Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

HHS Public Access

Author manuscript

Prev Med. Author manuscript; available in PMC 2024 March 25.

Published in final edited form as:

Prev Med. 2021 July ; 148: 106520. doi:10.1016/j.ypmed.2021.106520.

Health-related behaviors and health insurance status among US adults: Findings from the 2017 behavioral risk factor surveillance system

Guixiang Zhao,

Jason Hsia,

Machell Town*

Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Hwy, MS F-78, Atlanta, GA 30341, United States of America

Abstract

Health insurance coverage has increased overtime in the US. This study examined the associations between health insurance status and adoption of health-related behaviors among US adults. Using data collected through the 2017 Behavioral Risk Factor Surveillance System on health insurance coverage and type of insurance, we examined four health-related behaviors (i.e., no tobacco use, nondrinking or moderate drinking, meeting aerobic physical activity recommendations, and having a healthy body weight) and their associations with health insurance status. We conducted log-linear regression analyses to assess the associations with adjustment for potential confounders. Results showed 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,

*Corresponding author. mpt2@cdc.gov (M. Town).

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.

Credit author statement

Machell Town: Conceptualization; **Guixiang Zhao:** Data curation; **Guixiang Zhao:** Formal analysis; **Machell Town:** Funding acquisition; **Guixiang Zhao, Machell Town:** Investigation; **Guixiang Zhao, Jason Hsia:** Methodology; **Machell Town:** Project administration; **Machell Town:** Resources; **Guixiang Zhao:** Software; **Machell Town:** Supervision; **Guixiang Zhao, Jason Hsia, and Machell Town:** Validation; **Guixiang Zhao:** Visualization; **Guixiang Zhao:** Writing - original draft; **Guixiang Zhao, Jason Hsia, and Machell Town:** Writing - review & editing.

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.

Declaration of Competing Interest

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

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

respectively, but 10% less likely to report nondrinking or moderate drinking than adults with public insurance. In conclusion, we found significant associations existed between having health insurance coverage and engaging in some health-related behaviors among US adults.

Keywords

BRFSS; Health insurance; Health-related behaviors; Uninsured

1. Introduction

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 (Colpani et al., 2018; Fletcher et al., 2018; Lavie et al., 2018; Virtanen et al., 2018). 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 (Tsai et al., 2010), improved health-related quality of life (Bloom et al., 2017; Cohrdes et al., 2018; Emamvirdi et al., 2016; Heikkinen et al., 2008), or reduced overall or cardiovascular mortality risk (Colpani et al., 2018; Ford et al., 2011; Zhao et al., 2014). 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 (Costanzo et al., 2019; Stockwell et al., 2016; GBD 2016 Alcohol Collaborators, 2018). 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 2015–2020 *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 (US Department of Health and Human Services and US Department of Agriculture, 2015).

Health insurance coverage has been shown to improve access to and affordability of care, which could be critical to managing chronic conditions (Hasan et al., 2010; Valdovinos et al., 2020). Improving access to care may result in increased opportunities for lifestyle counseling through physician-patient interactions (Lin et al., 2014; Patnode et al., 2017). 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.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

2. Methods

2.1. Study design and sample

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 (Centers for Disease Control and Prevention, 2020). The median response rate was 45.9% (ranging from 30.6% in Illinois to 64.1% in Wyoming) for the 2017 BRFSS.

2.2. Health-related behaviors and health insurance status

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) (Henley et al., 2014; Liu et al., 2016); 3) participating in at least moderate aerobic physical activity at recommended level—defined as engaging in moderate-intensity aerobic physical activity for ≥150 min/week, or vigorous-intensity aerobic physical activity for ≥75 min/week, or an equivalent combination (U.S. Department of Health and Human Services, 2008), and 4) having a healthy body weight—defined as body mass index (BMI) within 18.5–24.9 kg/m^2. 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 (Centers for Disease Control and Prevention, 2019). 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.

2.3. Study covariates

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 (FPL, <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,

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

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.

2.4. 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. Effect sizes were calculated as changes (percentage points) in adjusted prevalences of health-related behaviors between insured vs. uninsured. SAS-callable SUDAAN software (Research Triangle Institute, NC) was used to account for the multistage, complex sampling design.

3. Results

For this study, data from 431,409 adults who resided in 50 states and DC were used. 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.

3.1. Weighted prevalences of health-related behavers

The weight prevalences of the four health-related behaviors and having all 4 behaviors differed significantly by sociodemographic characteristic (Table 1). Overall, older adults (≥65 years), women, and adults in other racial/ethnic group, attaining education at college and above, and with house income of ≥200% FPL had a higher prevalence of having all 4 health behaviors compared with their respective counterparts in each sociodemographic category.

Adults who had none of chronic diseases had highest prevalences of no tobacco use, having a healthy body weight, and having all 4 health behaviors, whereas adults with ≥3 chronic diseases had lowest prevalences of no tobacco use, meeting physical activity recommendations, having a healthy body weight, and having all 4 health behaviors, but highest prevalence of nondrinking or moderate drinking (Table 1).

Adults with health insurance had significantly higher prevalences of no tobacco use, meeting physical activity recommendations, or having all 4 health-related behaviors than adults who were uninsured (Table 1). Adults who reported having routine checkup visit within the

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

past year had significantly higher prevalences of no tobacco use, nondrinking or moderate drinking, meeting physical activity recommendations, and having all 4 health behaviors but a lower prevalence of having a healthy body weight than those who reported no routine checkup (Table 1).

3.2. Associations between health insurance status and adapting health-related behaviors

After multivariate adjustment for study covariates, insured adults were 9% (APR: 1.09, 95% CI: 1.07–1.11), 8% (APR: 1.08, 95% CI: 1.04–1.11), and 6% (APR: 1.06, 95% CI: 1.00–1.17) more likely to report no tobacco use, meeting physical activity recommendations, or having all 4 health-related behaviors, respectively (Model 2, Table 2). In contrast, insured adults were 6% (APR: 0.94, 95% CI: 0.91–0.98) less likely to report having a healthy body weight than uninsured adults after multivariable adjustment. The effect sizes were: 6.8% (percentage point, $P < 0.001$) for no tobacco use, 3.7% ($P < 0.001$) for meeting physical activity recommendations, −2.0% ($P < 0.01$) for having a healthy body weight, and 2.3% ($P < 0.05$) for having all 4 health behaviors.

Among adults aged 18–64 years, similar patterns existed except the prevalence of having all 4 health-related behaviors did not differ significantly by health insurance status. The effect sizes were: 6.7% (percentage point, $P < 0.001$) for no tobacco use, 3.6% ($P < 0.001$) for meeting physical activity recommendations, and − 2.3% ($P < 0.001$) for having a healthy body weight in this age group.

Adults aged ≥65 years who were insured were 27% (APR: 1.27, 95% CI: 1.08–1.49) and 55% (APR: 1.55, 95% CI: 1.17–2.04) more likely to report meeting physical activity recommendations or having all 4 health-related behaviors, respectively, compared with those uninsured (Table 2). The effect sizes were: 11.6% (percentage point, $P < 0.01$) for meeting physical activity recommendations and 4.6% ($P < 0.01$) for having all 4 health behaviors.

3.3. Associations between type of health insurance and adapting health-related behaviors

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% (APR: 1.15, 95% CI: 1.10–1.20) and 5% (APR: 1.05, 95% CI: 1.00–1.11) more likely to report no tobacco use or meeting physical activity recommendations, respectively, but were 8% (APR: 0.92, 95% CI: 0.87–0.98) and 13% (APR: 0.87, 95% CI: 0.79–0.97) less likely to report nondrinking or moderate drinking or having a healthy body weight (Table 3). Adults with public insurance were 7% (APR: 1.07, 95% CI: 1.02–1.12) more likely to report no tobacco use than uninsured adults. Compared with adults with public insurance, adults with private insurance were 8% (APR: 1.08, 95% CI: 1.05–1.10) and 7% (APR: 1.07, 95% CI: 1.02–1.13) more likely to report no tobacco use and meeting physical activity recommendations, respectively, but 10% (APR: 0.90, 95% CI: 0.87–0.94) less likely to report nondrinking or moderate drinking (Table 3). Similar patterns were also observed in adults aged 18–64 years, but not

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

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 (APR: 2.29, 95% CI: 1.03–5.06) of that among those uninsured (Table 3).

4. 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 (Cohen et al., 2018; Zhao et al., 2017). Having health insurance improves access to care (Hasan et al., 2010; Valdovinos et al., 2020) and is associated with a high rate of routine physical checkups in the population (Fang et al., 2016). 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%, $P < 0.001$, data not shown). This may help increase the opportunities for physician counseling to patients about their health-related behaviors (Lin et al., 2014; Patnode et al., 2017). 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 dietary intake or 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 (Zhao et al., 2018).

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

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 (Altman and Frist, 2015) and adults with special or severe medical comorbidities may not be able to work, resulting in low incomes that qualify them for Medicaid (Altman and Frist, 2015). These conditions may have prevented them from engaging in some health-related behaviors, such as physical activity (Carroll et al., 2014), 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 (Altman and Frist, 2015), 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 (U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2019) 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 min/week, or 75 min/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 (US Department of Health and Human Services, 2008; US Department of Health and Human Services and US Department of Agriculture, 2015) 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/counseling on health-related behavioral risk factors; therefore, it

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

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 causal relationship between health insurance status and engagement in health-related behaviors cannot be inferred because of the cross-sectional study design in the present study. Finally, 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.

5. 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.

Acknowledgments

We would like to thank the survey participants and state BRFSS coordinators for their efforts and time to collect the data.

References

Altman D, Frist WH, 2015. Medicare and Medicaid at 50 years: perspectives of beneficiaries, health care professionals and institutions, and policy makers. JAMA. 314 (4), 384–395. [PubMed: 26219056]

Bloom EL, Minami H, Brown RA, Strong DR, Riebe D, Abrantes AM, 2017. Quality of life after quitting smoking and initiating aerobic exercise. Psychol. Health Med 22 (9), 1127–1135. [PubMed: 28103704]

Carroll DD, Courtney-Long EA, Stevens AC, et al. , 2014. Vital signs: disability and physical activity–United States, 2009–2012. MMWR 63 (18), 407–413. [PubMed: 24807240]

Centers for Disease Control and Prevention, 2019. Statistical Brief on the Health Care Access Module, 2013 and 2014. Available at. http://www.cdc.gov/brfss/data_documentation/pdf/2013-2014_hcs.pdf. Access Dec. 15, 2019.

Centers for Disease Control and Prevention, 2020. Behavioral Risk Factor Surveillance System. Available at. https://www.cdc.gov/brfss/. Access Dec. 15, 2019.

Cohen RA, Terlizzi EP, Martinez ME, May 2019. Health Insurance Coverage: Early Release of Estimates from the National Health Interview Survey, 2018. National Center for Health Statistics. Available from: https://www.cdc.gov/nchs/data/nhis/earlyrelease/insur201905.pdf.

Cohrdes C, Mensink GM, Holling H, 2018. How you live is how you feel? Positive associations between different lifestyle factors, cognitive functioning, and health-related quality of life across adulthood. Qual. Life Res 27 (12), 3281–3292. [PubMed: 30136071]

Colpani V, Baena CP, Jaspers L, van Dijk GM, Farajzadegan Z, Dhana K, Tielemans MJ, Voortman T, Freak-Poli R, Veloso GGV, Chowdhury R, Kavousi M, Muka T, Franco OH, 2018. Lifestyle factors, cardiovascular disease and all-cause mortality in middle-aged and elderly women: a systematic review and meta-analysis. Eur. J. Epidemiol 33 (9), 831–845. [PubMed: 29524110]

Costanzo S, de Gaetano G, Di Castelnuovo A, Djoussé L, Poli A, van Velden DP, 2019. Moderate alcohol consumption and lower total mortality risk: justified doubts or established facts? Nutr. Metab. Cardiovasc. Dis 29 (10), 1003–1008. [PubMed: 31400826]

Emamvirdi R, Hosseinzadeh AN, Colakoglu FF, 2016. Health-related quality of life with regard to smoking, consumption of alcohol, and sports participation. Iran Red Crescent Med J 18 (7), e27919. [PubMed: 27651950]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Fang J, Zhao G, Wang G, Ayala C, Loustalot F, 2016. Insurance status among adults with hypertension-the impact of underinsurance. J. Am. Heart Assoc 5 (12), e004313. [PubMed: 28003253]

Fletcher GF, Landolfo C, Niebauer J, Ozemek C, Arena R, Lavie CJ, 2018. Promoting physical activity and exercise: JACC health promotion series. J. Am. Coll. Cardiol 72 (14), 1622–1639. [PubMed: 30261965]

Ford ES, Zhao G, Tsai J, Li C, 2011. Low-risk lifestyle behaviors and all-cause mortality: findings from the National Health and nutrition examination survey III mortality study. Am. J. Public Health 101 (10), 1922–1929. [PubMed: 21852630]

Alcohol use and burden for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet 392 (10152), 2018, 1015–1035. [PubMed: 30146330]

Hasan O, Orav EJ, Hicks LS, 2010. Insurance status and hospital care for myocardial infarction, stroke, and pneumonia. J. Hosp. Med 5 (8), 452–459. [PubMed: 20540165]

Heikkinen H, Jallinoja P, Saarni SI, Patja K, 2008. The impact of smoking on health-related and overall quality of life: a general population survey in Finland. Nicotine Tob. Res 10 (7), 1199–1207. [PubMed: 18629730]

Henley SJ, Kanny D, Roland KB, Grossman M, Peaker B, Liu Y, Gapstur SM, White MC, Plescia M, 2014. Alcohol control efforts in comprehensive cancer control plans and alcohol use among adults in the USA. Alcohol Alcohol. 49 (6), 661–667. [PubMed: 25313255]

Lavie CJ, Laddu D, Arena R, Ortega FB, Alpert MA, Kushner RF, 2018. Healthy weight and obesity prevention: JACC health promotion series. J. Am. Coll. Cardiol 72 (13), 1506–1531. [PubMed: 30236314]

Lin JS, O'Connor EA, Evans CV, Senger CA, Rowland MG, Groom HC, 2014. U.S. preventive services task force evidence syntheses, formerly systematic evidence reviews. In: Behavioral Counseling to Promote a Healthy Lifestyle for Cardiovascular Disease Prevention in Persons With Cardiovascular Risk Factors: An Updated Systematic Evidence Review for the U.S. Preventive Services Task Force. Agency for Healthcare Research and Quality (US), Rockville (MD).

Liu Y, Croft JB, Wheaton AG, Kanny D, Cunningham TJ, Lu H, Onufrak S, Malarcher AM, Greenlund KJ, Giles WH, 2016. Clustering of five health-related behaviors for chronic disease prevention among adults, United States, 2013. Prev. Chronic Dis 13, E70. [PubMed: 27236381]

Patnode CD, Evans CV, Senger CA, Redmond N, Lin JS, 2017. U.S. preventive services task force evidence syntheses, formerly systematic evidence reviews. In: Behavioral Counseling to Promote a Healthful Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Known Cardiovascular Disease Risk Factors: Updated Systematic Review for the U.S. Preventive Services Task Force. Agency for Healthcare Research and Quality (US), Rockville (MD).

Stockwell T, Zhao J, Panwar S, Roemer A, Naimi T, Chikritzhs T, 2016. Do "moderate" drinkers have reduced mortality risk? A systematic review and meta-analysis of alcohol consumption and all-cause mortality. J. Stud. Alcohol. Drugs 77 (2), 185–198. [PubMed: 26997174]

Tsai J, Ford ES, Li C, Zhao G, Pearson WS, Balluz LS, 2010. Multiple healthy behaviors and optimal self-rated health: findings from the 2007 behavioral risk factor surveillance system survey. Prev. Med 51 (3–4), 268–274. [PubMed: 20647019]

U.S. Department of Health and Human Services, 2008. Physical Activity Guidelines for Americans. USDHHS, Washington, DC, 2008. http://www.health.gov/paguidelines/default/aspx. Access Dec. 15, 2019.

U.S. Department of Health and Human Services and U.S. Department of Agriculture, December 2015. 2015–2020 Dietary Guidelines for Americans, 8th ed. Available at. http://health.gov/dietaryguidelines/2015/guidelines/ Access Feb. 12, 2020.

U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2019. Healthy People 2020. Healthy People 2020 Objectives, Washington, DC. Available at. https://www.healthypeople.gov/2020/topics-objectives/. Access Dec. 15, 2019.

Valdovinos EM, Niedzwiecki MJ, Guo J, Hsia RY, 2020. Effects of Medicaid expansion on access, treatment and outcomes for patients with acute myocardial infarction. PLoS One 15 (4), e0232097.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Virtanen M, Vahtera J, Singh-Manoux A, Elovainio M, Ferrie JE, Kivimaki M, 2018. Unfavorable and favorable changes in modifiable risk factors and incidence of coronary heart disease: the Whitehall II cohort study. Int. J. Cardiol 269, 7–12. [PubMed: 30005835]

Zhao G, Li C, Ford ES, Fulton JE, Carlson SA, Okoro CA, Wen XJ, Balluz LS, 2014. Leisure-time aerobic physical activity, muscle-strengthening activity and mortality risks among US adults: the NHANES linked mortality study. Br. J. Sports Med 48 (3), 244–249. [PubMed: 24096895]

Zhao G, Okoro CA, Dhingra SS, Xu F, Zack M, 2017. Trends of lack of health insurance among US adults aged 18–64 years: findings from the behavioral risk factor surveillance system, 1993–2014. Public Health 146, 108–117. [PubMed: 28404462]

Zhao G, Okoro CA, Hsia J, Town M, 2018. Self-perceived poor/fair health, frequent mental distress, and health insurance status among working-aged US adults. Prev. Chronic Dis 15, E95. [PubMed: 30025217]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

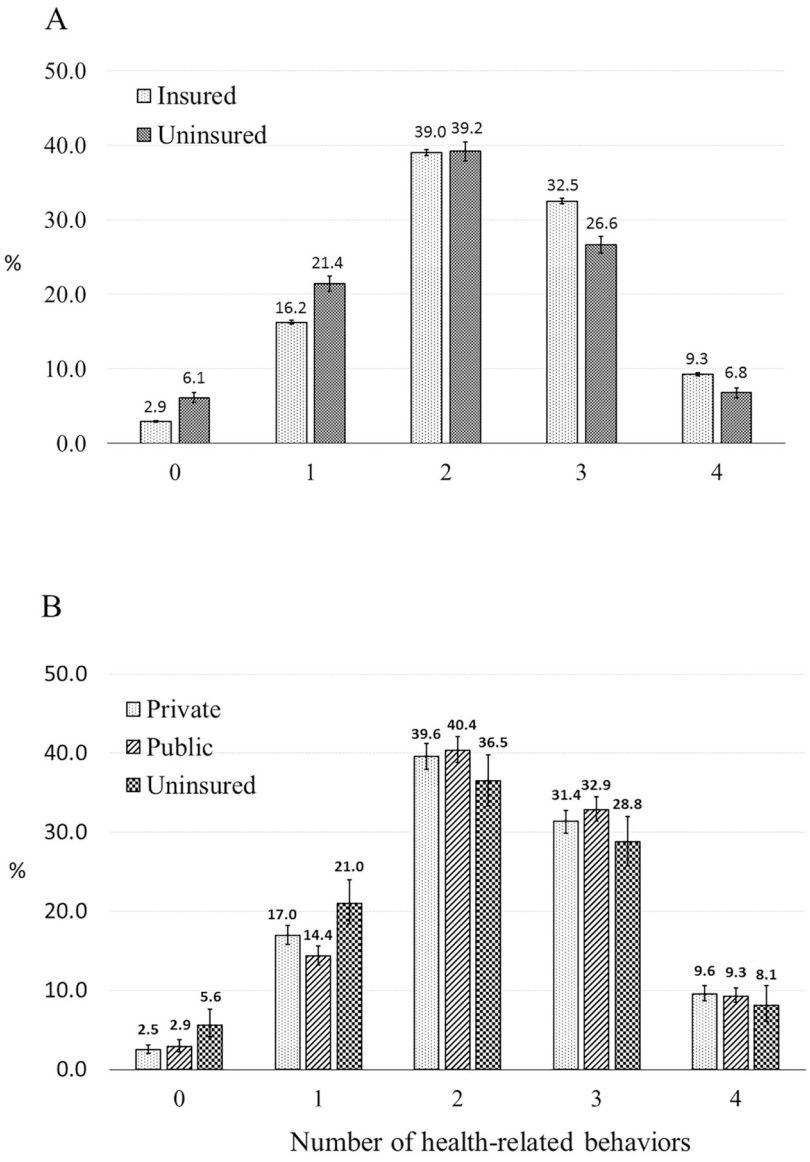

Fig. 1.

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.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Prev Med. Author manuscript; available in PMC 2024 March 25.

Table 1

Weighted prevalences[a] of health-related behaviors among US adults[b], by sociodemographic, health insurance coverage, routine checkup visit, and number of chronic diseases, BRFSS 2017.

	No tobacco use[c]	Nondrinking or moderate drinking[d]	Meeting aerobic physical activity recommendations[e]	Healthy body weight	Having all 4 health behaviors[f]
Overall	80.1 (79.8–80.4)	63.5 (63.2–63.9)	50.5 (50.1–50.8)	32.7 (32.4–33.0)	9.1 (8.9–9.3)
Age (years)					
18–64	77.8 (77.4–78.1)	59.3 (58.9–59.7)	49.6 (49.2–50.0)	33.1 (32.8–33.5)	8.1 (7.9–8.3)
≥65	88.8 (88.4–89.2)	79.7 (79.2–80.1)	53.7 (53.0–54.3)	31.0 (30.4–31.6)	12.6 (12.2–13.1)
Sex					
Men	75.8 (75.3–76.2)	61.0 (60.5–61.5)	51.7 (51.2–52.2)	27.8 (27.3–28.2)	7.4 (7.1–7.7)
Women	84.2 (83.9–84.6)	65.9 (65.5–66.4)	49.3 (48.8–49.8)	37.7 (37.2–38.2)	10.7 (10.4–11.0)
Race/ethnicity					
Non-Hispanic white	78.9 (78.6–79.2)	61.2 (60.8–61.5)	53.1 (52.8–53.5)	33.5 (33.1–33.8)	9.1 (8.9–9.3)
Non-Hispanic black	79.0 (78.2–79.9)	69.2 (68.2–70.2)	43.7 (42.6–44.8)	26.1 (25.2–27.0)	6.7 (6.1–7.4)
Hispanic	84.1 (83.3–84.9)	65.2 (64.1–66.3)	43.9 (42.8–45.1)	27.4 (26.4–28.5)	7.2 (6.5–7.8)
Other	83.3 (82.3–84.3)	71.1 (69.7–72.4)	50.9 (49.3–52.5)	45.1 (43.6–46.7)	15.4 (14.2–16.7)
Education					
<High school diploma	69.1 (68.1–70.1)	76.8 (75.9–77.8)	37.1 (35.9–38.3)	28.0 (26.9–29.1)	5.9 (5.3–6.6)
High school graduate/GED	74.2 (73.7–74.8)	67.7 (67.0–68.3)	46.0 (45.3–46.6)	30.2 (29.6–30.8)	8.0 (7.6–8.4)
Some college	79.9 (79.4–80.4)	61.1 (60.4–61.7)	52.3 (51.6–52.9)	31.7 (31.0–32.3)	8.7 (8.3–9.1)
≥College	91.4 (91.1–91.7)	56.1 (55.5–56.6)	59.0 (58.4–59.5)	38.5 (37.9–39.0)	11.8 (11.5–12.2)
Federal poverty level (%)					
<100	71.4 (70.4–72.4)	72.9 (71.8–73.9)	40.6 (39.4–41.8)	29.1 (28.1–30.2)	6.7 (6.1–7.4)
100–199	74.9 (74.2–75.6)	70.9 (70.1–71.7)	44.9 (44.1–45.8)	30.1 (29.4–30.9)	7.8 (7.3–8.3)
≥200	84.6 (84.2–85.0)	56.9 (56.4–57.4)	56.3 (55.8–56.8)	32.7 (32.2–33.2)	9.7 (9.4–10.0)
Unknown	79.8 (79.3–80.3)	65.8 (65.2–66.4)	48.4 (47.7–49.1)	35.7 (35.0–36.3)	9.8 (9.3–10.2)
Number of chronic diseases					
None	83.2 (82.8–83.7)	58.2 (57.6–58.8)	53.6 (53.0–54.2)	41.4 (40.8–42.0)	11.7 (11.3–12.1)
1	79.6 (79.0–80.1)	59.3 (58.7–60.0)	52.8 (52.1–53.5)	32.3 (31.6–32.9)	8.9 (8.5–9.3)
2	79.0 (78.4–79.6)	67.1 (66.4–67.8)	50.2 (49.4–51.0)	25.4 (24.7–26.1)	6.9 (6.5–7.3)
≥3	76.1 (75.5–76.7)	77.4 (76.8–78.0)	41.9 (41.2–42.6)	20.5 (19.9–21.1)	5.7 (5.3–6.1)

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

	No tobacco use[c]	Nondrinking or moderate drinking[d]	Meeting aerobic physical activity recommendations[e]	Healthy body weight	Having all 4 health behaviors[f]
Health insurance coverage					
Yes	81.6 (81.4–81.9)	63.4 (63.0–63.7)	51.7 (51.3–52.0)	32.5 (32.2–32.9)	9.3 (9.1–9.5)
No	68.6 (67.5–69.6)	64.4 (63.3–65.5)	41.4 (40.3–42.6)	33.3 (32.2–34.4)	6.8 (6.1–7.4)
Routine checkup visit					
Yes	82.7 (82.4–83.0)	66.1 (65.7–66.5)	51.5 (51.1–52.0)	31.1 (30.7–31.5)	9.4 (9.1–9.6)
No	74.2 (73.6–74.7)	56.9 (56.3–57.6)	48.4 (47.7–49.1)	36.3 (35.7–36.9)	8.3 (7.9–8.7)

[a] Presented as % and 95% confidence interval in parenthesis.

[b] Adults residing in 50 states and DC, excluding pregnant women.

[c] Defined as currently not smoking and not using chewing tobacco, snuff, snus, e-cigarettes, or other electronic vaping products every day or some days.

[d] Defined as adults aged 18–20 years who reported nondrinking, or adults aged ≥21 years who drank no alcohol or 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.

[e] Defined as engaging in moderate-intensity aerobic physical activity for ≥150 min/week, or vigorous-intensity aerobic physical activity for ≥75 min/week, or an equivalent combination.

[f] Included no tobacco use, nondrinking or moderate drinking, meeting aerobic physical activity recommendations, and having a healthy body weight.

Prev Med. Author manuscript; available in PMC 2024 March 25.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Prev Med. Author manuscript; available in PMC 2024 March 25.

Table 2

Prevalences and adjusted prevalence ratios (with 95% CIs) for four health-related behaviors among US adults[a] aged ≥18 years in 50 states and DC, by health insurance status, BRFSS 2017.

	n	% (95% CI)			APR[f] (95% CI)	
		Insured	Uninsured	*P*-value	Model 1	Model 2
Adults aged ≥ 18 years						
No tobacco use[b]	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)
Nondrinking or moderate drinking[c]	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 recommendations[d]	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)
Having all 4 health behaviors[e]	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)
Adults aged 18–64 years						
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)
Nondrinking or moderate drinking[c]	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)
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)
Nondrinking or moderate drinking[c]	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)
Having all 4 health behaviors	127,332	12.7 (12.3–13.2)	7.7 (5.9–10.0)	<0.001	1.39 (1.06–1.81)	1.55 (1.17–2.04)

[a] Adults residing in 50 states and DC, 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 no alcohol or 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 min/week, or vigorous-intensity aerobic physical activity for ≥75 min/week, or an equivalent combination.

[e] Included no tobacco use, nondrinking or moderate drinking, meeting aerobic physical activity recommendations, and having a healthy body weight.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

[f] APR: Adjusted prevalence ratio. Model 1: Adjusted for age (except for age-specific group analyses), sex, race/ethnicity, education, and federal poverty level (the uninsured group as a referent). Model 2: Adjusted for variables in model 1 plus routine checkup and number of chronic conditions (the uninsured group as a referent). The 95% CI (for APR) not including 1.00 denotes a statistical significance.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 3

Prevalences and adjusted prevalence ratios (with 95% CIs) for four health-related behaviors among adults[a] aged ≥18 years living in 5 states and DC, by type of insurance coverage, BRFSS 2017.

	% (95% CI)				APR[g] (95% CI)		
	Private insurance	Public insurance	Uninsured	P-value	Private insurance vs. uninsured	Public insurance vs. uninsured	Private vs. public insurance
Adults aged ≥ 18 years							
No tobacco use[b]	85.4 (84.3–86.4)	80.4 (79.0–81.6)	69.4 (66.6–72.1)	<0.001	1.15 (1.10–1.20)	1.07 (1.02–1.12)	1.08 (1.05–1.10)
Nondrinking or moderate drinking[c]	54.9 (53.5–56.4)	73.1 (71.7–74.5)	62.7 (59.7–65.6)	<0.001	0.92 (0.87–0.98)	1.02 (0.96–1.09)	0.90 (0.87–0.94)
Meeting aerobic physical activity recommendations[d]	54.2 (52.7–55.8)	47.9 (46.3–49.5)	44.5 (41.4–47.7)	<0.001	1.05 (1.00–1.11)	0.95 (0.87–1.04)	1.07 (1.02–1.13)
Healthy body weight	34.1 (32.7–35.5)	31.1 (29.7–32.6)	38.3 (35.2–41.6)	<0.001	0.87 (0.79–0.97)	0.91 (0.82–1.02)	0.96 (0.89–1.03)
Having all 4 health behaviors[e]	9.6 (8.7–10.6)	9.3 (8.5–10.3)	8.1 (6.1–10.6)	0.469	1.00 (0.73–1.35)	0.97 (0.71–1.32)	1.03 (0.86–1.23)
Adults aged 18–64 years							
No tobacco use	85.0 (83.8–86.1)	70.9 (68.5–73.2)	69.1 (66.3–71.9)	<0.001	1.15 (1.10–1.20)	1.04 (0.99–1.10)	1.10 (1.06–1.14)
Nondrinking or moderate drinking	52.8 (51.2–54.4)	70.1 (67.6–72.5)	62.4 (59.3–65.3)	<0.001	0.94 (0.88–1.00)	1.06 (1.00–1.14)	0.88 (0.83–0.93)
Meeting aerobic physical activity recommendations	53.9 (52.3–55.6)	42.1 (39.5–44.8)	44.7 (41.5–47.9)	<0.001	1.05 (1.00–1.13)	0.92 (0.84–1.02)	1.12 (1.04–1.21)
Healthy body weight	34.5 (33.0–36.0)	30.8 (28.4–33.2)	38.8 (35.6–42.1)	<0.001	0.85 (0.77–0.95)	0.89 (0.79–1.01)	0.96 (0.87–1.06)
Having all 4 health behaviors	9.1 (8.2–10.2)	7.1 (5.7–8.7)	8.1 (6.1–10.7)	0.079	0.97 (0.70–1.34)	0.94 (0.66–1.33)	1.03 (0.78–1.36)
Adults aged ≥ 65 years							
No tobacco use	89.2 (86.8–91.1)	88.0 (86.5–89.4)	76.8 (62.5–86.8)	0.135	1.11 (0.95–1.30)	1.11 (0.95–1.30)	1.00 (0.97–1.03)
Nondrinking or moderate drinking	75.0 (72.1–77.8)	75.6 (74.0–77.1)	71.0 (56.9–81.9)	0.745	1.11 (0.92–1.33)	1.09 (0.91–1.30)	1.02 (0.98–1.06)
Meeting aerobic physical activity recommendations	57.1 (53.4–60.8)	52.7 (50.8–54.7)	39.4 (26.2–54.3)	<0.05	1.19 (0.82–1.74)	1.17 (0.80–1.69)	1.02 (0.95–1.10)
Healthy body weight	30.8 (27.7–34.0)	31.4 (29.7–33.2)	24.7 (14.5–38.6)[f]	0.552	1.35 (0.78–2.33)	1.41 (0.82–2.41)	0.96 (0.86–1.08)
Having all 4 health behaviors	13.5 (11.2–16.1)	11.2 (10.1–12.4)	6.3 (3.2–11.2)[f]	<0.05	2.29 (1.03–5.06)	2.12 (0.97–4.64)	1.08 (0.88–1.32)

[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 no alcohol or 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.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

[d] Defined as engaging in moderate-intensity aerobic physical activity for ≥150 min/week, or vigorous-intensity aerobic physical activity for ≥75 min/week, or an equivalent combination.

[e] Included no tobacco use, nondrinking or moderate drinking, meeting aerobic physical activity recommendations, and having a healthy body weight.

[f] Unstable estimates with RSE between 20 and 30%.

[g] 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). The 95% CI (for APR) not including 1.00 denotes a statistical significance.