women. Acta Obstet Gynecol Scand, 82 : 280, 2003
355. Moalli, P. A., Ivy Jones, Sonya, Meyn, Leslie, Zyczynski, Halina : Risk Factors Associated with Pelvic Floor Disorders in Women Undergoing Surgical Repair. Obstet Gynecol, 101 : 869874, 2003
356. Kumari, S., Walia, I., Singh, A. : Self-reported uterine prolapse in a resettlement colony of north India. J Midwifery Womens Health, 45 : 343, 2000
357. Hendrix, S. L., Clark, A., Nygaard, I., Aragaki, A., Barnabei, V., McTiernan, A. : Pelvic organ prolapse in the Women's Health Initiative : gravity and gravidity. Am J Obstet Gynecol, 186 : 1160, 2002
358. Samuelsson, E. C., Arne Victor, F. T., Tibblin, G., Svardsudd, K. F. : Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors. Am J Obstet Gynecol, 180 : 299, 1999
359. Swift, S. E. : The distribution of pelvic organ support in a population of female subjects seen for routine gynecologic health care. Am J Obstet Gynecol, 183 : 277, 2000
360. Boyles, S. H., Weber, A. M., Meyn, L. : Procedures for pelvic organ prolapse in the United States, 1979-1997. Am J Obstet Gynecol, 188 : 108, 2003
361. Mant, J., Painter, R., Vessey, M. : Epidemiology of genital prolapse : observations from the Oxford Family Planning Association Study. Br J Obstet Gynaecol, 104 : 579, 1997
362. Brown, J. S., Waetjen, L. E., Subak, L. L., Thom, D. H., Van den Eeden, S., Vittinghoff, E. : Pelvic organ prolapse surgery in the United States, 1997. Am J Obstet Gynecol, 186 : 712, 2002
363. Olsen, A. L., Smith, V. J., Bergstrom, J. O., Colling, J. C., Clark, A. L. : Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. Obstet Gynecol, 89 : 501, 1997
364. Risk factors for genital prolapse in non-hysterectomized women around menopause. Results from a large cross-sectional study in menopausal clinics in Italy. Progetto Menopausa Italia Study Group. Eur J Obstet Gynecol Reprod Biol, 93 : 135, 2000
365. Hendrix, S. L. : Urinary incontinence and menopause : an evidence-based treatment approach. Dis Mon, 48 : 622, 2002
366. Chiaffarino, F., Chatenoud, L., Dindelli, M., Meschia, M., Buo-

naguidi, A., Amicarelli, F. et al. : Reproductive factors, family history, occupation and risk of urogenital prolapse. Eur J Obstet Gynecol Reprod Biol, 82 : 63, 1999

367. Moalli, P. A., Jones Ivy, S., Meyn, L. A., Zyczynski, H. M. : Risk factors associated with pelvic floor disorders in women undergoing surgical repair. Obstet Gynecol, 101 : 869, 2003
368. O'Boyle, A. L., Woodman, P. J., O'Boyle, J. D., Davis, G. D., Swift, S. E. : Pelvic organ support in nulliparous pregnant and nonpregnant women : a case control study. Am J Obstet Gynecol, 187 : 99, 2002
369. O'Boyle, A. L., O'Boyle, J. D., Ricks, R. E., Patience, T. H., Calhoun, B., Davis, G. : The natural history of pelvic organ support in pregnancy. Int Urogynecol J Pelvic Floor Dysfunct, 14 : 46, 2003
370. Brown, J. S., Waetjen, L. E., Subak, L. L., Thom, D. H., Van den Eeden, S., Vittinghoff, E. : Pelvic organ prolapse surgery in the United States, 1997. Am J Obstet Gynecol, 186 : 712, 2002
371. Norton, P. A., Baker, J. E., Sharp, H. C., Warenski, J. C. : Genitourinary prolapse and joint hypermobility in women. Obstet Gynecol, 85 : 225, 1995
372. Spence-Jones, C., Kamm, M. A., Henry, M. M., Hudson, C. N.: Bowel dysfunction : a pathogenic factor in uterovaginal prolapse and urinary stress incontinence. Br J Obstet Gynaecol, 101 : 147, 1994
373. Marchionni, M., Bracco, G. L., Checcucci, V., Carabaneanu, A., Coccia, E. M., Mecacci, F. et al. : True incidence of vaginal vault prolapse. Thirteen years of experience. J Reprod Med, 44: 679, 1999
374. Wiskind, A. K., Creighton, S. M., Stanton, S. L. : The incidence of genital prolapse after the Burch colposuspension. Am J Obstet Gynecol, 167 : 399, 1992
375. Kjolhede, P., Noren, B., Ryden, G. : Prediction of genital prolapse after Burch colposuspension. Acta Obstet Gynecol Scand, 75 : 849, 1996
376. Clark, A. L., Gregory, T., Smith, V. J., Edwards, R. : Epidemiologic evaluation of reoperation for surgically treated pelvic organ prolapse and urinary incontinence. Am J Obstet Gynecol, 189 : 1261, 2003
377. Davis, G. D. : Uterine prolapse after laparoscopic uterosacral transection in nulliparous airborne trainees. A report of three cases. J Reprod Med, 41 : 279, 1996
378. Jorgensen, S., Hein, H. O., Gyntelberg, F. : Heavy lifting at work and risk of genital prolapse and herniated lumbar disc in assistant nurses. Occup Med (Lond), 44 : 47, 1994
379. Lind, L. R., Lucente, V., Kohn, N. : Thoracic kyphosis and the prevalence of advanced uterine prolapse. Obstet Gynecol, 87 : 605, 1996
380. Nguyen, J. K., Lind, L. R., Choe, J. Y., McKindsey, F., Sinow, R., Bhatia, N. N. : Lumbosacral spine and pelvic inlet changes associated with pelvic organ prolapse. Obstet Gynecol, 95 : 332, 2000
381. Fultz, N. H., Herzog, A. R. : Measuring urinary incontinence in surveys. Gerontologist, 33 : 708, 1993
382. Roe, B., Doll, H. : Prevalence of urinary incontinence and its relationship with health status. J Clin Nursi, 9 : 178, 2000
383. Dallosso, H. M., Matthews, R. J., McGrother, C. W., Clarke, M., Perry, S. I., Shaw, C. et al. : An investigation into nonresponse bias in a postal survey on urinary symptoms. BJU Int, 91 : 631, 2003
384. Seim, A., Sandvik, H., Hermstad, R., Hunskaar, S. : Female urinary incontinence—consultation behaviour and patient experiences : an epidemiological survey in a Norwegian community. Fam Pract, 12 : 18, 1995
385. Burgio, K. L., Ives, D. G., Locher, J. L., Arena, V. C., Kuller, L. H. : Treatment seeking for urinary incontinence in older adults. J Am Geriatr Soc, 42 : 208, 1994
386. Rizk, D. E., Shaheen, H., Thomas, L., Dunn, E., Hassan, M. Y.: The prevalence and determinants of health care-seeking behavior for urinary incontinence in United Arab Emirates women. Int Urogynecol J Pelvic Floor Dysfunct, 10 : 160, 1999
387. Hannestad, Y. S., Rortveit, G., Hunskaar, S. : Help-seeking and associated factors in female urinary incontinence. The Norwegian EPINCONT Study. Epidemiology of Incontinence in the County of Nord-Trondelag. Scand J Prim Health Care, 20 : 102, 2002
388. Hagglund, D., Walker-Engstrom, M. L., Larsson, G., Leppert, J.: Reasons why women with long-term urinary incontinence do not seek professional help : a cross-sectional population-based cohort study. Int Urogynecol J Pelvic Floor Dysfunct, 14 : 296, 2003
389. Kinchen, K. S., Burgio, K., Diokno, A. C., Fultz, N. H., Bump, R., Obenchain, R. : Factors associated with women's decisions to seek treatment for urinary incontinence. J Womens Health (Larchmt), 12 : 687, 2003
390. Reymert, J., Hunskaar, S. : Why do only a minority of perimenopausal women with urinary incontinence consult a doctor? Scand J Prim Health Care, 12 : 180, 1994
391. Dugan, E., Roberts, C. P., Cohen, S. J., Preisser, J. S., Davis, C. C., Bland, D. R. et al. : Why older community-dwelling adults do not discuss urinary incontinence with their primary care physicians. J Am Geriatr Soc, 49 : 462, 2001
392. MacKay, K., Hemmett, L. : Needs assessment of women with urinary incontinence in a district health authority. Br J Gen Pract, 51 : 801, 2001
393. Norton, P. A., MacDonald, L. D., Sedgwick, P. M., Stanton, S. L. : Distress and delay associated with urinary incontinence, frequency, and urgency in women. Br Med J, 297 : 1187, 1988
394. Roe, B., Doll, H., Wilson, K. : Help seeking behaviour and health and social services utilisation by people suffering from urinary incontinence. Int J Nurs Studies, 36 : 245, 1999
395. Seim, A., Sivertsen, B., Eriksen, B. C., Hunskaar, S. : Treatment of urinary incontinence in women in general practice : observational study. BMJ, 312 : 1459, 1996
396. Mitteness, L. S. : So what do you expect when you're 85? : Urinary incontinence in late life. Res Soc Health Care, 6 : 177, 1987
397. Shaw, C. : A review of the psychosocial predictors of help-seeking behaviour and impact on quality of life in people with urinary incontinence. J Clin Nurs, 10 : 15, 2001
398. Sandvik, H., Hunskaar, S., Eriksen, B. C. : Management of urinary incontinence in women in general practice : actions taken at the first consultation. Scand J Prim Health Care, 8 : 3, 1990
399. Herzog, A. R., Fultz, N. H., Normolle, D. P., Brock, B. M., Diokno, A. C. : Methods used to manage urinary incontinence by older adults in the community. J Am Geriatr Soc, 37 : 339, 1989
400. Diokno, A. C., Burgio, K., Fultz, H., Kinchen, K. H., Obenchain, R., Bump, R. C. : Prevalence and outcomes of continence surgery in community dwelling women. J Urol, 170 : 507, 2003
401. Seim, A., Eriksen, B. C., Hunskaar, S. : A study of female urinary incontinence in general practice. Demography, medical history, and clinical findings. Scand J Urol Nephrol, 30 : 465, 1996
402. Sandvik, H., Hunskaar, S. : Incontinence pads - prevalence of use and individual consumption. Scand J Soc Med, 21 : 120, 1993
403. Sandvik, H., Kveine, E., Hunskaar, S. : Female urinary incontinence - psychosocial impact, self care, and consultations. Scand J Caring Sci, 7 : 53, 1993
404. Andersen, J. T., Sander, P. : Minimal care—a new concept for the management of urinary incontinence in an open access, interdisciplinary incontinence clinic. The way ahead? Scand J Urol Nephrol Suppl, 179 : 55, 1996
405. Hunskaar, S., Seim, A., Freeman, T. : The journey of incontinent women from community to university clinic; implications for selection bias, gatekeeper function, and primary care. Fam Pract, 13 : 363, 1996