# Correlates of health care use among White and minority men and women with diabetes: An NHANES study

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## ARTICLE INFO

## ABSTRACT

*Aims:* The current study sought to identify patient-level factors related to health care use among White and minority men and women with diabetes.
*Methods:* A sample of 447 of non-pregnant individuals with diabetes, ages 18–64, was drawn from the 2015–2016 National Health and Nutrition Examination Surveys dataset. Poisson regression models tested associations between health care use and self-rated health, depression, medical comorbidities, body mass index, marital status, number of children, income, insurance coverage, and age, stratified by gender and racial/ethnic minority status.
*Results:* Poorer self-rated health was the only significant correlate of increased health care use among White men with diabetes whereas income and insurance were significant correlates of increased use among minority men. Among White and minority women, higher levels of depression and being single were correlated with greater health care use. Comorbid medical conditions and insurance coverage were also related to use among minority women.
*Conclusions:* Among individuals with diabetes, health care use among White men appeared to be driven by subjective health whereas financial factors were critical among minority men. Family structure and mental health were instrumentally associated with health care use among all women. These factors can be targeted to promote equitable access to care.

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## 1. Introduction

More frequent outpatient medical visits can promote improved diabetes control [1,2]. Nevertheless, rates of health care use among individuals with diabetes are variable, particularly across gender and racial/ethnic groups. Among individuals with poor glycemic control, men use less general and specialty medical care than women [3]. More generally, individuals with racial/ethnic minority backgrounds have been observed to use more health care than their White counterparts [4]. The specific factors that drive health care use within gender and racial/ethnic may help to explain such disparities in health care use and can inform efforts to ensure equitable access to care across all individuals with diabetes.

Several factors can serve as barriers and/or facilitators toward one's health care use. Andersen and Newman's [5] framework organizes patient-level determinants of health care use within three categories: need/illness factors,

enabling factors, and predisposing factors. Several need/illness factors have emerged in the literature on diabetes and chronic medical conditions to be associated with health care use: self-rated health [6], depression [7–9], medical comorbidities [9,10], body mass index [11] (BMI). Enabling factors including insurance coverage [12] and income [2,13], are also associated with greater health care use. The predisposing factor of age is positively related to health care use [14]. Family context, another predisposing factor, has been found to be related to diabetes self-management [15], but has been largely understudied as a correlate of health care use among adults with diabetes. A review of studies of individuals with chronic medical conditions revealed mixed findings regarding marital status [16]. Cox et al. [17] evaluated determinants of health care use among Vietnamese, Portuguese, and Hispanic individuals with chronic medical conditions and found that marital status was *positively* associated with more frequent outpatient medical visits among Portuguese participants, *negatively* associated with visits among Hispanic participants, and *not* associated with visits among Vietnamese participants. However, individuals with diabetes were only marginally represented in these study sample (18%, 12%, and 9%, respectively). Lack of research on whether marriage and parenthood are associated with health care use among men and women with diabetes leave unanswered questions on whether the familial context may uniquely influence health care use and/or explain gender and racial/ethnic disparities.

### 1.1. The current study

The current study sought to identify key correlates of health care use among people with diabetes based on gender and race/ethnicity. Based on the Andersen model [5] we investigated self-rated health, depression, medical comorbidities, body mass index (BMI), number of children in the home, income, insurance coverage, marital/cohabiting status, and age as determinants of health care use, stratified by gender and race/ethnicity. We hypothesized that self-rated health, depression, income, and insurance coverage would be significantly associated with health care use within all 4 subgroups, with differential associations across the other factors. Although consistent health care use may represent routine and preventive services, which are critical to effective diabetes management, frequent use may also be indicative of fragmented services or poor quality of care. Nevertheless, examining the patient-level factors associated with health care use among individuals with diabetes is an important step toward developing specific outreach efforts to people with diabetes based on gender and race/ethnicity, which can help close the gap in health care use and promote equitable access among those in need.

## 2. Material and methods

### 2.1. Data

The current study used 2015–2016 dataset from the National Health and Nutrition Examination Surveys (NHANES). NHANES is sponsored by the National Center for Health Statistics of the Centers for Disease Control and Prevention (CDC). The sample is nationally representative of the US civilian population that was selected using a complex, stratified, multistage probability cluster sampling design [18]. All study data were collected at a single time point and the majority of study measures were collected via self-report. However, body mass index (BMI) was calculated based on weight and height measures that were captured via examination by highly trained medical personnel.

### 2.2. Sample

The current study sample consisted of 447 participants from the 2015–2016 NHANES dataset that met the following inclusion criteria: (1) diagnosed with diabetes, (2) between the ages of 18 and 64 years old, and (3) not pregnant at the time of data collection. Diabetes diagnosis was determined based on participant self-report on the following item: "Have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?" The age criterion was intended to exclude children, who are not primarily responsible for their own health care use, and individuals ages 65 and over, based on prior evidence suggesting discrepant patterns in health care use among these individuals related to Medicare coverage [19]. Pregnant individuals were also excluded due to gender-specific and time-limited health care needs and recommendations related to their pregnancy status.

## 3. Measures

See Table 1 for means and standard deviations of all study measures by group.

Gender. Each participant's gender was measured via self-report on the NHANES demographics survey.

Race/ethnicity. Each participant's self-identified race/ethnicity was measured via self-report. For the current study, response options were used to stratify people as having a racial/ethnic identification of either White (non-Hispanic white) or minority (includes Hispanic, Black, Asian, other race/ethnicity, and multiracial).

Health care use. Participants were asked "During the past 12 months, how many times have you seen a doctor or other health care professional about your health at a doctor's office, clinic or some other place?" This item excluded overnight hospitalizations, visits to emergency rooms, home visits, and telephone calls. 0 (none), 1 (1), 2 (2–3), 3 (4–5), 4 (6–7), 5 (8–9), 6 (10–12), 7 (13–15), and 8 (16 or more). Previous studies have found concordance rates between self-report and administrative data that range from 76% (among individuals in the general population) [20], to 30% (among participants of a weight management program) [21], to 88% (among individuals with chronic medical conditions) [22]. Although more objective measures of health care use are more methodologically sound, self-report has been deemed a validated approach when administrative data are unavailable [21], as in the current study.

| Table 1 – Descriptive statistics of study variables within full and subsamples. | | | | |
|---|---|---|---|---|
| Sample | White men | Minority men | White women | Minority women |
| N | 53 | 178 | 35 | 181 |
| **Mean (sd)** | | | | |
| Self-rated health | 2.99 (0.96) | 3.52 (0.90) | 3.33 (0.92) | 3.62 (0.90) |
| Depression | 3.94 (5.90) | 3.23 (4.35) | 6.50 (6.57) | 5.04 (5.27) |
| Comorbidities | 2.43 (1.68) | 1.50 (1.37) | 3.22 (2.06) | 1.98 (1.63) |
| BMI | 33.11 (7.28) | 31.71 (7.86) | 36.00 (9.02) | 35.54 (8.88) |
| Children in home | 0.24 (0.62) | 0.93 (1.34) | 0.52 (0.72) | 1.06 (1.25) |
| Income | 1.61 (0.77) | 1.12 (0.93) | 1.34 (0.92) | 1.03 (0.92) |
| Age | 52.95 (10.34) | 50.30 (10.27) | 52.48 (10.23) | 48.46 (10.94) |
| **%** | | | | |
| Marital status | 55.6% | 74.0% | 74.7% | 56.2% |
| Insurance | 95.3% | 80.6% | 96.5% | 79.3% |

Self-rated health. Participants were asked, "Would you say your health in general is…" with response options ranging from 1 (excellent) to 5 (poor), such that higher values on this measure indicated relatively poorer self-rated health.

Depression. The Patient Health Questionnaire [23,24], a 9-item depression screening, was used to measure the frequency of participants' depression symptoms over the past 2 weeks. Response categories for the nine-item instrument "not at all," "several days," "more than half the days," and "nearly every day" were given a point ranging from 0 to 3, all of which were summed into a composite score that ranged from 0 to 30 with higher scores indicating more severe depression. A continuous score on this measure has been found to correlate highly with the number of major depressive episode symptoms [25], which allowed us to represent depression along a continuum (rather than using a cutoff).

Comorbidities. Participants were asked, "have you ever been told by a doctor or health professional that you have…?" for the following comorbidities: asthma, overweight, arthritis, congestive heart failure, coronary heart disease, angina, heart attack, stroke, emphysema, thyroid problem, chronic bronchitis, any liver condition, chronic obstructive pulmonary disease, and cancer/malignancy. Responses for each item were coded into 0 (no) and 1 (yes) and a sum score (range: 0, 14) was generated to reflect a total count of comorbidities.

Body mass index (BMI). Examination results provided objective measures of weight and height, which were used to calculate BMI (body weight in kilograms divided by the square of the body height in meters) for each participant.

Marital status. Participants self-reported on their marital status, and the response were coded into a binary variable in which 0 represents widowed, divorced, separated, or never married and 1 represents married or living with a partner.

Number of children. Participants self-reported on the number of young children (ages 5 and younger) and older children (ages 6–17) in the household. Response options for younger children ranged from 0 (none) to 3 (3 or more) and response options for older children ranged from 0 (none) to 4 (4 or more). The ceilings created to avoid disclosure concerns among participants. These two items were summed to create a summary score for the total number of children in the home.

Income. An income to poverty ratio was used to represent participant's incomes. We used the NHANES variable based on commonly used ratio groups: 0 representing ≤130% of the federal poverty line; 2) >130% and ≤185% of the federal poverty line; and 3) >185% of the federal poverty line.

Insurance. Participants self-reported whether they were currently covered by health insurance (0 = no, 1 = yes).

Age. Participant age in years was measured through self-reported.

## 4. Analyses

We created a regression model in which self-rated health, depression, comorbidities, BMI, marital status, number of children in the home, income, insurance coverage, and age were all simultaneously regressed on health care use in order to test the unique associations between each of these factors and health care use while adjusting for all other factors. This regression model was run separately within each of our four subsamples: White men, minority men, White women, and minority women. MEC sample weights were used to account for the complex survey design of the NHANES study [18]. All analyses were conducted in 2018 using Mplus statistical software [26], which uses Full Information Maximum Likelihood to account for missing data, allowing us to retain the full sample in all analyses.

## 5. Results

Our full sample of individuals with diabetes was 46% female and 50% White with a mean age of 51.1 years. Approximately 65% were married/cohabiting and the average number of comorbidities was 2.25. See Table 2 for full results of regression analyses described below.

White men. Poorer self-rated health was associated with greater health care use ($\beta = 0.80$, $p = .04$). No other determinants were significant among White men.

Minority men. Higher income ($\beta = -0.37$, $p < .01$) and not having insurance coverage ($\beta = 0.80$, $p < .01$) were both associated with less health care use among minority men.

White women. Fewer comorbidities ($\beta = 0.58$, $p = .03$) and being married/cohabiting ($\beta = -0.67$, $p < .01$) were associated with less health care use among White women.

Minority women. Less comorbidities ($\beta = 0.54$, $p < .01$) and being married/cohabiting ($\beta = -0.26$, $p < .05$) were associated with less health care use among minority women as well. In

**Table 2 – Standardized regression coefficients and p-values for health care use among White and minority men and women with diabetes.**

|  | White men | Minority men | White women | Minority women |
|---|---|---|---|---|
| Self-rated health | 0.80* (0.04) | 0.22 (0.18) | −0.10 (0.73) | 0.28 (0.05) |
| Depression | −0.32 (0.39) | 0.20 (0.09) | 0.48 (0.10) | 0.26* (0.02) |
| Comorbidities | 0.47 (0.07) | 0.22 (0.07) | 0.58* (0.03) | 0.54* (<0.01) |
| BMI | −0.10 (0.77) | −0.20 (0.07) | −0.24 (0.35) | −0.15 (0.17) |
| Marital status | −0.19 (0.47) | −0.03 (0.84) | −0.67* (<0.01) | −0.26* (<0.05) |
| Children in home | 0.05 (0.82) | −0.22 (0.06) | 0.12 (0.79) | 0.21 (0.21) |
| Income | −0.26 (0.22) | −0.37* (<0.01) | 0.38 (0.27) | 0.11 (0.47) |
| Insurance | 0.22 (0.42) | 0.80* (<0.01) | −0.26 (0.24) | 0.62* (<0.01) |
| Age | −0.04 (0.89) | 0.09 (0.56) | −0.12 (0.68) | −0.19 (0.25) |

Note.
* $p < .05$.

addition, less depression ($\beta = 0.26$, $p = .02$) and not having insurance coverage ($\beta = 0.62$, $p < .01$) were also associated with less health care use in this group.

## 6. Discussion

Our study identified specific patterns of determinants of health care use among people with diabetes based on gender and racial/ethnic background. We found that poorer self-rated health was the only significant correlate of health care use among White men with diabetes, whereas lower income and having insurance coverage were significantly associated with greater health care use among minority men with diabetes. Among White women with diabetes, more medical comorbidities and being single were related to greater health care use. Both of these factors, in addition to more severe depression and being single, were also significantly associated with more frequent health care use among minority women with diabetes. These patterns suggest that key barriers and facilitators to receiving health care may vary by gender and racial/ethnic minority status and that outreach efforts to promote health care use among individuals with diabetes should be tailored accordingly.

Interestingly, poorer self-rated health was the only factor that significantly related to health care use among White men with diabetes. While self-rated health has been previously found to predict health care use across genders,[27] our findings suggest that is especially critical among White males with diabetes. Although limited statistical power due to small sample size may have allowed otherwise significant determinants to go undetected in this subsample, our findings suggest that White men's health care use is not driven by predisposing, enabling factors, or even objective measures of need (e.g., depression, comorbidities, BMI), but *perceived* need. The lack of associations between health care use and income and insurance coverage suggest that financial and logistical barriers are not major barriers in this group.

Among minority men with diabetes, lower income and insurance coverage were the only correlates of more frequent health care use. This pattern of findings suggests that health status as well as mental and medical comorbidities were unrelated to health care use once these two financial constructs were accounted for. Although higher income may be

expected to be associated with greater health care use among minority men with diabetes, due to greater access to care, our findings revealed the inverse association. One possible explanation could be that lower income may be a marker for increased health care needs among minority men with diabetes. For instance, individuals with financial constraints that preclude their diabetes medication use are at risk for poorer functioning, more symptoms, and higher hemoglobin A1c [28], which may lead to increased medical appointments. However, this explanation may be unlikely given that the association between income and health care use was found after adjusting for self-rated health. An alternative explanation could be that lower income is associated with less efficient and lower quality care, which may enhance the need for more frequent outpatient visits among minority men with diabetes. In general, individuals from lower socioeconomic groups have been found to experience longer wait times and fewer referrals for specialist care compared to individuals from higher socioeconomic groups [29,30]. Further research is needed to determine the extent to which socioeconomic status reflects an increased health care need and/or is associated with poorer quality care. Understanding this link has important implications for providing equitable care and can better tailor interventions to meet the specific needs of low-income minority men with diabetes. Such efforts could build upon previous health care interventions that target racial/ethnic minorities with diabetes that have been empirically supported to improve health outcomes, such as diabetes control and reduced diabetes complications, and possibly reduced health disparities in quality of care [31].

Regarding insurance coverage being associated with more frequent health care use among minority men with diabetes, this finding is particularly important given the context of the current sample. Specifically, the racial/ethnic minorities in the current sample had well over 10% lower rates of insurance coverage than their White counterparts and builds upon prior evidence that insurance coverage is the primary contributor to racial/ethnic disparities in access to care [32].

Two factors were significantly associated with greater health care use among both White and minority women with diabetes: number of medical comorbidities and marital status. Regarding medical comorbidities, it seems appropriate that more medical comorbidities enhances need for health

care, which would lead to greater use. Interestingly, this same association was not found among men. In addition, our results indicate that both White and minority women with diabetes who are married/cohabiting use less health care than their unmarried/non-cohabiting counterparts, while adjusting for all other factors, is unique contribution to the diabetes literature. One possible explanation for this finding is that marriage may serve as a protective factor among women with diabetes, which may lead to less health care needs among these women compared to their single counterparts. Previous studies have found that marital status is associated with better health among patient with diabetes [33] and that cohabiting with a partner is associated with better overall well-being and lower diabetes distress [34]. However, it is also possible that married women with diabetes experience greater barriers to health care use, such as domestic responsibilities, in which case outreach to these individuals may be necessary to facilitate increased care.

Depression has been established as a key driver of health care use [16,35–37]. However, some findings indicate that depression is primarily associated with problems in patient-initiated behaviors, including medication adherence, diet, and exercise, among individuals with diabetes but not with receipt of preventive services [38]. We found that among minority women with diabetes, depression was the only significant correlate of health care use. This finding is particularly concerning given that minority individuals are less likely than white individuals to obtain depression treatment [39], and also less likely to receive appropriate treatment when such services are obtained [40,41]. Recommendations set forth by the American Diabetes Association (ADA) to incorporate mental health screenings and services within diabetes care models [42] can be instrumental in identifying and meeting the mental health needs among these women. Such integrated models are particularly critical given that two thirds of primary care physicians report that they are unable to connect their patients with outpatient mental health services [43].

Lastly, for minority women (similar to minority men) with diabetes, insurance coverage was a significant correlate of health care use. As mentioned above, this finding suggests that this coverage is a critical aspect of access for people with ethnic/racial minority status, though it may not be for White people. Assessing and addressing these issues as part of diabetes care could improve access to and equity of care.

The current study design was observational and cross-sectional, which limited our ability to draw causal conclusions. The small size of the subsamples, particularly among White men and women, limited our statistical power to detect effects. The primary construct of interest, health care use, was limited by a reliance on single self-report item. While some research suggests that biases in self-report are generally unrelated to demographic characteristics [22], other evidence suggests that biases are associated with gender, BMI, and age [21]. These variables were either used for stratification or included as covariates in the current study, which helps to adjust for such potential biases. Future research would benefit from using more objective and multidimen-

sional measures of health care use. Additionally, our measure captured any outpatient health care use, limiting our ability to determine the extent to which the results apply to diabetes-specific care. Due to limited group subsample sizes, our study collapsed widely heterogeneous racial/ethnic minority groups, which likely have differences in determinants of health care use.

## 7. Conclusion

Diabetes is a complex medical condition that requires active disease management by both patients and providers. The current findings highlight several correlates of health care use among individual with diabetes. Perceptions of overall health emerged as an important correlate among White men whereas factors related to access were most pertinent among minority men. Factors related to access were also significant among minority women, while depression and being single were associated with more health care use among both White and minority women. These factors can serve as indicators of risk for underutilization among individuals with diabetes and be used to improve outreach efforts, particularly within vulnerable groups. Further, integration of the current results with empirical findings about the provider-, system-, and societal-level factors that also relate to health care use among individuals with diabetes can pave the way for more equitable, comprehensive, and high-quality care among individuals across racial/ethnic and gender groups.

## 8. Data statement

All data are available online at: https://wwwn.cdc.gov/nchs/nhanes/search/datapage.aspx?Component=Questionnaire&CycleBeginYear=2015.

## Conflict of interest

## Funding

## Author contributions

JW conceived study idea, conducted analyses, and wrote manuscript. JB assisted in conceptualization, and editing of manuscript. KH contributed toward editing of manuscript. All authors were involved in writing the paper and had final approval of the submitted version.

## Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.diabres.2019.03.001.

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