



Expert Panel Report

Defining the Term “Frontier Area” for Programs Implemented through the Office for the Advancement of Telehealth

Prepared by: the Center for Rural Health, University of North Dakota
under contract to St. Alexius Hospital, Bismarck, ND

Funded through grant #: 3H2ATMOO244AO

*Office for the Advancement of Telehealth, Health Resources and Services Administration,
U.S. Department of Health and Human Services*

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May, 2006

*Connecting resources and knowledge to strengthen
the health of people in rural communities.*

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Expert Panel Members

Sponsor:

Office for the Advancement of Telehealth
Health Resources and Services Administration
U.S. Dept. of Health and Human Services
Washington, DC
* Dena S. Puskin, Sc.D., Director
Robert Pie, Program Analyst

Expert Panel

Calvin Beale
Senior Demographer
Economic Research Service
U.S. Department of Agriculture
Washington, DC

Caroline Ford, Director
Office of Rural Health
Nevada

* Harold F. Goldsmith, Ph.D.
Maryland

* Gary Hart, Ph.D., Director and Professor
WWAMI Rural Health Research Center
Department of Family Medicine
University of Washington - Seattle

Beth Landon
National Rural Health Association
Alaska Center for Rural Health, UAA
Alaska

* Carol Miller, Executive Director
Frontier Education Center
New Mexico

Keith Mueller, Ph.D., Director
RUPRI Center for Health Policy Analysis
Nebraska

Alice J. Rarig, Health & Social Services Planner
Office of the Commissioner, DHSS
Alaska

Michael Ratcliffe
Chief, Geographic Standards and Criteria Branch
Geography Division
U.S. Census Bureau
Washington, DC

Tom Ricketts, Ph.D.
Sheps Center for Health Services Research
North Carolina

Nancy Willis
St. Alexius Medical Center
North Dakota

Project Staff:

* Mary Amundson, M.A., Assistant Professor
Center for Rural Health, University of North Dakota
North Dakota

Paul Lorah, Ph.D.
Department of Geography
University of St. Thomas
Minnesota

* Mary Wakefield, Ph.D., R.N., Director
Center for Rural Health, University of North Dakota
North Dakota

Ex-officio members:

* Steve Hirsch
Office of Rural Health Policy
Health Resources and Services Administration
Washington, DC

Andy Jordan
Office of Shortage Designation
Health Resources and Services Administration
Washington, DC

Richard Lee, Public Health Analyst
Bureau of Primary Healthcare
Health Resources and Services Administration
Washington, DC

* Also served as members of the Core Committee

Executive Summary

In 2003, the U.S. Congress passed legislation directing the Secretary of Health and Human Services to issue regulations that would define the concept of “Frontier Area” to be used in the Telehealth programs authorized in Public Law 107-251. The law states:

The Secretary shall issue regulations specifying, for the purposes of this section (Telehealth programs under this statute) a definition of the term ‘Frontier Area.’ The definition shall be based on factors that include population density, travel distance in miles to the nearest medical facility, travel time in minutes to the nearest medical facility, and such other factors as the Secretary determines to be appropriate.

To address many of the issues in the development of such a definition, St. Alexius hospital, in Bismarck ND, and the Center for Rural Health at the University of North Dakota entered into a collaboration in January, 2004 under a grant from the Health Resources and Services Administration’s Office for the Advancement of Telehealth (OAT). The Center convened a broad-based group of experts from both within and outside of the federal government. The expert panel was charged with examining current definitions of frontier areas and developing specific recommendations regarding an appropriate definition of Frontier Area that would be applicable to telehealth programs. The definition was considered only in the context of telehealth policies and programs authorized under PL 107-251 which include the Telehealth Network Grant and the Telehealth Resource Center Grant Programs.

The Expert Panel considered a number of rural and frontier definitions, the characteristics of frontier areas, as well as the purpose and structure of telehealth programs. After considerable deliberation, it was determined that current definitions had shortcomings in their applicability to telehealth programs, and inadequately reflected the components of the definition mandated by PL 107-251. A set of eight principles were identified to guide the development of a definition and the definition was assessed against those principles.

Various approaches to operationally define Frontier Area were considered by the Panel and considerable analyses were conducted and discussed, including mapping various approaches. After extensive discussion and evaluation of impact, the Expert Panel, using a consensus process, recommended the following definition of Frontier Areas for telehealth programs: **ZIP code areas whose calculated population centers are more than 60 minutes or 60 miles along the fastest paved road trip to a short-term non federal general hospital of 75 beds or more, and are not part of a large rural town with a concentration of over 20,000 population.** A reconsideration process is also recommended as part of the application of this definition. Each of the characteristics of the definition, including the reconsideration process is more fully described in the report.

Introduction

In 2003, the U.S. Congress passed “Safety-Net” legislation (Public Law 107-251.) The law directed the Secretary of Health and Human Services to issue regulations that would define the concept of “Frontier Area” to be used in the Telehealth programs authorized in PL 107-251. Subtitle B, Section 330I (r) of the law states:

The Secretary shall issue regulations specifying, for the purposes of this section (Telehealth programs under this statute), a definition of the term ‘Frontier Area.’ The definition shall be based on factors that include population density, travel distance in miles to the nearest medical facility, travel time in minutes to the nearest medical facility, and such other factors as the Secretary determines to be appropriate.

The telehealth programs referenced in the statutory language are those administered through the Office for the Advancement of Telehealth (OAT), the Health Resources and Services Administration, U.S. Department of Health and Human Services. OAT leads, coordinates and promotes the use of telehealth technologies through a number of activities, including administering telehealth grant programs. The OAT telehealth grant programs are designed to increase access to quality health care services for underserved populations by promoting the use of telecommunications and information technologies. The applicability of a definition of “Frontier Area” was considered only in the context of telehealth policies and programs authorized under PL 107-251, which include the Telehealth Network Grant and the Telehealth Resource Center Grant Programs.

Process

To address issues in the development of a frontier definition, St. Alexius hospital in Bismarck ND, and the Center for Rural Health at the University of North Dakota entered into a collaboration in January, 2004 under a grant from the Health Resources and Services Administration’s Office for the Advancement of Telehealth (OAT). The Center convened a broad-based group of experts from both within and outside of the federal government. The Expert Panel was charged with examining current definitions of frontier areas and developing specific recommendations regarding an appropriate definition of Frontier Area that would be applicable to telehealth programs. The definition was considered only in the context of telehealth policies and programs authorized under PL 107-251 which include the Telehealth Network Grant and the Telehealth Resource Center Grant Programs.

The members of this panel include geographers, researchers, federal and local policy makers, frontier health services administrators, and national association representatives. Additionally, Panel members represented different geographic areas in the United States.

A two-day meeting of the Expert Panel was held in Washington, DC. In the meeting, existing definitions of Frontier were reviewed and principles were adopted that would be relevant to developing a new definition of Frontier. Discussion during the two-day meeting included: an overview of Frontier history, perspectives on defining frontier, and principles to guide the development of a frontier area definition. Strengths and limitations of existing rural and Frontier definitions were considered. The meeting was followed by a series of conference calls of the Expert Panel to review analyses and make recommendations.

To facilitate its work, a subgroup of the Panel, the Core Group, was formed to guide ongoing analytic work and draft recommendations to be considered by the full Expert Panel. This Core Group also developed agendas for Expert Panel conference calls and evaluated different modeling approaches to defining frontier areas. This final report reflects analytic approaches and recommendations produced through this process.

The Expert Panel considered the historical context, a number of frontier and rural definitions, the characteristics of frontier areas, as well as the purpose and structure of telehealth programs. This was done in part to determine what relevance, if any, currently available definitions, or their component parts, might have for telehealth programs. Regarding telehealth programs, it should be noted that the significance of these is their impact on the provision of health services to isolated underserved areas, not the technologies used.

Moreover, for the purposes of the telemedicine programs in question, the designation of ‘frontier’ relates to areas to be served by telemedicine programs, not necessarily the areas providing telemedicine services. For example, the Telehealth Network Grant Program is to award at least 50% of the grant dollars to programs that serve rural communities with telemedicine services. That is not to say that academic health centers and others cannot be grantees, but rather that the services they provide with grant funds are to be directed to rural communities. Thus, if a rural community of 25,000 population is surrounded by more frontier communities than it serves, it still can be eligible for any preferential treatment that might be afforded ‘frontier networks’ under this program in that providers in the rural small towns serve frontier communities.

In the existing literature, frontier areas are often conceptualized as sparsely populated rural areas that tend to be relatively isolated, i.e., inaccessible to cities and towns or other central places that have plentiful goods and services including medical facilities. The charge embedded in Pubic Law 107-251 builds on this general characterization of Frontier Areas by specifically stating that in addition to population density, the definition of Frontier Area should also take into account the relative isolation of an area from medical services based on distance in miles and travel time in minutes to the nearest medical facility.

The statute itself does not specify what should be considered a medical facility, or what other factors ought to be reflected in the definition, although it allows for the inclusion of other factors. Some members of the Expert Panel suggested that other factors should be considered such as social and cultural barriers or social and economic changes, and related policies that reflect transitions underway in rural America. However, other than recommending a process for reconsideration, no consensus was achieved on other characteristics of a definition beyond those stipulated in the statute.

Principles for Selection of Frontier Definition Characteristics

The Panel developed a set of eight guiding principles deemed important in the consideration of a definition of Frontier Area for application to telehealth programs. The Panel determined that a definition of Frontier Area should:

- (1) Address legislative language provisions.
- (2) Be practical to implement. That is, the data necessary to apply the definition are both available and obtainable at a reasonable cost. The computational aspects of any formula used should be reasonable to implement.
- (3) Be cost-effective to implement. Cost should be considered from the perspective of administering the definition as well as from that of consequent changes to affected communities.
- (4) Be based on evidence and science. The definition should follow the principles of good science and be replicable by researchers using the same formula and data.

- (5) Have face validity. The definition should reflect the nature/characteristics of frontier.
- (6) Be clear regarding both the dichotomous and continuous implications of the definition and allow prioritization of various levels of frontier.
- (7) Be easy to understand. The definition should be explainable to a variety of stakeholders including Congress and the public.
- (8) Include a process for exceptions. A mechanism is included to accommodate outlier areas that should legitimately be considered but which may not fall into the set of areas clearly meeting the specified criteria.

Overview of Current Rural and Frontier Definitions¹

To propose a definition of Frontier Area for telehealth, as prescribed in Public Law 107-251, the Expert Panel reviewed and critiqued various existing sets of definitions and characteristics of rural and frontier. Various rural and frontier definitions are used to designate qualifying geographic areas for allocation of resources through a variety of federal and state programs (Hart, Larson, and Lishner, 2005). Challenged by data limitations and specific program needs, many public programs have resorted to developing their own definitions of “frontier.” A number of contemporary definitions use various parameters in order to accommodate data limitations and different policy uses. Definitions have varied in the level of analysis used for determining population density (e.g., county, census tract, ZIP code) and in the factors used to measure isolation (e.g., travel time, population density, existence of roads and services, access to hospital services or other types of health care). A summary of a selection of these definitions follows:

- **County Designations of Isolated Rural Areas (Frontier-like Areas)**

- (1) Frontier Areas for Community Health Center Purposes. In the mid-1980’s, the federal Community Health Center (CHC) program adopted the frontier county definition which had been developed by the Bureau of Health Professions and legislatively mandated for certain BHP programs, i.e., to consider as frontier those counties with a population less than or equal to 6 persons per square mile, but added the condition that in order to receive a frontier preference in funding CHCs in such counties should also be located at considerable distance (greater than 60 minutes travel time) to a medical facility large enough to be able to perform a caesarian section delivery or handle a patient having a cardiac arrest. These additional criteria were dropped in later years, and health center programs began to define frontier counties with only the single criterion of population density greater than or equal to 6 persons per square mile. (Frontier Educational Center, January 2000, p.2). While Bureau of Primary Health Care policies refer to population densities of service areas, densities of counties are often used for analytic and other purposes.
- (2) Frontier Mental Health Service Resources Network Density Continuum. The Frontier Mental Health Service Resources Network, a project sponsored by the Federal Center for Mental Health Services, suggested a designation of frontier-like areas (a Rural Composite Index) that emphasized three density related variables and thereby produced a continuum of counties classified from the most rural (frontier) to the most urban. It would have designated frontier counties as those counties with small populations (generally less than 10,000), low population density (generally less than seven persons per square mile) and which were predominately

¹ This section draws heavily on an unpublished paper by H. Goldsmith, 2004, prepared for the Expert Panel.

rural (75 percent or more of the county's population resides in territory designated as rural by the Census Bureau).

- (3) Frontier Education Center Composite Designation of Frontier Counties. The Frontier Education Center serves as a clearinghouse for frontier research, education and advocacy. In 1997, the Frontier Education Center, in conjunction with the Office of Rural Health Policy, conducted a multi-discipline consensus development project "to generate...[an] acceptable definition of frontier that...goes beyond the use of density as a single factor" (Ciarlo and Zelarney, 2000). A matrix of weighted elements was developed based on density, distance, and travel time. The consensus group created a typology in which density of counties was coded <12, 12-16, 16-20 persons per square mile. Distance to a service/market was coded >90, 60-90, 30-60, <30 miles. Travel time to service/market was coded >90, 60-90, 30-60 and <30 minutes. A unique aspect of the application of the consensus definition is the involvement of states throughout the process. The matrix and a list of potential counties is provided to states which could then analyze local conditions and provide a list of frontier areas in their state. This final definition was developed to be inclusive of extremes of distance, isolation, and population density. The definition also reflected an underlying concern that the real frontier dilemma is how to create or maintain even a fragile infrastructure in a frontier community.
- (4) Rural-Urban Continuum Codes (RUCC --- also known as Beale Coding System). This classification distinguishes metropolitan (metro) counties (counties that are part of the daily labor market of a large [50,000 or more] population aggregation) by the population size of their metro area. Nonmetropolitan counties (i.e., all other counties) were characterized by degree of urbanization (size of urban population) and adjacency to a metro area or areas (adjacent counties must be physically adjacent to a metropolitan county and have at least two percent of the resident labor force commuting to a central metropolitan county). The RUCC categories have been subdivided into three metro and six nonmetro groupings, resulting in a nine-part county codification. These codes allow researchers working with county data to separate such data into finer residential groups beyond a simple metro-nonmetro dichotomy, particularly for the analysis of trends in nonmetro areas that may be related to degree of rurality and metro proximity (USDA, 2003 passim). Based on the RUCC, the most rural counties are nonmetropolitan counties that are completely rural or have less than 2,500 persons. These counties may be considered to approximate isolated rural counties, i.e., frontier counties.
- (5) U.S. Department of Agriculture (USDA) 2003 Urban Influence Codes. A key underpinning of the 2003 Urban Influence Codes is that an area's geographic context has a significant effect on its development. Economic opportunities accrue to a place by virtue of both its size and its access to larger economies. Access to larger economies enables a smaller economy to connect to national and international marketplaces. These relationships among economies are basic concepts of the central place theory commonly studied in regional economics. Population size, urbanization, and access to larger communities are often crucial elements in research dependent on county-level data sets. To further such research, the Economic Research Service developed a set of county-level urban influence categories that captures some differences in economic opportunities" (USDA, 2003.)

The 2003 Urban Influence Codes divide the 3,141 counties, county equivalents, and independent cities in the United States into 12 groups. Metropolitan counties are divided into two groups by the size of the metro area---those in "large" areas with a least one million residents and those in "small" areas with fewer than one million residents. Of the remaining

counties (nonmetro counties), micropolitan counties (counties with Census Bureau-defined urban clusters of 10,000 to 49,999) are divided into three groups by their adjacency to metro areas-adjacent to a large metro area, adjacent to a small metro area, and not adjacent to a metro area. Nonmetro outside core based statistical areas (OCBSA) (counties that are not metro or micro counties) are divided into seven groups by their adjacency to metro or micro areas and whether or not they have their “own town” of at least 2,500 residents. The most rural counties in this classification would be OCBSA counties (counties that are not classified as metropolitan or micropolitan) that are without a town of 2,500 and are not adjacent to metro or micro areas. These areas have an average population density of 3.5 persons per square mile.

- **Sub-County Units to Designate Isolated Rural (Frontier) Areas**

Rural-Urban Commuting Areas (RUCAs). The Rural-Urban Commuting Areas (RUCAs) provide a readily available and flexible approach to the rural-urban designation of U.S. settlement areas, identifying frontier-like rural areas based on census tracts and ZIP codes rather than counties. This system is based on measures of urbanization, population density, and daily work commuting (ERS-USDA Briefing Room: *Measuring rurality: rural-urban commuting area codes*, 2003 passim). These codes were initially developed using 1990 decennial census data by geographers at WWAMI Rural Research Center at the University of Washington in cooperation with ERS, USDA, (Morrill, Cromartie, and Hart, 1999), and with support from the Health Resources and Services Administration’s Office of Rural Health Policy. The census tract and ZIP code versions have been updated using Census 2000 data.

The RUCA system is a ten-tiered classification system based on census tract geography. Both population size and commuting relationships are used to classify census tracts. First, urbanized area (continuously built up areas of 50,000 people or more), large town (10,000-49,999 population), and small town (2,500 to 9,999 population) core tracts are identified. Next, codes are assigned based on the primary (largest) and secondary (second largest) work commuting flows using the most recent data available as of August, 2005. In all, there are 33 RUCA codes that relate the size of the population cluster and the size of the larger place where the primary and secondary commuting flows. High commuting tracts are those where the primary or largest commuting flow is greater than 30% to a core area. Low commuting tracts are those where the largest flow to core areas is 10-30%. The remaining census tracts are assigned code 10.

Sparsely populated census tracts are identified as RUCAs that do not have strong commuting ties to large central places or to a large town (town of 10,000 - 49,999 or Urbanized Areas) and also could be identified as frontier census tracts. Alternatively, the RUCAs permit more restrictive designations of comparatively isolated rural census tracts (e.g., tracts with no place of 2,500 or more and where there are no commuting flows of 10% or more to places of 2,500 or more). A travel distance/time tool to facilitate refined definitions of isolated rural locales for the new version of the RUCAs was developed late in 2005 and is now available.

Other approaches to creating subcounty units include the Goldsmith methodology. Using census data, large metropolitan counties are identified and rural populations are further identified within large metropolitan areas through the use of census tract data. Then, applying commuting data, isolated rural census tracts are identified (Ricketts, 1999).

- **Alternatives or Supplements to the use of County or Sub-County Units for Designating Isolated Rural Areas**

- (1) Paved roads and distance to transportation nodes and hospitals may be used as an alternative to census tracts or counties. “Places that are relatively distant from paved roads, airports, waterways, and railroads are likely to have few people, less access to global markets” (Lorah 2003, p.77). Distance from paved roads, combined with information about distance to transportation nodes, can be used to help designate isolated rural areas. Lorah suggests that measuring the straight-line distance from the nearest medical facility is relatively simple using Geographic Information Systems – assuming data on the location of medical facilities. Distances and travel times from facilities such as hospitals to the calculated population centers of other ZIP code areas can be a measure of access to medical facilities.
- (2) 1986 Bureau of Health Care Delivery and Assistance Designation. In 1986, the Bureau of Health Care Delivery and Assistance stated that to be eligible for support as a Frontier Area, the following criteria must be met:

Service areas: a rational area in the frontier will have at least 500 residents within a 25-mile radius of the health service delivery site or within the rationally established trade area. Most areas will have between 500 and 3,000 residents and cover large geographic areas. Population density: the service area will have six or fewer persons per square mile. Distance: the service area will be such that distance from a primary care delivery site within the service area to the next level of care will be more than 45 miles and /or the average time traveled more than 60 minutes (U.S. Department of Health and Human Services, 1986 as quoted in Hewitt 1992, p.51).

- (3) Density: The Oak Ridge National Laboratory 2003 LandScan Population Database is a population density database available for the United States. The database was created using detailed census data and probability models that assign populations within census blocks on the basis of a number of variables including: roads, land cover, satellite images of lights at night, and the exclusion of water and ice areas.

- **Standards and Thresholds for Determining whether Distance/Time Traveled are Excessive.**

To facilitate federal program administration, the following measures/guidelines have either been proposed or used to determine excessive distance or excessive travel time to medical facilities:

- (1) Graduate Medical Education National Advisory Committee Report. “Spatial or geographic considerations in access to care relate to any persons who must travel some distance to reach services. In the development of the Graduate Medical Education National Advisory Committee Reports, a special panel attempted to develop standards for access to services based upon distance to care expressed as travel time” (Ricketts and Savitz, 1994, p.100). These standards are as follows: emergency medical services 30 minutes, obstetrical services 45 minutes, child care/pediatrics medical care 30 minutes, adult medical care 30 minutes, surgical care/general surgery 90 minutes.
- (2) Health Professional Shortage Areas (HPSAs). Guidelines for HPSAs imply that travel in excess of 30 minutes for primary care is considered excessive. Further, time can be converted into distance as follows:

- (a) Under normal conditions with primary roads available: 20 miles
 - (b) In mountainous terrain or in areas with only secondary roads available: 15 miles.
 - (c) In flat terrain or in areas connected by interstate highways: 25 miles.
- (3) 1986 Bureau of Health Care Delivery and Assistance Designation. In 1986, the Health Resources and Services Administration's Bureau of Health Care Delivery and Assistance defined excessive travel time or distance as the distance between a primary care delivery site within a service area to the next level of care in excess of 45 miles and/or average time travel more than 60 minutes (U.S. Department of Health and Human Services, 1986, as quoted in Hewitt, 1992, p.51).

Approaches Considered by the Expert Panel to Operationally Define Frontier Area

The statutory language of PL 107-251, included the following components for inclusion in the proposed definition of Frontier Area:

- medical facility,
- population density,
- travel distance in miles to the nearest medical facility,
- travel time in minutes to the nearest medical facility, and
- other factors the Secretary determines to be appropriate.

In developing its definition, the Expert Panel always kept in mind that the relevance of the proposed Frontier Area definition should be determined through careful analysis of the impact of the definition on policies, programs, and populations relevant to telehealth programs.

Approach 1:

The Expert Panel and Core Committee discussed various approaches to operationally defining the key elements of Frontier Area as proposed in Public Law 107-251, including elements of currently available definitions. After significant deliberation, the Panel determined current definitions had: 1) shortcomings in their applicability to telehealth programs; 2) inadequately reflected the components of the definition mandated by PL 107-251, and/or 3) did not meet principles the Expert Panel thought important to a definition created for specific application to OAT sponsored programs. Consequently, it was the view of the Expert Panel that a new definition of Frontier Area should be proposed for the purposes of telehealth.

Impact of this Approach. Choosing to pursue a new definition of Frontier Area rather than selecting a current definition is consistent with the views expressed by many in the rural community. Organizations such as the National Rural Health Association suggest that definitions should be tailored to meet the needs of the program(s) to which they are being applied, rather than assuming that one definition will be highly relevant to all programs and policies.

Approach 2:

The Expert Panel directed project staff to undertake analyses to produce a targeted definition of Frontier Area applicable to telehealth programs. The Expert Panel chose to explore a new approach to defining Frontier Area, beginning with operationally defining the term medical facility as “available emergency services, indicated by having a “Type IV or V trauma center designation.” The assumption was that the existence of such a trauma center indexed the availability of at least a level of medical services consistent with acceptable emergency room coverage. Such a facility could then serve as a central point from which density, time and

distance could be measured. A stand alone trauma center data set was obtained and multiple analyses were conducted. However, the data set was not reliable for purposes of this project. A more complete and current list of trauma centers available was obtained from the American Hospital Association's Annual Survey of Hospitals. This list of 1,172 trauma centers included the addresses and specific trauma levels of designated trauma centers. The information was then individually entered into a program to obtain trauma center latitudes and longitudes. In many cases, individual searches were performed to obtain a more precise location of the facilities.

Once the trauma centers were located, they were analyzed by their state locations and trauma level designations. In addition, through the use of their latitudes and longitudes, the trauma centers were mapped and various linear distances were extended around them using a variety of trauma center levels. This was done to delineate the populations that were within the stated distances to a trauma center and those that were not close to any trauma center (frontier population). ZIP code areas and their calculated population centers were used for the population analyses.

Through substantial analytic work, the Expert Panel determined that the limitations in the trauma data set were considerable and the base criteria for designating trauma centers varied so dramatically from state to state as to render the use of trauma centers unusable for the Panel's purposes. When the locations of all 1,171 Level One through Level Five trauma centers were mapped, clear differences among the classification systems used by individual states appeared. For example, significant clusters of hospitals with trauma center designations emerged in Mississippi, Oklahoma, and Iowa. In contrast, Arizona did not have a single facility included in this trauma center dataset. The analysis included the preparation of maps to show geographic distribution as well as a web site for Expert Panel members to view analytic findings.

Such differences between states (and probably within states) in the designation of what constituted a trauma center clearly indicates that this approach did not index the availability of medical services and so the actual distribution of medical facilities would not be accurately reflected in a definition of frontier developed based on trauma centers. Furthermore, staffing varied markedly among the smallest rural emergency rooms with potential impact on the type and extent of services locally available. As a result, the Expert Panel concluded that this approach could not adequately meet the principles it set forth for a frontier definition. Consequently, further delineation of time, distance, and density related to this definition of medical facility was not pursued.

Impact of this Approach: A clear and consistent definition of the term 'medical facility' is imperative. However, the data set does not reliably define trauma centers in a manner that allows them to be compared from state to state. For example, two of three variables in the statutory language are directly linked to this term – "travel distance in miles to the nearest **medical facility**" and "travel time in minutes to the nearest **medical facility**." If 50 mile buffers were used to define distance, misidentifying or omitting even a few medical facilities (by omitting suitable facilities or including unsuitable ones) would create major problems and inaccuracies in final maps. This significant discrepancy occurs because an area within 50 miles of a single medical facility is 7,853 square miles. In other words, incorrectly locating a hospital in a frontier area could result in an area larger than Delaware being misidentified.

Approach 3:

The Panel considered new approaches to: 1) operationally define the term "medical facility," 2) control density, and 3) designate time and distance from defined medical facilities. In terms of defining "medical facility," the Panel engaged in considerable discussion that was informed by mapping efforts and practical knowledge of and experience with rural hospitals. Ultimately the Panel achieved consensus to define "**medical facility**" as a **75-bed or greater short-term non-federal general**

hospital. Such hospitals were considered to represent medical facilities that achieved a minimum range of services and associated physician specialties to allow them to function as a source for telehealth services. The definition was arrived at after consideration of other medical facility characteristics, including a range of other hospital bed sizes such as 50 and 100 beds. The American Hospital Association data set that was used to identify hospitals meeting this definition of medical facility is considered reliable in identifying hospitals with these types of characteristics. Numerous analyses were performed for a set of states across the nation to help the Panel members evaluate how the criterion applied compared to their experiences.

Using the designation of medical facility as a 75-bed or greater short term non-federal general hospital, substantial analysis and modeling was conducted that plotted alternative time, distance, and density options. With this information, the Panel was able to make decisions as to how to operationally define both density and access (time and distance) to the designated medical facilities. Control of density was achieved in two ways. First, large densely settled urban agglomerations (urbanized areas as designated by the Census Bureau) were excluded from being designated as frontier areas. Their inclusion would have been inconsistent with the conception of frontier areas as sparsely populated areas and small towns isolated from large central places with medical facilities (i.e., urbanized areas). Second, non-metropolitan towns of 20,000 (large cities) or more were excluded from the designation of frontier. The reasonableness of this decision is detailed below in the discussion of access to facilities. Together these exclusions represented direct control of density. Indirect control over density was achieved by designating the areas at considerable distance and time from urbanized areas or large cities as frontier.

More specifically, to determine access to medical facilities outside of urbanized areas or outside of nonmetropolitan cities with populations of 20,000 or more, numerous mileage and travel times to the designated medical facilities were considered. The Panel considered various travel distances of 30, 40, 50, 60, 70, 80, 90, and 100 miles and 30, 40, 50, 60, 70, 80, 90, and 100 minutes and, various combinations of miles and minutes. After many alternate analyses were performed and examined by the Panel, the criteria were narrowed to travel time of 60 minutes or travel distance of 60 miles. The expert opinion of the Panel was that 60 minutes or 60 miles adequately addressed both the time and distance issue.

Not only is this designation consistent with earlier designations of access of sparsely populated areas and small towns to medical services in large central places (i.e., average time travel more than 60 minutes often considered excessive) but it indirectly approximates sparsely populated areas (areas with low county densities.) To arrive at this designation the following steps were taken.

1. The Center for Evaluative Clinical Sciences, at Dartmouth College was asked to perform an analysis producing an electronic file that contained travel distances and times from the calculated population center of each of the over 30,000 ZIP Code Tabulation Areas (ZCTAs) defined by the Census Bureau to the nearest short-term non federal general hospital (as identified from 2002 data provided by the American Hospital Association). The travel distances/times computed by Dartmouth were from the ZCTA centers for all ZCTAs that were not designated as Rural-Urban Commuting Area (RUCAs) version 1.1 code 1s (Census Bureau defined Urbanized Area core areas). A set of algorithms determined the path to the nearest paved road and then the distance and travel time along the fastest road path to the in-scope hospitals. If the nearest hospital was farther than 100 road miles it was designated as 100 or more miles. The travel times and distances were appropriately adjusted for speed limits, urban congestion, and ZIP code areas not connected by roads (e.g., islands in Hawaii) to a eligible hospital. Population data from Census 2000 were linked to the travel distances and times.

2. Using the Dartmouth data, analyses were performed by the University of Washington Rural Health Research Center that used alternative time and distance criteria to determine most reasonable time and distance designations. The base analyses involved travel distances of 30, 40, 50, 60, 70, 80, 90, and 100 miles and 30, 40, 50, 60, 70, 80, 90, and 100 minutes and, various combinations of miles and minutes. The analyses included national and state populations designated under the various criteria, maps to show their geographic distributions, and a web site to facilitate panel members' viewing of the analytic findings. After reviewing the analyses, the Expert Panel agreed that the distance criterion should be 60 miles and the time criterion should be 60 minutes.
3. In the course of the analyses, the Expert Panel proposed examining the characteristics of those rural towns that were designated as frontier and had populations greater than 10,000. The results of the analysis prompted the Expert Panel to recommend an additional criterion that rural towns with a population of 20,000 and over would not be designated as frontier. The population areas encompassed in this criterion are defined in the same way as the Bureau of the Census determines the city and town populations of Urbanized Areas and Urban Clusters.
4. After identifying areas that were outside of urbanized areas and large cities and were 60 minutes and/or 60 miles from a 75-bed or greater short term non-federal general hospital, a decision was needed regarding specific operational criteria. Several analyses were conducted. These analyses included travel times (in minutes) and distances (in miles) from 30 to 100. Specifically, evaluations were made by the Expert Panel of 60 minutes only, 60 miles only, 60 minutes and 60 miles and 60 minutes or 60 miles. First, the designation of 60 minutes and 60 miles was excluded because it was considered to under represent frontier-like areas. It excluded areas less than 60 miles but 60 minutes or more that were deemed isolated frontier-like areas (illustratively, islands with limited transportation, mountainous regions with poor roads, particularly in severe weather conditions). In analysis conducted by the University of Washington Rural Health Center, the designation 60 minutes or 60 miles has 99.9 percent congruence of the areas that were 60 minutes only. However, in order to be inclusive, albeit of a relatively small population the designation of 60 minutes or 60 miles was selected. While this criterion is more complex to calculate than just calculating 60 minutes, it would avoid disenfranchising a segment of the relevant population.

It is of interest to note that the analysis conducted shows that there are substantial variations between states in the proportion and numbers of the population designated as frontier, both within select criteria and across different criteria. For instance, using the 60 minute and 60 mile test criteria, states varied significantly in the percentage of their population designated as frontier from 0 percent (e.g., Delaware and Connecticut) to over 15 percent (Alaska (49%), Wyoming (39%), Montana (38%), North Dakota (19%)). The associated states with the largest numbers of frontier population from largest to smallest by these test criteria were Colorado, Montana, Alaska, Arizona, Texas, Wyoming, Iowa, Oregon, Washington, Nebraska, Utah, Wisconsin, Nevada, New Mexico, and Kansas. Throughout the deliberations of the Expert Panel, data were provided on the number of people that would be affected by various characteristics being considered, that is, the magnitude of impact on the populations included and excluded by the various combinations.

Appendix A describes comparisons made of alternative time and distance frontier designations that were reviewed by the Expert Panel during their deliberations of Approach 3. In constructing the maps, the American Hospital Association was the source of hospital information used from 2002. All ZIP code areas within Census Bureau defined Urbanized Areas (as defined by Version 1.1 RUCA 1s) were not considered eligible for inclusion in Frontier Areas. Population estimates used for the analyses are for 1998.

If the recommended definition is adopted, the actual eligibility would need to be more carefully determined with the newest data (e.g., 2005 population and Version 2.0 RUCA 1s, and newer hospital and travel distance and time data).

Recommended Characteristics of a Definition of Frontier Area

The Panel examined various combinations of distance and time, which also reflected population density. After extensive discussion, additional analyses and evaluation of impact, the Expert Panel recommended the following.

Definition of Frontier Area for use associated with programs within the jurisdiction of the Office for the Advancement of Telehealth:

ZIP code areas whose calculated population centers are more than 60 minutes or 60 miles along the fastest paved road trip to a short-term non federal general hospital of 75 beds or more, and are not part of a large rural town with a concentration of over 20,000 population. A reconsideration process is also recommended as part of the application of this definition.

The following section provides rationale for these elements of the recommended definition of Frontier Area.

Description of proposed characteristics of the definition of Frontier Area

Medical facility that is a 75 bed (or more), non-federal short term general hospital, as noted earlier, was chosen because the panel members believed that this size could best serve as a proxy for the availability of a full complement of essential services. More specifically, after considering a range of medical facility characteristics, the Panel members recommended this size and type of facility because it would achieve a minimum range of services and associated physician specialties that could function as a source for telehealth services.

Travel distance in miles to nearest facility or travel time in minutes to nearest facility. Sixty minutes or sixty miles was chosen. In examining distance in mileage and travel time, it was determined that either travel time or distance, combined with going outside of urbanized areas or large cities, adequately addressed the time and distance issues. Panel members believed that exceeding sixty minutes or sixty miles would compromise access to many specialty and critical support services, even with emergency and other medical transportation. Sixty minutes is often referred to in the emergency medical services literature as ‘the golden hour,’ when access to medical care for categories of patients may be critically important. In the test analysis, sixty miles provides little additional refinement to the definition of Frontier Area, but by its inclusion, incorporates an additional population that would be otherwise excluded using only sixty minutes.

Population density is reflected as less densely settled areas indexed by areas outside of large urban aggregations (either outside of urbanized areas or outside of nonmetropolitan cities with concentrated populations of 20,000 or more) that are 60 minutes or 60 miles from the designated medical facility.

Impact of this approach. Based on 1998 population data, the test analyses suggested that the proposed definition would result in the designation of communities containing approximately 7,000,000 people that would qualify for a “Frontier” preference under the telehealth programs authorized under Public

Law 107-251. However, as these characteristics of a Frontier Area definition are applied, results will vary when: 1) all ZIP code areas and updated ZIP code area populations are used instead of the Census Bureau ZCTAs; 2) ZIP code areas, 2000 Census Bureau Urbanized Area definitions and designations are updated and employed via the updated version 2.0 RUCAs; 3) hospital information is updated and, 4) the travel distance/time data are updated. If the definition of Frontier Area recommended in this report is adopted, the actual eligibility would need to be more carefully determined using the latest data. It is important to note that the developmental data used (e.g., 1998 populations) were used because they were convenient and economical. Nevertheless, it is anticipated that the findings will not be substantially different in the aggregate as the aforementioned information is updated.

Other Factors as the Secretary Determines to be Appropriate - Reconsideration Process

A reconsideration process is recommended as part of the application of any definition of Frontier Area under Public Law 107-251, Subtitle B, Section 330I of the statute. State Offices of Rural Health or their designees should be actively included in the processes by which reconsideration criteria are developed, perhaps through negotiated rule-making processes, but not in such a manner that the State Offices would be precluded from providing technical assistance to applicants for the program. In order to facilitate requests for reconsideration of areas that do not meet the operational definition of Frontier Area, the Panel recommends that a number of steps be implemented:

At the time of the adoption of the final rule, a list of areas that meet the definition of “frontier area” should be published in the Federal Register.

- State Offices of Rural Health and other relevant organizations should be notified by the Office for the Advancement of Telehealth (OAT/HRSA/DHHS) upon the publication of the list of frontier areas and be asked to disseminate the list and the process for reconsideration widely within their state. This will assure that communities learn of their designation and whether a need exists to submit a request for reconsideration.
- Program announcements and/or guidance’s for the programs under this section of the statute should publish the list of frontier areas as part of grant announcements. At the conclusion of the reconsideration process, a final list of Frontier Areas should be published associated with the relevant grant cycle.

The chief executive of a state, in consultation with the state Office of Rural Health and other relevant agencies, or the highest elected official of a federally-recognized tribe should be provided the opportunity to recommend additions or deletions of designated frontier areas if they find that these areas should have been either included or excluded initially from the list of designated frontier areas as a result of inaccuracies in the analyses that produced the original list (e.g., mistakes in mapping programs, calculation of mileage or travel-time). The reason for requesting reconsideration must be specified and documented in the request as to why an exception should be made to the designated list related to the published criteria. Among the reasons for reconsideration, states and tribes may include rationales such as seasonal fluctuations in travel time related to the time of year, island locations, topography, or other unique characteristics of their state or tribe.

Requests for reconsideration shall be solicited through the Federal Register Notice in sufficient time for incorporation of any designated changes, prior to issuance of the application guidance associated with telehealth grant programs being competed under the authorization of PL 107-251 if a preference for frontier is specified. Adequate time should be given for the reconsideration process; ideally 60 days between the time when regulations are issued that identify ‘frontier areas’ and the date on which applications are due. The agency will respond in as timely a fashion as possible to requests so as not to advantage or disadvantage potential or actual applicants.

As mentioned earlier in the report, the Expert Panel identified a set of eight guiding principles perceived as important in the selection of characteristics of a definition of Frontier Area. The Panel determined that most of the guiding principles were met by the recommended definition of Frontier Area. More specifically, the recommended definition addresses the provisions included in the legislative language. It is practical to implement as the data needed to apply the definition are available at reasonable cost. The definition is simple and related application of it should be cost-effective. The definition was arrived at after review of other related definitions, extensive analytical work, and evidence derived from the opinions of the panel experts. The formula that implements the definition is clear enough to be replicated by others. The recommended definition has face validity and is easy to understand. A reconsideration process for determining legitimate exceptions is reflected in the definition. While the Expert Panel reviewed numerous combinations of criteria for time, distance, size of medical facility, etc., the panel chose a dichotomous definition that meets a majority of the guiding principles deemed to be important.

Appendix: Background Analysis

The comparisons presented in this Appendix were the most reasonable time and distance criteria considered by the Expert Panel during their deliberations of Approach 3 (i.e., 60 minutes and/or 60 miles and 60 minutes and 50 miles). They were used to assist in the determination of specific definition characteristics. If the recommended definition is adopted, the actual eligibility would need to be more carefully determined with the newest data (e.g., 2005 population and Version 2.0 RUCA 1s, and newer hospital and travel distance and time data). Ultimately, the Expert Panel recommended Criterion B, the impact of which is depicted on the map labeled B.

Travel distances and travel times listed in this Appendix are to the nearest non-federal short-term general hospital of 75 beds or more. The American Hospital Association is the source of hospital information from 2002. All ZIP codes within Census Bureau-defined Urbanized Areas (as defined by Version 1.1 RUCA 1s) were not considered eligible for inclusion in Frontier Areas. Population estimates are for 1998.

Maps with Specific Time and/or Distance Criteria and the Total Population included in Defining Frontier Areas.

The Expert Panel concentrated on several travel time, distance, and combinations of time/distance in their considerations. It is of interest to note that the analysis conducted shows that there are substantial variations among states in the proportion and numbers of the population designated as frontier, both within select criteria and across different criteria. For instance, using the 60 minute and 60 mile test criteria, states varied significantly in the percentage of their population designated as frontier from 0 percent (e.g., Delaware and Connecticut) to over 15 percent (Alaska (49%), Wyoming (39%), Montana (38%), North Dakota (19%)). The associated states with the largest numbers of frontier population from largest to smallest by these test criteria were Colorado, Montana, Alaska, Arizona, Texas, Wyoming, Iowa, Oregon, Washington, Nebraska, Utah, Wisconsin, Nevada, New Mexico, and Kansas. Throughout the deliberations of the Expert Panel, data were provided on the number of people that would be affected by various characteristics being considered. That is, the magnitude of impact on the populations included and excluded was calculated for the various combinations of possible elements of the definition.

After examining the maps and tabled values and informed by panel member expertise with many of the states, the Expert Panel determined that several of the possible criteria were too strict and eliminated places that should not be included within a telehealth funding program (e.g., criterion AB, AC, AD, and

A). Of those that remained, it was noted that the numbers that qualify were about the same and agreement between them was high. For example, while criterion B captured 99.9% of the designated population, it was decided that leaving out even a small fraction, while easier to calculate, would exclude a relevant part of the population. Consequently, of the various criteria, it was decided that it was important to have a criterion that could be calculated in a standardized fashion and that did not eliminate any of the targeted population. Criterion D met most of the principles identified as important by the Panel and was determined to provide the best fit for the definition of Frontier Area.

The Panel's final iteration of criteria comparisons are listed below along with the population inclusion/exclusion ramifications and geographic distributions as shown in the associated maps. In constructing the maps, the American Hospital Association 2002 data was the source of hospital location information. ZIP code areas within Census Bureau-defined Urbanized Areas (as defined by Version 1.1 RUCA 1's) were not considered eligible for inclusion in Frontier Areas.

Table 1
Criteria, Associated Maps and Related Populations

Maps	Criteria	Frontier Telehealth Population
A	greater than 60 minutes and 60 miles	4,456,703
B	greater than 60 minutes only	6,962,967
C	greater than 60 minutes and 50 miles	6,139,392
D	greater than 60 minutes or 60 miles	6,971,386

Table 2
Comparisons of all Combinations of the Criteria and Agreement between the Combinations

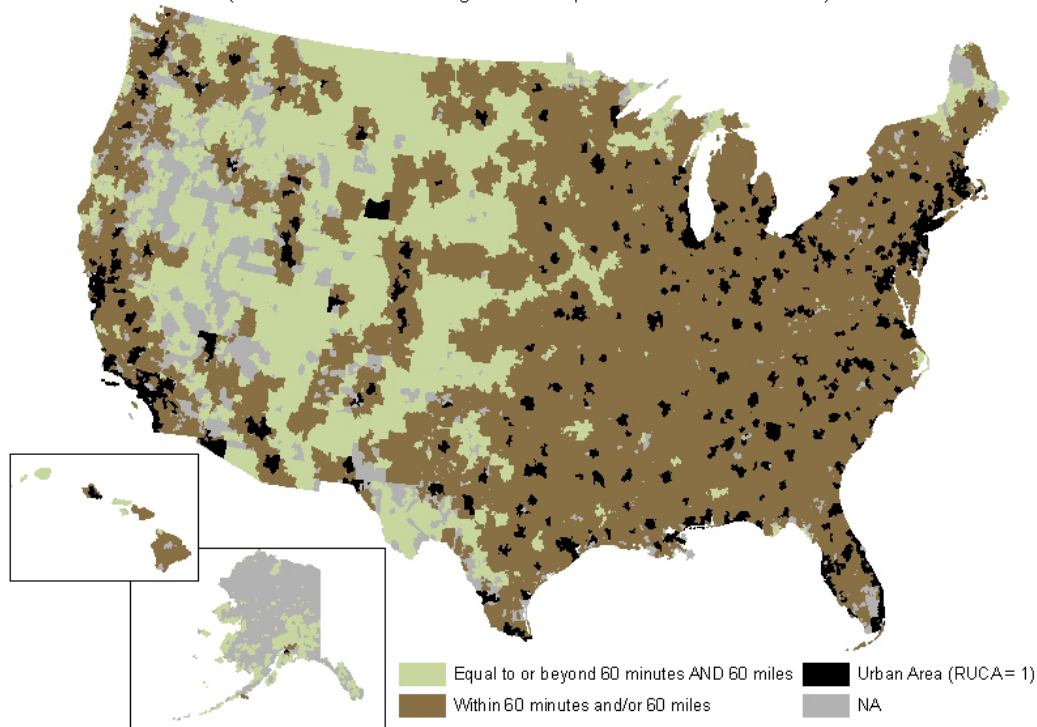
Criteria (see above)	Total Yes for either and both	Agree	% Agree
AB	6,962,967	4,456,703	64.0%
AC	6,139,392	4,456,703	72.6%
AD	6,971,386	4,456,703	63.9%
BC	6,962,967	6,139,392	88.2%
BD	6,971,386	6,962,967	99.9%
CD	6,971,386	6,139,392	88.1%

The maps provided below reflect and correspond to these definitions and comparisons. Note that each definition is mapped (A - D) and those ZIP code areas where there is disagreement between the pairs of definitions are mapped (AB - CD). The maps have accompanying codes for the various colored areas. NA (Not applicable) refers to ZTCAs that do not have populations for various reasons (e.g., water bodies, missile ranges).

A

Travel Distance to Nearest Hospital

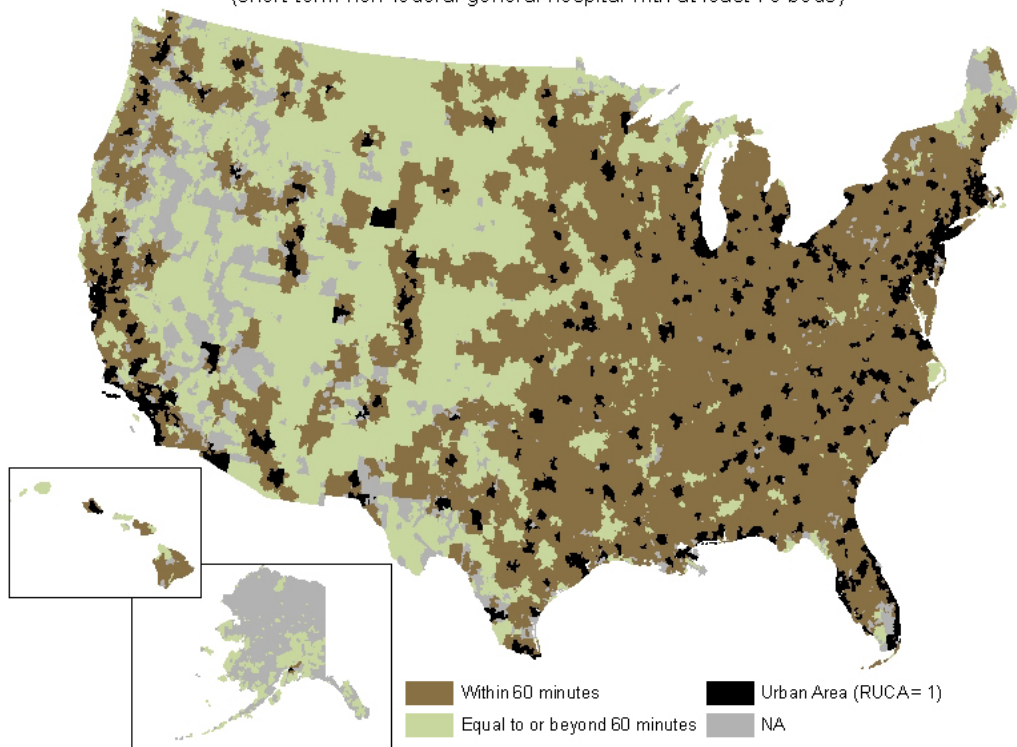
(short-term non-federal general hospital with at least 75 beds)



B

Travel Distance to Nearest Hospital

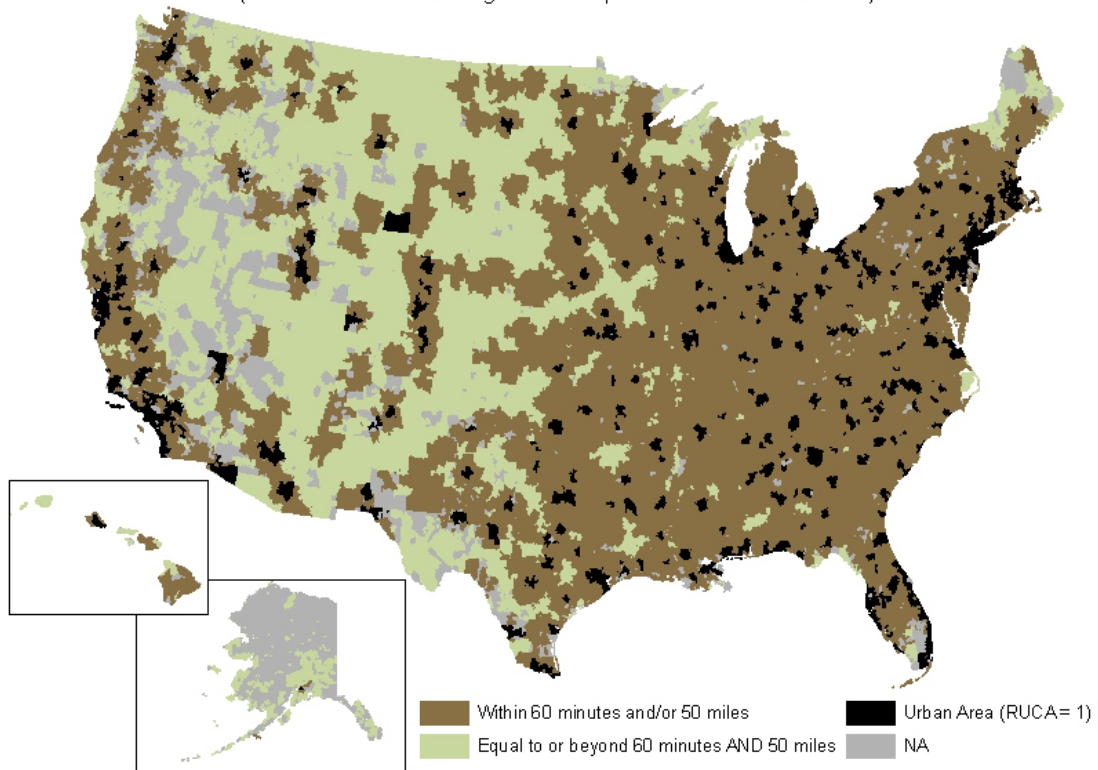
(short-term non-federal general hospital with at least 75 beds)



C

Travel Distance to Nearest Hospital

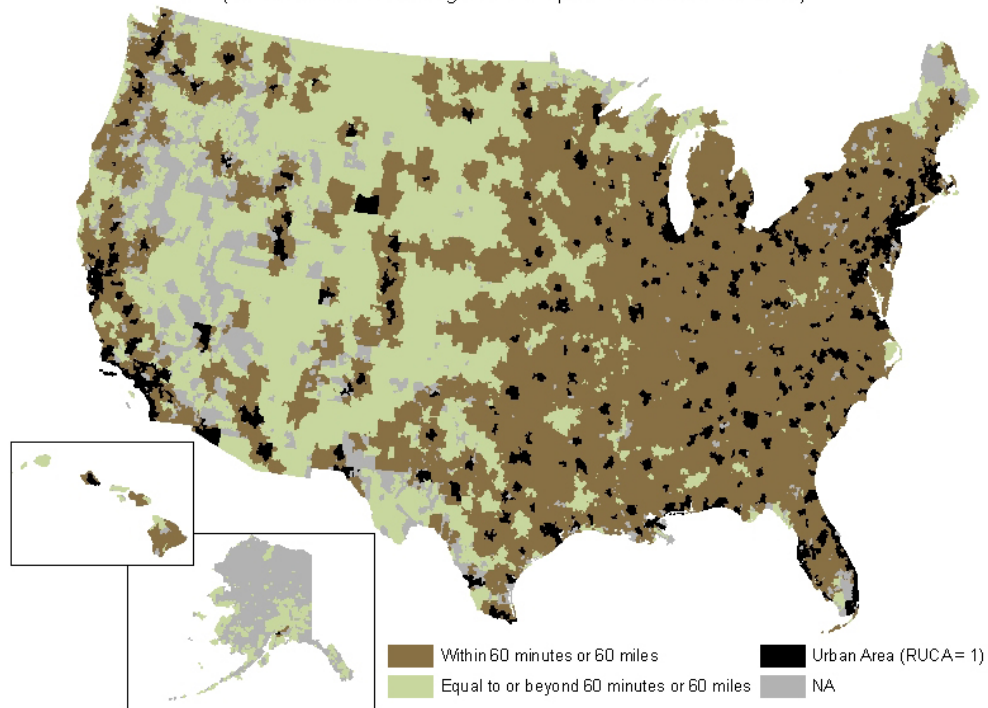
(short-term non-federal general hospital with at least 75 beds)



D

Travel Distance to Nearest Hospital

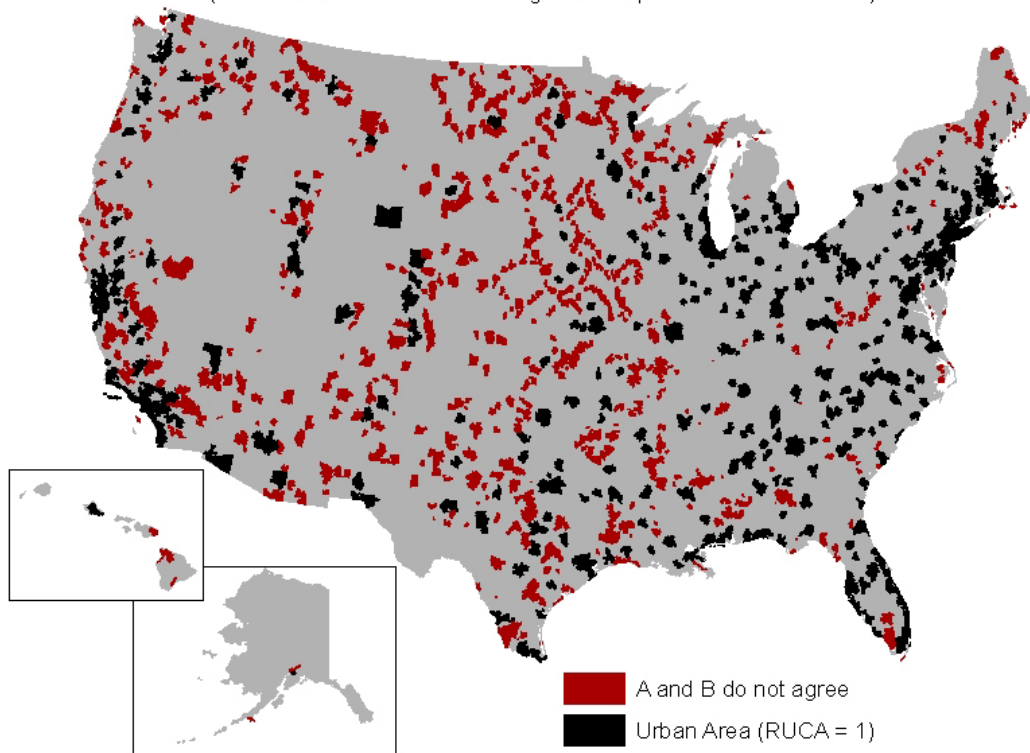
(short-term non-federal general hospital with at least 75 beds)



AB

Sensitivity Analysis

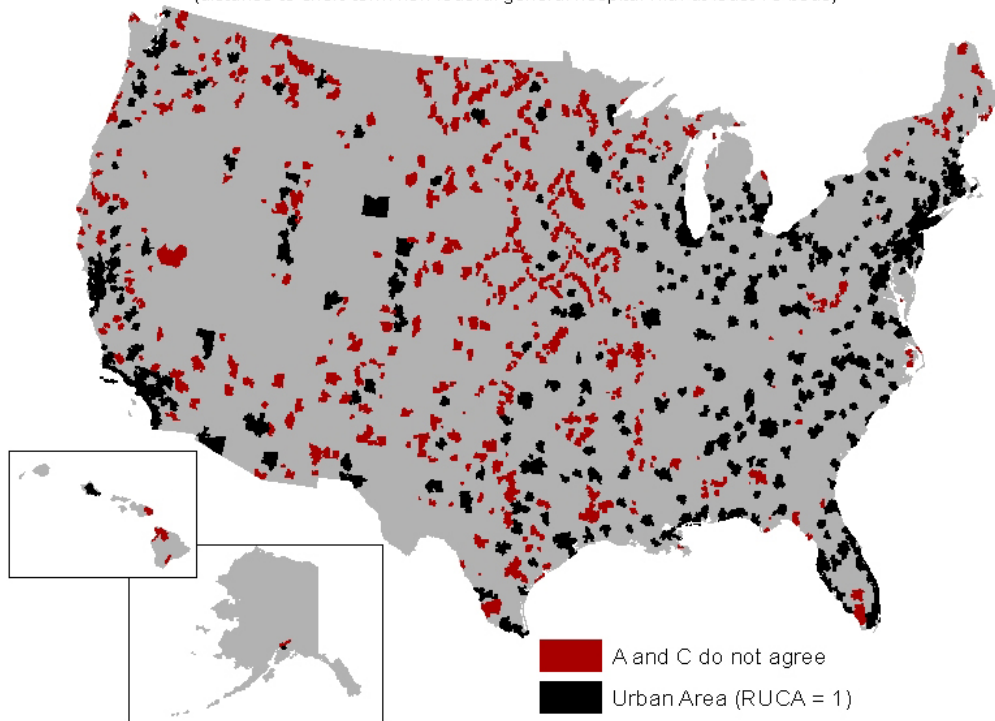
(distance to short-term non-federal general hospital with at least 75 beds)



AC

Sensitivity Analysis

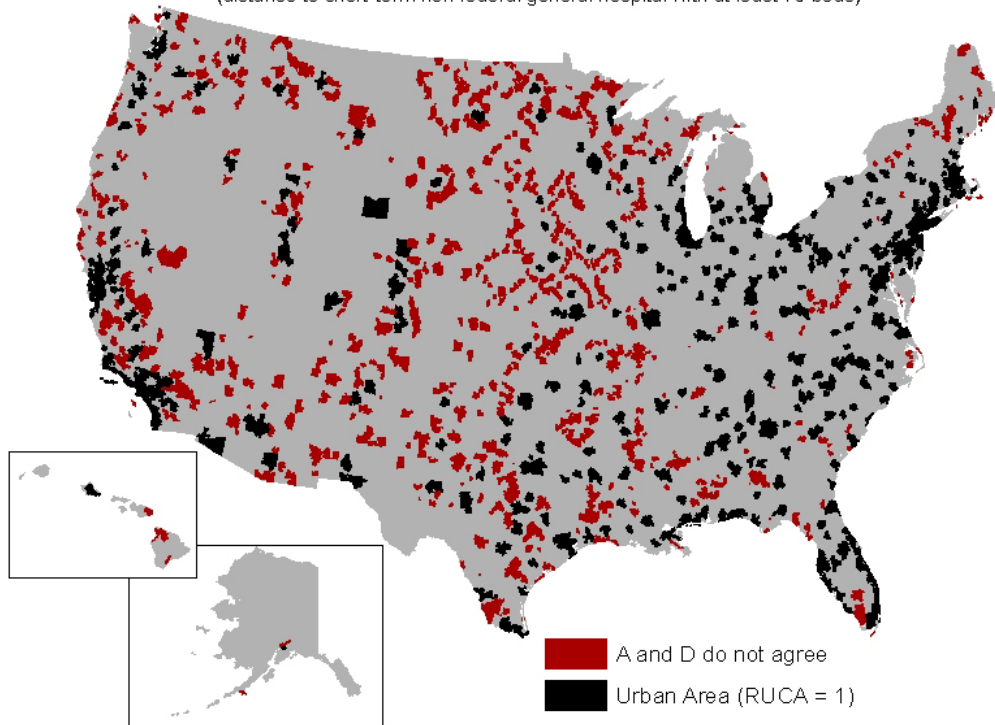
(distance to short-term non-federal general hospital with at least 75 beds)



AD

Sensitivity Analysis

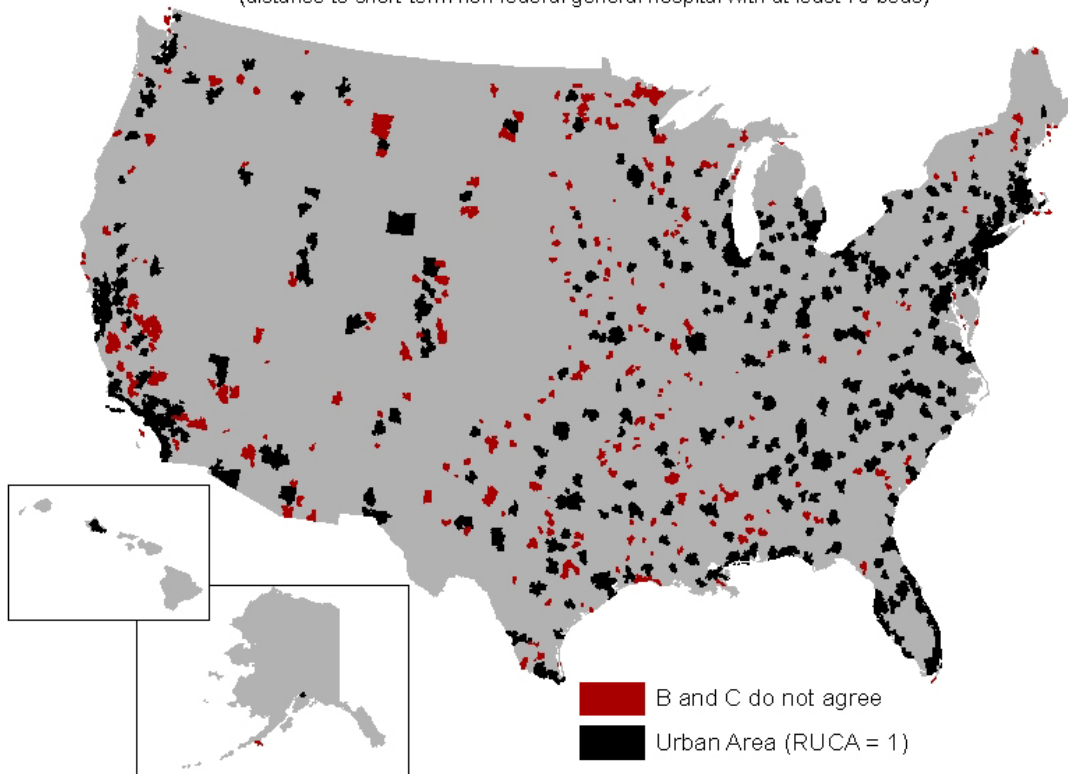
(distance to short-term non-federal general hospital with at least 75 beds)



BC

Sensitivity Analysis

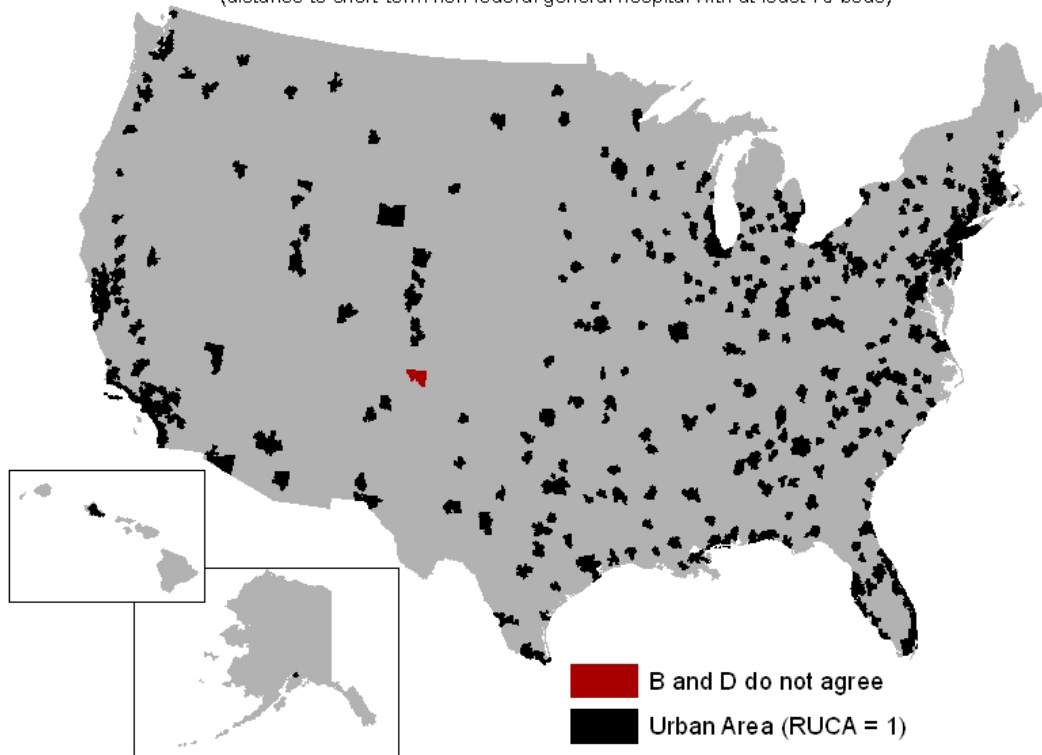
(distance to short-term non-federal general hospital with at least 75 beds)



BD

Sensitivity Analysis

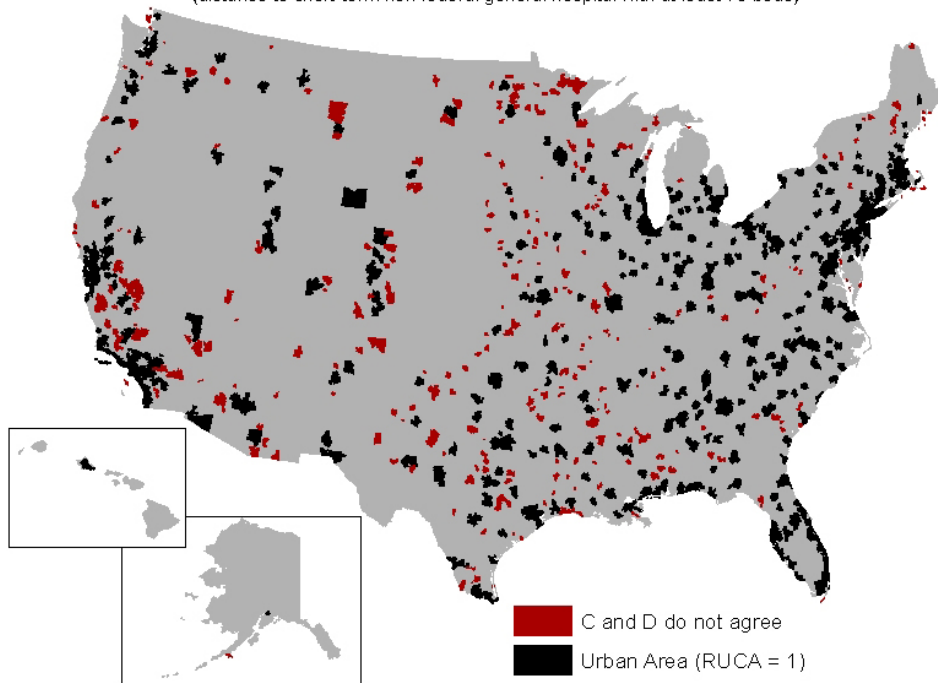
(distance to short-term non-federal general hospital with at least 75 beds)



CD

Sensitivity Analysis

(distance to short-term non-federal general hospital with at least 75 beds)



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