

SOCIAL DETERMINANTS OF EMERGENCY DEPARTMENT VISITS AMONG PERSONS DIAGNOSED WITH CORONARY HEART DISEASE AND STROKE

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Background: Social determinants of health (SDOH) are associated with a variety of health outcomes, yet their relation to emergency department (ED) visits among individuals with coronary heart disease (CHD) or stroke is unclear.

Objective: We examined whether SDOH were associated with ≥ 1 ED visit among persons diagnosed with CHD or stroke.

Methods: We performed a cross-sectional analysis of the 2010-2018 National Health Interview Survey, examining ED visits among individuals who self-reported CHD or stroke diagnosis. The outcome was defined as reporting ≥ 1 ED visit in the previous 12 months vs none. The SDOH examined were race, employment status, poverty, insurance status, marital status, and educational status.

Results: We included N=14,925 participants with a diagnosis of CHD or stroke. The mean (\pm SD) age was 68 (\pm .14) years. After adjusting for age and sex, non-Hispanic Blacks were more likely (adjusted odds ratio [AOR]: 1.29; 95%CI: 1.15-1.44) to report having ≥ 1 ED visits than Whites. Compared with Whites, Asians had lower odds of having ≥ 1 ED visit in the previous 12 months (AOR: .63, 95%CI: .49-.82). Those who were unmarried (AOR: 1.21, 95%CI: 1.12 – 1.31), unemployed (AOR: 1.53, 95%CI: 1.36-1.72) and had a poverty income ratio of < 1 (AOR: 1.47, 95%CI: 1.31-1.67) had higher odds of having ≥ 1 ED visits.

Conclusion: Being Black, unmarried, unemployed, and having lower income levels were associated with a higher likelihood of having ≥ 1 ED visits in the prior 12 months among individuals with a CHD or stroke diagnosis. SDOH should be considered when developing systematic interventions to prevent costly ED visits. *Ethn Dis.* 2021;31(1):41-46; doi:10.18865/ed.31.1.41

INTRODUCTION

More than 120 million Americans have been diagnosed with some form of cardiovascular disease, including coronary heart disease (CHD), hypertension, heart failure, and stroke.¹ By 2035, more than 130 million adults are projected to have some form of cardiovascular disease, and health care costs are expected to exceed \$1 trillion.^{1,2} CHD and stroke are the first and second leading causes of death attributable to cardiovascular disease in the United States, affecting approximately 18.2 million and 7 million Americans, respectively.¹ Stroke is the leading cause of serious long-term disability.¹

Persons with CHD or stroke demonstrate a high frequency of emergency departments (ED) visits to manage acute and chronic symptoms. CHD and stroke-related ED visits contribute to an estimated \$9.4 billion annual

costs in the United States.² Frequent ED revisits may reflect disease progression and poorly controlled chronic conditions.^{3,4} Also important, EDs serve as a safety-net for health care access among those who are medically or socially unstable.^{3,5} Indeed, ED revisits are often attributed to a lack of access to follow-up care, no access to a primary medical home, premature hospital discharge, and lack of social support.^{4,6-8} Currently, EDs provide one-third of all acute care for more than 139 million Americans annually.^{9,10}

Social determinants of health (SDOH) are defined as the conditions in which people are born live, work, learn, and age that affect their health risks and outcomes.^{5,11-13} SDOH also encompasses the intersectionality of social, economic, and environmental factors that include race, ethnicity, education, employment, social support, culture, and health care ac-

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cess.^{12,13} The ED often serves as the first line of care for population health, especially among those with low socioeconomic status and those who are less likely to access primary care.^{3,5,9}

SDOH are associated with a variety of outcomes such as increased health risks, higher disease burden, and shorter life expectancy.¹² SDOH influences many health outcomes.^{12,14} However, chronic conditions such as CHD and stroke require higher demands for self-management.^{15,16} Effec-

ing SDOH in the management of cardiovascular conditions.^{11,12} Death and disability are more prominent among those who have heightened social needs, underscoring the need for understanding the role that social determinants play in health outcomes for individuals with CHD or stroke.^{12,14}

Despite the important role of the ED among those with low socioeconomic status, how SDOH are associated with ED visits in the context of CHD or stroke is unclear. The objective of this study was to examine the SDOH that are associated with ED visits among patients with CHD or stroke.

history of CHD or stroke. CHD history was defined as a positive response to the question, "Have you ever been told by a doctor or other health professional that you had ... coronary heart disease?" Stroke history was defined as positive response to the question: "Have you ever been told by a doctor or other health professional that you had ...a stroke?" Participants who were aged <18 years and those missing data on ED visits (n=324) were excluded.

Outcomes

The main outcome of this study was at least one ED visit in the previous 12 months and was ascertained with the question: "During the past 12 months, how many times have you gone to a hospital emergency room about your own health? (This includes emergency room visits that resulted in a hospital admission)." Responses were dichotomized as ≥ 1 or none.

Social Determinants of Health

The SDOH examined were race, employment status, poverty, insurance status, marital status, and educational status.^{12,13} We examined these variables as dichotomous: marital status (currently married/not married); employment status (employed/not employed); and insurance status (insured/not insured). We examined educational status in the following categories: \leq high school, some college, and \geq Bachelor's degree. We examined poverty income ratio (PIR) as a proxy for income status. The PIR, the ratio of income to poverty, was obtained by dividing the midpoint of an individual's family income by the poverty threshold for that respective year. The PIR was

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tive management of these conditions requires health insurance and sufficient resources to access care, and doctor's appointments to promote positive health outcomes. SDOH such as poverty and poor health care access often serve as barriers to self-management of these chronic conditions.¹² The American Heart Association and American Colleges of Cardiology (AHA/ACC) emphasize the importance of address-

METHODS

Study Design and Data Source

We performed a cross-sectional analysis of the 2010-2018 National Health Interview Survey (NHIS), a principal source of information on the health status of non-institutionalized adults who are aged ≥ 18 years in the United States.^{17,18} NHIS is one of the major data collection programs for the National Center for Health Statistics (NCHS), and the Centers for Disease Control and Prevention.^{17,18} Data from the NHIS are reported in the aggregate, providing estimates of health indicators, health care utilization and access and health care behaviors. Data used in this study were publicly available from the NCHS and de-identified and therefore did not require ethical approval from an institutional review board.

Participants

We included 14,925 individuals aged ≥ 18 years who reported a prior

Table 1. Sociodemographic characteristics of participants diagnosed with CHD or stroke by number of ED visits^a

Characteristics (%)	Total visits	No ED visits	≥1 ED visits	P
Weighted, n	5,433,291	3,284,442	3,284,442	
Unweighted, n	14,925	8,957	5,968	
Age (±SD)	67.5 (±0.12)	67.96 (±0.15)	66.96 (±0.18)	<.001
Sex				<.001
Female	46.97	43.77	51.86	
Male	53.03	56.23	48.14	
Marital status				<.001
Not married	58.39	54.81	63.87	
Race/ethnicity				<.001
Non-Hispanic White	75.19	77.29	71.97	
Hispanic	8.32	7.95	8.89	
Non-Hispanic Black	12.83	10.73	16.03	
Non-Hispanic Asian	2.59	3.01	1.93	
Other races	1.08	1.02	1.18	
Education				<.001
≥ Bachelor’s degree	21.04	23.20	17.74	
Some college	28.29	27.48	29.53	
≤ High school	50.67	49.32	52.73	
Poverty-income ratio (PIR)				<.001
PIR ≥ 2.00	56.03	60.59	49.06	
PIR 1-1.99	25.93	24.56	28.02	
PIR <1	18.04	14.86	22.91	
Employment status				<.001
Unemployed	74.24	71.74	78.08	
Health insurance status				.29
Not insured	4.69	4.54	4.91	
Perceived health status				<.001
Excellent	5.39	6.75	3.32	
Very Good	18.06	21.68	12.54	
Good	33.27	36.44	28.43	
Fair	29.24	26.04	34.14	
Poor	14.03	9.09	21.57	

SD, standard deviation; ED, emergency department; PIR <1 = below poverty level; PIR 1-1.99=between 100%-200% above poverty level; PIR ≥2= >200% above poverty level.

a. Weighted sample demographic characteristics presented.

categorized as follows: <1, 1 to 1.99, and ≥2. A PIR of <1 means that an individual is below the federal poverty level, a person with a PIR between 1 and 1.99 is between 100% and 200% above the poverty level, and PIR ≥2 means that a person is 200% or more above the poverty level. Participant’s perceived health status was categorized as “excellent,” “very good,” “good,” “fair,” or “poor.” Covariates examined were age (continuous) in years, and sex (male/female).

Statistical Analyses

We pooled nine years of data (2010-2018) to improve the reliability of our estimates. Sampling weights were applied per NCHS guidelines¹⁹ to account for the complex sampling strategy. Descriptive statistics were used to examine differences in sociodemographic characteristics between participants who had no visits and those who had ≥1 ED visits. We used survey-weighted t-tests and chi-square tests to examine differences in continuous

and categorical variables, respectively.

We used survey-weighted logistic regression to examine the relationship between SDOH characteristics and ED visits for any reason within the previous 12 months among participants with CHD or stroke. Females, non-Hispanic Whites, ≤ high school, PIR<1, unemployed, and not insured were used as a reference for both models. Model 1 included race/ethnicity, education, employment status, income, insurance status, and marital status and was un-

adjusted. We adjusted for age and sex in Model 2. Statistical significance was determined with a two-sided $\alpha < .05$. All analyses were performed using the Stata[®] 16.1 SE statistical software.²⁰

RESULTS

Sociodemographic Characteristics

We included 14,925 participants with CHD or stroke, and 40% (5,968) had ≥ 1 ED visit in the last 12 months. The mean age for those who had ≥ 1 ED visit was 67.5 (± 12) years and 47% were female. A higher proportion of participants with CHD or stroke (with ≥ 1 ED visit) were non-Hispanic White (75%), had \leq high school education (51%), and unemployed (74%). Details of the sociodemographic characteristics are found in Table 1.

Social Determinants Associated with ED Visits Among Those with CHD or Stroke

Unadjusted and adjusted logistic regression models for the associations between SDOH and ≥ 1 ED visits are presented in Table 2. The unadjusted model showed the likelihood of having ≥ 1 ED visits was higher among Blacks and those who were unmarried, had a PIR < 1 , less than high school and some college education, and were unemployed. Similarly, after adjusting for age and sex, those who were Black, female, unmarried, had a PIR < 1 , and less than high school education, had higher odds of having ≥ 1 ED visits within the previous 12 months. Additionally, the age and sex-adjusted models showed that

Asians had the lowest odds of having ≥ 1 ED visits among all the racial/ethnic groups. A sensitivity analysis was performed to examine variation across regions; there were no significant differences in CHD or stroke ED visits across the four United States regions (North, Midwest, South and West).

DISCUSSION

In this study, we examined the SDOH that are associated with ED visit frequency among patients with coronary heart disease or stroke. Findings from this study indicate that being Black, having low-income, being unemployed, having a high school diploma or less, and being unmarried were associated with a higher likelihood of ≥ 1 ED visits for any reason in the prior 12 months among individuals with a CHD or stroke diagnosis. To our knowledge, there are currently no published studies examining the association of SDOH with ED visits among individuals with CHD or stroke. However, there is an abundance of literature examining the influence of SDOH on CVD risk and health outcomes among racial/ethnic groups.

Previous studies reporting trends in ED visits examined associations between race/ethnicity and neighborhood characteristics, socioeconomic status (SES), insured status, and patterns of ED use.^{4,8,21} A study by Kangovi et al used qualitative analysis to identify patterns of high-frequency ED use among patients with low socioeconomic status with chronic conditions including myocardial, infectious, gastrointestinal, neurological, and pulmonary diseases.⁴ Themes identified for increased ED

visits within the prior six months were food insecurity, lack of insurance, caregiver burden, family dysfunction, and trauma.⁴ These social conditions were identified in 90% of participants who were African American.⁴ A previous cross-sectional study using the National Hospital Medical Ambulatory Care Survey examined ED visit rates for patients with diagnoses of pneumonia, congestive heart failure, angina, perforated appendix, and other non-CVD related acute and chronic conditions. Researchers of this study observed a higher ED use among non-Hispanic White persons and those without health insurance.⁷ Although in our study we observed the highest ED utilization among non-Hispanic Whites, our results showed that ED visits (none vs ≥ 1) were the same for those who were insured vs uninsured. Consistent with our findings, a previous NHIS (2013-2014) analysis examining non-Hispanic Black persons showed higher odds of ED visits (within the previous 12 months) and those who did not have health insurance, but not significantly different from those who were insured.⁸ Furthermore, those who had more than one ED visit within the previous 12 months were more likely to be female.^{7,8}

It is well-established in the literature that ethnic minority populations and socially at-risk groups are more likely to use the ED more frequently.^{4,13,21} Furthermore, previous studies show that persons of racial and ethnic minority backgrounds with low-income are twice as likely to use the ED for non-urgent visits than those who are White with high socioeconomic status.^{4,21} Ethnic minority populations carry a substantial burden of CHD or stroke and of-

Table 2. Logistic regression analyses of the associations between social determinants of health and having ≥1 ED visit in the prior 12 months among persons with CHD or stroke (N=14,925)

	Model 1 ^a	Model 2 ^b
	OR (95% CI)	OR (95% CI)
CHD/Stroke with ≥1 ED visit	.94 (.75 – 1.16)	1.55 (1.24-2.23) ^c
Age	-	.99 (.99- .99) ^c
Sex		
Female	-	Ref
Male	-	.82 (.77 – .87) ^c
Married		
Currently married	Ref	Ref
Not married	1.23 (1.14–1.32) ^c	1.20 (1.11–1.28) ^c
Race/ethnicity		
Non-Hispanic White	Ref	Ref
Hispanic	1.07 (.95–1.19)	1.03 (.92–1.16)
Non-Hispanic Black	1.38 (1.26–1.51) ^c	1.32 (1.20–1.44) ^c
Non-Hispanic Asian	.68 (.55–.83) ^c	.67 (.54–.82) ^c
Non-Hispanic Other	1.13 (0.84–1.51)	1.08 (.81–1.45)
Education		
≥ Bachelor’s degree	Ref	Ref
Some college	1.24 (1.13–1.35) ^c	1.19 (1.09–1.31) ^c
≤ High school	1.10 (1.01–1.20) ^c	1.09 (1.00–1.18)
Poverty income ratio		
PIR ≥200%	Ref	Ref
PIR 1-1.99%	1.23 (1.14–1.34) ^c	1.20 (1.11–1.31) ^c
PIR <1	1.57 (1.44–1.72) ^c	1.46 (1.33–1.60) ^c
Employment status		
Employed	Ref	Ref
Unemployed	1.24 (1.14–1.34) ^c	1.35 (1.23–1.47) ^c
Health insurance status		
Insured	Ref	Ref
Not insured	1.00 (.86–1.17)	.93 (.79–1.09)

a. Model 1: Unadjusted

b. Model 2: adjusted for age and sex.

c. Denotes statistical significance (P<.05)

SD, standard deviation; ED, emergency department; PIR <1 = below poverty level; PIR 1-1.99=between 100%-200% above poverty level; PIR ≥2= >200% above poverty level. Results are weighted.

ten use the EDs in urban safety-net hospitals more frequently to manage these chronic conditions.²¹ There are considerable health disparities among non-Hispanic Blacks regarding CHD or stroke.²² Our study adds to the compelling evidence that health disparities among Blacks are associated with SDOH such as low-income, neighborhood characteristics, education levels, and employment status.^{4,22}

Study Limitations and Strengths

There are limitations to this study. First, we employed a cross-sectional design that hampers our ability to make any causal inferences about the association between SDOH and ED visits. Second, CHD and stroke diagnoses were self-reported. Thus, it is possible this study may underestimate the prevalence of CHD or stroke due

to recall bias and lower health care access including lack of health insurance coverage and poor health care utilization. Furthermore, there is a chance of information bias related to the number of ED visits reported. A strength of this study includes the use of a relatively large sample from a nationally represented dataset, contributing to the generalizability of results. To our knowledge, this is the first study of this type to make associations between SDOH and ED visits for individuals with CHD or stroke, adding new knowledge about the characteristics of those who are more likely to visit the ED more than once in a 12-month period.

CONCLUSION

Social determinants of health were associated with at least one ED visit for those with CHD or stroke, specifically among Blacks, and those with low-income, less education, or were unemployed and unmarried. Reduction of cardiovascular health inequities requires social and medical interventions addressing the SDOH that serve as barriers to achieving optimal health access and care among these socially at-risk populations. SDOH should be considered when developing systematic interventions to prevent costly ED visits for those with CHD or stroke. Further investigation is necessary to explore the influence of behavioral and environmental factors such as medication adherence, occupational hazards, access to transportation, and neighborhood characteristics on the number of ED visits among people with CHD or stroke.

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CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Baptiste, Turkson-Ocran, Han, Himmelfarb, Commodore-Mensah; Acquisition of data: Baptiste, Turkson-Ocran, Commodore-Mensah; Data analysis and interpretation: Baptiste, Turkson-Ocran, Han, Himmelfarb, Commodore-Mensah; Manuscript draft: Baptiste, Turkson-Ocran, Han, Himmelfarb, Commodore-Mensah; Statistical expertise: Baptiste, Turkson-Ocran, Han, Himmelfarb, Commodore-Mensah; Administrative: Baptiste, Turkson-Ocran; Supervision: Baptiste, Himmelfarb, Commodore-Mensah

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