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ORIGINAL RESEARCH

Rurality, Death, and Healthcare Utilization in Heart Failure in the Community

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BACKGROUND: Prior reports indicate that living in a rural area may be associated with worse health outcomes. However, data on rurality and heart failure (HF) outcomes are scarce.

METHODS AND RESULTS: Residents from 6 southeastern Minnesota counties with a first-ever code for HF (*International Classification of Diseases, Ninth Revision* [*ICD-9*], code 428, and *International Classification of Diseases, Tenth Revision* [*ICD-10*] code I50) between January 1, 2013 and December 31, 2016, were identified. Resident address was classified according to the rural-urban commuting area codes. Rurality was defined as living in a nonmetropolitan area. Cox regression was used to analyze the association between living in a rural versus urban area and death; Andersen-Gill models were used for hospitalization and emergency department visits. Among 6003 patients with HF (mean age 74 years, 48% women), 43% lived in a rural area. Rural patients were older and had a lower educational attainment and less comorbidity compared with patients living in urban areas ($P<0.001$). After a mean (SD) follow-up of 2.8 (1.7) years, 2440 deaths, 20 506 emergency department visits, and 11 311 hospitalizations occurred. After adjustment, rurality was independently associated with an increased risk of death (hazard ratio [HR], 1.18; 95% CI, 1.09–1.29) and a reduced risk of emergency department visits (HR, 0.89; 95% CI, 0.82–0.97) and hospitalizations (HR, 0.78; 95% CI, 0.73–0.84).

CONCLUSIONS: Among patients with HF, living in a rural area is associated with an increased risk of death and fewer emergency department visits and hospitalizations. Further study to identify and address the mechanisms through which rural residence influences mortality and healthcare utilization in HF is needed in order to reduce disparities in rural health.

Key Words: heart failure ■ outcomes ■ rural ■ rural-urban commuting area

The recent American Heart Association presidential advisory emphasizes the urgent need to better understand and address disparities in rural health.[1] Rural residents in the United States experience excess mortality compared with their urban counterparts.[2,3] In particular, Americans in rural areas are more likely to die from the 5 leading causes of death, including heart disease, compared with those living in urban areas.[2] A higher proportion of tobacco smoking,[4] obesity,[5] and sedentary activity,[6] and worse survival after diabetes mellitus[7] and coronary disease[8] diagnoses have been observed in rural areas compared with urban areas. While the exact mechanism for these associations are not entirely clear, patients in rural areas may have more challenges accessing care because of several barriers such as healthcare workforce shortages and hospital closures, or financial, insurance, or transportation issues.[9–11] While these results are a cause for substantial concern, data remain limited and, specifically, the impact of rurality on heart failure (HF) outcomes is understudied.[12–17] This is important given recent reports of higher rates of HF among rural residents.[12,18] HF is a complex syndrome and challenging

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CLINICAL PERSPECTIVE

What is New?

- In a southeastern Minnesota community, almost half of the patients with heart failure live in a rural area.
- Living in a rural area was associated with a significantly increased risk of death, specifically noncardiovascular-related death.
- Rurality was also associated with fewer emergency department visits and hospitalizations, possibly reflecting difficulties in accessing care.

What are the Clinical Implications?

- Our study highlights important rural-urban disparities among patients with heart failure.
- Future studies are needed to identify and address the mechanisms through which rural residence influences mortality and healthcare utilization in patients with heart failure.

Nonstandard Abbreviations and Acronyms

REP	Rochester Epidemiology Project
RUCA	rural-urban commuting area

to manage, which often requires frequent healthcare encounters. Thus, one can hypothesize that living in a rural area could have a particularly deleterious impact on HF outcomes. We undertook this population-based study to test this hypothesis and evaluate the association between rurality and mortality and healthcare utilization among patients with HF living in a large geographically defined area of southeastern Minnesota.

METHODS

Study Setting

This study was conducted in southeastern Minnesota, within the 6 counties of Dodge, Freeborn, Mower, Olmsted, Steele, and Wabasha (30% rural according to the US Census definition), incorporating data from Mayo Clinic Rochester, Mayo Clinic Health System clinics and hospitals, and Olmsted Medical Center and its affiliated clinics. Our study utilized the Rochester Epidemiology Project (REP), a records linkage system that allows retrieval of nearly all healthcare utilization and outcomes of residents living in southeastern Minnesota.[19–21] This region has a similar distribution of age, sex, and racial/ethnic characteristics as the state of Minnesota and the Upper Midwest region of the United States.[19,21]

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

Case Identification

Residents 18 years or older with a first-ever *International Classification of Diseases, Ninth Revision* (*ICD-9*), code 428 or *International Classification of Diseases, Tenth Revision* (*ICD-10*), code I50 for HF within the REP records of the 6-county area in southeastern Minnesota between January 1, 2013 and December 31, 2016, were identified. Medical record history was available beginning in 2010, thus a 3-year look-back window was used to determine incidence.

Ascertainment of Rurality

Resident address at the time of HF was geocoded and classified according to the rural-urban commuting area (RUCA) codes.[22–24] RUCA codes classify US census tracts using population density, urbanization, and daily commuting. There are 10 primary codes and several secondary codes. The primary codes refer to the primary commuting destination and the secondary codes refer to the secondary flow (Table S1).[23] These codes are useful for identifying rural areas in metropolitan counties. The Rural Health Research Center of the University of Washington provides 6 different categorizations of rural; however, they recommend 1 of 3 categorizations (A: urban, large town, small town, and isolated rural; B: urban, large town, small town/isolated rural; and C: urban versus large town/small town/isolated rural) (Table S2).[23] RUCA codes were categorized into urban versus rural using category C (Table S2).

Other Patient Characteristics

The comorbidities included in the Charlson comorbidity index were retrieved from the medical record using the electronic indices of the REP record linkage system, and the score was calculated for each participant. Educational attainment, marital status, age, and sex were also obtained through the REP.

Outcomes

Participants were followed from HF diagnosis date through December 31, 2018, for vital status, emergency department (ED) visits, and hospitalizations. Deaths were identified from medical records and death certificates received from the state of Minnesota. Cardiovascular cause of death was determined from the underlying cause of death using the *ICD-10* codes outlined by the American Heart Association.[25] ED visits and hospitalizations were collected through the REP, which, as described above, collects information from all inpatient and outpatient care in the 6 counties. The primary reason for hospitalization was classified as cardiovascular or noncardiovascular using *ICD-10* codes outlined by the American Heart Association.[25] ED visits that resulted in a hospitalization were counted as both an ED visit and a hospitalization.[26] In-hospital transfers were counted as 1 hospitalization.[26,27]

Statistical Analysis

Baseline characteristics are presented as frequency (percentage) for categorical variables, mean (SD) for normally distributed continuous variables, or median (interquartile range) for continuous variables with a skewed distribution. Chi-square or *t* tests were used to test differences in characteristics between the urban and rural categories.

Mortality was assessed with the Kaplan-Meier method according to urban versus rural residence and compared with the log-rank test. Cox proportional hazards regression was used to examine the association between rurality and death. Univariate models were run first and then covariates including age, sex, education, and the Charlson comorbidity index were added to the model.

The cumulative mean number of hospitalizations and ED visits over follow-up by urban versus rural residence were plotted using a nonparametric estimator described by Nelson.[28] To determine whether rurality is associated with ED visits or hospitalizations, Andersen-Gill modeling was used to account for repeated events univariately and while controlling for baseline characteristics. The proportional hazard assumption was tested using the scaled Schoenfeld residuals and was found to be valid.

All analyses were performed using SAS statistical software, version 9.4 (SAS Institute Inc). This study was approved by the Mayo Clinic and Olmsted Medical Center institutional review boards. The study was considered minimal risk by both institutional review boards; therefore, the requirement for informed consent was waived. However, records of any patient who had not provided authorization for their medical records to be used for research, as per Minnesota statutes, were not reviewed.

Table 1. Baseline Characteristics of Patients With HF, Stratified by Rural Residence

	Urban (n=3409)	Rural (n=2594)	*P* Value
Age, mean (SD), y	73.1 (14.7)	75.3 (14.1)	<0.01
Women	1620 (47.5)	1283 (49.5)	0.14
Charlson comorbidity index			0.02
0	808 (23.7)	691 (26.6)	
1 or 2	1298 (38.1)	978 (37.7)	
3+	1303 (38.2)	925 (35.7)	
Myocardial infarction	325 (9.5)	226 (8.7)	0.28
Chronic pulmonary disease	951 (27.9)	696 (26.8)	0.36
Renal disease	659 (19.3)	503 (19.4)	0.95
Diabetes mellitus	1106 (32.4)	803 (31.0)	0.22
Cancer	566 (16.6)	400 (15.4)	0.22
Cerebrovascular disease	454 (13.3)	329 (12.7)	0.47
Peripheral vascular disease	1034 (30.3)	641 (24.7)	<0.01
Dementia	260 (7.6)	221 (8.5)	0.21
Liver disease	193 (5.7)	81 (3.1)	<0.01
Married	1662 (54.8)	885 (54.9)	0.94
Missing	377	983	
Education			<0.01
Missing	143	385	
Eighth grade or less	163 (5.0)	158 (7.2)	
Some high school	168 (5.1)	214 (9.7)	
High school/GED	1146 (35.1)	978 (44.3)	
Some college or 2-y degree	914 (28.0)	527 (23.9)	
4-y college degree	311 (9.5)	151 (6.8)	
Postgraduate studies	564 (17.3)	181 (8.2)	

All values are presented as number (percentage) unless otherwise noted. GED indicates general educational development; and HF, heart failure.

RESULTS

Among 6003 patients with HF (mean age, 74 years; 48% women), 43% of patients lived in rural areas. Rural patients were older and had lower educational attainment compared with urban patients (P<0.01, Table 1). Furthermore, rural patients had a lower comorbidity burden compared with urban patients (P=0.02).

After a mean (SD) follow-up of 2.8 years (1.7 years), 2440 deaths occurred. The mortality rate was 0.13 per patient-year for urban residents and 0.17 for rural residents (Table 2). Living in a rural area was associated with an increased risk of all-cause death (Figure1). After adjustment for age, sex, education status, and comorbidity burden, rurality remained associated with an increased risk of death (adjusted hazard ratio [HR], 1.18; 95% CI, 1.09–1.29). After adjustment there was a significant association between living in a rural area and noncardiovascular-related death (adjusted HR, 1.30; 95% CI, 1.16–1.45); however, the association was no longer significant for cardiovascular-related death (adjusted HR, 1.06; 95% CI, 0.92–1.21). There was no statistically significant interaction between rurality and age or sex for the outcome of all-cause mortality.

During follow-up, 20 506 ED visits and 11 311 hospitalizations occurred. The rates of ED visits were 1.31 and 1.16 per patient-year and rates of hospitalizations were 0.76 and 0.58 per patient-year for urban and rural

Table 2. Rates* and HRs and 95% CIs for the Association Between Rurality and Outcomes in HF

	Urban Rate	Rural Rate	Urban HR	Rural HR	*P* Value
Death (2440 events)					
Unadjusted	0.13 (0.12–0.14)	0.17 (0.16–0.18)	1 (Reference)	1.31 (1.21–1.42)	<0.001
Adjusted†			1 (Reference)	1.25 (1.15–1.35)	<0.001
Adjusted‡			1 (Reference)	1.18 (1.09–1.29)	<0.001
Cardiovascular death (969 events)					
Unadjusted	0.05 (0.05–0.06)	0.07 (0.06–0.07)	1 (Reference)	1.20 (1.05–1.36)	0.006
Adjusted†			1 (Reference)	1.10 (0.97–1.25)	0.143
Adjusted‡			1 (Reference)	1.06 (0.92–1.21)	0.426
Noncardiovascular death (1410 events)					
Unadjusted	0.07 (0.05–0.08)	0.10 (0.06–0.11)	1 (Reference)	1.43 (1.29–1.58)	<0.001
Adjusted†			1 (Reference)	1.38 (1.25–1.54)	<0.001
Adjusted‡			1 (Reference)	1.30 (1.16–1.45)	<0.001
ED visits (n=20506)					
Unadjusted	1.31 (1.29–1.33)	1.16 (1.13–1.18)	1 (Reference)	0.87 (0.81–0.94)	0.001
Adjusted†			1 (Reference)	0.91 (0.84–0.98)	0.012
Adjusted‡			1 (Reference)	0.89 (0.82–0.97)	0.005
Hospitalizations (n=11311)					
Unadjusted	0.76 (0.74,0.78)	0.58 (0.56–0.60)	1 (Reference)	0.76 (0.70–0.81)	<0.001
Adjusted†			1 (Reference)	0.78 (0.73–0.83)	<0.001
Adjusted‡			1 (Reference)	0.78 (0.73–0.84)	<0.001
Cardiovascular-related hospitalizations (n=3402)					
Unadjusted	0.24 (0.23–0.25)	0.16 (0.15–0.17)	1 (Reference)	0.64 (0.58–0.71)	<0.001
Adjusted†			1 (Reference)	0.65 (0.59–0.72)	<0.001
Adjusted‡			1 (Reference)	0.67 (0.61–0.74)	<0.001
Noncardiovascular-related hospitalizations (n=7908)					
Unadjusted	0.52 (0.51–0.53)	0.42 (0.41–0.44)	1 (Reference)	0.81 (0.74–0.88)	<0.001
Adjusted†			1 (Reference)	0.84 (0.77–0.91)	<0.001
Adjusted‡			1 (Reference)	0.84 (0.77–0.91)	<0.001

HR indicates hazard ratio; and ED, emergency department.
*Rates per patient-year.
†Adjusted for age, sex, and Charlson comorbidity index.
‡Adjusted for age, sex, Charlson comorbidity index, and education level.

residents, respectively (Table 2). Rurality was associated with a decreased risk of ED visits and hospitalizations (Figure1). After adjustment, patients living in a rural area were less likely to go to the ED or be hospitalized (ED-adjusted HR, 0.89 [95% CI, 0.82–0.97]; hospitalization-adjusted HR, 0.78 [95% CI, 0.73–0.84]) (Table 2). Rurality was also associated with a lower risk of both cardiovascular and noncardiovascular-related hospitalizations (Table 2).

A significant interaction existed between rurality and sex for ED visits and hospitalizations. All associations between ED visits and hospitalizations were stronger for women compared with men (Table 3). In addition, for ED visits, a significant interaction between rurality and age existed (P=0.031). The associations between rurality and ED visits were stronger among younger women compared with older women (HR for rural versus urban 60 years, 0.73 [95% CI, 0.63–0.86]; HR for rural versus urban 80 years, 0.86 [95% CI, 0.77–0.95]). There was no association between rurality and ED visits for men of any age (HR for 60 years, 0.90 [95% CI, 0.77–1.05]; HR for 80 years, 1.05 [95% CI, 0.93–1.18]).

Marital status was available in a subset of patients (n=4643), and, for all outcomes, further adjustment for marital status did not materially change the results.

DISCUSSION

Within a 6-county region in southeastern Minnesota, 43% of patients with HF lived in a rural area. Among patients with HF, living in a rural area was independently associated with an increased risk of death compared with living in an urban area, and the association was driven by noncardiovascular-related death. In addition, rurality was associated with fewer ED visits and hospitalizations overall, with the relative

Table 3. Rates* and Adjusted† HRs (95% CI) for Nonfatal Outcomes by Sex and Rurality

	Urban Rate	Rural Rate	Urban HR	Rural HR	*P* Value for Interaction
ED visits					
Women	1.39 (1.35–1.42)	1.12 (1.09–1.16)	1 (Reference)	0.81 (0.73–0.90)	0.024
Men	1.24 (1.21–1.27)	1.19 (1.15–1.22)	1 (Reference)	0.97 (0.87–1.10)	
Hospitalizations					
Women	0.79 (0.77–0.82)	0.55 (0.52–0.57)	1 (Reference)	0.70 (0.63–0.78)	0.003
Men	0.73 (0.71–0.76)	0.62 (0.59–0.65)	1 (Reference)	0.87 (0.79–0.96)	
Cardiovascular-related hospitalizations					
Women	0.23 (0.22–0.25)	0.13 (0.12–0.14)	1 (Reference)	0.57 (0.48–0.67)	0.004
Men	0.25 (0.24–0.26)	0.18 (0.17–0.20)	1 (Reference)	0.77 (0.67–0.87)	
Noncardiovascular-related hospitalizations					
Women	0.56 (0.54–0.58)	0.41 (0.39–0.44)	1 (Reference)	0.76 (0.67–0.85)	0.021
Men	0.48 (0.47–0.50)	0.44 (0.41–0.46)	1 (Reference)	0.92 (0.82–1.04)	

ED indicates emergency department; and HR, hazard ratio.
*Per patient-year.
†Adjusted for age, sex, Charlson comorbidity index, and education level.

reduction in ED visits and hospitalizations associated with rurality being greater in women than in men. Furthermore, when examining the effect of rurality among women, the lower utilization of ED visits was more prominent in younger age groups.

Rurality and HF

In the region that we studied, ≈30% reside in a rural area. Using RUCA codes to define rurality, we found that a higher proportion, ≈43%, of patients with HF from this region live in a rural area. It is reported that a higher proportion of people 65 years and older live in rural areas compared with urban areas,[29] and HF is more common among older adults.[25] Furthermore, one report indicated that patients with HF were more likely to live in rural areas.[12] Thus, our findings of a higher proportion of patients with HF living in a rural area compared with the general population are congruent with these previous findings.

Rurality and Health Outcomes

Recent reports have indicated that rural residents have an excess risk of mortality compared with their urban counterparts.[2,3] Americans living in rural areas are more likely to die from the 5 leading causes of death: heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke, than those living in urban areas.[2,30] Smoking,[4] obesity,[5] adverse outcomes of diabetes mellitus,[7] or coronary heart disease[8] are all more frequent in rural areas.

However, little is known about HF. In eastern Ontario, among residents with HF from 1994 to 1999 and 2009 to 2013 across both time periods, the incidence of HF was higher in rural residents compared with urban residents; however, rurality was not a predictor of 1-year mortality after HF.[12] Another study from Canada, which used administrative data, found that rural patients with HF are less likely to receive outpatient care and more likely to be hospitalized or use the ED[31] compared with urban patients. Finally, in a small study of 136 patients with HF, rural patients were less likely to experience a composite outcome of ED visit, rehospitalization, or mortality compared with urban residents.[32] The aforementioned studies have heterogeneous source populations, limited follow-up, small sample sizes, and variable ascertainment methods. Therefore, the results are inconclusive, emphasizing the need for the large population-based study reported herein.

Our study was designed to address the aforementioned limitations by studying a large geographically defined population of patients with HF with near-complete capture of all diagnoses, healthcare encounters, and health outcomes. We used RUCA codes to define rurality, which classifies census tracts using population density, urbanization, and daily commute, making it possible to identify rural areas in metropolitan counties. Our results indicate that patients with HF living in rural areas have a higher risk of mortality and are less likely to go to the ED or be hospitalized. Our comprehensive data allowed us to analyze cardiovascular versus noncardiovascular-related death and we found that after adjustment for confounders, the association between rurality and death pertained to noncardiovascular death. Furthermore, we found that the association with rurality and fewer ED visits and hospitalizations was stronger among women than men and the association with fewer ED visits was stronger among younger women compared with older women.

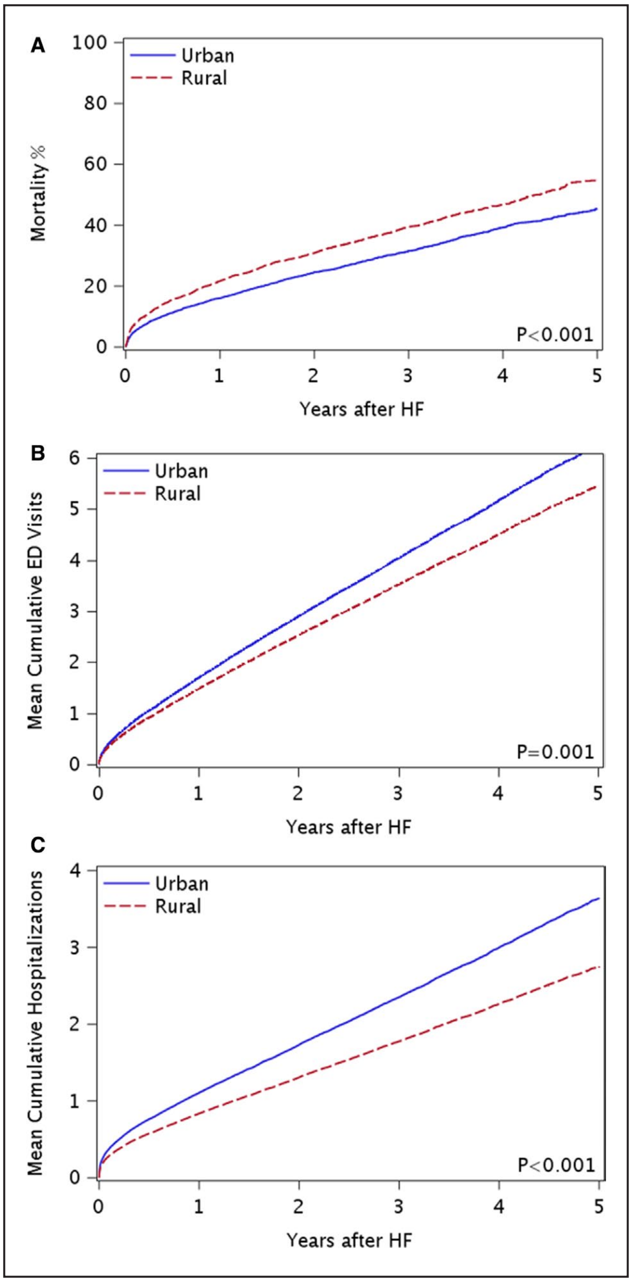

Figure. Mortality (A), mean cumulative emergency department visits (B), and hospitalizations (C) by rurality. HF indicates heart failure.

Clinical Implications

The mechanisms through which rural residence influences mortality and healthcare utilization in patients with HF are not yet clearly established. However, the known shortage of care providers in rural areas[33] and documented difficulties in accessing care[10,11] may contribute to the adverse outcomes of patients with HF living in rural areas. A recent study also suggested that poverty is a strong driver of the association between rurality and mortality[3] and individuals in the rural high poverty category had the highest mortality rate, followed by urban high poverty, rural low poverty, and urban low poverty.[3]

Herein, after adjustment, rurality was associated with noncardiovascular death. Patients with HF have greater multimorbidity and often have functional limitations compared with patients without HF.[34] Thus, HF often requires complex management skills and may also require frequent healthcare visits. Patients in rural areas may have more challenges accessing care because of several barriers such as healthcare workforce shortages, or financial, insurance, or transportation issues, which could make it difficult to get to office visits, thus contributing to poor outcomes.[9] In this regard, the rapid expansion of telehealth should be mentioned. Several barriers notwithstanding, including access to technology, broadband internet,[35] and financial implications,[36] it has the potential to alleviate disparities in access to care and perhaps to improve outcomes.[37-39]

Limitations and Strengths

While this study presents important new findings, some limitations should be considered in its interpretation. We may not have captured some healthcare encounters that occurred outside of the REP, but our coverage of this population was >90%, suggesting that we did not miss significant healthcare data. Our study was conducted in a population of mostly non-Hispanic White individuals, thus the generalizability may be limited. However, as mentioned, this region has similar age, sex, and racial/ethnic characteristics as the state of Minnesota and the upper Midwest region of the United States.[19,21] Finally, as with any observational study, we cannot rule out the effect of residual confounding.

Our study has several notable strengths. This is a large, community-based cohort study and, via the REP, we have comprehensive ascertainment of comorbidities, death, and healthcare utilization in a large area of southeastern Minnesota containing sizable rural and urban populations.[19] As mentioned above, we geocoded patient addresses allowing us to use RUCA codes to define rurality.[22–24] We chose to define rurality using RUCA codes because it allowed identifying pockets of rural areas in metropolitan counties and vice versa, enabling a more nuanced approach in ascertaining rurality than simple county-based measures alone.[24]

CONCLUSIONS

In a southeastern Minnesota community, almost half of the patients with HF live in a rural area, which is associated with significant disparities including an increased risk of death, specifically noncardiovascular-related death. Rurality was also associated with fewer ED visits and hospitalizations, possibly reflecting difficulties in accessing care. Our study highlights important rural-urban disparities among patients with HF, and further studies are needed to identify and address the mechanisms through which rural residence influences these poor outcomes.

ARTICLE INFORMATION

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Disclosures

None.

Supplementary Material

Tables S1 and S2

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SUPPLEMENTAL MATERIAL

Table S1. RUCA Code Definitions: Version 2.0[a]

1 Metropolitan area core: primary flow within an Urbanized Area (UA) 1.0 No additional code 1.1 Secondary flow 30% through 49% to a larger UA
2 Metropolitan area high commuting: primary flow 30% or more to a UA 2.0 No additional code 2.1 Secondary flow 30% through 49% to a larger UA
3 Metropolitan area low commuting: primary flow 10% to 30% to a UA 3.0 No additional code
4 Micropolitan area core: primary flow within an Urban Cluster (UC) of 10,000 through 49,999 (large UC) 4.0 No additional code 4.1 Secondary flow 30% through 49% to a UA 4.2 Secondary flow 10% through 29% to a UA
5 Micropolitan high commuting: primary flow 30% or more to a large UC 5.0 No additional code 5.1 Secondary flow 30% through 49% to a UA 5.2 Secondary flow 10% through 29% to a UA
6 Micropolitan low commuting: primary flow 10% to 30% to a large UC 6.0 No additional code 6.1 Secondary flow 10% through 29% to a UA
7 Small town core: primary flow within an Urban Cluster of 2,500 through 9,999 (small UC)

7.0 No additional code 7.1 Secondary flow 30% through 49% to a UA 7.2 Secondary flow 30% through 49% to a large UC 7.3 Secondary flow 10% through 29% to a UA 7.4 Secondary flow 10% through 29% to a large UC
8 Small town high commuting: primary flow 30% or more to a small UC 8.0 No additional code 8.1 Secondary flow 30% through 49% to a UA 8.2 Secondary flow 30% through 49% to a large UC 8.3 Secondary flow 10% through 29% to a UA 8.4 Secondary flow 10% through 29% to a large UC
9 Small town low commuting: primary flow 10% through 29% to a small UC 9.0 No additional code 9.1 Secondary flow 10% through 29% to a UA 9.2 Secondary flow 10% through 29% to a large UC
10 Rural areas: primary flow to a tract outside a UA or UC (including self) 10.0 No additional code 10.1 Secondary flow 30% through 49% to a UA 10.2 Secondary flow 30% through 49% to a large UC 10.3 Secondary flow 30% through 49% to a small UC 10.4 Secondary flow 10% through 29% to a UA 10.5 Secondary flow 10% through 29% to a large UC 10.6 Secondary flow 10% through 29% to a small UC

RUCA, Rural-Urban Commuting Area

[a]WWAMI RUCA Rural Health Research Center. Code Definitions: Version 2.0. Accessed at: https://depts.washington.edu/uwruca/ruca-codes.php April 23, 2020.

Table S2. Categorizations of RUCA codes[a]

Categorization A: Urban: 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1. Large Rural City/Town (micropolitan): 4.0, 4.2, 5.0, 5.2, 6.0, and 6.1 Small Rural Town: 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2 Isolated Small Rural Town: 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6
Categorization B: Urban: 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1 Large Rural City/Town: 4.0, 4.2, 5.0, 5.2, 6.0, and 6.1 Small and Isolated Small Rural Town: 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6
Categorization C: Urban: 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1 Rural: 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6

RUCA, Rural-Urban Commuting Area

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