




ORIGINAL RESEARCH

Investigating Rurality as a Risk Factor for State and Trait Hopelessness in Hospitalized Patients With Ischemic Heart Disease

Deb Bomgaars, PhD, RN, CNE; Gwenneth A. Jensen, PhD, RN, CNS; Lynn L. White, PhD, RN, ACNS-BC; Kristin M. Van De Griend, PhD, MPH; Angela K. Visser, MS; Madison P. Goodyke , BSN, RN; Anna Luong, BSN, RN; Nathan L. Tintle , PhD; Susan L. Dunn , PhD, RN

BACKGROUND: Rurality and hopelessness are each associated with increased mortality in adults with ischemic heart disease (IHD), yet there is no known research examining rurality as a risk factor for hopelessness in patients with IHD. This study evaluated rurality as a risk factor for state and trait hopelessness in adults hospitalized with IHD in samples drawn from the Great Lakes and Great Plains regions of the United States.

METHODS AND RESULTS: A descriptive cross-sectional design was used. Data were collected from 628 patients hospitalized for IHD in the Great Lakes (n=516) and Great Plains (n=112). Rural–Urban Commuting Area codes were used to stratify study participants by level of rurality. Levels of state hopelessness (measured by the State-Trait Hopelessness Scale) were higher in rural patients (58.8% versus 48.8%; odds ratio [OR], 1.50; 95% CI, 1.03–2.18), a difference that remained statistically significant after adjusting for demographics, depression severity (measured by the Patient Health Questionnaire–8), and physical functioning (measured by the Duke Activity Status Index; OR, 1.59; 95% CI, 1.06–2.40; $P=0.026$). There was evidence of an interaction between marital status and rurality on state hopelessness after accounting for covariates ($P=0.02$). Nonmarried individuals had an increased prevalence of state hopelessness (nonmarried 72.0% versus married 52.0%) in rural areas ($P=0.03$).

CONCLUSIONS: Rural patients with IHD, particularly those who are nonmarried, may be at higher risk for state hopelessness compared with patients with IHD living in urban settings. Understanding rurality differences is important in identifying subgroups most at risk for hopelessness.

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Key Words: hopelessness ■ ischemic heart disease ■ rural

Mortality rates in the United States from all causes are higher in adults residing in rural areas compared with urban regions, with a widening of this disparity in recent years.¹ Factors contributing to this widening mortality gap include a variety of demographic, environmental, economic, and social factors. Rural residents are more likely to have

limited socioeconomic resources,^{1–3} be uninsured or underinsured,^{3,4} and often have restricted access to high-quality emergency and specialty care.^{4–6} Those living in rural communities have higher age-adjusted mortality rates and excess deaths from many of the leading causes of death nationally, including cardiovascular disease.⁴ Rurality is associated with increased

Correspondence to: Susan L. Dunn, PhD, RN, College of Nursing, University of Illinois Chicago, 845 South Damen Ave., Chicago, IL 60612. E-mail: sdunn01@uic.edu

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CLINICAL PERSPECTIVE

What Is New?

- This study is the first of its kind to examine rurality as a risk factor for state and trait hopelessness in patients with ischemic heart disease (IHD).
- Rural patients with IHD may be at higher risk for state hopelessness compared with patients with IHD living in urban settings.
- Rural patients with IHD who are nonmarried may be at higher risk for state hopelessness than their married counterparts.

What Are the Clinical Implications?

- Understanding rurality differences is important in identifying subgroups most at risk for hopelessness.
- Knowledge of hopelessness in rural patients with IHD is important for health care professionals in both acute care and outpatient settings so that they can identify and counsel at-risk patients.

Nonstandard Abbreviations and Acronyms

IHD	ischemic heart disease
RUCA	Rural–Urban Commuting Area

ischemic heart disease (IHD) mortality.^{3,6} Many of the known risk factors for IHD are observed at higher rates in rural compared with urban residents. Residents of rural areas tend to be older,⁶ have greater rates of high blood pressure and obesity,⁴ have higher rates of cigarette smoking and report less leisure-time physical activity.⁷

Although studies have explored risk factors for and prevalence of various physical health outcomes in rural residents, there is less published research regarding mental health differences between rural and nonrural adults. Psychiatric disorders have been identified as less prevalent in rural adults compared with those residing in urban settings.⁸ Rural White women have been identified at higher risk for major depressive disorder, whereas Black women were less likely to meet major depressive disorder criteria in the same sample.⁹ Other research has found the prevalence of depression similar when comparing rural and urban adults,^{10,11} with higher suicide rates in rural adults compared with their urban counterparts.¹⁰ The variations in mental health findings between urban and rural adults may be attributed to a variety of factors. Adults residing in rural settings are less open

about their psychological problems¹² and less accepting of mental health treatment because of self-stigma compared with urban adults.^{12,13} Adults living in rural settings have less access to mental health treatment,¹⁴ and some with mental health disorders are less likely to use psychotherapy treatments than their urban counterparts.¹⁵

Among these many mental health issues, hopelessness is an important psychological factor associated with the development and progression of IHD, independent of depression^{16,17}; however, it has received less attention in the literature. Hopelessness, characterized by feelings of helplessness along with an overall pessimistic outlook of the future,^{17,18} is present in 27% to 52% of patients with IHD.^{17–19} Hopelessness may represent a temporary response to new events (a state) and/or reflect a habitual outlook (a trait) toward many areas of life.^{20,21} The differentiation between state and trait hopelessness is essential, as individuals experiencing state hopelessness may respond to short-term interventions in an outpatient setting, whereas those with trait hopelessness may need long-term therapy.²²

Hopelessness is associated with a 3.4 times increased risk of death or nonfatal myocardial infarction in patients with IHD, independent of depression.²³ Rurality is also associated with increased IHD mortality.^{3,6} Although hopelessness has been observed in rural survivors of stroke²⁴ and identified as higher in rural compared with urban adults with cancer at the end of life,²⁵ there is no known research examining rurality as a risk factor for hopelessness in patients with IHD.

Measurement of hopelessness in adults residing in the general population in rural areas has also been limited. Hopelessness has been observed in Northern Plain Indians, recruited from North and South Dakota reservations²⁶ and in older adults in rural Alabama.⁵ Other studies aiming to differentiate hopelessness in rural versus urban general populations have been limited by dichotomous hopelessness measures,^{27–29} limiting the analysis that can be performed. Relatedly, observation of hopelessness in different racial/ethnic groups has also been limited.³⁰ Some evidence has shown that Black men are less likely to experience hopelessness related to depression than White men,³¹ whereas other evidence indicates higher rates of hopelessness in racial/ethnic minority patients with IHD compared with White patients with IHD.³² Similarly, the relationships between marital status and hopelessness in patients with IHD are underexplored, although some evidence suggests that unmarried/unpartnered individuals with IHD have higher levels of state hopelessness as compared with married patients with IHD.^{18,32} Despite its importance as a risk factor for the development of IHD and IHD mortality, there has been no known research to date examining hopelessness differences

in patients with IHD by rurality and how these differences may be mediated or moderated by patient characteristics or IHD risk factors.

Purpose

The purpose of this study was to evaluate rurality as a risk factor for state and trait hopelessness in adults hospitalized with IHD in samples drawn from the Great Lakes and Great Plains regions of the United States. Based on the literature, we investigated the following research questions and had the following hypotheses:

1. Is there evidence of an association between rurality and state or trait hopelessness?
 - It was hypothesized that both state and trait hopelessness levels would be higher in rural compared with urban adults hospitalized with IHD.
2. Is the association between rurality and state or trait hopelessness moderated by race/ethnicity?
 - It was hypothesized that the association between rurality and state and trait hopelessness would be moderated by race/ethnicity.
3. Is the association between rurality and state or trait hopelessness moderated by marital status?
 - It was hypothesized that the association between rurality and state and trait hopelessness would be moderated by marital status.
4. Is the association between rurality and state or trait hopelessness better explained by other patient characteristics?

METHODS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

A descriptive cross-sectional design was used. Data were collected from 628 patients hospitalized for IHD in 1 city in the US Great Lakes (n=516) and 1 city in the Great Plains (n=112) using similar recruiting protocols and instruments. The human subject review boards of the sponsoring university and hospitals approved the research. Participants provided written informed consent.

Sample and Setting

A total of 628 individuals hospitalized with IHD in hospital systems in the Great Lakes (1 hospital in 1 city) and Great Plains (2 hospital locations in the same city) were enrolled and participated in the study. Inclusion

criteria were a diagnosis of myocardial infarction or unstable angina or having undergone a percutaneous coronary intervention or coronary artery bypass surgery, age ≥ 18 years, planned discharge home, and the cognitive and physical abilities to complete the study measures. Although ability to speak/read English was not required (a translator was available), all study participants spoke and read English.

Measures

A variety of demographic variables were collected (biological sex, age, race/ethnicity, marital status, employment status, education level, and insurance status) along with self-reported information on prior diagnosis or treatment for heart condition, prior diagnosis or treatment for depression, and self-reported exercise before hospitalization.

The State–Trait Hopelessness Scale was used to measure state and trait hopelessness.²² The State–Trait Hopelessness Scale is a 23-item (10 state, 13 trait) instrument measured on a 4-point Likert-type scale (1=strongly disagree, 4=strongly agree). A total mean score is obtained for the State and Trait Subscales by summing subscale items and dividing by the number of items, resulting in a range from 1 to 4 for each subscale. Higher scores are indicative of greater hopelessness levels. Reliability and validity of the subscales were previously supported in a sample of 520 patients with IHD²² and a sample of 20 moderately to severely hopeless patients with IHD,³³ with a portion of both samples living in urban settings. As in prior work,¹⁹ the short version of the State–Trait Hopelessness Scale was used. In line with prior research,^{19,34} clinically relevant mean values ≥ 1.8 were used as an indicator of moderate to severe state and trait hopelessness.

Given the known association, yet distinct conceptualization, of hopelessness and depression, the Patient Health Questionnaire–8^{35,36} was used to measure depression severity. The 8 items are scored from 0 (not at all) to 3 (nearly every day), providing a range of scores from 0 to 24, with higher scores indicating greater depression severity.^{35,36} Internal reliability and criterion validity have been established.^{35,36}

Hopelessness is associated with decreased physical functioning³⁷ and lower levels of physical activity in patients with IHD in both hospital-based cardiac rehabilitation³⁷ and home settings.¹⁹ For the current study, all participants completed the Duke Activity Status Index.³⁸ The Duke Activity Status Index is a 12-item scale that measures perceived functional capacity of cardiovascular patients based on ability to perform activities of daily living.³⁸ Each response on the Duke Activity Status Index, scored from 1 to 4, is weighted based on the known metabolic cost of each activity.³⁸ Composite scores are added and can range from 0

(low) to 58.2 (high). Reliability of the Duke Activity Status Index is well established in patients with IHD.^{22,39,40}

Rural Stratification using RUCA Codes

Rural–Urban Commuting Area (RUCA) codes are used to stratify individuals by level of rurality.^{41,42} RUCA codes, a classification system created based on US census tract data,⁴² aid in the characterization of geographic areas based on density, urbanization, and daily commuting. RUCA codes provide information on whether a zip code is considered urban, large rural, small rural, or isolated.^{42,43} The RUCA code classification system consists of 33 numeric codes, with each code providing detailed information on the level of population density, urbanization, and daily commuting for a zip code.^{42,43} Following prior research, *rural* was defined in this study as RUCA codes 7 through 10: code 7=small town core with primary flow within an urban cluster of 2500 through 9999 (small urban cluster), code 8=small town high commuting with primary flow 30% or more to a small urban cluster, code 9=small town low commuting with primary flow 10% through 29% to a small urban cluster, and code 10=rural areas with primary flow to a tract outside a urbanized area or urban cluster.^{41–43}

Statistical Analysis

Data were collected on paper forms and were entered into SurveyMonkey Inc.⁴⁴ R Version 3.6.2⁴⁵ was used for data analysis. Generalized linear mixed models were used for evaluating differences in rural and urban samples using a logistic link function to predict rural versus urban. Generalized linear mixed models were also used for analyses predicting hopelessness using a logistic link function when predicting the prevalence of moderate to severe state or trait hopelessness

(dichotomous response) and a linear link when predicting continuous levels of state or trait hopelessness. A random effect term was entered into all models for the data collection site and fixed effects for all other demographic and clinical covariates. Interaction terms were added to the model when testing moderating hypotheses for racial/ethnic minority status or marital status. A sensitivity analysis fit models separately for the Great Plains and Great Lakes regions. A second sensitivity analysis created an age-matched and sex-matched sample and fit models as described earlier in this paragraph, accounting for sample matches with a random effect term. Correlation tests were used to evaluate interscale correlations. To determine the statistical significance for all tests, 2-sided tests with $P=0.05$ were used.

RESULTS

Sample Characteristics

Overall, the demographic and health history profiles of the rural participants were similar with those of the urban participants, with ~25% of the sample living in a rural area (Table 1). Women comprised ~33% of the sample, and ~67% were married, with the remainder split between never married (5%), divorced/separated (18%), and widowed (10%). The majority of the sample respondents were White participants (92%), with the remainder split between Black participants (2.7%; $n=17$), American Indian participants (2.4%; $n=15$), Asian participants (0.1%; $n=1$), Hispanic participants (0.8%; $n=5$) and other/mixed race/ethnicity participants (1.9%; $n=12$). Black/Hispanic/Asian/mixed race or ethnicity participants were primarily in urban locations (86%; 30/35), whereas Native American participants were less likely to be in an urban location (53% urban; 8/15). Rural participants were slightly older (65

Table 1. Sample Characteristics (N=628)

Variable	Overall (N=628), % (x/n)* or mean±SD	Rural (n=148), % (x/n)* or mean±SD	Urban (n=480), % (x/n)* or mean±SD	P value*
Women	33.0 (207/628)	29.7 (44/148)	34.0 (163/480)	0.389
Racial/ethnic minority	8.0 (50/628)	8.1 (12/148)	7.9 (38/480)	0.744
Married	66.9 (420/628)	66.2 (98/148)	67.1 (322/480)	0.649
Employed	29.0 (182/628)	29.7 (44/148)	28.8 (138/480)	0.452
Some college	53.5 (336/628)	48.6 (72/148)	55.0 (264/480)	0.374
Medicaid	9.9 (62/628)	6.8 (10/148)	10.8 (52/480)	0.455
Cardiac history	51.1 (320/626)	51.4 (76/148)	51.0 (244/478)	0.709
Depression history	25.1 (157/625)	25.0 (37/148)	25.2 (120/477)	0.846
Prior exercise	56.4 (352/624)	52.4 (77/147)	57.7 (275/477)	0.655
Age, y	63.39±10.98	64.93±11.02	62.91±10.94	0.163
Depression severity	5.6±4.75	5.59±5.07	5.61±4.65	0.437
Physical functioning	25.03±17.9	23.57±17.11	25.49±18.13	0.185

*x/n= count/sample size. P value from generalized linear mixed model testing whether there is a difference in the demographic/clinical variable by rurality.

versus 63 years, respectively), but with similar levels of employed participants (29%) having attended some college (approximately half) and on Medicaid (approximately 10%). Prior history of heart problems (approximately half), depression history (approximately one-quarter), and history of regular exercise (approximately half) were also similar between the rural and urban participants. In line with prior research,^{19,34} the correlation between state and trait hopelessness was 0.71 in this sample, and the correlation between depression severity and state and trait hopelessness was 0.36 and 0.43, respectively.

Hopelessness by Rurality

As seen in Table 2 and Figure 1, levels of state hopelessness were generally higher in rural patients (58.8% versus 48.8%; odds ratio [OR], 1.50; 95% CI, 1.03–2.18), a difference that remained statistically significant even after adjusting for demographics and physical health, mental health, and exercise histories (all Table 1 variables; OR, 1.59; 95% CI, 1.06–2.40; $P=0.026$). Levels of trait hopelessness were only slightly higher in rural patients (59.5% versus 55.0%); a difference that was not statistically significant.

When viewed as a continuous scale, state hopelessness levels were (on average), higher in rural patients (mean \pm SD: 1.84 \pm 0.59 rural versus 1.72 \pm 0.53 urban; $P=0.027$). The difference remained statistically significant after adjusting for all Table 1 sample characteristic variables except depression severity (difference in means of 0.10; 95% CI, 0.01–0.19; $P=0.039$), but was only borderline significant after adjusting for depression severity (difference in means of 0.10; 95% CI, 0.0–0.19; $P=0.058$). Trait hopelessness levels were, on average, slightly higher in rural patients (mean \pm SD: 1.91 \pm 0.57 rural versus 1.88 \pm 0.55 urban, a nonstatistically significant difference; $P=0.38$). The estimated difference in group means remained small and nonsignificant after adjusting for Table 1 sample characteristic variables (difference in means of 0.02; 95% CI, –0.07 to 0.11; $P=0.61$).

Interaction With Demographic Characteristics

The potential interaction of 2 demographic characteristics associated with hopelessness in prior research

(marital status^{18,32} and race/ethnicity)³² with rurality were also investigated (Table 3). There was evidence of a statistically significant interaction between marital status and rurality on the prevalence of state hopelessness after accounting for Table 1 covariates ($P=0.021$). In particular, nonmarried individuals had an increased prevalence of state hopelessness (72.0% nonmarried versus 52.0% married) in rural areas ($P=0.031$). However, in urban areas, there was little evidence of a difference in prevalence (50.6% nonmarried versus 47.8% married; $P=0.559$; Figure 2). In a post hoc analysis of nonmarried individuals in rural settings, the prevalence of state hopelessness was highest among never-married individuals (77.8%; 7 out of 9), followed by divorced/separated (73.9%; 17 out of 23) and widowed individuals (66.7%; 12 out of 18), with all 3 subgroups yielding a higher prevalence than married individuals (52.0%). In urban settings, never-married individuals also showed the highest prevalence (68.2%; 15 out of 22), followed by divorced/separated (52.8%; 47 out of 89) and widowed individuals (38.3%; 18 out of 47).

In contrast, there was no evidence of a statistically significant interaction between race/ethnicity and rurality for state or trait hopelessness ($P > 0.05$), although non-White participants had higher levels of state hopelessness than White participants in both rural (66.7% versus 58.1%) and urban (63.2% versus 47.5%) settings (Figure 3). There was also no evidence of an interaction between sex and rurality for either state hopelessness ($P=0.437$) or trait hopelessness ($P=0.394$), which supports previous research examining hopelessness.^{19,37}

Sensitivity Analyses

In a sensitivity analysis, we conducted both descriptive and inferential analyses of the results in Tables 2 and 3 for both the Great Plains ($n=112$) and Great Lakes ($n=516$) samples. Although the results were generally less statistically significant than in the pooled analysis, similar magnitude effect sizes were observed within both subsamples (Tables S1–S4). In a second sensitivity analysis, we created an age-matched and sex-matched sample of urban and rural participants. The results generally followed the same pattern of statistical significance (detailed results not shown).

Table 2. Prevalence of State and Trait Hopelessness by Rurality

	Rural, % (x/n)*	Urban, % (x/n)*	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)†
State hopelessness	58.8 (87/148)	48.8 (234/480)	1.50 (1.03–2.18)‡	1.54 (1.03–2.29)‡	1.59 (1.06–2.40)‡
Trait hopelessness	59.5 (88/148)	55.0 (264/480)	1.20 (0.83–1.74)	1.23 (0.82–1.84)	1.26 (0.83–1.89)

*x/n= count/sample size. All Table 1 variables except the Patient Health Questionnaire–8.

†All Table 1 variables.

‡ $P<0.05$.

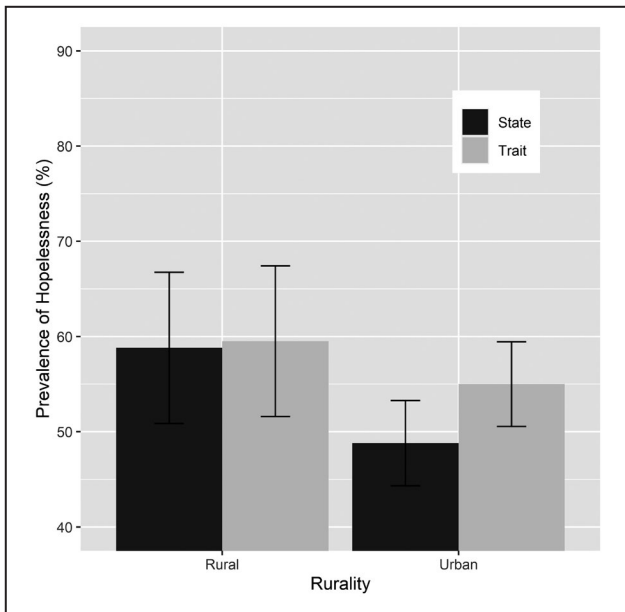


Figure 1. Prevalence of state and trait hopelessness by rurality. Error bars represent the SE within each group.

DISCUSSION

Given that rurality^{3,6} and hopelessness²³ are both known to contribute to increased mortality in adults with IHD, this study evaluated rurality as a risk factor for state and trait hopelessness in adults hospitalized with IHD in samples drawn from the Great Lakes and Great Plains regions of the United States. Levels of state hopelessness were significantly higher in rural compared with urban adults hospitalized with IHD. This result is in line with recent findings that greater hopelessness levels were observed in rural adults compared with urban adults with cancer at the end of life.⁹ Trait hopelessness levels were not significantly different in rural versus urban groups, indicating that a habitual outlook toward many areas of life was similar

in rural and urban adults with IHD. Further research differentiating state and trait hopelessness in rural and urban populations is needed. In addition, further research is needed to explore whether rural patients with IHD continue to have higher state hopelessness levels compared with urban patients with IHD after hospital discharge and throughout their recovery period. Patients with IHD with state hopelessness may be treated with short-term cognitive interventions in outpatient or home settings; however, cognitive interventions may be less accessible to patients with IHD living in rural settings. Clinical trials examining cognitive interventions delivered by telehealth are needed.

When viewed as a continuous scale, higher state hopelessness in rural compared with urban patients with IHD remained statistically significant after adjusting for all sample characteristics, except depression severity. Hopelessness, a negative outlook and sense of helplessness toward the future,²⁰ has been identified as increasing vulnerability to depression in college students⁴⁶ and men with HIV.⁴⁷ Yet, hopelessness and depression are unique in patients with IHD in a number of ways. In patients with IHD, hopelessness is associated with increased risk of death and adverse events^{17,39} and increased development of IHD^{17,23,48,49} and leads to decreased physical functioning³⁷ and lower physical activity levels,^{19,37} all independent of depression. Further research with a larger sample size is needed to examine the relationship between hopelessness and depression, and their potential distinction, in rural versus urban patients with IHD.

Rural residents are more likely to have limited resources,¹⁻³ which may contribute to stressful life experiences across their lifespan. Given that adults who report adverse childhood experiences are at greater risk for hopelessness compared with men and women who report no adverse childhood experiences,⁵⁰ research examining the association between adverse childhood experiences and hopelessness in adults with IHD is needed.

Table 3. Interactions Between Sample Characteristics and Rurality on State and Trait Hopelessness

Hopelessness	Demographic subgroup	Rural, % (x/n)*	Urban, % (x/n)*	Unadjusted P value	Adjusted* P value	Adjusted† P value
State	Racial/ethnic minority	66.7 (8/12)	63.2 (24/38)	0.652	0.883	0.988
	Not racial/ethnic minority	58.1 (79/136)	47.5 (210/442)			
Trait	Racial/ethnic minority	58.3 (7/12)	60.5 (23/38)	0.773	0.960	0.913
	Not racial/ethnic minority	59.6 (81/136)	54.6 (241/441)			
State	Married	52.0 (51/98)	47.8 (154/322)	0.086	0.021†	0.021†
	Nonmarried	72.0 (36/50)	50.6 (80/158)			
Trait	Married	50.6 (53/98)	51.6 (166/322)	0.570	0.241	0.244
	Nonmarried	70.0 (35/50)	62.0 (98/158)			

*x/n= count/sample size. All Table 1 variables except the Patient Health Questionnaire–8.

†All Table 1 variables.

‡P<0.05.

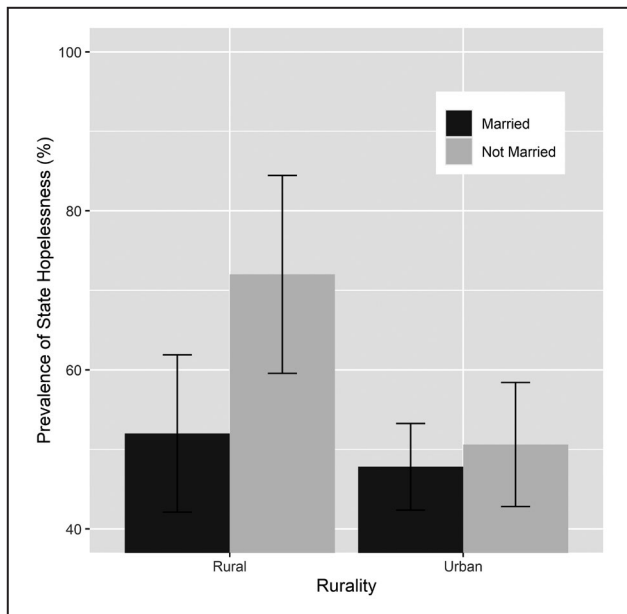


Figure 2. Prevalence of state hopelessness by rurality stratified by marital status. Error bars represent the SE within each group.

Because patients with IHD who are nonmarried^{18,32} and of racial/ethnic minority status³² have been previously identified to have higher state hopelessness levels than married or White patients with IHD, the potential interaction of these characteristics with rurality on state and trait hopelessness were investigated. Evidence of a statistically significant interaction between marital status and rurality on the prevalence of state hopelessness was identified. These findings support evidence from previous studies that unmarried patients with IHD are more likely to have increased hopelessness levels.^{18,32} Results are additionally consistent with prior research with healthy adults revealing an association between increased hopelessness and lower relationship satisfaction⁵¹ and lower levels of social networks.⁵²

Nonmarried patients with IHD living in rural settings had an increased prevalence of state hopelessness as compared with married rural dwellers. However, in urban areas there was little evidence of a difference in prevalence of state hopelessness in married versus nonmarried groups. Given that hopelessness is associated with increased risk of death or nonfatal myocardial infarction in patients with IHD²³ and single adults are at a higher risk for mortality related to IHD compared with adults who are married,⁵³ further research examining the relationship between marital status and hopelessness in rural and urban settings is urgently needed. In addition, the small number of different types of non-married patients resulted in low power for investigating whether particular nonmarried groups in rural areas

are at risk for hopelessness. Further research with a larger sample is needed and should include additional categories (eg, unmarried but cohabitating) to provide potentially important information on underrepresented groups.

There was no evidence of a statistically significant moderating effect of racial/ethnic minority status on the relationship between rurality and hopelessness for either state or trait hopelessness, although non-White participants had higher state hopelessness levels in both rural and urban settings. There was limited racial/ethnic diversity in the sample attributed to the low prevalence of racial/ethnic minority patients at each of the 3 hospitals in the study (<10% in all cases), resulting in low power for investigating the potential interaction of racial/ethnic minority status and rurality on hopelessness. Additional research with larger samples of racial/ethnic minority patients with IHD from both rural and urban settings is needed to further elucidate hopelessness in racial/ethnic minority patients.

Study Limitations

The small number of different types of nonmarried patients and limited racial/ethnic diversity, both described previously, are limitations to this study. We did not adjust for multiple testing, which can be a limitation. Finally, future research is needed to confirm that these study findings hold true in both rural and urban populations living in various US regions (eg, beyond the Great Lakes and Great Plains).

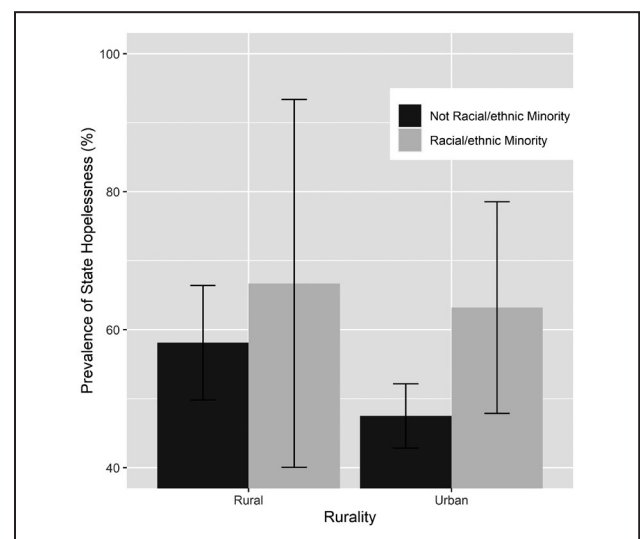


Figure 3. Prevalence of state hopelessness by rurality by minority status. Error bars represent the SE within each group.

CONCLUSIONS

This study is the first of its kind to examine rurality as a risk factor for state and trait hopelessness in patients with IHD. Findings indicate that rural patients with IHD may be at higher risk for state hopelessness, particularly if they are nonmarried. Understanding rurality differences is essential in identifying subgroups most at risk for hopelessness. Knowledge of hopelessness in rural patients with IHD is important for health care professionals in both acute care and outpatient settings so that they can identify and counsel at-risk patients.

ARTICLE INFORMATION

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Affiliations

Nursing Department, Dordt University, Sioux Center, IA (D.B.); Sanford Health, Sioux Falls, SD (G.A.J.); Avera McKennan Hospital and University Health Center, Sioux Falls, SD (L.L.W.); Sociology Department (K.M.V.D.); and Kielstra Center for Research and Scholarship (A.K.V.), Dordt University, Sioux Center, IA; College of Nursing, Department of Biobehavioral Nursing Science, University of Illinois Chicago, IL (M.P.G., A.L., S.L.D.); and Statistics Department, Dordt University, Sioux Falls, SD (N.L.T.).

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Disclosures

None.

Supplementary Material

Table S1–S4

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SUPPLEMENTAL MATERIAL

Table S1. Prevalence of State and Trait Hopelessness by Rurality – Great Lakes only.

	Rural	Urban	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)*	Adjusted Odds Ratio (95% CI)†
State hopelessness	58.1% (43/74)	49.8% (220/442)	1.4 (0.9, 2.3)	1.4 (0.8, 2.5)	1.4 (0.8, 2.5)
Trait hopelessness	58.1% (43/74)	54.8% (242/442)	1.2 (0.7, 1.9)	1.1. (0.6, 1.9)	1.1 (0.6, 1.9)

CI indicates confidence interval

*All Table 1 variables except PHQ

†All Table 1 variables

Table S2. Prevalence of State and Trait Hopelessness by Rurality – Great Plains only.

	Rural	Urban	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)*	Adjusted Odds Ratio (95% CI)†
State hopelessness	59.5% (44/74)	36.8% (14/38)	2.5 (1.1, 5.6)‡	1.8 (0.7, 4.7)	2.1 (0.7, 6.2)
Trait hopelessness	60.8% (45/74)	57.9% (22/38)	1.1 (0.5, 2.5)	1.2 (0.5, 3.0)	1.3 (0.5, 3.3)

CI indicates confidence interval

*All Table 1 variables except PHQ

†All Table 1 variables

‡ $P < 0.05$

**Table S3. Moderating Effects of Sample Characteristics on the Relationship between
Rurality and State and Trait Hopelessness – Great Lakes.**

Hopelessness	Demographic Subgroup	Rural % (x/n)	Urban % (x/n)	Unadjusted p-value	Adjusted* p-value	Adjusted† p-value			
State	Ethnic Minority	100% (3/3)	64.7% (22/34)	0.979	0.978	0.976			
	Not Ethnic Minority	56.5% (39/69)	48.0% (190/396)						
	Ethnic Minority	66.7% (2/3)	61.8% (21/34)				0.933	0.811	0.899
	Not Ethnic Minority	56.5% (39/69)	53.5% (212/396)						
State	Married	53.1% (26/49)	48.3% (142/294)	0.348	0.170	0.190			
	Not married	69.6% (16/23)	51.5% (70/136)						
Trait	Married	51.0% (25/49)	50.3% (148/294)	0.658	0.351	0.376			
	Not married	69.6% (16/23)	62.5% (85/136)						

* All Table 1 variables except PHQ

† All Table 1 variables

**Table S4. Moderating Effects of Sample Characteristics on the Relationship between
Rurality and State and Trait Hopelessness – Great Plains.**

Hopelessness	Demographic Subgroup	Rural % (x/n)	Urban % (x/n)	Unadjusted p-value	Adjusted* p-value	Adjusted† p-value
State	Ethnic Minority	55.6% (5/9)	50.0% (1/2)	0.628	0.852	0.978
	Not Ethnic Minority	60.0% (39/65)	35.3% (12/34)			
Trait	Ethnic Minority	55.6% (5/9)	0.0% (0/2)	0.988	0.987	0.991
	Not Ethnic Minority	61.5% (40/65)	58.8% (20/34)			
State	Married	52.1% (25/48)	36.8% (7/19)	0.261	0.078	0.282
	Not married	73.1% (19/26)	35.3% (6/17)			
Trait	Married	56.2% (27/48)	57.9% (11/19)	0.369	0.417	0.659
	Not married	69.2% (18/26)	52.9% (9/17)			

*All Table 1 variables except PHQ

†All Table 1 variables