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Urinary, Fecal, and Dual Incontinence in Older U.S. Adults

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Abstract

OBJECTIVES—To estimate the prevalence of urinary (UI), fecal (FI), and dual incontinence (DI) and to identify shared factors associated with each type of incontinence in older U.S. women and men.

DESIGN—Population-based cross-sectional study.

SETTING—National Health and Nutrition Examination Survey (NHANES, 2005–2010).

PARTICIPANTS—Women and men aged 50 and older.

MEASUREMENTS—UI was defined as moderate to severe (≥3 on a validated UI severity index, range 0–12); FI was at least monthly loss of solid, liquid, or mucus stool; and DI was the presence of UI and FI.

RESULTS—Women were more likely than men to report UI only and DI but not FI only (UI only, women 19.8%, men 6.4%; FI only, women 8.2%, men 8.4%; DI women, 6.0%, men 1.9%). In both sexes, prevalence increased with age. In regression models adjusted for parity and hysterectomy, DI in women was associated with non-Hispanic white race (odds ratio (OR) = 2.3, 95% confidence interval (CI) = 1.5–3.4), depression (OR = 4.7, 95% CI = 2.0–11.1), comorbidities (OR = 4.3, 95% CI = 1.9–9.6 for ≥3 comorbidities vs none), hysterectomy (OR = 1.8, 95% CI = 1.2–2.7), and diarrhea (OR = 2.8, 95% CI = 1.5–5.0). In men, ADL impairment

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(OR = 2.4, 95% CI = 1.2–4.9) and poorer self-rated health (OR = 2.8, 95% CI = 1.5–5.30) were associated with DI.

CONCLUSION—UI, FI, and DI are common in older women and men. Factors associated with DI were distinct from those associated with UI and FI. There were also differences according to sex, with DI associated with depression and comorbid diseases in women and lack of functional ability and poorer self-rated health in men.

Keywords

dual incontinence; fecal incontinence; older adults; urinary incontinence

Urinary incontinence (UI), fecal incontinence (FI), and dual incontinence (DI, of urine and stool) are known to increase in prevalence with age in men and women and can have a devastating effect on quality of life.[1–8] Incontinence is often cited as the impetus for long-term care placement.[9] With the aging population in the United States, there is a need for identification of sex-specific factors associated with each disease state to permit the development of prevention and treatment strategies and to facilitate the appropriate distribution of healthcare resources.

Men and women are exposed to different risk factors for pelvic floor dysfunction (e.g., childbirth-related pelvic floor injury vs prostate cancer treatment) and therefore may experience different rates of UI, FI, and DI. With aging, decompensating medical conditions such as diabetes mellitus, stroke, and cognitive and mobility impairment, appear to influence incontinence more strongly than direct pelvic floor injury.[2,4,8,10–12] This is most evident in the observation that older men and women experience similar rates of FI despite the unique potential in women for anal sphincter trauma with vaginal delivery.[13]

DI is the most extreme manifestation of pelvic floor dysfunction, and estimates of the prevalence of DI in community-dwelling adults ranges from 2.5 to 14.5%.[2,4,5,12,14] When evaluating risk factors associated with DI, the magnitude of association with DI differs from the magnitude of association with isolated UI or FI, raising questions about the pathogenesis of DI and how it differs from that of isolated UI or FI. For example, in the Nurses Health Study of more than 64,000 women, depression, multiparity, and decompensating medical conditions that denote frailty were more strongly associated with DI than with isolated UI or FI.[2] Whether DI is uniquely associated with similar risk factors in men or whether there are sex differences in correlates of DI based on pelvic floor trauma exposure is unknown.

The purpose of this study was to analyze a robust sample of older men and women enrolled in the National Health and Nutrition Examination Survey (NHANES) program from 2005 to 2010 to estimate the prevalence of UI, FI, and DI. The study sought to identify shared or unique factors and potentially modifiable conditions associated with each incontinence type according to sex.

METHODS

The NHANES program consists of cross-sectional national health surveys conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and

Prevention. The NHANES oversampled persons aged 60 and older and racial and ethnic groups other than white people (non-Hispanic black, Mexican American, and low-income non-Hispanic white) to provide more-reliable estimates for these groups and uses a complex, stratified, multistage, probability cluster design. The NCHS ethics review board approved the protocol, and all participants provided written informed consent.[15]

Participants were interviewed in their homes and then underwent standardized physical examination, including measured height and weight, and further questioning in a mobile examination center. Trained interviewers asked women and men aged 20 and older questions about UI and FI in a private interview. The study population was limited to individuals aged 50 and older.

Methodology similar to that used in a previous study using NHANES data from 2005–06 was used to define UI and FI.[1] (Specific questionnaires can be found at http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm.) The goal was to identify bothersome or symptomatic UI and FI. UI was defined using a validated two-item incontinence severity index, which includes frequency of episodes (<once per month, a few times a month, a few times a week, or every day or night) and the amount of leakage (drops, splashes, more). The responses on the two questions were multiplied to obtain a total severity score ranging from 1 to 12 (mild or slight symptoms 1–2, moderate symptoms 3–6, severe symptoms 7–9, very severe 10–12).[16] For this analysis, the categories of severe and very severe symptoms were combined to indicate severe incontinence. Moderate to severe incontinence corresponds to at least weekly leakage or monthly leakage of volumes more than just drops.[1] The Fecal Incontinence Severity Index, which defines the leakage of gas, mucus, liquid, or solid stool at least monthly was used to evaluate for the occurrence of FI.[16] A DI variable that included the presence of at least one positive response for moderate to severe UI and monthly FI was created from the responses for UI and FI.

Participants self-reported their race and ethnicity, which was then categorized as non-Hispanic white, non-Hispanic black, Hispanic (including Mexican American), and other or mixed race or ethnicity. Race and ethnicity was then dichotomized as non-Hispanic white versus all other racial and ethnic groups. Age was categorized as 50 to 59, 60 to 69, 70 to 79, and 80 and older. Education was categorized as less than a high school education, a high school education (including General Education Development or equivalent), or more than high school. The poverty income ratio, an indicator of socioeconomic status that uses the ratio of income to the family's poverty threshold set by the U.S. Census Bureau, was categorized as less than 1 (below the poverty threshold), 1 to 2 (1–2× the poverty threshold), and 2 and more (2× the poverty threshold). Body mass index (BMI) was calculated as kg/m^2 and categorized as less than 25.0 (underweight or normal weight), 25.0 to 29.9 (overweight), and 30.0 or more (obese).

Data on disease types were ascertained according to the question "Has a doctor or other health professional told you that you had [disease]?" Disease types were examined and categorized as positive according to self-report: hypertension, arthritis, cerebrovascular accident, chronic lower respiratory tract disease, coronary heart disease, congestive heart failure, liver disease, thyroid disease, cancer (other than skin), and diabetes mellitus.[17]

Chronic lower respiratory tract disease included self-reported emphysema, chronic bronchitis, and asthma, and coronary heart disease included coronary artery disease, angina pectoris, and myocardial infarction. Participants who were taking insulin or diabetes mellitus medication were considered to have diabetes mellitus. The cumulative number of positive responses to these four disease types was divided into four categories (0, 1, 2, ≥3). Depression was assessed using the validated Patient Health Questionnaire-9 (PHQ-9), which yields scores from 0 to 27, with a score of 10 or greater indicating major depression.[18]

Self-described general health status was defined according to the answer to the question, "Would you say that in general your health is excellent, very good, good, fair, or poor?" Responses to this question were aggregated into two categories: excellent, very good, or good versus fair or poor. Three activities of daily living (ADLs) were analyzed: feeding, dressing, and transferring. These ADLs were combined into one variable accounting for any level of impairment and dichotomized as yes versus no.

Stool consistency was assessed using the Bristol Stool Form Scale[13] (color picture card with pictures and written descriptors of the seven stool types) and the following written question: "Please look at this card and tell me the number that corresponds with your usual or most common stool type." Diarrhea was defined as a Type 6 (fluffy pieces with ragged edges, a mushy stool) or Type 7 rating (watery, no solid pieces, entirely liquid) and categorized versus all other types.

Parity was defined based on the question "How many times have you been pregnant?" and dichotomized as none versus one or more. Women were also asked, "Have you had a hysterectomy, including a partial hysterectomy, that is, surgery to remove your uterus or womb?" with response options of yes or no.

The 2005–06, 2007–08, and 2009–10 survey data for women and men aged 50 and older were combined to provide robust sample sizes. Prevalence estimates and 95% confidence intervals (CIs) were calculated using STATA 12.1 (STATA Corp. College Station, TX), which incorporates the design effect, appropriate sample weights, and stratification and clustering of the complex NHANES sample design. The sample weights adjust for unequal probabilities of selection and nonresponse. The Pearson chi-square test was used to assess the association between types of incontinence and demographic and medical characteristics. Estimates with relative standard errors greater than 30% were identified as statistically unreliable. Separate multinomial logistic regression models stratified according to sex were constructed to assess factors independently associated with UI, FI, and DI. Prevalence odds ratios (ORs) and 95% CIs were reported from the multinomial models, using the appropriate sampling weights, with the level of statistical significance set at $P < .05$.

RESULTS

In NHANES, 7,994 men and women aged 50 and older were asked questions on UI and FI. Of these, 751 (9.4%) did not answer questions on UI, and 867 (10.8%) did answer questions on FI, leaving 893 (11.1%) without available data on UI and FI. Ultimately, 3,497 women and 3,604 men aged 50 were evaluated. Overall, women were more likely than men to report

UI only and DI but not FI only. UI only occurred in 19.8% (95% CI = 18.1–21.7%) of women and 6.4% (95% CI = 5.4–7.5%) in men, and DI occurred in 6.0% (95% CI = 5.0–7.1%) of women and 1.9% (95% CI = 1.4–2.7)% of men (Table 1). Stress incontinence was more common in women than men (37.8% vs 3.1%, $P < .001$), and urgency incontinence was similar in women and men (18.4% vs 17.1%, $P = .29$). The prevalence of FI only was similar in women (8.2%, 95% CI = 7.0–9.5%) and men (8.4%, 95% CI = 7.1–9.8%).

In both sexes, the prevalence of all incontinence types increased with age. In participants aged 80 and older, the prevalence of UI was 26.7% in women and 13.0% in men, the prevalence of FI was 10.3% in women and 12.0% in men, and the prevalence of DI was 10.5% in women and 3.3% in men. The proportion of women with UI was the primary determinant of the higher prevalence of DI in women. In bivariate analyses, DI was more common in non-Hispanic white women than in women of other races. DI was also more common in women with less than a high school education, obesity (BMI ≥30 kg/m^2), more comorbidities, ADL impairment, moderate to severe depression, a prior hysterectomy, and diarrhea (Table 1). In the bivariate analyses of men, DI was associated with obesity, more comorbidities, ADL impairment, poorer self-rated health, moderate to severe depression, and diarrhea (Table 1).

In the adjusted models, the only shared factor associated with UI, FI, and DI was age in women or men. The factors associated with DI were different in men and women. In women, non-Hispanic white race (OR = 2.3, 95% CI = 1.5–3.4), higher education (OR = 0.6, 95% CI = 0.4–1.0 for > high school vs < high school), comorbidities (OR = 4.3, 95% 1.9–9.6 for ≥3 comorbidities vs 0), depression (OR = 4.7, 95% CI = 1.9–11.1), hysterectomy (OR = 1.8, 95% CI = 1.2–2.7), and diarrhea (OR = 2.8, 95% CI = 1.5–5.0) were associated with DI (Table 2). In men, poverty (OR = 2.7, 95% CI = 1.1–7.1 for two times the poverty index vs at or below), ADL impairment (OR = 2.4, 95% CI = 1.2–4.9), and poorer self-rated health (OR = 2.8, 95% CI = 1.5–5.0) were associated with DI (Table 3). Small samples sizes did not allow for similar comparisons for subtypes of UI, FI, and DI in older men and women.

DISCUSSION

In this community-dwelling sample of 7,101 men and women aged 50 and older, UI and DI were significantly more frequent in women than in men, whereas the prevalence of FI was similar in both sexes. A higher UI rate in women was the primary determinant of the observed difference in DI prevalence, and age was the only shared factor associated with UI, FI, and DI in women or men. The factors associated with DI were different in men and women, which may highlight potential differences in disease pathogenesis.

Sex differences in correlates of UI, FI, and DI have been investigated in several smaller studies. In a cross-sectional study of 1,000 Medicare beneficiaries, white race and higher Charlson comorbidity score were identified as being uniquely associated with UI and DI in women, whereas depressive symptoms were associated with DI in men and women.[12] Two other small population-based studies identified poor health status and functional limitations as associated factors for DI in both sexes,[4,6] although sample size and differences in disease

definition limited conclusions about differences between the sexes in factors associated with UI, FI, and DI in these studies.

The current focused on DI, given that it is associated with greater impairment in quality of life than UI or FI and that it represents the most severe form of pelvic floor dysfunction.[3,10] Age was clearly identified as the strongest shared risk factor for DI, increasing from 4% of women and 1.3% of men aged 50 to 59 to 10.5% of women and 3.3% of men aged 80 and older. The strong association between advancing age and incontinence of all types was similarly observed in the Nurses' Health Study, in which the prevalence of DI increased from 5.4% in women aged 62 to 69 years to 10.6% in women aged 80 to 87.[2] No data on men were available from that study. Because the successful control of urine and stool relies on a complex set of neurophysiological pathways, normal neuromuscular and connective tissue function, and adequate cognition and mobility, it is not surprising that advanced age is strongly associated with loss of bowel and bladder control.

In addition to age, significant differences between the sexes were found in factors associated with DI. In women, depression was the strongest associated modifiable factor, with almost five times as great a likelihood of reporting DI. This association was even more robust than observed in the Nurses' Health Study, in which depression was associated with 2.28 greater odds of DI.[2] Although an association with DI was observed in men in bivariate analyses, the association did not remain significant with multivariate modeling. In women, it is possible that a bidirectional pathophysiological mechanism exists for this observation, and clinicians should be alert to the possibility that aggressive treatment of depression may influence rates of DI.

In men, there was a unique association between ADL impairment (OR = 2.4) and DI and between poorer self-rated health (OR = 2.8) and DI, suggesting that, in older men, systemic illness and limited mobility may play a more significant role in the development of DI than pelvic floor injury itself. Behavioral interventions such as improved toileting assistance could be of significant benefit in this population.

Non-Hispanic white women had higher odds of DI than women of other races. This association has been detected in several other studies.[2,12,19,20] It is possible that a protective effect on UI prevalence was the primary determinant of the observed lower prevalence of DI in minority women. Alternatively, true differences in DI prevalence between races could be related to racial differences in obstetric pelvic floor trauma, dietary factors, differences in bowel motility, or sampling error. Similar to other studies, racial differences in DI prevalence were not observed in men.[12]

Strengths of the current study include the robust sample size from NHANES 2005–10 and stringent definitions of UI, FI, and DI to include only individuals with bothersome moderate to severe symptoms. Limitations of the study include that causality cannot be ascertained because NHANES data are cross-sectional. Thus, definitive conclusions regarding potential sex-specific interventions to pursue to prevent these conditions cannot be made. Health status and reproductive variables were self-reported, although questions from validated instruments were used to assess the presence of UI and FI. Additionally, NHANES did not

query men regarding conditions associated with pelvic floor trauma such as prostatectomy or radiation treatment. This national survey assessed only noninstitutionalized adults, which may limit the generalizability of these results to other groups.

In conclusion, significant sex differences in correlates of DI were identified that may contribute to better efforts at disease prevention and management. Overall, the prevalence of incontinence of any type in older community-dwelling U.S. residents is common and linearly increases with age. Given the aging of the population and the effect of incontinence, whether urinary, fecal, or dual, on quality of life, these results are important to develop optimal treatment strategies for men and women.

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Table 1

Sociodemographic Characteristics and Medical Information for Women and Men Aged ≥50 in the National Health and Nutrition Examination Survey 2005–10

		Urinary Incontinence Only		Fecal Incontinence Only		Dual Incontinence	
Characteristic	**Total, n**	**n**	**% (95% CI)**	**n**	**% (95% CI)**	**n**	**% (95% CI)**
Women							
All	3,497	699	19.8 (18.1–21.7)	296	8.2 (7.0–9.5)	227	6.0 (5.0–7.1)
Age							
50–59	1,074	199	18.2 (15.1–21.7)	78	7.0 (5.5–8.8)	52	4.0 (2.7–5.8)
60–69	1,177	212	18.2 (15.0–21.8)	110	10.1 (7.9–12.8)	71	6.4 (4.5–8.9)
70–79	787	169	22.4 (19.1–26.2)	58	6.8 (4.9–9.4)	60	7.4 (5.6–9.8)
≥80	459	119	26.7 (22.4–31.5)	50	10.3 (7.6–13.9)	44	10.5 (8.0–13.7)
Race and ethnicity							
Non-Hispanic white	1,865	410	20.5 (18.4–22.7)	157	8.2 (6.8–9.9)	143	6.5 (5.2–7.9)
Other	1,632	289	17.4 (15.0–20.2)	139	7.9 (6.2–10.1)	84	4.2 (3.1–5.5)
Poverty index							
Below poverty threshold	541	124	26.5 (22.6–30.8)	47	8.5 (6.3–11.3)	41	7.8 (5.0–11.9)
1–2× poverty threshold	920	189	19.5 (16.4–23.0)	80	8.6 (6.2–12.0)	74	8.6 (6.3–11.8)
≥2× poverty threshold	2,036	386	19.1 (17.1–21.3)	169	8.0 (6.7–9.5)	112	5.0 (3.9–6.3)
Education level							
<High school	1,098	252	23.6 (20.4–27.2)	86	7.3 (5.6–9.4)	89	9.9 (7.8–12.4)
High school	906	170	20.0 (16.4–24.3)	81	8.7 (7.2–10.6)	49	4.6 (3.4–6.2)

Characteristic	Total, n	Urinary Incontinence Only		Fecal Incontinence Only		Dual Incontinence	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
>High school	1,487	276	18.3 (16.4–20.4)	128	8.2 (6.3–10.7)	89	5.3 (4.1–6.8)
BMI, kg/m^2							
<25.0	886	135	12.9 (10.7–15.5)	82	8.9 (7.0–11.4)	41	4.2 (2.9–5.9)
25.0–29.9	1,080	199	19.8 (16.6–23.4)	86	7.6 (5.4–10.7)	71	5.4 (4.1–7.1)
≥30.0	1,531	365	25.1 (22.0–28.4)	128	8.0 (6.6–9.7)	115	7.8 (6.1–9.9)
Number of comorbidities							
0	883	129	14.2 (11.3–17.8)	51	6.0 (4.3–8.4)	26	2.5 (1.5–4.2)
1	1,183	231	19.4 (16.3–22.9)	97	7.2 (5.5–9.4)	65	5.0 (3.8–6.7)
2	810	198	24.6 (21.1–28.4)	87	11.0 (8.9–13.4)	50	6.6 (4.8–9.0)
≥3	575	132	24.4 (20.4–29.0)	54	9.9 (7.0–13.4)	81	13.6 (9.3–19.5)
Self-rated health							
Excellent, very good, good	2,442	455	18.7 (16.4–21.1)	187	7.6 (6.2–9.1)	124	4.8 (3.8–6.1)
Fair or poor	1,055	244	24.4 (21.2–27.8	108	10.6 (8.3–13.4)	103	10.6 (8.3–13.4)
ADL impairment							
No	2,064	406	19.6 (17.4–22.0)	173	8.7 (7.1–10.6)	131	6.3 (5.2–7.7)
Yes	683	167	25.4 (21.5–29.7)	74	10.6 (7.5–14.7)	72	10.7 (7.4–15.3)
Depression							
None or mild	3,339	660	19.5 (17.8–21.4)	279	8.1 (7.0–9.3)	189	5.5 (4.5–6.6)
Moderate or severe	149	36	28.1 (20.3–37.4)	16	12.4 (6.1–23.4)	38	21.9 (15.4–30.1)
Hysterectomy							

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Characteristic	Total, n	Urinary Incontinence Only		Fecal Incontinence Only		Dual Incontinence	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
No	2,044	382	18.09 (16.2–20.0)	164	7.3 (6.0–8.8)	101	4.4 (3.4–5.7)
Yes	1,392	306	23.1 (20.3–26.1)	127	9.3 (7.6–11.4)	125	8.6 (6.9–10.6)
Parous							
No	256	46	18.3 (13.0–25.2)	14	5.4 (2.6–11.0)	14	5.4 (3.0–9.4)
Yes	3,135	636	19.9 (18.1–21.9)	272	8.4 (7.3–9.6)	206	6.1 (5.1–7.2)
Diarrhea							
No	3,093	608	19.8 (8.0–21.8)	237	7.4 (6.2–8.7)	177	5.3 (4.3–6.4)
Yes	354	80	20.2 (15.9–25.2)	53	15.8 (11.1–21.8)	48	14.4 (10.1–20.2)
Men							
All	3,604	264	6.4 (5.4–7.5)	307	8.4 (7.1–9.8)	78	1.9 (1.4–2.7)
Age							
50–59	999	50	4.1 (3.0–5.7)	91	7.4 (5.6–9.8)	12	1.3 (0.5–3.1)
60–69	990	75	5.6 (4.2–7.3)	80	7.3 (5.5–9.5)	23	1.5 (0.8–2.7)
70–79	633	82	11.1 (8.4–14.4)	82	11.2 (8.5–14.5)	29	3.7 (2.4–5.8)
≥80	333	57	13.0 (10.4–16.1)	54	12.0 (8.6–16.4)	14	3.3 (1.9–5.4)
Race and ethnicity							
Non-Hispanic white	2,013	155	6.4 (5.2–7.8)	212	9.0 (7.6–10.7)	46	1.9 (1.2–2.8)
Other	1,591	109	6.3 (4.9–8.1)	95	5.7 (4.4–7.4)	32	2.1 (1.2–3.5)
Poverty index							

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Characteristic	Total, n	Urinary Incontinence Only		Fecal Incontinence Only		Dual Incontinence	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Below poverty threshold	487	31	6.2 (3.8–9.9)	43	10.1 (7.0–14.3)	8	(0.5–2.1)
1–2× poverty threshold	871	67	7.6 (5.4–10.4)	78	9.8 (7.4–12.8)	25	2.1 (1.2–3.7)
≥2× poverty threshold	2,246	166	6.1 (5.2–7.3)	186	7.9 (6.4–9.7)	45	2.0 (1.2–3.1)
Education level							
<High school	1,165	90	7.8 (6.2–9.7)	85	8.0 (6.0–10.7)	30	2.4 (1.3–4.3)
High school	825	65	7.5 (5.8–9.5)	65	8.0 (6.0–10.5)	17	1.9 (1.1–3.3)
>High school	1,612	109	5.4 (4.1–7.1)	156	8.6 (7.1–10.5)	31	1.7 (1.1–2.8)
BMI, kg/m^2							
<25.0	84	49	5.7 (3.7–8.7)	79	9.2 (6.8–12.3)	20	1.7 (1.1–2.8)
25.0–29.9	1,470	99	5.5 (4.2–7.2)	114	7.7 (5.9–9.9)	17	1.2 (0.7–2.2)
≥30.0	1,291	116	7.8 (6.5–9.4)	114	8.6 (6.7–11.1)	41	2.8 (1.7–4.5)
Number of comorbidities							
0	1,197	52	3.6 (2.6–5.1)	78	7.0 (5.2–9.4)	15	1.5 (0.5–3.9)
1	1,123	81	5.6 (4.2–7.6)	79	7.3 (5.7–9.3)	16	1.2 (0.7–2.0)
2	692	68	9.4 (6.6–13.2)	68	9.9 (7.9–12.4)	18	2.5 (1.4–4.4)
≥3	522	59	12.6 (9.0–17.4)	75	12.9 (9.9–16.7)	25	3.6 (2.5–5.3)
Self-rated health							
Excellent, very good, good	2,595	168	5.8 (4.7–7.1)	187	7.1 (5.6–8.8)	41	1.4 (0.8–2.5)
Fair or poor	1,008	96	8.7 (6.3–11.7)	120	13.5 (10.7–16.9)	37	3.8 (2.7–5.3)
ADL impairment							

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Characteristic	Total, n	Urinary Incontinence Only		Fecal Incontinence Only		Dual Incontinence	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
No	2,162	174	7.3 (6.0–8.9)	167	8.0 (6.6–9.9)	45	1.8 (1.2–2.5)
Yes	626	62	9.8 (7.3–13.0)	92	14.8 (11.9–18.3)	27	4.9 (3.2–7.3)
Depression							
None or mild	3,506	251	6.0 (5.1–7.1)	290	8.2 (6.9–9.7)	67	1.7 (1.2–2.5)
Moderate or severe	90	12	21.1 (10.7–37.5)	17	17.2 (9.3–29.4)	9	8.2 (3.4–18.6)
Diarrhea							
No	3,272	237	6.1 (5.1–7.3)	252	7.5 (6.1–9.2)	62	1.6 (1.1–2.3)
Yes	296	25	9.9 (5.9–15.9)	55	20.3 (14.2–28.2)	15	5.6 (2.8–10.8)

CI = confidence interval; BMI = body mass index; ADL = activity of daily living.

Table 2

Association Between Variables and Urinary, Fecal and Dual Incontinence in Women Aged 50 and Older in the National Health and Nutrition Examination Survey 2005–10 (n = 2,560)

	Urinary Incontinence Only	Fecal Incontinence Only	Dual Incontinence
Variable	**Odds Ratio (95% Confidence Interval)**		
Age (reference 50–59)			
60–69	1.2 (0.8–1.8)	1.3 (0.7–2.4)	1.4 (0.7–2.8)
70–79	1.3 (0.9–2.1)	0.8 (0.4–1.5)	1.6 (0.8–3.2)
≥80[a]	2.0 (1.2–3.3)	1.4 (0.7–2.5)	2.3 (1.1–4.9)
Non-Hispanic white[a]	2.0 (1.6–2.7)	1.3 (0.9–2.0)	2.3 (1.5–3.4)
Poverty index (reference at or below poverty level)			
1–2× above poverty level	0.7 (0.5–1.0)	1.1 (0.6–1.9)	1.4 (0.8–2.5)
≥2× above poverty level	0.8 (0.5–1.1)	1.1 (0.7–1.9)	1.1 (0.6–2.0)
Education level (reference <high school)[a]			
High school	0.8 (0.6–1.1)	0.9 (0.6–1.4)	0.4 (0.3–0.7)
>High school	0.7 (0.6–0.9)	1.1 (0.6–1.8)	0.6 (0.4–1.0)
Body mass index, kg/m^2 (reference < 25.0)			
25.0–29.9	1.2 (0.8–1.6)	0.8 (0.5–1.4)	1.2 (0.8–2.0)
≥30.0	1.8 (1.3–2.5)	0.9 (0.6–1.4)	1.5 (0.9–2.4)
Comorbidities (reference 0)[a]			
1	1.1 (0.8–1.5)	1.5 (0.8–2.7)	2.2 (1.1–4.2)
2	1.2 (0.8–1.7)	2.2 (1.2–3.8)	2.1 (1.0–4.2)
≥3	1.2 (0.8–1.9)	2.1 (1.1–3.9)	4.3 (1.9–9.6)
Activity of daily living impairment	1.3 (0.97–1.7)	1.1 (0.6–1.8)	1.5 (0.9–2.7)
Self-rated health fair or poor (reference excellent, very good, good)	1.3 (0.9–1.8)	1.2 (0.7–2.1)	1.0 (0.6–1.7)
Moderate or severe depression (reference none or mild)[a]	2.2 (1.2–4.2)	1.6 (0.6–4.6)	4.7 (1.9–11.1)
Hysterectomy[a]	1.1 (0.9–1.4)	1.4 (1.0–1.9)	1.8 (1.2–2.7)
Parous	1.1 (0.7–1.9)	3.2 (1.3–7.9)	1.2 (0.6–2.3)
Diarrhea[a]	1.0 (0.7–1.4)	2.6 (1.6–4.1)	2.8 (1.5–5.0)

[a]Factors significantly associated with dual incontinence in adjusted model that included the variables listed in the table.

Table 3

Association Between Variables and Urinary, Fecal, and Dual Incontinence in Men Aged 50 and Older in the National Health and Nutrition Examination Survey 2005–10 (n = 2,680)

	Urinary Incontinence Only	Fecal Incontinence Only	Dual Incontinence
Variable	**Odds Ratio (95% Confidence Interval)**		
Age (reference 50–59)			
60–69	1.2 (0.7–4.6)	0.9 (0.5–1.7)	1.2 (0.3–5.0)
70–79[a]	2.8 (1.7–4.6)	1.6 (0.9–3.1)	3.5 (1.0–11.7)
≥80[a]	3.5 (1.6–7.7)	1.7 (0.9–3.5)	3.3 (1.0–10.6)
Non-Hispanic white[a]	0.9 (0.6–1.4)	2.2 (1.5–3.2)	0.7 (0.4–1.5)
Poverty index (reference at or below poverty level)			
1–2× above poverty level	0.9 (0.4–1.9)	0.8 (0.5–1.4)	2.3 (0.9–5.9)
≥2× above poverty level[a]	1.1 (0.6–2.0)	0.7 (0.4–1.3)	2.7 (1.1–7.1)
Education level (reference <high school)			
High school	1.0 (0.7–1.6)	1.1 (0.7–1.9)	1.2 (0.4–3.7)
>High school	1.0 (0.6–1.5)	1.6 (1.0–2.7)	1.4 (0.6–3.0)
Body mass index, kg/m^2 (reference <25.0)			
25.0–29.9	0.9 (0.6–1.6)	0.8 (0.6–1.1)	0.6 (0.3–1.5)
≥30.0	1.4 (0.8–2.3)	0.9 (0.6–1.4)	1.3 (0.6–3.1)
Comorbidities (reference 0)			
1	1.2 (0.7–2.1)	1.0 (0.6–1.6)	0.8 (0.3–1.9)
2	1.9 (1.2–3.1)	1.3 (0.8–1.9)	1.1 (0.4–3.2)
≥3	2.0 (1.1–3.5)	1.4 (0.9–2.3)	1.2 (0.5–3.0)
Activity of daily living impairment[a]	1.2 (0.8–1.9)	1.7 (1.2–2.4)	2.4 (1.2–4.9)
Self-rated health fair or poor (reference excellent, very good, good)[a]	1.1 (0.7–1.8)	1.9 (1.4–2.8)	2.8 (1.5–5.0)
Moderate or severe depression (reference none or mild)	3.2 (1.2–8.7)	1.8 (0.8–4.1)	1.7 (0.6–5.2)
Diarrhea	1.9 (0.97–3.7)	3.0 (1.8–5.0)	1.9 (0.6–6.5)

[a] Factors associated with dual incontinence in adjusted model containing the variables listed in the table.