

Overactive bladder prevalence trends in the United States, 2009–2018: NHANES analysis

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Abstract

To evaluate the long-term trends in the prevalence of overactive bladder (OAB) among U.S. adults and quantify associated sociodemographic disparities, we analyzed data from 24,569 non-pregnant adults aged ≥ 20 years, derived from five consecutive National Health and Nutrition Examination Survey (NHANES) cycles spanning 2009-2010 to 2017-2018. Stratification was performed by age, sex, race/ethnicity, educational attainment, and family poverty-income ratio (PIR). Results showed that between 2009 and 2018, the OAB prevalence in the study population exhibited a significantly increasing trend after an initial plateau phase, rising from 15.55% (2009-2010) to 17.57% (2017-2018), with an absolute increase of 2.02%. Notable disparities were observed across subgroups, yet the upward prevalence trend persisted in certain ones. Adults aged ≥ 64 years, females, non-Hispanic Black individuals, and those with less than a high-school education consistently demonstrated the highest prevalence. High-income families (PIR ≥ 3.50) reported a higher OAB prevalence compared to low-income counterparts, which is hypothesized to relate to a greater diagnosis detection rate rather than an elevated disease risk. These findings underscore an urgent need for targeted public health initiatives. Such initiatives should address population aging and inequities in access to OAB diagnosis and care, thereby improving health equity in this clinical domain.

Keywords: National health and nutrition examination survey, overactive bladder, prevalence

Overactive bladder (OAB) is characterized by urinary urgency, often accompanied by frequency, nocturia, and/or urgency incontinence, in the absence of urinary tract infection. It represents a significant public health concern due to its broad impact on both health and quality of life, particularly in older adults, where it increases the risk of falls, infections, depression, and sleep disturbances. With the aging U.S. population and lifestyle changes, including reduced physical activity and a higher prevalence of comorbid conditions, the prevalence and societal burden of OAB are expected to rise. However, despite its growing impact, long-term, nationally representative data on OAB prevalence trends are scarce.

The National Health and Nutrition Examination Survey (NHANES) is a cross-sectional survey employing a stratified, multistage probability sampling design to monitor the health and nutritional status of the non-institutionalized civilian population in the United States. Response rates declined from 79.4% in 2009–2010 to 51.9% in 2017–2018, and survey weights were adjusted accordingly to account for potential non-response bias. According to the International Continence Society, OAB is defined as a symptom syndrome characterized by urgency, usually accompanied by urge urinary incontinence (UUI) and nocturia, in the absence of urinary tract infection or other obvious pathology. UUI was assessed using the question: “During the past 12 months, have you leaked or lost control of even a small amount of urine with an urge or pressure to urinate, and you could not get to the toilet fast enough?” Nocturia was evaluated with the question: “In the past 30 days, during a typical night, how many times did you wake up and urinate?” An OAB Symptom Score (OABSS) was calculated by combining the UUI and nocturia scores, and individuals with a total score of ≥ 3 were classified as having OAB. In this study, we assessed trends in the prevalence of OAB among non-pregnant adults aged 20 years and

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older.

We estimated age- and sex-standardized OAB prevalence for five NHANES cycles (2009-2010 through 2017-2018), stratified prevalence estimates by sex, age group, race/ethnicity, parental education level, and family poverty-income ratio (PIR). All statistical analyses incorporated NHANES sampling weights to account for the examination survey design weights and ensure national representativeness. Statistical analyses were performed using R software (version 4.2.3), and two-sided *P*-values < 0.05 were considered statistically significant. The NHANES protocol was approved by the Ethics Review Board of the National Center for Health Statistics, and written informed consent was obtained from all participants.

The study included 24,569 non-pregnant adults aged ≥ 20 years with complete data, with a weighted mean age of 48.1 years, and 50.27% were women (Table 1). Overall, the weighted prevalence of OAB increased from 15.55% in 2009–2010 to 17.57% in 2017–2018, representing an absolute rise of 2.02% (95% CI, 0.00% to 4.05%; *P* < 0.05) (Table 1). Although the prevalence initially decreased slightly from 15.55% in 2009–2010 to 15.28% in 2013–2014, it subsequently increased to 17.37% in 2015–2016 and then rose modestly to 17.57% in 2017–2018. Subgroup analyses showed that this overall upward trend was also present among five key populations: adults over 65 years old, males, non-Hispanic White individuals, those with a college degree or higher, and individuals from high-income families (income-to-poverty ratio (PIR) ≥ 3.50) (Figure 1).

Among age groups, individuals older than 64 consistently exhibited the highest prevalence of OAB, remaining above 32% throughout the 10-year period. Women had a higher prevalence than men across all survey cycles. Regarding race and ethnicity, Non-Hispanic Black participants showed a significantly higher prevalence compared to other groups. Socioeconomic disparities also significantly influenced OAB prevalence patterns, with higher prevalence among individuals with less than a high school education compared to college graduates, and the highest prevalence observed in low-income households (PIR < 1.30) versus high-income families (PIR ≥ 3.50).

Prevalence by age. All prevalences were standardized by age. “Others” in race/ethnicity include Asian, other Hispanic, Alaskan Native, and multiracial individuals. Family income level was classified using the family income to poverty ratio (PIR) < 1.30 (low income), 1.30 to 3.49 (middle income), and ≥ 3.50 (high income). Error bars denote 95% confidence intervals.

This large-scale analysis provides an assessment of OAB prevalence in U.S. adults using 10-year nationally representative NHANES data from 2009 to 2018. The prevalence was relatively stable from 2009 to 2014 but increased significantly thereafter, leading to a marked overall upward trend over the decade.

Our findings highlight significant OAB prevalence disparities, especially among older adults, females, and non-Hispanic Black individuals. These disparities are broadly consistent with global epidemiological patterns

and may reflect both biological and social determinants of health. First, older adults consistently exhibited the highest prevalence of OAB, aligning with global meta-analyses reporting a 28.3% prevalence among individuals aged 60 and above [1]. Age-related changes in detrusor muscle function, combined with a higher burden of comorbidities such as frailty, hyperlipidemia, and stroke, may contribute to this increased susceptibility [2-4]. Second, women demonstrated a consistently higher risk of OAB than men [5]. This sex-based difference may stem from physiological and anatomical factors, including pelvic floor dysfunction related to pregnancy and childbirth, which can compromise bladder control. Third, non-Hispanic Black participants had a higher prevalence of OAB than other racial and ethnic groups, a pattern documented in previous studies. Possible explanations include differences in comorbidities, health care access, and cultural factors influencing symptom reporting and health-seeking behavior. Finally, regarding socioeconomic factors, individuals with higher educational attainment consistently exhibited lower OAB prevalence, possibly due to greater health literacy, more proactive health-seeking behaviors, and better awareness of bladder health [6]. In contrast, participants from higher-income households reported a greater prevalence of OAB—a counterintuitive pattern that may reflect higher health care utilization and better access to screening and diagnostic services, leading to increased detection rather than a true increase in disease burden [7]. The cross-sectional nature of our data also precludes establishing causality, and reverse causation cannot be ruled out.

This study has several limitations. First, the research findings are only applicable to the American population and cannot be generalized to other countries. Second, OAB status was determined based on self-reported data, which may be subject to recall bias and misclassification due to participants’ subjective perceptions, potentially leading to under or overestimation of prevalence. Third, although sampling weights were applied to adjust for non-response, the remaining disparities in response rates may have introduced bias. Despite these limitations, the findings highlight the urgent need for targeted public health strategies that address both the aging population and inequities in access to diagnosis and care, particularly among socioeconomically diverse groups, to help mitigate the rising burden of OAB.

Declarations

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Table 1. Estimated prevalence of overactive bladder among US adults (≥ 20 years) by sociodemographic factors, from 2009 to 2018 NHANES.

| Characteristic | Participants, N (%) | Weight prevalence, % (95% CI) ^a (N = 3,290) ^b | | | | P for Trend ^c | Difference in Prevalence, % (95% CI) | | |
|-----------------------------------|------------------------|---|-------------------------|-------------------------|-------------------------|-----------------------------|--------------------------------------|------------------------------|------------------------------|
| | | 2009-2010 (n = 5235) | 2011-2012 (n = 4624) | 2013-2014 (n = 5020) | 2015-2016 (n = 4879) | | 2017-2018 (n = 4811) | 2009-2010 vs 2017-2018 | 2013-2014 vs 2015-2016 |
| Overall | 24569 (100) | 15.55 (14.05-17.04) | 15.36 (13.44-17.27) | 15.28 (13.68-16.89) | 17.37 (15.59-19.16) | 17.57 (16.20-18.94) | 2.02 (0.00, 4.05) | 2.09 (-0.31, 4.49) | 0.20 (-2.05, 2.45) |
| Age group, y | | | | | | | | | |
| 20-44 | 9965 (40.56) | 6.80 (5.60-8.01) | 6.47 (5.16-7.78) | 7.42 (5.52-9.32) | 8.03 (6.38-9.68) | 8.86 (7.31-10.42) | 2.06 (0.09, 4.02) | 0.60 (-1.91, 3.12) | 0.84 (-1.43, 3.10) |
| 45-65 | 8601 (35.01) | 17.70 (15.15-20.24) | 17.72 (14.15-21.29) | 16.80 (14.13-19.47) | 21.08 (18.47-23.69) | 19.42 (16.33-22.51) | 1.72 (-2.28, 5.72) | 4.28 (0.54, 8.01) | -1.66 (-5.70, 2.38) |
| > 65 | 6003 (24.43) | 33.67 (31.21-36.13) | 33.42 (29.32-37.51) | 32.43 (28.59-36.28) | 33.92 (29.18-38.67) | 36.22 (32.17-40.26) | 2.54 (-2.19, 7.28) | 1.49 (-4.62, 7.60) | 2.29 (-3.94, 8.53) |
| Sex | | | | | | | | | |
| Female | 12351 (50.27) | 18.54 (16.65-20.42) | 19.46 (16.70-22.21) | 19.17 (16.70-21.64) | 19.96 (17.64-22.27) | 21.52 (19.45-23.59) | 2.98 (0.18, 5.78) | 0.79 (-2.60, 4.18) | 1.56 (-1.54, 4.67) |
| Male | 12218 (49.73) | 12.36 (10.72-13.99) | 10.98 (9.41-12.56) | 11.14 (9.82-12.47) | 14.62 (11.66-17.57) | 13.36 (11.82-14.89) | 1.00 (-1.24, 3.24) | 3.47 (0.23, 6.71) | -1.26 (-4.59, 2.07) |
| Race/ethnicity | | | | | | | | | |
| Mexican American | 3565 (14.5) | 20.42 (17.69-23.15) | 21.53 (18.09-24.96) | 19.30 (16.42-22.18) | 21.03 (19.21-22.86) | 18.51 (15.79-21.23) | -1.90 (-5.76, 1.95) | 1.73 (-1.68, 5.14) | -2.52 (-5.79, 0.76) |
| Non-Hispanic Black | 5298 (21.6) | 27.15 (23.86-30.45) | 25.20 (21.09-29.30) | 26.48 (23.57-29.40) | 27.34 (24.54-30.15) | 27.61 (24.85-30.36) | 0.45 (-3.84, 4.75) | 0.86 (-3.18, 4.91) | 0.27 (-3.67, 4.20) |
| Non-Hispanic White | 9954 (40.5) | 13.09 (11.16-15.01) | 13.53 (11.37-15.69) | 13.24 (11.56-14.91) | 15.67 (13.12-18.22) | 16.30 (14.28-18.33) | 3.22 (0.42, 6.01) | 2.44 (-0.61, 5.48) | 0.63 (-2.62, 3.89) |
| Others ^d | 5752 (23.4) | 15.61 (11.95-19.26) | 15.20 (12.04-18.37) | 15.60 (12.27-18.92) | 16.31 (14.27-18.34) | 16.41 (14.32-18.49) | 0.80 (-3.40, 5.01) | 0.71 (-3.19, 4.61) | 0.10 (-2.81, 3.01) |
| Education level | | | | | | | | | |
| less than high school | 5598 (22.8) | 23.68 (20.55-26.81) | 25.02 (20.32-29.71) | 23.96 (20.65-27.27) | 27.74 (24.18-31.30) | 26.71 (22.78-30.64) | 3.03 (-1.99, 8.06) | 3.78 (-1.08, 8.64) | -1.03 (-6.33, 4.28) |
| High school graduator GED | 5576 (22.7) | 17.94 (14.55-21.33) | 18.36 (13.99-22.73) | 15.57 (12.21-18.93) | 21.61 (19.26-23.95) | 18.82 (15.44-22.19) | 0.88 (-3.9, 5.67) | 6.04 (1.94, 10.13) | -2.79 (-6.90, 1.32) |
| Some college or associated degree | 7496 (30.5) | 13.89 (12.70-15.09) | 13.60 (11.98-15.22) | 16.31 (13.86-18.75) | 17.02 (15.01-19.02) | 18.94 (16.76-21.12) | 5.05 (2.57, 7.54) | 0.71 (-2.45, 3.87) | 1.93 (-1.03, 4.89) |
| College graduate or above | 5908 (24.0) | 9.82 (7.51-12.12) | 9.59 (7.91-11.27) | 9.68 (8.32-11.04) | 10.38 (7.41-13.35) | 12.02 (9.39-14.66) | 2.21 (-1.29, 5.71) | 0.70 (-2.57, 3.97) | 1.65 (-2.32, 5.62) |

Table 1 continued: Estimated prevalence of overactive bladder among US adults (≥ 20 years) by sociodemographic factors, from 2009 to 2018 NHANES.

| Characteristic | Participants, N (%) | Weight prevalence, % (95% CI) ^a (N = 3,290) ^b | | | | Difference in Prevalence, % (95% CI) | | | | |
|--------------------------------|------------------------|---|-------------------------|-------------------------|-------------------------|--------------------------------------|-----------------------------|---------------------------|---------------------------|---------------------------|
| | | 2009-2010 (n = 5235) | 2011-2012 (n = 4624) | 2013-2014 (n = 5020) | 2015-2016 (n = 4879) | 2017-2018 (n = 4811) | P for Trend ^c | 2017-2018 vs 2009-2010 | 2015-2016 vs 2013-2014 | 2017-2018 vs 2015-2016 |
| Family PIR ^e | | | | | | | | | | |
| Low income (< 1.30) | 7946 (32.34) | 22.40 (18.99- 25.82) | 23.77 (20.92- 26.63) | 22.73 (20.48- 24.99) | 25.68 (22.84- 28.52) | 26.01 (22.51- 29.52) | 0.118 | 3.61 (-1.29, 8.51) | 2.95 (-0.68, 6.57) | 0.33 (-4.18, 4.85) |
| Middle income (1.30-3.49) | 9323 (37.95) | 16.80 (14.82- 18.77) | 16.84 (13.87- 19.81) | 16.92 (14.06- 19.77) | 18.30 (15.62- 20.97) | 17.90 (16.41- 19.39) | 0.231 | 1.10 (-1.37, 3.58) | 1.38 (-2.53, 5.29) | -0.40 (-3.46, 2.66) |
| High income (≥ 3.50) | 7300 (29.71) | 11.23 (8.86- 13.61) | 9.31 (7.48- 11.14) | 9.70 (8.12- 11.29) | 12.74 (10.09- 15.39) | 13.71 (11.45- 15.96) | 0.027 | 2.47 (-0.80, 5.74) | 3.04 (-0.05, 6.13) | 0.97 (-2.51, 4.44) |

Note: ^a The values for percentage (95% CI) are weighted using National Health and Nutrition Examination Survey sample weights to be nationally representative and standardized to the overall sample-weighted age distribution. ^b The numbers of the unweighted population. ^c P values for trend from 2009 to 2018 are age-adjusted. ^d "Others" include Asian, other Hispanic, Alaskan Native, and multiracial individuals. ^e Family PIR is an index for the ratio of family income to poverty, using poverty guidelines from the Department of Health and Human Services. Abbreviations: Family PIR: Family income-to-poverty ratio; GED: General Educational Development. Source: National Health and Nutrition Examination Survey.

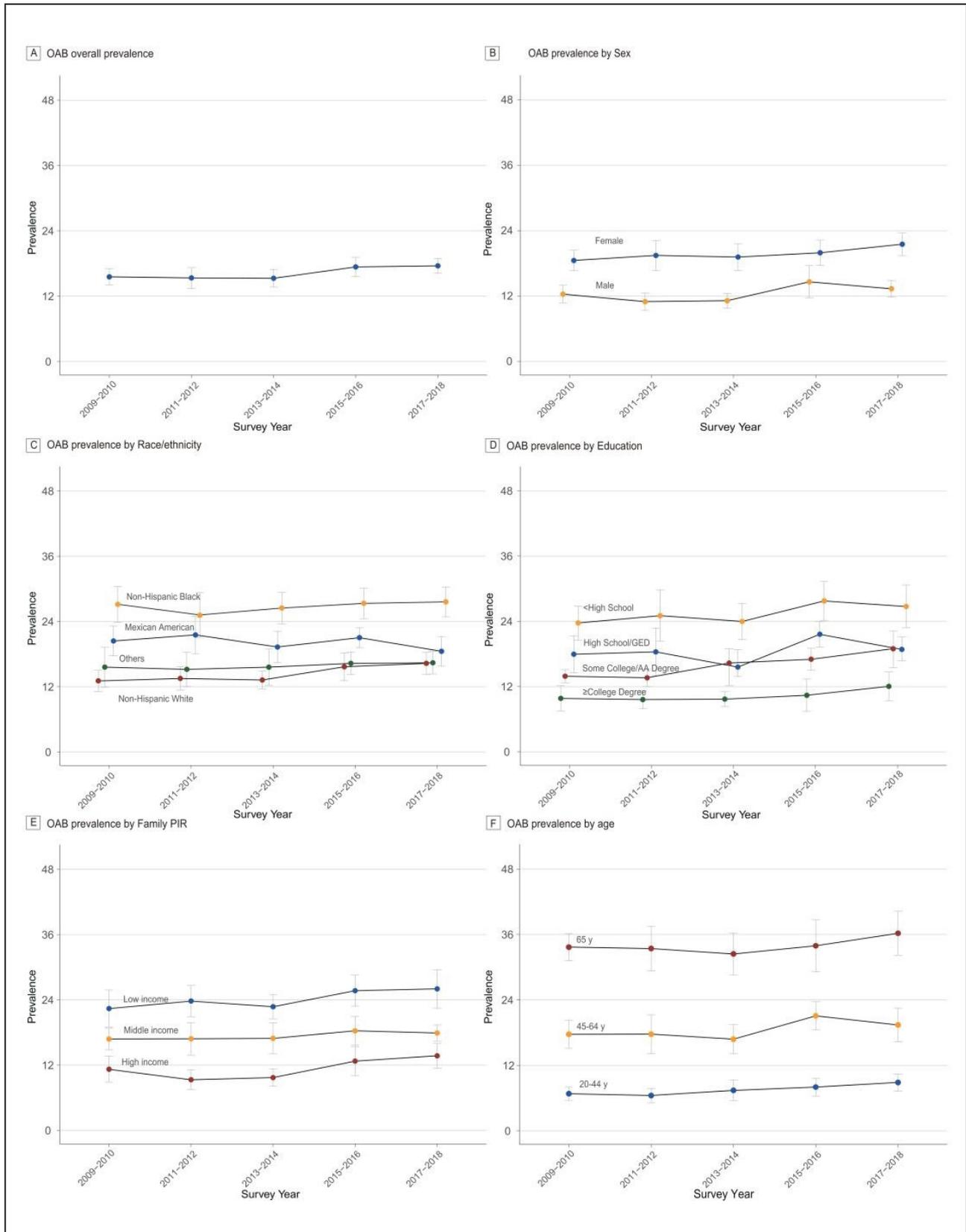


Figure 1. Trends in estimated prevalence of OAB among U.S. adults according to sex group, race/ethnicity, education level, family PIR and age group, 2009–2018. (A) Prevalence overall; (B) Prevalence by sex; (C) Prevalence by race/ethnicity; (D) Prevalence by education level; (E) Prevalence by family PIR; (F) Prevalence by age. All prevalences were standardized by age. “Others” in race/ethnicity include Asian, other Hispanic, Alaskan Native, and multiracial individuals. Family income level was classified using the family PIR < 1.30 (low income), 1.30 to 3.49 (middle income), and ≥ 3.50 (high income). Error bars denote 95% confidence intervals. Abbreviations: OAB: overactive bladder; Family PIR: Family income-to-poverty ratio; GED: General Educational Development.

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