Health-Related Behaviors and Health Insurance Status among US Adults: Findings from the 2017 Behavioral Risk Factor Surveillance System

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Abstract

Background

Health insurance coverage has increased over time. However, little is known on the associations between health insurance status and adoption of health-related behaviors among US adults.

Methods

The 2017 Behavioral Risk Factor Surveillance System collected data on health insurance coverage in 50 states and the District of Columbia (DC), and on type of insurance in 5 states and DC. We examined four health-related behaviors: no tobacco use, nondrinking or moderate drinking, meeting aerobic physical activity recommendations, and having a healthy body weight. We conducted log-linear regression analyses to assess the associations between health-related behaviors and insurance status, while adjusting for potential confounders. Data analyses were conducted in 2019.

Results

The percentages of adults who reported no tobacco use or meeting physical activity recommendations were significantly higher, and the percentages of adults with a healthy body weight were significantly lower among those who were insured versus uninsured, or among adults with private insurance versus uninsured. Adults with health insurance also had a higher prevalence of reporting all 4 health-related behaviors than those uninsured. These patterns persisted after multivariable adjustment for potential confounders including sociodemographics, routine checkup, and number of chronic diseases. Adults with public insurance were 7% more likely to report no tobacco use than adults who were uninsured. Additionally, adults with private insurance were 8% and 7% more likely to report no tobacco use and meeting physical activity recommendations, respectively, but 10% less likely to report nondrinking or moderate drinking than adults with public insurance.

Conclusions

Significant associations existed between having health insurance coverage and engaging in some health-related behaviors among US adults.

Background

Behavioral risk factors play an important role in the prevention and control of multiple chronic conditions or diseases. Abundant evidence has shown that smoking or tobacco use, excessive drinking (including heavy or binge drinking), sedentary behavior, or obesity are linked to increased risk of adverse health effects, such as heart disease, hypertension, stroke, cancer, or diabetes [1–4]. On the other hand, health-
related behaviors such as nonsmoking, engaging in regular physical activity, or having a healthy body weight are associated with optimal self-rated health [5], improved health-related quality of life [6–9], or reduced overall or cardiovascular mortality risk [1, 10, 11]. For alcohol consumption, although previous studies have indicated that moderate alcohol consumption has protective health benefits (e.g., reducing risk of heart disease), recent studies show this may not be true [12–14]. Whether the improved outcomes in some studies are due to moderate alcohol consumption or other differences in behaviors or genetics between people who drink moderately and people who don’t remains unknown. The 2015–202 Dietary Guidelines for Americans does not recommend that individuals who do not drink alcohol start drinking for any reason; and if alcohol is consumed, it should be in moderation—up to one drink per day for women and up to two drinks per day for men—and only by adults of legal drinking age [15].

Health insurance coverage has been shown to improve access to and affordability of care, which could be critical to managing chronic conditions [16, 17]. Improving access to care may result in increased opportunities for lifestyle counseling through physician-patient interactions [18, 19]. However, little is known on the associations between insurance status and adoption of health-related behaviors. The aim of this study was to examine health-related behaviors and their associations with health insurance status among US adults using population-based surveillance data.

Methods

We analyzed data from the 2017 Behavioral Risk Factor Surveillance System (BRFSS), a state-based, landline- and cellular-telephone survey of noninstitutionalized adults (aged ≥ 18 years) residing in all 50 states, the District of Columbia (DC), and participating US territories. Detailed information on the BRFSS has been described elsewhere [20]. The median response rate was 45.9% (ranging from 30.6% in Illinois to 64.1% in Wyoming) for the 2017 BRFSS.

The four health-related behaviors examined in this study included 1) no tobacco use—defined as currently not smoking and not using chewing tobacco, snuff, snus, e-cigarettes or other electronic vaping products every day or some days; 2) Nondrinkers or moderate drinkers are defined as adults aged 18–20 years who did not drink at all, or adults aged ≥ 21 years who drank no alcohol or drank alcohol in moderation during the past 30 days. Moderate drinking was defined as drinking up to 2 alcoholic drinks a day for men and up to 1 drink a day for women, and not engaging in either binge drinking (5 or more drinks for men and 4 or more drinks for women on one occasion) or heavy drinking (15 or more drinks per week for men and 8 or more drinks per week for women) [21, 22]; 3) participating in at least moderate aerobic physical activity at recommended level—defined as engaging in moderate-intensity aerobic physical activity for ≥ 150 minutes/week, or vigorous-intensity aerobic physical activity for ≥ 75 minutes/week, or an equivalent combination [23], and 4) having a healthy body weight—defined as body mass index (BMI) within 18.5–24.9 kg/m². A composite score for the number of the 4 health-related behaviors was calculated.
For health insurance status (yes/no), data from 50 states and DC were analyzed. For type of insurance, however, data were obtained only from 5 states (Delaware, Florida, New Jersey, Wisconsin, Maine) and DC, and were categorized as 1) private insurance—i.e., employer-based or self-purchased plans, 2) public insurance—i.e., Medicaid, Medicare, TRICARE, VA or Military, Alaska Native, Indian Health Service, Tribal Health Services, or some other source, or 3) uninsured [24]. Because of the Medicare eligibility for adults aged 65 years or older, we analyzed data overall and stratified by age groups 18–64 years and ≥ 65 years as well.

Sociodemographic covariates included age, sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), educational attainment (less than high school graduate, high school graduate/GED, some college, or college graduate and above), marital status (married; previously married—i.e., divorced, widowed, or separated; and never married or living with a partner), and federal poverty level (< 100%, 100–199%, ≥ 200%, and unknown). We also included routine physical checkup within the previous year (yes/no) and the number of chronic conditions/diseases [coronary heart disease, hypertension, stroke, diabetes, arthritis, current asthma, cancer (skin or non-skin cancers), chronic obstructive pulmonary disease (COPD), a history of depression, and any disability] as study covariates.

Statistical analyses

Data analyses for this study were conducted in 2019. Participants who responded “don’t know/not sure,” refused to answer, or had missing responses to any of the above study variates (except for income—the missing income/FPL was treated as an unknown group in regression models) were excluded from analysis. Pregnant women were also excluded. The weighted prevalences with 95% confidence intervals (CIs) of having health-related behaviors were estimated by health insurance status and type of insurance coverage. Adjusted prevalence ratios with 95% CIs were estimated by conducting log-linear regression analyses with robust variance estimator while adjusting for study covariates. SAS-callable SUDAAN software (Research Triangle Institute, NC) was used to account for the multistage, complex sampling design.

Results

For this study, data from 431,409 adults who resided in 50 states and DC were used. Data analysis was conducted in 2019. The basic characteristics of study participants are: mean age 47.5 years, 49.0% men, 63.6% non-Hispanic white, 11.9% non-Hispanic black, 16.0 Hispanic, and 27.4% college graduate or above. Data from 51,647 adults in 5 states and DC were included in analysis by type of insurance.

Most adults (88.0%) reported having health insurance—85% of adults aged 18–64 years and 98% of those aged ≥ 65 years. Having a number of health-related behaviors differed significantly by insurance status (Fig. 1A). The percentages of adults reporting 3 or 4 health-related behaviors were significantly higher among adults with insurance vs. uninsured.
The weighted prevalences of no tobacco use, meeting physical activity recommendations, or having all 4 health-related behaviors were significantly higher among adults who were insured than among adults who were uninsured (P < 0.001 for all, Table 1). After multivariate adjustment for study covariates, insured adults were 9% (P < 0.001), 8% (P < 0.001), and 6% (P < 0.05) more likely to report no tobacco use, meeting physical activity recommendations, or having all 4 health-related behaviors, respectively (Model 2, Table 1). In contrast, insured adults were 6% less likely to report having a healthy body weight than uninsured adults (P < 0.01) after multivariable adjustment. Similar patterns existed among adults aged 18–64 years, except the prevalence of having all 4 health-related behaviors did not differ significantly by health insurance status. Adults aged ≥ 65 years who were insured were 27% (P < 0.01) and 55% (P < 0.01) more likely to report meeting physical activity recommendations or having all 4 health-related behaviors, respectively, compared with those uninsured (Table 1).
Table 1
Prevalences and adjusted prevalence ratios (with 95% CIs) for four health-related behaviors among US adults aged ≥ 18 years in 50 states and DC, by health insurance status, BRFSS 2017

| Health Behavior                                      | n       | % (95% CI) | APRf (95% CI) | Model 1 | Model 2 |
|------------------------------------------------------|---------|------------|---------------|---------|---------|
|                                                      | Insured | Uninsured  | P-value       |         |         |
| Adults aged ≥ 18 years                               |         |            |               |         |         |
| No tobacco useb                                    | 405,691 | 81.6 (81.4–81.9) | 68.6 (67.5–69.6) | <0.001  | 1.10 (1.09–1.12)*** | 1.09 (1.07–1.11)*** |
| Non drinking or moderate drinkingc                  | 401,344 | 63.4 (63.0–63.7) | 64.4 (63.3–65.5) | 0.072   | 0.99 (0.97–1.01) | 0.97 (0.95–1.00) |
| Meeting aerobic physical activity recommendationsd  | 383,697 | 51.7 (51.3–52.0) | 41.4 (40.3–42.6) | <0.001  | 1.08 (1.05–1.11)*** | 1.08 (1.04–1.11)*** |
| Healthy body weight                                | 399,045 | 32.5 (32.2–32.9) | 33.3 (32.2–34.4) | 0.179   | 0.90 (0.87–0.93)*** | 0.94 (0.91–0.98)**  |
| n         | % (95% CI)          | APRf (95% CI)       |
|-----------|---------------------|---------------------|
| **Having all 4 health behaviors** |                     |                     |
| 353, 333  | 9.3 (9.1–9.5)       | 6.8 (6.1–7.4)       | < 0.001             | 1.05 (1.00–1.14)* | 1.06 (1.00–1.17)* |
|           |                     |                     |                     |                     |                     |
| **Adul ts aged 18–64 y ears** |                     |                     |
| No tobacco use | 260, 070           | 79.4 (79.1–79.7)   | 68.0 (67.0–69.1)   | < 0.001             | 1.10 (1.08–1.12)** | 1.09 (1.07–1.11)** |
| Non drinking or moderate drinkingc | 258, 460           | 58.5 (58.1–58.9)   | 63.7 (62.6–64.8)   | < 0.001             | 1.02 (1.00–1.04)** | 0.98 (0.96–1.00)   |
| Meeting aerobic physical activity recommendations | 247, 375           | 51.0 (50.5–51.4)   | 41.6 (40.4–42.7)   | < 0.001             | 1.08 (1.05–1.11)** | 1.08 (1.04–1.11)** |
| Healthy body weight | 256, 786           | 33.0 (32.6–33.4)   | 33.5 (32.4–34.7)   | 0.374               | 0.86 (0.83–0.90)** | 0.93 (0.90–0.97)** |
|                          | n   | % (95% CI)                      | APRf (95% CI)       |
|--------------------------|-----|---------------------------------|---------------------|
| **Having all 4 health behaviors** | 226,001 | 8.3 (8.0−8.5) 6.7 (6.1−7.4) | <0.001 1.01 (0.91–1.12) 1.04 (0.94–1.16) |
| **Adults aged ≥65 years** |     |                                 |                     |
| No tobacco use           | 145,621 | 88.9 (88.5−89.3) 83.3 (79.3−86.6) | 0.002 1.03 (0.98–1.08) 1.02 (0.97–1.07) |
| Non drinking or moderate drinking | 142,884 | 79.5 (79.0−80.0) 84.9 (81.7−87.6) | 0.001 1.01 (0.97–1.04) 1.00 (0.97–1.04) |
| Meeting aerobic physical activity recommendations | 136,322 | 54.0 (53.4−54.7) 36.8 (31.1−43.0) | <0.001 1.23 (1.06–1.43)** 1.27 (1.08–1.49)** |
| Healthy body weight      | 142,259 | 31.0 (30.4−31.6) 28.0 (21.5−35.5) | 0.394 0.99 (0.77−1.29) 1.07 (0.83–1.37) |
Among adults residing in 5 states and DC, 52.2% reported having private insurance, 34.3% had public insurance, and 13.5% were uninsured. The percentages of adults reporting 2, 3, or 4 health-related behaviors were higher among adults with private or public insurance vs. uninsured (Fig. 1B).

Compared with uninsured adults, adults with private insurance were 15% (P < 0.001) and 5% (P < 0.05) more likely to report no tobacco use or meeting physical activity recommendations, respectively, but were 8% (P < 0.01) and 13% (P < 0.01) less likely to report nondrinking or moderate drinking or having a healthy body weight (Table 2). Adults with public insurance were 7% (P < 0.01) more likely to report no tobacco use than uninsured adults. Compared with adults with public insurance, adults with private insurance were 8% (P < 0.001) and 7% (P < 0.05) more likely to report no tobacco use and meeting physical activity recommendations, respectively, but 10% less likely to report nondrinking or moderate drinking (Table 2). Similar patterns were also observed in adults aged 18–64 years, but not in adults aged ≥ 65 years. In contrast, after multiple variable adjustment, the prevalence of having all 4 health-related behaviors among adults aged ≥ 65 years with private insurance was more than twice of that among those uninsured (Table 2).
Table 2
Prevalences and adjusted prevalence ratios (with 95% CIs) for four health-related behaviors among adults aged ≥ 18 years living in 5 states and DC, by type of insurance coverage, BRFSS 2017

| % (95% CI) | APR^g (95% CI) |
|------------|----------------|
|            | Private insurance vs. Uninsured | Public insurance vs. Uninsured | Private vs. Public insurance |
| **Adults aged ≥ 18 years** | | | |
| **No tobacco use** | 85.4 (84.3–86.4) | 80.4 (79.0–81.6) | < 0.001 | 1.15 (1.10–1.20)** | 1.07 (1.02–1.12)* | 1.08 (1.05–1.10)** |
| **No drinking or moderate drinking** | 54.9 (53.5–56.4) | 73.1 (71.7–74.5) | < 0.001 | 0.92 (0.87–0.98)** | 1.02 (0.96–0.99) | 0.90 (0.87–0.94)** |
| % (95% CI)                               | APR (95% CI)     |
|-----------------------------------------|------------------|
|腰围(95% CI)                             | 1.05 (1.00-1.11)*|
|(<0.001)                                 | 0.95 (1.02-1.13)**|
|(<0.001)                                 | 0.87 (0.79-0.97)**|
|(<0.001)                                 | 0.90 (0.89-1.03)  |
|(<0.001)                                 | 1.00 (0.73-1.35)  |
|(<0.001)                                 | 1.03 (0.86-1.23)  |

- **Metabolic aerobic physical activity recommendations**
- **Body weight**
- **Having all 4 health behaviors**

**Adults aged 18-64 years**
| % (95% CI)                     | APR$^g$ (95% CI) |
|--------------------------------|------------------|
| No tobacco use                  | 1.15 (1.10–1.20)** | 1.10 (1.06–1.14)** |
| co use                          |                  |                   |
|                                |                  |                   |
| No drinking or moderate drinking | 0.94 (0.88–1.00)* | 1.00 (0.83–0.93)** |
| drinking                       |                  |                   |
|                                |                  |                   |
| Meeting aerobic physical activity recommendations | 1.05 (1.00-1.13)* | 1.12 (1.04–1.21)** |
|                                |                  |                   |
| Healthy body weight             | 0.85 (0.77–0.95)** | 0.96 (0.87–1.06)   |
|                                |                  |                   |
|                                |                  |                   |

* p < 0.05  ** p < 0.01  *** p < 0.001
| Have all 4 health behaviors | % (95% CI) | APR with 95% CI | (95% CI) |
|-----------------------------|------------|----------------|---------|
|                             | 9.1 (8.2–10.2) | 0.97 (0.70–1.34) | 0.97 (0.70–1.34) |
|                             | 7.1 (5.7–8.7) | 0.079 | 0.97 (0.70–1.34) |

| Adults aged ≥ 65 years | No tobacco use | No drinking or moderate drinking |
|-----------------------|----------------|----------------------------------|
| % (95% CI)            | APR with 95% CI | (95% CI) |
| No tobacco use        | 89.2 (86.8–91.1) | 1.11 (0.95–1.30) | 1.11 (0.95–1.30) |
|                       | 88.0 (86.5–89.4) | 0.135 | 1.11 (0.95–1.30) |
| No drinking or moderate drinking | 75.0 (72.1–77.8) | 1.11 (0.92–1.33) | 1.11 (0.92–1.33) |
|                        | 75.6 (74.0–77.1) | 0.745 | 1.11 (0.92–1.33) |
| % (95% CI)       | APR\(^{g}\) (95% CI) |
|------------------|----------------------|
| Measuring aerobic physical activity recommendations |                        |
| 57.1 (53.4–60.8) | 1.19 (0.82–1.74)     |
| 52.0 (50.0–54.0) | 1.10 (0.95–1.26)     |
| 39.4 (26.2–54.3) | <0.05                |

| Healtbody weight |          | 1.35 (0.78–2.33) | 1.41 (0.80–2.41) | 0.96 (0.86–1.08) |
|------------------|----------|-------------------|------------------|------------------|
| 30.8 (27.7–34.0)| 1.4      | 0.552             | 1.35             | 0.96             |
| 31.4 (29.7–33.2)| 1.4      | 0.552             | 1.35             | 0.96             |
| 24.7 (14.5–38.6)| 0.552    | 1.35 (0.78–2.33) | 1.41 (0.80–2.41) | 0.96             |

| Having all 4 health behaviors |          | 2.29 (1.03–5.06) | 2.10 (0.88–3.20) |
|-------------------------------|----------|------------------|------------------|
| 13.5 (11.2–16.1)             | 2.10     | 0.552            | 1.35             |
| 11.2 (10.1–12.4)             | 2.10     | 0.552            | 1.35             |
| 6.3 (3.2–11.2)               | 2.10     | 0.552            | 1.35             |

\(^{a}\) Data obtained from Delaware, Florida, New Jersey, Wisconsin, and Maine, and the District of Columbia, excluding pregnant women.

\(^{b}\) Defined as currently not smoking and not using chewing tobacco, snuff, snus, e-cigarettes, or other electronic vaping products every day or some days.

\(^{c}\) Defined as adults aged 18–20 years who reported nondrinking, or adults aged ≥ 21 years who drank alcoholic beverages at no more than moderate level (≤ 2 drinks a day for men or ≤ 1 drink a day for women and not engaging in heavy drinking or binge drinking) within the previous 30 days.

\(^{d}\) Defined as engaging in moderate-intensity aerobic physical activity for ≥ 150 minutes/week, or vigorous-intensity aerobic physical activity for ≥ 75 minutes/week, or an equivalent combination.
Included no tobacco use, nondrinking or moderate drinking, meeting aerobic physical activity recommendations, and having a healthy body weight.

Unstable estimates with RSE between 20–30%

APR: Adjusted prevalence ratio. Adjusted for age (except for age-specific group analyses), sex, race/ethnicity, education, federal poverty level, routine checkup and number of chronic conditions (the uninsured group or public insurance group as referents).

Boldface indicates statistical significance, *P < 0.05, **P < 0.01, ***P < 0.001

Discussion

Our results from a large, population-based survey demonstrated that, after controlling for potential confounders, having insurance coverage (versus uninsured) was associated with a significantly higher prevalence of no tobacco use or meeting physical activity recommendations, but was associated with a significantly lower prevalence of having a healthy body weight among US adults overall or adults aged 18–64 years. Having private insurance (versus public insurance or uninsured) was also associated with a significantly higher prevalence of no tobacco use or meeting physical activity recommendations, but a significantly lower prevalence of nondrinking or moderate drinking or having a healthy body weight (versus uninsured only) among all adults or adults aged 18–64 years. Moreover, the prevalence of having all 4 health-related behaviors was significantly higher among US adults overall, especially among older adults, who reported having insurance coverage (private or public insurance) compared to uninsured adults.

To our knowledge, this study is the first to examine the relationships between health insurance status and four health-related behaviors among US adults. Evidence has shown the number of people covered by health insurance has increased over the past 20 more years.\(^{25,26}\) Having health insurance improves access to care\(^{[16, 17]}\) and is associated with a high rate of routine physical checkups in the population\(^{[27]}\). In the present study, we also found the percentage of adults who reported having a routine check-up within the previous year was significantly higher among those with health insurance than those uninsured (74.4% vs. 43.3%, P < 0.001). This may help increase the opportunities for physician counseling to patients about their health-related behaviors\(^{[18, 19]}\). The results of the present study suggest that adults with health insurance were more likely to exhibit positive health-related behaviors (i.e., total number of four health-related behaviors), especially in lower tobacco use and greater physical activity participation. However, we found that adults with health insurance had a lower prevalence of having a healthy body weight compared with those who were uninsured after adjustment for potential confounders. Maintenance of a healthy body weight requires a balance between energy intake and expenditure. In the present study, although we have found that participation in physical activity at the recommended level was greater among adults with insurance, there was no information available
regarding their healthy eating behavior—another modifiable healthy behavior, in the BFRSS. Thus, the underlying reason for the lower percentage of insured adults than uninsured adults with a normal body weight warrants further investigation.

Our group previously reported that US working-aged adults with Medicaid/Medicare or other public insurance were more likely to report having poor/fair health and frequent mental distress compared with adults with employer-based insurance [28]. These results agree with the findings of the present study in that prevalences of health-related behaviors (i.e., no tobacco use or engaging in physical activity at the recommended level) were significantly higher among adults with private insurance than those with public insurance or who were uninsured, independent of sociodemographic characteristics, routine checkup, or coexistence of number of chronic diseases. Younger adults who have Medicare coverage are likely to have permanent disabilities [29] and adults with special or severe medical comorbidities may not be able to work, resulting in low incomes that qualify them for Medicaid [29]. These conditions may have prevented them from engaging in some health-related behaviors, such as physical activity [30], which may partly help explain why adults aged 18–64 years who had public insurance were less likely to report meeting physical activity recommendations than those with private insurance.

Adults aged 65 years or older are eligible for Medicare coverage [29], and about 98% of this subpopulation reported having health insurance in the present study (vs. 85% among adults aged 18–64 years). Nonetheless, we found that the older adults with health insurance were 27% and 55% more likely to report meeting physical activity recommendations or having all 4 health-related behaviors than older adults who were uninsured. Moreover, although we did not observe significant differences in individual health-related behaviors by type of insurance coverage among older adults, our results did show that having private or public insurance was associated with a significantly higher prevalence of reporting all 4 health behaviors in this group. Of note is that data for the analysis by type of insurance coverage were obtained only from 5 states and DC. Moreover, with a very small percentage of uninsured in the older age group (aged ≥ 65 years), it is not too unexpected that no significant differences were found in some outcome measures.

Healthy people 2020 objectives [31] on improving health-related behaviors include: 1) Reducing cigarette smoking to 12%, reducing use of smokeless tobacco products to 0.2%, or reducing use of cigars, cigarillos, or little filtered cigars to 0.3% (TU-1); 2) Reducing the proportion of adults (18 + years) who drank excessively in the previous 30 days to 25.0% (SA-15); 3) Increasing the proportion of adults who engage in aerobic physical activity of at least moderate intensity for at least 150 minutes/week, or 75 minutes/week of vigorous intensity, or an equivalent combination to 47.9% (PA-2.1); and 4) Increasing the proportion of adults who are at a healthy weight to 33.9% (NWS-8). Results of the present study further demonstrate that achieving all 4 health-related behaviors remains a distant target, especially among uninsured adults. This suggests continuing opportunities for use of lifestyle and health-risk behavior interventions through public health programs or physician counseling in the population. Population strategies such as Dietary or Physical Activity Guidelines for Americans [15, 23] can also help improve health-related behaviors in the US population.
There are several limitations for this study. First, BRFSS data are based on self-reports, so results may be subject to recall and social-desirability bias. Second, BRFSS did not collect data on physician visits/counselling on health-related behavioral risk factors; therefore, it is unknown whether the associations between insurance status and engagement in health-related behaviors are mediated through physician-patient interactions or if there may be other unknown factors contributing to the associations. Third, the data on type of insurance coverage were collected only from 5 states and DC, so generalizability of the study results to the US population is limited.

**Conclusion**

This study of a population-based survey demonstrated significant associations between health insurance status or type of insurance coverage and engaging in some health-related behaviors among US adults.

**Declarations**

*Disclaimer:*

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**Ethics approval and consent to participate**

The BRFSS protocol was approved by the Centers for Disease Control and Prevention Institutional Review Board and was determined to be exempt.

**Consent to publish**

Survey participants consented for the data to be used in publications.

**Availability of data and materials**

The data for this study are publicly released by the Centers for Disease Control and Prevention and available at [https://www.cdc.gov/brfss/](https://www.cdc.gov/brfss/).

**Competing Interest**

All authors have no financial support or competing interest to declare.

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None.

**Author Contributions**
GZ, JH, and MT participated in the conceptualization and design of the study, the analysis of the data, drafted the initial version of the manuscript and participated in critical revision of the manuscript. GZ had full access to the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Acquisition of data: GZ. Analysis of data: GZ. Interpretation of data: GZ, JH, MT. Drafting of the manuscript: GZ. Critical revision of the manuscript for important intellectual content: GZ, JH, MT. Study supervisor: MT.

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Figures
Figure 1

A

- Insured
- Uninsured

Number of health-related behaviors

B

- Private
- Public
- Uninsured

Number of health-related behaviors
Weighted percentages with 95% CIs of adults who reported having a number of health-related behaviors by health insurance status from all 50 states and DC (A), or by type of insurance coverage from 5 states and DC (B), among US adults, BRFSS, 2017.