

Today's Presentation



Designing Rural vs Urban Outcomes Research

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What Does it Mean to Be Rural?

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Bennett KJ, Borders TF, Holmes GM, Kozhimannil KB, Ziller E.
What Is Rural? Challenges And Implications Of Definitions
That Inadequately Encompass Rural People And Places. *Health
Aff (Millwood)*. 2019 Dec;38(12):1985-1992.

Agenda

- Description of what “rural” means
- Overview of some common definitions
- Discussion of challenges related to rural health research
- Example of rural classification in Maine

What is Rural?

- Rural as a morbidity and mortality risk factor has gained increased attention
 - CDC and NCHS reports
- What does a rurality measure capture?
 - A proxy for lower SES?
 - A measure of health system capacity?
 - Distance to resources?
 - A distinct culture?

Rural Definitions

- Numerous definitions of rurality based on different geographic units:
 - census tracts, zip codes, counties, even states
- Definitions may conflict between federal and state agencies and even across different federal agencies

Rural Definitions

- US Census Bureau's urban-rural classification: **census tracts** of urbanized areas (50,000 or more people) and urban clusters (2,500-50,000)
 - Rural = areas that fall outside of urban
- Office of Management and Budget: metropolitan (< 50K people, urban) and non-metropolitan (rural) **counties**

Rural Definitions

- Rural-Urban Continuum Codes & Urban Influence Codes (RUCC): 9-level and 12-level **county** classification schemes based on OMB delineation of metro areas, population & adjacency to urban areas
 - 1974, 1983, 1993, 2003, 2013, 2023 (urban threshold raised from 2.5K to 5K)

Rural Definitions

- Rural-Urban Commuting Area (RUCA) codes: **census tracts (or zip codes)** based on Census Bureau urban area delineations, population and commuting patterns from the American Community Survey
 - 1990, 2000, 2010, planned 2020 (no earlier than Fall 2024)

Rural Definitions

- NCHS Urban-Rural Classification, 6-level **county**
 - 1990, 2006, 2013, planned 2024
 - Based on most recent OMB delineation of MSA and micropolitan statistical areas and postcensal estimates of resident US population

Other Typologies

- Index of Relative Rurality: a continuous, **county**-based measure from 0-1

<https://purr.purdue.edu/publications/2960/1>

Rural-Specific:

- Frontier and Remote Areas: 4-level, Zip Code based
- ERS County Typology Codes: Describes socioeconomic characteristics of rural counties

Counties as Geographic Workhorses

- Many rural definitions are county-based
- All states have them (or equivalents)
- Distinct geographic boundaries
- Some governmental authority in most states

But are Counties—and Equivalents—Equivalent?

- 3,142 counties—and equivalents—in the US, including the District of Columbia
- Extreme heterogeneity between counties
- Excluding DC, number of counties per state ranges from 3 (DE) to 254 (TX)

Land & Population Size

Kalawao, HI

- 53 sq. miles (12 land)
- < 100 population

Falls Church, VA

- 2 sq. miles

Yukon–Koyukuk, AK

- 146k sq. miles



Los Angeles, CA

- 10 mil population

Geographically Mixed Counties

Counties classified as urban may contain rural places, especially when large

Coconino County, AZ

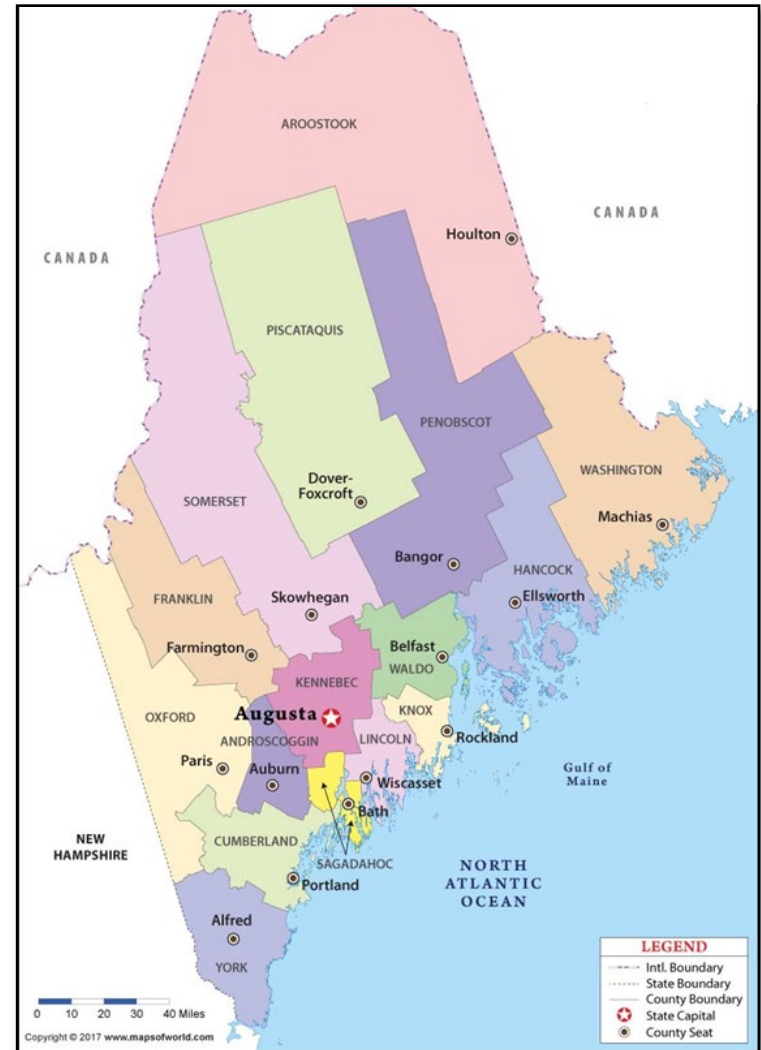
- Urban (Flagstaff)
- ~19k sq. miles, 38% reservation lands representing 5 tribes



Geographically Mixed Counties

Mount Chase, ME

- Town, pop. ~200
- 100 mi. N of Bangor
- 1 hour, 7 mins from nearest hospital



Rural Heterogeneity

- Rural places and populations in the US are diverse: racially/ethnically, economically, geographically, politically
- Discussions of rural places often center on white, working-class populations
 - Average/mean statistics mask critical intra-rural differences

Research Challenges

- Numerous approaches to measuring “rural” but for most rural = not urban
- County-level and/or dichotomous measures can mask big intra-rural differences (but often the best we have)
- Public use data are increasingly less likely to contain even dichotomous measures


What do you adjust for when your exposure is “rural”?

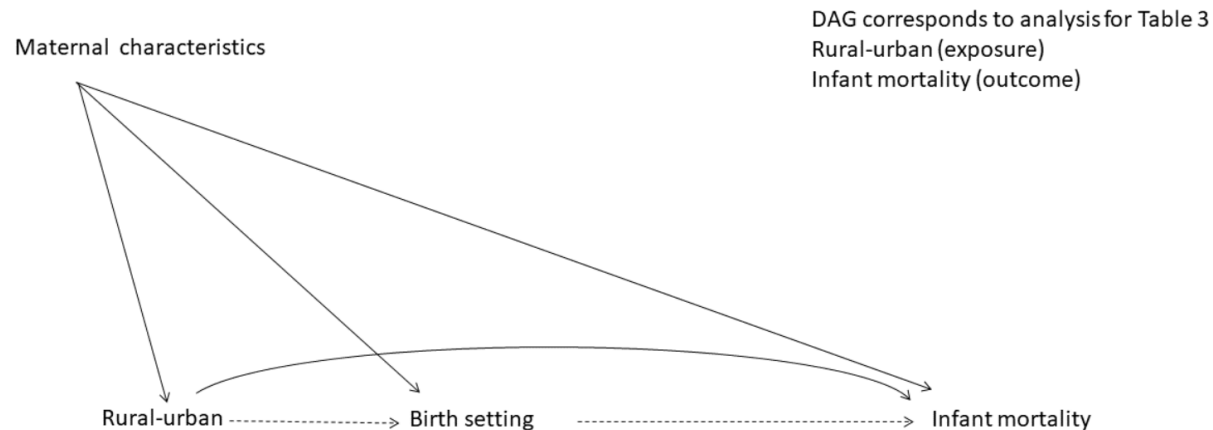
- Be careful of health intermediates like BMI and smoking

ORIGINAL ARTICLE

 Paediatric and Perinatal Epidemiology WILEY

Out-of-hospital births and infant mortality in the United States: Effect measure modification by rural maternal residence

Elora A. Way¹  | Jenny L. Carwile² | Erika C. Ziller¹ | Katherine A. Ahrens¹ 



Unadjusted:
(Model 1): Rural exposure only

Adjusted for maternal characteristics:
(Model 2) Adjusted for age, race/ethnicity,
education, marital status

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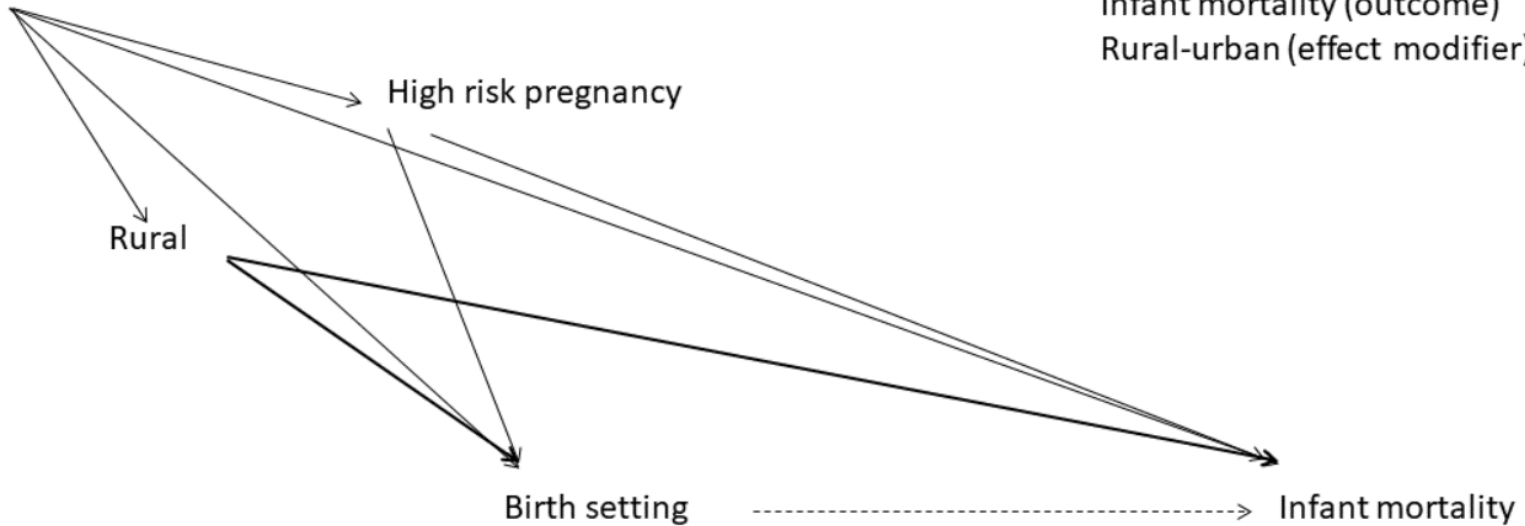
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www.ruralhealthresearch.org

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Maternal characteristics



DAG corresponds to analysis for Table 4
Birth setting (exposure)
Infant mortality (outcome)
Rural-urban (effect modifier)

Unadjusted:

(Model 1): Birth setting exposure only

Adjusted for maternal characteristics:

(Model 2) Adjusted for age, race/ethnicity, education, marital status

Adjusted for high-risk pregnancy markers:

(Model 3) Adjusted for Model 2 plus preterm birth (proxy for preterm labor or medical indication for preterm delivery), birthweight (proxy for intrauterine growth restriction), plurality, breech presentation, parity, previous cesarean, maternal smoking

(Model 4) Adjusted for Model 3 plus hypertension during pregnancy and pre-pregnancy and/or gestational diabetes

<https://depts.washington.edu/uwruca/ruca-uses.php>

RUCA Data

Using RUCA Data

The RUCA codes can be used in many different ways in various types of health related research and program development and implementation. There are 33 codes. The large number of codes facilitate the aggregation of the codes to fit specific needs of those using them for health, demographic, geographic, and other purposes.

In almost all cases, the RUCA codes should be aggregated for use. For instance, it may be appropriate to aggregate them into two groups: rural and urban. In other instances it may be appropriate to create a specific group for the purposes of targeting a program (e.g., limiting a telehealth subsidy program to areas that are smaller and less functionally related to urban and large rural places: 7.0, 7.4, 8.0, 8.4, 9.0, 9.2, 10.0, 10.3, 10.5, 10.6).

There are many ways to aggregate the codes based on the policy goal. A few examples follow. Under most circumstances, suggested categorizations A, B, and C (below) will be most appropriate.

The way in which RUCAs have been used most is to aggregate the codes into four categories. This is a generally useful aggregation that is used for many health related projects. When this does not fit the bill, method B or C (see below) of collapsing the categories is usually satisfactory. This categorization approximates the metro/non metro split at the Census tract (ZIP code) level: **Categorization A.**

Urban focused: 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) focused: 4.0, 4.2, 5.0, 5.2, 6.0, and 6.1

Small Rural Town focused: 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 focused: 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6

The percentage of the estimated 2004 US population for these groupings are: urban, 81.0%; large rural, 9.6%; small rural, 5.2%; and isolated small rural, 4.2% (55,526,530 rural residents in the US). The advantage of this definition is that it splits urban and rural in approximately the same way as does the OMB Metro definition but at the sub county-level, and it divides rural into three relevant and useful categories. In many studies and programs, it makes sense to separate the large rural cities/towns (say a place of 30,000 population with many medical providers) from those places that have 1,000 population and are isolated from urban places. It is clear that under most circumstances these two types of places differ greatly and should be considered separately.

Alternatively, the small rural and isolated small rural categories can be combined to create a single "small" rural category: **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

The three categories can be aggregated. For instance, the three rural categories can be combined to create one "rural" category (this would approximate the standard Metro definition but at the sub county level: 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

Another alternative is to define urban as all places that have 30% or more of their workers going to a Census Bureau defined Urbanized Area (this is the same as "C" but with code 3.0 being moved to the rural group): **Categorization D.**

Urban: 1.0, 1.1, 2.0, 2.1, 4.1, 5.1, 7.1, 8.1, and 10.1

Rural: 3.0, 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

A more complicated approach is to assign Census tracts (ZIP codes) as in "A" but use the secondary work commuting flows to assign them to the largest place where 30% or more of their population commutes: **Categorization E.**

Urban: 1.0, 1.1, 2.0, 2.1, 4.1, 5.1, 7.1, 8.1, and 10.1

Large Rural City/Town: 3.0, 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.2, 8.2, and 10.2

Small Rural Town: 7.0, 7.3, 7.4, 8.0, 8.3, 8.4, 9.0, 9.1, 9.2, and 10.3

Isolated Small Rural Town: 10.0, 10.4, 10.5, and 10.6

And finally, another example categorization involves defining a group that is non-urban and non-large rural: **Categorization F.**

Rural town focused or weakly related to urban and large rural places: 3.0, 6.0, 6.1, 7.0, 7.3, 7.4, 8.0, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.3, 10.4, 10.5, and 10.6 Not above: all other codes.

Of course, there are many variations of these aggregation schemes and other alternatives. In some demographic studies, all the codes might be used or simple combining of categories could be used (e.g., combine 10.0, 10.4, and 10.5 to create a very isolated and small rural town/area group). However, in general it is expected that categorizations A, B, and C will be used most often. For categorizations that use the Remote Tool in combination with RUCA codes, go to the Remote Tool link in the methods section.