Area-based Socio-economic Measures as Tools for Health Disparities Research, Policy and Planning

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This special issue of the Canadian Journal of Public Health focuses on the contemporary use of area-based socio-economic measures (ABSMs). ABSMs, as the name suggests, are tools that utilize information (often from the census) selected specifically to characterize the socio-economic profile of geographic areas rather than of individuals. Single-component measures, such as neighbourhood income, are a common example; multiple-component area-based measures of deprivation are another instance of ABSMs.

Interest in such devices is not as recent as we may tend to assume. The tools of what was at the time the emerging science of statistics were being used in England by the second half of the nineteenth century to describe the geography of health, particularly by showing differences in mortality between urban and rural areas but also by demonstrating differences between wealthy and poor urban areas.1,2 By the early 20th century in the United States, where statistically-based empirical orientations to social science were taking root, there were numerous attempts to objectively categorize what had come to be called socio-economic status (SES).3–6 Chapin, for example, developed a four-component scale consisting of cultural possessions, effective income, participation in group activities, and material possessions “in order to permit the equating of these factors in experimental study.” (ref. 4, p. 99) It is an index that has a familiar ring almost a century later.

By the 1930s, again in the United States, this practical interest in statistics and geography saw the first use of census tracts in social analyses;7,8 and by the late 1950s, Coulter and Guralnick were reporting that census data were being used at census-tract level in conjunction with vital statistics to describe differences in mortality rates between socio-economic groups.9 At the same time, Farber and Osoinach (1959) had developed an index of socio-economic rank of census tracts using census data on occupation, education, income, and non-white population.10

While much of this history may be largely unknown today, there is no doubt that considerable interest in ABSMs has arisen over the last two decades. There are three separate though intimately intertwined rationales for this interest: deficiencies in (micro-level) data, the emergence of a conceptual and theoretical concern with “place” and health, and an emerging imperative to ground research on social inequalities in health in order to facilitate the production of evidence that can inform place-based action.

Canadian researchers and planners seeking to describe and act upon socio-economic disparities in health face a key and ongoing challenge in the paucity of available data that encompass health and socio-economic information. Few Canadian vital statistics include socio-economic data that would facilitate the tracking of disparities in birth outcomes and mortality. Birth registrations in the US, for example, contain data on maternal education, but only two provinces collect such information in Canada: Quebec and Newfoundland and Labrador.11 Death records in the US capture occupational information and educational attainment.12 Occupation information is used primarily for occupation-specific health research (see, for example, ref. 13). In the UK, occupation is also recorded on death certificates and, unlike in the US, such occupational categories have been the basis of the Registrar General’s social class schema for almost a century. This has enabled extensive descriptions of socio-economic differentials in mortality.14–16 The Registrar General’s schema and analyses that employ it have not been without their critics,17 but in Canada such research cannot even be considered because although mortality records include information on deaths by sex, age and cause, they collect no information that can be used to determine socio-economic status.

As with vital statistics, most health system-generated data – both administrative and clinical – and disease registries are similarly lacking in socio-economic content. Health sector information such as hospital admission records rarely include information on income, education, occupation or other socio-economic measures. Some primary health care and home/continuing care providers may collect demographic and socio-economic data about their patients and clients, but the fact remains that there is no system in Canada for such information to be systematically collected, standardized and aggregated.

Population health surveys can be well suited to higher-level analyses of social inequalities in health, including in morbidity and disability, and in health care access and use. The Canadian Community Health Survey (CCHS), for example, brings together health and socio-economic data and is a key source of information for public health in Canada. However, despite its large sample size, the CCHS is designed for use at the health region level, not for sub-regional, small-area analysis. At small areas of geography, the sample numbers are often not large enough to produce reliable information, even when it is feasible to merge cycles. Although the CCHS facilitates a better understanding of the relationship between individual SES and health, it is not local enough to provide information on the contexts in which these relationships play out.

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These limitations represent important gaps in the detection, understanding and monitoring of health disparities.

ABSMs – derived from geographical areas – can be used in conjunction with vital statistics and administrative health system data to enable a methodological compromise that substitutes aggregate data for micro-level (person or household) data. This kind of analysis usually involves matching individuals to a spatial location using place of residence information such as postal codes, which are normally collected in administrative and clinical data.* Using this information enables the compilation of health, socio-demographic and other data to create small area profiles (for example, census dissemination areas or census tracts).

Used in this way, ABSMs serve as an operational compromise for individual-level characteristics, for which they serve as a proxy. For this substitution to be valid, it requires a certain amount of assurance that the areas themselves are sufficiently socio-economically homogenous (and defined at the right scale to be so) that the aggregate data portray a composite or average individual.20 In other words, greater homogeneity within areas signifies greater reliability of this proxy status of the area data for micro-level data. This need for the assurance of a high degree of homogeneity means that ABSMs are typically considered more appropriate for use in urban areas, where population density and homogeneity tend to be higher.

An ongoing challenge to the use of ABSMs focuses precisely on the extent to which (notwithstanding the putative homogeneity of the area) the aggregate variables reflected in them do in fact serve as reasonable proxies for individual characteristics.21 Some researchers, such as Geronimus, have found “substantially larger estimated effects when using aggregate variables compared with when using microlevel ones.” (ref. 21, p. 835) whereas others have concluded that “the risk, if any, in the absence of individual-based socio-economic information is a conservative estimate of socioeconomic inequalities in health.” (ref. 22, p. 833; see also refs. 23 and 24)

Another trend that has motivated the use of ABSMs has been the growing conceptual interest in contextual (or place-based) influences on health.21 In this case, area-level variables are not used in analyses simply because individual-level data are unavailable. Subramanian et al., for example, suggest that ABSMs actually capture phenomena that micro-level data do not: “a shared collective or contextual dimension that all individuals within a context share.” (ref. 22, p. 833, emphasis added)

Some researchers argue that a more nuanced methodological perspective is one that seeks to move beyond what could be a fruitless insistence on a sharp distinction between micro-level and area-level phenomena. Geronimus points out that “distinguishing between the impacts of individual and community characteristics is conceptually and empirically difficult, because of the complexity of the social processes involved, as well as for the obvious reason that individuals are neither randomly assigned to place of residence nor to social identity.” (ref. 21, p. 839) We are in error, he suggests, when we assume that what we are measuring with micro-level data is exclusively individual characteristics, and that aggregate variables reflect only contextual phenomena.

Macintyre et al. elaborate on this point when they observe that “the distinction between composition [aggregated individual variables] and context [supra-individual area variables] may not be as conceptually clear or as useful as may appear at first glance. The properties of individuals or households which are used in many multilevel models are themselves shaped by the properties of the locality used in the same models.” (ref. 25, p. 129) These researchers point out that employment and occupation as micro-level variables are shaped and constrained in concrete social circumstances by the local labour market economy, just as individual educational attainment is arrived at within a contingent context of local school standards, environments and resources.25

If there are compelling reasons for using area-based variables that go beyond their filling in for missing micro-level data, this raises the question as to whether the most important (from a health perspective) area-level phenomena are best captured by the variables routinely used in ABSMs if those variables are collected to provide information about individuals and households, and selected on the basis of availability and assumptions about their proxy status. Another question hones in on the level of aggregation itself.

There are two aspects to the issue of geographical scale. The first is a methodological issue briefly referred to earlier, which is known as the modifiable aerial unit problem (MAUP). The MAUP refers to the bias that can be built into analyses as a result of the use of units of analysis that may be the product of administrative or political convenience rather than sound empirical principles.26 The second issue relates to whether geographical units of analysis have some relation to actual communities (again, because of their administrative origins). Kreiger et al. point out that “the validity of using area-based socioeconomic measures depends on the extent to which areas constitute meaningful geographic units—a different question from whether they are ‘proxies’ for individual-level socio-economic data.” (ref. 23, p. 479) Implicit in this observation is the concern that the instrumental, politico-administrative geographical boundaries of the census or of postal codes may not be the most meaningful way of dividing up the world in order to further our understanding of health determinants and of creating impetus for addressing health inequities. Macintyre et al. put the same concern this way: “just because something is an appropriate size of territory for one census enumerator or mail delivery person does not necessarily mean it is the appropriate scale for analysing [socioeconomic effects on health].” (ref. 25, p. 134) In other words, even if we concede that ABSMs have a value over and above that of a compromise alternative to missing micro-level data, the fact remains, as Foley pointed out over half a century ago, that “census tract data may have their greatest general research value in providing rough ecological profiles.” (ref. 8, p. 738, emphasis added)

A third rationale behind the increasing use of ABSMs is that, notwithstanding the fact that they may represent an operational and methodological compromise in the measurement of social disparities and health, there are a number of practical benefits to using them. Exercising suitable caution, planners and managers can benefit from analyses that are appropriate and relevant to the needs of local decision-making that would not otherwise be available to them. Moreover, ABSMs can be used in conjunction with geospatial information systems (GIS) and mapping software to create compelling visual images of the social distribution of health and health-related factors. Such tools, at the very least, may provide useful guidance as to where to focus closer scrutiny or allow dis-

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* The work of Wilkins et al. has done much to enable researchers in Canada to easily link postal codes to standard census geographic areas. (See, for example, refs. 18 and 19.)
cussions between local actors referencing tangible places rather than abstract population groupings.

In addition to Statistics Canada’s single-component neighbourhood income measure, which has been used extensively, over the last two decades there has been a growing interest in the population health literature on the development and use of multiple-component ABSMs. This special issue of the Canadian Journal of Public Health brings together, for the first time, descriptions of Canadian experiences with multiple-component ABSMs and insights from their development and use. The papers in this issue are aimed specifically at a readership of Canadian front-line planners and decision-makers, and thus the focus is on descriptive overviews of the development and application of ABSMs, including their strengths and limitations, as well as a discussion of the extent to which they have been used for policy making and program planning.

To set the context, this special issue opens with an example from New Zealand, where the New Zealand Deprivation Index (NZDep) has been used as a national policy tool for 15 years. In their article, Salmond and Crampton describe how the NZDep was developed and how it has been used to visualize variations in health as well as to allocate funds to local areas based on needs. They also highlight how the index evolved over time based on user feedback, and provide insights into some of the challenges of using ABSMs for research, planning and policy.

The next four articles focus on Canadian examples of multiple-component ABSMs. These were developed in Ontario (CAN-Marg), Quebec (Deprivation Index), Manitoba (SEFI) and British Columbia (Vandix). Matheson et al. introduce the Canadian Marginalization Index (CAN-Marg), which is structured along four separate dimensions of marginalization. They describe the development of this ABSM and the associations of the various components with health disparities across Canada. Pampalon et al. also describe a multiple-component ABSM for use across the country, and demonstrate how the Deprivation Index’s two dimensions (material and social) have been used in research and for planning in Quebec in particular. Although the CAN-Marg and Deprivation Index measure different conceptualizations of socio-economic status, both were created using factor analyses of census information and have been shown to reveal social inequalities in health.

Next, Chateau et al. present the Socio-economic Factor Index (SEFI and SEFI-2) and its associations with population health outcomes within Manitoba. Originally created to bypass the problem of suppression of income data at small scales, the new version of the ABSM (SEFI-2) includes census variables related to material and social deprivation, including income, similar to the Deprivation Index used in Quebec. It does, however, use alternative variables to best reflect the various dimensions of deprivation in the Manitoba context.

Finally, Bell and Hayes present the Vancouver Area Neighbourhood Deprivation Index (VANDIX). Unlike the three previous examples of ABSMs presented in this issue, the VANDIX was created to circumvent the problem of limited health data at small geographical scales within a city (rather than trying to address limited socio-economic information on health records). Thus, the ABSM is used as a proxy for health. Like the other ABSMs in this issue, the VANDIX is based on census information; however, its development was based on key informant surveys instead of being data driven.

Unlike elsewhere (United Kingdom or New Zealand, for example), no single measure of area socio-economic status or deprivation has attained standard usage in Canada. Instead, a number of provincial tools have emerged, which may signal that this is the level at which standardization will be established. What all of the Canadian ABSMs have in common, however, is that they have hitherto drawn on information obtained through the (mandatory) long form of the census. The full impact of the recent replacement of the long-form census with the (voluntary) National Household Survey is still to be determined. In the meantime, ABSMs help to fill an important gap in our understanding and monitoring of social inequalities in health.

REFERENCES