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A community-based epidemiological survey of female urinary incontinence: The Norwegian EPINCONT Study

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Abstract

Objectives: The aim was to assess the prevalence of any urinary leakage in an unselected female population in Norway, and to estimate the prevalence of significant incontinence. Methods: The EPINCONT Study is part of a large survey (HUNT 2) performed in a county in Norway during 1995–97. Everyone aged 20 years or more was invited. 27,936 (80%) of 34,755 community-dwelling women answered a questionnaire. A validated severity index was used to assess severity. *Results:* Twenty-five percent of the participating women had urinary leakage. Nearly 7% had significant incontinence, defined as moderate or severe incontinence that was experienced as bothersome. The prevalence of incontinence increased with increasing age. Half of the incontinence was of stress type, 11% had urge and 36% mixed incontinence. *Conclusions:* Urinary leakage is highly prevalent. Seven percent have significant incontinence and should be regarded as potential patients. © 2000 Elsevier Science Inc. All rights reserved.

Keywords: Epidemiology; Community-based; Female; Prevalence; Urinary incontinence

1. Introduction

Urinary incontinence is a common condition among women [1]. The estimates of the prevalence of incontinence do, however, vary widely [2–4]. The differing results can partly be attributed to the use of different definitions of incontinence [2]. Study samples selected on different criteria and variations in survey procedures also contribute to varying prevalence estimates.

In 1998 the 1st International Consultation on Incontinence recommended the development of standardized instruments for measuring the prevalence of incontinence in community surveys, including a screening question for any involuntary loss of urine, a measure of frequency, quantity, and duration [2].

The EPINCONT (Epidemiology of Incontinence in the County of Nord-Trøndelag) study was designed in accordance with these recommendations. It is a community-based survey performed in collaboration with the National Health Screening Service of Norway. As far as we know, it is the largest epidemiological survey carried out on urinary incontinence. In this article, we report the crude prevalence rates and emphasize analyses on age, severity, and type of incontinence.

2. Subjects and methods

The Nord-Trøndelag Health Survey 2 (HUNT 2) was a large survey performed in one county in Norway during the years 1995–97. This county has a geographical, demographical, and occupational structure fairly representative of Norway as a whole, although the average income and the prevalence of higher education is somewhat less than the average for Norway. Everyone aged 20 years or more (n = 94,197) residing in the county were invited to participate. The complete HUNT 2 survey covered many topics, for example mental health, cardiovascular diseases, asthma, and urinary incontinence. A similar survey was performed in the same county during the years 1984–86 (HUNT 1).

Invitations were sent by mail along with questionnaire 1, which was to be returned when attending the screening station. This was a stationary or mobile (bus) office in each municipality. Questionnaire 1 did not contain any questions about urinary incontinence. Several clinical parameters were measured on all participants at the screening station, and further investigations were performed for smaller samples. Before leaving the screening station all the participants

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received questionnaire 2 (different for men and women), which was to be filled in at home and returned by mail. Questions about urinary leakage were included among approximately 130 questions asked to women.

47,313 women were invited to the HUNT 2 study. 948 women were institutionalized, but only 60 of these participated in the study. The overall participation rate in HUNT 2 was 74%, lowest in the youngest and the oldest age groups (Table 1). 34,755 community-dwelling women received questionnaire 2. These are defined as the source population of the EPINCONT study; institutionalized women were excluded. 27,936 women (the study population) answered the questions about urinary incontinence, giving an overall response rate for the EPINCONT study of 80%. Response rates for women under 60 years were around 84%. From 60 to 80 years of age response rates steadily declined to 69%. In the oldest age group (90+) 41% participated.

The results presented in this article relate exclusively to the questions about incontinence. This section of the questionnaire (Appendix) started with an entry question whether the participant experienced involuntary loss of urine or not. If the answer was yes, she was asked to answer more specific questions: How often do you leak (four answering levels), how much leakage each time (three levels), do you leak when coughing, sneezing, laughing, lifting heavy items (yes/no), is leakage accompanied by sudden and strong urge to void (yes/no). We also asked about duration of urinary leakage (three levels), whether she had consulted a doctor about leakage (yes/no), and to what extent she considered her leakage a problem (five levels). Due to an error, the question about duration was only included in approximately 75% of the questionnaires.

Urinary incontinence was defined as any leakage. The incontinent group in the material has been defined by including everyone answering "yes" on the entry question ($n = 6386$). Those who, despite answering "no" or failing to answer the entry question, had answered confirmatively regarding both frequency, volume, and type of leakage ($n = 490$) were also included.

A severity index developed by Sandvik *et al.* was used to characterize the degree of incontinence [5]. The index was calculated by multiplying the reported frequency (four levels) by the amount of leakage (dichotomized to two levels). The resulting index value (1–8) was further categorized into slight (1–2), moderate (3–4), and severe (6–8). 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 [5,6]. 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.

The impact of incontinence (to what extent she thought of her leakage as a problem) was in some analyses dichotomized to two levels: minor problem (no problem/a small nuisance) on one hand and bothered (some bother/much bothered/a major problem) on the other.

Significant incontinence was defined as the fraction of women with moderate and severe incontinence on severity index, who at the same time stated that they were bothered by their condition.

If the woman had answered "yes" on the question about loss of urine when coughing etc., a stress component was defined. If the woman had answered "yes" on the question about urge to go to the toilet, an urge component was defined. When answering "yes" on both of these two questions, mixed incontinence was defined. "No" on both questions or "no" on one and missing on the other were grouped as "other."

The participants were analyzed as 5-year age groups by severity and type of incontinence. When appropriate, three age groups were defined (20–44, 45–59, and 60+). Otherwise age was considered a continuous variable.

Table 1
Participation rates for HUNT2 and EPINCONT

Age (years)	Invited (*n*)	Participated in HUNT2 (*n*)	Participation rate for HUNT2 (%)	Received EPINCONT questionnaire[a] (*n*)	Answered the EPINCONT questionnaire (*n*)	Participation rate for EPINCONT (%)
20–29	8978	4774	53	4774	3990	84
30–39	8048	6122	76	6122	5217	85
40–49	8570	7047	82	7047	5909	84
50–59	6665	5775	87	5775	4816	83
60–69	5487	4714	86	4714	3685	78
70–79	5791	4448	77	4436	3210	72
80–89	3241	1766	54	1727	1044	60
90+	533	169	32	160	65	41
Total	47313	34815	74	34755	27936	80

[a] Institutionalized women excluded.

Table 2
Prevalence of involuntary leakage of urine and distribution of symptoms (n = 6792) of different types among women with any leakage[a]

Age (years)	Respondents (*n*)	Incontinent women (*n*)	Prevalence of urinary incontinence		Symptoms of stress incontinence		Symptoms of urge incontinence		Symptoms of mixed incontinence		Incontinence type not classified[b]	
			%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
20–24	1876	194	10	(9.0–11.7)	48	(40.8–55.0)	13	(7.8–17.4)	33	(26.5–39.9)	6	(3.3–10.8)
25–29	2114	303	14	(12.8–15.8)	54	(48.2–59.5)	13	(9.2–16.8)	28	(23.2–33.3)	5	(2.8–8.1)
30–34	2494	454	18	(16.7–19.7)	59	(54.3–63.3)	10	(7.3–13.0)	27	(23.0–31.2)	4	(2.5–6.5)
35–39	2723	577	21	(19.7–22.7)	60	(55.8–63.8)	7	(5.3–9.8)	29	(25.1–32.6)	4	(2.6–6.0)
40–44	2931	702	24	(22.4–25.5)	60	(56.7–63.9)	8	(6.4–10.6)	29	(25.3–32.0)	3	(1.6–4.2)
45–49	2978	848	28	(26.9–30.1)	65	(61.5–68.0)	7	(5.1–8.5)	27	(23.5–29.5)	2	(1.3–3.4)
50–54	2775	838	30	(28.5–31.9)	55	(51.4–58.1)	7	(5.7–9.3)	36	(32.8–39.3)	2	(1.1–3.1)
55–59	2041	564	28	(25.7–29.6)	52	(48.2–56.5)	9	(7.1–12.1)	37	(32.5–40.5)	2	(0.9–3.3)
60–64	1853	486	26	(24.2–28.2)	42	(37.8–46.6)	10	(7.5–13.0)	46	(41.7–50.6)	2	(0.7–3.3)
65–69	1832	501	27	(25.3–29.4)	38	(33.2–41.8)	16	(12.5–19.0)	44	(39.9–48.7)	2	(1.3–3.3)
70–74	1797	538	30	(28.0–32.2)	33	(29.3–37.4)	16	(13.1–19.4)	48	(44.0–52.6)	2	(1.0–3.7)
75–79	1413	478	34	(31.3–36.2)	34	(29.6–38.2)	19	(15.5–22.6)	44	(39.6–48.5)	3	(1.6–4.9)
80–84	757	267	35	(31.9–38.7)	32	(26.4–37.9)	21	(15.8–25.8)	40	(34.4–46.4)	7	(3.9–10.5)
85–89	287	100	35	(30.8–41.6)	28	(18.9–37.8)	23	(15.3–33.3)	40	(30.4–51.0)	9	(3.7–16.1)
90+	65	26	40	(27.6–51.1)	28	(12.1–49.4)	12	(2.6–31.2)	48	(27.8–68.7)	12	(2.6–31.2)
Total	27936	6876	25	(24.1–25.2)	50	(49.1–51.5)	11	(10.4–11.9)	36	(34.4–36.7)	3	(2.6–3.4)

[a] Eighty-four women (1.2%) did not answer the relevant questions.
[b] Not classified because of incomplete answers.

Statistical analyses were done by univariate and bivariate methods. Chi-square tests were used when comparing different types of urinary incontinence with regard to severity and impact. Spearman's rank correlation coefficient was calculated between severity and the rating of incontinence as a problem. Statistical significance was accepted at the 5% level ($P < 0.05$).

Ethical approval for HUNT was obtained from both the Regional and the National ethics review board. The subjects gave an extensive written consent to the use of the data.

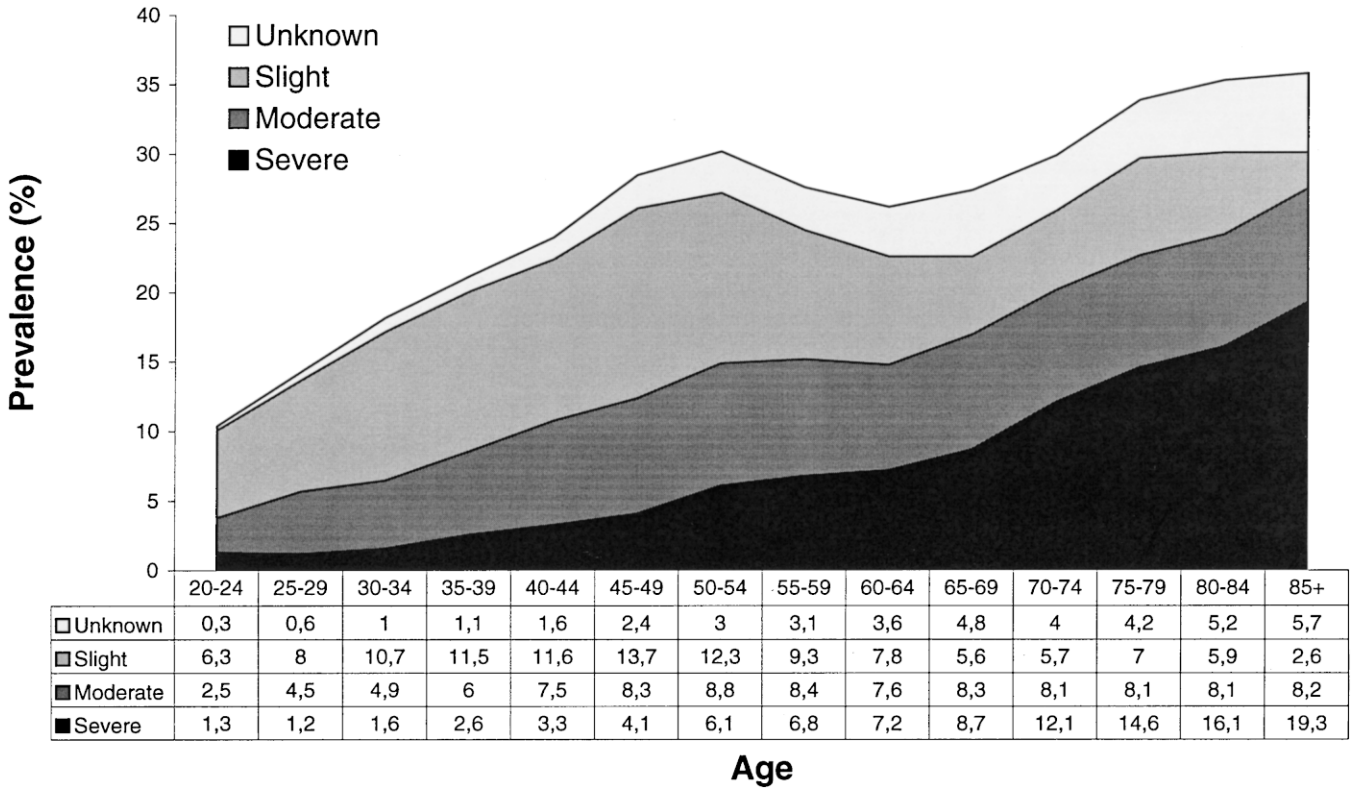


Fig. 1. Prevalence of urinary incontinence by age group and severity.

HUNT has also obtained approval from the Norwegian Data Inspectorate.

3. Results

Twenty-five percent of the women reported that they had involuntary loss of urine. The mean age of the incontinent women was 53.2 years versus 47.7 years for the continent women. The prevalence of incontinence increased with increasing age (Table 2). The lowest prevalence was observed in the younger age groups (12% for women <30 years), the highest was observed among the eldest (40% for women >90 years). However, there was also a peak around mid-age with a prevalence of 30% among women 50–54 years of age (Fig. 1).

3.1. Severity and type of incontinence

Table 3 shows the frequency, amount of leakage, the severity assessment according to the severity index, and type of incontinence. The prevalence of severe urinary incontinence increased by increasing age (Fig. 1). Among incontinent women below 45 years of age, 57% had slight incontinence, 31% moderate, and 12% severe incontinence while the corresponding figures were 46%, 33%, and 21% for women between 45 and 59 years of age. In age group 60+, 24% had slight and 31% moderate incontinence while as many as 44% reported having severe incontinence.

Half of the incontinent women were experiencing symptoms of stress incontinence alone. Symptoms of urge incontinence alone affected only one in ten, while mixed incontinence was reported by one in three (Table 3). The fraction of stress incontinence symptoms was highest among the women between 25 and 49 years of age, thereafter there was a relative decrease with increasing age (Table 2). Symptoms of urge incontinence were most frequent among the youngest (<35 years) and oldest (>65 years) women. Mixed incontinence increased with increasing age except for a relatively high fraction (33%) in women 20–24 years of age.

The severity of incontinence varied between the different types. The fraction of severe incontinence was 17%, 28%, and 38% in the stress, urge, and mixed groups, respectively. For all types, incontinence of moderate degree was present in almost 30% of the cases. Slight incontinence was found in 53% in the stress group, 39% in the urge group, and 31% in the mixed group. The differences between groups were statistically significant ($P < 0.001$).

Within each type of incontinence, severity increased with increasing age. In the stress group, 10% of women aged 25–44 had severe incontinence compared with 15% in age group 45–59 and 33% in age group 60+. In the urge group the corresponding figures were 8%, 18%, and 45%, and in the mixed group 19%, 33%, and 53%.

3.2 Experiencing incontinence as a problem

Two-thirds of the incontinent women stated that their leakage was no problem or just a small nuisance, while about 10% were much bothered or experienced their incontinence as a great problem (Table 3). The age-specific prevalence of incontinence on different levels of impact is displayed in Fig. 2.

There was a significant correlation (Spearman's $R = 0.56$, $P < 0.01$) between the severity index and the rating of incontinence as a problem.

Seven percent of the study population had significant incontinence (Fig. 3).

Among women with slight incontinence only 10% answered that they were bothered by their symptoms. In comparison, 34% of those with moderate incontinence and 73% of those with severe incontinence were bothered.

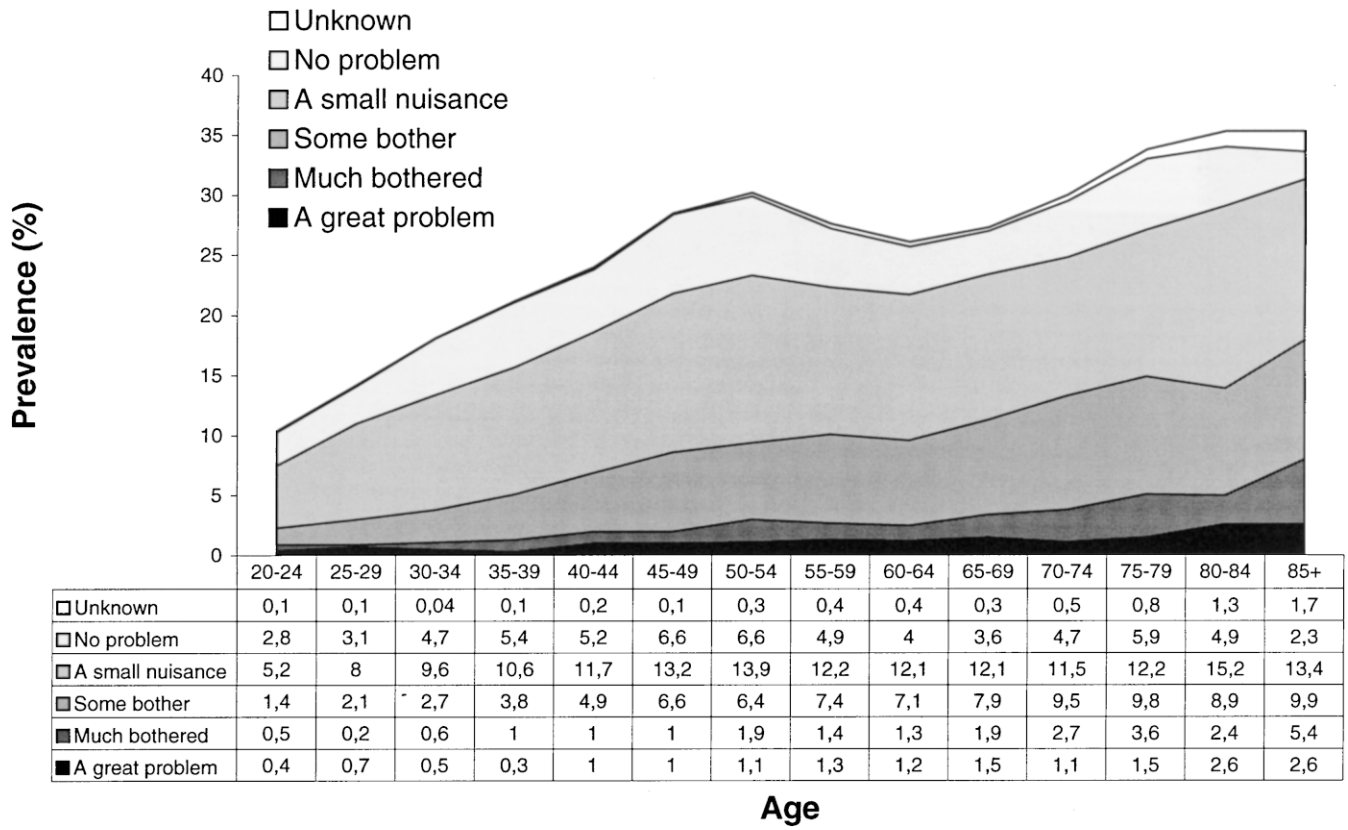
The impact of urinary leakage differed between the incontinence types. Among the women who stated that they had symptoms of mixed incontinence, 47% were bothered. The corresponding figures for urge and stress incontinence were 36% and 24%, respectively. The differences between groups were statistically significant ($P < 0.001$).

A total of 26% of the women had consulted a doctor about their urinary leakage. However, 54% of those with severe incontinence had consulted. Among those who were bothered or worse affected by their incontinence, 64% had consulted.

Table 3
Amount, frequency, severity, type, and duration of urinary incontinence, impact of incontinence, having consulted a doctor about incontinence

	Incontinent women		
	n	%	95% CI[a]
Amount ($n = 6501$)			
Drops or little	3710	57	55.8–58.2
More	2791	43	41.8–44.2
Frequency ($n = 6368$)			
Less than once a month	1073	17	15.9–17.7
Once or more per month	2436	38	37.1–39.4
Once or more per week	1610	25	24.2–26.3
Every day and/or night	1249	20	18.6–20.6
Severity index ($n = 6194$)			
Slight	2649	43	41.5–44.0
Moderate	1953	31	30.4–32.7
Severe	1592	26	24.6–26.8
Incontinence type ($n = 6792$)			
Stress	3414	50	49.1–51.5
Urge	756	11	10.4–11.9
Mixed	2417	36	34.5–36.7
Other[b]	205	3	2.6–3.5
Duration of UI ($n = 4985$)			
0–5 years	3288	66	64.7–67.3
5–10 years	994	20	18.8–21.0
> 10 years	703	14	13.1–15.0
Impact of incontinence ($n = 6795$)			
No problem	1369	20	19.2–21.1
A small nuisance	3155	46	45.2–47.6
Some bother	1599	24	22.5–24.5
Much bothered	393	6	5.2–6.3
A great problem	279	4	3.6–4.6
Consulted a doctor about UI ($n = 6625$)			
Yes	1745	26	25.3–27.4
No	4880	74	72.6–74.7

[a] Confidence interval.
[b] Cannot be further classified.



	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Unknown	0,1	0,1	0,04	0,1	0,2	0,1	0,3	0,4	0,4	0,3	0,5	0,8	1,3	1,7
No problem	2,8	3,1	4,7	5,4	5,2	6,6	6,6	4,9	4	3,6	4,7	5,9	4,9	2,3
A small nuisance	5,2	8	9,6	10,6	11,7	13,2	13,9	12,2	12,1	12,1	11,5	12,2	15,2	13,4
Some bother	1,4	2,1	2,7	3,8	4,9	6,6	6,4	7,4	7,1	7,9	9,5	9,8	8,9	9,9
Much bothered	0,5	0,2	0,6	1	1	1	1,9	1,4	1,3	1,9	2,7	3,6	2,4	5,4
A great problem	0,4	0,7	0,5	0,3	1	1	1,1	1,3	1,2	1,5	1,1	1,5	2,6	2,6

Fig. 2. Prevalence of urinary incontinence by age group and impact.

4. Discussion

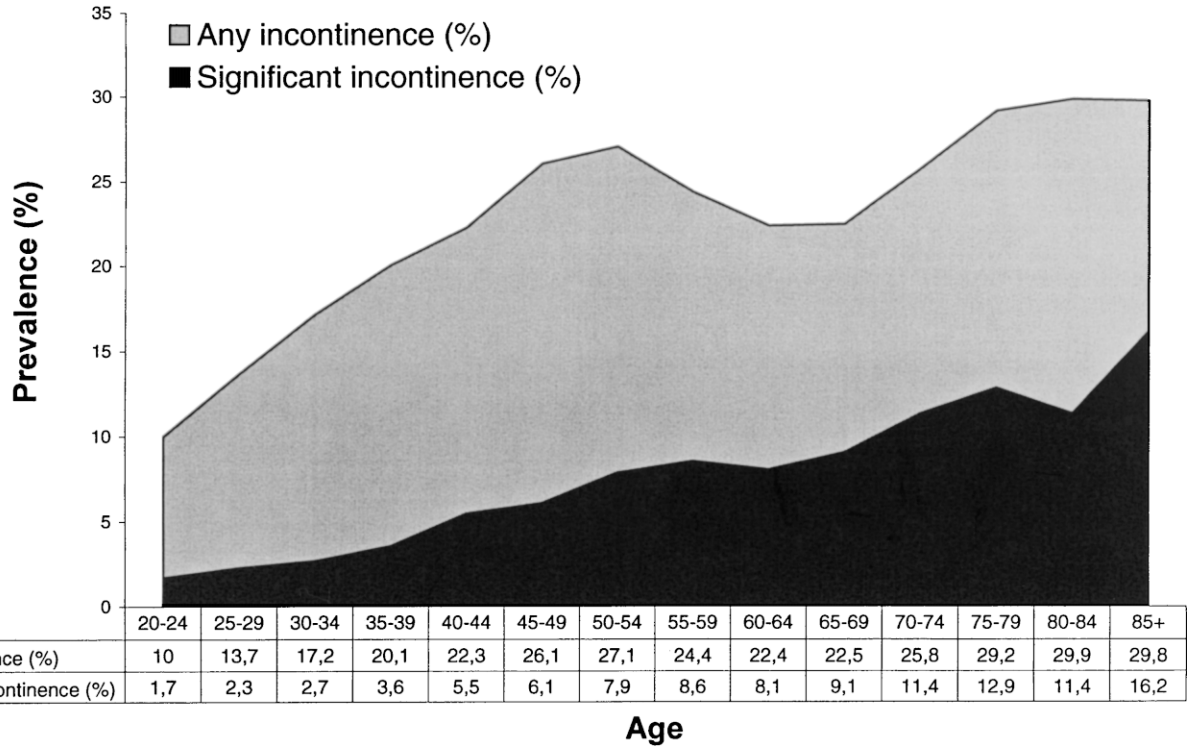
This survey confirms that involuntary loss of urine is highly prevalent among adult women. While one of four women experienced any leakage of urine only one of 15 had symptoms of significant incontinence.

One strength of this survey is that a whole community was invited. The overall response rate for our study was good. However, the youngest and the eldest women did not participate to the same degree as the middle-aged, and this may have introduced a bias. The young non-participants may represent a healthy part of the population also with regard to urinary incontinence and their no-show may cause an over-estimate of incontinence among women 20–30 years of age. The opposite may be the case with the eldest women; those who did not participate may be of poorer health also when it comes to incontinence. A study of non-participants in the HUNT 1-survey showed that the youngest participants did not have higher rates of morbidity than the youngest non-participants [7]. A group of non-participants in the oldest age groups had significantly poorer health than the participants.

As the EPINCONT study is a part of a larger survey, we have no reason to think that incontinent women as a group are under-represented in HUNT 2 because of embarrassment and reluctance to report their problems, or over-represented because of eagerness to tell. Such effects may however influence their answers to the particular questions about incontinence.

The differing prevalence estimates in earlier studies are caused by study populations selected on different criteria and different survey procedures, but most important by the use of different definitions of urinary incontinence [2–4]. The International Continence Society's (ICS) definition of incontinence requires that the urine loss should be objectively demonstrable [8]. This is impossible to fulfill in an epidemiological survey of this size. Holtedahl *et al.* found that compared with any self-reported leakage or self-reported regular leakage with or without objective demonstration, the full ICS-definition was rather restrictive [9]. Foldspang *et al.* discussed whether the social and hygienic aspect of the ICS definition is appropriate for etiological research [10], and the committee on epidemiology on the 1st International Consultation on Incontinence did not recommend that bother or quality of life should be included in the definition of urinary incontinence [2]. In our study we used a low threshold for identifying the women as incontinent, and we are only able to register symptoms of incontinence and do not identify women with urinary incontinence as a condition.

We found a crude prevalence rate of any incontinence of 25%. Compared with previous studies also using postal questionnaires and covering a comparably wide age-span, our prevalence estimate is lower than some [11–13] and higher than others [14–17] The steadily increasing preva-



	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Any incontinence (%)	10	13,7	17,2	20,1	22,3	26,1	27,1	24,4	22,4	22,5	25,8	29,2	29,9	29,8
Significant incontinence (%)	1,7	2,3	2,7	3,6	5,5	6,1	7,9	8,6	8,1	9,1	11,4	12,9	11,4	16,2

Fig. 3. Prevalence of any ($n = 6170$) and significant ($n = 1832$) incontinence by age group (women with incomplete data on significance were excluded).

lence of any incontinence with age has been indicated by several other studies [13,17–20], and the highest prevalence in old age is also consistent with other studies [5,16,19,21, 22]. In the 1999 WHO/ICS-report [2] it is concluded that the median level of prevalence estimates gives a picture of an 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%). Despite a wide definition of incontinence, our estimates are in the lower part of these ranges. Narrow confidence intervals strengthen the external validity of the present study results. Institutionalized women are not included in our study, and this may partly explain the relatively low prevalence rate among the eldest.

Several measures have been used to denote severity of incontinence in previous studies. We have used a validated severity index. Sandvik *et al.*, using the same index, reported similar findings except that they found a marked peak of severe incontinence in the midlife group [5], in contrast to a prevalence peak due to slight incontinence in our study. There has been shown a tendency for middle-aged severely incontinent women to respond better in incontinence surveys than their younger and older counterparts [23]. This may be irrelevant in a general health survey as HUNT 2, and may explain the difference between these two studies.

That severe incontinence is most prevalent among the eldest has also been shown previously [18,24]. The rising prevalence of urge and mixed incontinence in the older age groups did not alone explain the increasing prevalence of severe incontinence with age. Severity increased with age regardless of type.

A wide inclusion of women with urinary leakage in epidemiological surveys makes it possible to obtain knowledge of a problem with no definite "starting point," and with a wide range of severity. It is desireable to define a level of significant incontinence, though. In a public health perspective the estimate of the total extent of the symptoms may provide an incentive for information and self-care programs for those with only slight symptoms, while an estimate of the prevalence of significant incontinence can suggest the number of women in need of professional help.

The definition of significant incontinence resulted in a group consisting of 7% of the study population, in agreement with most other studies [18,20,24–29]. Significantly incontinent women should be regarded as potential patients.

One-third of the women with urinary leakage had mixed incontinence and one-half had stress incontinence. This is similar to findings in some earlier studies [12,14,18,29], but differs from others [24,26]. Sandvik *et al.* [30] found similar figures, but did a correction for validity with a final diagnosis by a gynecologist after urodynamic evaluation as "gold standard." This showed that mixed incontinence was overreported, mainly on the expense of pure stress incontinence. Urge symptoms, and even more mixed incontinence, seem to be connected with an increasing degree of both severity and bother compared with pure stress incontinence symptoms as previous studies also have shown [18,31].

5. Conclusion

Involuntary loss of urine is a common symptom among adult community-dwelling Norwegian women. The preva-

lence of any incontinence is increasing with increasing age as is the prevalence of severe incontinence.

Seven percent of our study population had significant urinary incontinence, and we recommend that they should be regarded as potential patients while those with less problems should be offered information and advice on self-care.

Acknowledgments

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Appendix

The EPINCONT questionnaire in English translation

1. Do you have involuntary loss of urine?
   yes
   no
2. How often do you have involuntary loss of urine?
   less than once a month
   once or more per month
   once or more per week
   every day and/or night
3. How much urine do you leak each time?
   drops or little
   small amounts
   large amounts
4. Do you have involuntary loss of urine in connection with coughing, sneezing, laughing, lifting heavy items?
   yes
   no
5. Do you have involuntary loss of urine in connection with sudden and strong urge to void?
   yes
   no
6. For how long have you had involuntary loss of urine?
   0–5 years
   5–10 years
   more than 10 years
7. Have you consulted a doctor because of involuntary loss of urine?
   yes
   no
8. How do you experience your leakage problem?
   no problem
   a small nuisance
   some bother
   much bothered
   a major problem

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