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The role of demographics, social determinants of health, health risk factors, behavioral risk factors, and religious attendance in cardiovascular disease risk

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Abstract:	Introduction Research exploring the role of Social Determinants of Health (SDOH) suggests that they significantly affect health, health disparities, and health outcomes. While religious beliefs and practices have been found to influence health behaviors and health outcomes, the research on the role of religious attendance has been inconsistent.This study investigated the relationships between demographics, SDOH, health risks, behavioral health risk factors, and religious attendance with having been diagnosed with cardiovascular disease (CVD). Methods The current study used the National Health and Nutrition Examination Survey 2007-2008 dataset stratified by sex. The sample includes 1,396 women and 1,560 men aged 40 and older. Religious attendance was operationalized as less than weekly, weekly, and more than weekly. CVD was determined by those who reported being told they had a heart attack, stroke, or both. Using logistic regression, we modeled the risk of CVD, stratified by sex. Findings Six multiple logistic regression models were used, three models each for women and men. In the third model for women, we found that older age, current cigarette use, and a higher number of healthcare visits, but not religious attendance, were predictive of CVD. In the third model for men, we found that older age, having difficulty walking, higher relative fat mass, a higher number of healthcare visits, and more than weekly religious attendance were predictive of CVD. Conclusion Older age and the number of health visits were related to CVD for women and men. However, none of the SDOH variables were significant for either group. Among women, cigarette use was significant, while among men, the significant variables were having difficulty walking, higher RFM, and religious attendance more than once a week. Additional research is needed to expand our knowledge of SDOH, religion, and health outcomes.
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The role of demographics, social determinants of health, health risk factors, behavioral risk factors, and religious attendance in cardiovascular disease risk

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Abstract

Introduction

Research exploring the role of Social Determinants of Health (SDOH) suggests that they significantly affect health, health disparities, and health outcomes. While religious beliefs and practices have been found to influence health behaviors and health outcomes, the research on the role of religious attendance has been inconsistent. This study investigated the relationships between demographics, SDOH, health risks, behavioral health risk factors, and religious attendance with having been diagnosed with cardiovascular disease (CVD).

Methods

The current study used the National Health and Nutrition Examination Survey 2007-2008 dataset stratified by sex. The sample includes 1,396 women and 1,560 men aged 40 and older. Religious attendance was operationalized as less than weekly, weekly, and more than weekly. CVD was determined by those who reported being told they had a heart attack, stroke, or both. Using logistic regression, we modeled the risk of CVD, stratified by sex.

Findings

Six multiple logistic regression models were used, three models each for women and men. In the third model for women, we found that older age, current cigarette use, and a higher number of healthcare visits, but not religious attendance, were predictive of CVD. In the third model for men, we found that older age, having difficulty walking, higher relative fat mass, a higher number of healthcare visits, and more than weekly religious attendance were predictive of CVD.

Conclusion

Older age and the number of health visits were related to CVD for women and men. However, none of the SDOH variables were significant for either group. Among women, cigarette use was significant, while among men, the significant variables were having difficulty walking, higher RFM, and religious attendance more than once a week. Additional research is needed to expand our knowledge of SDOH, religion, and health outcomes.

Keywords: Religious Attendance, cardiovascular disease, social determinants of health, health

risk factors, behavioral risk factors

May 10, 2023

Dear Drs. Kawachi and Subramanian,

We wish to submit an original research article entitled, ***The role of demographics, social determinants of health, health risk factors, behavioral risk factors, and religious attendance in cardiovascular disease risk***, for consideration by the Social Science and Medicine journal. We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere.

We used the NHANES 2007-2008 dataset to examine if demographics, social determinants of health (SDOH), health factors, behavioral factors, and religious attendance influence cardiovascular disease (CVD). We defined CVD as having had a heart attack, stroke, or both. We examine women and men separately, as there are different risk factors based on sex, using logistic regression. We used three models for each group, the first included demographic and SDOH variables, the second included health and behavioral health risk factors, and the third was religious attendance. Religious attendance was operationalized as less than weekly, weekly, and more than weekly attendance. We found that among women, older age, current cigarette use, and higher number of healthcare visits, but not religious attendance, were predictive of CVD. Among men we found that older age, having difficulty walking, higher relative fat mass, higher number of healthcare visits, and more than weekly religious attendance were predictive of CVD.

We think these findings add to the knowledge base on the role that SDOH and religious attendance have on CVD. Further these data could provide healthcare providers with more details about the behaviors of their patients to improve decision making on determining risk of CVD.

Thank you for your consideration.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Introduction

Research associated with social determinants of health (SDOH) indicates that social factors play a significant role in shaping health outcomes and disparities. Many studies have found that individuals who experience social and economic disadvantages, such as poverty, low educational attainment, and inadequate access to healthcare, are more likely to have poor health outcomes and a higher risk of chronic diseases (Adler & Newman, 2002; Braveman et al., 2011; Marmot, 2015).

Religious belief and practices have been shown to influence a person's health behaviors such as physical activity, diet, alcohol use and smoking. It provides social support and a sense of belonging which have an impact on mental health and the overall well-being (Raj et al., 2013). Moreover, religion has been related to health outcomes, such as cardiac disease (Obiseasan et al., 2006; Salmoirago-Blotcher et al., 2011). The main objective of this study is to examine how SDOH and religion influence health outcomes related to cardiovascular disease (CVD).

The literature on the influence of religion on health outcomes, however, has mainly focused on mortality, specific diagnoses, and categories of health, including chronic illnesses by subgroups of the population (Banerjee et al., 2014: Gillum & Ingram, 2006; Jim et al., 2015; Li et al., 2016; Roger & Hatala, 2018; Salmoirago-Blotcher et al., 2011; Zimmer et al., 2016). A meta-analysis by Coruh et al. (2005) reported a correlation between religion and positive health outcomes. Other reviews, however, have not found a direct relationship or were non-conclusive (Bagiella et al., 2005). There is also support for religion having positive and negative relationships with health behaviors, such as smoking, alcohol use, and dietary habits (Chatters, 2000; Idler, 2010; Salmoirago-Blotcher et al., 2011)

Studies on religion and health that reported results based on demographics and illness-related variables are ample (e.g., Bradley et al., 2020; Chatters, 2000; Guillum, 2006). In contrast, the literature which includes social determinants of health (SDOH) when exploring religion and health is sparse (Jilani et al., 2021; Powell-Wiley, 2022). According to *Healthy People 2030*, SDOH are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks. SDOH includes economic stability, access to quality education, access to quality health care, living in a safe neighborhood, and positive interactions with community members, family, and friends (Healthy People 2030, n. d.). Through the *Healthy People* initiatives, there is evidence and federal support for understanding causal factors related to health disparities. While the *Healthy People* initiative released its first report in 1979, entitled *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention*, it was not until the 2020 publication that social determinants of health became a topic of focus (Koh et al., 2011). Since the emergence of the concept of SDOH and the impact on health there has been a call to capture and apply social data in conjunction with health data to advance both individual and population health. Capturing and acting on SDOH in clinical settings has never been more relevant (Pantell et al., 2020).

One methodological challenge when reviewing the available research on the effects of religion on health outcomes is that religiousness is not a consistently defined or measured factor. We noted that a common measure of religiousness is self-reported attendance to religious services. However, the use of religious attendance as a metric for religiosity does not fully provide the influence of religious behavior on health outcomes. For example, religious attendance is a public display of religious involvement, but it does not include private religious

involvement such as prayer and religious coping (Hall et al., 2008). Although religious attendance has been reported to be related to healthy lifestyle behaviors and positive health outcomes among those with cardiac disease (Obisesan et al., 2006; Salmoirago-Blotcher et al., 2011), many researchers identify the need to go further and explore the influence religion has on health and psychosocial outcomes, such as social support and culture, to better understand the role religion plays on health outcomes (Bradley et al., 2020; Obisesan et al., 2006; Salmoirago-Blotcher et al., 2011)

According to the World Health Organization (n. d.) cardiovascular diseases (CVDs) are the leading cause of death globally, with more than four out of five CVD deaths due to heart attacks and strokes. Approximately one third of these deaths occur prematurely in people under 70 years of age. In the United States, heart disease is the leading cause of death and stroke is fifth, regardless of gender or race and ethnicity. Among men, who are White, Black, American Indian or Alaskan Natives, Native Hawaiian or Pacific Islanders, or Hispanic heart disease is the leading cause of death while it is the second leading cause in Asian men. Strokes are the fifth leading cause for White and Native Hawaiian or Pacific Islander men, while it is the fourth for Black and Hispanic men, third for Asian men, and eighth for American Indian or Alaskan Native men (Centers for Disease Control and Prevention, 2018a). Among women, heart disease is the leading cause of death among Whites and Blacks but the second leading cause among Asians, American Indian or Alaskan Natives, Native Hawaiian or Pacific Islander, or Hispanics. Stroke is the fifth leading cause among women who are White, third among those who are Black, Asian, Native Hawaiian or Pacific Islander, or Hispanic, and seventh among American Indian or Alaskan Natives (Centers for Disease Control and Prevention , 2022b).

This overwhelming cardiovascular burden is the result of not only an aging population, but also a dramatic rise in obesity and resulting comorbidities such as hypertension, diabetes mellitus, and physical inactivity. The most likely reasons for this increase in CVD have been attributed to changes in societal and environmental conditions that have led to changes in diet and physical activity (Havranek et al., 2015). Health behaviors that are risk factors of heart disease are: poor diet, physical inactivity, and tobacco and alcohol use. The effects of behavioral risk factors may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids, being overweight, and being obese (World Health Organization, n. d.).

The purpose of our study was to investigate the relationships between demographics, SDOH, health and health behaviors known to be related to cardiac disease, religious attendance and having been diagnosed with CVD, which was measured as having had a heart attack or stroke.

Methodology

Participants 40 years and older in the National Health and Nutrition Examination Survey (NHANES) 2007-2008 survey were included in this study. The NHANES is a biannual national survey that assesses the physical and nutritional health and psychosocial domains of the non-institutionalized civilian population in the United States. It is carried out and overseen by the National Center for Health Statistics, whose institutional review board approves each survey cycle. Detailed survey descriptions, methodology, sampling procedures, laboratory test procedures, and data tables are publicly available on the Centers for Disease Control and Prevention website (Zipf et al., 2013).

The NHANES 2007-2008 dataset was used as it was the most recent survey that included a question related to religion. Only respondents 40 years and older were asked to answer the question on religious attendance. The data will be analyzed separately for men and women.

Measures

Dependent Variable.

The dependent variable in this study is cardiac disease, which was calculated from the responses to two variables in the Medical Conditions file. If a participant reported yes to "ever told you had a stroke," or "ever told you had a heart attack," or yes to both, they were coded as yes to heart disease, all other responses were coded as no.

Independent Variables.

Demographics and Social Determinants of Health (SDOH)

The demographic variables were age, gender, race and ethnicity, and marital status. The SDOH variables were place of birth, poverty level, health insurance, worried about running out of food, and food didn't last. Respondents 80 years old or older were all aggregated in the age category of 80. The SDOH variables were selected as they were included in the 2007-2008 questionnaire.

Health and Behaviors Risk Factors for Cardiac Disease

Health risk factors for cardiac disease include data on mobility limitations, blood pressure, fasting glucose, and relative fat mass (RFM). We selected RFM instead of BMI, as it has been found to be a better predictor of heart disease (Woolcott & Bergman, 2018). Mobility limitation was calculated using a question from the Physical Functioning section of the survey; "because of a health issue, do you have difficulty walking without any special equipment?" The

two items were: “How much difficulty do you have walking for a quarter of a mile [that is about 2 or 3 blocks]?” and “How much difficulty do you have walking up 10 steps without resting?”

Blood pressure was a yes/no question asking if the respondent had ever been told they had high blood pressure. Fasting glucose was based on laboratory results of blood drawn during the medical exam at the mobile examination centers. The value of the fasting book glucose was used in the analysis. Relative fat mass (RFM) was calculated using height and waist circumference data using these formulas:

$$\text{Women: } RFM = 76 - (20 * (\text{height} / \text{waist}))$$

$$\text{Men: } RFM = 64 - (20 * (\text{height} / \text{waist}))$$

Behavioral risk factors were alcohol use, cigarette use, and the number of healthcare visits. New variables were calculated based on alcohol and cigarette use questions. The new alcohol variable is type of drinker and has four categories: never drank, current drinker, past drinker, and unknown. The unknown category comprises those who did not participate in the physical exam. Type of alcohol user was calculated using four variables from the Alcohol Use section: had at least 12 alcoholic drinks in any one year, at least 12 alcoholic drinks over a lifetime, how often drank over the past 12 months, and the average number of drinks per day over the past 12 months. Cigarette use was calculated into a yes/no variable using two questions in the Cigarette Use section, smoked at least 100 cigarettes in a lifetime and do you now smoke cigarettes.

Statistical Analysis

For the data processing and statistical analysis of this study, R version 4.2.0 was used within RStudio 2022.07.2 Build 576. Six multiple logistic regression models were used. Given that logistic regression requires observations for every field being analyzed, any records from the

NHANES datasets with missing values were discarded. That is, the total number of NHANES participants was 10,149, and the analytic sample was restricted to the responses from 2,956 participants providing responses to the relevant study questions.

For the analysis, the data was separated by sex (w-women, m-men) and explored three logistic regression models (1-3) for a total of six models 1w, 1m, 2w, 2m, 3w and 3m. Model one for each dataset (1w and 1m) included demographics and SDOH. The second set (2w and 2m) added health indicators; and the third set (3w and 3m) in addition to SDOH and health indicators, included religious attendance.

An initial determination of model fit was evaluated by calculating the Bayesian Information Criterion (BIC) which measures how well a statistical model fits the data (Schwarz, 1978). Typically, a lower BIC value indicates a better fit when comparing similar models. Another key indicator used in this analysis to compare model fit is McFadden's Pseudo R^2 (McFadden, 1974).

The predictive capabilities of the models were evaluated by conducting out-of-sample testing. Each of the models are trained using a random sample of 70% of the available records for that model, then the coefficient estimates were applied to generate probabilities using the remaining 30% of records using an initial threshold of 0.5 for classification.

Results

The total sample was 2,956, with 1,396 women and 1,560 men (See Table 1). The reported attendance to religious services for women was 54.8% less than weekly, 31.1% weekly, and 14.1% more than weekly. The reported attendance was 66.7%, 23.5%, and 9.8% for men, respectively. On average both women and men were prediabetic based on the fasting glucose values, ranging from 3.9 to 32.4 for women and 8.0 to 42.8 for men. In terms of RFM, which is a

measure of risk for heart disease, women had an average score of 42.4 and men had an average score of 30.1, ranging from 21.4 to 54.7 and 3.1 to 26.1, respectively.

Table 1: Demographic, Social Determinants of Health, Religious Attendance, and Cardiovascular Disease Variables by Gender (n = 2,956)

Among women, attending religious services once a week or more than once a week, with less than once a week as the reference, was not significant. Two demographic variables, age and race and ethnicity, and two behavioral health risk factors, cigarette use and number of healthcare visits in the past 12 months, were significant. There is a positive relationship between age and the likelihood of cardiovascular disease (OR: 2.07, $p<0.001$, OR: 2.78, $p<0.001$, OR: 2.66, $p<0.001$) for women. For model 1w ethnicity is significant, specifically, being a Hispanic women reduced one's risk of CVD (OR: 0.26, $p<0.001$). Though race and ethnicity were no longer significant once the health and behavioral risk factors and religious attendance were added in model 2w and model 3w. In models 2w and 3w, the number of healthcare visits is significant for increasing the risk for CVD. Reporting one or fewer visits in the past 12 months being the reference, those with two to three visits had an odd ratio of 5.59 ($p<.05$), four to nine visits had a odds ratio of 6.33 ($p<.05$), ten to twelve visits had an odds ratio of 12.5 ($p<.05$), and 13 and more had an odds ratio of 10.1 ($p<.05$). Being a current cigarette smoker increased the risk of CVD, with the reference being never having smoked, models 2w and 3w show an increased risk for CVD (OR:5.29, $p<0.001$, OR: 5.53, $p<0.001$) while those reporting never to use tobacco or being a former tobacco smoker were not significant (See Table 2).

Table 2: Logistic regression models for Women respondents, odds ratio, confidence interval, and level of significance

In the models for men, there were significant findings for age, having difficulty walking, number of healthcare visits over the previous 12 months, RFM, and religious attendance. None of the SDOH variables were significant, and the other variables in health and behavioral health risk factors were not significant. Specifically, there was a significant positive relationship between age and the likelihood of cardiovascular disease (OR: 1.89, p<0.001, OR: 2.47, p<0.001, OR: 2.49, p<0.001). In model 2m, with one or fewer visits in the past 12 months being the reference, those with two to three visits had an odd ratio of 2.85 (p<.05), four to nine visits had a odds ratio of 2.96 (p<.05), ten to twelve visits had an odds ratio of 3.6 (p<.05), and 13 and more was not significant. In model 3M the odds rations were 3.14 (p<.05), 3.33 (p<.01), 3.91 (p<.05), and 3.00 (p<.05). In all three models RFM was positively related to an increased risk for CVD, in model 1m the odds ratio was 1.77 (p<.001), in model 2m it was 1.74 (p<.001), and in model 3m it was 1.75 (p<.05), with attending religious services less than once a week. Attending more than weekly was significant with an odds ratio of .25 (p<.05). None of the SDOH were significant, and the remainder of the health and behavioral health factors were not significant at the p<.05 level.

It is important to note that some features, although not significant within a 95% confidence interval, were close and at least significant within a 90% C.I. They include ethnicity for model 1m (OR: 0.62, P=.057) indicating that being a Hispanic male reduces one's risk of CVD. Also, having high blood pressure for models 2m and 3m (OR: 1.68 P<.063 and OR: 1.66, P<.071) as well as fasting glucose for models 2m and 3m (OR: 1.27 P<.058 and OR: 1.26, P<.072) indicate that as levels of high blood pressure or fasting glucose increase so does one's risk of CVD. Finally, for model 2m being a current smoker increases CVD risks (OR: 2.06 P<.062) (See Table 3).

Table 3: Logistic regression models for Male respondents, odds ratio, confidence interval, and level of significance

Table 4 displays the resulting p-values and BICs. All models show significance (p <.000), indicating that they are all a better fit compared to the 'empty model'. Lower BIC values are noted for both the second and third models (irrespective of gender) when compared to the first model (1w/1m) indicating that the addition of variables in models 2 and 3 were beneficial and did not significantly reduce their goodness-of-fit.

Table 4: Statistics for both models

Discussion

In the final model for women we found that age, current cigarette smoker, and the number of healthcare visits were predictive of having CVD. Being older increased risk by 266%, being a current cigarette smoker increased risk by 553%, and reporting having two or three healthcare visits increased risk by 540%, four to nine visits raised it by 640%, 10 to 12 visits raised it to 1,220%, with 13 or more visits increasing risk by 1,000%.

In final model for men we found that older age, having difficulty walking, higher relative fat mass, a higher number of healthcare visits, and more than weekly religious attendance were predictive of CVD. Being older increased risk by 176%, having difficulty walking increased risk by 318%, having a higher RFM increased risk by 175%, and reporting numbers of healthcare visits increased risk between 300% to 391%. Two to three visits increased risk by 314%, four to nine by 333%, 10 to 12 by 391%, and 13 or more visits increased risk by 300%.

Obisesan et al., (2006) reported similar results as it related to age. They found that women and men 60 years and older had a higher risk for having a heart attack than did those under 60. They also found no difference in risk for heart attack for those 60 years and over who attended services once a week and those who attended less frequently. A finding they reported that was different than ours was that Black or African American women who attended religious services had a lower risk of stroke when

controlling for demographics and health factors. Finally, they reported for non-Black or African American women there was a 39% lower risk for a stroke when controlling for demographic variables which was significant. This significance did not persist after added health variables to the variable controlled for. In addition, the findings on race and ethnicity were different as our study does not reflect that there is a statistical significance for these variables.

Prior research found that religious attendance is associated with better health outcomes, inclusive of reduced mortality (Hall et al., 2008, Li et al., 2016). Our findings were different than other studies because we included more than weekly religious attendance and others only looked at less than weekly and weekly attendance. In addition, our study finds religious attendance influences the overall CVD outcomes of men more than women. These results highlight the importance of sex differences with health outcomes and religion. Research that focuses on these differences can contribute to better patient care in identifying sex specific concerns, however this observation should not minimize individual patient concerns.

Even though this study did not find an association between SDOH and cardiovascular health, health care has grown in their understanding of the importance of SDOH on overall health outcomes. However, this was not represented in the 2007-2008 NHANES dataset. For future research, more SDOH data is needed from reliable sources to gather additional insight on the role a broader range of SDOH factors such as environmental, neighborhood, and social support have on CVD and other health outcomes. The impact religion and spirituality have on health outcomes could be better understood if data beyond religious attendance could be capture by NHANES.

There were a few limitations in our study. One was that religious attendance is a poor indicator of religion and spirituality (Hall et al., 2008). Another limitation is that we did not use religious attendance to explore its role in social support. That is, we did not include other measures of social support, such as the number of close friends or types of relationships with family members, both of which have been reported to be significant predictors of health

outcomes (Pantell et al., 2013). Also, the NHANES survey captures a limited number of SDOH variables which restricts our study implications to a narrower set of external factors and their influence on CVDs. Finally, our sample was limited as variables such as smoking status and blood tests were only available for those respondents who also participated in the physical examination.

Future Directions

To improve the way that religion is measured it would be necessary to develop a set of metrics that help acquire a broader understanding of the role that religion has on heart disease. For example, metrics to question could be related to religious persistence, religion as a social support and religion as a motivating factor for healthy behavior.

To address the limited number of SDOH variables, it will be necessary for NHANES to include additional items such as environment and neighborhood factors which are recognized to influence health and behavioral health risk factors. Additional variables will allow researchers to explore an expanded set of dimensions that could help capture more accurately the impact of SDOH on health and behavioral health risk factors.

Finally, to better understand the relationship that the number of healthcare visits had on CVD it would be necessary to identify the reasons for the visits. For example, were they associated with other chronic conditions other than heart disease? Or were they related directly to heart disease? This information could provide additional layers of granularity that could result in more precise predictive models on cardiac outcomes.

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Table 1: Demographic, Social Determinants of Health, Religious Attendance, and Cardiovascular Disease Variables by Gender (n = 2,956)

	Women (n = 1396)		**Men (n = 1560)**	
	Mean (SD)	**Range**	**Mean (SD)**	**Range**
Age^	60.2 (12.4)	40-80	60.6 (12.3)	40-80
Fasting Glucose (mmol/L)	6.3 (2.2)	3.9-32.4	6.6 (2.3)	8.0-42.8
Relative Fat Mass (RFM)	42.4 (5.2)	21.4-54.7	30.1 (5.0)	3.1-26.1
	N	**%**	N	%
Ethnicity				
Hispanic	385	27.6	391	25.1
Non-Hispanic Black	264	18.9	290	18.6
Non-Hispanic White	703	50.4	830	53.2
Other	44	3.2	49	3.1
Education				
Less than High School	462	33.1	505	32.4
High School/GED	346	24.8	364	23.3
Some College	331	23.7	358	22.9
College Graduate or above	257	18.4	333	21.3
Marital Status				
Married	751	53.8	1110	71.2
Never Married	99	7.1	118	7.6

Previously Married	546	39.1	332	21.3
Poverty Level				
Less than or equal to 130%	446	34.0	431	29.3
Greater than 130% to equal to 185%	209	16.0	208	14.1
Greater than 185%	655	50.0	831	56.5
Health Insurance				
Yes	1153	82.6	1288	82.7
No	243	17.4	270	17.3
Number of Healthcare Visits in the past 12 months				
0 to 1	311	22.3	475	30.5
2 to 3	387	27.7	385	24.7
4 to 9	470	33.7	466	29.9
10 to 12	118	8.5	114	7.3
13 or more	110	7.9	118	7.6
Worried about Household Running Out of Food				
Never True	1093	78.9	1276	82.2
Sometimes True	178	8.2	166	12.0
Often True	114	8.2	89	5.7
Food Ran Out				
Never True	1130	81.5	1318	84.7
Sometimes True	174	12.5	166	10.7
Often True	83	6.0	72	4.6

Difficulty Walking				
Yes	163	11.7	194	12.4
No	1233	88.3	1366	87.6
High Blood Pressure				
Yes	682	48.9	700	44.9
No	713	51.1	859	55.1
Cigarette Use				
Never	808	57.9	586	37.6
Current	243	17.4	342	21.9
Former	344	24.7	631	40.5
Alcohol Use				
Never	435	31.2	147	9.4
Current	742	53.2	1047	67.1
Former	219	15.7	366	23.5
Religious Attendance				
Less than weekly	765	54.8	1039	66.7
Weekly	434	31.1	366	23.5
More than weekly	197	14.1	153	9.8
Cardiovascular Disease				
No	1273	9.2	2738	92.6
Yes	123	8.8	218	7.4

Table 2: Logistic regression models for Women respondents, odds ratio, confidence interval, and level of significance

Characteristic	Model 1w (n = 1265)			Model 2w (n = 597)			Model 3w (n = 597)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Demographics and SDOH									
Age	2.07	1.58, 2.75	**<0.001**	2.78	1.76, 4.60	**<0.001**	2.66	1.67, 4.40	**<0.001**
Race and Ethnicity									
Non-Hispanic White	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Hispanic	0.26	0.12, 0.51	**<0.001**	0.46	0.17, 1.16	0.11	0.45	0.16, 1.15	0.11
Non-Hispanic Black	0.62	0.33, 1.10	0.11	0.75	0.27, 1.85	0.5	0.71	0.26, 1.78	0.5
Other	0.41	0.06, 1.51	0.2	0.44	0.02, 2.68	0.5	0.53	0.03, 3.23	0.6
Marital Status									
Never Married	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Married	2.97	0.98, 13.0	0.089	3.56	0.57, 71.2	0.3	3.56	0.57, 70.8	0.3
Previously Married	2.31	0.77, 10.1	0.2	2.74	0.43, 55.3	0.4	2.87	0.45, 57.3	0.4
Education									
High School/GED	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Less than High School	0.89	0.51, 1.56	0.7	0.88	0.39, 1.99	0.8	0.94	0.41, 2.17	0.9
Some college	0.96	0.53, 1.72	0.9	0.81	0.31, 2.07	0.7	0.81	0.31, 2.08	0.7
College Graduate or above	0.51	0.22, 1.11	0.11	0.59	0.17, 1.81	0.4	0.61	0.18, 1.87	0.4
Poverty Level									
Poverty Index in (1.30, 1.85)	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Poverty Index <= 1.3	1.47	0.79, 2.82	0.2	1.16	0.46, 3.08	0.8	1.16	0.46, 3.10	0.8
Poverty Index > 1.85	1.03	0.55, 1.99	>0.9	1.32	0.52, 3.52	0.6	1.36	0.54, 3.66	0.5
Health Insurance									

Characteristic	Model 1w (n = 1265)			Model 2w (n = 597)			Model 3w (n = 597)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Not Covered	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Covered	0.75	0.35, 1.72	0.5	0.47	0.17, 1.42	0.2	0.50	0.18, 1.52	0.2
Worried food would run out									
Never true	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Often True	1.30	0.30, 4.93	0.7	0.80	0.09, 5.80	0.8	0.76	0.09, 5.59	0.8
Sometimes true	1.40	0.47, 3.80	0.5	1.07	0.17, 4.92	>0.9	1.09	0.17, 5.05	>0.9
Ran out of food									
Never true	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Often True	2.67	0.63, 11.9	0.2	6.15	0.68, 58.4	0.11	6.82	0.75, 65.5	0.089
Sometimes true	1.75	0.61, 5.18	0.3	3.01	0.57, 20.1	0.2	3.11	0.58, 21.1	0.2
Health risk factors									
Difficulty walking									
No				Ref.	Ref.		Ref.	Ref.	
Yes				1.34	0.58, 2.92	0.5	1.43	0.61, 3.17	0.4
Told had high blood pressure									
No				Ref.	Ref.		Ref.	Ref.	
Yes				1.47	0.70, 3.15	0.3	1.47	0.70, 3.18	0.3
Relative Fat Mass				1.50	0.86, 2.67	0.2	1.50	0.86, 2.69	0.2
Fasting glucose				0.73	0.41, 1.12	0.2	0.74	0.41, 1.13	0.2
Behavioral risk factors									
Cigarette use									
Never				Ref.	Ref.		Ref.	Ref.	
Current				5.29	1.99, 14.5	**<0.001**	5.53	2.07, 15.2	**<0.001**

Characteristic	Model 1w (n = 1265)			Model 2w (n = 597)			Model 3w (n = 597)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Former				1.69	0.73, 3.87	0.2	1.76	0.76, 4.05	0.2
Alcohol use									
Never				Ref.	Ref.		Ref.	Ref.	
Current Drinker				0.84	0.36, 1.98	0.7	0.80	0.34, 1.91	0.6
Past drinker				0.76	0.28, 1.98	0.6	0.75	0.28, 1.97	0.6
Number of healthcare visits past 12 months									
2 to 1				Ref.	Ref.		Ref.	Ref.	
2 to 3				5.59	1.39, 38.0	**0.032**	5.40	1.33, 37.0	**0.037**
4 to 9				6.33	1.59, 43.0	**0.022**	6.40	1.60, 43.7	**0.021**
10 to 12				12.5	2.68, 91.9	**0.004**	12.2	2.61, 90.1	**0.004**
13 or more				10.1	1.94, 79.1	**0.011**	10.0	1.92, 78.8	**0.011**
Religious Attendance									
Less than Weekly							Ref.	Ref.	
Weekly							1.48	0.71, 3.07	0.3
More than Weekly							0.82	0.27, 2.23	0.7

Table 3: Logistic regression models for Male respondents, odds ratio, confidence interval, and level of significance

Characteristic	Model 1m (n = 1416)			Model 2m (n = 652)			Model 3m (n = 650)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Demographic and SDOH									
Age	1.89	1.55, 2.34	**<0.001**	2.47	1.75, 3.56	**<0.001**	2.49	1.76, 3.61	**<0.001**
Race and Ethnicity									

Characteristic	Model 1m (n = 1416)			Model 2m (n = 652)			Model 3m (n = 650)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Non-Hispanic White	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Hispanic	0.62	0.37, 1.00	0.057	0.98	0.47, 1.97	0.9	1.02	0.49, 2.06	0.9
Non-Hispanic Black	1.31	0.84, 2.01	0.2	1.60	0.80, 3.14	0.2	1.87	0.92, 3.75	0.078
Other	1.04	0.29, 2.84	>0.9	2.90	0.40, 13.3	0.2	3.85	0.52, 18.3	0.12
Marital Status									
Never Married	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Married	0.62	0.33, 1.25	0.2	0.65	0.24, 1.92	0.4	0.62	0.23, 1.83	0.4
Previously Married	0.61	0.30, 1.27	0.2	0.52	0.18, 1.63	0.2	0.45	0.15, 1.41	0.2
Education									
High School/GED	**Ref.**	Ref.		Ref.	Ref.		Ref.	Ref.	
Less than High School	**1.13**	0.72, 1.77	0.6	0.89	0.43, 1.84	0.8	0.91	0.44, 1.88	0.8
Some college	**0.77**	0.46, 1.28	0.3	0.84	0.38, 1.86	0.7	0.87	0.39, 1.92	0.7
College Graduate or above	**0.97**	0.58, 1.62	0.9	1.38	0.66, 2.93	0.4	1.33	0.63, 2.84	0.5
Poverty Level									
Poverty Index in (1.30, 1.85)	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Poverty Index <= 1.3	1.03	0.62, 1.73	0.9	1.12	0.50, 2.62	0.8	1.08	0.47, 2.54	0.9
Poverty Index > 1.85	0.82	0.50, 1.34	0.4	0.82	0.38, 1.84	0.6	0.80	0.37, 1.81	0.6
Health Insurance									
Not Covered	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Covered	1.12	0.60, 2.20	0.7	0.95	0.37, 2.66	>0.9	0.92	0.36, 2.58	0.9
Worried that food would run out									

Characteristic	Model 1m (n = 1416)			Model 2m (n = 652)			Model 3m (n = 650)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Never true	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Often True	2.65	0.73, 9.18	0.13	1.34	0.11, 12.7	0.8	1.51	0.12, 14.5	0.7
Sometimes true	1.50	0.62, 3.41	0.3	1.05	0.25, 3.70	0.9	1.05	0.26, 3.65	0.9
Food ran out									
Never true	Ref.	Ref.		Ref.	Ref.		Ref.	Ref.	
Often True	0.95	0.25, 3.64	0.9	1.73	0.14, 23.1	0.7	1.37	0.11, 19.1	0.8
Sometimes true	1.22	0.50, 3.07	0.7	1.40	0.36, 5.94	0.6	1.51	0.39, 6.22	0.6
Health risk factors									
Difficulty walking									
No				Ref.	Ref.		Ref.	Ref.	
Yes				3.12	1.64, 5.92	**<0.001**	3.18	1.66, 6.09	**<0.001**
Told had high blood pressure									
No				Ref.	Ref.		Ref.	Ref.	
Yes				1.68	0.98, 2.92	0.063	1.66	0.96, 2.91	0.071
Fasting glucose				1.27	0.99, 1.62	0.058	1.26	0.98, 1.62	0.072
Relative Fat Mass	1.77	1.31, 2.40	**<0.001**	1.74	1.06, 2.93	**0.033**	1.75	1.05, 2.96	**0.034**
Behavioral risk factors									
Cigarette use									
Never				Ref.	Ref.		Ref.	Ref.	
Current				2.06	0.96, 4.41	0.062	1.77	0.81, 3.87	0.2
Former				1.22	0.66, 2.29	0.5	1.14	0.61, 2.16	0.7
Alcohol use									
Never				Ref.	Ref.		Ref.	Ref.	
Current Drinker				2.01	0.77, 6.02	0.2	1.85	0.70, 5.57	0.2

Characteristic	Model 1m (n = 1416)			Model 2m (n = 652)			Model 3m (n = 650)		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Past drinker				1.92	0.71, 5.90	0.2	2.02	0.73, 6.24	0.2
Number of healthcare visits past 12 months									
0 to 1				Ref.	Ref.		Ref.	Ref.	
2 to 3				2.85	1.18, 7.41	**0.024**	3.14	1.29, 8.21	**0.014**
4 to 9				2.96	1.27, 7.44	**0.015**	3.33	1.42, 8.46	**0.008**
10 to 12				3.60	1.20, 10.9	**0.021**	3.91	1.31, 11.9	**0.015**
13 or more				2.68	0.95, 7.77	0.064	3.00	1.06, 8.78	**0.040**
Religious attendance									
Less than Weekly							Ref.	Ref.	
Weekly							0.78	0.42, 1.42	0.4
More than Weekly							0.25	0.06, 0.79	**0.03**

[1] OR = Odds Ratio, CI = Confidence Interval

Table 4: Statistics for both models

Model for Women				Models for Men			
	P-value	**BIC**	**McFadden's Pseudo R2**		**P-value**	**BIC**	**McFadden's Pseudo R2**
Model 1w	<.001	758.9855	0.157	Model 1m	<.001	1112.1097	0.141
Model 2w	<.001	463.7499	0.212	Model 2m	<.001	605.3793	0.219
Model 3w	<.001	474.9299	0.216	Model 3m	<.001	611.9759	0.230