

A Strategy for Developing Environmental Health Indicators for Rural Canada

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ABSTRACT

Our understanding of and ability to describe rural health conditions can be considerably enhanced by the use of rural health indicators which allow us to compare rural and non-rural areas or areas differentially located on the urban-rural continuum in terms of various health conditions. However, while health indicators abound, there are very few that can be used to describe the health conditions of rural Canada. This paper discusses the concepts of health in a rural context and adopts a broad definition of health that goes beyond the mere absence of disease or impairment. We propose five broad categories of health indicators: health status indicators, health determinant indicators, health behaviour indicators, health resource indicators, and health service utilization indicators. The most commonly used health indicators in Canada and the datasets from which they are derived are examined in order to assess their applicability to “communities” or “regions”. This review highlights the strengths and limitations of various datasets and indicators and their applicability to the “community” and “regional” scale for rural environments. Finally, challenges in data availability and use are discussed as they relate to rural health indicator development.

RÉSUMÉ

Le recours à des indicateurs de santé en milieu rural, qui permet de comparer les régions rurales et les régions non rurales ou des régions situées en des endroits distincts d'un même grand territoire, peut améliorer grandement la compréhension de l'état de santé en milieu rural. Toutefois, alors que les indicateurs de santé sont nombreux, très peu peuvent servir à décrire l'état de santé des régions rurales au Canada. Les auteurs analysent les concepts de la santé en milieu rural et optent pour une définition large de la santé, qui dépasse la simple absence de maladies ou de déficiences. Ils proposent cinq grandes catégories d'indicateurs de santé : des indicateurs de l'état de santé, des indicateurs des déterminants de la santé, des indicateurs des comportements liés à la santé, des indicateurs des ressources en santé et des indicateurs de l'utilisation des services de santé. Ils étudient les indicateurs de santé les plus utilisés au Canada et les ensembles de données dont ils découlent afin d'en évaluer l'applicabilité aux collectivités ou aux régions. L'étude souligne les avantages et les limites de divers ensembles de données et d'indicateurs et compare leur applicabilité aux milieux ruraux à l'échelle de la collectivité et de la région. De plus, les auteurs traitent des problèmes de disponibilité et d'utilisation des données en rapport avec l'élaboration d'indicateurs de santé en milieu rural.

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A set of commonly used rural health indicators does not exist in Canada. In particular, there are very few rural health indicators that are of an environmental nature. Some very useful rural health-related data, such as data on agricultural injury, do exist. But, to date, there have been few attempts to examine the feasibility of turning such data into health indicators. As far as we are aware, a recent study by the present authors, *Assessing Rural Health: Toward Developing Health Indicators for Rural Canada*,¹ represents the first attempt at examining the feasibility of developing rural health indicators in a systematic manner and for the whole of Canada. Although the initial focus of *Assessing Rural Health* was not on environmental health indicators per se, it did discuss some of the issues that are relevant to the focus of this publication.

Depending on how “rural” is defined, about a quarter to about a third of the population and well over 90% of the land mass in Canada are rural. That rural communities differ from urban and suburban communities in many respects has been extensively documented. There are considerable rural-urban differences in health status, health behaviour, health-resource availability and health-service utilization.²⁻⁸ Generally speaking, the rural population has poorer health status, lower life expectancy, higher accident and injury rates and higher levels of disability. Even the widely held image of a clean, wholesome rural environment has been shattered by the recent water-contamination tragedies in Walkerton and North Battleford. To improve rural health, it is necessary to document the health conditions of rural communities and populations. Rural health indicators are a means to this end. Similarly, rural environmental health indicators allow us to assess the state of the environment and its potential impact on health in rural areas.

The central question for our present task is: *Can environmental health indicators for rural Canada be readily developed given the types and nature of health and related datasets at our disposal?* In order to answer this question, we need to address several conceptual and methodological issues. Although the terms “health”, “environment” and “rural” are used frequently in daily conversations, they are not clear-cut concepts. In fact, there are no universally

agreed-upon definitions. Since how we understand these concepts affects the way rural environmental health indicators are developed, it is necessary first of all to discuss what they mean. Because the concepts of environment and health indicators have been discussed elsewhere in this publication,^{9,10} we focus here on rural. Much of the following discussion is on the broader issue of developing rural health indicators, of which rural environmental health indicators are a subset.

First step: Linkages to rural people, communities and regions

From a pragmatic point of view, a key step in the development of health indicators rests in our ability to link our indicator and risk factor measures with our target populations. In the context of this paper, we must then be able to distinguish between rural and non-rural populations. This leads to the inevitable question: "What is rural?" It has been noted that there are almost as many definitions of rural as there are researchers.¹¹ Fitzpatrick and LaGory¹² are right in pointing out that all human action takes place in geographic space and this geographic space is more than a physical container; it is also a social and cultural phenomenon. As a result, some definitions of rural are derived from cultural and social manifestations of rural communities. However, for the purpose of developing rural health indicators, such definitions of rural are not useful. Health indicators are typically derived from available secondary data which can rarely be aggregated or disaggregated on the basis of social and cultural characteristics.

One of the most desirable linkage tools is the use of postal codes. Wilkins¹³ discussed the potential of using this approach for health studies, while Sanmartin and Snidal,¹⁴ among others, employed postal codes to examine rural physician characteristics. In these studies, rural postal codes were readily recognizable because they had "0" in the second position in the 6-character postal code. While this use of "0" for rural may have been useful in the past, it is becoming less so as Canada Post reorganizes postal codes in such a way that they are not correlated with any commonly accepted rural-urban designation. Even so, the postal code conversion files provided by Statistics Canada enable us to link them

with standard census geographical units such as Enumeration Areas (EAs), Census Subdivisions (CSDs), Census Divisions (CDs) and so on. Almost everybody knows his/her postal code, whereas few people know their EA, CSD or CD.

When examining the geographic distribution of Canadian physicians, Pitblado and Pong¹⁵ have maintained that access to unaggregated data that can subsequently be aggregated without the limitation of pre-defined geographical units is the most desirable, since there is not a universally agreed-upon definition of rural. Postal codes can be aggregated to form larger geographical units for the purpose of constructing rural health indicators. Commenting on spatial analysis, Gilbert¹⁶ has arrived at a similar conclusion. He has recommended the use of the unit postcode area in the United Kingdom as the basic building block of spatial statistics because of the relatively small area it covers and the geography of population and economic activities it reflects.

For researchers who do not work in government, perhaps the greatest disadvantage with using postal codes centres around the problem of access. There are access restrictions due to confidentiality/privacy matters. More commonly, researchers must use aggregated data and therefore must define rural based on given parameters of existing administrative datasets. From our perspective, this means dealing with aggregations that can be called communities or regions.

We believe there are two major approaches to achieving a functional definition of rural at this level: the "rural and small town Canada" designation of Statistics Canada and their modification of the scheme developed by the Organization for Economic Cooperation and Development (OECD). Both approaches have a fairly long history of usage and are, therefore, relatively familiar to researchers. And both can be used as a basis for record linkages with respect to many datasets that can be employed to generate health indicators for Canada's rural population.

Useful discussions of the development and applications of these terms can be found in Bollman¹⁷ and the most recent summary of these approaches can be found in du Plessis et al.¹⁸ In brief, "rural and small town Canada" is particularly applicable to communities, i.e., where people live.

In the parlance of the Census, rural-and-small-town communities are Census Subdivisions that are located outside the predominantly urban areas known as Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs).

OECD defines a "community" as rural if the population density is less than 150 persons per square kilometre. Statistics Canada, in contributing to the work of OECD, applies this definition of rural using the Census Consolidated Subdivision as the community.^{18,19} CDs are used to equate with the OECD term "region." Regions are classified as "predominantly rural" if more than 50% of the population lives in rural communities; "intermediate" if 15% to 50% live in rural communities; and "predominantly urban" if less than 15% live in rural communities. Additional classes have also been added to recognize the diversity of rural and remote areas of Canada: metro-adjacent subregions, non-adjacent subregions and northern hinterland subregions.

The ability to identify "regions" is important for the development of rural health indicators. This is because, in many instances, health dataset records do not provide sufficient geographical information to identify communities. The next closest level is the region. There is an advantage in using regions expressed as CDs. In many provinces, public health units, health planning regions, or health authorities have been established for the purposes of health care planning and/or delivering health services. These administrative or planning entities are often coterminous with one or more CDs.

Examples of rural health indicators

In *Assessing Rural Health*,¹ a series of health indicators were provided along with various definitions or geographical designations of rural. Here, two examples, both using data from the Census of Agriculture, are presented for illustrative purposes. For other examples of rural health indicators and the data sources from which they are derived, see *Assessing Rural Health* (the website address for this report is identified in the References section of this paper).

Example 1: Incidence of Farm Injuries Source: 1996 Census of Agriculture²⁰

Raw Data: Counts of farm operators by sex reporting farm-related injuries requir-

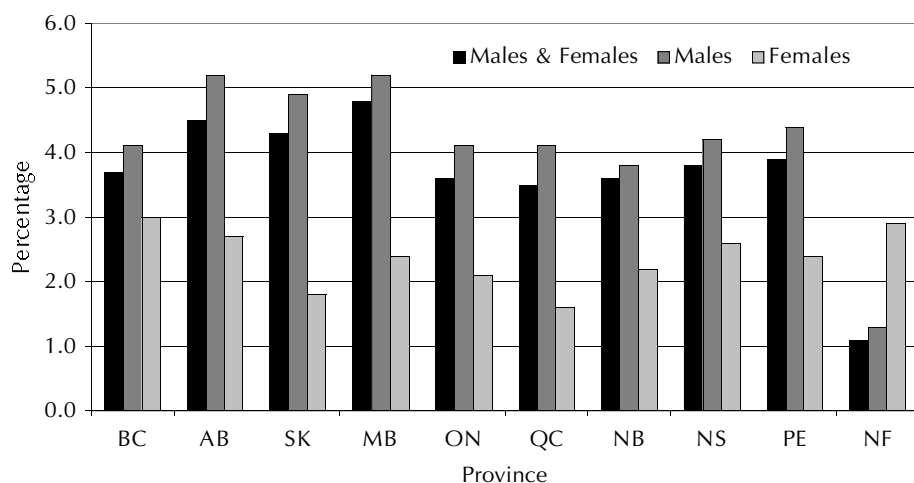


Figure 1. Proportions of farm operators reporting farm-related injuries.

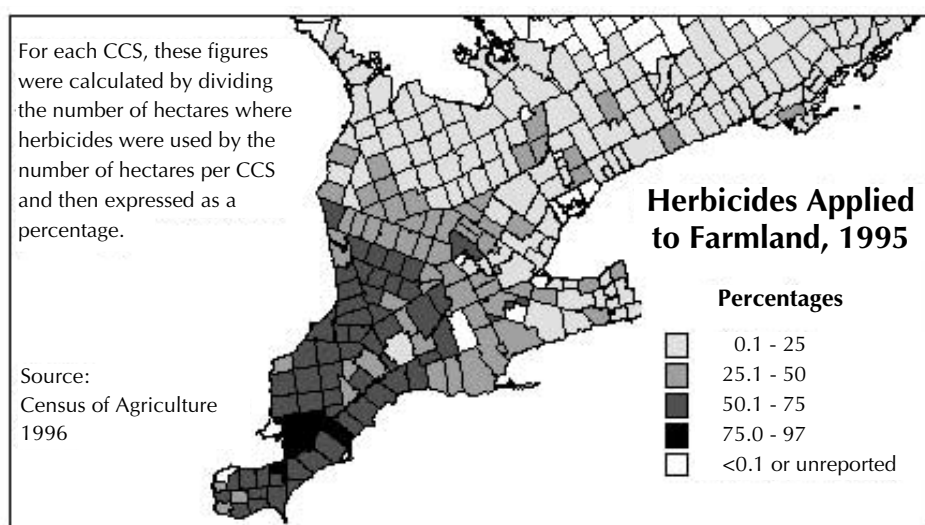


Figure 2. Map of herbicide application to southwestern Ontario farmland in 1995.

ing professional medical attention per province.

Results: Figure 1 shows a count of farm-related injuries by sex for each province.

Discussion: Since the vast majority of farms are located in rural areas, it made little sense to compare the number of farm injuries in rural and urban areas, thus farm-related injuries were examined by province and sex only. While Figure 1 shows that there are indeed provincial and sex-related differences in the percentage of farm-related injuries, the results are not particularly revealing. More could be learned from a subprovincial analysis. Further work should look at whether the Census of Agriculture can be used at finer levels of geography. Future analysis should also focus on deriving rates of trauma, controlling for differences in population, and on making results more comparable

between different rural regions within a province.

Example 2: Herbicide Application

Source: 1996 Census of Agriculture²⁰

Raw Data: Counts of hectares applied with herbicide per Census Consolidated Subdivision. The 1996 Census of Agriculture provides counts of the farm areas (hectares) where herbicides, insecticides and fungicides have been applied. This variable was not split into a rural/urban dichotomy, as it is obvious that herbicide/pesticide-use rates are much higher in rural areas.

Results: For illustrative purposes, the analysis has been done for southwestern Ontario where farming is the predominant economic activity (see Figure 2).

Discussion: Herbicide application does show spatial variation in southwestern

Ontario. It increases from east to west, which is to be expected since the high-intensity farming areas are located in the western part of southwestern Ontario. With such information, it may be possible to further examine whether there is an equivalent east-west gradation of certain health problems associated with rates of herbicide applications.

Next steps

In order to improve rural health, one of the first steps that need to be taken is to understand and be able to describe rural health conditions. Our understanding of and ability to describe rural health conditions can be considerably enhanced by the use of rural health indicators which would allow us to compare rural and non-rural areas or areas differentially located on the urban-rural continuum in terms of various health conditions such as environmental quality and impact. However, while health indicators abound, there are very few that can be used to describe the health conditions of rural Canada.

Our recent review¹ of three major publications on health indicators – *Report on the Health of Canadians* (Health Canada), *Statistics Canada Health Indicators Database* (Statistics Canada) and *Community Health Indicators: Definitions and Interpretations* (Canadian Institute for Health Information) – shows that the bulk of the indicators are derived from a limited number of datasets. With the exception of the datasets from the Laboratory Centre for Disease Control (Health Canada), it is possible to assign records contained in most of the other datasets to either communities or regions. Although it is possible to assign records from the National Population Health Survey to communities or regions, the sample size is generally too small to permit subprovincial analysis. Unfortunately, this is true of most of the survey-based datasets we have examined.

Although there is a growing interest in the determinants of health, there are relatively few indicators of health determinants. In particular, as Pengelly et al.²¹ have pointed out, there are few indicators of environmental status. As well, there are many datasets (e.g., Survey of Income and Labour Dynamics and the Canadian Agricultural Injury Surveillance Program database) that do not appear to have been

well exploited. Such datasets may be useful for generating health indicators, particularly health determinant indicators.

There are also practical or logistical problems that have made rural health indicator development difficult. For instance, the Laboratory Centre for Disease Control has many datasets on notifiable diseases, but such data are only available at the provincial level. Subprovincial data are needed for generating rural health indicators. In order to obtain subprovincial data on notifiable diseases, one has to obtain permission from each province – a cumbersome and time-consuming process. There are other problems, such as the cost associated with obtaining data at the subprovincial or subregional level. For instance, Statistics Canada has made available, free of charge, a large amount of data through the Data Liberation Initiative. However, most of these data are at a high level of aggregation. To obtain lower-level data, one has to make special data requests which must be paid for. This often discourages rural health indicator development.

To facilitate the development of rural health indicators, including rural environmental health indicators, we propose the following:

First, the two rural health indicators shown above are meant to indicate what is feasible. The next logical step is to construct a broad array of rural health indicators, including rural environmental indicators, relying on national and provincial datasets that are publicly available and using the methodological approaches we have suggested. Some of the indicators may not be very satisfactory because of the way rural is defined or operationalized in some datasets. However, it should be seen as another step in a long journey toward a better understanding of rural health.

Second, on the basis of the above, it should be possible to construct health profiles of rural Canada. According to Hansluwka,²² in health indicator research, there is a shift away from relying on individual indicators toward the “characteristic” approach by organizing the information into a health profile. We should be able to use a series of health indicators, including environmental health indicators, to paint a composite picture of the health conditions of rural Canada.

Third, the development of rural health indicators will not progress very far unless health surveys, administrative databases and other datasets begin to include appropriate geographic information that could be used to differentiate between rural and non-rural or regions of varying degrees of “ruralness.” This is particularly important since rural Canada is not a homogeneous entity.²³ The availability of postal code information would allow researchers to configure geographic units of analysis in whatever ways they want. Postal codes can be aggregated in many ways, making them useful building blocks.

Closely related to this is the issue of data release. We understand the reasons (e.g., issues of statistical reliability and protection of privacy) for the suppression of data release for small areas. However, this practice puts rural Canadians at a disadvantage. Sparse population is an inherent characteristic of rural Canada. Data suppression due to small numbers will inordinately and adversely affect the information that can be garnered for studying rural health issues. Some means must be found for the release of these small numbers. Otherwise, we will continue to be forced to employ health indicators that are inevitably weighted or biased toward urban populations.

Fourth, as pointed out earlier, very few environment-related rural health indicators are presently available in Canada. At the 1999 National Consensus Conference on Population Health Indicators, which was hosted by the Canadian Institute for Health Information,²⁴ several health indicators related to environmental factors were identified for potential future development. These are exposure to second-hand smoke, air quality, water quality, toxic waste and ecological footprint. We believe that given the large amount of health- and environment-related data collected by federal and provincial/territorial jurisdictions, many more rural environmental health indicators can be developed.

Finally, another priority task that has been identified by the International Joint Commission is the harmonization of indicators between jurisdictions. Since countries collect health and environmental data in different ways and for different reasons, the ability to use such data to generate comparable health indicators, other than the most basic ones such as infant mortality

and life expectancy, is a major challenge. Furthermore, for political and administrative reasons, different countries may define “rural” in dissimilar manners, making it even more difficult to compare rural health indicators. This is an issue that needs further exploration and discussion.

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