



Urinary incontinence as a worldwide problem

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Abstract

Objectives: This paper reviews the literature on the prevalence of urinary incontinence (UI) and demonstrates its impact as a worldwide problem. **Methods:** A MEDLINE search was performed to review population-based studies in English. Studies were grouped according to demographic variables and type of incontinence. Risk factors, help-seeking behavior, and quality of life measures were analyzed. **Results:** The median prevalence of female UI was 27.6% (range: 4.8–58.4%) and prevalence of significant incontinence increased with age. The commonest cause of UI was stress (50%), then mixed (32%) and finally urge (14%). Risk factors included parity, obesity, chronic cough, depression, poor health, lower urinary tract symptoms, previous hysterectomy, and stroke. Although quality of life was affected, most patients did not seek help. **Conclusion:** UI is a prevalent cross-cultural condition. Future studies should rely on universally accepted standardized definitions to produce meaningful evidence-based conclusions, as well as project the costs of this global healthcare problem.

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1. Introduction

According to the International Continence Society (ICS) the definition of urinary incontinence (UI) changed from ‘the involuntary loss of urine that is a social or hygienic problem and is objectively demonstrable’ in 1979 [1] to ‘the complaint of any involuntary leakage of urine’ in 2002 [2]. The former definition is impractical for large epidemiologic studies, which are usually based on

questionnaires or interviews. However, the present definition is too broad and potentially could include any patient with even one episode of UI in a lifetime. Despite this discrepancy, the recent ICS report states that UI should be further described by specifying frequency, severity, risk factors, social and hygienic impact, effect on quality of life, and whether or not the individual seeks help [2]. The stated reasons for this and other changes in the terminology of lower urinary tract function are to promote treatments based on symptoms, facilitate comparison of results, and help with effective communication between investigators.

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Numerous epidemiologic studies show that the incidence of UI increases with age [3–8], with the range of prevalence estimates among community dwelling patients varying enormously (2–58%) [4–6,9]. The lower prevalence of UI in institutionalized patients is even higher, with many authors suggesting a prevalence of 40–60% [10–12]. Despite these high prevalence rates, UI is not a static condition. Rather it is a dynamic condition whereby significant incidence rates are associated with equally significant remission rates, and patients move back and forth from continence to incontinence [13].

This review describes epidemiologic studies on UI from around the world. An attempt is made to compare different studies, and the difficulties encountered in such comparisons are presented. Also, the importance of UI as a national health care issue and a worldwide problem is stressed. Finally, recommendations for future epidemiologic studies are presented.

2. Materials and methods

A MEDLINE literature search was performed spanning the period from January 1980 to October 2002 using the key words: ‘urinary incontinence’ combined with ‘epidemiology’ and ‘prevalence’. Other studies were identified by reviewing secondary references in the original citations. Only population-based studies in English were reviewed, and studies limited to only men or institutionalized patients were excluded.

Only one population-based study was included from each nation where such a publication was available. In some countries, no population-based studies could be identified, but prevalence studies targeting a specific group within the population were available. These studies were also included for analysis. Studies targeting specific ethnic or racial groups were also included. More than one population-based study from the United States was included only when originating from a different state and by a different author. Although some authors have published numerous well designed prevalence studies from the same country, due to lack of space we elected to present the one study

from that country or state that surveyed the largest and most representative population sample.

Studies were grouped together according to location, year of survey, nature of population sample, age, gender, population size, response rate, type of survey, definition, and prevalence of UI. Furthermore, studies that stratified for age and prevalence by type of UI (stress, urge, or mixed) were grouped together. Age groups were divided into 10-year periods ranging from the 5th year in one decade to the 4th year in the next. Studies that stratified their age groups from year zero to year 9 of each decade were grouped with the next group up for comparison purposes. For example, the age range 30–39 was grouped with that of 35–44 and so forth. Risk factors of UI, help-seeking behavior, and quality of life measures were analyzed.

Because no unifying definition was presented in the majority of the studies, a modification of the definitions reported by Hampel et al. [5] was used to classify studies as follows:

1. Any UI in the previous 12 months (Definition I).
2. More than one episode of UI in a month (Definition II).
3. Two or more episodes of UI in a week (Definition III).
4. Involuntary UI that is a social or hygienic problem and is objectively demonstrable (Definition IV).
5. Any UI, past or present (Definition V).

Studies not meeting any of the definitions listed were grouped with the one closest to their definition. Mean and median with range of prevalence were calculated for the pooled data.

3. Results

Thirty-five studies [3,7,13–45] were identified using the selection criteria mentioned above (Table 1). Of those, 10 were from North America, eight from Asia, 13 from Europe, one from Africa, and three from Australasia. Populations 5 years of age and above from all continents and different races were studied. Twenty-one studies included only women, whereas 14 others included both genders.

Table 1
Worldwide prevalence of urinary incontinence

Study 1 ^o author	Location	Year of survey	Population sampling	Age	Sex	Respondents/ population	Response rate	Survey type	Definition	Prevalence
Chiarelli [14]	Australia	1996	Random sample national database	18+	F	41 724/88 250	48% (y) ^a 54% (m) 41% (o)	Mailed survey	Definition I	12.8% (y) ^a 36.1% (m) 35% (o)
Temml [15]	Austria	1998–99	City voluntary free health survey	20+	M/F	2498/NR	NR	On-site survey	Definition II	5% (M) 26.3% (F)
Schulman [16]	Belgium	1994–95	Stratified random population sample	30+	M/F	5269/5920	89%	Home survey	Definition I	5.2% (M) 16% (F)
Alnaif [17]	Canada	1996	Ob/Gyn visitors during U of T ^b day	15–19	F	332/474	70%	On-site survey	Definition I	27%
Moller [18]	Denmark	1996	Random sample national register in two counties	40–60	F	2860/4000	72%	Mailed survey	Definition III	16.1%
Thomas [3]	England	Prior to 1980	Random sample of GP practices	5+	M/F	18 084/20 398	89%	Mailed survey	Definition II	3.3% (M) 8.5% (F)
Peyrat [19]	France	1998	Academic hospital employees	18+	F	1700/2800	61%	Mailed survey	Definition I	27.5%
Lionis [20]	Greece	1997	All patients in two GP practices over 4 months	35–75	F	251/NR	NR	Personal interview	Definition I	27.5%
Rekers [21]	Holland	Prior to 1991	Stratified random sample city register	35–79	F	1299/1920	68%	Mailed survey	Definition I	26.5%
Brieger [22]	Hong Kong	1996	Random sample phone directory	NR	F	1500/3509	43%	Phone interview	Definition V	13%
Vinker [23]	Israel	Prior to 2001	Random sample of GP practices	30–75	F	418/500	84%	GP office survey	Definition V	36%
Bortolotti [24]	Italy	1997	Random sample of GP practices	40+	M/F	5488/5488	100%	Phone interview	Definition I	3% (M) 11% (F)
Ueda [25]	Japan	Prior to 2000	Random sample prefecture population	40+	M/F	1836/3500	53%	Mailed survey	Definition I	10.5% (M) 53.7% (F)
Dolan [26]	N. Ireland	Prior to 1999	Random sample of GP practices	35–74	F	689/1050	66%	Mailed survey	Definition I	57%
Holst [27]	New Zealand	Prior to 1988	Random sample city electoral register	18+	F	851/1125	76%	Phone interview	Definition I	31%
Lara [28]	New Zealand/ three ethnicities	1991	Random sample electoral list from three districts	18+	F	556/1028	54%	Mailed survey	Definition V	29.2% (PI) ^c 31.2% (EU) 46.8% (Ma)
Okonkwo [29]	Nigeria	Prior to 2001	Random sample of Gyn patients	20+	F	3963/NR ^a	NR	Personal interview	Not defined	20% stress 22% urge
Hannestad [7]	Norway	1995–97	Total county population	20+	F	27 936/34 755	80%	Mailed survey	Definition V	25%
Yarnell [30]	South Wales	Prior to 1981	Random sample district electoral register	18+	F	1000/1060	94%	Personal interview	Definition I	45%
Ju [31]	Singapore	1989	National postal district register	65+	M/F	919/1143	80%	Personal interview	Definition II	4.4% (M) 4.8% (F)

Table 1 (Continued)

Study 1 ^a author	Location	Year of survey	Population sampling	Age	Sex	Respondents/ population	Response rate	Survey type	Definition	Prevalence
Gavira Iglesias [32]	Spain	1996	Random sample census three municipalities	65+	M/F	827/869	95%	Personal interview	Definition I	29% (M) 42% (F)
Milsom [33]	Sweden	1986	Random sample city population register	46+	F	7459/10 000	75%	Mailed survey	Definition IV	16.8%
Tseng [34]	Taiwan	1997	Random sample town population	65+	M/F	504/630	80%	Personal interview	Definition I	15% (M) 27.7% (F)
Swaddiwudhipong [35]	Thailand	1989	Total 8 village population	60+	M/F	567/602	94%	Personal interview	Not defined	13.3% (M) 14.5% (F)
Maral [36]	Turkey	Prior to 2000	Random sample district population	15+	M/F	2053/2261	91%	Personal interview	Definition V	1% (M) 20.8% (F)
Rizk [37]	United Arab Emirates	1996–97	Random sample from GP visits and community	NR	F	400/448	89%	Personal interview	Definition I	20.3%
Lagace [38]	USA Michigan	1990	All patients in five GP practices	20+	M/F	2830/3638	78%	GP office survey	Definition I	11% (M) 43% (F)
Nygaard [13]	USA Iowa	1981–82	Total two county population	65+	F	2025/2530	80%	Personal interview	Definition V	55.1%
Wetle [39]	USA Mass.	1982	Total community population	65+	M/F	3809/4485	85%	Personal interview	Definition V	34.1% (M) 44.4% (F)
Burgio [40]	USA Pennsylvania	Prior to 1991	Sample of city patients with driver's licenses	42–50	F	541/901	60%	Personal interview	Definition V	58.4%
Roberts [41]	USA Minnesota	1994	Random sample county population	50+	M/F	1540/2337	66%	Mailed survey	Definition I	24% (M) 49% (F)
Brown [42]	USA four states	1992–94	Random sample population listing	69+	F	7949/8366	95%	Personal interview	Definition I	41%
Sze [43]	USA N. Carolina	2000–01	All gyn patients medical center three racial groups	30+	F	2370/NR	NR	Gyn office survey	Definition V	41% white 31% black 30% hisp
Miles [44]	USA five states	1993–94	Random sample Hispanic population	65+	M/F	2660/3051	86%	Personal interview	Definition I	14.1%
Fultz [45]	USA all states	1993–94	Random sample of Medicare enrollees	70+	F	4221/5250	80%	Phone and personal interview	Definition I	23% white 16% black

M, male; F, female; NR, not reported; GP, General Practitioner; gyn, gynecology; Mass, Massachusetts; hisp, Hispanic. Definition I: Any uncontrolled urine loss in the previous 12 months. Definition II: More than one episode of UI in a month. Definition III: Two or more episodes of UI in a week. Definition IV: Involuntary loss of urine that is a social or hygienic problem and is objectively demonstrable. Definition V: Any UI, past or present.

^a Three age cohorts (y, young: 18–23 years; m, middle age: 45–50 years; o, old: 70–75 years).

^b U of T, University of Toronto.

^c PI, Pacific Island; EU, European; Ma, Maori.

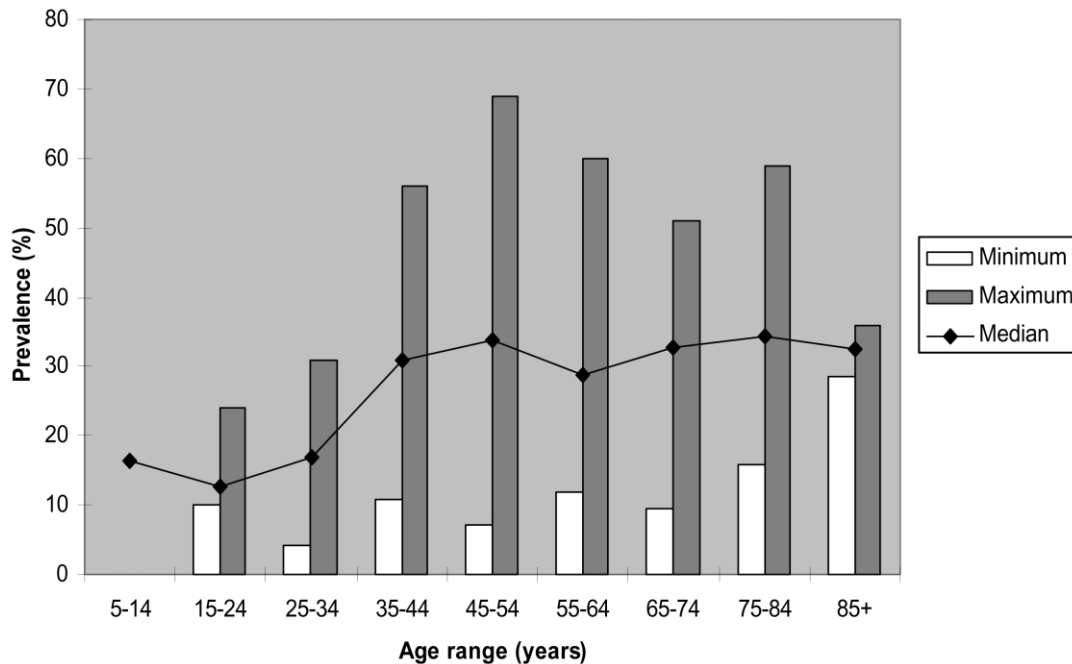


Fig. 1. Prevalence of any UI in women by age group (data from 13 studies).

Approximately 230 000 people were surveyed with a median response rate of 80% (range: 41–100%). The median prevalence of UI was 27.6% (range: 4.8–58.4%) in females, and 10.5% (range: 1–34.1%) in males.

The survey was conducted on total populations in 5/35 (14%) studies, random population samples in 15/35 (43%) studies, doctors' patients in 8/35 (23%) studies, and 'other' in 7/35 (20%) studies. Although the majority of the studies 19/35 (54%) defined UI as any loss of urine in the past 12 months, more than five different definitions were used. Some studies included only patients with stress urinary incontinence [36], others included patients with only stress or urge incontinence [43], and still others did not report on what definition they used [29,35].

Fig. 1 shows the relationship between age and median prevalence of any UI in females pooled from 13 studies [3,7,14–16,21,24–27,30,33,38] with an age span of four decades or more including pre- and post-menopausal women. The median prevalence of any UI had two peaks, one at the 5th decade (33%) and another at the 8th decade

of life (34%). Six studies [3,7,21,27,33,38] distinguished any or occasional UI from regular or significant UI. Fig. 2 shows that the median prevalence of significant UI increased from the 2nd to the 8th decades of life.

Five studies presented comparisons between different races or ethnicities [28,31,40,43,45]. The prevalence of UI was higher in Maori women (46.8%) compared with Pacific Island (29.2%) and European women (31.2%) ($\chi^2 = 14.02$, $P = 0.001$) [28]. Two American studies showed that UI was higher in white (23–32%) compared with black women (16–18%) ($\chi^2 > 10$, $P < 0.01$) [40,45]. Another study showed that white women had higher prevalence of UI compared with black and Hispanic women with rates of 41%, 31% and 30%, respectively, $P < 0.001$ [43]. Finally, a low prevalence study from Singapore did not reveal any significant difference in prevalence of UI between Chinese (5.2%), Malay (1.1%), and Indian (1.6%) elderly people ($P > 0.05$) [31].

Fig. 3 includes pooled data from 14 studies [7,15,16,19,20,22,24,25,27,28,30,34,40,41] showing the relationship between age and median prevalence

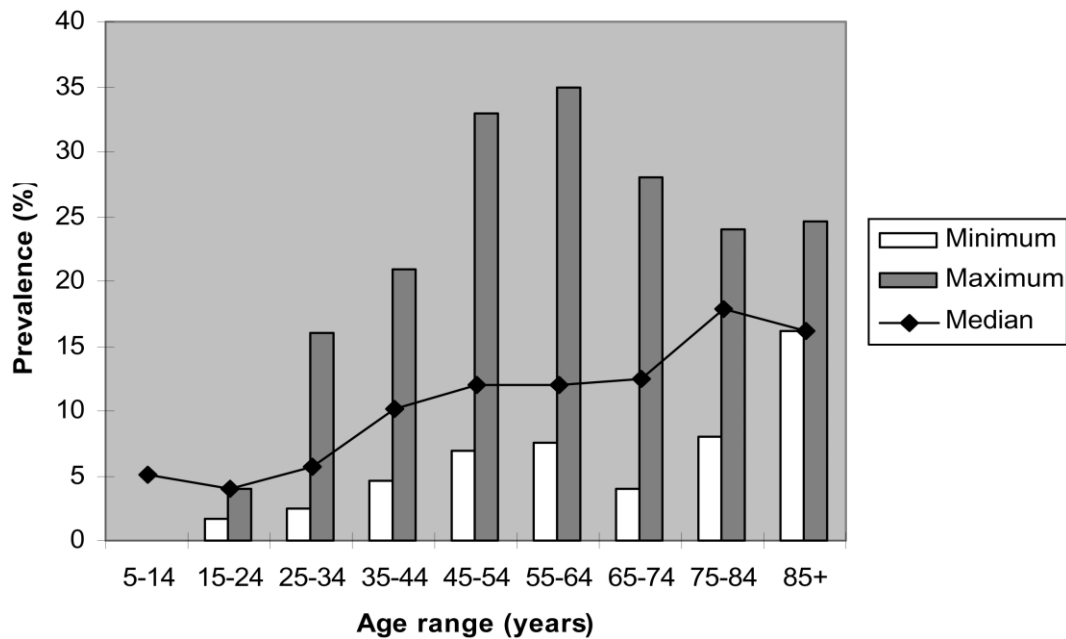


Fig. 2. Prevalence of significant UI in women by age group (data from six studies).

Prevalence of the three subtypes of UI in females. The prevalence of stress UI peaked at the 4th decade, whereas urge and mixed UI peaked at the 8th decade. Considering women of all ages, the most common cause of UI was stress followed by mixed and urge with a mean prevalence of 50%, 32%, and 14%, respectively (Fig. 4).

Twenty-one studies [3,13,14,16,17,19,21–28,33,34,36–38,40,45] analyzed risk factors associated with UI. Common risk factors studied, excluding age, and their significance are listed in Table 2. Fifteen studies [3,7,16,20,21,23,25–28,30,31,38,40,41] reported on help-seeking behavior (Table 3). There was no standardized definition of severity of UI between the studies. Common reasons given for not seeking help included: UI not seen as abnormal or serious, UI being part of the normal aging process, low expectation of treatment benefit, lack of knowledge as to where to seek treatment, embarrassment, hesitation, or fear to consult health care professionals, consultation cost too expensive, and others.

Fourteen studies [7,14–16,18,20,21,27,30–32,37,40,41] reviewed the effect of UI on quality

of life. Patients suffered social consequences, negative feelings, and/or embarrassment in 8–74% of cases [15,16,20,21,23,30,31]. UI had a moderate to severe impact on the quality of life in 10% [7] to 22% [27] of patients (Table 4). Physical and mental component summary scores of the short form health questionnaire (SF-36) were significantly lower in incontinent compared to continent women [14]. In one study, UI was related to an outwardly expressed anger [40]. UI interfered with marital and sexual life in 7.5–33% of patients [15,20,37]. Severity of UI was directly related to a negative quality of life [7,15,16,18,27,32].

4. Discussion

UI remains a worldwide problem affecting women of all ages and across different cultures and races. The range of prevalence rates among the published studies is wide. This variation is due to differences in definitions used, population surveyed, survey type, response rate, age, gender, availability and efficacy of health-care, and other factors [9]. Some studies included women of

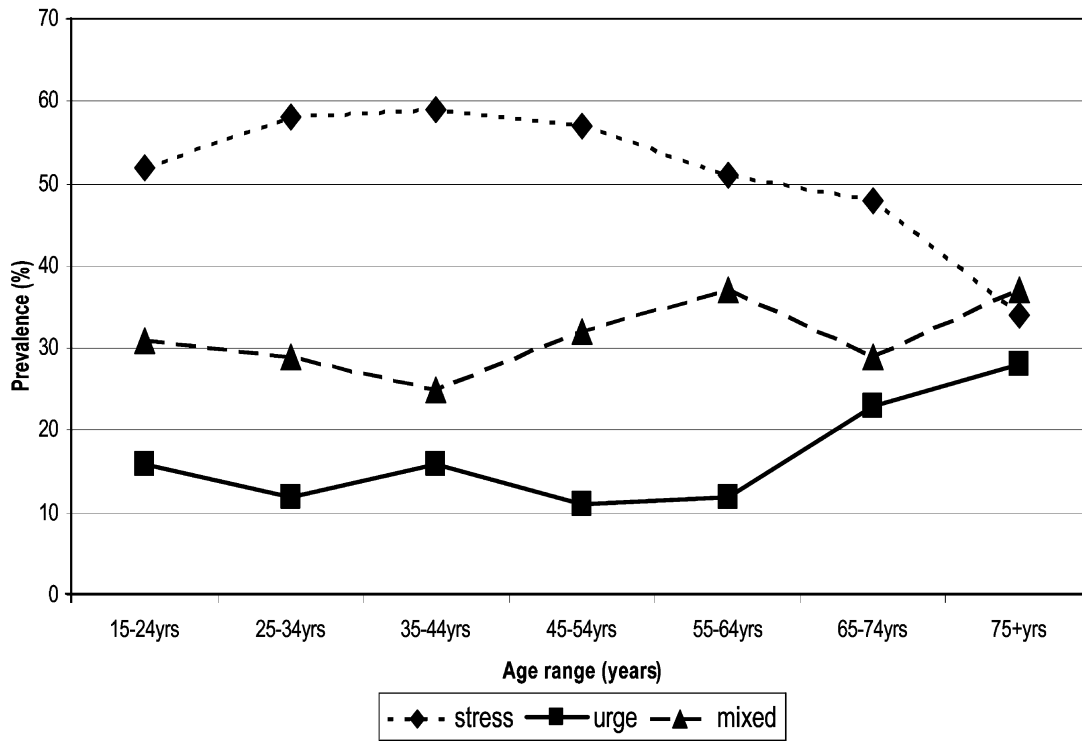


Fig. 3. Median prevalence of stress, urge, and mixed UI by age group.

all ages [3,7,14,15,19,27–30,36,38], whereas others included only elderly women [13,31,32,34,35,39,41,42,44,45]. Also, many elderly women (over 65) are in nursing homes and they are not accounted for in population-based

studies in community-dwelling patients. The prevalence of UI would be higher if they were included [10–12].

More than five different definitions of UI were used in more than five different patient popula-

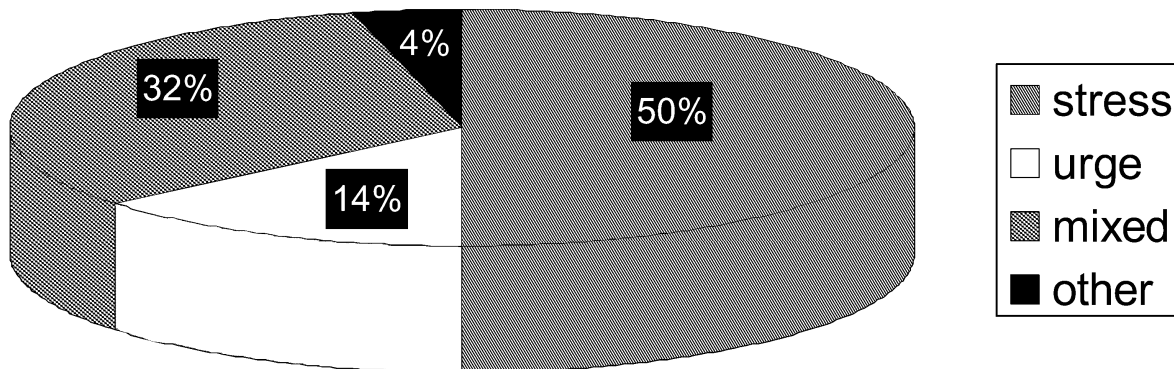


Fig. 4. Overall mean prevalence of different types of UI (data from 14 studies).

Table 2
Urinary incontinence: risk factors in both sexes

Risk factor	Number of studies		Total no. of studies
	Sig.	NS	
Alcohol drinking		4	4
Chronic cough	3		3
Constipation	1	2	3
Depression	1		1
Diabetes	3	1	4
Education	1	2	3
Fecal incontinence	1	1	2
Functional or motor impairment	5		5
General health status	3		3
Hormone replacement		1	1
Income		2	2
Lower urinary tract symptoms	3		3
Menopause	1	4	5
Parity (≥ 1 birth)	11	7	18
Previous hysterectomy	7	1	8
Smoking		5	5
Stroke	5	1	6
Weight or body mass index	8	4	12

Sig., significance; NS, not significant.

tions. In general, studies with a broad definition of UI such as any loss of urine in a 12-month period had a higher prevalence rate than those

Table 3
Percent of patients seeking help by severity of UI

Study 1° author	Country	Help-seeking (%)		
		Mild incontinence	Severe incontinence	Any incontinence
Burgio [40]	USA	26	55	19
Dolan [26]	N. Ireland		40	20
Hannestad [7]	Norway		54	26
Holst [27]	Australia		35	
Ju [31]	Singapore			60
Lagace [38]	USA	14	41	28
Lara [28]	New Zealand			26
Lionis [20]	Greece			16
Rekers [21]	Holland	22	44	28
Roberts [41]	USA			13
Schulman [16]	Belgium			41
Thomas [3]	England	5	29	10
Ueda [25]	Japan			3
Vinker [23]	Israel			32
Yarnell [30]	S. Wales		50	9
Median (range)		18 (5–26)	42.5 (29–55)	23 (3–60)

Table 4
Impact of urinary incontinence on the quality of life

Study	Quality of life (%)			
	None	Slight	Moderate	Severe
Hannestad [7]	66	24	6	4
Holst [27]	12	66	17	5
Iglesias [32]	77	11	9	1
Temml [15]	34	48	11	7
Median	50	36	10	4.5

defining UI over a shorter period of time such as two or more wetting episodes in the past month (Table 1). Further evidence of this is found in the study by Thomas et al. whereby prevalence of UI in women was 8.5% when the definition used was two or more wetting episodes per month, and 16.6% for less than two incontinence episodes [3].

There was also a wide variation in the populations sampled and response rates. Ideally, total populations sampled in a certain geographical location with a high response rate reflect the prevalence of UI more accurately than samples taken from doctors' offices with a low response rate. Another important variable is the type of survey used and the manner in which the questions about UI are asked. Fultz and Herzog showed that the use of

an introduction and follow-up probe question about UI resulted in a doubling of the prevalence rate [4,46].

The relationship between age and prevalence of any UI in women is not straight forward. The peaks in the 5th and 8th decades and the decline in between suggest that menopause may not have a positive influence on the overall prevalence of UI (Fig. 1). In fact, four out of five studies that examined menopause as a risk factor did not find any significant correlation between UI and menopausal status (Table 2). However, median prevalence of significant UI showed a gradual increase to reach a prevalence rate of 18% by the 8th decade (Fig. 2).

Most studies on UI have been conducted on white women. Studies that compared white and black women showed that the prevalence of UI was higher in the former [40,43,45]. Comparison groups in other studies had small numbers and no significant trends could be established. It is noteworthy to mention, however, that although stress and urge incontinence are the common types of UI in developed countries, vesico-vaginal fistulae remain the most common cause of UI in developing countries [47].

The prevalence of stress UI peaked at the 4th decade and gradually declined thereafter to its lowest level by the 8th decade. However, the prevalence of urge and mixed incontinence increased after the 4th decade. These findings are supported by a large population-based prevalence study in patients with overactive bladder (OAB) [48]. This survey of 16 776 patients from six countries showed that the prevalence of OAB (urgency, frequency, nocturia \pm urge incontinence) increased from 9% at 40–44 years to 31% at 75+ years. Such findings have to be interpreted with caution, however. Sandvik et al. validated survey questions with clinical diagnosis made by a gynecologist after urodynamic testing [49]. The results showed that stress incontinence was under-reported, in contrast to mixed incontinence which was over-reported in epidemiologic studies. The percentage of stress incontinence increased from 51 to 77%; mixed incontinence reduced from 39 to 11%; and urge incontinence changed only slightly from 10 to 12%.

Alcohol, smoking, income, and hormone replacement were not significantly related to UI. However, chronic cough, depression, functional or motor impairment, general health status, lower urinary tract symptoms, and history of stroke were significantly related to UI (Table 2). Two out of three studies failed to show that constipation or level of education were significant risk factors. Previous hysterectomy was a significant risk factor, but menopausal status was not. Finally, multiparity and obesity increased the risk of UI in 11/18 (61%) and 8/12 (67%) studies, respectively. Most studies that reviewed parity as a risk factor for UI did not report on peripartum parameters including the mode of delivery that could have an influence on the development of UI.

The overwhelming majority of patients with UI did not seek medical help for their condition in 14/15 (93%) of the studies (Table 3). Even with severe UI, only 42.5% of patients consulted a health care professional. UI remains an under-reported and embarrassing condition across all countries and cultures. Severity of UI (volume, frequency, and duration) was directly related to decreased quality of life [7,15,16,18,27,32]. Although 50% of patients reported that UI affected their quality of life at least slightly (Table 4), 77% of these patients did not seek help. People are still not informed about available treatment modalities and health care professionals need to educate patients and incorporate questions about incontinence in their history forms.

Future prevalence studies should aim at distinguishing significant UI that is clinically relevant and affects the patient's quality of life from that UI described as rare or occasional. Studies should use standardized definitions, survey representative population samples, and improve response rates. Validated tools such as the severity index should be used to classify UI [50]. This index is based on the frequency of UI which is divided into four levels of severity (1–4) and the amount of urine loss which is divided into three levels (1–3) (Table 5). By multiplying the frequency level with the amount level, a severity index is obtained: mild (1–2), moderate (3–6), severe (8–9), and very severe (12).

Table 5

Urinary incontinence severity indicator^a

A.	Frequency of UI	Once or less/month 1	Few times/month 2	Few times/week 3	Every day 4
B.	Amount of UI	Few drops 1	Small splashes 2	More 3	
C.	Severity index (A×B)	Mild 1–2	Moderate 3–6	Severe 8–9	Very severe 12

^a Adapted from Sandvik et al. [50].

The impact of UI on health care costs is substantial and increasing. The condition imposes a significant financial burden on individuals, their families, and healthcare organizations. Studies from the US have reported that direct health care costs in individuals 65 years of age and older amounted to approximately 8.2 billion in the 1980s and 16.4 billion US\$ in the 1990s [51,52]. The cost of UI on society for individuals aged 65 years and older was \$26.3 billion [52]. In Sweden, the estimated annual cost for UI was 1.8 billion Swedish Crowns in 1990, or approximately 2% of the total health care costs [53].

In conclusion, UI remains a highly prevalent cross-cultural and costly condition that affects women of all ages. Risk factors are numerous and the impact on the quality of life is substantial. Only a minority of patients seek help for their condition. Future epidemiologic studies should ensure unifying definitions to produce meaningful evidence-based medicine, and to project the costs involved in managing this global health care problem with the goal of improving the quality and availability of health care.

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