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Socioeconomic Status and Cardiovascular Disease Risk in Vermont Adults

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Title:
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Abstract:
Objectives. To investigate the connection between socioeconomic status (SES) and cardiovascular disease in Vermont adults through the Behavioral Risk Factor Surveillance System (BRFSS) data.
Methods. Data from 4,231 participants from the BRFSS 2019 Vermont survey was used. Education level, income level, federal poverty status, and employment status were used to represent overall socioeconomic status. The study investigated the connection of those variables with a history of coronary heart disease (CHD) and myocardial infarction (MI) to represent overall cardiovascular disease (CVD). Simple and multiple logistic regressions were used.
Results. People aged 65 years or above, who smoke, have high blood pressure, are not employed, are men, and have high cholesterol are more likely to experience a history of MI event or CHD. There is no significant association between education level or being overweight and history of MI event or CHD ($P < .05$).
Conclusions. The results showed a significant association between socioeconomic status and CVD. Income and employment status were especially significantly associated with CVD. Limitations regarding education level within our sample may explain a disparity between our results and the previous literature.

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death globally and the second leading cause of death in Vermont adults.[1,2] Previous research has found that high blood pressure, high cholesterol, and smoking are key factors in the development of CVD.[1] Low socioeconomic status, measured through income level, education and employment, has also been shown to be a strong predictor of CVD when looking at national data.[3] Specifically, research on country-level data determined low education, low income, and unstable employment have been tied to cardiovascular disease.[4,5] While there is national data addressing this association, it has yet to be studied in Vermont specifically, which could aid in the creation of programs specific to the risk factors for CVD in Vermont.

The purpose of this study was to investigate risk factors for developing CVD related to structural and societal inequities, specifically, how socioeconomic status (SES) impacts the risk of developing CVD. The aim was to further research this connection within Vermont by looking at the BRFSS data for the state. The team's research question was: Is there an association between high and low socioeconomic status and cardiovascular disease status in Vermont? The results of this study may identify Vermonters most at risk for CVD and lead to the creation of effective prevention programs within this population.

METHODS

This study focused on 2019 BRFSS participants in the state of Vermont. This began with identifying key variables from the 2019 BRFSS questionnaire and variable definition table. No variables or categories were created or transformed by the research team. The University of Vermont Institutional Review Board has reviewed this project and determined that it qualifies as exempt from additional review

A history of MI or CHD was identified as the outcome. The exposures were education level, income level, federal poverty, and employment status represented socioeconomic status. Due to a coding issue, participants identified as having 1 to 3 years of college or 4 years of college were not included in the analyses. High blood pressure, high cholesterol, smoking status, age, and BMI were identified as potential cofounders. Definitions of each variable count can be found in Table 1.

Variable	Characteristics	Frequency	Percent
Education Level	Never attended school or only attended kindergarten	127	3%
	Grades 1 through 8 (Elementary)	1033	24%
	Grades 9 through 11 (Some high school)	995	24%
	Grade 12 or GED (High school graduate)	2076	49%
	College 1 year to 3 years (Some college or technical school)	0	0%
	College 4 years or more (College graduate)	0	0%
Employment Status	Employed for wages	1841	44%
	Self-employed	524	12%
	Out of work for more than 1 year	56	1%
	Out of work for less than 1 year	60	1%
	Homemaker	105	2%
	Student	44	1%
	Retired	1326	31%
	Unable to work	275	6%
Income	Less than $10,000	100	2%
	$10-<$15,000	193	5%
	$25-<20,000	241	6%
	$20-<$25,000	318	8%
	$25-<$35,000	408	10%
	$35-<$50,000	566	13%
	$50-<$75,000	808	19%
	$75-<$100,000	645	15%
	$100,000+	952	23%
BMI	Not overweight or obese	1493	35%
	Overweight or obese	2378	56%
Reported CHD or MI	Yes	374	9%
	No	3823	90%
Smoking	Non-Smoker	3725	88%
	Smoker	506	12%
Cholesterol	Not at risk	2709	64%
	At risk (high cholesterol)	1522	36%
High BP	Not at Risk	2551	60%
	At Risk (high blood pressure)	1680	40%
Sex	Male	1990	47%
	Female	2241	53%
Age	Under 65	2489	59%
	Over 65	1742	41%

Table 1. Descriptive table of variables utilized in the analysis with their specific characteristics, frequency of use in the survey, and accompanying percentage. All variables and categories were taken from the BRFSS Variable guide. No variables or categories were created or transformed by the research team.

A bivariate logistic regression analysis was performed for each variable against the outcome and the odds ratios were interpreted. Each of the variables was added to the multiple logistic regression to assess for the presence of a confounder. A confounder was identified if there was a >10% difference in the odds ratios Once all confounders were identified they were controlled for in the final model. A statistically significant result was measured as less than a *P* value less than .05.

RESULTS

In this study, 4213 participants were identified that completed all the questions for the variables selected.

Variable Name	Odds Ratio	P value
Age (> 65 years old versus < 65 years old)	2.09	$P < .001$
With high blood pressure versus without high blood pressure	2.38	$P < .001$
Individuals who smoke versus those who do not	1.54	$P = .01$
Individuals who are not employed versus those who are	1.13	$P < .001$
Individuals with high cholesterol versus without high cholesterol	1.88	$P < .001$
High income versus low income	1.16	$P < .001$
Men versus women	2.65	$P < .001$

Table 2. Multiple logistic regression comparing the incidence of myocardial infarction (MI) or cardiovascular disease (CVD) against independent variables of age, level of education,

overweight/obese designation, high blood pressure, smoking status, employment status, annual household income level, high cholesterol, and sex of participant.

As noted in Table 2, individuals above the age of 65 years old had 2.09 times higher odds of having an MI or CVD diagnosis compared to those under the age of 65 years old at a $P < .001$ level.

Individuals with high blood pressure were at 2.38 times greater odds of having an MI or CVD diagnosis compared to those with low blood pressure at a $P < .001$ level. Individuals who smoke had 1.54 times greater odds of having an MI or CVD diagnosis compared to those who do not smoke at a $P = .01$ level.

Individuals who are not employed had a 1.13 times greater odds of having an MI or CVD diagnosis compared to those who are employed at a $P < .001$ level. Individuals with high cholesterol had a 1.88 times greater odds of having an MI or CVD diagnosis compared to those without high cholesterol at a $P < .001$ level. Men had a 2.65 times greater odds of having an MI or CVD diagnosis compared to women at a $P < .001$ level.

There was no significant association between education level or being overweight and history of MI event or CHD at the $P = .05$ level.

DISCUSSION

The results showed a significant association between low SES and higher risk of CVD overall. Low income and un-employment were especially associated with higher risk of CVD. No association was found between education and CVD. Low income has previously shown to be a risk factor for high risk of CVD in other studies. In a study looking at countries with different income levels, countries with lower income were significantly associated with more risk of CVD.[5]

However, across the literature there is a consensus that education level is significantly associated with CVD. A study done in Japan found that less education leads to ignorance of risk factors, which then enables participation in unhealthy behaviors.[6] Income and job strain did attenuate the effect of education on CVD risk when studied in Danish employees.[4]

The current study did not include individuals who reported having some college or having completed college. Future studies on this subject should have a wider range of education

levels. Bias may have introduced itself because the team selected the variables used. The state of Vermont collected survey answers via phone.

In terms of social assistance programs, research says they need to be expanded in order to catch up with the cost of living.[7] Social assistance programs are designed to supplement income to disadvantaged populations.[7] However, since the 1990s little legislative effort has been made to help these programs keep up with the current cost of living.[7] This has led to recipients of social assistance programs having worse health outcomes than those not on social assistance programs.[7] One such example of this phenomenon is Temporary Assistance for Needy Families (TANF). While the state of Vermont increased TANF benefits since 1996, in 2021 benefits still have not kept up with inflation.[8] Because of this, low income families sometimes have to choose between necessary items for childcare and paying rent.[8] Cash assistance programs are proven to improve the health of low income children as well as education.[8] Increasing benefits from cash assistance programs could help manage some of the burdens of low SES families, allowing them more time and resources to invest in their health.

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