



## DEPARTMENT OF VETERANS AFFAIRS

# Mortality and Revascularization Following Admission for AMI: Implications for Rural Veterans

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## Introduction

Among Veterans Health Administration (VA) hospitals, veterans with acute myocardial infarction (AMI) represent roughly 15,000 admissions annually and AMI quality of care has been the focus of much research within the VA system. Given that rural veterans comprise over 3,000 of those admissions and that research indicates rural-urban disparities for access and quality of care beyond VA populations<sup>1</sup>, it becomes important to consider whether and how patient rurality impacts AMI outcomes, such as mortality and receipt of coronary revascularization.

This research brief, based on a study recently published in the *Journal of Rural Health*,<sup>2</sup> examines these issues and also explored whether the different rural classification systems affected the interpretation between rurality and AMI outcomes.

### Rural-Urban Classification: Two Approaches

Currently many definitions of rural exist in the literature. This study examines two classification approaches.

The first approach, VA Urban/Rural/Highly Rural (URH) classification, incorporates a population

density measure that defines *urban* as any US Census Bureau defined urbanized area, *rural* as any area not defined as urban, and *highly rural* as a rural territory with a population density of less than seven civilians per square mile.

## Key Findings

- The URH rural classification demonstrated somewhat different associations with mortality compared to the more widely accepted RUCA classification.
- The findings do not suggest a rural-urban disparity for AMI outcomes or access limitations for revascularization procedures.

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In contrast, the Rural and Urban Commuter Area (RUCA)<sup>3</sup> codes were adopted as a Census tract-based classification scheme that utilizes standard US Census definitions combined with work commuting information to delineate urban vs. rural areas. The RUCA algorithm creates 30 mutually exclusive categories and, to facilitate comparison to the three-category URH system, these codes were collapsed into three categories: *urban areas*, *large or small towns*, and *isolated small towns*.

## Methods

The study sample was derived from all veterans admitted to a VA acute care hospital from 2006-2007. Patient Treatment File (PTF) data was used to identify 21,515 consecutive patients with the principal diagnosis of AMI, and only patients with a relatively new AMI were included in these analyses. Thus, the final sample included n=15,870 patients.

Generalized estimating equations and Cox proportional hazards were used to adjust mortality and coronary revascularization for demographics, medical comorbidities, and laboratory severity.

## Findings

### AMI Mortality Rates

Applying VA URH codes, the unadjusted 30-day AMI Mortality rates were similar for *rural* vs. *urban* veterans

(8.1% (n=488) vs. 8.8% (n=827) and *highly rural* vs. *urban* veterans (6.0% (n=11) vs. 8.8% (n=827)). Applying the RUCA codes demonstrated a similar rate of unadjusted mortality for rural vs. urban veterans.

### 30-Day Mortality

Using logistic regression analysis, 30-day mortality was similar across *rural* and *urban* classifications using both the RUCA and VA URH classification methods.

### Revascularization Within 30-Days

In contrast, receipt of revascularization within 30-days did demonstrate different risks for rural veterans relative to urban veterans, depending upon the rural-urban classification methodology used. Using RUCA codes, this study indicates that veterans from *large* and *small towns* (OR, 0.89; 95% CI 0.83 – 0.95) and *isolated towns* (OR, 0.86; 0.78 – 0.93) had lower hazards for receipt of 30-day revascularization compared to *urban* veterans.

Alternatively, using the VA URH classification, no difference was found for *rural* (HR, 0.96; 0.94 – 1.00) or *highly rural* veterans (OR, 1.13; 0.96 – 1.31) compared to *urban* veterans for receipt of 30-day revascularization. (See Table 1).

**Table 1. Unadjusted and adjusted rates of receipt of 30-day revascularization, stratified by rural-urban classification**

		Receipt of Revascularization (%)	Hazards for Receipt of Revascularization (adjusted) (95% CI)
<b>VA URH</b>	Urban	2,953 (31.5)	Reference
	Rural	1,948 (32.2)	0.96 (0.94 – 1.00)
	Highly Rural	58 (31.5)	1.13 (0.96 – 1.31)
<b>RUCA</b>	Urban	3,422 (33.1)	Reference
	Large or Small Town	1,088 (31.0)	0.89 (0.83 – 0.95)
	Isolated Town	404 (29.9)	0.86 (0.78 – 0.93)

### Likelihood of Being Transferred or Admitted to VA Hospital

Using the VA URH classification, we found that *rural* veterans were roughly two times more likely to be transferred relative to *urban* veterans (8.9% vs. 4.7%;  $P < .001$ ), and those classified as *highly rural* were roughly three times more likely to be transferred (15% vs. 4.7%;  $P < .001$ ).

The proportion of veterans transferred was somewhat different using RUCA codes. Veterans from *large and small towns*, relative to *urban* veterans, had a higher transfer rate (10.7% vs. 4.9%;  $P < .001$ ) as did veterans from *isolated small towns* relative to *urban* veterans (9.6% vs. 4.9%;  $P < .001$ ).

### Conclusions

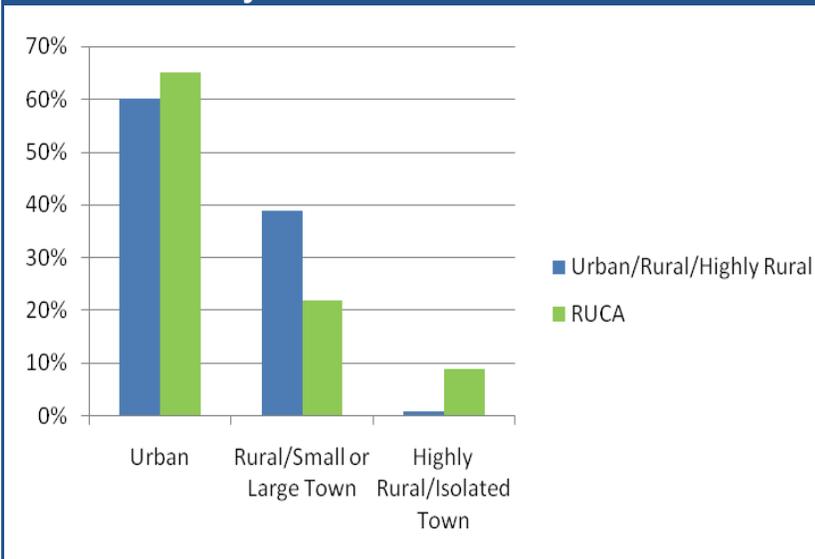
This study suggests several insights into AMI care for rural veterans within the VA system. *First*, despite the observation that rural veterans are more likely to be admitted to non-revascularization capable VA hospitals and are more likely to be transferred, there were no differences in adjusted mortality between rural and urban veterans.

*Second*, the VA URH classification system demonstrated slightly different associations with mortality and substantially different associations with receipt of revascularization compared to the RUCA classification system. Thus, this study suggests that the current VA URH system identifies different sets of patients admitted for AMI than the more widely used RUCA codes, underscoring the importance of interpreting with caution any single study that utilizes only one measure of rurality as the independent variable of interest.

### References

1. Sheikh K, Bullock C. (2001). Urban-rural differences in the quality of care for Medicare patients with acute myocardial infarction. *Arch Intern Med.*, 161(5): 737-743.
2. Abrams, TE, Vaughan-Sarrazin, M, Kaboli, PJ. (2010). Mortality and revascularization following admission for acute myocardial infarction: Implication for rural veterans. *J Rural Health.*, 26(4): 310-317.
3. <http://depts.washington.edu/uwruca/ruca1/ruca-methodology11.php>. (Accessed on Jan 25, 2010).

Figure 1. Rurality Designation for Veterans Admitted for AMI by URH and RUCA Classifications



### Impact

- Interpreting outcomes is dependent on the designation used. The current VA definition identifies such a small population of highly rural veterans (1.5%) that interpreting the effects of living in these areas is limited (See Figure 1).
- Future work should consider both rurality and travel time and their associations with outcome.
- A quality gap for rural veterans with AMI was not apparent suggesting equal quality of care for urban and rural veterans.

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