

The Impact of Race, and Insurance Status on Breast Cancer Screening: Results from the Behavioral Risk Factor Surveillance System Data

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Abstract

Purpose

Breast cancer is the second major cause of cancer-related death of women in the United States ¹, yet current gaps exist in breast cancer screening for minority women ². The purpose of this study is to address these gaps by assessing the relationships among race, health insurance coverage, and breast cancer screening in a nationally representative sample of women.

Design:

A cross-sectional descriptive analysis of the 2018 BRFSS survey data was used to meet the study purpose. BRFSS participants who declared themselves to be of female sex and who were adults with the age \geq of 40 years were selected for inclusion.

Methods

Data were analyzed using SPSS version 26. Exploratory and descriptive analyses were performed, followed by comparative analyses based on the variable type. Relationships between race, insurance status, and mammogram screening were examined. Chi-square, logistic, and multinomial logistic regression were used.

Findings:

The original 2018 BRFSS dataset included 437,436 participants and 145,837 women were selected based on inclusion criteria. Participant age ranged from 40 to 74 years. The majority were White only non-Hispanic (78.1%), reported having a mammogram in the past two years (76.1%), had earned \leq a 4-year college degree (61.1%), had an annual income of \leq \$75,000 (58.4%) and married (58.2%). Less than half had a healthcare plan through an employer (44.9%) and were employed (40.5%). Participants who had a plan purchased through an employer or union were more likely to have a mammogram in the past two years when compared with other health coverage. Furthermore, White only, non-Hispanics were 1.25 times more likely and Black only, non-Hispanics were 1.98 times more likely to have a mammogram in the past two years compared to participants from other racial and ethnic groups.

Conclusion

The findings of this study provide an additional indication that race, and health insurance status do impact breast cancer screening.

Clinical Relevance:

Knowledge gained from this study can be used by practicing nurses to educate racial and ethnic minority women on the significance of breast cancer screening and prevention.

Introduction

Breast cancer is currently the second major cause of cancer-related death for women in the United States¹. Notwithstanding its limitations, mammography remains the only screening test for breast cancer advocated by the United States Preventive Services Task Force and the American Cancer Society, thus, currently, the most effective screening exam to decrease breast cancer mortality³. The American College of Radiology (ACR) has advised yearly mammography screening commencing at age 40 for females with a normal risk of developing breast cancer². Mammogram screening has reliably decreased breast cancer mortality by approximately 40% since 1990 and most of this improvement is ascribed to early detection². Although the national efforts by the Center for Disease Control and Prevention and the Breast and Cervical Cancer Early Detection Program were effective in increasing breast cancer screening rates, there are still substantial disparities in breast cancer screening utilization and breast cancer mortality among racial and ethnic minority women⁴.

Factors such as paucity of socioeconomic resources and limited access to healthcare have led to inequalities in the care of underprivileged populations⁵. Compared with their White counterparts, racial and ethnic minorities women experience more underinsurance or lack health insurance coverage completely⁵. The disparity in insurance status and the resulting decrease in access to care stems from social determinants of health and results in a lower adherence to breast cancer screening recommendations⁴. Lower rates of screening mammography result in diagnosis of cancer at a later stage disease and impacts survival rates⁴. Recognizing social determinants of health that cause delays in care accessibility may lead to individualized interventions mainly targeted to increase adherence to mammogram screening; hence, improving health outcomes for women who experience health inequality. The purpose of this study is to examine the relationship of race and health insurance coverage on screening for breast cancer by using the data from the Behavioral Risk Factor Surveillance System (BRFSS) survey, in a nationally representative sample of adult women.

Methods

Data Source, Ethical Conduct of Research

The BRFSS is a recurrent cross-sectional survey carried out with technical and methodological aid from the Centers for Disease Control and Prevention (CDC)⁶. The BRFSS data was initially devised to assist the nation in its data gathering efforts in order to obtain a comprehensive view of state and local data for health program development. Since 1984, the CDC began to conduct yearly health-related telephone

survey in the United States and its territories to collect data on health behaviors, chronic diseases, health care accessibility, and the use of health services. State health organizations jointly work together to develop the survey and conduct the interviews themselves or through the assistance of contractors. Participants' samplings are performed through the random digit dialing from commercially accessible phone catalogs. Once consented, participants take part in the survey using Computer-Assisted Telephone Interviews (CATI) system⁶. Cellular surveys use the Telecordia database of telephone exchanges and 1000 banks to arbitrary choose telephone numbers. Once gathered, 2018 data was processed, aggregated, weighted by the CDC and made openly accessible for analysis on the CDC website. The 2018 BRFSS data was retrieved and an analysis of the relationships between race, insurance status, and screening for breast cancer was performed. Due to the de-identified freely available national data used in this analysis, Institutional Review Board review was not sought or required.

The Study Design

Study Population and Sample

For the present analysis, the populations of interest were noninstitutionalized adult females ≥ 40 years since the recommended mammograms screening starts at age 40. Exclusion criteria included men, women younger than 40 years of age, transgender individuals, institutionalized female population, and women of unknown race.

Measures

Descriptive Variables

The current study consisted of female survey participants ≥ 40 years who responded to questions in the Breast and Cervical Cancer-Screening module of the BRFSS (Sect. 14 of the 2018 survey)⁶.

Age

Age was collected as a categorical variable and provided in the dataset via the following categories: (40–44, 45–49, 50–54, 55–, 60–64, 65–69, 70–74).

Race

Race was collected as a categorical variable and provided in the dataset via the following categories: (White, Black, Hispanic, Other (Asian, American Indian or Alaskan Native, Native Hawaiian or others Pacific Islander, others race, multiracial).

Marital status

Marital status was collected as a categorical variable and provided in the dataset via the following categories: Marital status (Married, Divorced, Widowed, Separated, Never married, A member of an unmarried couple).

Employment

Employment was collected as a categorical variable and provided in the dataset via the following categories: (Employed for wages, Self-employed, Out of work for 1 year or more, Out of work for 1 less than 1 year, A homemaker, A student, Retired, Unable to work).

Income

Income was collected as a categorical variable and provided in the dataset via the following categories: (> \$10,000; \$10,000 – > \$15,000; \$15,000 – > \$25,000; \$25,000 – > \$35,000; \$35,000 – > \$50,000; \$50,000 – > \$75,000; \$75,000 or more).

Education

Education was collected as a categorical variable and provided in the dataset via the following categories: (Never attended school or only kindergarten, Elementary, Some high school, High school graduate, Some college or technical school, College graduate).

Independent variables

Primary Health Insurance Coverage

Primary Health Insurance Coverage was collected as a categorical variable and provided in the dataset via the following categories: (A plan purchased through an employer or union, A plan that you or another family member buys on your own, Medicare, Medicaid or other state program, Tricare formerly champus VA or Military, Alaska native, Indian health service, tribal health services, Some other source, None No coverage).

Race

Race was collected as a categorical variable and provided in the dataset via the following categories: (White, Black, Hispanic, Other (Asian, American Indian or Alaskan Native, Native Hawaiian or others Pacific Islander, others race, multiracial)).

Dependent variables

Mammogram screening was collected as a categorical variable and provided in the dataset via the following categories: (Have You Ever Had a Mammogram: Yes and No).

Results

After cleaning and screening the data, the final sample for this analysis included 16,147 female participants aged between 40 and 74 years. Most of the participants were married (58.2%), had less than a 4 year college degree (61.1%) were employed for wages (40.5%) or retired (30.0%), had an income of less than \$75,000 (58.4%), had a mammogram in the past two years (76.1%), were White, non-Hispanic

(78.1%), and had a healthcare plan purchased through an employer or union (44.9%). Detailed demographic data can be seen in Table 1.

Table 1
Participant Demographics (N = 16,147)

Variables	Frequency	Percentage
Age		
40–44	1376	8.5
45–49	1660	10.3
50–54	2005	12.4
55–59	2556	15.8
60–64	2774	17.2
65–69	3081	19.1
70–74	2695	16.7
Marital Status		
Married	9398	58.2
Divorced	2880	17.8
Widowed	1920	11.9
Separated	398	2.5
Never married	1201	7.4
A Member of an Unmarried Couple	297	1.8
Refused	53	0.3
Education Level		
Never Attended School or Only Kindergarten	8	0.0
Grades 1–8 (Elementary)	282	1.7
Grades 9–11 (Some High School)	789	4.9
Grade 12 or GED (High School Graduate)	4143	25.7
College 1–3 Years (Some College or Technical School)	4646	28.8
College 4 Years or More (College Graduate)	6259	38.8
Refused	20	0.1
Employment Status		
Employed for Wages	6537	40.5
Self Employed	1190	7.4

Variables	Frequency	Percentage
Out of Work for 1 Year or More	227	1.4
Out of Work for Less Than 1 Year	176	1.1
A Homemaker	1079	6.7
A Student	35	0.2
Retired	4848	30.0
Unable to Work	1999	12.4
Refused	56	0.3
Income Level		
Less Than \$10,000	722	4.5
Less Than \$15,000 (\$10,000 To Less Than \$15,000)	808	5.0
Less Than \$20,000 (\$15,000 To Less Than \$20,000)	1014	6.3
Less Than \$25,000 (\$20,000 To Less Than \$25,000)	1236	7.7
Less Than \$35,000 (\$25,000 To Less Than \$35,000)	1357	8.4
Less Than \$50,000 (\$35,000 To Less Than \$50,000)	1954	12.1
Less Than \$75,000 (\$50,000 To Less Than \$75,000)	2324	14.4
\$75,000 Or More	4627	28.7
Don't Know / Not Sure	894	5.5
Refused	1211	7.5
Had Mammogram		
Yes	12283	76.1
No	3864	23.9
Race		
White Only, Non-Hispanic	12618	78.1
Black Only, Non-Hispanic	1973	12.2
American Indian or Alaskan Native Only, Non-Hispanic	301	1.9
Asian Only, Non-Hispanic	71	0.4
Native Hawaiian or Other Pacific Islander Only, Non-Hispanic	8	0.0
Other Race Only, Non-Hispanic	57	0.4

Variables	Frequency	Percentage
Multiracial, Non-Hispanic	182	1.1
Hispanic	937	5.8
Health Coverage		
A Plan Purchased Through an Employer or Union	7251	44.9
A Plan That You or Another Family Member Buys on Your Own	1809	11.2
Medicare	5293	32.8
Medicaid or Other State Program	1315	8.1
Tricare (Formerly Champus), VA, or Military	372	2.3
Alaska Native, Indian Health Service, Tribal Health Services	107	0.7

Race and Mammogram

A significant relationship between race and having a mammogram in the past two years was found ($\chi^2(6) = 92.06, p < 0.01$). The detailed results of the chi square analysis are found in Table 2 below.

Table 2
Participants Who Had a Mammogram in The Past 2 Years (N = 16,147) by Race.

Race	Yes (%)	No (%)
White Only, Non-Hispanic	9,577 (75.9)	3,041 (24.1)
Black Only, Non-Hispanic	1631 (82.7)	342 (17.3)
American Indian or Alaskan Native Only, Non-Hispanic	198 (65.8)	103 (34.2)
Asian Only, Non-Hispanic	47 (66.2)	24 (33.8)
Native Hawaiian or Other Pacific Islander Only, Non-Hispanic	5 (62.5)	3 (37.5)
Other Race Only, Non-Hispanic	40 (70.2)	17 (29.8)
Multiracial, Non-Hispanic	130 (71.4)	52 (28.6)
Hispanic	655 (69.9)	282 (30.1)
<i>Note.</i> $\chi^2(7) = 92.29, p < 0.01$		

Healthcare Coverage and Mammogram

A significant relationship between healthcare coverage and whether participants had a mammogram in the past two years was found ($\chi^2(5) = 84.00, p < 0.01$). The detailed results of the chi square analysis are found in Table 3 below.

Table 3
Participants Who Had a Mammogram in The Past 2 Years (N = 16,147) by Health Coverage

Variables	Women Respondents Aged 40–74 Who Have Had Mammogram in The Past 2 Years		
	Yes	No	Total
A Plan Purchased Through an Employer or Union	5,620 (77.5)	1,631 (22.5)	7,251 (100.0)
A Plan That You or Another Family Member Buys on Your Own	1,338 (74.0)	471 (26.0)	1,809 (100.0)
Medicare	4,086 (77.2)	1,207 (22.8)	5,293 (100.0)
Medicaid or Other State Program	877 (66.7)	438 (33.3)	1315 (100.0)
Tricare (Formerly Champus), VA, Or Military	289 (77.7)	83 (23.3)	372 (100.0)
Alaska Native, Indian Health Service, Tribal Health Services	73 (68.2)	34 (31.8)	107 (100.0)
Total	12,283 (76.1)	3,864 (23.9)	16,147 (100.0)
<i>Note.</i> $\chi^2(5) = 84.00, p < 0.01$			

Race, Healthcare Coverage, and Mammogram in past Two Years

A logistic regression was performed to assess the impact of race on the likelihood of having a mammogram performed in the past two years. The full model contained one independent variable (race) with eight categories. The full model containing all predictor variables was statistically significant ($\chi^2(7) = 92.29, p < 0.01$). The model as a whole explained 1.0% (Nagelkerke R²) of the variance in mammograms performed in the past two years and correctly classified 76.1% of cases. As shown in Table 4, only three races made a unique statistically significant contribution to the model. However, the odds ratio indicated that Black only – non-Hispanic and American Indian or Alaskan native only non-Hispanics were less likely to have a mammogram in the past two years when compared to White only, non-Hispanics.

Table 4
Logistic Regression Results for Race on Mammography

Variables		B	S.E.	Exp(B)
Step 0	Constant	-1.16	0.02	0.32
Step 1	White Only, Non-Hispanic			
	Black Only, Non-Hispanic	-0.30	0.07	0.74*
	American Indian or Alaskan Native Only, Non-Hispanic	-0.72	0.09	0.49*
	Asian Only, Non-Hispanic	0.19	0.14	1.21
	Native Hawaiian or Other Pacific Islander Only, Non-Hispanic	0.17	0.26	1.19
	Other Race Only, Non-Hispanic	0.33	0.73	1.39
	Multiracial, Non-Hispanic	-0.01	0.30	0.99
	Hispanic	-0.07	0.18	0.93
	Constant	-0.84	0.07	0.43

* $\chi^2(7) = 92.29, p < 0.01$; Nagelkerke $R^2 = 1.0\%$

Logistic Regression Results for Race on Mammography

A logistic regression was performed to assess the impact of Health Coverage on the likelihood that participants had a mammogram performed in the past two years. The full model contained one independent variable (health coverage) with six categories. The full model containing all predictor variables was statistically significant ($\chi^2(5) = 84.00, p < 0.01$). The model as a whole explained .07% (Nagelkerke R^2) of the variance in mammograms performed in the past two years and correctly classified 76.1% of cases. As indicated in Table 5, only two health coverage plans made a unique statistically significant contribution to the model. However, the odds ratio indicated that participants with a plan that they or another family member bought on their own and participants with Medicaid or other state program were less likely to have a mammogram in the past two years when compared to participants who had a plan purchased through an employer or union.

Table 5
Logistic Regression Results for Race on Mammograms

Variables		B	S.E.	Exp(B)
Step 0	Constant	-1.16	0.02	0.32
Step 1	A Plan Purchased Through an Employer or Union			
	A Plan That You or Another Family Member Buys on Your Own	-0.47	0.21	0.62*
	Medicare	-0.28	0.21	0.76
	Medicaid or Other State Program	-0.46	0.21	0.63*
	Tricare (Formerly Champus), VA, Or Military	0.07	0.22	1.07
	Alaska Native, Indian Health Service, Tribal Health Services	-0.48	0.24	0.62
	Constant	-0.76	0.21	0.47

Logistic Regression Results for Race and Health Coverage on Mammograms

A logistic regression was performed to assess the impact of race and health coverage on the likelihood that participants had a mammogram performed in the past two years. The full model contained two independent variables: race with eight categories and health coverage with six categories. The full model containing all predictor variables was statistically significant ($\chi^2(12) = 166.53, p < 0.01$). The model explained 2.0% (Nagelkerke R^2) of the variance in mammograms performed in the past two years and correctly classified 76.1% of cases. As shown in Table 6, only two races made a unique statistically significant contribution to the model. This indicates that White only, non-Hispanics were 1.25 times more likely and Black only, non-Hispanics were 1.98 times more likely to have a mammogram in the past two years compared to participants from other racial and ethnic groups.

Table 6
Logistic Regression Results for Race and Health Coverage on Mammograms

Women Respondents Aged 40–74 Who Have Had Mammogram in The Past 2 Years		B	Std. Error	Exp(B)
Yes	Intercept	0.92	0.26	
	White Only, Non-Hispanic	0.22	0.08	1.25*
	Black Only, Non-Hispanic	0.68	0.09	1.98*
	American Indian or Alaskan Native Only, Non-Hispanic	-0.19	0.16	0.83
	Asian Only, Non-Hispanic	-0.28	0.26	0.76
	Native Hawaiian or Other Pacific Islander Only, Non-Hispanic	-0.45	0.73	0.64
	Other Race Only, Non-Hispanic	-0.02	0.30	0.98
	Multiracial, Non-Hispanic	0.03	0.18	1.03
	Hispanic	0 ^b		
	A Plan Purchased Through an Employer or Union	0.08	0.25	1.08
	A Plan That You or Another Family Member Buys on Your Own	-0.12	0.25	0.89
	Medicare	0.05	0.25	1.05
	Medicaid or Other State Program	-0.47	0.25	0.62
	Tricare (Formerly Champus), VA, Or Military	0.07	0.28	1.07
	Alaska Native, Indian Health Service, Tribal Health Services	0		

Discussion

The current study revealed a relationship between obtaining mammography screening and multiple factors including race and lack of adequate health insurance coverage. Regular screening for breast cancer, including annual mammograms and breast exams by a qualified medical expert is crucial for early detection of breast cancer². However, the social determinants of health such as age, race, income, and insurance status are impediments that could constitute barriers to carrying out the recommended guidelines for screening. Social determinants of health are influential factors of healthcare utilization and this association has been demonstrated in the literature previously^{7; 8}. Since the findings of the present investigation were obtained by using a large national sample exploiting data from a national survey (BRFSS) with known higher response rates, there is a smaller margin of error in examining relationships for hard to reach populations such as minorities. In addition, the random sampling of the participants via random digit dialing from commercially available phone lists increases the generalization of the results.

Hence, the sample is representative of the larger national populations and is less likely to be subject to bias.

Race and Mammogram

This analysis found a significant relationship between race and having a mammogram. Black women were less likely to have a mammogram in the past two years when compared to other races. Existing evidence indicates that racial and ethnic minority women are prone to experience delays in treatment, as well as lower than recommended rates of mammogram screening⁹. This delay in diagnosis and treatment for black women leads to an increased rate of diagnosis at a later-stage breast cancer and subsequently leads to an increased morbidity and mortality rates⁸.

Insurance status and Mammogram

The role of adequate insurance coverage was identified in this study as important in access to Mammogram screening. Women having employer or union purchased health insurance coverage were more likely to have a mammogram in the past two years when compared to women who were underinsured through state or state subsidized insurance programs. This finding supports currently available literature linking social determinants of health with preventative screening⁹. The findings of this analysis are consistent with the findings of a retrospective chart review of 157 women ages 40–75 years¹⁰. Of the patients who were able to get their screening mammograms performed in Khali and colleagues' study, 84.5% utilized BRIDGE healthcare clinic's program (student-run free clinics). Therefore, this study substantiated the evidence that volunteer providers such as student-run free clinics play an essential part in expanding uninsured patients' access to mammograms. Consequently, facilitating access to care and increasing access to payment for breast cancer screening through innovative programs may be linked with screening mammography compliance and subsequently earlier diagnosis of breast cancer¹¹. Thus, healthcare coverage and accessibility are essential tools required for successful health prevention campaigns¹⁰.

Race, Insurance Status, and Mammogram

The combined impact of race and adequate insurance coverage was found to be significant with having a mammogram. While a secured source of health coverage increased the prospect of having a mammogram, race was also important. White women and their Black counterparts were more likely to have a mammogram when compared to other races. Similarly, in a previously published systematic review, White women were more likely to have adequate health insurance coverage when compared to other ethnic minority women¹¹. This investigation has provided evidence that obtaining a screening mammography exam is related to both race and insurance coverage. Hence, a major role in healthcare accessibility such as paying for recommended healthcare services can be financially draining for individuals with income scarcity and lack of adequate health insurance coverage. Thus, having access to care and having an adequate insurance coverage may be linked with the likelihood of getting a screening mammography and consequently earlier diagnosis of breast cancer¹¹.

Social Determinants of Health

These findings support that the social determinants of health such as marital status, education, employment, and having adequate health insurance may be important related to having screening mammography. As it was established in prior research, these social determinant aspects were found to be prominent factors of healthcare utilization ^{12; 13}. Comparably to the findings of the existing study, being married, having a university education were among positive predictors for mammography uptake (66.8 %) ¹⁴. Likewise, another study revealed participants with a higher education were significantly more likely to adhere to the recommendations of breast cancer screenings ¹⁵. Similarly, published evidence that employment was also a determining factor for participating in mammogram ¹⁶. Moreover, having a usual source of healthcare and a woman's geographical location were associated with timely screening mammography ⁹. Having a consistent source of care increased the likelihood of acquiring preventive health education and an annual breast cancer screening as recommended ¹⁷. Furthermore, women of color differ from their White counterparts in the degree to which increasing socioeconomic resources is correlated with increasing cancer screening utilization ¹⁸.

Future Clinical and Research Implications

Breast health awareness is a fundamental part of health promotion and a key factor in early stage breast cancer detection. However, the importance of a yearly screening mammogram remains limited and not adequately practiced among minority women who lack consistent health insurance. Factors such as ethnicity, socio-economic status, and geographical location are influential assessment findings to be considered. For clinicians, assessing for these social determinants of health may contribute to mammography adherence. Assisting women to overcome these barriers may increase breast cancer screening and early detection. In addition, providing education about an individual risks and barriers to obtaining screening and subsequent treatment could also increase the mammography adherence rates and early intervention if needed.

As per the Association of Women's Health, Obstetric and Neonatal Nurses' (AWHONN) advocacy and recommendations, it is necessary to provide resources and education to women's health nurses so they can be better equipped to assist female patients with their breast health ¹⁹. Subsequently, taking into consideration the particularities presented by each participant, and proactively encouraging individuals on the health advantages of cancer preventive services could raise awareness and consequently improve mammogram screening rates ⁹. Future policy work should focus on finding means to expand healthcare accessibility and involvement in disadvantaged populations. Breast cancer awareness can be improved and eventually breast cancer disparity reduced by developing a community-based participatory approach and a culturally responsive breast cancer screening program ^{20; 21}. Through their contribution, practicing nurses empower women by encouraging them to take active roles in monitoring their own breast health. Therefore, practicing nurses assist in improving outcomes of care, and simultaneously contribute in shrinking the gap and apparent disparity in cancer diagnosing and treatment ¹⁹. Healthcare providers'

counseling and suggestions about mammogram screening and recommended national guidelines⁹ serve as a preliminary point for exploring some of the socio-demographic, health-related, and circumstantial characteristics that obstruct timely screening mammography²². Future research should continue to focus on the impact of social determinants of health on access and outcomes of care.

Limitations

Although the BRFSS dataset is a sizeable nationwide representative sample, this study does have shortcomings. Using the BRFSS dataset, to conduct a secondary analysis constrained the investigator to the sampling measures and the data at hand. The cross-sectional design limits establishing any causal relationships between Race, Health Insurance Coverage, and Breast Cancer Screening. Since the BRFSS is a telephone survey, potential participants who live in households without telephone coverage, may be excluded. Furthermore, The BRFSS relies on self-reported data obtained from the participants which may be sources of possible error that could result in some misclassification of the variables: age, race, education, income, employment, primary health insurance coverage, and mammogram screening.

Conclusion

This study discovers that race and insurance status have an impact on breast cancer screening. The results of this study provide further evidence that having health insurance coverage facilitates access to preventive care for women. Since mammography screening rates continue to be lower than recommended in patients with low socioeconomic status, these results will be foundational to a developing a program of research focused on increasing access to care and eliminating healthcare disparity in ethnic minority women with breast cancer. Identifying and understanding these influences will be key to the development of interventions aimed at increasing healthcare availability in this population. Through individualized patients 'care plans, education, and awareness, practicing nurses can empower racial and ethnic minority women to adhere to their recommended yearly mammography screening guidelines.

Clinical Resources:

- Association of Women's Health, Obstetric and Neonatal Nurses.
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<https://doi.org/10.1016/j.jacr.2017.06.001>

Declarations

Ethics approval and consent to participate:

Not applicable.

Consent for publication:

Not applicable.

Availability of data and materials

The 2018 BRFSS dataset was used. Available at:

https://www.cdc.gov/brfss/annual_data/annual_2018.html

Competing interests:

The authors declare that they have no competing interest regarding the publication of this paper.

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Authors' contributions:

The authors (SY, JM, and LAT) confirm their contribution to the paper as follows:

SY wrote the main manuscript text and substantially contributed through the acquisition and analysis of the data. SY and JM substantially contributed by drafting the manuscript and design of the study. SY and JM substantially contributed to the interpretation of the results. JM and LAT edited and revised the article critically for important intellectual content and approved the version to be published.

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