An Alternative Approach to Defining Rural for the Purpose of Providing Emergency Medical Services (EMS)

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This document was created through the efforts of Gary Wingrove, Manager, Mayo Clinic's Gold Cross Ambulance Service and Thomas Judge, Executive Director, Lifeflight of Maine. It was developed for, and included in the final ***Rural Emergency Medical Service Agenda for the Future***. The attached maps were produced by the Rural Policy Research Institute under contract with the American Ambulance Association. Reprinted with permission.

*This document, along with maps for all states are available at http://tasc.ruralhealth.hrsa.gov/ems.shtml under the title ***An Alternative***

Approach to Defining Rural for the Purpose of Proving Emergency Medical Services.

July 2004

Executive Summary

Defining "Rural" and "Access" Appropriately for Emergency Medical Services

For the purposes of program administration, the Federal government has created many different methods for defining rural America. There is no universally accepted definition of "rural" across Federal agencies. A consumer accessing specific health care services like primary care physician or hospital care has different needs than farmers accessing funding formulas for crop support. Geographical need must be integrated with time in the access of emergent healthcare.

EMS is different from other health care services because it is a service delivered directly to the consumer often times during life-threatening events when minutes and even seconds count. In accessing emergency care, time and miles are as much key determinates in mortality and morbidity as the specific injury or illness.

An appropriate EMS definition of "rural" must account for a combination of service availability, population coverage, and a time based geographic delivery of emergency services. To insure the existence of a stable and vibrant EMS system, Federal programs should define and serve rural communities with policies that encourage service availability with optimal response times to emergent events.

The most widely used definition of urban and rural is "Metropolitan Statistical Areas" or MSAs. *OMB creates a list of CBSAs (MSA and NECTA plus their Micropolitan components) for the* ***single expressed purpose of collecting and reporting statistics****.* In fact, OMB expressly cautions federal agencies and Congress against the use of these county-based definitions for any purpose other than gathering and reporting statistics. OMB specifically states, "**The Metropolitan and Micropolitan Statistical Area Standards *do not equate* to an urban-rural classification**; many counties included in Metropolitan and Micropolitan Statistical Areas, and many other counties, contain both urban and rural territory and populations"[1] [emphasis added]. OMB stresses that there are "often unintended consequences" when using the definitions for non-statistical purposes.

Beyond OMB's admonition that MSAs do not equate to an urban-rural classification system, the failure of county based methods in describing rural and urban geography as a means to distinguish market areas has been well documented. In 1998 Ricketts[2], et al, stated "Metropolitan counties may include substantial rural areas…" and when referring to the Goldsmith modification stated "the criteria for identifying isolated rural areas have been applied to only very large counties though it is obvious there are equally isolated areas in many of the smaller counties of the nation."

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[1] Office of Management & Budget. 2003. http://www.whitehouse.gov/omb/bulletins/b03-04.html. OMB BULLETIN NO. 03-04. June 6, 2003.

[2] Ricketts, Thomas C.; Johnson-Webb, Karen D.; and Taylor, Patricia. *Definitions of Rural: A Handbook for Health Policy Makers and Researchers.* Chapel Hill, NC: Cecil G. Sheps Center for Health Services Research, University of North Carolina, July, 1998. Pages 6-7.

In 1989 the Office of Technology Assessment[3] said, "Problems in MSA classification may occur when county boundaries do not conform to actual urban or suburban development. An MSA may inappropriately include nonsuburban areas located in the outlying sections of some counties." In 2000 Zelarney[4], et al, said "metro boundaries based on counties can extend well past the dense urban core into much less densely settled – even frontier – territory."

To illustrate the problem with using counties as a baseline for defining rural, under current Medicare reimbursement[5] (Goldsmith-modified MSA counties) there are 3,938 urban zip codes with population density less than 150 per square mile. 1,832 of these zip codes serve populations less than 2,500.

In the 1990s the ORHP and the USDA began collaborating and commissioned a study by the University of Washington[6] on a new way to define rural that would decrease the inherent defects of MSA distinctions between "urban" and "rural" communities. Rural-Urban Commuting Areas (RUCA) account for commuting patterns and build on definitions of urbanized areas and urban places developed by the Census Bureau.

According to the ERS[7], RUCAs are "based on measures of urbanization, population density, and daily commuting." According to the Office of Technology Assessment[8], "to study the geographic variation of access to health care, a typology that includes population size, density, and distance to large settlements is of interest." RUCAs meet all of these tests.

The county based urban-rural distinction was seen as problematic from the beginning and ambulance providers have consistently proposed that a more precise definition of urban-rural geography is necessary to assure that there is reasonable and timely access to emergency health care in rural areas. The broad county line distinction often does not reflect ambulance service coverage areas and is neither specific nor sensitive in defining progressively rural areas with decreasing population density and often increasing geographic barriers to care. There is a general consensus in the ambulance industry that a definition of rural for ambulance payment must be made at a sub-county level.

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[3] Hewitt, Maria. *Defining "Rural" Areas: Impact on Health Care Policy and Research*. Washington, DC: Office of Technology Assessment, Congress of the United States, July 1989. Page 8.

[4] Zelarney, Pearlanne T, and Ciarlo, James A. *Defining and Describing Frontier Areas in the United States: An Update – Letter to the Field No. 22*. Boulder, Colorado: Western Interstate Commission for Higher Education, December, 2000.

[5] Data source: University of Missouri, Rural Policy Research Institute, http://www.rupri.org. There are 42,531 zip codes in the CMS ambulance zip code list on 7/1/2004. For this analysis, the following were subtracted: 9,713 zip codes for post office boxes; 2,661 zip codes whose geography and population was encased and reported within another zip code; 1,195 for which GIS data is not available and 111 zip codes with erroneous population data. 28,851 zip codes were analyzed.

[6] http://www.fammed.washington.edu/wwamirhrc/rucas/rucas.html

[7] http://www.ers.usda.gov/Briefing/Rurality/RuralUrbanCommutingAreas/

[8] Hewitt, page 24.

A sub-county geographic area with specificity in population can be achieved through joining several existing methods of determining urban and rural continuums. This would allow greater specificity through the use of Census Bureau derived census block and census tract areas.

According to Cromartie and Swanson[9], "Census Tracts are large enough to have acceptable sampling error rates (containing an average of 4,000 people); are consistently defined across the Nation; are usually subdivided as population grows to maintain geographic comparability over time; and can be aggregated to form county [or zip code] level statistical areas when needed."

When applying an urban-rural definition to the provision of ambulance service that is appropriate for the manner in which ambulance services are organized, no existing definition leads to a reasonable outcome. A potential modified version of the RUCA definition may be the "best fit" for ambulance services, by defining those areas in RUCA series 1 (roughly equivalent to the Census Bureau's Urbanized Area classification) as urban and all other areas as rural, cross-walked to UA and ZCTA files to assure specificity in geographic and population density need. Likewise, tiers of "rurality" and therefore ambulance volume can be recognized using the RUCA system because of its straightforward approach in defining high and low commuting zones as well as separating geography by population density, large and small towns, and areas with no definable commuting pattern.

This approach achieves a unit of measurement that is flexible, precise, stable and more consistent than using county boundaries and yet practical as the RUCA areas are mapped to zip codes. Ambulance services have been reporting the point of pick up zip code to CMS since April 2002 when the new ambulance fee schedule began implementation. Transition to a payment method based on zip code mapped RUCAs would be transparent on implementation for ambulance services. Using a combination of data from these three sources a much more accurate urban-rural continuum for EMS is possible.

This approach is both more sensitive (it uses RUCAs assigned by CT) and more specific (CTs are mapped to zip codes) than a county boundary based method. If this method is adopted, it will require periodic and frequent updates by ORHP and CMS as zip code boundaries change and new codes are added.

[9] Cromartie, John and Linda Swanson, "Census Tracts More Precisely Define Rural Populations and Areas." Rural Development Perspectives, vol 11, no 3. 1996.

Document

Defining "Rural" and "Access" Appropriately for Emergency Medical Services

> "Access to health care for rural Americans has to be examined according to the service needed. It is one thing for a resident to travel 30 to 60 miles for routine examinations or elective surgery. It is a whole different ball game when the emergency medical service needs to be delivered timely to the resident experiencing a heart attack." John Baerg, Emergency Medical Technician and Commissioner, Watonwan County, Minnesota

For the purposes of program administration the Federal government has created many different methods for defining rural America. To date, there is no universally accepted definition of "rural" across Federal agencies and various definitions are used simultaneously in developing policies for grant formulas or adjusting payment for services purchased by the Federal government. While it may be appropriate to use multiple definitions of rural, the definition used for a particular program or purpose should adequately describe the geography that the program or purpose is intended to serve.

Access to healthcare is an increasing challenge in rural communities. A year 2000 Blue Ribbon Commission in Maine noted that "given the distribution of Maine's population, geography is also a significant factor in access. Those in the more populous parts of the state have more opportunities for care."[10] A consumer accessing specific health care services like primary care physician or hospital care has different needs than farmers accessing funding formulas for crop support. Geographical need must be integrated with time in the access of emergent healthcare. Only recently has the Centers for Medicare and Medicaid Services (CMS) or the US General Accounting Office (GAO) explored alternatives for defining "rural" in relation to access to emergency medical services (EMS).

EMS is different from other health care services because it is a service delivered directly to the consumer often times during life-threatening events when minutes and even seconds count. Unlike other health care encounters swift response determines EMS outcomes. In accessing emergency care, time and miles are as much key determinates in mortality and morbidity as the specific injury or illness. In emergency care, access is a combination of resource availability and time based care.

In recent years, significant progress has been made at the Federal level in developing adequate funding and resource availability through cost based reimbursement for physician and hospital services in the Federally Qualified Health Centers, Rural Health Clinics, and Medicare Rural Hospital Flexibility (Critical Access Hospital) Funding

[10] Maine Emergency Medical Services Board. (2000) *Blue Ribbon Commission Report to the Governor*.

Programs. There are no equivalent programs for EMS[11]. In addition, existing definitions and funding mechanisms do not adequately describe rural for the purpose of assuring timely access to emergency healthcare.

Federal programs that are geared toward ensuring a stable and vibrant EMS system need a better method of defining rural and access that is geared toward this unique combination of access issues. An appropriate EMS definition of "rural" must account for a combination of service availability, population coverage, and a time based geographic delivery of emergency services. To insure the existence of a stable and vibrant EMS system, Federal programs should define and serve rural communities with policies that encourage service availability with optimal response times to emergent events.

Existing Federal Methods for Defining Urban and Rural

Metropolitan Statistical Areas & New England City and Town Areas

The most widely used definition of urban and rural was developed by the Office of Management and Budget (OMB) when it created "Metropolitan Statistical Areas" or MSAs in the 1940s[12]. This method designates rural counties by exclusion. Until 2000, each county (or in the case of New England, towns within counties) was metropolitan[13] because it is an MSA[14] or the county was non-metropolitan.

New England was treated differently than all other parts of the country with both an MSA county level designation and a further definition of New England County Metropolitan Areas (NECMA). NECMAs were not designated using entire counties, but individual towns and cities were designated metropolitan areas. All other areas, even those inside counties with metropolitan towns or cities were considered non-metropolitan.

In 2000 OMB changed this classification by adding a third component, Micropolitan[15,16] counties, and changed the NECMAs to New England City and Town Areas (NECTAs).[17] The combination of Metropolitan and Micropolitan counties is now called Core-Based Statistical Areas (CBSA). All counties that are part of an MSA are considered urban. All other counties, including Micropolitan counties, are still considered non-metropolitan by the Department of Health & Human Service's (DHHS) federal Office of Rural Health

[11] The Medicare Rural Hospital Flexibility Program has a provision to provide cost-based ambulance services, but it is limited by federal legislation to ambulance services owned and operated by Critical Access Hospitals (CAHs) and then further limited to CAH ambulance services at least 35 miles from the next ambulance service. Very few ambulance services qualify for this reimbursement because rural ambulance services tend to be community operated and are spaced closer than 35 miles in order to maintain acceptable response and transport times.
[12] Washington State Department of Health. (2004) *Guidelines for Using Rural-Urban Classification Systems for Public Health Assessment*. http://www.doh.wa.gov/Data/Guidelines/RuralUrban.htm. p.8.
[13] http://www.census.gov/population/estimates/metro-city/03mfips.txt
[14] http://www.census.gov/population/estimates/metro-city/03msa.txt
[15] http://www.census.gov/population/estimates/metro-city/03mcsa.txt
[16] http://www.census.gov/population/estimates/metro-city/03nmifips.txt
[17] http://www.census.gov/population/estimates/metro-city/03nfips.txt

Policy (ORHP) and the Department of Agriculture's (USDA) Economic Research Service (ERS). Counties that are not CBSAs are considered rural by OMB.

In this methodology, a county or counties is Metropolitan because they have either cities or urbanized areas with population exceeding 50,000 (MSA); or, at least 50% of the population resides in urban areas of 10,000 or more population; or, that contain at least 5,000 people residing within a single urban area of 10,000 or more population ("central county"). "Outlying counties" are included in the CBSA if they meet specified requirements of commuting to or from the central counties.

OMB creates a list of CBSAs (MSA and NECTA plus their Micropolitan components) for the single expressed purpose of collecting and reporting statistics. In fact, OMB expressly cautions federal agencies and Congress against the use of these county-based definitions for any purpose other than gathering and reporting statistics. OMB specifically states, "The Metropolitan and Micropolitan Statistical Area Standards do not equate to an urban-rural classification; many counties included in Metropolitan and Micropolitan Statistical Areas, and many other counties, contain both urban and rural territory and populations"[18] [emphasis added]. OMB stresses that there are "often unintended consequences" when using the definitions for non-statistical purposes.

CBSAs are based on county boundaries. County boundaries are established by states and are stable over time. Many county lines were arbitrarily drawn around physical features (e.g., lakes and rivers), property tracts, existing settlements, or existing political needs around populations. Over time, populations have re-organized to meet different needs. For example, at one time rivers were once essential for moving raw materials and products to different parts of the country and therefore mills and factories were established adjacent to water ways. As transportation evolved to rail, truck, or air and electrical generation became less dependent on rivers and streams, major waterways became less significant for industry and in production and population growth shifted towards rail lines, interstates and airports. County boundaries, though, remain stagnant. In the densely populated Eastern states, counties are relatively small in geographical size. Counties tend to be significantly larger in the Midwest and West.

Federal agencies have investigated a number of ways to modify CBSAs while still using county lines as the basis for urban-rural distinctions. ERS has created Rural-Urban Continuum Codes[19], Urban Influence Codes[20] and Public Use Micro Data Sample-L Labor Market Areas[21].

[18] Office of Management & Budget. 2003. http://www.whitehouse.gov/omb/bulletins/b03-04.html. OMB BULLETIN NO. 03-04. June 6, 2003.
[19] http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/
[20] http://www.ers.usda.gov/briefing/rurality/UrbanInf/
[21] http://www.ers.usda.gov/DB/PUMSL/

The failure of county based methods in describing rural and urban geography as a means to distinguish market areas has been well documented. In 1998 Ricketts[22], et al, stated "Metropolitan counties may include substantial rural areas…" and later stated "the criteria for identifying isolated rural areas have been applied to only very large counties though it is obvious there are equally isolated areas in many of the smaller counties of the nation."

In 1989 the Office of Technology Assessment[23] said, "Problems in MSA classification may occur when county boundaries do not conform to actual urban or suburban development. An MSA may inappropriately include nonsuburban areas located in the outlying sections of some counties." In 2000 Zelarney[24], et al, said "metro boundaries based on counties can extend well past the dense urban core into much less densely settled – even frontier – territory."

In recognition of these issues, in 1993 the ORHP and ERS commissioned an investigation by Harold F. Goldsmith[25], et al, to develop refinements in defining MSAs to better describe rural and urban geography. The paper noted that "when Federal programs are implemented to provide health services to rural areas, they immediately encounter the problem that there are no operational definitions of "rural areas" which precisely divide the population of the United States into "rural residents" and "urban residents." The two most commonly used dichotomous definitions are rural areas and urban areas, a Bureau of the Census (BC) designation based on density, and metropolitan areas and non-metropolitan areas, and Office of Management and Budget (OMB) designation based on the integration of counties with big cities (see Hewitt 1989 and OMB 1990). Both definitions are useful but imperfect."

This modification sought to identify large urban counties (1,225 square miles or more) that contained census tracts with urban pockets but low population density as "rural areas, with their small populations, sparse settlement and remoteness, often needed Federal government assistance in order to maintain a variety of essential health services. Under usual market conditions, health and related services tend to be concentrated in big cities and their suburban areas (see United States General Accounting Office, Nov. 1992, and Goldsmith, et al, in press). Thus, residents of small towns or the open country (rural residents) are considerably less likely than the residents of big cities and their suburbs to have easy geographical access to health services unless the development of such services is encouraged and supported."

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[22] Ricketts, Thomas C.; Johnson-Webb, Karen D.; and Taylor, Patricia. *Definitions of Rural: A Handbook for Health Policy Makers and Researchers.* Chapel Hill, NC: Cecil G. Sheps Center for Health Services Research, University of North Carolina, July, 1998. Pages 6-7.

[23] Hewitt, Maria. *Defining "Rural" Areas: Impact on Health Care Policy and Research*. Washington, DC: Office of Technology Assessment, Congress of the United States, July 1989. Page 8.

[24] Zelarney, Pearlanne T, and Ciarlo, James A. *Defining and Describing Frontier Areas in the United States: An Update – Letter to the Field No. 22*. Boulder, Colorado: Western Interstate Commission for Higher Education, December, 2000.

[25] Goldsmith, Harold F.; Puskin, Dena F; and Stiles, Diane J. *Improving the Operational Definition of "Rural Areas" for Federal Programs*. Washington, DC: Federal Office of Rural Health Policy, 1993. http://ruralhealth.hrsa.gov/pub/Goldsmith.htm

Based on 1980 Census results, the researchers used the proposed modification formula to identify 75 counties nationwide for which only part of the county would be recognized as urban. In 1996, twelve additional counties were added to the list based on 1990 Census data. *ORHP has no plans to update the Goldsmith modification in the future.* ORHP has abandoned this method in favor of the Rural Urban Commuting Areas (RUCA) approach.

In the 1990s the ORHP and the USDA began collaborating and commissioned a study by the University of Washington[26] on a new way to define rural that would decrease the inherent defects of MSA distinctions between "urban" and "rural" communities. Rural-Urban Commuting Areas (RUCA) account for commuting patterns and build on definitions of urbanized areas and urban places developed by the Census Bureau. RUCAs are used to define eligibility for many programs administered through ORHP and can be mapped by census tract or zip code. They have proven a valuable resource for defining rural in terms of citizens having access to services they may travel to. RUCAs are established by assigning codes to Census Tracts that are then mapped to zip codes.[27] ORHP is planning to update RUCAs and publish a federal register notice in fall 2004.

According to the ERS[28], RUCAs are "based on measures of urbanization, population density, and daily commuting." According to the Office of Technology Assessment[29], "to study the geographic variation of access to health care, a typology that includes population size, density, and distance to large settlements is of interest." RUCAs meet all of these tests. The Washington State Department of Health[30] describes RUCAs as "a ten-tiered classification system based on census tract geography. Both population size and commuting relationships are used to classify census tracts … The RUCA system provides a great deal of flexibility as the codes can be collapsed or combined in several different ways."

EMS Urban-Rural Distinctions

Prior to 2002, ambulance reimbursement for Medicare Beneficiaries was based on traditional charge to cost profiles (for hospital-based providers) or a Health Care Finance Administration (HCFA) defined "reasonable charge" method (for non-hospital ambulance suppliers) developed for individual and groups of providers within sub-regional area. There was no urban rural distinction and charges and reimbursement varied widely throughout the country and even within regions.

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[26] http://www.fammed.washington.edu/wwamirhrc/rucas/rucas.html

[27] The methods used by the University of Washington to map Census Tract RUCA assignments to zip codes are available at http://www.fammed.washington.edu/wwamirhrc/rucas/methods.html. Population distribution across the RUCA codes resulted in less than 1% variation between CTs and zip codes.

[28] http://www.ers.usda.gov/Briefing/Rurality/RuralUrbanCommutingAreas/

[29] Hewitt, page 24.

[30] http://www.doh.wa.gov/data/guidelines/ruralurban.htm

As a requirement of the 1997 Balanced Budget Act, CMS issued a Final Rule in February 2002[31] creating a single national fee schedule for emergency and non-emergency ambulance services. Considerable effort was expended in the five year negotiated rule making process on defining an urban-rural distinction. The Final Rule defined "a rural area to be an area outside a Metropolitan Statistical Area (MSA) or a New England County Metropolitan Area, or an area within an MSA identified as rural, using the Goldsmith modification."

The Rule noted that "we could not easily adopt and implement, within the constraints necessary to implement the fee schedule timely, a methodology for recognizing geographic population density disparities other than MSA/non-MSA. However, we will consider alternative methodologies that may more appropriately address payment to isolated, low-volume rural ambulance suppliers. Thus, the rural adjustment in this rule is a temporary proxy to recognize the higher costs of certain low-volume rural suppliers."[32]

The Rule also said, "Several difficult issues will need to be resolved to establish more precise criteria for suppliers that should receive the rural adjustment. Examples of such issues include: (1) Appropriately identifying an ambulance supplier as rural; (2) identifying the supplier's total ambulance volume (because Medicare has a record only of its Medicare services); and (3) identifying whether the supplier is isolated, because some suppliers might not furnish services to Medicare beneficiaries (thus, Medicare would have no record of their existence) and one of these suppliers might be located near an otherwise ''isolated'' supplier. Addressing these issues in some cases will require the collection of data that are currently unavailable. We intend to work with the industry and with the Office of Rural Health Policy to identify and collect pertinent data as soon as possible."[33]

MSAs with the Goldsmith modification are the current method used by CMS to describe rural for the purposes of reimbursement under the Medicare Ambulance Fee Schedule. CMS has taken these definitions and assigned a "rural" or "urban" designation to each United States Postal Service (USPS) zip code in the country. Ambulance providers are required to document the zip code of the point of origin for the ambulance transport. In the Rule, the first 17 miles for ambulance transports originating in a "rural" zip code are paid at a slightly higher rate.

The county based urban-rural distinction was seen as problematic from the beginning and ambulance providers have consistently proposed that a more precise definition of urban-rural geography is necessary to assure that there is reasonable and timely access to emergency health care in rural areas. The broad county line distinction often does not reflect ambulance service coverage areas and is neither specific nor sensitive in defining progressively rural areas with decreasing population density and often increasing

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[31] Federal Register 2/27/2002, Vol. 67, No. 29, Part IV, 42 CFR Parts 410 and 414. *Medicare Program: Fee Schedule for Payment of Ambulance Services and Revisions to the Physician Certification Requirements for Coverage of Non-Emergency Ambulance Services, Final Rule.*
[32] Ibid page 9110
[33] Ibid page 9110

geographic barriers to care. There is a general consensus in the ambulance industry that a definition of rural for ambulance payment must be made at a sub-county level.

Recognizing continuing problems in assuring rural EMS coverage, the Medicare, Medicaid, and SCHIP Benefits Improvement Act of 2000 (BIPA) directed GAO to examine rural ambulance costs and make recommendations to CMS on improvements to the Final 2002 Rule "to address appropriate, payment for ambulance services furnished in rural, low-volume areas."[34]

The "temporary proxy" has undergone a number of modifications since the 2002 Final Rule with the most recent adjustments occurring in a Final Rule promulgated as required under Section 414 of the 2003 Medicare Prescription Drug, Improvement and Modernization Act.

Nonetheless, EMS reimbursement remains tied to county based geography and with a zip-code based point of pick up to determine if the origin of the service is in an MSA or non-MSA area and there is no current methodology to account on the challenges to provide service in progressively rural areas.

Medicare is the single largest payer for most ambulance providers. Adequate Medicare reimbursement is a key factor in assuring service availability in rural areas. As noted by the GAO, "refining Medicare's ambulance fee schedule to adequately account for cost differences in providing ambulance services across various geographic areas is important to ensuring beneficiaries' access to services. Access is a particular concern in rural areas, since providers' cost per trip is likely to be higher because they provide fewer trips. Moreover, our analysis shows that the cost per trip is likely to be highest in the least densely populated rural counties. While the fee schedule incorporates a rural adjustment to raise payments for trips provided in rural areas, its definition of "rural" is broad. As a result, the fee schedule's rural payment adjustment does not sufficiently target trips provided in the least densely populated rural counties."[35]

The challenge for policy makers is to develop a methodology that can blend the need with the tools available. Both county based borders and zip-code based point of pick-ups, which often cross county boundaries, have inherent weaknesses in defining "rural."

Targeting Appropriate Ambulance Reimbursement in Rural Areas

In both the 2002 Final Rule and the GAO report there is recognition of a need to develop a methodology that is both sensitive and specific enough to identify "rural" and target additional reimbursement for EMS services in progressively rural and frontier areas. This is necessary to assure that any additional targeted reimbursement be "sufficiently precise to limit the rural bonus payment to only those rural ambulances that are isolated,

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[34] US General Accounting Office. *AMBULANCE SERVICES: Medicare Payments Can Be Better Targeted to Trips in Less Densely Populated Rural Areas.* GAO-03-986, (Washington, DC: September 2003), p.27. http://www.gao.gov/new.items/d03986.pdf

[35] Ibid. page 20

essential, (and) low-volume."[36] CMS further noted in response to the GAO report: "the complexity of the issues and the need for careful analysis to assure that the appropriate payments are made to only those ambulance suppliers/providers who require additional payment because of low volume and not because of some other reason (e.g. inefficiency or competition from another supplier)."[37]

The GAO ultimately determined that a blend of population density within a landscape is a key factor in defining "rural" but supported the CMS use of county level designation of urban and rural. Their report states, "The difference in the volume of Medicare ambulance trips provided in rural and urban counties largely reflects differences in their population density. Not surprisingly, the number of Medicare ambulance trips in a county is strongly related to its population, with counties with fewer residents having fewer trips. Trip volume is also related to a county's land area, although to a lesser extent. Population density - the ratio of population to land area - reflects both of these measures."[38]

The GAO analysis also "examined several other classification systems: urban influence codes (UIC), which classify counties based on each county's largest city and its proximity to other areas with large, urban populations; rural-urban continuum codes (RUCC), which classify metropolitan counties by the size of the urban area and non-urban counties by the size of the urban population and proximity to a metropolitan area; and rural-urban commuting areas (RUCA), which classify census tracts using patterns of urbanization, population density, and daily commuting patterns, and then map the census tracts into zip codes. These systems are more complex than the system we used, and we found that they did not help explain variation in trip volume as well as counties grouped by population density."

In response to comments by provider associations suggesting that county level urban rural distinctions were too broad the GAO noted: "With respect to the geographic unit used to identify trips for the rural adjustment, we agree that, since counties are relatively large geographic units, it is possible for trips in some areas to be overpaid and others underpaid. Moreover, in principle, a rural classification system that uses a smaller geographic unit, such as zip codes, might better target payments to trips in areas with low population density. Yet our analysis indicates that zip codes do not explain variation in trip volume as well as counties. Further, county boundaries tend to be more stable over time than zip code boundaries. In addition, a variety of technical difficulties hinder the use of zip codes for ambulance payments, including the absence of zip codes for some rural areas."[39]

The GAO also noted that "with respect to multiple adjustment categories, we did not address whether there should be a single adjustment or whether there should be multiple adjustment amounts to reflect differing levels of population density. A decision on single

[36] Federal Register 2/27/2002.
[36] Ibid page 9110
[37] CMS Correspondence - Administrator Scully to GAO 9/11/2003 as attached to GAO Report.
[38] Ibid
[39] GAO-03-986, pg. 22

or multiple categories would require balancing increased precision with increased complexity." [40]

Tools and Troubles

There is universal agreement within the ambulance industry that county boundaries and the MSA/Goldsmith model do not accurately describe rural areas for the provision of ambulance service[41] and that current CMS policy does not accurately target rural ambulance payments. There are problems in the use of zip codes as a determinate of ambulance payments. The definition of rural be exclusion – any area outside of a Goldsmith modified MSA – does not address the stratification of need in progressively rural and frontier areas.

To illustrate the problem with using counties as a baseline for defining rural, under current Medicare reimbursement[42] (Goldsmith-modified counties) there are 3,938 urban zip codes with population density less than 150 per square mile. 1,832 of these zip codes serve populations less than 2,500. Similarly, there are 199 rural zip codes with population density greater than 1,000 per square mile. 332 rural zip codes serve populations greater than 25,000, and 15 of these serve a population greater than 50,000.

Using zip codes as a means of identifying rural is also problematic. Zip codes are established by the USPS for the purposes of delivering mail. Zip codes areas are irregular in shape and in population (some zip codes are a single building and others encompass hundreds of square miles).

The main problem with using zip code population density as a rural proxy is that both the numerator and denominator are variable. Should one or the other (square miles or population) be constant it would be easy and logical to compare one area to another. Two variables, though, make it nearly impossible to make comparisons.

Table 1 illustrates the problem of zip code population density by showing how combinations of population and square miles can yield the same result of a density of 150 persons per square mile[43].

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[40] Ibid, pg. 22
[41] Ibid, pg. 21.
[42] Data source: University of Missouri, Rural Policy Research Institute, http://www.rupri.org. There are 42,531 zip codes in the CMS ambulance zip code list on 7/1/2004. For this analysis, the following were subtracted: 9,713 zip codes for post office boxes; 2,661 zip codes whose geography and population was encased and reported within another zip code; 1,195 for which GIS data is not available and 111 zip codes with erroneous population data. 28,851 zip codes were analyzed.
[43] Data Source: 2004 Census Bureau ZCTA file.

Table 1					
	CMS	Zip	Square		
State	Designation	Code	Miles	Population	Density
MN	Rural	55955	15.07	2272	150.72
CA	Rural	93015	123.06	18555	150.78
CT	Urban	06758	2.15	325	151.06
MS	Urban	39465	126.14	18965	150.34

Using a 150 per square mile density approach compared to the CMS zip code list,[44] 1,132 zip codes would no longer be rural-eligible although they include zip areas with as few as 10 people (92 zip codes under 500 population). Under this method, 3,938 currently urban zip codes would become rural, 7 with zip code populations exceeding 40,000 (including one with a density of 20).

It is important to note that there is not a universally agreed upon definition of population density in regards to a rural definition. While the example above uses a density of 150, the GAO[45] references that the quarter of rural counties that are most densely populated begins with a population density of 52 persons per square mile, but it does not list the density of the most densely populated county in this group.

Problems associated with using zip code as a designation for rural have also been identified by the Office of Technology Assessment.[46] Extensive, detailed and regularly updated demographic and other data by zip code is available through the Census Bureau and other agencies.

Congress directed in the Medicare Modernization Act of 2003[47] that pharmacy network access be defined using a Department of Defense (DoD) population density method. For pharmacy networks under the MMA using the DoD method, urban is defined as those 5 digit zip codes with a population density greater than 3,000 persons per square mile; suburban between 1,000 and 3,000 densities and rural less than 1,000 densities.

An analysis of the zip code density model designed by the Department of Defense compared to the CMS zip code list[48], shows that of the 15,122 currently rural-eligible zip codes, 15,006 would be classified rural, 79 would be suburban and 37 would be urban. This would include 13 urban and 17 suburban zip codes with less than 1,000 population, and 17 zip codes with population exceeding 50,000 – two of which, due to large geography contained in the zip code, have a population density less than 100.

[44] See footnote 15 for a description of the zip code data.
[45] GAO-03-986, page 15.
[46] Hewitt. Page 17.
[47] P.L. 108-173
[48] See footnote 15 for a description of the zip code data.

Although zip codes are problematic in pure form they are the only reliable and readily available mechanism to determine the point of origin for an EMS call and CMS has established and formalized their continued use as the key determinate to locate an urban or rural point of pick up.

A Way Forward

A sub-county geographic area with a specificity in population can be achieved through joining several existing methods of determining urban and rural continuums. This would allow greater specificity through the use of Census Bureau derived census block and census tract areas.

Urbanized Areas

Urbanized Areas (UA)[49] were last updated after the 2000 Census. The Census Bureau defines an UA area as "An area consisting of a central place(s) and adjacent territory with a general population density of at least 1,000 people per square mile of land area that together have a minimum residential population of at least 50,000 people." UAs are based on Census Blocks and Block Groups which are the smaller units that make up Census Tracts (CT). The US Census Bureau attempts to identify CTs as those areas optimally containing exactly 4,000 people[50]. While there is some variation of the population within CT, the variation is controlled.

According to Cromartie and Swanson[51], "Census Tracts are large enough to have acceptable sampling error rates (containing an average of 4,000 people); are consistently defined across the Nation; are usually subdivided as population grows to maintain geographic comparability over time; and can be aggregated to form county [or zip code] level statistical areas when needed."

In describing the use of UAs as a Congressional definition for the Rural Health Clinic Program, Ricketts[52] notes that "it was apparent that both the OMB and Census definitions excluded certain areas which were clearly rural in nature but did not fall under existing definitions of "rural" or "nonmetropolitan"… the solution was to use the Census Bureau definition of "Urbanized Area" … as the factor for excluding sites for Rural Health Clinic designation. Clinics located outside of "Urbanized Areas" are geographically eligible for RHC designation." RUCA series 1 is a nearly identical representation of urban as UAs.

ZCTAs

One alternative is to define rural areas by the population density of each zip code directly by obtaining the ZIP Code Tabulation Area (ZCTA) database from the U.S. Census Bureau. ZCTAs are derived from the area and population of each of the 8 million census

[49] http://www.census.gov/geo/www/ua/ua_2k.html

[50] Census tract lines are drawn within county boundaries. While they will optimally contain exactly 4,000 people they may contain as few as 1,500 or as many as 8,000 because they follow the easily identifiable physical characteristics of land area. http://www.census.gov/geo/www/psapage.html

[51] Cromartie, John and Linda Swanson, "Census Tracts More Precisely Define Rural Populations and Areas." Rural Development Perspectives, vol 11, no 3. 1996.

[52] Ricketts, page 6.

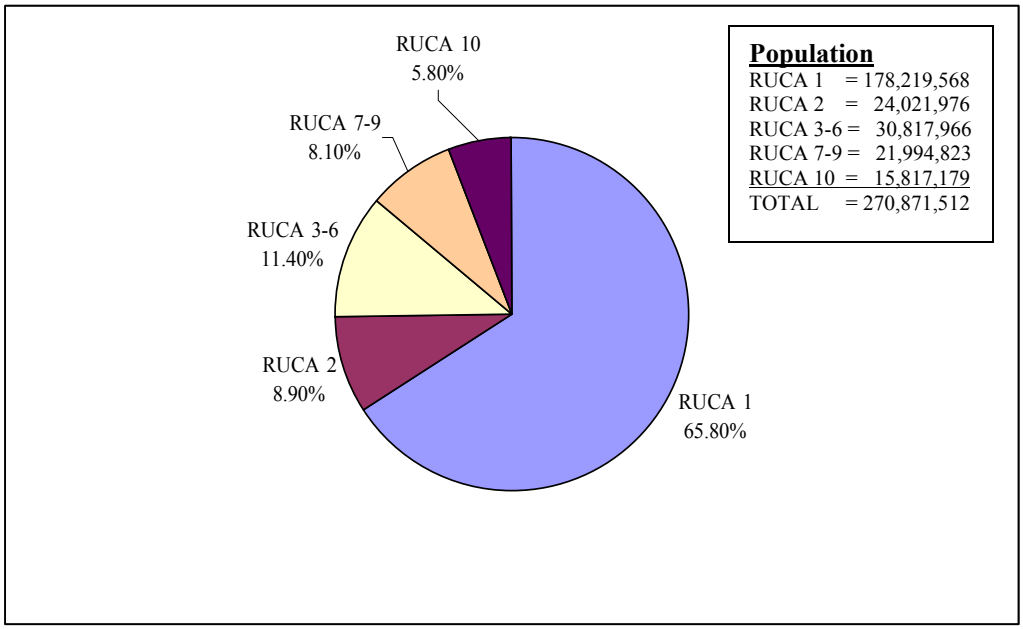
blocks across the country, and are the most reliable measurement of the population and area of each zip Code. The ZCTA database offers the ability to remove the so called "point zip codes" that represent post office boxes and individual office buildings with high mail volume (e.g. Visa, MasterCard, etc.), where no one actually lives. Further, the ZCTA file assigns a zip code equivalent to 100% of the Country.

Rural-Urban Commuting Areas

As noted earlier, the ORHP developed a geographic urban-rural continuum system to define eligibility for many programs administered through ORHP that can be mapped by census tract or zip code. A modified RUCA system is significantly more sensitive in determining "ruralness" than county borders. RUCA areas that are series 1 (1.0 and 1.1) are closely aligned with UAs as noted above.

Chart 1[53] shows an analysis combining zip code files with 1998 RUCA files that identifies a rapid population stratification between RUCA 1 urban zones and all other RUCA areas.

Chart 1



While ORHP has designated RUCA series 3 and above as rural, RUCAs areas other than series 1 under a modified system might be considered rural and then tested against UA designated areas and ZCTA files (specificity) to assure the areas were truly geographically time dependent in EMS service availability. This further modification of the RUCA system may be necessary, as there are over 100 series 2 RUCA-based ZIP codes with populations between 25,000 and 80,000 with population densities as high as 4,200 per square mile. [Note: a reclassification funded by ORHP of census blocks and census tracts based on the 2000 Census is currently under underway and will result in a reclassification of zip codes that may resolve this issue.]

[53] ORHP 2004

Using the current RUCA maps, the Rural Policy Research Institute (RUPRI) performed an extensive spatial analysis of RUCAs to determine that this modification would re-define an additional 6% of the US geography from urban to rural as compared to the MSA/Goldsmith model currently used by CMS. It removes the inherent weaknesses from the MSA county level designation (especially counties classified as MSA when they are adjacent and those affected by Goldsmith). It also leads to a clearly defined urban area, as opposed to "salt and pepper" pockets that occur with a simple population density by ZCTA model.

This approach achieves a unit of measurement that is flexible, precise, stable and more consistent than using county boundaries and yet practical as the RUCA areas are mapped to zip codes. Ambulance services have been reporting the point of pick up zip code to CMS since April 2002 when the new ambulance fee schedule began implementation. Transition to a payment method based on zip code mapped RUCAs would be transparent on implementation for ambulance services.

Using a combination of data from these three sources a much more accurate urban-rural continuum for EMS is possible. EMS is a service delivered to the user when seconds, not minutes, count. There are inherent weaknesses in each definition set that either excludes areas that should be rural, or include areas that should not be rural. For the purposes of EMS, many suburban locales are more rural than urban because ambulance cost per call is volume dependent. These services tend to serve both suburban and rural residents from one or more bases of operation. There are also a number of isolated places with concentrated population that also serve large geographies. Because ambulance services tend to be organized around populations of people instead of political boundaries, these current definitions are inappropriate.

Tiering Within the Rural Geography

As noted earlier, ambulance services are organized around populations of people and the need to meet appropriate response time goals. In rural areas, populations of people are separated geographically and some areas are more densely populated than others. Because of these factors, and supported by the GAO, population determination is the most useful variable for the purpose of analyzing costs per trip to ambulance volume; costs to provide ambulance service vary from area to area.

The GAO[54] notes that "trip volume is the key factor affecting differences in ambulance providers' cost per trip. Ambulance providers' total costs primarily reflect readiness - the need to have an ambulance and crew available when emergency calls are received. Readiness-related costs are fixed, meaning that they do not increase with the number of trips provided, as long as a provider has excess capacity. As a result, providers that make fewer trips tend to have a higher cost per trip than those that make more trips. We also found that the length of providers' trips had little effect on their cost per trip. The modest variation in Medicare payments to ambulance providers that serve rural counties probably

[54] GAO-03-986, Exec. Summary.

does not fully reflect their differences in costs because the key factor affecting provider costs—the number of trips—varies widely across rural counties."

"The number of Medicare ambulance trips provided in rural counties varies markedly with population density, with the least densely populated rural counties tending to have fewer trips than other rural counties. For example, the quarter of rural counties that are the most densely populated, with 52 or more persons per square mile, averaged over 2,200 Medicare trips in 2001. (See table 5.) In contrast, only about 300 Medicare trips, on average, were made in the quarter of rural counties that are the least densely populated, with 11 or fewer persons per square mile. Even fewer Medicare trips - only about 200 - were made in frontier counties, which are counties with 6 or fewer persons per square mile. This suggests that the cost per trip is likely higher for providers serving the least densely populated rural counties."

A modified RUCA system is a reasonable method upon which to group locations because it has some natural tiering built into the structure. One potential method of tiering rural areas for the purpose of ambulance reimbursement can be demonstrated by analyzing EMS run data from Minnesota with existing RUCA files.

Minnesota is the only state that could be identified that is currently collecting point of pick up zip code information as part of their statewide EMS data collection system. Minnesota provided 12 consecutive months of data for this analysis. This data includes a set of all transported patients and a separate set for transported patients over age 65[55].

While this analysis has limitations in that it uses 1998 RUCA designations there is a pronounced difference in volume between RUCA 1 Urban and all other RUCA designations and it may useful in modeling a more appropriate urban rural divide. Under this model RUCA 1 would be deemed "urban" with four additional potential "rural" tiers. The urban zone would not be eligible for a rural modifier and the tiered rural zones would be progressively eligible for increased rural modifiers tied to lower volume and higher costs per trip.

Tier 1: RUCA 2 (High Metropolitan Commuting Area – 30% or more of the commuting flow to Urban Area)
Tier 2: RUCA 3-6 (Low Metropolitan Commuting Area and Large Town Cores, Commuting flows less than 30% large town)
Tier 3: RUCA 7-9 (Small Town Cores, Commuting flows to small towns)
Tier 4: RUCA 10 (Rural Area, No dominate commuting flow)

In the Minnesota data set, there is a striking difference between RUCA series 1 zip codes and RUCA series 2 zip codes. The "run volume opportunity" for ambulance services

[55] Data source: Minnesota Emergency Medical Services Regulatory Board. Ambulance run data from April 1, 2003 to March 31, 2004. Minnesota provided two data sets. One set includes all ambulance runs in which a patient was transported. The other set contains ambulance runs for transported patients over age 65. Not all persons over 65 participate in the Medicare program and there are some disabled persons under 65 who are Medicare beneficiaries. Minnesota does not collect payer information.

operating in RUCA 2 zip codes is more similar to RUCAs 3-10 than the Urbanized Areas (RUCA 1).

Minnesota Ambulance Runs All Patients Transported in a 12 Month Period					
	Average	Average	Average	Total	Average
Zone	Runs/10000	Runs/10000/Day	Square Miles	Runs	Runs/SqMi
RUCA 1	1477	4.05	3413	189958	55.65
RUCA 2	416	1.14	4746	15056	3.17
RUCA 3-6	399	1.09	9095	33248	3.66
RUCA 7-9	485	1.33	14383	30001	2.09
RUCA 10	468	1.28	42242	37520	0.89

Minnesota Ambulance Runs Patients Age 65 or Older Transported in a 12 Month Period					
	Average	Average	Average	Total	Average
Zone	Runs/10000	Runs/10000/Day	Square Miles	Runs	Runs/SqMi
RUCA 1	582	1.59	3287	63983	19.47
RUCA 2	129	0.35	4774	4523	0.95
RUCA 3-6	187	0.51	8932	14431	1.62
RUCA 7-9	232	0.64	14220	14107	0.99
RUCA 10	236	0.65	41277	16589	0.40

The ambulance services in these areas are serving a common or like group of citizens. While no two ambulance services may look alike side-by-side, there are enough commonalities within these geographies that the ambulance services tend to more similar than diverse in terms of size, organizational status (paid vs. volunteer), run volume, and costs of service. Likewise, ambulance volume is more similar than diverse within these common geographies.

Summary

There are a number of methods for defining urban and rural in use by the federal government. When applying a definition to the provision of ambulance service, that is appropriate for the manner in which ambulance services are organized, no existing definition leads to a reasonable outcome. A potential modified version of the RUCA definition may be the "best fit" for ambulance services, by defining those areas in RUCA series 1 as urban and all other areas as rural, cross-walked to UA and ZCTA files to assure specificity in geographic and population density need. Likewise, tiers of "rurality" and therefore ambulance volume can be recognized using the RUCA system because of its straightforward approach in defining high and low commuting zones as well as separating geography by population density, large and small towns, and areas with no definable commuting pattern.

This approach is both more sensitive (it uses RUCAs assigned by CT) and more specific (CTs are mapped to zip codes) than a county boundary based method. If this method is

adopted, it will require periodic and frequent updates by ORHP and CMS as zip code boundaries change and new codes are added. A similar approach (one using RUCA 1 as an urban definition and grouping the remaining RUCAs into tiers for rural levels[56]) has been adopted by the State of Washington's Department of Health for the purposes of public health planning.

While CMS is currently collecting point of pickup zip code data on Medicare ambulance runs, neither the GAO nor ORHP have made use of the data. There is general agreement in the EMS provider community that CMS should immediately begin publishing this data, in order to expedite a policy solution for rural EMS reimbursement.

Once CMS releases its zip code data, it will be possible to further analyze the validity and impact of using a modified, updated RUCA classification to develop rural reimbursement tiers. While the CMS zip code point of pickup files only reference Medicare beneficiaries, and therefore the data set is only a partial reflection of EMS activity, CMS is the single largest payer for most rural EMS providers.

Conclusion

Federal programs that are geared toward ensuring a stable and vibrant EMS system need a better method of defining rural and access that is structured toward this unique combination of access issues. A rural appropriate EMS definition must account for a combination of service availability, population coverage, and a time based geographic delivery of emergency services. To insure the existence of a stable and vibrant EMS system, Federal programs should define and serve rural communities with policies that encourage service availability with optimal response times to emergent events.

[56] Washington State Department of Health. p.5.