



Health behaviors and related disparities of insured adults with a health care provider in the United States, 2015–2016



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ABSTRACT

Health care providers are in a unique position to address patients' health behaviors and social determinants of health, factors like income and social support that can significantly impact health. There is a need to better understand the risk behaviors of a population that providers may counsel (i.e., those who are insured and have a provider.) Using the 2015 and 2016 CDC's Behavioral Risk Factor Surveillance System, we examine the prevalence of health behaviors and the existence of disparities in health behaviors based on social determinants among American adults. Our sample included noninstitutionalized adults aged 18 to 64 years, in the U.S. ($N > 300,000$). We used multivariate logistic regression analysis to assess the independent effects of income, education, sex, race, and metropolitan status on nine key health behaviors.

Among adults with insurance and a provider ($n > 200,000$): 1) rates of engaging in poor health behaviors ranged from 6.4% (heavy drinking) to 68.1% (being overweight or obese), 2) rural residence, lower income, and lower education were associated with decreased clinical preventive services, 3) lower income and lower education were associated with lifestyle-related risks, and 4) being black was associated with receiving more cancer screenings, no influenza vaccination, inadequate physical activity, and being overweight or obese.

Insured adults, with a provider, are not meeting recommended guidelines for health behaviors. Significant disparities in health behaviors related to social factors exist among this group. Health care providers and organizations may find it helpful to consider these poor health behaviors and disparities when determining strategies to address SDOH.

1. Introduction

In health care, there is an increasing emphasis on addressing the social determinants of health (SDOH), defined by the World Health Organization as, “the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life” in an effort to help lower health risks and improve health outcomes (Danaei et al., 2009; Semahegn et al., 2018). A meta-analysis of nearly 50 studies attributed over one-third of all annual deaths in the U.S. to social determinants of health—factors such as income, education, social supports, and racial segregation (Galea et al., 2011). A starting point for addressing SDOH is with health care providers who are in a unique position to have the attention of and influence over their patients as well as access to SDOH data and oftentimes its integration with patient medical records (Behforouz et al., 2014; Kassler et al., 2015). However, there is a gap in the literature

about the health behaviors of individuals who have health insurance and a health care provider—the very population whose SDOH providers would likely be addressing in an effort to help facilitate their patients engaging in healthier behaviors (Short and Mollborn, 2015).

A variety of factors (e.g., cost, availability, insurance, degree of cultural competence, health literacy) drive gaining access to preventive health services and engaging in health behaviors (U.S. Department of Health and Human Services, 2010). The main strategies offered by public health officials, researchers, and policymakers for improving access usually center around providing insurance and a health care provider (Agency for Healthcare Research and Quality, 2018). Insurance helps remove the cost barrier (America's Health Insurance Plans (AHIP), 2018), as has the passing of the Affordable Care Act (ACA) in 2010 (Kaiser Family Foundation, 2017), and health care providers are charged with making recommendations about clinical preventive services and counseling about lifestyle behaviors (e.g.

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alcohol misuse, obesity prevention) (Chauhan et al., 2017) as outlined by the U.S. Preventive Services Task Force (2018).

We predict that despite having insurance and a health care provider, these U.S. adults will still have poor rates of health behaviors given the many other factors which play a role in such decisions. For example, stress affects individuals across all socioeconomic levels (Kahneman and Deaton, 2010; Luthar, 2003) and is associated with poor health behaviors (Park and Iacocca, 2014; Schneiderman et al., 2005). Additionally, a recent study showed there are deficits in health literacy, a factor associated with health-promoting behaviors (Aaby et al., 2017; Fernandez et al., 2016), even among educated university employees (Karl and McDaniel, 2018). While improving rates of having insurance and a health care provider can help improve health behaviors, we hypothesize that poor rates of health behaviors and disparities in health behaviors based on demographic, socioeconomic, and geographic factors persist among those fortunate enough to have insurance and a health care provider. If we fail to reject this hypothesis, this knowledge may motivate health systems and providers to help intervene on the health behaviors of their patients as well as target vulnerable groups who are likely to have worse health behaviors.

Both the passage of the ACA and the shift from a fee-for-service payment structure to value-based health care prioritize delivering high-quality care that prevents disease and maintains long-term health (DeVoe et al., 2016). Greater incentives now exist for health care providers to consider the SDOH of their patients and intervene on their own or through partnerships with community health agencies or other health care providers. More health systems are implementing integrated care models (Antonuzzo et al., 2017; Araujo de Carvalho et al., 2017; Borgermans et al., 2017) and complex care management (Hong et al., 2014) both of which are health care models where teams of providers work together to address the various physical, mental, and social needs of their patients. Research shows that health care providers can help address their patients' SDOH when armed with education about SDOH and strategies for taking positive action (Naz et al., 2016; Page-Reeves et al., 2016).

While this paper focuses on the prevalence and disparities in health behaviors among a population likely intervened upon by providers—those with insurance and a provider—, we first present the context for their health behaviors by comparing them to all Americans and to the other subgroups with differing status regarding having insurance and a health care provider. The spotlight is on poor health behaviors because they account for a significant proportion of disease, premature deaths, and health care costs for Americans (Centers for Disease Control and Prevention; Danaei et al., 2009; Mokdad et al., 2004). The prevalence of poor health behaviors such as smoking, inadequate physical activity, and heavy drinking, as well as not receiving recommended clinical preventive services such as mammograms and influenza vaccinations is very high in the U.S. (Fox and Shaw, 2015; Mokdad et al., 2004), and does persist among employed and insured American adults (Hughes et al., 2010). Furthermore, it is well documented that disparities in health behaviors related to socioeconomic status (SES) and race/ethnicity exist among Americans (Adler and Newman, 2002; Fox and Shaw, 2015; Pampel et al., 2010; Williams and Wyatt, 2015). For example, Fox and Shaw's analysis of National Health Interview Survey data highlights disparities in health behaviors based on SES among American adults (Fox and Shaw, 2015). We examine such disparities among those Americans with health insurance and a health care provider to better inform health systems and providers who address SDOH by developing programs, targeting subgroups, and providing counseling for this population.

2. Methods

2.1. Study design and sample

This study utilized a cross-sectional study design with data from the

2015–2016 BRFSS. The BRFSS is a continuous, random-digit-dialed telephone survey of U.S. resident civilian noninstitutionalized adults aged 18 years or older that collects data about health conditions, life-style-related risks, and clinical preventive services utilization. Interviewers tell those individuals selected that they will not be monetarily compensated for participating and that taking part helps improve the health of U.S. residents. The number of interviews in each state varies based on funding and region sizes. The BRFSS survey uses a multistage cluster design to collect data from a sample representative of the U.S. civilian noninstitutionalized population continuously throughout the year. The BRFSS survey interviewers collect information from one adult resident from each household randomly contacted. Interviewers are either employed by the CDC or universities or telephone call centers on contract with the CDC. Phone numbers are chosen by Random Digit Dialing (RDD) techniques on both landlines and cell phones.

BRFSS uses an advanced statistical weighting method called iterative proportional fitting. Standard demographic variables of age, gender, and race and ethnicity as well as other variables such as marital status, education level, phone source (landline or cell), and renter or owner status factor into BRFSS statistical weighting. We included data from all 50 U.S. states from 2015 and 2016. The BRFSS survey used a standardized set of core questions, optional modules, and questions of interest to specific states. The data presented in this article were measured as core questions for all states. The questionnaire was available to respondents in English or Spanish. The survey response rates were 47.7% and 46.4% in 2016 and 48.2% and 47.2% in 2015 (for landlines and cell phones, respectively) (Centers for Disease Control and Prevention, 2016, 2017). BRFSS survey data and documentation is available from the CDC (Centers for Disease Control and Prevention, 2018).

The study population included adults aged 18 to 64 years, in the U.S., with health insurance and a healthcare provider. Adults were considered insured if they reported that they had any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service. Adults were considered having a provider if they have one or more persons they think of as their personal doctor or health care provider. We excluded adults older than 64 years because most of this group has Medicare.

2.2. Measures

We characterized the sample by two health care access variables—having insurance and a provider. The health care access variables were based on point-in-time questions and did not ask about health care coverage or providers over a certain duration (e.g., 12 months). Having insurance and a provider were also inclusion criteria for the majority of our analysis in which we focused on the subgroup of our sample who indicated having some “health care coverage” and a person or persons they thought of as their “personal doctor or health care provider.” In this way, we excluded individuals who were less likely to have access to health care as indicated by their not having any kind of health care coverage nor a person or persons they considered their health care provider. We characterized the insured with a provider sample by five demographic variables—sex, race/ethnicity, income, education, and metropolitan status. We chose these independent variables because they are repeatedly mentioned in the research literature describing social determinants of health. There are other social determinants of health (e.g., social support, food insecurity) that did not have enough data available in the BRFSS dataset and which we did not include in our analysis.

Our dependent variables were four self-reported measures of use of recommended clinical or preventive services and five self-reported measures of recommended lifestyle behaviors. We chose these risks based on findings that they increase an individual's risk for chronic

Table 1
Definitions of study variables used in the behavioral risk factor surveillance system survey.
Recommendation source: U.S. Preventive Services Task Force.

Variable	Definition
Dependent	
Clinical preventive services	
No breast cancer screening	No receipt of a mammogram within the past 2 y among women aged 40–64 y
No cervical cancer screening	No receipt of a Papanicolaou test within the past 3 y among women aged 21–64 y with an intact uterus
No colon cancer screening	No receipt of either fecal occult blood testing within the past y or blood stool and sigmoidoscopy within the past 5 y or colonoscopy within the past 10 y among adults aged 50–64 y
No influenza vaccination	No receipt of an influenza vaccine by injection or nasal spray within the past year among adults aged 50–64 y
Lifestyle-related risks	
Binge drinking	Having ≥ 5 drinks on one occasion among men aged 18–64 y or having ≥ 4 drinks on one occasion among women aged 18–64 y
Heavy drinking	Having, on average, > 14 drinks per week among men aged 18–64 y or having > 7 drinks per week among women aged 18–64 y
Inadequate physical activity	Not participating in moderate physical activity for ≥ 30 -min total ≥ 5 d/wk. and not participating in vigorous physical activity for ≥ 20 -min total ≥ 3 d/wk. among adults aged 18–64 y, based on respondent estimates of physical activity participation
Overweight/obese	Having a body mass index > 25 among adults aged 18–64 y
Smoking	Current smokers among adults aged 18–64 y
Independent	
Socioeconomic	
Age	Age of respondent, categorized (see Tables 2 & 3 for age groups)
Sex	Sex of respondent
Race/ethnicity	Racial/ethnic group with which respondent identifies
Annual household income	Annual household income from all sources
Education	Level of education completed
Metropolitan status	Metropolitan status group with which respondent identifies
Health care access	
Have health insurance	Indicated having “any kind of health care coverage, including health insurance, prepaid plans such as HMOs, government plans such as Medicare, or Indian Health Service?”
Have health care provider	Indicated yes to whether there was one person or more than one person “you think of as your personal doctor or health care provider”

disease and earlier death. Throughout this article, all the rates for dependent variables are framed negatively (e.g., not receiving colon cancer screening or engaging in binge drinking). (Table 1).

2.3. Statistical analysis

For all dependent variables, we performed two types of analyses. First, we calculated the proportion of adults with health insurance and a health care provider engaging in unhealthy behaviors. Second, we determined the independent effects of demographic, socioeconomic, and geographic variables on recommended health behaviors.

We used means and frequencies to describe demographic variables and health behaviors, and multivariate logistic regression analysis to determine the independent effects of income, education, sex, race/ethnicity, and metropolitan status on each recommended health behavior. We used reverse coding for dependent variables that were not already framed negatively in the dataset. We used 2016 data for all the behaviors except inadequate physical activity for which we used 2015 data because questions on physical activity were not asked in 2016. The survey design and weighted sampling probabilities were accounted for in our analyses, and all tests were two-tailed. Data were analyzed using STATA version 15.0. (StataCorp LP, College Station, Texas).

3. Results

3.1. Prevalence of health behaviors

The study population represented adults aged 18 to 64 years, in the U.S., with health insurance and a healthcare provider (208,972 in 2015 and 224,884 in 2016; the latter was 46% of the entire 2016 BRFSS sample.) Table 2 shows the prevalence estimates of health behaviors stratified by different insurance and provider statuses. Tables 3 and 4 show the prevalence estimates of the health behaviors stratified by the six demographic, socioeconomic, or geographic variables. Among the sample, the percentages not receiving clinical preventive services according to recommendations were as high as 54.8% (no influenza vaccination) and 29.2% (no colon cancer screening) (Table 3). The

percentages engaging in lifestyle-related risks were as high as 68.1% (being overweight or obese) and 46.6% (inadequate physical activity) (Table 4).

3.2. Use of clinical preventive services

Table 5 shows the odds ratios (ORs) resulting from logistic regression analyses predicting the receipt of clinical preventive services from the demographic, socioeconomic, and geographic variables. Rural residence, lower income, and lower education were associated with significantly lower receipt of clinical preventive services. Specifically, living in a rural area was associated with lower receipt of all the clinical preventive services. Both having an income less than \$25 K and an income less than \$50 K were associated with lower receipt of all three cancer screenings. Additionally, having less than a college education was associated with lower receipt of colon cancer screening, cervical cancer screening, and influenza vaccination. Black persons were significantly more likely than white persons to receive all three cancer screenings but less likely than white persons to receive an influenza vaccination.

3.3. Lifestyle-related risks

Table 6 shows the ORs resulting from logistic regression analyses predicting lifestyle-related risks from the demographic, socioeconomic, and geographic variables. Having less than a college education was associated with smoking, inadequate physical activity, and being overweight or obese. Lower income levels were associated with smoking and inadequate physical activity. Furthermore, being male was associated with being overweight or obese and binge drinking. Black persons were significantly more likely than white persons to have inadequate physical activity and be overweight or obese, and significantly less likely than white persons to engage in binge drinking, heavy drinking, and smoking.

Table 2

Proportion of adults with different insurance and provider statuses not receiving clinical preventive services and not engaging in recommended lifestyle-related behaviors.

Outcome	% (95% confidence interval) of respondents				
	All (N = 303,047)	Insured with provider (n = 224,884)	Insured without provider (n = 44,474)	Uninsured with provider (n = 14,181)	Uninsured without provider (n = 17,114)
Clinical preventive services					
No breast cancer screening	26.7 (25.4–28.1)	22.1 (21.0–23.2)	50.4 (48.4–52.4)	44.7 (42.3–47.1)	69.1 (66.5–72.0)
No cervical cancer screening	19.2 (18.4–20.1)	14.9 (14.3–15.6)	31.6 (30.3–32.8)	29.8 (28.1–31.6)	45.3 (43.2–47.4)
No colon cancer screening	34.7 (33.3–36.0)	29.2 (28.1–30.3)	60.1 (58.4–61.8)	54.9 (52.9–57.0)	81.0 (79.6–82.5)
No influenza vaccination	59.7 (58.3–61.1)	54.8 (53.6–56.0)	72.0 (71.0–73.1)	71.3 (69.7–72.9)	81.5 (80.5–82.5)
Lifestyle-related behaviors					
Binge drinking	17.9 (16.9–18.8)	16.1 (15.2–17.1)	25.2 (23.7–26.7)	16.7 (15.5–17.8)	23.1 (21.8–24.5)
Heavy drinking	6.9 (6.5–7.3)	6.4 (6.0–6.7)	8.8 (8.3–9.2)	6.9 (6.2–7.6)	9.0 (8.4–9.6)
Inadequate physical activity	47.9 (46.4–49.3)	46.6 (45.1–48.1)	49.1 (47.5–50.7)	54.6 (53.0–56.2)	56.2 (54.3–58.1)
Overweight/obese	66.8 (65.8–67.8)	68.1 (67.1–69.2)	61.3 (60.0–62.6)	68.5 (67.1–69.9)	62.4 (61.2–63.6)
Smoking	18.5 (17.5–19.6)	16.3 (15.2–17.3)	22.0 (20.4–23.5)	27.0 (25.0–29.0)	32.9 (30.4–35.4)

Some variables do not sum to 303,047 because of missing data.

4. Discussion

The nationally representative rates of engaging in health behaviors presented here indicate that, despite having both health insurance and a health care provider, a large proportion of such individuals are not meeting recommendations for health behaviors. We must pay particular attention to individuals not receiving an influenza vaccination and being overweight or obese as reported by the majority of the respondents. We found significant disparities related to education, income, sex, race, and metropolitan status. These findings are consistent with previous research showing that poor health behaviors and disparities based on demographic and socioeconomic factors exist among

American adults. This study adds new findings in that we examined a subset of the population who has both health insurance and a health care provider—two factors shown to improve health care access and outcomes—and found that the poor health behavior and disparities persist among this group.

We found that the only health behavior examined where individuals with a health care provider were worse off than those without a health care provider was being overweight or obese. A possible explanation for this is that individuals who are obese or overweight are more likely to have comorbid conditions (e.g., diabetes, coronary heart disease) (Nguyen et al., 2008; Van Nuys et al., 2014) for which they may seek care (St Sauver et al., 2013). This also suggests that there is an

Table 3

Proportion of adults insured with a provider not receiving clinical preventive services.

Variable	No. of subjects	% (95% confidence interval) of respondents			
		No breast cancer screening	No cervical cancer screening	No colon cancer screening	No influenza vaccination
All	224,884	26.7 (25.4–28.1)	19.2 (18.4–20.1)	34.7 (33.3–36.0)	59.7 (58.3–61.1)
Sex					
Men	102,749	NA	NA	29.8 (28.7–30.9)	57.5 (56.4–58.6)
Women	122,112	22.1 (21.0–23.2)	14.9 (14.3–15.6)	28.8 (27.7–30.0)	52.8 (51.4–54.2)
Age, y					
18–24	19,312	NA	29.4 (27.7–31.0)	NA	61.8 (60.3–63.3)
25–34	35,211	NA	10.7 (10.0–11.3)	NA	59.4 (58.1–60.8)
35–44	39,529	38.7 (36.8–40.6)	11.6 (10.8–12.3)	NA	58.5 (57.2–59.9)
45–54	54,463	21.9 (20.7–23.2)	13.7 (12.8–14.5)	42.6 (41.4–43.9)	56.6 (55.3–57.8)
55–64	76,371	18.5 (17.5–19.5)	18.2 (17.3–19.2)	24.2 (23.1–25.3)	49.3 (48.1–50.6)
Race/ethnicity					
White	166,119	22.4 (21.2–23.5)	15.0 (14.2–15.8)	28.5 (27.3–29.7)	53.9 (52.8–55.1)
Black	20,776	16.5 (15.4–17.6)	11.9 (11.0–12.8)	29.2 (27.6–30.8)	59.6 (57.8–61.3)
Asian/Hawaiian/Pacific islander	6609	23.3 (17.7–28.9)	21.6 (18.4–24.8)	35.1 (30.6–39.6)	51.0 (48.6–53.5)
American Indian/Alaskan native	4045	29.6 (26.5–32.7)	20.9 (18.4–23.4)	38.7 (34.9–42.5)	52.7 (49.8–55.6)
Hispanic	6136	26.5 (22.8–30.1)	15.2 (13.4–17.0)	31.7 (29.6–33.7)	59.1 (57.4–60.8)
Other	21,200	23.4 (21.0–25.7)	13.8 (12.5–15.1)	35.7 (33.0–38.4)	57.5 (54.6–60.5)
Income					
< 15,000	18,304	29.6 (28.0–31.1)	24.4 (22.3–25.9)	37.8 (36.6–39.1)	57.6 (56.5–58.8)
15,000–24,999	27,159	28.7 (27.2–30.2)	21.0 (19.8–22.2)	36.8 (35.5–38.0)	58.9 (57.8–59.9)
25,000–49,999	41,211	24.6 (23.4–25.9)	16.6 (15.7–17.4)	32.5 (31.1–34.0)	58.5 (57.2–59.7)
≥ 50,000	98,210	19.1 (18.0–20.3)	10.9 (10.3–11.5)	25.1 (24.0–26.2)	53.0 (51.7–54.3)
Education					
< High school	16,475	28.0 (25.8–30.1)	23.5 (20.9–26.1)	42.3 (40.7–43.9)	58.6 (57.2–59.9)
High school graduate	60,886	24.1 (23.0–25.3)	19.4 (18.5–20.3)	33.8 (32.7–35.0)	59.6 (58.8–60.9)
Some college	62,977	23.4 (22.1–24.8)	16.3 (15.5–17.0)	29.5 (28.3–30.7)	57.1 (55.9–58.3)
College graduate	83,924	19.4 (18.3–20.5)	11.3 (10.6–11.9)	37.0 (29.4–44.7)	49.5 (48.1–50.9)
Metropolitan status					
City	35,224	22.8 (21.5–24.1)	13.4 (12.5–14.4)	25.7 (24.5–26.8)	53.6 (52.2–55.0)
Outside city	18,615	22.3 (20.0–24.6)	14.0 (12.7–15.4)	26.0 (24.1–27.8)	55.1 (52.6–57.6)
Suburban	15,810	24.4 (22.9–25.9)	14.5 (13.3–15.8)	27.4 (26.0–28.8)	57.3 (55.2–59.5)
Rural	34,227	28.0 (26.3–29.7)	18.1 (17.1–19.2)	32.4 (30.7–34.0)	59.3 (57.7–60.8)

Some variables do not sum to 224,884 because of missing data.

Table 4
Proportion of adults insured with a provider not engaging in recommended lifestyle-related behaviors.

Variable	No. of subjects	% (95% confidence interval) of respondents				
		Binge drinking	Heavy drinking	Inadequate physical activity	Overweight/obese	Smoking
All	224,884	17.9 (16.9–18.8)	6.9 (6.5–7.3)	47.9 (46.4–49.3)	66.8 (65.8–67.8)	18.5 (17.5–19.6)
Sex						
Men	102,749	21.5 (20.4–22.6)	6.6 (6.2–6.9)	45.5 (44.1–46.9)	76.1 (75.2–77.0)	16.7 (15.7–17.7)
Women	122,112	12.3 (11.5–13.1)	6.3 (5.8–6.7)	47.4 (45.7–49.0)	61.9 (60.5–63.2)	16.0 (14.9–17.0)
Age, y						
18–24	19,312	27.2 (25.4–29.0)	7.6 (7.0–8.2)	43.6 (42.4–44.7)	43.1 (41.7–44.4)	11.9 (10.9–12.8)
25–34	35,211	25.1 (23.8–26.4)	6.6 (6.1–7.0)	47.8 (46.6–49.1)	61.3 (59.9–62.6)	18.0 (16.6–19.3)
35–44	39,529	19.2 (18.0–20.5)	6.3 (5.9–6.8)	47.4 (46.0–48.8)	68.3 (67.1–69.6)	16.7 (15.3–18.2)
45–54	54,463	15.5 (14.6–16.5)	6.5 (6.1–6.9)	47.0 (45.4–48.7)	72.0 (70.9–73.1)	17.0 (15.9–18.1)
55–64	76,371	10.7 (10.0–11.3)	6.1 (5.7–6.5)	46.1 (44.3–47.9)	71.7 (70.7–72.7)	15.7 (14.8–16.7)
Race/ethnicity						
White	166,119	17.0 (15.9–18.0)	6.9 (6.5–7.3)	45.1 (43.6–46.6)	67.3 (66.2–68.4)	16.1 (15.0–17.3)
Black	20,776	11.7 (10.7–12.7)	4.2 (3.6–4.7)	57.0 (55.2–58.8)	78.5 (77.3–79.6)	17.7 (16.1–19.3)
Asian/Hawaiian/Pacific islander	6609	11.0 (9.1–12.8)	3.2 (2.2–4.2)	47.6 (45.2–50.0)	47.8 (42.0–53.5)	7.9 (6.8–9.0)
American Indian/Alaskan native	4045	14.1 (12.1–16.1)	5.9 (4.5–7.3)	49.0 (46.7–51.4)	74.2 (71.8–76.5)	28.7 (24.3–33.0)
Hispanic	6136	15.9 (14.2–17.6)	6.3 (5.2–7.3)	45.0 (43.2–46.7)	68.9 (67.2–70.6)	23.9 (20.8–27.0)
Other	21,200	15.9 (15.1–16.7)	4.9 (4.4–5.4)	51.4 (48.8–53.9)	70.5 (69.4–71.7)	13.2 (11.9–14.4)
Income						
< 15,000	18,304	11.7 (10.9–12.6)	4.6 (4.2–5.0)	61.0 (58.7–63.4)	70.4 (69.3–71.4)	36.0 (33.9–38.1)
15,000–24,999	27,159	13.3 (12.2–14.4)	5.4 (5.0–5.9)	56.8 (55.0–58.6)	71.1 (70.0–72.3)	28.8 (27.4–30.2)
25,000–49,999	41,211	15.6 (14.7–16.5)	6.3 (5.9–6.7)	50.8 (49.5–52.2)	71.5 (70.4–72.6)	19.9 (18.9–20.9)
≥ 50,000	98,210	18.7 (17.6–19.7)	7.3 (6.9–7.7)	40.9 (39.6–42.2)	67.2 (66.1–68.2)	9.6 (9.0–10.1)
Education						
< High school	16,475	12.1 (11.0–13.3)	4.9 (4.4–5.5)	64.1 (62.0–66.2)	73.5 (72.3–74.7)	38.1 (35.0–41.3)
High school graduate	60,886	16.1 (15.0–17.2)	6.6 (6.2–7.0)	54.4 (52.8–56.0)	72.6 (71.9–73.4)	24.6 (23.5–25.8)
Some college	62,977	16.8 (15.7–17.9)	6.6 (6.1–7.0)	48.3 (46.9–49.7)	70.8 (69.9–71.8)	18.3 (17.3–19.3)
College graduate	83,924	16.3 (15.4–17.2)	6.4 (6.0–6.8)	39.3 (37.9–40.7)	62.9 (61.5–64.2)	7.0 (6.6–7.4)
Metropolitan status						
City	35,224	13.2 (12.6–13.8)	6.1 (5.8–6.4)	45.7 (44.0–47.4)	67.5 (66.2–68.8)	15.8 (14.7–16.9)
Outside city	18,615	13.6 (12.7–14.4)	6.0 (5.4–6.6)	44.6 (42.5–46.7)	66.8 (65.4–68.2)	14.6 (13.0–16.1)
Suburban	15,810	13.9 (13.0–14.7)	6.4 (5.7–7.1)	47.3 (45.2–49.3)	70.3 (68.7–71.9)	17.7 (16.3–19.1)
Rural	34,227	13.7 (12.2–15.1)	6.2 (5.5–6.9)	49.0 (46.4–51.6)	70.4 (69.1–71.7)	20.3 (19.0–21.6)

Some variables do not sum to 224,884 because of missing data.

The number of subjects in 2015 was 208,972. This dataset was only used for calculating inadequate physical activity and subgroup number of participants was very proportional to that from the 2016 dataset.

Table 5
Comparisons between receipt of clinical preventive services and demographic, socioeconomic, and geographic variables.

Variable	Odds ratio (95% confidence interval) of respondents			
	No breast cancer screening	No cervical cancer screening	No colon screening	No influenza vaccination
Income				
< 15,000	1	1	1	1
15,000–24,999	0.94 (0.85–1.02)	0.82 (0.72–0.93)	0.99 (0.93–1.06)	1.03 (0.97–1.10)
25,000–49,999	0.73 (0.66–0.81)	0.61 (0.54–0.69)	0.86 (0.80–0.93)	1.07 (0.99–1.14)
≥ 50,000	0.53 (0.48–0.58)	0.38 (0.33–0.44)	0.67 (0.62–0.72)	0.97 (0.91–1.03)
Education				
< High school	1	1	1	1
High school graduate	0.95 (0.85–1.02)	0.82 (0.72–0.93)	0.99 (0.93–1.06)	1.03 (0.97–1.10)
Some college	1.03 (0.9–1.18)	0.88 (0.75–1.02)	0.76 (0.70–0.82)	1.01 (0.95–1.08)
College graduate	0.90 (0.79–1.04)	0.70 (0.58–0.84)	0.63 (0.58–0.70)	0.78 (0.73–0.84)
Metropolitan status				
City	1	1	1	1
Outside city	1.05 (0.90–1.10)	1.07 (0.97–1.17)	1.03 (0.95–1.12)	1.08 (0.99–1.18)
Suburban	1.03 (0.93–1.14)	1.03 (0.92–1.14)	1.07 (1.01–1.14)	1.15 (1.08–1.22)
Rural	1.15 (1.05–1.26)	1.19 (1.09–1.30)	1.24 (1.15–1.34)	1.18 (1.12–1.25)
Sex				
Men	1	1	1	1
Women	N/A	N/A	0.88 (0.80–0.93)	0.85 (0.83–0.88)
Race/ethnicity				
White	1	1	1	1
Black	0.58 (0.51–0.65)	0.54 (0.46–0.62)	0.85 (0.78–0.93)	1.28 (1.18–1.39)
Asian/Hawaiian/Pacific islander	1.18 (0.81–1.71)	1.27 (0.94–1.70)	1.42 (1.02–1.98)	0.98 (0.88–1.08)
American Indian/Alaskan native	1.10 (0.89–1.34)	0.98 (0.80–1.21)	1.27 (1.04–1.56)	0.84 (0.72–0.98)
Hispanic	1.07 (0.87–1.33)	0.82 (0.68–0.99)	1.10 (0.97–1.26)	1.21 (1.11–1.33)
Other	1.00 (0.87–1.16)	0.62 (0.50–0.78)	1.06 (0.94–1.19)	1.13 (1.02–1.26)

Table 6
Comparisons between lifestyle-related risks and demographic, socioeconomic, and geographic variables.

Variable	Odds ratio (95% confidence interval) of respondents				
	Binge drinking	Heavy drinking	Inadequate physical activity	Overweight/obese	Smoking
Income					
< 15,000	1	1	1	1	1
15,000–24,999	1.12 (1.00–1.25)	0.10 (0.96–1.36)	0.83 (0.78–0.89)	1.04 (1.01–1.17)	0.79 (0.75–0.83)
25,000–49,999	1.34 (1.23–1.47)	1.36 (1.20–1.54)	0.69 (0.65–0.74)	1.18 (1.11–1.25)	0.53 (0.50–0.56)
≥ 50,000	1.78 (1.62–1.96)	1.64 (1.44–1.85)	0.51 (0.48–0.55)	1.01 (0.95–1.08)	0.28 (0.26–0.30)
Education					
< High school	1	1	1	1	1
High school graduate	1.10 (0.99–1.22)	1.15 (0.94–1.42)	0.43 (0.07–0.87)	1.05 (0.90–1.11)	0.65 (0.60–0.70)
Some college	1.06 (0.93–1.19)	1.09 (0.88–1.36)	0.65 (0.60–0.72)	0.99 (0.90–1.10)	0.54 (0.49–0.60)
College graduate	0.89 (0.79–1.00)	0.99 (0.80–1.22)	0.50 (0.44–0.55)	0.68 (0.61–0.76)	0.23 (0.20–0.26)
Metropolitan status					
City	1	1	1	1	1
Outside city	1.02 (0.95–1.10)	0.95 (0.87–1.05)	0.99 (0.94–1.06)	0.99 (0.94–1.05)	0.95 (0.89–1.00)
Suburban	1.03 (0.95–1.11)	0.99 (0.87–1.11)	1.02 (0.96–1.09)	1.16 (1.08–1.25)	1.01 (0.95–1.08)
Rural	1.00 (0.90–1.12)	0.94 (0.83–1.05)	1.05 (0.98–1.13)	1.15 (1.07–1.23)	0.99 (0.91–1.06)
Sex					
Men	1	1	1	1	1
Women	0.53 (0.51–0.56)	1.06 (0.96–1.17)	1.08 (1.03–1.13)	0.46 (0.44–0.49)	0.97 (0.93–1.01)
Race/ethnicity					
White	1	1	1	1	1
Black	0.77 (0.68–0.86)	0.60 (0.52–0.69)	1.39 (1.30–1.50)	2.09 (1.91–2.29)	0.74 (0.65–0.84)
Asian/Hawaiian/Pacific islander	0.50 (0.38–0.67)	0.39 (0.26–0.58)	1.24 (1.09–1.42)	0.47 (0.40–0.56)	0.48 (0.39–0.58)
American Indian/Alaskan native	1.08 (0.90–1.30)	0.72 (0.51–1.02)	0.86 (0.74–0.99)	1.30 (1.12–1.50)	1.27 (0.94–1.70)
Hispanic	0.89 (0.78–1.03)	0.93 (0.73–1.18)	0.84 (0.75–0.94)	1.10 (0.98–1.23)	1.26 (1.08–1.46)
Other	1.00 (0.88–1.15)	0.60 (0.50–0.71)	1.06 (0.95–1.17)	1.16 (1.05–1.27)	0.51 (0.43–0.60)

opportunity for providers to intervene on behaviors related to obesity such as engaging in physical activity and consuming a healthy diet. Previous studies show that medical education for physicians is lacking in the areas of physical activity and diet (Adams et al., 2015; Cardinal et al., 2015), and that physicians have knowledge gaps in obesity guidelines and its pathophysiology (Glauser et al., 2015). Better training providers in obesity management and prevention may help providers care for obese individuals (Sanchez-Ramirez et al., 2018).

We found that living in a rural area was associated with lower receipt of all the clinical preventive services yet was not associated with engaging in fewer lifestyle-related behaviors than those not living in a rural area. This suggests that living in rural areas does not increase the likelihood of engaging in all poor health behaviors. Rather, barriers may exist in rural areas that are specific to receiving services such as cancer screenings and influenza vaccination. Clinical preventive services differ from lifestyle-related behaviors in that the individual must be present at a clinical or community health setting to receive the services whereas he/she can engage in behaviors such physical activity or not smoking outside the health care setting. Previous research cites insufficient public transport, distance from clinic, and scarcity of services as barriers to receiving health services in rural areas (Sanchez-Ramirez et al., 2018; Peppercorn et al., 2013).

Lower income levels were associated with lower receipt of all of the cancer screenings and engaging in poor lifestyle-related behaviors except for heavy drinking and binge drinking. Reasons for the drinking exception may be that people with higher incomes can afford alcohol and may be more likely to dine out and vacation, both of which are activities that often involve drinking. Prior research shows that low income correlates with poor health literacy (Ayotte et al., 2009; Rikard et al., 2016). Poor health literacy may play a role in individuals with lower income not engaging in healthy behaviors by preventing them from obtaining and processing health information available to them from their insurers or health care providers.

This study showed that SDOH are related to health behaviors of insured adults with a health care provider. Acknowledging the role SDOH have in the daily-lived experiences of marginalized groups provides insight into short- and long-term outcomes and behaviors. Defined by five key areas (economic stability, education, health and

health care, neighborhood and built environment, social and community context), SDOH allow for a broader understanding of disease onset and the circumstances by which they exist. It is necessary to recognize that said determinants define systems by which people are born, grow up, live, work, and age, but more importantly that these circumstances are shaped by the distribution of money, power, and resources nationally and globally (CDC, 2008; Solar and Irwin, 2007; WHO, 2008).

There were associations between race and health behaviors with Black and Hispanic people having worse rates of receiving influenza vaccination than White people and Black people being more likely to be overweight or obese and have inadequate physical activity. Conversely, White people had worse rates of receiving the three cancer screenings and had higher rates of binge drinking, heavy drinking, and smoking than Black people. Interestingly, American Indian/Alaskan Native people were more likely to be overweight or obese but less likely to have inadequate physical activity compared to White people. One explanation for American Indian/Alaskan Native peoples' worse overweight and obesity rate despite its better physical activity rate is that, over time, this group has adopted the Western diet which is high in glucose and simple carbohydrates—two dietary factors known to cause obesity (Halpern, 2007; McCoy, 2012). It is not surprising that there were disparities based on race, given that race is a complex and multidimensional social construct that has established a conceptual framework for how we perceive health, illness, social demands, and environmental changes across the life course. To understand the role of race in one's lived experiences is to understand the extent to which the individual identifies with that (race or cultural) group.

The guise of racial disparities, however, is often fueled by identifiable indices such as economic assembly, education, poverty, unemployment, and food and housing insecurity. Thus, the role of SDOH cannot be overstated. Understanding the meaning of each determinant establishes knowledge of health outcomes, and how to best prioritize access and availability of services across diverse populations. We recommend future research examining subsets of the population addressed in this study (e.g., men or women only, young adults or older adults only, Black women, White women, etc.). This would provide further insight into the existence of associations with health behaviors for subgroups, which could then lead to targeting groups in need of

greater health intervention.

4.1. Strengths and limitations

There are strengths to our study. First, the current analysis is based on samples from a national dataset and has a large sample size, increasing the generalizability of the findings to the U.S. adult population. Second, we included a variety of independent variables by which to characterize the population which resulted in better determining which specific factors were associated with the examined health behaviors.

There are limitations to our study. First, the findings are based on self-reported data. We expect that respondents were likely to under-report risky health behaviors, as has been the case in other survey-based studies (Klatsky et al., 2006; Rauscher et al., 2008). However, this limitation only makes our findings more conservative—in reality, the prevalence of engaging in poor health behaviors is likely higher than indicated in this study. Second, these data are “cross-sectional,” or collected at a point in time. Therefore, we can only claim that the relationships between the independent and dependent variables are associations rather than causal. Third, we were limited to the basic questions about whether the individuals have health insurance and a health care provider. We could not analyze the specific types of insurance (e.g., comprehensive or catastrophic plans) or health care provisions (e.g., behavioral health care provider, community medical center, etc.).

4.2. Implications for future research

Future research about effective education regarding SDOH aimed at health care providers could help address the underlying barriers to better health outcomes for American adults. Additionally, investigation into the mechanisms by which social and cultural factors influence health behaviors would aid curriculum designers in developing training for both health care professional students and current health care professionals' continuing education. Furthermore, community-based research testing the utilization of community and government resources and their availability for health practitioners will help inform collaboration between clinicians and public health workers in addressing living and working conditions, a strong predictor of general health (Braveman and Gottlieb, 2014).

5. Conclusions

With evidence mounting about the integral role that SDOH plays in determining population health, understanding which groups are most affected and adopting strategies to address underlying social factors of health may be one way that health care providers can improve the health outcomes of their patients. The poor health behaviors and disparities reported here suggest looking beyond health insurance and a regular source of care to structural barriers (convenient appointment times, transportation to clinic, waiting times), language barriers, and financial constraints. Health care providers, in collaboration with community, government, and payers have the opportunity to make a significant impact on disease prevention and quality of life improvement for American adults.

Conflict of interest

None of the authors have any conflicts of interest to declare.

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