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# RURALITY LITERATURE REVIEW

Prepared for the  
North West Local Health Integration Network

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## MAIN MESSAGES

- There are many definitions of rural, each with its own strengths and weaknesses. There does not appear to be a consensus around which definition of rurality is best; however, the literature emphasizes the importance of selecting a definition that most closely matches the question at hand.
- There is agreement that providing health care to rural populations is more costly than providing health care in urban areas – reasons for this include the absence of economies of scale, unproductive time spent travelling to deliver service to dispersed populations, greater needs of the rural population, and the difficulty of recruiting and retaining an adequate rural health work force.
- While numerous articles underline the need for rural funding adjustments, very few jurisdictions have developed specific funding formulae to support rural health care services. These range from relatively simple rural and northern adjustments, through to complex formulae that accommodate the great variations in health and service delivery found among rural communities. As with the discussion around rurality, the message is clear: rural funding formulae, if they are to be effective, must accurately measure the distinctive health needs and the additional costs associated with delivering services to rural populations.

## OBJECTIVES

The objective of this study was to conduct a focussed literature review related to rural funding formulae, health data gaps, and effects of socioeconomic and demographic changes. Of specific interest were: health service funding issues related to rurality, definitions of rurality used in other rural and remote areas along with funding formulae used in these areas, economic disadvantages of health service delivery in smaller communities, travel cost as a factor for cost of service delivery and lower levels of investment in supports and programs in rural communities.

## METHODS

The literature review included a comprehensive search of PubMed, CINAHL, and Proquest databases for relevant articles with an emphasis on material published in the last ten years and accessible as full text documents. As well, a grey literature search was conducted using various internet search engines. Literature was selected



for inclusion based on relevance to health care funding, service delivery and equity issues with a focus on rural and remote issues. As well, national and international websites for key government and non-government organizations were searched to identify policy documents and specific examples of the way rural funding issues were addressed. Ongoing consultation with the North West LHIN helped to ensure that the documents selected addressed the topics that were most relevant to issues of concern to Northern Ontario's rural and remote communities.

Over the course of the literature search, four broad themes emerged that shape policy and funding decisions around the development and sustainability of rural services – definitions of rurality, rural health service funding issues, rural costs, and rural funding formulae. The remainder of this report provides a summary of the information in these four areas, highlighting examples which illustrate the technical and practical difficulties involved in developing appropriate measures to identify and address rural health service delivery issues.

## DEFINITIONS OF RURALITY

There are many articles that discuss the issue of rurality in general terms, examining the health problems that are common to rural populations, their service needs and the difficulties which are encountered in delivering health and supportive services to widely dispersed rural communities. There is also considerable debate about the varying definitions of rurality, their applicability to health service planning and funding, and the need for a common definition; however, there are few suggestions as to what this common definition might look like. In general, definitions of rurality are based on: population size/population density; geography/spatial indicators including a measure of travel time; and population characteristics weighted to determine degree of rurality.

### POPULATION DENSITY DEFINITIONS

These definitions typically use census data to categorize areas based on the size of their population and the density of population within an area. Statistics Canada and the Organization for Economic Co-operation and Development (OECD)

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both provide definitions based on population size. Also, the United States Census Bureau, the Office for Management and Budget, the United States Department of Agriculture and, the Office of National Statistics in the U.K. use population density criteria to distinguish rural populations.

These definitions are widely applied to assess rural health needs, health outcomes, and, in some cases, to develop funding formula for rural health care service delivery. Population size/population density have been used in studies measuring health needs across urban/rural communities,<sup>1 2</sup> and in examining health outcomes between urban and rural residents.<sup>3</sup> To cite examples, which are discussed in more detail in subsequent sections of this report, a recent study used Statistics Canada's definition of rural in order to assess rural community well-being in Manitoba,<sup>4</sup> as well as access to and utilization of health services in Ontario.<sup>5</sup> Density definitions are widely used in the U.K. as the basis for both health care

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<sup>1</sup> Gibson, A., Asthana, S., Brigham, P., Moon, G. & Dicker, J. Geographies of need and the new NHS: methodological issues in the definition and measurement of the health needs of local populations. *Health & Place*. 2002; 8: 47-60.

<sup>2</sup> Barnett, S., Roderick, P., Martin, D., Diamond, I. & Wrigley, H. Interrelations between three proxies of health care need at the small area level: an urban/rural comparison. *Journal of Epidemiology and Community Health*. 2002; 56: 754-761.

<sup>3</sup> O'Neill, N.P. & Godden, D.J. Stroke outcomes in Northern Scotland: does rurality really matter? *Rural and Remote Health*. 2003; 3 (3): 243.

<sup>4</sup> Ramsey, D. & Beesley, K. Rural community well-being: The perspectives of health care managers in south western Manitoba, Canada. *Journal of Rural and Community Development*. 2006; 2: 86-107.

<sup>5</sup> Rosenberg, M. & Hanlon, N. Access and utilization: A continuum of health service environments. *Social Science & Medicine*. 1996; 43 (6): 975-983.

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needs assessments and funding allocations – for example, the Scottish government uses this definition in their health care funding formula.<sup>6</sup>

The most frequently cited advantage of using a population size/population density definition of rural is that the information is readily available, usually through census bureaus, and therefore easy to apply; an often cited critique of this definition is that it fails to adequately capture the heterogeneity within rural populations and may, in some cases, mask significant problems in accessing care experienced by low-income rural residents, minority populations, or specific age groups, such as seniors.<sup>7</sup> DuPlessis et al. suggest that a key concern, for researchers and policy-makers alike, is identifying which definition of rurality is most appropriate for a given rural population; they recommend strategically selecting a definition of rural which best matches the scale and geographic dimension of the issue at hand.<sup>8</sup>

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<sup>6</sup> Scottish Executive. *Fair shares for all technical report*. Found at: <http://www.scotland.gov.uk/library2/doc02/fsat-01.htm>. Accessed November 12, 2007.

<sup>7</sup> Barnett, S., Roderick, P., Martin, D., Diamond, I. & Wrigley, H. Interrelations between three proxies of health care need at the small area level: an urban/rural comparison. *Journal of Epidemiology and Community Health*. 2002; 56: 754-761.

<sup>8</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). *Definitions of Rural*. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

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***Canada - Statistics Canada - Urban and Rural Areas***

Statistics Canada defines “rural areas” as all areas outside urban areas (See *Figure 1*). A rural area has a population of less than 1,000 people and a population density of less than 400 people per square kilometre.<sup>9</sup> Statistics Canada also makes use of the definition of “community” as rural if the population density is less than 150 people per square kilometre, using the same rural population density definition developed by the Organization for Economic Co-operation and Development (OECD).<sup>10</sup> In Canada, this definition is applied at the Census Consolidated Subdivision level.<sup>11</sup>

Applied at the Census Division, Statistics Canada’s census regions can be defined as: “predominantly rural” (more than 50% of the population lives in a “rural community”); “intermediate” (between 15% and 50% lives in a “rural community”) or “predominantly urban” (less than 15% of the population lives in a “rural

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<sup>9</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). *Definitions of Rural*. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

<sup>10</sup> Centre for Rural and Northern Health Research Laurentian University. *Assessing Rural Health: Toward Developing Health Indicators for Rural Canada*. Found at: <http://cranhr.laurentian.ca/pdf/indcat/INDCATRS.pdf>. Accessed November 16, 2007

<sup>11</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). *Definitions of Rural*. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

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community).<sup>12</sup> Statistics Canada identifies three sub-groups of “predominantly rural regions” as “adjacent to metropolitan centres”, “not adjacent to metropolitan centres” and “northern regions.”<sup>13</sup> Pitblado et al. (1999) make use of the Statistics Canada and OECD definition of urban/rural as shown in *Figure 1*, in order to develop health indicators for rural Canada.<sup>14</sup>

Pitblado et al. argue that these definitions have a long history of use and are familiar to researchers, as well, many datasets use EA, CSD, and CD classification so it is simple to apply this definition to data. They recommend using the OECD definition and then using the Statistics Canada codes (1-5) if more detail is required. It should be noted that different areas of Canada are classified as “rural” depending on the definition used. For example, census “rural areas” classify 22% of the population as rural whereas the OECD classifies 38% of the population as rural.<sup>15</sup> In

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<sup>12</sup>DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

<sup>13</sup>DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

<sup>14</sup>Pitblado, J. R., Pong, R. W., Irvine, A., Nagarajan, K.V., Sahai, V., Zelmer, J., Dunikowski, L., & Pearson, D. Assessing rural health: Toward developing health indicators for rural Canada. Found at: <http://cranhr.laurentian.ca/pdf/indcat/INDCATRS.pdf>. Accessed November 16, 2007.

<sup>15</sup>DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at:

addition to this, different people are classed as rural depending on the definition used – the OECD “predominantly rural regions” only includes 51% of the people who live in census “rural areas.”<sup>16</sup> (See *Figures 1 and 2*).

Figure 1

<i>Statistics Canada</i>
<i>Statistics Canada divides land into 7 geographic units:<sup>17</sup></i>
<ol style="list-style-type: none"> <li>1. <b>Enumeration Area (EA)</b> is the area canvassed by one census representative. It is the smallest geographic unit for which census data is collected.</li> <li>2. <b>Census Subdivision (CSD)</b> applies to municipalities or their equivalent.</li> <li>3. <b>Census Consolidated Subdivision (CCS)</b> is a grouping of census subdivisions where the smaller more urban census subdivisions are combined with the larger more rural census subdivisions.</li> <li>4. <b>Census Division (CD)</b> is the intermediate geographic areas between the municipality and the province level.</li> <li>5. <b>Province/Territory (PT)</b> are made up of the ten provinces and three territories.</li> <li>6. <b>Census Metropolitan Area (CMA)</b> is a large urban area together with adjacent urban and rural areas that have a high degree of social and economic integration with the urban core. A CMA must have an urban core population of at least 100,000.</li> <li>7. <b>Census Agglomeration (CA)</b> is a large urban area together with adjacent urban and rural areas that have a high degree of social and economic integration with the urban core and a population of at least 10,000.</li> </ol>

<http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>.

Accessed November 16, 2007.

<sup>16</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>.

Accessed November 16, 2007

<sup>17</sup> Pitblado, J. R., Pong, R. W., Irvine, A., Nagarajan, K.V., Sahai, V., Zelmer, J., Dunikowski, L., & Pearson, D. Assessing rural health: Toward developing health indicators for rural Canada. Found at: <http://cranhr.laurentian.ca/pdf/indcat/INDCATRS.pdf>. Accessed November 16, 2007.

Figure 2

<i>Statistics Canada Urban/Rural Codes</i>
<b>Statistics Canada divides land into 5 urban-rural areas:<sup>18</sup></b>
<p><i>Based on the above, each EA is classified using an urban/rural code from 1 to 5:</i></p> <ol style="list-style-type: none"> <li>1. <b>'Urban core'</b> are urban areas that form the core of CMA's or CA's.</li> <li>2. <b>'Urban fringe'</b> are urban areas contained within boundaries of CMA's or CA's but not contiguous with the urban core.</li> <li>3. <b>'Rural Fringe'</b> are non-urban areas contained within boundaries of CMA's or CA's.</li> <li>4. <b>'Urban Outside'</b> CMA/CA are small towns that are urban (based on a population of 1,000 or more with a density of 400 or more people per square kilometre) and located outside boundaries of CMA's or CA's.</li> <li>5. <b>'Rural'</b> are non-urban areas located outside the boundaries of CMA's or CA's.</li> </ol>

### ***United States – Urban and Rural Areas***

In the U.S., there are two widely used definitions of urban-rural populations based on population density: one developed by the Census Bureau and the other, by the Office of Management and Budget. Both departments define rural communities as that part of a territory or population which exists outside of identified urban or metropolitan clusters.

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<sup>18</sup> Pitblado, J. R., Pong, R. W., Irvine, A., Nagarajan, K.V., Sahai, V., Zelmer, J., Dunikowski, L., & Pearson, D. Assessing rural health: Toward developing health indicators for rural Canada. Found at: <http://cranhr.laurentian.ca/pdf/indcat/INDCATRS.pdf>. Accessed November 16, 2007.



The U.S. Census Bureau defines 'urbanized areas' (densely settled territory that contains 50,000 people or more) and 'urban clusters' (densely settled territory with at least 2,500 but fewer than 50,000 people) where a cluster is made up of one or more block groups or census blocks each having a population density of at least 1,000 people per square mile and surrounding block groups having a population of at least 500 people per square mile. Rural is thus delineated as all territory, population and housing units located outside urbanized areas and urban clusters.<sup>19</sup>

The U.S. Office of Management and Budget (OMB) defines metropolitan and non-metropolitan populations. 'Metropolitan Statistical Areas' (MSAs) include counties or county clusters containing at least one urban area with a population of at least 50,000 and 'Micropolitan Statistical Areas' are counties containing an urban area of 10,000 – 49,000 people. Rural areas are thus defined as those areas outside of Metropolitan or Micropolitan areas.<sup>20</sup> OMB classification has been used as the basis for several measures of rurality which include proximity to metropolitan areas (Rural-Urban Continuum Codes) and commuting/economic integration (Rural-

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<sup>19</sup> Center for Geographic Information, Michigan Department of Information Technology. Understanding Census Bureau Geography. Found at: [http://www.michigan.gov/cgi/0,1607,7-158-12540\\_13863-27257--,00.html](http://www.michigan.gov/cgi/0,1607,7-158-12540_13863-27257--,00.html). Accessed November 19, 2007.

<sup>20</sup> Vanderboom, C. P & Madigan, E. A. Federal definitions of rurality and the impact on nursing research. *Research in Nursing and Health*. 2007; 30: 175-184.

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Urban Commuting, Urban Influence Codes) – these measures are discussed in more detail in the commuting flow section below.

As with the Canadian examples cited previously, several American studies demonstrate that different areas are considered rural depending on which definition is used. For example, when the OMB and the Census Bureau definitions of rural were cross-tabulated for the 2000 census, 11% of the population were classified as metropolitan but rural and 7% were classified as non-metropolitan but urban.<sup>21</sup> Vanderboom and Madigan show that when categorizing states by rurality, the choice of measure influences which states are classified as most rural.<sup>22</sup>

It should be noted that a significant weakness of dichotomous definitions of rurality like those described above, is that they fail to identify the diversity of rural populations and mask the extent to which rural populations are disadvantaged.<sup>23</sup> For example, one study uses infant mortality to show that rural disadvantage depends on how rural is defined. Farmer et al. compare total and race-specific (black vs. white) rates of infant mortality across 3 different conceptualizations of

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<sup>21</sup> Hart, G. L., Larson, E. H., & Lishner, D. M. Rural definitions for health policy and research. *American Journal of Public Health*. 2005; 95 (7): 1149 – 1155.

<sup>22</sup> Vanderboom, C. P. & Madigan, E. A. Federal definitions of rurality and the impact on nursing research. *Research in Nursing and Health*. 2007; 30: 175-184.

<sup>23</sup> Hall, Susan A, Kaufman, Jay S, Ricketts, & Thomas C. Defining Urban and Rural Areas in US Epidemiological Studies. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*. 2006; 83 (2): 162 – 175.

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rurality (metropolitan/nonmetropolitan dichotomy, a five-level measure based on population size of the largest community in the county, and a nine-level measure based on the size of the largest place along with contiguity of the county to a Metropolitan Statistical Area). They found that the 9-category classification was able to better capture the heterogeneity of rural America; however they argue that one must also look at differences based on race and region as well.<sup>24</sup>

### ***Canada - Commuting Flow RSTs and MIZs***

Population-based definitions of rurality have been expanded in Canada to include the influence of commuting and proximity to metropolitan areas. As DuPlessis et al. note, commuting flow definitions of rurality are favoured in studies which examine rural communities access to services, such as specialist care, which are centred in urban areas.<sup>25</sup>

Statistics Canada uses Metropolitan Influenced Zone (MIZ) classification in order to distinguish between urban and four types of rural based on population

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<sup>24</sup> Farmer, F.L, Clarke, L. L & Miller, M. Consequences of differential residence designations for rural health policy research: The case on infant mortality. *The Journal of Rural Health*. 1993; 9 (1): 17-26.

<sup>25</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

density and commuting flow (see *Figure 3*).<sup>26</sup> Statistics Canada also makes use of a 'non-metropolitan region' definition of rural which classifies each CD based on population size and adjacency to metropolitan areas (*Figure 4*), using Ehrensaft's classification, which represents an adaptation of the American Beale codes.<sup>27</sup>

Related to the MIZ classification, Statistics Canada defines "Rural and Small Towns" (RST) as that part of a population living outside the main commuting zone of larger urban centres (population of 100,000 or more). In this definition, CMA's and CA's have a core population of 100,000 and rural areas are defined according to the proportion of the employed labour force that commutes to work in the urban core; RST is thus the non-CMA/CA population.<sup>28</sup> Because this captures rural to urban commuting variations, the MIZ classification system also allows for

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<sup>26</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

<sup>27</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

<sup>28</sup> DuPlessis, V., Beshiri, R., & Bollman, R. (December 2002). Definitions of Rural. *Statistics Canada Agriculture Division: Agriculture and Rural Working Paper Series*. Found at: <http://www.statcan.ca/english/research/21-601-MIE/21-601-MIE2002061.htm>. Accessed November 16, 2007.

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identification of those areas which are at risk because of difficulty accessing services.<sup>29</sup>

Figure 3

<i>Statistics Canada Metropolitan Influence Zones (MIZ)<sup>30</sup></i>
<p><b>Urban areas</b></p> <ol style="list-style-type: none"> <li>1. <b>Census metropolitan areas</b> (population of at least 100,000)</li> <li>2. <b>Census Agglomerations</b> (large urban area together with adjacent urban and rural areas that have a high degree of social and economic integration with the urban core and a population of at least 10,000).</li> </ol>
<p><b>Rural Areas</b></p> <p>All other populations are defined as rural and further classified into 4 MIZs based on the proportion of the workforce that commutes to any CMA or CA as follows:</p> <ol style="list-style-type: none"> <li>1. <b>Strong MIZ:</b> commuting flow <math>\geq 30\%</math>;</li> <li>2. <b>Moderate MIZ:</b> commuting flow <math>\geq 5\%</math> and <math>&lt; 30\%</math>;</li> <li>3. <b>Weak MIZ:</b> commuting flow <math>&gt; 0</math> and <math>&lt; 5\%</math>;</li> <li>4. <b>No MIZ:</b> no commuters</li> </ol>

<sup>29</sup> Canadian Institute for Health Information. *Summary report: How healthy are rural Canadians? An assessment of their health status and health determinants*. Found at: [http://www.torc.on.ca/documents/Summary\\_Report\\_How\\_Healthy\\_Are\\_Rural\\_Canadians\\_2006.pdf](http://www.torc.on.ca/documents/Summary_Report_How_Healthy_Are_Rural_Canadians_2006.pdf). Accessed December 6, 2007.

<sup>30</sup> Canadian Institute for Health Information. *How healthy are rural Canadians? Summary Report, 2006*. Found at: [http://www.torc.on.ca/documents/Summary\\_Report\\_How\\_Healthy\\_Are\\_Rural\\_Canadians\\_2006.pdf](http://www.torc.on.ca/documents/Summary_Report_How_Healthy_Are_Rural_Canadians_2006.pdf). Accessed November 21, 2007.

Figure 4

<i>Statistics Canada 'Metropolitan - Non-metropolitan Codes'</i>
<p><b><u>Metropolitan Regions:</u></b></p> <p><b><i>Major Metropolitan:</i></b></p> <p>0 - central CDs of urban settlements of 1 million people or more</p> <p>1 - fringe CDs of urban settlements of 1 million people or more</p> <p><b><i>Mid-size metropolitan:</i></b></p> <p>2 - CDs containing urban settlements of 250,000 to 999,999 people</p> <p><b><i>Smaller metropolitan:</i></b></p> <p>3 - CDs containing urban settlements of 50,000 to 249,999 people</p>
<p><b><u>Non-metropolitan Regions:</u></b></p> <p><b><i>Non-metropolitan small city zone:</i></b></p> <p>4 - non-metro CDs containing urban settlements of 20,000 - 49,999 people, adjacent to a metropolitan area</p> <p>5 - non-metro CDs containing urban settlements of 20,000 - 49,999 people, not adjacent to a metropolitan area</p> <p><b><i>Small town zone:</i></b></p> <p>6 - non-metro CDs containing urban settlements of 2,500 - 19,999 people, adjacent to a metropolitan area</p> <p>7 - non-metro CDs containing urban settlements of 2,500 - 19,999 people, not adjacent to a metropolitan area</p> <p><b><i>Predominantly rural:</i></b></p> <p>8 - non-metro CDs containing no urban settlements (no places of 2,500 or more) adjacent to a metropolitan area</p> <p>9 - non-metro CDs containing no urban settlements not adjacent to a metropolitan area</p> <p><b><i>Northern hinterland:</i></b></p> <p>10 - CDs that are entirely or in major part north of the following parallels: Newfoundland, 50<sup>th</sup>; Quebec and Ontario, 49<sup>th</sup>; Manitoba, 53<sup>rd</sup>; Saskatchewan, Alberta and British Columbia, 54<sup>th</sup>; all of Yukon, Northwest Territories and Nunavut</p>

### ***United States – Rural-Urban Commuting Flows***

In the United States, the United States Department of Agriculture uses a variant of the U.S. Office of Management and Budget (OMB) classification of metropolitan/nonmetropolitan areas to further classify nonmetropolitan regions based on adjacency to metropolitan areas/commuting flow. Rural-Urban Continuum Codes (RUCC),<sup>31</sup> Urban Influence Codes (UIC)<sup>32</sup>, and Rural Urban Commuting Area (RUCA)<sup>33</sup> are described below.

Rural-Urban Continuum Codes (RUCC) (*Figure 5*) use OBM classification of metropolitan/non-metropolitan and then subdivides these classifications into three metropolitan groupings and six non-metropolitan groupings based on their adjacency to metropolitan areas.<sup>34</sup> In this measure a nonmetropolitan county is defined as adjacent if it physically adjoins one or more metropolitan areas and has at least 2% of its employed labour force commuting to a central metropolitan county, all other nonmetropolitan counties are then classified as nonadjacent.

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<sup>31</sup> Vanderboom, C. P. & Madigan, E. A. Federal definitions of rurality and the impact on nursing research. *Research in Nursing and Health*. 2007; 30: 175-184.

<sup>32</sup> Hart, G.L., Larson, E.H., & Lishner, D. M. Rural definitions for health policy and research. *American Journal of Public Health*. 2005; 95 (7): 1149 – 1155.

<sup>33</sup> WWAMI Rural Health Research Center. About RUCA. Found at: <http://depts.washington.edu/uwruca/rural.html>. Accessed November 23, 2007.

<sup>34</sup> United States Department of Agriculture Economic Research Division. Measuring rurality: Rural-urban Continuum Codes. Found at: <http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/>. Accessed December 5, 2007.

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Figure 5

<b>United States - Rural-Urban Continuum Codes (RUCC)</b>
<p><b>Metropolitan Counties:</b>            1 = population of 1 million or more            2 = population of 250,000 or more            3 = population of less than 250,000</p>
<p><b>Nonmetropolitan Counties:</b>            4 = urban population of 20,000 or more, adjacent to a metropolitan area            5 = urban population of 20,000 or more, not adjacent to a metropolitan area            6 = urban population of 2,500 – 19,999, adjacent to a metropolitan area            7 = urban population of 2,500 – 19,999, not adjacent to a metropolitan area            8 = completely rural or less than 2,500 urban population, adjacent to a metropolitan area            9 = completely rural or less than 2,500 urban population, not adjacent to a metro area</p>

The Urban Influence Codes (UIC) (*Figure 6*) use the OBM classification and further subdivides counties into two metropolitan, three nonmetropolitan micropolitan and seven non-metropolitan noncore groups based on population size and adjacency to metro- or micro-politan counties.<sup>35</sup> The advantage of these classification systems is their ability to identify proximity to urban areas; their primary limitation is their failure to identify rural areas that may be included in a census metropolitan area.<sup>36</sup>

<sup>35</sup> United States Department of Agriculture Economic Research Division. Measuring rurality: Urban influence codes. Found at: <http://www.ers.usda.gov/Briefing/Rurality/UrbanInf/>. Accessed December 5, 2007.

<sup>36</sup> Racher, F., Vollman, A., & Annis, R. (2004). Conceptualizations of "Rural": Challenges and implications for nursing research. *Online Journal of Rural Nursing and Health Care*, 4(2), 61-77.



Figure 6

<b>United States - Urban Influence Codes (UIC)</b>
<p><b>Metropolitan Counties:</b></p> <p>1 = large metropolitan area with a population of 1 million or more</p> <p>2 = small metropolitan area with a population of less than 1 million</p>
<p><b>Nonmetropolitan Counties:</b></p> <p>3 = micropolitan area adjacent to a large metropolitan area</p> <p>4 = noncore area adjacent to a large metropolitan area</p> <p>5 = micropolitan area adjacent to a small metropolitan area</p> <p>6 = noncore area adjacent to a small metropolitan area and contains a town of at least 2,500 people</p> <p>7 = noncore area adjacent to a small metropolitan area and does not contain a town of at least 2,500 people</p> <p>8 = micropolitan area not adjacent to a metropolitan area</p> <p>9 = noncore adjacent to micropolitan area and contains a town of at least 2,500 people</p> <p>10 = noncore adjacent to micropolitan area and does not contain a town of at least 2,500 people</p> <p>11 = noncore not adjacent to metro- or micro-politan area and contains a town of at least 2,500 people</p> <p>12 = noncore not adjacent to metro- or micro-politan area and does not contain a town of at least 2,500 people</p>

Finally, the Rural Urban Commuting Area (RUCA)<sup>37</sup> (Figure 7) uses the US Census Bureau classification of 'urbanized areas' and 'urban clusters' to classify areas based on their size and their functional relationship measured by census-based work commuting flows. In the newer RUCA version, rural areas are further analyzed by their travel time distance from each ZIP code to the nearest urbanized

<sup>37</sup> WWAMI Rural Health Research Center. About RUCA. Found at: <http://depts.washington.edu/uwruca/rural.html>. Accessed November 23, 2007.

area or urbanized cluster. In general, ZIP codes that are 60 minutes or more from an urbanized area or 40 minutes or more from a urban cluster are considered to be more remote.<sup>38</sup> The newer zip-code methodology also enables closer examinations of the health variations and service utilization patterns found among rural populations.<sup>39</sup> It can, for example, distinguish rural communities that, due to their location and the difficulties of travel, must access care outside the counties in which they are situated. It also can identify rural populations that have poorer health status. Recent RUCA examples include examinations of geographic access to care for rural populations,<sup>40</sup> an analysis of the uptake of Medicare rural physician incentives,<sup>41</sup> workforce constraints on the expansion of rural health care centres,<sup>42</sup> and a summary report on the health workforce in rural America.<sup>43</sup>

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<sup>38</sup> WWAMI Rural Health Research Center. RUCA data: Travel distance and time, remote, isolated, and frontier. Found at:

[http://depts.washington.edu/uwruca/travel\\_dist.html](http://depts.washington.edu/uwruca/travel_dist.html). Accessed November 23, 2007.

<sup>39</sup> Hart, G. *Use of RUCAs in Health Services Research*. Presentation at Academy Health Annual Conference; Seattle, WA; June 25, 2006.

<sup>40</sup> Chan, L., Hart, L.B., Goodman, D.C. Geographic access to health care for rural Medicare beneficiaries. *Journal of Rural Health*. 2006; 22(2):140-6.

<sup>41</sup> Chan, L., Hart, L.B., Ricketts, T.C. 3<sup>rd</sup>, Beaver, S.K. An analysis of Medicare's Incentive Payment program for physicians in health professional shortage areas. *Rural Health*. 2004. 20(2):109-17.

<sup>42</sup> Rosenblatt RA, Andrilla CHA, Curtin T, Hart LG. Shortages of medical personnel at community health centers: implications for planned expansion. *JAMA*. Mar 1 2006;295(9):1042-1049.

<sup>43</sup> Larson EH, Johnson KE, Norris TE, Lishner DM, Rosenblatt RA, Hart LG. *State of the health workforce in rural America: profiles and comparisons*. Seattle, WA: WWAMI Rural Health Research Center, University of Washington; 2003.

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Figure 7

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**United States - Rural-Urban Commuting Area (RUCA) Definitions**

- **Metropolitan area core:** primary flow within an Urbanized Area (UA); secondary flow 30% - 49% to a larger UA
- **Metropolitan area high commuting:** primary flow 30% or more to a UA; secondary flow 30% - 49% to a larger UA
- **Metropolitan area low commuting:** primary flow 10% - 30% to a UA
- **Micropolitan area core:** primary flow within an Urban Cluster of 10,000 - 49,999 (large UC); secondary flow 30% - 49% to a UA; secondary flow 10% - 29% to a UA
- **Micropolitan high commuting:** primary flow 30% or more to a large UC; secondary flow 30% - 49% to a UA; secondary flow 10% - 29% to a UA
- **Micropolitan low commuting:** primary flow 10% - 30% to a large UC; secondary flow 10% - 29% to a UA
- **Small town core:** primary flow within an Urban Cluster of 2,500 - 9,999 (small UC); secondary flow 30% - 49% to a UA; secondary flow 30 - 49% to a large UC; secondary flow 10% - 29% to a UA; secondary flow 10% - 29% to a large UC
- **Small town high commuting:** primary flow 30% or more to a small UC; secondary flow 30% - 49% to a UA; secondary flow 30% - 49% to a large UC; secondary flow 10% - 29% to a UA; secondary flow 10% - 29% to a large UC; primary flow 10% - 29% to a small UC; secondary flow 10% - 29% to a UA; secondary flow 10% - 29% to a large UC
- **Rural areas:** primary flow to a tract outside a UA or UC (including self); secondary flow 30% - 49% to a UA; secondary flow 30% - 49% to a large UC; secondary flow 30% - 49% to a small UC; secondary flow 10% - 29% to a UA; secondary flow 10% - 29% to a large UC; secondary flow 10% - 29% to a small UC

### ***United Kingdom - Rural Settlement Classifications***

Unlike Canada and the United States, which rely heavily on population measures and commuting flows to describe rural populations and their access to care, the United Kingdom has developed rural classification systems which look at settlement patterns and the context in which rural services are delivered. In 2004, the Office of National Statistics in England and Wales implemented the “Rural and Urban Area Classification”<sup>44</sup> system, which is based on population density per hectare squared. The ONS begins by retaining the census definition of urban and rural based on population size, where urban areas have a population of 10,000 people or more and rural areas are those places outside census urban areas (population of less than 10,000 people). “Rural places” are then further classified based on “underlying settlement type” and “context.”<sup>45</sup>

To begin, identification of rural settlement is derived from a grid covering England and Wales with 35 million cells, each 1ha. Individual addresses are captured where they occur within the grid forming a pattern of household densities. Residential densities are then averaged for each cell creating a ‘density profile’ (this

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<sup>44</sup> Office of National Statistics. Rural and Urban Area Classification 2004. Found at: <http://www.statistics.gov.uk/geography/nrudp.asp>. Accessed October 10, 2007.

<sup>45</sup> Bibby, P. & Shepherd, J. Developing a New Classification of Urban and Rural Areas for Policy Purposes – the Methodology. Found at: <http://www.statistics.gov.uk/geography/nrudp.asp>. Accessed October 10, 2007.

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refers to a series of density measures focussed on a given 1ha cell but calculated at 200m, 400m, 800m and 1600m respectively) which is then used to identify 9 'settlement types' based on the identified rules (see *Figure 8*).

*Figure 8*

<b><i>UK Rural and Urban Density Profiles:</i></b>
<ul style="list-style-type: none"> <li>• If <math>D_{800} &gt; 8</math>, a grid square is deemed to form part of a "small town or urban area"</li> <li>• If <math>D_{400} &gt; 8</math> and <math>D_{800} &lt; 4</math>, a grid square is deemed to form part of a "fringe (urban, town)"</li> <li>• If <math>D_{800} &gt; 2.5</math> and <math>D_{800} &gt; 2.5 * D_{1600}</math>, a grid square is deemed to form part of a "small town"</li> <li>• If <math>D_{800} &gt; 4</math> and <math>D_{400} &gt; 4</math> and <math>D_{800} &lt; 8</math>, a grid square is deemed to form part of a "fringe (urban, town)"</li> <li>• If <math>D_{800} &lt; 8</math> and <math>D_{400} &gt; 8</math> (this rule only finds new cases where <math>D_{400} &gt; 8</math> and <math>D_{800} = 4</math>), a grid square is deemed to form part of a "small town"</li> <li>• If <math>D_{800} &gt; 0.18</math> and <math>D_{400} &gt; 2 * D_{800}</math> and <math>D_{200} &gt; 1.5 * D_{800}</math>, a square is deemed to form part of a "village"</li> <li>• If <math>D_{1600} &gt; 1.0</math> and <math>D_{400} &gt; 1.5 * D_{800}</math> and <math>D_{400} &lt; 2 * D_{800}</math> and <math>D_{200} &gt; 0</math>, a square is deemed to form part of a "village envelope (in peri-urban)"</li> <li>• If <math>D_{1600} &gt; 1.0</math>, a grid square is deemed to form part of a "peri-urban zone"</li> <li>• If <math>D_{1600} = &lt; 1.0</math> and <math>D_{800} &gt; = 15</math>, a grid square is deemed to form part of a "village envelope"</li> </ul>

The “context” of a settlement refers to the broader setting in which it is located. Density profiles are used at a larger scale in order to characterize aspects of accessibility and population sparsity. In order to calculate sparsity, for each 1ha cell the density of households across areas of 10,000m, 20,000m and 30,000m is calculated. Focus is on areas whose population is considered “sparse” at all 3 scales.

Using the above measures, Census Output Areas are classified into 4 morphological types based on their underlying settlement component (urban, small town and fringe, village and, dispersed). Output areas are also given a sparsity score and classified as “sparse” if they fall within the sparsest 5% of output areas at all three scales and “less sparse” if they do not fall within this threshold. Finally, settlement type and context are combined to produce the following rural settlement classifications: “Sparse, small town and fringe”, “Sparse village”, “Sparse hamlets and dispersed households”, “Less sparse small town and fringe”, “Less sparse village” and “Less sparse hamlets and dispersed households”. A complete methodology can be found in Bibby and Shepherd’s *Developing a New Classification of Urban and Rural Areas for Policy Purposes – the Methodology*<sup>46</sup>.

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<sup>46</sup> Bibby, P. & Shepherd, J. *Developing a New Classification of Urban and Rural Areas for Policy Purposes – the Methodology*. Found at: <http://www.statistics.gov.uk/geography/nrudp.asp>. Accessed October 10, 2007.

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## RURALITY INDEXES

In addition to definitions of rurality based on population and/or geography, several jurisdictions have developed rurality indexes as part of health human resources planning and policy development. Although specific factors assessed differ, the indices all weight and sum variables in order to provide a “degree of rurality” measure. Other assessments incorporate measures of “remoteness” or “isolation” to identify the degree of difficulty that residents experience in accessing services. The following sections describe examples of the rurality indexes and remoteness classifications developed in Canada, Australia and Scotland. Common to these definitions is the idea that there are differences within rural populations and that a measure must be able to capture these differences by looking at the comparative or relative rurality of a community.<sup>47</sup>

### ***Canada - General Practitioner Rurality Index (GPRI)***

The General Practitioner Rurality Index (GPRI) for Canada measures the rurality of Canadian general practitioner services using 6 variables – remoteness from basic referral centre, remoteness from an advanced referral centre, drawing population, number of general practitioners, number of specialists, and presence of

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<sup>47</sup> Kralj, B. Measuring “rurality” for purposes of health-care planning: an empirical measure for Ontario. Found at: <https://www.oma.org/shortage/data/00rurality.asp>. Accessed November 22, 2007.

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an acute care hospital. The six variables are weighted and summed on a 100-point scale; the higher the score, the more rural a community is considered to be (see Figure 9).<sup>48</sup>

Figure 9

<b>Canada - General Practice Rurality Index</b>
<b>Factors used to assign GPRI scores:<sup>49</sup></b>
<b>Remoteness from closest advanced referral centre</b> (closest metropolitan area with registered subspecialists in cardiothoracic surgery, neurosurgery, pediatric surgery, radiation oncology and haematology) is calculated as Distance (in km)/50.
<b>Remoteness from closest basic referral centre</b> (or advanced referral centre if closer). A basic referral centre will have registered specialists in general internal medicine, general surgery, ophthalmology, orthopaedic surgery and radiology. This variable is calculated as Distance (in km)/25.
<b>Drawing population</b> (up to 20 points) can be given calculated as drawing population/2000. If the calculation is negative then no points are awarded.
<b>Number of general practitioners</b> (up to 20 points) is calculated as 20/# of full-time equivalent GPs with their main place of business within 25 km of the centre of the community.
<b>Number of specialists</b> (up to 10 points) – if there are no specialists with main place of business within 25 km of the centre of the community the score is 10, otherwise, the score is calculated as 6/# of specialists.
<b>Presence of an acute care hospital</b> (up to 10 points) – if there are no acute care hospitals with inpatient beds within 25 km of the centre of the community the score is 0, otherwise the score is 10 – (# of specialists) and if this is a negative value then the score is 0.

<sup>48</sup> Leduc, E. Defining rurality: a General Practice Rurality Index for Canada. *Canadian Journal of Rural Health*. 1997; 2 (2): 125.

<sup>49</sup> Table adapted from: Leduc, E. Defining rurality: a General Practice Rurality Index for Canada. *Canadian Journal of Rural Health*. 1997; 2 (2): 125.



A simplified version of the GPRI, the GPRI-S uses only drawing population, remoteness from closest advanced referral centre, and remoteness from closest basic referral centre in order to assign rurality scores.<sup>50</sup> Strong correlation between GP billing data and rurality scores based on GPRI and GPRI-S is evidence of the index's validity.<sup>51</sup> The focus on billing data is based on the fact that emergency department, after-hours services and hospital inpatient care are a greater part of a rural GP's workload while the urban GP's workload includes more office visits, surgical assists and emergency department shift work.

The GPRI has been critiqued for being difficult to administer due to the high number of variables and for not really explaining more of the variation than Statistics Canada's Rural and Small Town approach.<sup>52</sup> However the authors maintain that the GPRI is useful and provides a continuous measure of rurality which is not calculated by the RST approach.<sup>53</sup>

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<sup>50</sup> Olatunde, S., Leduc, E. R., & Berkowitz, J. Different practice patterns of rural and urban general practitioners are predicted by the General Practice Rurality Index. *Canadian Journal of Rural Medicine*. 2007; 12 (2): 73-80.

<sup>51</sup> Olatunde, S., Leduc, E. R., & Berkowitz, J. Different practice patterns of rural and urban general practitioners are predicted by the General Practice Rurality Index. *Canadian Journal of Rural Medicine*. 2007; 12 (2): 73-80.

<sup>52</sup> Pitblado, R. The validity of the GPRI. *The Canadian Journal of Rural Medicine*. 2007; 12 (4): 247.

<sup>53</sup> Leduc, E. The validity of the GPRI. *The Canadian Journal of Rural Medicine*. 2007; 12 (4): 247 - 248.

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### ***Canada - Rurality Index of Ontario (RIO)***

The Rurality Index of Ontario (RIO)<sup>54</sup> developed by the Ontario Medical Association includes 10 variables – travel time to nearest basic referral centre, travel time to nearest advanced referral centre, community population, number of active GPs, population to GP ratio, presence of a hospital, availability of ambulance services, social indicators, weather conditions and, selected services to determine degree of rurality (see *Figure 10*).

Using the RIO, communities are given a score based on the variables above. Thus communities with higher scores are classified as more rural and communities with lower scores are classified as less rural. For example, Mississauga receives a score of 0, Thunder Bay receives a score of 9.72 and Longlac receives a score of 87.99.<sup>55</sup> Scores can also be located by postal code.<sup>56</sup>

RIO scores are used extensively by the Ontario Ministry of Health and Long-Term Care to identify communities that are eligible for extra funding – for example, the nursing community assessment visit program reimburses employers for travel

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<sup>54</sup> Kralj, B. *Measuring “rurality” for purposes of health-care planning: an empirical measure for Ontario*. Found at: <https://www.oma.org/shortage/Data/>. Accessed September 5, 2007.

<sup>55</sup> A complete list of 2004 RIO scores by community can be found through the OMA website at: <https://www.oma.org/shortage/data/00rurality.asp>. Accessed November 5, 2007.

<sup>56</sup> RIO scores for specific communities can also be searched by postal code at <https://www.oma.org/Custom1/nlp/NLPWF003.aspx>. Accessed November 5, 2007.

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and accommodation expenses of nurses for the purpose of assessing nursing employment opportunities in communities designated as underserved by a RIO score of 60 or over.<sup>57</sup> As well the rural medicine investment program provides tiered funding to physicians and specialists based on their RIO score of 45 or greater.<sup>58</sup> The RIO has also been used as a measure of access to medical care.<sup>59</sup>

A significant strength of using RIO is that its assessment of the degree of rurality allows health planners to customize health program elements to degree of rurality (i.e. provide the largest financial incentive to physicians working in the most rural areas). As well, RIO as a continuous measure of rurality allows for comparisons between areas by the travel time required to access care. This feature gives planners the ability to identify rural communities and populations which are at greater risk because of their isolation from advanced care.<sup>60</sup>

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<sup>57</sup> Ontario Ministry of Health and Long-term Care. *Nursing community assessment visit program*. Found at:

[http://www.health.gov.on.ca/english/providers/ministry/recruit/cav\\_nurse.html](http://www.health.gov.on.ca/english/providers/ministry/recruit/cav_nurse.html).

Accessed December 6, 2007.

<sup>58</sup> Ontario Ministry of Health and Long-term Care. *Rural medicine investment program*. Found at:

[http://www.health.gov.on.ca/english/providers/program/rmi/rmi\\_mn.html](http://www.health.gov.on.ca/english/providers/program/rmi/rmi_mn.html).

Accessed December 6, 2007.

<sup>59</sup> Croxford, R., Friedberg, J. & Coyte, P.C. Socio-economic status and surgery in children: myringotomies and tonsillectomies in Ontario, Canada 1996-2000. *Acta Paediatr.* 2004; 93: 1245-1250.

<sup>60</sup> Kralj, B. *Measuring "rurality" for purposes of health-care planning: an empirical measure for Ontario*. Found at: <https://www.oma.org/shortage/Data/>. Accessed September 5, 2007.

Figure 10

<i>OMA Rurality Index of Ontario (RIO)</i>
<ul style="list-style-type: none"> <li>• <b>travel time to nearest basic referral centre</b> (provides hospital/specialty services, including medical imaging) with the communities that have road travel times greater than 170 minutes receiving the highest score.</li> <li>• <b>travel time to the nearest advanced referral centre</b> with communities that have road travel times greater than 190 minutes receiving the highest score.</li> <li>• <b>community population</b> with communities with a population lower than 46,000 receiving points in a linear fashion and communities with populations greater than 46,000 receiving no points.</li> <li>• <b>number of active GP's in the community</b> where communities with no GP's are given the highest score, while communities with 20 or more GP's are given no points.</li> <li>• <b>population to GP ratio</b> where communities with population to GP ratios that exceed the provincial average receive added points.</li> <li>• <b>presence of a hospital</b> where points are added to communities with a hospital but points are deducted as the number of specialists increases. Thus the highest score is given to communities with a hospital but no specialists and the lowest score is given to communities with no hospital (or where the hospital is more than 40km away) or that have a hospital, but also 20 or more specialists.</li> <li>• <b>availability of ambulance service</b> where points are given to communities that have no ambulance service and communities with ambulance service of any kind get no points.</li> <li>• <b>social indicators</b> where communities with no airport, university or community college receive added points and communities with these facilities are given no points.</li> <li>• <b>weather conditions</b> where communities deemed to have extreme rainfall, snowfall (exceeds 75<sup>th</sup> percentile for the province) and extreme cold temperature (below the 25<sup>th</sup> percentile in the province) are awarded more points</li> <li>• <b>selected services</b> where more points are awarded to communities where GP's provide anaesthetic and obstetrical services.</li> </ul>

### ***Canada - Multistakeholder Framework/Index of Rurality***

The Multistakeholder Framework/Index of Rurality<sup>61</sup> was developed in partnership between the Canadian Medical Association, the Society for Rural Physicians of Canada, the Canadian Pharmacists Association and the Canadian Nurses Association. This index is based on the results of a survey of doctors, pharmacists and nurses which asked respondents to identify which 5 (out of 16) factors they believed were most important in defining a community as rural. The ten factors included in the final index were: distance to a secondary referral centre, barriers to access, number of health care providers, ability to provide specialist services, distance to tertiary referral centre, level of on-call responsibility, difficulty in obtaining locums, availability of equipment, availability of public transportation and, size of catchment area (see *Figure 11*). Each factor was then assigned a weight<sup>62</sup> and each community received a score -- the higher the score, the more rural a community is deemed to be. This index was developed by partners as a planning tool, however, we were unable to locate any evidence that it has been used to date.

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<sup>61</sup> Canadian Medical Association. *The development of a multistakeholder framework/index of rurality, 2003. Final Report to Health Canada.* Found at: [http://www.cma.ca/index.cfm/ci\\_id/3381/la\\_id/1.htm](http://www.cma.ca/index.cfm/ci_id/3381/la_id/1.htm). Accessed November 20, 2007.

<sup>62</sup> Based on the number of times key informants cited the factor as an issue affecting rural access to care.

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Figure 11

<i>Multi-Stakeholder Index of Rurality</i>
<ul style="list-style-type: none"> <li>• <b>Distance to a secondary referral centre</b> (fewer than 20km, 20-49km, 50-99km, 100-199km, 200 or more km)</li> <li>• <b>Barriers</b> (geography/weather/roads) to timely access to healthcare services (road access closed fewer than 5 days/year, road access closed 5 or more days/year, access by train and air only – somewhat weather dependent and limited schedule, access by air and water only – weather dependent, access by air only – weather dependent)</li> <li>• <b>Number of full-time equivalent health care providers</b> (based on formula of (number of health providers X 1,000)/population in community)</li> <li>• <b>Ability to provide services such as obstetrics, general surgery and anaesthesia</b> (services always available in town, services available most of the time in town, services available occasionally in town, no general anaesthesia and only normal delivery/childbirth available in town, no general anaesthesia and no provider available for delivery/childbirths)</li> <li>• <b>Distance to tertiary referral centre</b> (fewer than 20km, 20-49km, 50-99km, 100-199km, 200 or more km)</li> <li>• <b>Level of on-call responsibilities</b> based on the average of shared on-call responsibilities for all physicians who provide service to the community (fewer than or equal to 1 in 6 days/month, 1 in 5 days/month, 1 in 4 days/month, 1 in 3 days/month and more than 1 in 3 days/month)</li> <li>• <b>Difficulty in obtaining locums</b> (never difficult, seldom difficult, sometimes difficult, usually difficult and always difficult)</li> <li>• <b>Availability of equipment such as x-rays and lab services</b> (full suite of radiological and lab services 24hr/day, full suite with limited hours, most radiological and lab services with limited hours, limited x-ray and lab services, no x-ray or lab services available in town)</li> <li>• <b>Availability of public transportation to healthcare services</b> (regular bus service within and between communities and taxi; regular bus service between communities. hospital shuttle and taxi; limited bus service between communities and hospital shuttle and taxi; taxi only; no public transportation or taxi)</li> <li>• <b>Size of catchment area</b> (&lt;20km radius, 20-49km radius, 50-99km radius, 100-199km radius, 200 or more km radius)</li> </ul>

In their discussion of methodological issues surrounding the study of rural surgical services, Ellehoj, Tepper, Barrett and Iglesias (2006) argue that Canadian rurality indices need to be adjusted to recognize the difficulties that rural populations face in accessing specialist care. They begin by defining urban areas as areas with a population within 1 hour drive of metropolitan centres which include a medical school and/or within 30 minutes drive of remaining census metropolitan areas (population >35,000); the rural population becomes all the population not defined as urban based on the preceding rule.<sup>63</sup> Ellehoj et al. argue that what non-urban populations share is that of “having to access procedural care without significant local specialist presence” (p. 188) and as such a measure of rurality based on distance to service is the most useful in terms of highlighting issues of access in rural health research.

### ***Canada – Health Canada’s Rural and Remote Definitions***

Health Canada broadly defines rural and remote communities as those with a population of less than 10,000 and removed from urban services and resources.<sup>64</sup>

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<sup>63</sup> Ellehoj, E., Tepper, J., Barrett, B. & Iglesias, S. Research methodology for the investigation of rural surgical services. *Canadian Journal of Rural Medicine*. 2006; 11 (3): 187-194.

<sup>64</sup> Jennett, PA, Gagnon, MP, Bradstandt, HK. Preparing for success: Readiness models for rural telehealth. *Journal of Postgraduate Medicine*. 2005; 51: 279-285.

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Health Canada has developed a 4-level classification of remoteness<sup>65</sup> for Aboriginal communities, which distinguishes communities that can access physician services by road versus those that can only access physician services by air.

The four categories include: Type 1 - 'remote isolated': no scheduled flights or road access and minimal phone or radio service; Type 2 - 'isolated': scheduled flights, good phone services but no road access; Type 3 - 'semi-isolated': road access, physician services more than 90km away; Type 4 - 'non-isolated': road access with physician services less than 90km away. This measure has primarily been used by Health Canada's First Nations and Inuit Health Branch, to assess health issues, service needs and program delivery in First Nations communities.<sup>66</sup>

### ***Australia - Remoteness Classifications***

Australia uses 'remoteness classifications' based on road distance to metropolitan centres in order to conceptualize rural/remote issues. Rural, Remote and Metropolitan Areas (RRMA), Accessibility/Remoteness Index of Australia (ARIA) and the Standard Geographical Classification (ASGC) Remoteness Areas,

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<sup>65</sup> Canadian Population Health Initiative. (2006). How healthy are rural Canadians? An assessment of their health status and health determinants. Found at: <http://www.phac-aspc.gc.ca/publicat/rural06/index.html>. Accessed November 27, 2007.

<sup>66</sup> Health Canada. *A statistical profile on the health of first nations in Canada*. Ottawa, Canada: 2003.



along with their methodologies are described by the Australian Institute of Health and Welfare (2004).<sup>67</sup>

The Rural, Remote and Metropolitan Areas (RRMA) classification (*Figure 12*) is the oldest classification, developed in 1994 by the Department of Primary Industries and Energy and the Department of Human Services and Health. The RRMA places each 'statistical local area' (SLA) within capital cities and metropolitan centres in the 'metropolitan zone' and then all other SLA's are placed in rural or remote zones based on an 'index of remoteness' calculated using population density and distance to either a capital city, an 'other' metropolitan urban centre, a large urban centre or a small urban centre. Thus, the RRMA classification consists of three zones ('metropolitan', 'rural' and 'remote'), with seven distinct classes altogether.

*Figure 12*

<i>Australian Rural, Remote and Metropolitan Area Classification (RRMA)</i>
<ul style="list-style-type: none"> <li>• <b>Metropolitan Zone</b> consists of 'capital cities', and 'other metropolitan centres (population of 100,000 or more)</li> <li>• <b>Rural Zone</b> consists of 'large rural centres' (population 25,000 to 99,999), 'small rural centres' (10,000 to 24,999) and 'other rural areas' (less than 10,000)</li> <li>• <b>Remote Zone</b> consists of 'remote centres' (urban centre population of 5,000 or more), and 'other remote areas' (urban centre population of less than 5,000).</li> </ul>

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<sup>67</sup> Australian Institute of Health and Welfare. Rural, regional and remote health: A guide to remoteness classifications. Found at: <http://www.aihw.gov.au/publications/phe/rrrh-gtrc/rrrh-gtrc-c00.pdf>. Accessed November 19, 2007.

The Accessibility/Remoteness Index of Australia (ARIA) classification was developed in 1997 by the Department of Health and Aged Care (*Figure 13*). Based on an area's index value, it is categorized as 'highly accessible' (relatively unrestricted accessibility to a wide range of goods and services and opportunities for social interactions), 'accessible' (some restriction to accessibility for some goods and services and opportunities for social interaction), 'moderately accessible' (significantly restricted accessibility of goods and services and opportunities for social interactions), 'remote' (very restricted accessibility of goods, services and opportunities for social interaction), or 'very remote' (very little accessibility of goods and services and opportunities for social interaction).

*Figure 13*

<i>Australian Accessibility/Remoteness Index (ARIA)</i>
<ul style="list-style-type: none"> <li>• ARIA is a <b>continuous measure of remoteness</b> based on road distance to the closest service centre in four classes; population equal to or more than 250,000; between 48,000 and 249,999; between 18,000 and 47,999; and between 5000 and 17,999).</li> <li>• ARIA produces <b>index values</b> between 0 and 12 for 11,340 populated localities. Areas with an index value of 0 have the highest accessibility to goods and areas with an index value of 12 have the highest level of remoteness.</li> </ul>

The Australian Standard Geographical Classification (ASGC) Remoteness Areas Classification is calculated using ARIA+ index values, on a scale of 0-15, which include the addition of distance to service centres with populations of 1,000 to

4,999 people, as an indicator of difficulties accessing service (*Figure 14*). Index values are categorized into five classes that reflect the diversity of urban, rural and remote settings: 'major cities of Australia', 'inner regional Australia', 'outer regional Australia', 'remote Australia', and 'very remote Australia'. This measure is used, both to explore health issues<sup>68</sup> and assess viability of health services,<sup>69</sup> and the need for special rural funding allocations; for example, for rural aged care homes.<sup>70</sup>

*Figure 14*

<i>Australian Standard Geographical Classification (ASGC) Remoteness Areas</i>
<ul style="list-style-type: none"> <li>a) population equal to or more than 250,000</li> <li>b) between 48,000 and 249,999</li> <li>c) between 18,000 and 47,999</li> <li>d) between 5,000 and 17,999</li> <li>e) service centre with a population between 1,000 and 4,999.</li> </ul>

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<sup>68</sup> Caldwell, T.M., Jorm, A.F., Dear, K.B. Suicide and mental health in rural, remote and metropolitan areas in Australia. *Medical Journal of Australia*. 2004; (7 Suppl):S10-4.

<sup>69</sup> Jones, J.A., Humphreys, J.S., Adena, M.A. Doctors' perspectives on the viability of rural practice. *Rural and Remote Health*. 2004;4(2):305. Epub 2004 Jun 18.

<sup>70</sup> Australian Institute of Health and Welfare. Rural, regional and remote health: A guide to remoteness classifications. Found at: <http://www.aihw.gov.au/publications/phe/rrrh-gtrc/rrrh-gtrc-c00.pdf>. Accessed November 19, 2007.

### ***Scotland - Scottish Executive Urban Rural (SEUR) Classification***

The Scottish Executive Urban Rural (SEUR) classification uses both population and an accessibility measure (based on drive time) to define urban and rural areas (see *Figure 15*). This classification system is widely used by the Scottish government as a basis for the Scottish Household survey,<sup>71</sup> which informs their understanding of urban, rural and remote health inequalities communities.<sup>72 73</sup>

*Figure 15*

<b><i>Scottish Executive Urban and Rural Classification (SEUR)</i></b>
<ul style="list-style-type: none"> <li>• <b>Large urban areas:</b> settlements of over 125,000 people.</li> <li>• <b>Other urban areas:</b> settlements of 10,000 to 125,000 people.</li> <li>• <b>Accessible small towns:</b> settlements of between 3,000 and 10,000 people and within 30 minutes drive of a settlement of 10,000 or more.</li> <li>• <b>Remote small towns:</b> settlements of between 3,000 and 10,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more.</li> <li>• <b>Accessible rural:</b> settlements of less than 3,000 people and within 30 minutes drive of a settlement of 10,000 or more.</li> <li>• <b>Remote rural:</b> settlement of less than 3,000 people with a drive time of more than 30 minutes to a settlement of 10,000 or more.<sup>74</sup></li> </ul>

<sup>71</sup> Scottish Executive National Statistics. Scotland's people: results of the 2005/2006 Scottish household survey. Found at: <http://www.scotland.gov.uk/Resource/Doc/193421/0052120.pdf>. Accessed November 19, 2007.

<sup>72</sup> Office of the Chief Statistician, Scottish Executive. Urban rural classification 2005-2006. Found at: <http://www.scotland.gov.uk/Resource/Doc/933/0034463.pdf>. Accessed December 6, 2007.

<sup>73</sup> Levin, K. A. & Leyland, A. H. A comparison of health inequalities in urban and rural Scotland. *Social Science and Medicine*. 2006; 62: 1457-1464.

<sup>74</sup> Scottish Executive National Statistics. Scotland's people: results of the 2005/2006 Scottish household survey. Found at:

## SUMMARY OF RURALITY MEASURES

There are many different definitions of rural – these are based on population density, commuting flows or relationship with urban areas, there are indexes that assign scores based on a degree of rurality and there are measures which take into account ‘remoteness’ and access to service. There are strengths and weaknesses to each definition and it has been shown that the way in which one defines rurality will impact the way in which rural communities are understood. The consensus among researchers appears to be that one should use the definition of rurality which best fits the issue being addressed.

At the same time, reviewers caution that planners and decision-makers need to carefully consider the methodology behind the definitions of rurality that are used.<sup>75</sup> Each approach has its advantages and disadvantages (*Figure 16*). Dichotomous classifications based on population size or density, for example, can highlight general differences between urban and rural populations, but often fail to capture the heterogeneity of rural populations.

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<http://www.scotland.gov.uk/Resource/Doc/193421/0052120.pdf>. Accessed November 19, 2007.

<sup>75</sup> Pong, R. W. & Pitblado, J. R. Don't take "geography" for granted! Some methodological issues in measuring geographic distribution of physicians. *Canadian Journal of Rural Medicine*. 2001; 6 (2): 103-112.

More sophisticated assessments, incorporating measures of commuting flows or adjacency to metropolitan areas, are somewhat more robust, because they can be used to identify communities or populations which have comparatively good or poor access to services. Rurality indices, including multiple variables, are equally effective in locating health regions or communities which experience difficulties in accessing services due to remoteness. Which definition is most appropriate, therefore, depends on the population characteristics, service delivery patterns, and the health problem or access issue being addressed.

*Figure 16*

<i>Defining Rurality - Comparison of Measures, Factors Considered, Limitations and Applications</i>		
<i>Measure/Country</i>	<i>Factors considered</i>	<i>Limitations/Applications</i>
Statistics Canada/Canada	Population size/population density	Dichotomous definitions do not take into account heterogeneity of rural populations
Rural and Small Town (RST) /Canada	Population size, commuting patterns	Commuting/adjacency can be used as a proxy for access to service.
Organization for Economic Co-operation and Development (OECD)/Canada	Population density, adjacency to metropolitan centres	Statistics Canada uses this classification to identify three sub-groups of 'predominantly rural' populations
Office of Management and Budget (OMB)/U.S	Population size and proximity to metropolitan centres, commuting	Dichotomous definition

<b><i>Defining Rurality – Comparison of Measures, Factors Considered, Limitations and Applications</i></b>		
<b><i>Measure/Country</i></b>	<b><i>Factors considered</i></b>	<b><i>Limitations/Applications</i></b>
U.S Census Bureau/U.S	Population size and density	This is a straight dichotomous definition and therefore misses heterogeneity of rural populations
Rural and Urban Area Classification/U.K	Population density	6 types of rural populations are classified based on 'underlying settlement type' and 'context' – allows for a range of rurality
Rural-Urban Continuum Codes/U.S	Population size and adjacency to metropolitan areas	Relationship with metropolitan areas can be used as a proxy for access to resources
Rural-Urban Commuting Areas/U.S	Population size and work commuting flows	Identifies 33 classifications ranging from 'metropolitan area core' through small towns and rural areas with low commuting
Urban Influence Codes/U.S	Population size and adjacency to metropolitan areas	Adjacency is often used as a proxy for access therefore this type of definition can be useful for access to health care research
Metropolitan Influenced Zones/Canada	Population density and commuting flow	Allows for classification of four types of rural population based on strength of relationship with metropolitan areas
General Practitioner Rurality Index/Canada	6 variables are used to assign a degree of rurality to general practitioner services – remoteness from basic referral centre, remoteness from advanced referral centre,	Specific to general practitioner services. This is a continuous measure that allows for the calculating of a degree of rurality. This measure has been critiqued for being too complicated due to the high number of variables. A simplified version, GPRI-S uses only

<i>Defining Rurality – Comparison of Measures, Factors Considered, Limitations and Applications</i>		
<i>Measure/Country</i>	<i>Factors considered</i>	<i>Limitations/Applications</i>
	drawing population, number of general practitioners, number of specialists, and presence of an acute care hospital	drawing population, remoteness from closest advanced referral centre and remoteness from closest basic referral centre to assign rurality scores.
Rurality Index of Ontario (RIO)/Canada	10 variables are used to classify communities as more or less rural	Specific to health care, continuous measure of rurality captures differences between rural communities.
Multistakeholder Framework/Index of Rurality/Canada	Like to RIO, ten factors are used to assign a community a score – the higher the score, the more rural a community is deemed to be	As above, continuous measure allows for degrees of rurality Developed as a tool for health care planning however it has not been used to date.
Rural, Remote and Metropolitan Areas (RRMA)/Australia	Population density and distance to nearest urban centre	Includes ‘remote’ dimension
Accessibility/Remoteness Index of Australia (ARIA)/Australia	Population size and road distance to closest service centre	Continuous measure, includes accessibility dimension
Scottish Executive Urban Rural (SEUR) Classification/ Scotland	Population size and drive time to larger settlements	Includes accessibility dimension and also includes a ‘remote rural’ designation





## EQUITY IN ACCESSING CARE

Issues to consider with respect to rurality can be grouped into several areas: equity of access, rural needs, costs of rural services and funding. With respect to equity, there is evidence suggesting that rural deprivation may look different than urban deprivation and that this may lead to rural sub-populations being at higher risk of not receiving equitable health care.

In Canada, equity is defined as “equal access (or equal service) for equal need”<sup>76</sup>. Much of the literature on equity, in Canada and other jurisdictions, documents the shortage of specialists in rural areas<sup>77 78</sup> and describes the barriers that rural residents encounter when accessing specialist care which tends to be centralized in urban areas,<sup>79 80 81 82 83</sup> there are a number of studies which focus on

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<sup>76</sup> Clouter-Fisher, D., Penning, M. J., Zheng, C., & Druyts, E. F. The devil is in the details: trends in avoidable hospitalization rates by geography in British Columbia, 1990-2000. *BMC Health Research Services*. 2006; 6: 104.

<sup>77</sup> Pegram, R. W., Humphreys, J. S., & McLean, R. Meeting the needs of rural and remote Australians for specialist medical care: issues and options. *The Journal of the Royal College of Physicians of Edinburgh*, 2005 35:298-308.

<sup>78</sup> Ontario Rural Council Public Forum Report. Who cares for rural health? Found at: [www.torc.ca/downloads/July\\_2000\\_RuralHealthForumReport.rtf](http://www.torc.ca/downloads/July_2000_RuralHealthForumReport.rtf). Accessed November 27, 2007.

<sup>79</sup> Kelecher, H., & Ellis, J. Rural people utilising city hospitals: Issues for service provision. *Australian Journal of Rural Health*. 1996; 4: 144-150.

measuring access to primary care and emergency services. These include population/GP ratios, avoidable hospitalization rates, distance to service measures, as well as calculations of hospital catchment areas.

### ***Canada - Population/GP Ratios***

A widely used measure of access to primary health care is the population to physician ratio however, Pong & Pitblado point out that this ratio can be misleading if it ignores the geographical aspect.<sup>84</sup> The authors point out that the geographic unit used to construct the ratio is not necessarily reflective of health care delivery and consumption patterns – for example, geographic units are often selected based on data availability (i.e. census divisions, health regions, counties, provinces) but these represent artificial boundaries. The authors argue that if the geographic unit of analysis is too big (i.e. the province) it may miss the variability of physician

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<sup>80</sup> Davis, C., Girgis, A., Williams, P., & Beeney, L. Needs assessment of rural and remote women travelling to the city for breast cancer treatment. *Australian and New Zealand Journal of Public Health*. 1998; 22 (50): 525-527.

<sup>81</sup> Celaya, M. O., Rees, J. R., Gibson, J. J., Riddle, B. L., & Greenburg, E. R. Travel distance and season of diagnosis affect treatment choices for women with early-stage breast cancer in a predominantly rural population. *Cancer Causes Control*. 2006; 17: 851 – 856.

<sup>82</sup> Seidel, J. E., Beck, C. A., Pocobelli, G., Lemaire, J. B., Bugar, J. M., Quan, H., & Ghali, W. A. Location of residence associated with the likelihood of patient visit to the preoperative assessment clinic. *BMC Health Services Research*. 2006; 6: 13.

<sup>83</sup> Mungall, I. J. Trend towards centralisation of hospital services, and its effect on access to care for rural and remote communities in the UK. *Rural and Remote Health*. 2005; 5 (online): 390. Available from: <http://www.rrh.org.au>.

<sup>84</sup> Pong, R. W. & Pitblado, J. R. Don't take "geography" for granted! Some methodological issues in measuring geographic distribution of physicians. *Canadian Journal of Rural Medicine*. 2001; 6 (2): 103-112.

distribution however, if the geographic area is too small it may not capture the mobility of doctors and patients. For example, when using the provincial unit of analysis the population to GP ratio ranges from 769 to 1359 but when using the CD level, the ratio ranges from 392 to 8901. The authors conclude by stating that the population to GP ratio is useful for planning but researchers must critically evaluate their methodologies in terms of geography and its effects on access to care.

### ***Canada - Avoidable Hospitalization Rates and Access to Primary Care***

Analysis of avoidable hospitalization rates (AHR) is another measure used to evaluate population access to primary care. 'Avoidable hospitalizations' are based on the work of Weissman who used multiple selection criteria to identify 12 conditions for which hospitalization was considered avoidable given effective primary care - the 12 conditions are: ruptured appendix, asthma, cellulitis, congestive heart failure, diabetes, gangrene, hypokalemia, immunizable conditions, malignant hypertension, pneumonia, pyelonephritis and perforated or bleeding ulcer.<sup>85</sup> The expectation is that AHRs are lower when people are receiving appropriate primary care. Clouteir-Fisher et al. examine AHRs in relation to non-

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<sup>85</sup> Clouteir-Fisher, D., Penning, M. J., Zheng, C., & Druyts, E. F. The devil is in the details: trends in avoidable hospitalization rates by geography in British Columbia, 1990-2000. *BMC Health Research Services*. 2006; 6: 104.

avoidable and total hospitalizations rates across urban and rural geography<sup>86</sup> and find that AHR rates are 1.3 – 1.5 times higher in rural areas;<sup>87</sup> they argue that this reflects an ‘equity gap’ whereby rural residents have poorer access to primary care.

In Canada, avoidable hospitalization data is often used as a proxy measure to assess the difficulties that rural populations experience in accessing care. In Ontario, for example, the method – usually involving comparisons of health status and service utilization by postal code classification -- is extensively used as a proxy measure of access to care.

For example, the Ontario Joint Planning and Policy Committee links patient level data with population estimates based on postal code for their measurement of community-specific weighted cases. However, it is not always possible to achieve a one-to-one match between postal code and census sub-division and this uncertainty is greatest in rural and northern Ontario<sup>88</sup>. A second example, from the Arthritis Community Research and Evaluation Unit with the University Health Network,

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<sup>86</sup> Rural and urban areas in this study are defined based on geographical administrative health units in British Columbia where the population that falls under the jurisdiction of the province’s 11 Regional Health Boards is considered to be ‘urban’ while the population falling under the jurisdiction of the 7 Community Health Service Societies and the 34 Community Health Councils is considered to be ‘rural’.

<sup>87</sup> Clouter-Fisher, D., Penning, M. J., Zheng, C., & Druyts, E. F. The devil is in the details: trends in avoidable hospitalization rates by geography in British Columbia, 1990-2000. *BMC Health Research Services*. 2006; 6: 104.

<sup>88</sup> Ontario Joint Policy and Planning Committee. *Hospital Funding Report Using 2002/2003 Data*. 2004.

examined northern and remote, rural, urban and suburban differences in access to emergency care for arthritis and related conditions. This study used a general classification of urban or rural based on Canada Post's classification using the second digit of the residential postal code, with "0" designating a rural community.<sup>89</sup> Results confirmed that northern and remote locations had very high emergency room visit rates; rural locations, with no large cities, had rates close to the provincial average; and urban and suburban locations had the lowest rates observed. Northern and remote locations, moreover, had lower education levels, lower median household income, and less access to specialist services.

Closer examination of the analysis, however, reveals that the cluster methodology used in this study obscured much of the variation found among rural and remote populations in their access to care; the analysis classified Kenora and Rainy River Districts, for example, as "rural" and Thunder Bay District as "urban and suburban." The only districts identified as being "northern and remote" were Manitoulin, Timiskaming, Cochrane, and Haliburton.

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<sup>89</sup> Tyas, J., MacKay, C., Badley, E.M. *Arthritis and Related Conditions Within Ontario Emergency Departments*. 2006. Arthritis Community Research and Evaluation Unit (ACREU). Toronto Western Research Institute: Toronto, ON.

### ***United States - Emergency Service Availability***

The Expected Annual Emergency Miles per AMBulance (EXAMB) was developed by researchers in North Carolina as a county-level indicator of emergency service availability. EXAMB makes use of 4 factors (existing EMS resources, population health figures, geographic factors and availability of other health care resources) in order to produce a formula to calculate availability (see *Figure 12*).<sup>90</sup> When applying the EXAMB, researchers found that in Mississippi, South Carolina and Washington counties with higher levels of rurality (using Rural Urban Continuum Codes) had higher EXAMB scores.

*Figure 12*

<b><i>United States - EXAMB Formula: <math>365(t_d^*)m/a = 365(p^*/10,000)m/a</math></i></b>
<ul style="list-style-type: none"> <li>• Where 365 is the number of days in the year. Trips are estimated using 1 emergency response per 10,000 persons per day based on the adjusted county population. The components of the formula are calculated as follows:</li> <li>• The ambulance (a) - the number of ambulances per county obtained from state EMS agencies.</li> <li>• Estimates of EMS demand (<math>t_d^*</math>) - census-projected county level population with adjustments made for county demographics and health (<math>p^*</math>).</li> <li>• Estimated travel distance (m) - approximate round-trip mileage based on total land area in square miles assuming a circular shape.</li> <li>• State-specific population health and demographics adjustment (<math>p^*</math>) - county population multiplied by adjustment variables (percent of residents older than 65, percent poverty, motor vehicle crash mortality, cerebrovascular mortality, and physician availability).</li> </ul>

<sup>90</sup> Patterson, P. D., Probst, J. C., & Moore, C.G. Expected annual emergency miles per ambulance: An indicator for measuring availability of emergency medical services resources. *National Rural Health Association*. 2006; 22 (2): 102-111.

### ***United States - GIS Distance to Service***

Although the most-commonly used proxies for access to service in the health literature are provider to population ratios, Fortney, Rost & Warren argue that these assessments will miss variations in access based on people living in different locations within the aggregated area and that this measure does not account for people who use services that are not in their assigned area. The authors set out to compare different levels of spatial aggregation (county level, zip code level and street level) and different methods of calculating cost of space using GIS (Euclidean distance, road distance and travel time) with respect to accessibility and availability of health care providers.

The results show that the most accurate measure of accessibility is one-way travel time from the subject's street-level geocoded residential location to the street-level geocoded primary practice location and that the most accurate measure of availability is the number of street-level geocoded primary practice locations of providers within 30 minutes travel time of a subject's geocoded street-level address.<sup>91</sup>

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<sup>91</sup> Fortney, J., Rost, K. & Warren, J. Comparing alternative methods of measuring geographic access to health services. *Health Services & Outcomes Research Methodology*. 2000; 1 (2): 173-184

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### ***Canada – Underserved Areas***

From a health planning perspective, definitions that identify underserved or underserved areas also capture the difficulties that rural or isolated populations experience in accessing care. In Ontario, an agreement between the Ontario Ministry of Health and the Ontario Medical Association identifies communities of fewer than 10,000 people, greater than 80km from a regional centre of more than 50,000 people as “specified” or “isolated” communities.<sup>92</sup> Physicians in these communities then qualify for additional funding for continuing education, assistance with locum tenens and direct salaried funding.<sup>93</sup> This definition of rural was agreed upon in 1993 as part of the underserved areas program.<sup>94</sup>

In Ontario, the Underserved Area Program (UAP) provides benefits to communities that are designated as ‘underserved’. Communities can apply to the Ministry of Health and Long-term Care based on: health human resource information, community information, local health professional/population ratio, financial impact analysis, previous recruitment efforts, socioeconomic status of the area, local demand for services, availability of adequate housing and office facilities

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<sup>92</sup> Rourke, James. In search of a definition or “rural”. *Canadian Journal of Rural Medicine*. 1997; 2 (3): 113.

<sup>93</sup> Rourke, James. In search of a definition or “rural”. *Canadian Journal of Rural Medicine*. 1997; 2 (3): 113.

<sup>94</sup> Rourke, J. The politics of rural medical care: forces for change. *Ontario Medical Review*. 1994; 61 (8): 17-22

for the health care professional, additional health services needs and resources and, other factors (see *Figure 13*).<sup>95</sup>

Once a community is designated as 'underserved', it is eligible for certain benefits – it should be noted that Northern<sup>96</sup> and Southern Ontario are eligible for different benefits.<sup>97</sup> Northern Ontario communities, for example, are allocated physician recruitment funding and physicians who elect to practice there are eligible for reimbursement of relocation expenses, incentive grants, access to locum coverage for specialists and outreach physician care and backup for remote community health centres and nursing stations. Medical students and nurses also can receive reimbursement of tuition costs for return-of-service commitments in underserved communities.

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<sup>95</sup> Ontario Ministry of Health and Long-Term Care. Guidelines for designating communities experiencing long-standing difficulties attracting family physicians as underserved. Found at: [http://www.health.gov.on.ca/english/providers/program/uap/guidelines/genfamily\\_guidelines.html#1](http://www.health.gov.on.ca/english/providers/program/uap/guidelines/genfamily_guidelines.html#1). Accessed December 14, 2007.

<sup>96</sup> Northern Ontario is made up of the following districts: Algoma, Cochrane, Kenora, Manitoulin, Nipissing, Parry Sound, Rainy River, Sudbury, Thunder Bay and Timiskaming – all other counties are considered part of Southern Ontario.

<sup>97</sup> Ontario Ministry of Health and Long-Term Care. Guidelines for designating communities experiencing long-standing difficulties attracting family physicians as underserved. Found at: [http://www.health.gov.on.ca/english/providers/program/uap/guidelines/genfamily\\_guidelines.html#1](http://www.health.gov.on.ca/english/providers/program/uap/guidelines/genfamily_guidelines.html#1). Accessed December 14, 2007.

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Figure 13

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**Ontario – Underserviced Areas – Factors assessed in determining UAP designation**
**1. Health human resource information:**

- Number serving direct community
- Number serving catchment area for which that community is a part and number in each community in the catchment area
- Full-time or part-time status of each professional in direct and catchment communities
- Each professional in the direct or catchment community that is restricting or limiting his/her hours
- Type of practice (family or specialty)
- Other relevant data

**If health services are not available in the community then:**

- Where do patients go to obtain service
- How far do patients travel
- How much time is needed to reach a service provider
- How do patients travel
- Are there any travel conditions that may cause hardship
- How many health care providers are located in the community that patients travel to
- Are those physicians full-time or part-time
- Are those physicians restricting or limiting their practices
- Are those physicians able to accept new patients
- Type of practice

**2. Community information:**

- Direct population – size, density and mix (age and gender)
- Indirect/catchment population – includes population in surrounding area who make use of local health services

**3. Local health professional/population ratio****4. Financial impact analysis:**

- What additional resources (staffing, facilities, etc.) will be needed to support a physician who relocates to the community on a full-time basis and are those supports available

***Ontario – Underserviced Areas - Factors assessed in determining UAP designation*****5. Previous recruitment efforts:**

- A listing of recruitment activities carried out by the community, including reasons for lack of success

**6. Socio-economic status of the area:**

- Growing, stable or declining

**7. Local demand for service:**

- Health and social services that will make regular use of the health care professional's time beyond his/her own practice

**8. Availability of adequate housing and office facilities for the health care professional****9. Additional health service needs and resources:**

- For example, hospitals, nursing homes, ambulance, drug supplies, public health

**10. Other factors:**

- Community specific factors that affect the health needs of the community (i.e. large elderly population, high rates of occupational injury or auto accidents)

***United States – Medically Underserviced Area (MUA)***

The United States also uses underserviced area definitions to support health workforce development and ensure the viability of services in rural and isolated communities. These include designations of Health Professional Shortage Areas (HPSA) and Medical Underserviced Areas (MUA). Communities in the United States can be designated as Health Professional Shortage Areas based on provider to population ratio (for physicians the ratio is equal to or greater than 3,500 citizens : 1

GP), availability/accessibility of providers in adjacent areas and, high needs and/or insufficient capacity.<sup>98</sup> HPSAs can be designated for primary care physicians, dentists, and mental health providers and the federal government then provides programs and benefits such as placing practitioners via the National Health Services Corps, allowing foreign physicians to practice, and providing Medicare bonus payments based on HPSA designation.<sup>99</sup> The number of rural areas designated as HPSAs has increased over the last 20 years.

Medically-underserved Area (MUA) is a federal designation for an urban or rural area that does not have enough health care resources to meet the needs of its population. The designation is based on an index of medical under service which includes 4 factors - primary care physician-to-population ratio, infant mortality, percentage of population 65 and over, and percentage of population with incomes below the federal poverty level.<sup>100</sup> The MUA definition is primarily used to assess inequalities in access to care, for example, in rural areas of Southeastern States.<sup>101</sup>

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<sup>98</sup> National Health Service Corps. Health professional shortage areas. Found at: <ftp://ftp.hrsa.gov/nhsc/factsheets/HPSA.pdf>. Accessed December 13, 2007.

<sup>99</sup> Ricketts, T. C. Workforce issues in rural areas: A focus on policy equity. *American Journal of Public Health*. 2005; 95 (1): 42-48.

<sup>100</sup> Ricketts, T. C., Goldsmith, L. J., Holmes, G. M., Randolph, R., Lees, R., Taylor, D. H., & Ostermann, J. Designating places and populations as medically underserved: A proposal for a new approach. *Journal of Health Care for the Poor and Underserved*. 2007; 18: 567-589.

<sup>101</sup> Pathman DE, Fowler-Brown A, Corbie-Smith G. Differences in access to outpatient medical care for black and white adults in the rural South. *Med Care*. 2006; 44(5):429-38.

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### ***United Kingdom - Drive Time to Hospital Care***

A study from the U.K. compared straight-line distance and drive-time (based on road network travel speeds) to the nearest general practice and to the nearest acute hospital. Results demonstrated that drive time is a more accurate measure of access for peripheral and rural areas, where difficult terrain, weather, and a dispersed road network may increase the time required to access care.<sup>102</sup>

Christie et al. have applied this definition of drive times to model access to tertiary hospitals in Wales. The authors model changes to hospital configuration and show that access, as measured by actual drive time to care, varies across different population subgroups. They found that rural populations from socioeconomically deprived communities, and areas with a significant number of resides aged 75 years or older, had the most difficulty accessing care when actual drive times were taken into account.<sup>103</sup> They suggested, for most planning purposes, local residents' perceptions of drive time are adequate.<sup>104</sup>

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<sup>102</sup> Jordan, H., Roderick, P., Martin, D. & Barnett, S. Distance, rurality and the need for care: access to health services in South West England. *International Journal of Health and Geographics*. 2004; 3: 21.

<sup>103</sup> Christie, S. & Fone, D. Equity of access to tertiary hospitals in Wales: a travel time analysis. *Journal of Public Health Medicine*. 2003; 25 (4): 344 – 350.

<sup>104</sup> Fone, D.L., Christie, S., Lester N. Comparison of perceived and modelled geographical access to accident and emergency departments: a cross-sectional analysis from the Caerphilly Health and Social Needs Study. *International J Health Geography*. 2006; 13;5:16.

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### ***Canada – Travel Time to Emergency Care***

A similar approach has been used in Canada to compare straight-line and actual travel time using road networks, approaches to determine whether standards of emergency care access are being met. This approach has been employed in British Columbia's Northern Health Authority to examine rural and remote communities' access to emergency care.<sup>105</sup> The authors highlight the fact that straight-line estimations of access do not take into account limited road coverage, variable road conditions, climate and topographic barriers that are more prevalent in rural areas.

Using the straight line approach, 6.4% of the population lives farther than 60 minutes from emergency care but that number increased to 10.4% when using the travel time approach. According to the authors, this means that one in ten residents in this region lives in an area which fails to meet the B.C. Ministry of Health standard of emergency care access, which requires that 98% of a regional health authority's population reside within 60 minutes travel time from home to an emergency treatment site.

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<sup>105</sup> McGregor, J., Hanlon, N., Emmons, S., Voaklander, D. & Kelly, K. If all ambulances could fly: putting provincial standards of emergency care access to the test in Northern British Columbia. *Canadian Journal of Rural Medicine*. 2005; 10 (3): 163 – 168.

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### ***Canada – Rural Hospital Catchment Areas***

Several Canadian studies have used various approaches to modelling rural hospital catchment areas as a means of evaluating access to care. In a study on rural surgical services in Alberta and Northern Ontario, Ellehoj et al. evaluated access to services by modelling hospital catchment areas, which the authors refer to as General Hospital Districts (GHDs). Catchment areas are modelled by amalgamating the enumeration districts surrounding a facility based on travel distance (on roads), postal code assignments, and Voronoi polygons. The methodology involves first using Voronoi polygons to create regions surrounding each facility based on straight-line distance to form the first draft of GHDs. Then drive times and utilization data (based on postal code admission data) are used to refine the boundaries of each GHD.<sup>106</sup>

Schumurman et al. used a British Columbia example to test an alternative methodology for modelling hospital catchment areas around rural hospitals based on travel time.<sup>107</sup> The authors argue that using GIS network analysis can better represent access to hospital based health services in rural and remote communities.

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<sup>106</sup> Ellehoj, E., Tepper, J., Barrett, B. & Iglesias, S. Research methodology for the investigation of rural surgical services. *Canadian Journal of Rural Medicine*. 2006; 11 (3): 187-194.

<sup>107</sup> Schumurman, N., Fiedler, R., Grzybowski, S., Grund, D. Defining rational hospital catchments for non-urban areas based on travel-time. *International Journal of Health Geographics*. 2006; 5: 43.



In addition, it allows for access to different “baskets of service” to be assessed and to observe changes in access when hospitals and/or services are removed or added. In this study, vector based network analysis software is used to link populations (at the block census level) to health care services in the Interior Health Authority (IHA) in southern British Columbia. Four different scenarios are modelled: population within 1 hour travel time of any hospital; population within 1 hour travel time of any hospital offering critical care and surgical care; population within 1 hour of any hospital with obstetrician resident; removal of obstetrical service from one hospital and calculation of the population affected by the closure.

This allowed for the examination of access to specific services rather than to a hospital in general. The authors found that when considering access to any hospital, the straight-line approach finds a slightly higher proportion of the population within 1 hour of service whereas the reverse happens when examining specific scenarios. Thus, travel time is a more sensitive measure than straight-line distance in that it identifies populations along transportation routes that can be reasonably expected to access services within a prescribed time (e.g., some routes will involve higher speed limits so people can reach further distances within one hour while other routes will be less direct and have lower speed limits). Modeling closure of

one hospital resulted in 15% of the population falling outside the catchment area of any hospital.

### ***United States – Hospital Commuting Areas and Health Service Areas***

Makuc et al. discuss the concept of health care commuting areas (HCCAs) which were created in the 1970's to identify service areas for the entire United States. HCCAs were defined by grouping counties based on national natality data, national mortality data and census data on commuting for work. The authors note that these areas appeared to perform well as service areas but are based on very outdated data. As a result, they suggest 'health service areas' to define one or more counties that are relatively self-contained with respect to the provision of routine hospital care.<sup>108</sup> The authors make use of Medicare data on short-stay hospital stays to analyze flow of hospital stays between counties in order to group all U.S. counties into 802 'health service areas'.

### ***Ireland – Multidimensional Rural Health Authority Catchment Areas***

Shortt et al. note that application of different catchment methodologies to a common GP service population has the potential to produce different results – as much as a 12-fold difference between the size of catchment areas was noted by

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<sup>108</sup> Makuc, D. M., Haglund, B., Ingram, D. D., Kleinman, J. C., & Feldman, J. J. The use of health service areas for measuring provider availability. *The Journal of Rural Health*. 1991; 7 (4 – Supplemental): 347- 356.

conflicting methodologies.<sup>109</sup> In response to this problem the authors propose a multidimensional regional analytic technique whereby catchment areas for a rural health authority in Northern Ireland are calculated using eight different methodologies (75% and 85% percentage catchments, market share catchments, nearest feature catchments using straight-line distance, nearest feature catchments using travel time, patient to surgery mean distance based on 10 mile radius and, perceived catchments drawn by GP's). The next step involves producing a matrix representing the synthesis of all 8 methodologies and then, using the European Regionalization Algorithm and setting parameters around self-containment and patient population size, a series of tightly defined, highly compact, 'optimal' GP catchment areas are created.

### ***United States - MSU Rurality Index***

The MSU Rurality Index was developed as a research tool which can provide a locally normed resident-based measure of degree of rurality.<sup>110</sup> The MSU uses an equation made up of two variables, population of the county of residence (as reported in the census) and distance to emergency service (indicated by self-report

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<sup>109</sup> Shortt, N. K., Moore, A., Coombes, M., & Wymer, C. Defining regions for locality health care planning: a multidimensional approach. *Social Science and Medicine*. 2005; 60: 2715-2727.

<sup>110</sup> Weinert, C., & Boik, R. J. MSU Rurality Index: development and evaluation. *Research in Nursing and Health*. 1995; 18: 453 - 464.

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of study participants) in order to determine a degree of rurality for each individual in a study. Weinert et al. found that the tool has strong validity and reliability<sup>111</sup> and it has been used to study the use of complementary therapy<sup>112</sup> and identify factors that influence the use of cardiac rehabilitative services by rural populations.<sup>113</sup>

### ***New Zealand – Multiple Measures of Access to GP Services***

New Zealand uses three different methods of measuring access to general practitioner services – population/GP ratio, least cost path analysis (LPCA) and an allocation method which considers the capacity constraints of GP's.<sup>114</sup> Brabyn & Barnett calculate a least cost path analysis algorithm in order to determine the shortest travel distance and time between each census megablock and the closest GP practice. An allocation analysis is used to assign all potential patients to the closest GP until that practice is full and then allocate patients to the next closest GP. In this study, a 30 minute travel time threshold is set in order to capture poor geographic

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<sup>111</sup> Weinert, C., & Boik, R. J. MSU Rurality Index: development and evaluation. *Research in Nursing and Health*. 1995; 18: 453 – 464.

<sup>112</sup> Shreffler-Grant, J., Weinert, C., Nichols, E. & Bette, I. Complementary therapy use among older rural Americans. *Public Health Nursing*. 2005; 22 (4): 323-331.

<sup>113</sup> Johnson, J. E., Weinert, C., & Richardson, J. K. Rural residents' use of cardiac rehabilitation programs. *Public Health Nursing*. 1998; 15 (4): 288-296.

<sup>114</sup> Brabyn, L. & Barnett, R. Population need and geographical access to general practitioners in rural New Zealand. *The New Zealand Medical Journal*. 2004; 117 (1199): U996.

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access to GP's. This study found that LCPA and allocation provide a better picture of access to GP services especially in rural populations.

### ***New Zealand - GIS Community Resource Access Index***

The community resource access index was developed in New Zealand and uses GIS software to measure the travel time along road networks (0-10 minutes, 10-30 minutes, 30-60 minutes and, 60-245 minutes) from each census meshblock (smallest unit of dissemination of New Zealand census data, representing approximately 100 people) to 5 key local community resources that have been tied to health (recreational amenities, shopping facilities, educational facilities, health facilities and marae - a Maori meeting place).<sup>115</sup> Meshblocks are assigned to quintiles according to their level of access to each domain. In this way, the fifth of meshblocks with the least travel time between the population weighted centroid and the various resources receive a score of 1 (high accessibility) and the fifth of meshblocks with the longest travel time receive a score of 5 (low accessibility). Quintiles thus provide a relative measure of the extent to which areas are resource rich or poor. The study finds clear differences in accessibility between rural and urban neighbourhoods with travel times generally longer in rural neighbourhoods.

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<sup>115</sup> Pearce, J. Witten, K. & Bartie, P. Neighbourhoods and health: a GIS approach to measuring community resource accessibility. *Journal of Epidemiology and Community Health*. 2006; 60: 389-395.

## ASSESSING RURAL NEEDS & COSTS

The literature on assessing health need in rural populations and the costs of providing health services in rural communities draws attention to the limitations of using usual measures of mortality and morbidity to assess the health and need among rural populations and underlines the need for more complex measurements of rural deprivation.

## MEASURING RURAL DEPRIVATION

Haynes & Gale argue that deprived people with poor health in rural areas are 'hidden by favourable averages of health and deprivation measures' (p. 275).<sup>116</sup> The sections below discuss the limitations of conventional mortality and morbidity measures, using three examples from the Canadian literature, and outline the challenges inherent in developing deprivation indices, using examples from the United Kingdom.

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<sup>116</sup> Haynes, R., & Gale, S. Deprivation and poor health in rural areas: inequalities hidden by averages. *Health and Place*. 2000; 6: 275-285.

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### ***Canada – Rural and Northern Mortality Ratios***

Bedard et al. discuss the implications of using standard mortality ratios (SMR) for capitation funding in Ontario.<sup>117</sup> The authors compare funding allocations to Ontario counties that would result from several formulae – straight per capita, age and gender adjusted, simple linear SMR, and non-linear SMR and find that allocations depend heavily on which measure is chosen. For example, using a simple linear SMR adjustment would allocate more funds to northern and less urban counties due to higher death rates than would per capita or age and gender adjusted models, whereas using utilization rates in order to adjust funding has funding allocations flowing to regions with many hospitals and doctors, not necessarily to regions with higher relative need.

In a related article, the authors use Canadian data and find that regional SMR differs depending on the age cut off used (under 65 vs. under 75), and the period over which SMR's are averaged (1, 2, 3, or 4 years).<sup>118</sup> They conclude that “until more evidence is available to direct SMR index selection or demonstrably better need indicators are identified, these formulae should be regarded as quantitative

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<sup>117</sup>Bedard, K., Dorland, J., Gregory, A. W., & Roberts, J. Needs-based health care funding: implications for resource distribution in Ontario. *Canadian Journal of Economics*. 2000; 33 (4): 981-1008.

<sup>118</sup>Bedard, K., Dorland, J., Gregory, A. W., & Rosenberg, M. Standardized mortality ratios and Canadian health care funding. *Canadian Public Policy*. 1999; 25 (1): 47-64.

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aids in the budgeting process, to augment but not replace the qualitative judgements of decision makers” (p. 48).

### ***Canada - Assessing Neighbourhood Health Inequalities***

Although many analyses of urban-rural disparities in health are based on general comparisons of the health of rural and urban populations, Pamplon et al. argue that conventional methods of assessing rural-urban health needs can mask the significant health inequalities among rural populations at the local level.<sup>119 120</sup> In their study of the Quebec rural area of Portneuf (population 45,000), the authors divide the region into eight ‘neighbourhoods’ (four of these were associated with small towns and the other four were associated with the hinterlands of each of the four small towns)<sup>121</sup> and then compare these neighbourhood units with each other and the county as a whole, with respect to health (mortality, hospitalization, and

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<sup>119</sup> Pamplon, R., Lebel, A. & Hamel, D. Exploring rural health inequalities at the local scale: The case of Portneuf, Quebec. *Canadian Journal of Public Health*. 2007; 98 (2): 143 - 148.

<sup>120</sup> Lebel, A., Pamplon, R. & Villeneuve, P.Y. A multi-perspective approach for defining neighbourhood units in the context of a study on health inequalities in the Quebec City region. *International Journal of Health Geographics*. 2007; 5; 6: 27.

<sup>121</sup> In order to identify 8 ‘neighbourhoods’ the authors went through a three-step process: First, all subdivisions used by local administrations and institutions over the last 40 years were mapped using a geographic information system (GIS) and each subdivision was then weighted by its length and period of use and by its spatial accuracy. Next, the major socio-economic areas drawn from the census were mapped. Finally, a focus group of 8 community stakeholders from different fields validated and complimented the boundaries derived from the two maps.



disability). The results of statistical analysis demonstrated that there are indeed health disparities between 'neighbourhoods'.

For example, residents in the small town of Pont-Rouge have the highest life and disability-free life expectancies at birth and the lowest premature mortality and disability rates, whereas residents of the Donnacona hinterland and the St-Marc-des-Carriers hinterland are the unhealthiest. The authors argue that it is important to look at health inequalities at the local level in order to ensure health equity to all residents within rural populations not just rural populations as a whole when compared to urban populations.

### ***United Kingdom – Assessing Local Health Needs***

Considering the difficulty of applying usual measures of health need within a rural context, there has been movement towards developing local or area-level methodologies to assess both health status and health needs. Most of the research on rural health and deprivation, embedded in the more general literature on the relationship between health and place, comes from the United Kingdom, where several indexes of deprivation have been developed to explore small-area variations in health status, at the census tract, electoral ward, rural district or practice level.<sup>122</sup>

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<sup>122</sup> Locker, D. Deprivation and oral health: a review. *Community Dentistry and Oral Epidemiology*. 2000; 28: 161-169.

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The most widely used deprivation indices are: the Townsend Index (1988), which uses household-level census data on unemployment, car ownership, home ownership and overcrowding;<sup>123</sup> the Carstairs and Morris Index (1991), which uses four similar census-based measures, including male unemployment, car ownership, semi-skilled or unskilled occupations, and overcrowding, split by postcode to permit small-area analyses;<sup>124</sup> and the Jarman-8 and Jarman-10 Index, which calculate social deprivation using census data on the percentage of elderly living alone, children under age five, people living in one-parent families, unskilled workers, unemployment, overcrowding, household moving, and ethnic populations,<sup>125</sup> with the 10-item index adding two additional variables capturing the proportion of the population over 65 years of age and households lacking basic amenities.<sup>126</sup> These indices also have been widely used in England, Scotland and Wales, for example, to predict population needs for mental health,<sup>127</sup> or dental

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<sup>123</sup> Townsend, P., Philmore, P. and A. Beattie. *Deprivation and Health Inequality and the North*. London: Croom Helm; 1988.

<sup>124</sup> Carstairs, V. & Morris, R. Which deprivation? A comparison of selected deprivation indexes. *Journal of Public Health Medicine*; 1991; 13(4): 318-326.

<sup>125</sup> Jarman, B. Underprivileged areas: validation and distribution of scores. *British Medical Journal*. 1984; 289(6458): 1587-1592.

<sup>126</sup> Jarman, B. Hirsch, S.R., & White, P. (1992). Statistical models to predict psychiatric morbidity. In G. Thornicroft, C. Brewin, & J. Wing, (Eds.). *Measuring Mental Health Needs* (pp. 62-80). London: Royal College of Psychiatrists.

<sup>127</sup> Aoun, S., Pennebaker, D. & Wood, C. Assessing population need for mental health care: a review of approaches and predictors. *Mental Health Services Research*. 2004; 6(1): 33-46.

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care,<sup>128</sup> and, at the policy level, to assess quality of care outcomes at the general practice level.<sup>129</sup>

### ***Limitations of Existing Measures of Need***

Gibson et al. provide a summary of critiques levelled against existing proxies of need (mortality rates, deprivation and past utilization).<sup>130</sup> They point out that each of these measures do not adequately capture health needs in rural areas: Mortality fails to reflect the full extent of non-fatal morbidity for small rural practices where the number of deaths that occur tend to be low. Deprivation does not distinguish between, how actual health needs vary with social deprivation and how deprivation influences use of health services relative to need. And utilization does not address whether 'what *is* provides an adequate guide of what *ought* to be' (p. 49).

As a result of these critiques, the authors argue for using morbidity rather than mortality data in order to construct measures of actual health service need at the local population level. They suggest indicative prevalence (the expected

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<sup>128</sup> Locker, D. Deprivation and oral health: a review. *Community Dentistry and Oral Epidemiology*. 2000; 28: 161-169

<sup>129</sup> Saxena, S., Car, J., Eldred, D., Soljak, M., & Majeed, A. Practice size, caseload, deprivation and quality of care of patients with coronary heart disease, hypertension and stroke in primary care: national cross-sectional study. *BMC Health Services Research*. 2007; 7:96.

<sup>130</sup> Gibson, A., Asthana, S., Brigham, P., Moon, G. & Dicker, J. Geographies of need and the new NHS: methodological issues in the definition and measurement of the health needs of local populations. *Health & Place*. 2002; 8: 47-60.

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morbidity in a given population based on age, sex and socioeconomic status) provides a more accurate estimate of need in different populations.<sup>131</sup> In a related study, Asthana et al. find that “using a morbidity-based model would result in a significant shift in hospital resources away from deprived areas and toward areas with older demographic profiles and toward rural areas” (p. 539).<sup>132</sup>

As well, Farmer, Baird and Inverson argue that existing indices of deprivation do not adequately capture rural deprivation. For example, socioeconomic variables that are used as proxies for low income in urban areas may not be appropriate in rural areas (i.e. car ownership may be an appropriate indicator of low income status in urban areas where car ownership is a luxury; in rural areas, however, car ownership a necessity, rather than a luxury, because no public transportation is available). Another issue is that usual measures of deprivation do not capture rural communities’ restricted access and limited choice of health services.<sup>133</sup>

Newer measures, such as the Scottish Index of Multiple Deprivation,<sup>134</sup> (IMD2000), for example, attempt to capture relative deprivation in rural areas, by

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<sup>132</sup> Asthana, S., Gibson, A., Graham, M., Dicker, J. & Brigham, P. The pursuit of equity in NHS resource allocation: Should morbidity replace utilisation as the basis for setting health care capitations? *Social Science & Medicine*. 2004; 58: 539-551.

<sup>133</sup> Farmer, J. C., Baird, A. G., & Iverson, L. Rural deprivation: Reflecting reality. *British Journal of General Practice*. 2001; 51: 486-491.

<sup>134</sup> Scottish Index of Multiple Deprivation. Overview. Found at: [www.scotland.gov.uk/stats/simd2004/](http://www.scotland.gov.uk/stats/simd2004/). Accessed November 10, 2007.

including geographical measures of access to key services, such as food stores, general practitioner services, elementary schools, and post offices. While the newer indices provide a more exact measure of urban-rural differences, as with rurality indices in general, how deprivation indices are constructed remains an impediment to distinguishing among rural communities with better or poorer access to services.<sup>135</sup>

## ASSESSING RURAL COSTS

There is evidence that the costs of providing healthcare services in rural communities tends to be higher than in urban areas.<sup>136</sup> Several explanations have been offered for cost differentials. Higher costs in rural areas may be due to population differences, as measured by the severity of illness and longer lengths of stay. Higher rural costs are also due to the fact that small hospitals cannot achieve economies of scale, and there are often costs associated in providing outreach nursing or physician care (i.e. travel time, equipment/infrastructure costs).

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<sup>135</sup> Niggebrugge, A., Haynes, R., Jones, A., Lovett, A., & Harvey, I. The index of multiple deprivation 2000 access domain: a useful indicator of public health? *Social Science and Medicine*. 2005;60(12): 2743-2753.

<sup>136</sup> Watt, I. S. & Sheldon, T. A. Rurality and resource allocation in the UK. *Health Policy*. 1993; 26: 19-27.

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Rural clients also incur additional personal costs when they must travel to access centralized health services, such as specialty care, and, last but not least, there are also additional health human resources costs associated with the difficulties of recruiting and retaining health care providers in rural and isolated communities.<sup>137</sup>

Literature on assessing rural costs of care, from Australia, looks at urban-rural hospital costs variations with respect to Diagnostic Related Group Costs (DRGs). These analyses of administrative hospital utilization and cost data compare the diagnostic mix, severity and administrative differences for urban and rural hospitals.

Studies focused on costs of accessing care for rural patients typically quantify patient costs by looking at 'societal costs' that include productivity costs calculated by time away from work/lost wages including attendant costs, as well as transportation/accommodation costs to patients who need to travel.<sup>138</sup> Other assessments compare costs for rural clients accessing care, versus the costs to service providers of delivering rural services via outreach or telemedicine.<sup>139</sup> As noted in

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<sup>137</sup> Asthana, S. & Halliday, J. What can rural agencies do to address the additional costs of rural services? A typology of rural service innovation. *Health and Social Care in the Community*. 2004; 12 (6): 457-465.

<sup>138</sup> Roberts, G., Dunscombe, P. & Samant, R. Geographic delivery models for radiotherapy services. *Radiation Oncology*. 2002; 46: 290-294.

<sup>139</sup> Scuffman, P. & Steed, M.. An economic evaluation of the Highlands and Islands teledentistry project. *Journal of Telemedicine and Telecare*. 2002; 8(3), 165-177.

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the examples discussed below, in general, the cost of providing outreach is higher than centralized service when only the costs to providers are considered, however when the costs to patients are considered then outreach and fully decentralized models are cheaper.<sup>140</sup>

Assessment of the additional costs incurred by professionals delivering outreach care to rural and remote locations, focus on travel time and caseload effects. The examples, listed below, demonstrate considerable diversity in the methods used to calculate and adjust funding to accommodate the greater costs of providing rural care.

### ***Australia – Length of Stay Variations***

Several studies from Australia use length of stay (LOS) variations within-DRGs as a proxy for cost. One study compared the determinants of LOS between rural and urban hospitals<sup>141</sup>. The authors use Cox regression analysis to show that rural Aboriginals have a higher risk of prolonged hospitalization and that rural patients in general tend to have longer LOS than metropolitan patients (authors note that many times rural patients are transferred to metropolitan hospitals due to the

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<sup>140</sup> Dunscombe, P. & Roberts, G. Radiotherapy service delivery models for a dispersed patient population. *Clinical Oncology*. 2001; 13: 29-37.

<sup>141</sup> Lee, A. H. & Codde, J. Determinants of length of stay: Implications on differential funding for rural and metropolitan hospitals. *Australian Health Review*. 2000; 23 (4): 126-133.

complexity of their case, therefore overall LOS for rural hospitals is less than that for metropolitan hospitals even though rural patients are often sicker). The authors argue that these differences in LOS should be used to develop a DRG payment adjustment.

Beaver et al. focus on with-in DRG cost variation due to severity of illness and socio-economic characteristics of patients (rural vs. urban residence is one factor used) and make the case for funding adjustments.<sup>142</sup> In this study the authors use stepwise linear regression to produce a DRG payment adjustment index based on 3 binary variables: Aborigine vs. non-Aborigine, rural vs. urban usual place of residence of the patient and, hospital type (teaching vs. other). The authors select these variables based on evidence from other studies that suggest that: Aboriginal admitted patients are sicker than non-Aboriginal admitted patients, patients from rural areas are sicker than those from urban areas and, that teaching hospitals tend to attract patients with more complicated problems and tend to perform more complicated and therefore more costly treatments.

Russell-Weisz & Hindle look at high-LOS (this is defined as a LOS that is 3x longer than the average for the DRG in question) patients in the East Pilbara Health

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<sup>142</sup> Beaver, C., Zhao, Y., McDermid, S., & Hindle, D. Casemix-based funding of Northern Territory public hospitals: Adjusting for severity and socio-economic variations. *Health Economics*. 1998; 7: 53-61.

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Service in rural Australia and find that Aboriginal patients are 3 times more likely to be admitted and 2 times more likely to become high-LOS patients than non-Aboriginal patients and that 81% of high-LOS patients were from 'remote' (live more than 100km from an acute care hospital) communities<sup>143</sup>. The authors argue that Aboriginal and rural populations in general are often sicker at admission due to waiting longer to access service and that these patients are also more difficult to discharge quickly due to transportation difficulties, doctors' concern about patients completing treatment on an outpatient basis and, risks associated with unpredicted deterioration after patients return to a remote and isolated community. As a result, the authors conclude, hospitals serving remote communities, especially those with a high proportion of Aboriginals, will incur higher costs per admitted patient episode than would be suggested by DRG classification alone.<sup>144</sup>

### ***Australia – Population Dispersion Cost Factors***

In New South Wales, the resource distribution formula 'dispersion cost factor' looks at how spatial distribution of the population imposes costs in service delivery. A relative dispersion index is calculated for each Area Health Service (this

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<sup>143</sup> Russell-Weisz, D. & Hindle, D. High length-of-stay outliers under case mix funding of a remote rural community with a high proportion of Aboriginal patients. *Australian Health Review*. 2000; 23 (2): 47-61.

<sup>144</sup> Russell-Weisz, D. & Hindle, D. High length-of-stay outliers under case mix funding of a remote rural community with a high proportion of Aboriginal patients. *Australian Health Review*. 2000; 23 (2): 47-61.

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dispersion index is based on two calculations – the distance from the nearest major referral hospital and the distance from the nearest capital city). Analysis showed that as the degree of relative dispersion increased so did the per capita costs – this relationship is used to calculate a cost adjustment for each Area Health Service.<sup>145</sup>

### ***Canada – Societal Costs of Accessing Specialist Care***

A Canadian study of radiotherapy services uses a ‘societal-cost model’ (see *Figure 14*) to assess costs; this model is made up of three components – institutional costs, productivity costs and, geographical costs.<sup>146</sup> The authors find that the traditional centralized model for radiotherapy service delivery is the most expensive from both a societal and patient perspectives. A similar analysis of travel costs for pediatric consultation in Ontario found that patients estimated savings of \$1,318 in travel and associated costs when using telemedicine as opposed to traveling to the tertiary care children’s hospital.<sup>147</sup>

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<sup>145</sup> Health Economics Research Unit, University of Aberdeen. *Geographic differences in the costs of delivering health services in Scotland*. Found at: <http://www.nrac.scot.nhs.uk/docs/consultation/Technical%20Report%20E%20-%20Review%20of%20Excess%20Costs.pdf>. Accessed November 26, 2007.

<sup>146</sup> Roberts, G., Dunscombe, P. & Samant, R. Geographic delivery models for radiotherapy services. *Radiation Oncology*. 2002; 46: 290-294.

<sup>147</sup> Dick, P. T., Filler, R. & Pavan, A. Participant satisfaction and comfort with multidisciplinary pediatric telemedicine consultations. *Journal of Pediatric Surgery*. 1999; 34 (1): 137-142.

Figure 14

<i>Canada - Societal-cost model applied to Radiotherapy</i>
<p><b>Institutional costs:</b> the sum of the costs of those activities constituting a course of treatment (based on workload, hospital finances, staffing levels)</p> <p><b>Productivity costs:</b> calculated by the hourly income of the patient multiplied by the time spent traveling, waiting and receiving treatment, the attendants' costs (calculated in the same way) are also added</p> <p><b>Geographical costs:</b> made up of transportation costs (calculated by 41.5c/km), \$50/night accommodation cost for patients who must stay overnight and, \$40 per diem.</p>

### *Canada – Societal Costs of Lack of Supportive Care*

Literature from Canada discusses the fact that a lack of community-based resources for the aged results in rural elders being institutionalized in long term care facilities rather than remaining in their homes.<sup>148</sup> A study done by the Canadian Home Care Association identified similar issues to these, indicating that inadequate home care or community-based supportive care resources in rural locations leads to increased costs, to society and families because patients must seek acute care or residential facilities elsewhere.<sup>149</sup>

<sup>148</sup> Coburn, A. & Bolda, E. J. Rural elders and long-term care. *Western Journal of Medicine*. 2001; 174: 209-213.

<sup>149</sup> Canadian Home Care Association (2006). The delivery of home care services in rural and remote communities in Canada: Identifying service gaps and examining innovative practice. Found at: <http://www.cdnhomecare.ca/media.php?mid=1166>. Accessed December 11, 2007.

### ***Australia – Personal Costs of Accessing Local vs. Metropolitan Care***

Studies from Australia find that when accessing surgical specialists, rural and remote residents save approximately AU\$1077 per consult when using a local rather than a metropolitan service.<sup>150</sup> In this study costs to patients was calculated based on travel time, distance travelled, lost income, provision of an escort and waiting time. Travel costs specifically were determined using the mean return distance traveled in km multiplied by vehicle running costs and results showed that patients faced a mean round trip of 1215 km when accessing metropolitan services as opposed to 67.8 km when using a visiting service.

### ***Scotland – Personal and Systemic Costs of Screening Care***

A Scottish study looking at uptake of screening for aortic aneurysm in remote areas found that the highest personal costs as well as the highest NHS screening costs were observed in very remote rural areas (based on settlement size and drive times).<sup>151</sup> Personal costs were calculated based on travel, companion travel, work or activity foregoing and care of dependents, and NHS costs were calculated based on travel time and costs incurred by staff.

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<sup>150</sup> Rankin, S. L., Hughes-Anderson, W., House, A. K., Heath, D. I., Aitkin, R. J., & House, J. Costs of accessing surgical specialists by rural and remote residents. *ANZ Journal of Surgery*. 2001; 71: 544-547.

<sup>151</sup> Lindsay, S. M., Duncan, J. L., Cairns, J., & Godden, D. J. Geography, private costs and uptake of screening for abdominal aortic aneurysm in a remote rural area. *BMC Public Health*. 2006; 6: 80.

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### ***Ireland – Travel Time for Home Visiting***

One study from Northern Ireland develops a model for estimating travel times of health and social service professionals who provide home visiting services. The authors use a formula which takes into account the total distance travelled by professionals in each of the four health boards into which the province is divided. The authors note that the travel times and unproductive time totals were highest for the more rural boards and that this modelling led to decisions by the DHSS in Northern Ireland concerning the annual financial compensations required by boards for their relative rurality.<sup>152</sup>

### ***Scotland – Remoteness Adjustment for Community Care***

In Scotland, a remoteness adjustment for community services takes into account the additional travel time<sup>153</sup> associated with service delivery by nurses and health visitors<sup>154</sup>. This adjustment is based on a model developed by the National Economic Research Associates (NERA) which estimates the additional costs of providing district nursing in rural areas (see *Figure 15*) – NERA carried out an

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<sup>152</sup> Hindle, T., Hindle, A., & Spollen, M. Resource allocation for home-based health and social care services in areas having differential population density levels: A case study in Northern Ireland. *Health Services Management Research*. 2000; 13: 164-169.

<sup>153</sup> Travel time is based on straight-line distance between postcode sectors

<sup>154</sup> Scottish Executive. *Fair shares for all technical report*. Found at: <http://www.scotland.gov.uk/library2/doc02/fsat-01.htm>. Accessed November 12, 2007.

extensive literature review as well as a series of field visits to identify the potential influences on cost and then focussed on two factors (travel costs and unproductive time) based on several assumptions.<sup>155</sup> These assumptions are used to generate an index of relative costs of providing nursing visits per contact, with Scotland costs overall equal to 100 and health boards with an index value greater than 100, having average costs and with an index value less than 100, lower than average costs.

*Figure 15*

***Scotland - NERA model for estimating additional costs for rural district nurses***

**This model is based on the following assumptions:**

- The length of the district nurse working day is 7.5 hours (450 minutes). Of this, 90 minutes are spent in the nursing base/at the GP practice, leaving 360 minutes each day for home visits.
- The length of the health visitor working day is also 450 minutes. It was assumed (based on observations during site visits) that 50% of the day (225 minutes) is spent making home visits and the other 50% spent in clinic work. Thus the 'whole time equivalent' health visitor refers to 225 minutes for the purposes of the travel index.
- In rural areas it is assumed that the average time spent with each patient is 34 minutes. This is made up of 29 minutes of direct contact and 5 minutes for parking and getting in to see the patient. In urban areas this time is assumed to be 5 minutes higher (39 minutes) to account for travel between patients. Travel to patients in rural areas is measured separately.
- The average journey speed is assumed to be 20m/hr.
- The travel patterns of district nurses and health visitors are based on population distribution - the population of Scotland was broken down into those living within or outside clusters of more than 500 people (based on 1991 census).

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<sup>155</sup> Scottish Executive. *Fair shares for all technical report*. Found at: <http://www.scotland.gov.uk/library2/doc02/fsat-01.htm>. Accessed November 12, 2007.

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**Scotland - NERA model for estimating additional costs for rural district nurses**

- Estimates of demand for community nursing services have been made for each population cluster based national average contact rates for each population age group and this then provides for an estimate of the expected number of community nursing contacts in each cluster.
- Estimates of travel costs focus on: those living in small population clusters where the estimated level of nurse visits is too low to justify a locally based team, and those living outside population clusters of 500 or more people.

### *New Zealand and Australia - Rural and Remote Nursing Care*

Similar costing adjustments for rural and remote district nursing services are used in New Zealand and Australia. The New Zealand funding formula takes into account the unproductive travel time spent by nurses providing service in areas with widely dispersed populations.<sup>156</sup> The Australian funding for district nurses includes a weighting for rurality, however Alford argues that the weighting is insufficient to cover actual costs, because it is based on direct client care hours and does not take into account the travel required to care for rural and remote clients.<sup>157</sup>

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<sup>156</sup> Health Economics Research Unit, University of Aberdeen. *Geographic differences in the costs of delivering health services in Scotland: Implications for the national resource allocation formula*. Found at:

<http://www.nrac.scot.nhs.uk/docs/consultation/Technical%20Report%20E%20-%20Review%20of%20Excess%20Costs.pdf>. Accessed November 26, 2007.

<sup>157</sup> Alford, K. & O'Meara, A. Stretching district nursing services to meet rural needs. *Australian Journal of Rural Health*. 2001; 9: 286-292.

## SUSTAINABILITY OF RURAL SERVICES

Humphreys et al. note that in the context of rural and remote health, “the concept of sustainability refers to the ability of a health service to provide on-going access to appropriate quality care in a cost-efficient and health-effective manner” (p. 33).<sup>158</sup> The authors argue that rural communities share characteristics that threaten the sustainability or viability of health services – for example, population sizes are often too small to achieve economies of scale, it is difficult to recruit and retain a rural health workforce, communities are often geographically isolated and, there is often a high proportion of elderly, socioeconomically disadvantaged and indigenous people in rural communities.

O’Reilly notes that often, discussions about sustainability revolve around concerns about the minimum level of providers needed to provide services in a given community. He argues that the “minimum number” is not the same as the sustainable number of providers needed<sup>159</sup> -- that is, minimum numbers lead to burnout and a ‘revolving door’ for providers in rural communities.

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<sup>158</sup> Humphreys, J. S., Wakerman, J., & Wells, R. What do we mean by sustainable rural health services? Implications for rural health research. *Australian Journal of Rural Health*. 2006; 14: 33 – 35.

<sup>159</sup> O’Reilly, M. Solutions prove elusive as Ontario seeks alternatives to FFS in remote areas. *Canadian Medical Association Journal*. 1998; 159: 840-841.

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### ***Canada – Rural Hospital Nursing Services***

Baumann et al. argue that health care policies that are intended to build a sustainable workforce are often not useful in rural settings.<sup>160</sup> The authors show how three government policies meant to strengthen the nursing workforce: the goal of 70% full time employment, the new graduate policy and the late career initiative, are biased toward urban hospitals, and are not really beneficial to rural hospitals.<sup>161</sup> The authors conducted qualitative interviews with administrators and nurses in 21 small rural hospitals in south western Ontario.

Results demonstrated that it has been difficult for rural hospitals to reach the 70% full time employment target due to small programs, fewer nurses to staff the programs and the fact that many rural nurses do not want full time work. The authors conclude that: full-time ratios are not an efficient way to staff rural hospitals; many rural hospitals did not participate in the new graduate initiative because they employ few nurses who meet the criteria; and that implementing the late career initiative is difficult because experienced nurses are not able to be freed from their regular duties due to limited staffing in rural hospitals.

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<sup>160</sup> In this study, rural communities are defined based on a population size of 10 000 or less.

<sup>161</sup> Baumann, A., Hunsberger, M., Blythe, J. & Crea, M. Sustainability of the workforce: Government policies and the rural fit. *Health Policy* (2007), doi: 10.1016/j.healthpol.2007.09.004.

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### ***Canada – Rural Surgical Services***

A number of Canadian studies have identified rural surgical services as an essential component of ensuring the sustainability of rural hospital services. Kornelsen et al., for example, argue that general practitioner surgeons are necessary in order to support sustainable maternity services in rural hospitals.<sup>162</sup> The authors point out that many communities, especially in Western Canada rely on non-certified surgeons trained outside Canada and Canadian GP's with specialized training and skills in order to provide surgical services to rural communities that might otherwise not have any ability to provide this locally.

From a planning perspective, three different approaches have been used to estimate the number of surgeons required for rural hospitals. A study focussed on general surgeons in rural Manitoba examines these three methods: the ratio approach where an observed/desired physician population ratio is used as the basis for determining a region's general surgeon requirements; the repatriation approach where the need for additional surgeons is based on the number of patients leaving the area for surgery and the number of surgeons the region could support if much of this surgery were retained in that region and; the population-needs-based approach that examines the population age structure and health status relative to other

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<sup>162</sup> Kornelsen, J., Grzybowski, S. & Iglesias, S. Is rural maternity care sustainable without general practitioner surgeons? *Canadian Journal of Rural Medicine*. 2006; 11 (3): 218 – 220.

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regions and combines this with existing rate of surgery to determine if more general surgeons are needed.<sup>163</sup>

As might be expected, the authors find that estimations of need for surgical services depend on which method is used. For example, using the ratio approach 7.8 - 14.5 more general surgeons are needed, the repatriation approach estimates that up to 5 more general surgeons could be supported, while the population-needs-based approach suggests that 1.7 fewer surgeons are needed. The authors identify strengths and weaknesses of each approach and conclude that combining all three methods may be the most useful tool for planning.

### ***Australia - Maintaining Viable Rural and Remote Practices***

Two Australian reports - *Viable models of rural and remote practice* and *Easy entry, gracious exit* define conditions necessary to ensure viable rural medical practices.<sup>164</sup> The Viable models report identifies three dimensions (based on a national survey, focus groups and site visits) of viability as follows: (a) A level of remuneration that reflects the skills, workload and commitment of rural general practitioners; (b) Sufficient number of colleagues to limit after hours workload and

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<sup>163</sup> Roos, N., Black, C., Wade, J., & Decker, K. How many general surgeons do you need in rural areas? Three approaches to physician resource planning in southern Manitoba. *Canadian Medical Association Journal*. 1996; 155 (4); 395 - 401.

<sup>164</sup> Kamien, M. The viability of general practice in rural Australia. *The Medical Journal of Australia*. 2004; 180 (70): 318 - 319.

adequately skilled locums to support annual recreation and study leave; (c) adequate physical facilities and administrative support to support GP's to do their job. The results of the survey were used to derive benchmarks for viable practice with respect to income, education and workforce numbers.<sup>165</sup>

The 'easy entry, gracious exit model' focuses on continuity of the practice or practice management strategy rather than on continuity of the doctor. In this model, a third party provides the infrastructure necessary for a general practice and doctors are able to move in and out of the practice with more flexibility.<sup>166</sup>

### ***New Zealand – Maintaining Viable Rural Health Services***

In New Zealand 'community health trusts' were developed so that rural communities could not only plan their health services, but take ownership of and run small local hospitals and outreach services in rural areas that would otherwise be closed as they were seen to be unviable.<sup>167</sup> Several 'critical success factors' for community health trusts have been identified, these include: strong local leadership; local commitment through fundraising and board membership; involvement of local professionals and GPs on trusts and in negotiations; learning from other rural

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<sup>165</sup> Kamien, M. The viability of general practice in rural Australia. *The Medical Journal of Australia*. 2004; 180 (70): 318 – 319.

<sup>166</sup> New South Wales Rural Doctors Network. Easy entry, gracious exit. (2003). Found at: [http://www.nswrdn.com.au/client\\_images/296339.pdf](http://www.nswrdn.com.au/client_images/296339.pdf). Accessed December 1, 2007.

<sup>167</sup> Eyre, R. & Gauld, R. Community participation in a rural community health trust: the case of Lawrence, New Zealand. *Health Promotion International*. 2003; 18 (3): 189 – 197.

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community trusts; operational efficiency through reduction of overhead costs (no central bureaucracy to support) and flexible contracts with staff to meet local needs.<sup>168</sup>

## SUSTAINABILITY AND SCOPES OF PRACTICE

Although it is generally acknowledged that rural practitioners have scopes of practice which often extend beyond those of their counterparts in urban areas, there is limited literature examining how expanded practices ensure sustainable quality health care for rural populations.<sup>169 170 171 172 173</sup> Most of this material is discipline-specific, focussing on the experiences of general practitioners and nurses serving

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<sup>168</sup> Barnett, P. & Barnett R. Community ventures in rural health: The establishment of community health trusts in southern New Zealand. *Australian Journal of Rural Health*. 2001; 9: 229-234.

<sup>169</sup> Burley, MB. & Greene, P. Core drivers of quality: a remote health example from Australia. *Rural and Remote Health*. 2007; 7: 611 (Online).

<sup>170</sup> Bonsall, K. & Cheater FM. What is the impact of advanced primary care nursing roles on patients, nurses and their colleagues? A literature review. *International Journal of Nursing Studies* (2007), doi: 10.1016/j.ijnurstu.2007.07.013.

<sup>171</sup> Hanvey, L. Rural Nursing Practice in Canada: A discussion paper. Found at: [http://www.carrn.com/files/Rural-Nursing-discussion-paper\\_Draft3-Sept%2005-1.pdf](http://www.carrn.com/files/Rural-Nursing-discussion-paper_Draft3-Sept%2005-1.pdf). Accessed January 24, 2008.

<sup>172</sup> Rygh, EM. & Hjortdahl, P. Continuous and integrated health care services in rural areas. A literature study. *Rural and Remote Health*. 2007; 7: 766 (Online).

<sup>173</sup> Hartley, D, Hart, V, Hanrahan, N & Loux, S. Are advanced practice psychiatric nurses a solution to rural mental health workforce shortages? Found at: <http://muskie.usm.maine.edu/Publications/rural/wp31.pdf>. Accessed January 28, 2008.

rural and remote communities; a few studies consider rural physician's assistants, midwives, and community paramedics.

All underline the fact that scopes of practice enlarge along with distance from metropolitan services and tertiary care, and emphasize the need for more content specific to practicing in a rural/remote setting along with more opportunities for rural placements.<sup>174 175 176</sup> This is tied to evidence that exposure to rural clinical practice during undergraduate or graduate programs increases the likelihood of subsequent rural practice.<sup>177 178</sup>

### ***General Practitioners***

The expanded scope of practice for general practitioners serving rural and remote populations is a recurrent theme in the physician recruitment and retention

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<sup>174</sup> Registered Nurses Association of British Columbia (June 2005). What educational preparation do nurses need for practice in rural and remote Canada? Found at: [http://findarticles.com/p/articles/mi\\_qa3916/is\\_200506/ai\\_n13643834](http://findarticles.com/p/articles/mi_qa3916/is_200506/ai_n13643834). Accessed January 22, 2008.

<sup>175</sup> Arvier, PT, Walker, JH & McDonough, T. Training emergency medicine doctors for rural and regional Australia: can we learn from other countries? *Rural and Remote Health*. 2007; 7: 705 (Online).

<sup>176</sup> Ross, J. The development of the advanced role of rural nurses in New Zealand. *Australian Journal of Rural Health*. 1999; 7: 253-257.

<sup>177</sup> Tesson, G, Hogenbirk, J, Pong, R & Strasser, R. Medical education for rural practice: Some international comparisons. Found at: [http://www.cranhr.laurentian.ca/pdf/Medical\\_Education\\_for\\_Rural\\_Practice\\_Oct\\_23.pdf](http://www.cranhr.laurentian.ca/pdf/Medical_Education_for_Rural_Practice_Oct_23.pdf). Accessed January 28, 2008.

<sup>178</sup> Laven, G & Wilkinson, D. Rural doctors and rural backgrounds: How strong is the evidence: A systematic review. *Australian Journal of Rural Health*. 2003; 11 277-284.

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issues. Canadian surveys of physician services, for example, provide evidence that rural general practitioners' practice includes more hospital based medicine<sup>179</sup>, rural GP's perform more procedures than their urban counterparts<sup>180</sup> and that, "as geographic isolation increases, Canadian family physicians provide an increasingly broad spectrum of services" (p. 1548).<sup>181</sup>

Physicians assuming advanced practice roles in rural settings, moreover, also practice at a level beyond what would be expected in urban areas. An American survey of general surgeons serving rural and remote communities finds that these practitioners perform more procedures that are outside the realm of their initial surgical residence training than non-rural general surgeons.<sup>182</sup> Rural general surgeons, for example, perform more endoscopic, alimentary, obstetric and gynaecologic procedures and, as such, acquire more sub-speciality experience than they would if located in urban hospitals.

Similarly, an Australian literature review concludes that, in that country and abroad, rural doctors provide more procedural and other advanced care to their

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<sup>179</sup> Rourke, J. In search of a definition of "rural". *Canadian Journal of Rural Medicine*. 1997; 2 (3): 113.

<sup>180</sup> Vernon, C. & Rourke, J. The role of medical education in the recruitment and retention of rural physicians. *Medical Teacher*. 2004; 26 (3): 265-272.

<sup>181</sup> Hutten-Czapinski, P, Pitblado, R. & Slade, S. Short report: Scope of family practice in rural and urban settings. *Canadian Family Physician*.. 2004; 50: 1548-550.

<sup>182</sup> Breon, TA., Scott-Conner, CEH. & Tracy, RD. Spectrum of general surgery in rural Iowa. *Current Surgery*. 2003; 60 (1): 94-99.

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patients than urban doctors; the proportion of GP's providing complex services increases with increasing rurality and remoteness and; rural doctors are more likely to practice in multiple settings, including emergency departments, hospital settings and nursing homes and to provide obstetric deliveries.<sup>183</sup> Where outreach services are provided, local general practitioners often may be called upon to provide assistance to visiting specialists; a procedural review, for example, documents that such specialists often depend on GP's to provide advanced practice supports, such as anaesthetic and after-care services.<sup>184</sup>

### *Nurses*

Studies examining nursing in rural and remote regions from Canada, Australia and the United Kingdom confirm that nurses' scope of practice also enlarges and role responsibilities magnify as the degree of practice isolation increases. Canadian surveys, for example, find that rural nurses must be "proficient generalists"<sup>185</sup> in order to respond to the needs of rural communities with few health

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<sup>183</sup> Glazebrook, RM. & Harrison, SL. Obstacles to maintenance of advanced procedural skills for rural and remote medical practitioners in Australia. *Rural and Remote Health*. 2006; 6: 502 (Online).

<sup>184</sup> Pegram, RW, Humphreys, JS & McLean, R. Meeting the needs of rural and remote Australians for specialist medical care: issues and options. *Journal of the Royal College of Physicians of Edinburgh*. 2005; 35: 298-308.

<sup>185</sup> Priest, A. Nursing in rural and remote B.C. Registered Nurses Association of British Columbia (June 2002). Found at:



service resources.<sup>186</sup> On this topic, Kulig and associates' survey of nursing practice characteristics in rural and remote Canada concludes that:

Generally speaking, nurses noted that the further north you lived and worked, the more responsibility and independence you had. Having a broad knowledge base was necessary for working in a rural primary care setting as limited supports were available to deal with some clinical events" (p. 31).<sup>187</sup>

Similar observations are made in the extensive Australian literature on rural and remote nursing practice. A survey of nurse executives documents that their role expanded and multiplied with increasing distance from metropolitan areas – for example, 38% of rural and 71% of remote nurse executives reported dual or multiple roles such as direct patient care, forming community partnerships, managing resources and departments, health promotion, community education and the responsibility of being a sole practitioner in a remote area.<sup>188</sup>

Another Australian study of advanced practice nurses finds that those practicing in isolation from other medical and allied health professionals fulfilled a

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[http://findarticles.com/p/articles/mi\\_qa3916/is\\_200206/ai\\_n9141667](http://findarticles.com/p/articles/mi_qa3916/is_200206/ai_n9141667). Accessed January 24, 2008.

<sup>186</sup> MacLeod, M., Kulig, J., Stewart, N., & Pitblado, R. Nursing Practice in Rural and Remote Canada: Final report to Canadian health services research foundation (September 15, 2004). Found at: <http://ruralnursing.unbc.ca>. Accessed January 21, 2008.

<sup>187</sup> Kulig, J.C., Andrews, M.E., Stewart, N.L., Pitblado, R., MacLeod, M.L.P., Benthon, D., D'Arcy, C., Morgan, D., Forbes, D., Remus, G. & Smith, B. How do registered nurses define rurality? *Australian Journal of Rural Health*. 2008; 16: 28-32.

<sup>188</sup> Courtney, M., Yacopetti, J. James, C., Walsh, A. & Finlayson, K. Comparison of roles and professional development needs of nurse executives working in metropolitan, provincial, rural or remote settings in Queensland. *Australian Journal of Rural Health*. 2002; 10: 202 – 208.

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range of functions that would be provided by general practitioners, trained specialists or allied health professionals in metropolitan areas.<sup>189</sup> Nurses who are the sole providers in rural or remote regions also typically require skills and knowledge in a broader range of areas. Those who serve remote communities, for example, must be proficient in providing maternity, infant and child health, adolescent health, mental health, aged care, palliative care, emergency care, and public health services. Most rural and remote nurses take on administrative and management roles as well.

### *Midwifery*

In the United Kingdom, rising health care costs and centralisation of specialist services has led to an increasing reliance on midwife-led rural maternity services.<sup>190</sup> Midwives have been suggested as a way of sustaining rural maternity services; however, as Tucker et al. point out, most studies with respect to the outcomes of midwifery are done in urban settings where there are a high number of births and a broad range of resources and specialist services if complications arise. The authors

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<sup>189</sup> National Rural Health Alliance Inc. Advanced nursing practice in rural and remote areas (July 2005). Found at: <http://nrha.ruralhealth.org.au/cms/uploads/publications/advanced%20nursing%20practice%206%20july%202005.pdf>. Accessed January 24, 2008.

<sup>190</sup> Hundley, VA, Tucker, JS, van Teijlingen, E, Kiger, A, Ireland, JC, Harris, F, Farmer, J, Caldwell, JL & Byers H. Midwives' competence: is it affected by working in a rural location? *Rural and Remote Health*. 2007; 7: 764 (Online).

argue that rural midwives must maintain a broad range of skills with fewer deliveries per year, fewer options for continuing education and little or no backup if problems develop.<sup>191</sup> Considering that they practice with extremely limited supports, Ireland et al. highlight the need for quality, rural-specific training for midwives (and other health care professionals) practicing in rural areas.<sup>192</sup>

### ***Paramedics and Physician Assistants***

Expanded scope paramedics have also been used in Canada and Australia as a way to improve access to health care for residents of remote areas. Physician assistants perform a similar function in the United States. As illustrated by a Nova Scotia example, community paramedics in rural Canada combine provision of emergency care with preventive health care, administering flu shots, checking blood pressure, responding to inquiries from diabetics, through outreach clinics and home visits.<sup>193</sup> Expanded-role paramedics also work with nurse practitioners and off-site physicians to deliver wound care, take part in flu clinics and provide client

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<sup>191</sup> Tucker, J., Hundley V., Kiger A., Bryers H., Caldow, J., Farmer, J., Harris, F., Ireland, J. & van Teijlingen E. Sustainable maternity services in remote and rural Scotland? A qualitative survey of staff views on required skills, competencies and training. *Quality and Safety in Healthcare*. 2005; 14: 34 - 40.

<sup>192</sup> Ireland, J, Bryers, H, van Teijlingen, E, Hundley, V, Farmer, J, Harris, F, Tucker, J, Kiger, A & Caldow, J. Competencies and skills for remote and rural maternity care: a review of the literature. *Journal of Advanced Nursing*. 2007; 58 (2): 105-115.

<sup>193</sup> Misner, D. Community Paramedicine: Part of an integrated healthcare system. *Emergency Medical Services Magazine*. 2005; 34 (4): 89-90.

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education. Evaluative data shows that the teams are well-utilized, averaging about 300 patient contacts per month, with corresponding decrease in rural emergency department visits. In Australia, expanded scope paramedics offer similar services, providing emergency care, health education and training to the public.<sup>194</sup> They also lead and manage volunteer crisis response teams and provide health promotion and illness prevention work at the community level.<sup>195</sup>

Physician assistants, which are predominantly used in the United States, also assume expanded roles in rural communities. A survey of graduates from the University of Washington's MEDEX Northwest physician assistants (PA) program found that those who were practicing in rural areas reported performing a wider range of medical and administrative tasks than those practising in urban areas. Specifically, rural physician assistants were more likely to perform prenatal care, house calls, nursing home rounds, surgical assisting and administrative activities.<sup>196</sup>

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<sup>194</sup> Stirling, CM, O'Meara, P, Pedler, D, Tourle, V & Walker, J. Engaging rural communities in health care through paramedic expanded scope of practice. *Rural and Remote Health*. 2007; 7: 839 (Online).

<sup>195</sup> Stirling, CM, O'Meara, P, Pedler, D, Tourle, V & Walker, J. Engaging rural communities in health care through paramedic expanded scope of practice. *Rural and Remote Health*. 2007; 7: 839 (Online).

<sup>196</sup> Larson, EH., Hart, LG. & Hummel, J. Rural physician assistants: A survey of graduates of MEDEX Northwest. *Public Health Reports*. 1994; 109 (2): 266-274.

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### ***Difficulties of Sustaining Expanded Rural Practices***

Although we were not able to locate documentation from Canada, Australia or the United States on specific mechanisms for funding rural practitioners based on their level of skill, their need to perform more procedures, or other costs associated with supporting advanced practice, there are examples from the United Kingdom that underline the importance of such funding for sustaining rural health care.

Asthana et al. point out that, based on the experience in rural areas of England and Scotland, hiring nurses with extensive experience who are qualified enough to substitute for other health professionals that may be in short supply in rural or remote areas adds to the expense of delivering rural services. Nurses with requisite experience are often at the top of the pay scale because of longer service or advanced qualifications and, as such, unwilling to relocate to rural or remote locations without added remuneration. The authors argue that the additional expense of supporting advanced-level practice has to be taken in to account when allocating funding for rural or remote health services.<sup>197</sup> They also note that, without additional funding, innovative rural health practices may be limited in their

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<sup>197</sup> Asthana, S, Gibson, A, Moon, G, & Brigham, P. Allocating resources for health and social care: the significance of rurality. *Health and Social Care in the Community*. 2003; 11 (6): 486-493.

application; what works well in one rural location may not easily transferred to another rural location, because of differences in local resources and strengths.<sup>198</sup>

In the United Kingdom, however, recent analyses of rural health services acknowledge the need for funding advanced rural practice in the documentation around 'rural-proofing' the new general medical services (GMS) contracts.<sup>199</sup> In the new GMS contract, primary care physicians receive funding for essential, additional and enhanced services. As such, many of the services that have traditionally been provided by rural practitioners (i.e. minor surgery) are within the 'additional' or 'enhanced' service categories and therefore, there is an opportunity to recognize and reward them for providing these procedures/services.<sup>200</sup>

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<sup>198</sup> Asthana, S, & Halliday, What can rural agencies do to address the additional costs of rural services. A typology of rural service innovation. *Health and Social Care in the Community*. 2004;12(6):457-65.

<sup>199</sup> Royal College of General Practitioners. Investing in general practice: The new general medical services contract (February 2003). Found at: [http://www.rcgp.org.uk/pdf/ISS\\_SUMM03\\_03.pdf](http://www.rcgp.org.uk/pdf/ISS_SUMM03_03.pdf). Accessed February 1, 2008.

<sup>200</sup> Deaville, J, Mitchinson, K & Swindlehurst, H. Rural proofing the new GMS contract. Found at: [http://www.rural-health.ac.uk/publications/rural\\_proofing\\_gms\\_contract.pdf](http://www.rural-health.ac.uk/publications/rural_proofing_gms_contract.pdf). Accessed February 1, 2008.

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## FUNDING FORMULAE

Many of the analyses of rural health care emphasize the need for specialized funding formulae to address rural needs; however, few offer specific examples. Although capitation-based funding prevails, there appears to be a trend toward needs-based funding – several Canadian jurisdictions, New Zealand and Scotland have weighted capitation formulae that accommodate age, sex and socioeconomic characteristics, including those characteristic of rural or isolated populations.

### *Alberta – Rural and Northern Adjustments*

Alberta adopted a population-based funding model in 1997. As outlined in *Figure 16*, this model develops funding rates for different regions that are reflective of the health needs and service utilization patterns found among the general population then applies these rates to each region, based on its population size, gender and age-mix.<sup>201</sup>

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<sup>201</sup> Alberta Health and Wellness. 2007/2008 Regional Health Authority Global Funding: Methodology and funding manual. (April 19, 2007). Found at: <http://www.health.gov.ab.ca/regions/RHA07to08FundManual.pdf>. Accessed November 26, 2007.

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Figure 16

***Alberta - Population-Based Funding With Rural and Northern Adjustment Factors***

- population size
- population age (<1, 1-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90+)
- gender (male, female)
- socio-economic composition (welfare, aboriginal, premium subsidy, other)
- cost adjustment factor addresses above-average cost pressures of maintaining services in rural communities (hospital in-patient services and non-inpatient services) and is based on statistical measurement of regional cost variations.
- northern adjustment amount compensates for above average service delivery costs.

The Alberta formula includes a 'cost adjustment factor' that provides additional funding for regions with above-average cost pressures. The cost adjustment factor is calculated for hospital in-patient services and for non-inpatient services. For in-patient services, regression analysis is used to quantify the impact of various explanatory factors such as remoteness on regional costs. The results are then used to predict regional cost variations from justifiable factors and the cost variation for each region is applied to its forecasted hospital inpatient budget.

For non-inpatient services, the 'cost of doing business' and 'assured access' methodologies are applied to determine additional cost adjustments. With respect

to 'assured access', for the remote population in each region, a cost supplement is calculated by applying rates of 25% and 50% for remote and very remote populations respectively to the average per capita funding rate. Non-formula rural dialysis funding which covers the cost of 'hospitality' support costs (lab procedures, environmental services, etc.) is also provided to rural health authorities.

The Northern Lights and Peace Country Health Authorities, which serve northern regions of the province, also receive a fixed "northern adjustment" amount (in 2007/2008 this amount was \$58 million for Northern Lights and \$8 million for Peace Country). This allowance is not included in calculation of the cost adjustment factors for these regions.

### ***British Columbia - Remote and Northern Isolation Allowances***

Like Alberta, British Columbia makes use of a population needs-based funding formula which takes into account the age (based on 19 five-year age groups), sex (two groups) and socio-economic status (4 groups - 'aboriginal', 'welfare and disabled', 'premium assistance' and 'no premium assistance') of residents in different health regions across B.C. This model allocates funds to acute care and continuing care based on population characteristics. This formula also provides for a fixed 'remoteness adjustment' of 4% of available funds for acute care and 1% of available funds for continuing care in order to account for the higher costs

of providing care in more rural and remote areas due to travel, isolation and/or climate.<sup>202</sup> This adjustment is made based on Northern Isolation Allowance guidelines that allocate points to remote communities based on degree of isolation – in general, the farther the distance from a major centre/acute care facility, the more points are awarded.

### ***Manitoba – Hospital, Personal Care Homes and Home Care***

Manitoba has recently developed a methodology for determining the percentage of funds allocated to each regional health authority based on the size and characteristics of the populations in those authorities.<sup>203</sup> Although this methodology does not include a rurality adjustment at the present time, it does have the capacity, at the planning level, to accommodate differences in urban and rural population needs. The model incorporates 10 population characteristics for hospital care, six for personal care homes and eight for home care. (*Figure 17*)

The authors note that in addition to the population based funding, geographic/policy based funding, unmodelled funding, and community services

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<sup>202</sup> British Columbia Medical Association. *The population needs-based funding model*. Found at: [http://www.bcma.org/public/news\\_publications/publications/policy\\_papers/RegionalizingHealthCareBudgets/FundingModel.asp](http://www.bcma.org/public/news_publications/publications/policy_papers/RegionalizingHealthCareBudgets/FundingModel.asp). Accessed on November 14, 2007.

<sup>203</sup> Manitoba Centre for Health Policy. (October 2007). *Allocating funds for healthcare in Manitoba regional health authorities: A first step – Population-based funding*. Found at: [http://www.umanitoba.ca/centres/mchp/reports/pdfs/2005-2008/pop\\_fdg.pdf](http://www.umanitoba.ca/centres/mchp/reports/pdfs/2005-2008/pop_fdg.pdf). Accessed November 27, 2007.

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funding will need to be incorporated into the formula to provide an accurate picture of regional health care needs.

Figure 17

<b>Manitoba - Hospital, Personal Care Homes, and Home Care Adjustments</b>
<ul style="list-style-type: none"> <li>• hospital care needs (age, sex, co-morbidity, socioeconomic status, death, hospital proximity, newborn, low or high birthweight, chronic disease and injury hospitalization)</li> <li>• personal care needs (age, sex, co-morbidity, socio-economic status, death, marital status)</li> <li>• home care needs (age, sex, co-morbidity, socioeconomic status, death, marital status, chronic disease, and hospital days).</li> </ul>

### ***New Zealand -Rural Cost Adjustment Formula***

The New Zealand Population-Based Funding Formula (PBFF)<sup>204</sup> distributes funds to district health boards based on the relative need of their populations and the cost of providing services to meet those needs (*Figure 18*). This adjustment is based on the actual extra costs incurred by District Health Boards in rural areas based on the most recent year, thus the quantity of the adjustment is drawn from the

<sup>204</sup> Ministry of Health. (2004). *Population-based funding formula 2003*. Ministry of Health, Wellington, New Zealand. Found at: <http://www.moh.govt.nz/moh.nsf/pagesmh/3053?Open>. Accessed November 26, 2007.

existing rural price premium and the cost of existing rural services.<sup>205</sup> In 2003/2004 the rural adjustment was set at \$80 million, distributed across 21 health boards as a function of remoteness – for example, Auckland with a population of over 1,200,000 received less than 1% of the \$80 million, whereas the rural Waikato region, with a population of less than 400,000 residents, received almost 12%.

*Figure 18*

<b><i>New Zealand Population Based Funding Formula</i></b>
<ul style="list-style-type: none"> <li>• Demographic variations (age, sex) X national average cost of services for various demographic groups</li> <li>• Deprivation quintiles (based on NZDep2001<sup>206</sup>) X weighting for unmet need</li> <li>• Ethnicity (% of population that is 'Maori', 'Pacific peoples', or 'Other')</li> <li>• Actual costs incurred by district health boards in delivering services. The total sum of these costs is top-sliced off available funding and distributed according to a measure of remoteness of each district health board population</li> </ul>

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<sup>205</sup> Ministry of Health. (2004). Population-based funding formula 2003. Ministry of Health, Wellington, New Zealand. Found at: <http://www.moh.govt.nz/moh.nsf/pagesmh/3053?Open>. Accessed November 26, 2007.

<sup>206</sup> Salmond, C. & Crampton, P. (2002). NZDep2001 *Index of Deprivation*. Department of Public Health; Wellington School of Medicine and Health Sciences. Found at: [http://www.moh.govt.nz/moh.nsf/Files/phi-research-report/\\$file/phi-research-report.pdf](http://www.moh.govt.nz/moh.nsf/Files/phi-research-report/$file/phi-research-report.pdf). Accessed November 27, 2007.

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### ***Scotland – Rural Weighted Capitation Formulae***

Scotland uses a weighted capitation formula to adjust for rural population needs and the costs of providing health services in rural communities, as detailed in *The Fair Shares for All Technical Report*.<sup>207</sup> The formula also makes adjustments based on age and sex profiles of the population; levels of morbidity and life circumstances of the population and; differing costs of service in urban vs. rural/remote areas. Service costs are assessed through economies of scale (hospital and general medical services) and travel time and unproductive time (community health service). A discussion of how travel and unproductive time is assessed with respect to district nurses and community visitors can be found in the cost section of this report (*Figure 15*).

With respect to the cost of hospital services, regression analysis was used in order to estimate economies of scale – available evidence suggested that economies of scale are fully exploited in the range of 100-200 beds.<sup>208</sup> A ratio of actual to expected costs provides an index of the extent to which each hospital's unit costs are above or below the average of all hospitals in Scotland. Thus, the impact of

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<sup>207</sup> Scottish Executive. *Fair shares for all technical report*. Found at: <http://www.scotland.gov.uk/library2/doc02/fsat-01.htm>. Accessed November 12, 2007.

<sup>208</sup> Scottish Executive. *Fair shares for all technical report*. Found at: <http://www.scotland.gov.uk/library2/doc02/fsat-01.htm>. Accessed November 12, 2007.

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economies of scale and other factors on relative costs faced by district health boards in rural and remote areas are calculated by comparing each health board's actual expenditure on hospital services and the level of expenditure that each board would incur if these services were provided at the average unit cost for all health boards. It was found that it is the proportion of the population living in urban areas with a population of more than 1,000 people, along with Island status, that has the most significant impact on total hospital costs and general medical services.

Based on this ratio, a weighted adjustment is calculated for each health board based on its relative need for more resources due to higher costs as a function of remoteness. For example, Greater Glasgow receives a score of -5.549 reflecting the fact that its costs are actually lower than the average for all of Scotland, whereas the Western Isles and Shetland both receive scores of 28.491 because their costs are actually much higher than the average for all of Scotland. An index of effects of remoteness on relative costs of general medical services for each health board is similarly calculated (see *Figure 19*).

*Figure 19*

<b><i>Scotland - Index of Effects of Remoteness</i></b>
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|--|
| <ul style="list-style-type: none"> <li>• All health boards receive a cost score in relation to the Scotland average reflecting remoteness (Scotland = 100). E.g. Greater Glasgow receives a score of 93.9 (remoteness cost lower than the average); the Western Isles receive a score of 173.3 (much higher remoteness cost).</li> </ul> |
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The Scottish Allocation Formula (SAF) for GP practice remuneration is another funding formula based on population need (see *Figure 20*). The SAF is a weighted capitation formula based on: the age and sex structure of the population, the socio-economic circumstances of the population, and a measure of remoteness/rurality of each GP practice.<sup>209</sup>

*Figure 20*

<b>Scotland – Rural and Remote GP Practice Population Weighting</b>
<ul style="list-style-type: none"> <li>• Age groups (0-4, 5-14, 15-24, 25-44, 45-64, 65-74, 75-84, 85+)</li> <li>• Sex (male, female)</li> <li>• Unemployment rate of the practice population</li> <li>• Proportion of elderly people (65+) in the practice population</li> <li>• Standardized mortality rate (for people 65 or less)</li> <li>• Deprivation indicators from census data (i.e. is the head of household on income support or a single parent).</li> <li>• Population density (# of hectares per resident)</li> <li>• Population sparsity (proportion of the population in communities of less than 200)</li> <li>• Proportion of the population that qualify the GP to claim rural practice payments (this is the proportion of the GP's patient population that lives in a 'rural area' )</li> </ul>

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<sup>209</sup> The Scottish Government. Scottish Economic Report (March 2004): Remuneration of general medical services. Found at: <http://www.scotland.gov.uk/Publications/2004/03/19038/34139>. Accessed November 8, 2007.



## SUMMARY – FUNDING FORMULAE CONSIDERATIONS

As much as there are many definitions of rural - based on population size/density, relationship to urban areas and indexes meant to provide a degree of rurality measure, there is no consensus on which definition is best, however, there is agreement that researchers must purposefully select the definition that best captures the issue at hand.

With respect to assessing needs and calculating costs, the way that service is measured and costs calculated has implications for equity in policy planning. Dichotomous definitions that compare rural to urban populations may mask differences within rural populations and lead to inequitable access and or an inaccurate assessment of the needs of rural populations. Although it is generally acknowledged that the cost of providing service to rural populations is higher than the cost of providing those services to urban populations, failure to assess specific cost factors, for instance, may produce inaccurate estimates. As the examples cited reveal, rural costs are higher due to the lack of realizing economies of scale, higher costs of travel and lower caseloads for outreach service delivery and additional costs associated with developing sustainable rural hospitals and other health services.

While the funding formulae illustrated in this report attempt to address the issue of differing population needs and higher costs of delivering services in rural

areas, the way in which they do so differs significantly. Some of the simpler formulae, such as the Canadian examples cited, provide a fixed northern/rural adjustment, while some of the more complex ones, such as Scotland, provide detailed methodologies for calculating the added costs of delivering rural health services. Different ways of calculating costs and varying service delivery structures, moreover, mean that an assessment of need or funding formula developed in one jurisdiction may not work well in another. As Asthana emphasizes, however, the difficulties inherent in developing adequate measures should not be used as an excuse for not acknowledging rural needs for additional health care resources:

For the sake of both equity of access and staff morale, the resource implications of meeting national quality standards in rural areas should be explicitly acknowledged . . . [and] the possibility that the rural minority has a legitimate need for more health care resources should at the very least, be given serious consideration.”<sup>210</sup>

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<sup>210</sup> Asthana, S., Gibson, A., Moon, G., & Brigham, P. Associating resources for health and social care: the significance of rurality. *Health and Social Care in the Community*. 2003; 11(6): 486-493.

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