Does Choice of Spatial Unit Matter for Estimating Small-area Disparities in Health and Place Effects in the Vancouver Census Metropolitan Area?

Lisa N. Oliver, PhD (Cand), MA[1]
Michael V. Hayes, PhD[2]

ABSTRACT

Background: The purposes of this study were to determine (i) the extent to which small-area estimates of self-rated health are dependent upon the choice of areal unit and measure of socio-economic (SES) status, and (ii) the extent to which place effects on self-rated health are dependent upon the choice of areal unit and measure of SES.

Methods: The data were obtained from a subset of respondents in the Canadian Community Health Survey 2.1 (2003) aged 18 to 74 residing in the Vancouver Census Metropolitan Area. General health status was estimated using an item assessing respondents' self-rated health. Small-area data were obtained from the Statistics Canada 2001 Census at two spatial levels: larger Census Tract (CT) (average population 2,500-8,000) and smaller Dissemination Area (DA) (average population 400-700). SES quintiles were constructed using median family income and two indices. Hierarchical non-linear modelling was used to test for place effects.

Results: A gradient was found of increasing prevalence of "fair or poor" self-rated health by decreasing SES quintile at both the DA and CT level. With age category, sex, family income and education controlled for, hierarchical analysis showed that compared with living in a high SES CT or DA the odds of reporting fair or poor self-rated health increased for respondents living in the lowest quintile CT or DA.

Interpretation: Aggregation using DAs or CTs produces only small differences in estimates of fair or poor self-rated health by quintiles of SES. Gradients are somewhat stronger for DAs. Place effects are somewhat stronger for deprivation indices than the measure of median income.

MeSH terms: Factors; socioeconomic; small-area analysis; health; inequalities; urban spatial distribution

La traduction du résumé se trouve à la fin de l'article.

1. Department of Geography, Simon Fraser University, Burnaby, BC
2. Faculty of Health Sciences, Simon Fraser University, Burnaby, BC
Correspondence and reprint requests: Michael Hayes, PhD, Associate Dean, Faculty of Health Science, West Mall Centre Rm 2813, Simon Fraser University, Burnaby, BC Canada V5A 1S6, Tel: 604-268-6648, Fax: 604-291-5927
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Research on the social determinants of health has focused attention on the role of local contexts in shaping socio-economic inequalities in health status.[1] Canadian research has consistently demonstrated a social gradient in which various measures of health status increase with the increasing income and socio-economic status of neighbourhoods and small areas.[2] A small but growing body of Canadian research has demonstrated that living in deprived areas negatively influences health over and above what might be expected when individual factors are taken into account.[2-7] These effects are generally consistent using various measures of health status across elderly, adult and youth populations and using different spatial units, although they have not been found in all cases.[8]

Several issues are involved in attempts to estimate both the magnitude of health disparities for small areas and the relative influence place or context has upon health status over and above the influence of individual level characteristics[9] (see also papers by Dunn et al. and Gauvin et al. in this issue). In the greater Vancouver region, small-area analysis of health disparities is particularly problematic because administrative geographic units of data collection and service provision do not correspond to the geographic area of Greater Vancouver as an urban system. The Vancouver Census Metropolitan Area (CMA) is bisected by two health authorities (Vancouver Coastal and Fraser), with the domains of responsibility for each extending well beyond the bounds of the CMA (Figure 1). It has not been possible to date to estimate the extent of small-area disparities in health status across the Vancouver CMA because the underlying administrative data organization does not provide the required base population.

Data from Statistics Canada's Canadian Community Health Survey (CCHS) provide the opportunity to undertake research on a more disaggregated scale in the Vancouver CMA. A pressing question facing this type of research is how to determine the most appropriate geographic scale on which to assess area-based variations in health status and to estimate independent place effects on health. This is also a concern in neighbourhood-effects literature, in which researchers attempt to define meaningful "neighbourhood" units for analysis.[1,10,11] The choice of spatial scale is important for researchers as well as local health authorities and municipal policy makers who may wish to estimate disparities in health at the local level.

Embedded in this concern is the modifiable areal unit problem (MAUP),[12,13] which results when artificial boundaries are placed over continuous data for the purposes of reporting statistics (e.g., averages, rates) or for statistical modelling.[12] There are two properties to the MAUP. The *scale effect* refers to the influence of the size and number of areal units used. The *zonation effect* refers to the influence of the shape or configuration of areal units. Only a few studies have estimated place effects using different geographic units.[3,14,15] Some have called for future research to use both smaller and larger spatial units in order to better understand salient area-level processes.[16] One study in the Netherlands has found that geographic classification has little influence on the clustering of poor health.[14] In Canada, Ross et al.[3] have investigated neighbourhood effects on health in Montreal using both census tracts and "natural neighbourhoods" and found that the different units produced similar results.

Another key issue is which measures of deprivation are the best to assess small-area variation in health and place effects on health. There are several methods available to measure area-based deprivation, and they have been well reviewed in existing studies.[17,18] Debate often centres upon the benefits and drawbacks of assessing deprivation using single variables or deprivation indices.[19] A measure of income (e.g., average, median) has been used in many studies assessing place effects on health.[20-22]

Assessing deprivation through a single measure, such as income, has limitations, as it cannot capture salient social (e.g., lone-parent families, the elderly population living alone) and material (e.g., home ownership, car ownership, education) aspects of deprivation. While indices capture multiple aspects of deprivation they combine many variables into a single index, making it difficult to assess the variables that are the most influential. Furthermore, different areas may be quite different in terms of their material and social characteristics but end up having the same deprivation score.

Several measures of deprivation have been developed in the United Kingdom to capture both social and material aspects of deprivation, such as the Townsend Index, Jarman Index and Carstairs Index.[23-26] Studies have compared the implications of choosing these measures of deprivation to detect social gradients in health in other geographic areas.[25,27-31] Indices developed in the United Kingdom and elsewhere may not adequately capture deprivation in the Canadian context and/or may be based on census information for which there is no Canadian equivalent. Two indices have been developed to measure area-based deprivation within the Canadian context: the *Deprivation Index for Health and Welfare Planning for Quebec* (DIHWPQ) and the *Socioeconomic Factor Index* (SEFI).[18,32] These indices have both been created using data from the Census of Canada and have selected socio-economic indicators considered salient to the Canadian context. While a large body of research has compared indices of deprivation in the United Kingdom, there has been relatively little research that compares indices of deprivation developed in Canada.

This paper has two purposes. The first is to estimate inequalities in health status within the Vancouver CMA at two levels of spatial aggregation—census tract and dissemination area—and assess the extent to which resulting patterns change with the choice of spatial unit and measure of SES used. The second is to estimate place effects on health and the extent to which these vary with the choice of spatial unit and measure of SES used.

METHODS

Individual data

The CCHS is a cross-sectional health survey representative of the Canadian population that is designed to allow for a comparison of health at the subprovincial health region level across Canada.[33] Two major cycles (1.1 and 2.1) have been conducted as well as smaller cycles focusing on specific topics. This study uses data from Cycle 2.1 collected between January and November of 2003. The target population of the CCHS is Canadians over 12 years of age who live in private dwellings. The CCHS excludes people living on Indian Reserves and Crown Lands, institutional residents and full-time members of the armed forces. To allow for an adequate sample size across health regions in Canada, data were collected using three sampling frames, 48% from an area frame, 50% from a list frame of telephone numbers and 2% from a random digit dialing sampling frame. A full description of the CCHS is available elsewhere.[33]

Individual predictor variables

This study used data from CCHS 2.1 respondents living in the Vancouver CMA between 18 and 74 years of age. The individual-level predictor variables include sex, age, education and household income. Respondent's age was categorized into four groups: 18-29, 30-44, 45-59 and 60-74. Dummy variables were created, and the age category 30-44 was used as the reference category. Education was assessed from a CCHS variable that groups respondents' highest level of education into four categories: less than secondary school graduation, secondary school graduation, some post-secondary and post-secondary degree/diploma. Dummy variables were created, and the two middle categories, secondary school graduation and some post-secondary, were combined and used as the reference category. Income adequacy was assessed from a CCHS measure that classifies respondents' "total household income" into four categories, taking into account household size. For example, a 1- or 2-person family with a household income less than $15,000 or a 3- or 4-person family with a household income less than $20,000 would be classified in the lowest income category. For statistical modeling the two middle categories were combined into a single category and used as the reference category. Marital status at the time of the survey was indicated by a dummy variable (married or common law [reference category] and divorced, widowed, or single).

Individual outcome variables

Individual health outcomes were determined from the CCHS item "In general, would you say your health is: Excellent, Very Good, Good, Fair, Poor?" This variable was dichotomized into "Excellent, Very Good or Good" and "Fair or Poor", and the latter was used as the reference category.

Spatial variables

Two census geographic units were used. Census tracts (CTs) are geographic areas that are small and relatively stable with a population of 2,500 to 8,000 (average population 4000).[34] In contrast, dissemination areas (DAs) are the smallest geographic unit for which census data are available and typically consist of one or more neighbouring blocks with populations between 400 and 700.[34] In urban areas DAs are smaller subdivisions of CTs and respect CT boundaries. In the 2001 Census of Canada the Vancouver CMA was divided into 3,269 DAs and 384 CTs.

One indicator (median family income) and two indices (the DIHWPQ and the SEFI) of deprivation were selected for analysis. All measures of deprivation were constructed from the 2001 Census of Canada at the CT and DA level. The DIHWPQ was developed to reflect the social and material dimensions of deprivation using the census data at the enumeration area level (the smallest geographic area of census available from Statistics Canada, which was replaced by DAs in the 2001 census). This index is created by performing factor analysis on the following six components of deprivation related to health and welfare issues:

1. Education: proportion of people with no high school certificate
2. Employment: ratio of employment to population
3. Income: average income
4. Family structure: percentage separated, widowed or divorced
5. Single-parent families: proportion of families that have children and that are single parent
6. Living alone: proportion of people living alone.

After factor analysis, two factors with Eigenvalues over 1 were retained. The first factor reflects aspects of material deprivation (education, employment, income) and the second factor reflects social deprivation (family structure, single-parent families, living alone). To create a single measure, the factor scores were summed and divided into quintiles. The second measure of deprivation, the SEFI, is created from a different set of six census variables using factor analysis:

1. Age dependency ratio: ratio of people aged 65 and over compared with the population aged 15-65
2. Single-parent families: percentage of single-parent households among households with children
3. Female single-parent households: percentage of female-parent households among households with children
4. Female labour force participation rate: women working or seeking work on census day
5. Unemployment rate: unemployment rates of people 15-24 and 25 and over
6. Education: percentage of residents with a minimum of high school diploma.

The first step in creating this index was to run a factor analysis on the two measures of unemployment (component 5). A single factor with an Eigenvalue greater than 1 was retained as the variable for this component. All variables were transformed into *z* scores, and factor analysis was run on the six components. The factor score with the highest Eigenvalue was retained as the index variable and categorized into quintiles. Because of problems with data availability some slight modifications were made from the original index.*

Statistical analysis

The first analytic technique was to assess the prevalence of fair or poor self-rated health by quintiles at the CT and DA level for the three measures of SES. Prevalence estimates and confidence intervals were obtained using 500 bootstrap weights provided by Statistics Canada in SAS software to account for the complex sampling design of the CCHS. Sample weights were used, so the results are representative of the Canadian population. The quality of estimates was determined through the coefficients of variation produced using the bootstrapping technique. Following Statistics Canada guidelines estimates between 16.6% and 33.3% are flagged as marginal.[33] Maps displaying quintiles at the DA and CT levels were created for each of the SES indicators (all maps not shown) to visually assess the geographic areas from which population estimates were drawn.

The second analytic technique is hierarchical linear modeling (HLM) to assess place effects on health at the CT and DA level. Unlike techniques such as logistic regression, HLM is able to account for the structure of the data in which individuals are nested in higher level units. HLM is also a desirable technique because respondents in the same spatial units share place-based characteristics, violating assumptions of standard regression techniques.[35] Because the outcome variables are dichotomous and non-linear, Bernoulli models available in HLM 6.0 software were specified. Data were weighted using population weights supplied by Statistics Canada to reflect the population of the Vancouver CMA. Following Raudenbush and Bryk[35] unconditional models with no outcome variables were first run, and the variables were sequentially added. Results are presented for three types of model. The first model has a full set of level 1 (individual) variables but no level 2 (area) variables. The second model contains only level 2 predictor variables, and the third model contains the full set of variables at levels 1 and 2. This approach was adopted to examine possible over-specification of models, which may underestimate contextual effects. Separate models were run with CTs and DAs as the level 2 units.

RESULTS

Descriptive results

The CCHS 2.1 had a sample size of 6,157 respondents in the Vancouver CMA. After exclusion of missing cases and individuals outside the age range, the data on 3,920 respondents were available for analysis. At the CT level the sample size for analysis was 3,920 respondents in 378/384 CTs. In total, 98% of CTs had at least one respondent, and there was an average of 10 respondents per CT. At the DA level the sample size for analysis was 3,879 respondents in 1731/3269 DAs. At the DA level there was at least one respondent in 53% of DAs and an average of two respondents per DA. The number of respondents at the DA level was slightly lower because census data are suppressed for DAs with populations of fewer than 250 people.

* The original index uses the unemployment rate from four age groups (15-24;25-34;35-44;45-54), which were not available in the census files at the CT and DA level. The index was calculated using unemployment rate based on the two age break-downs available (15-24, 25 and over). We did not have education data available for "percentage of residents with a minimum of high school diploma" by age category and used available data for individuals 15 and over.

The prevalence of respondents reporting fair or poor self-rated health was estimated according to each respondent's DA or CT quintile of residence. This means that prevalence rates for both the DA and CT level were derived from different geographic areas of the Vancouver CMA. Because of the large number of DAs and CTs in the Vancouver CMA, we have illustrated the results using maps for a single municipality within our study region, the City of Vancouver (see Figure 1). DAs and CTs within the City of Vancouver that have the lowest quintile of median family income are shown in Figures 2 and 3, respectively. Because there were CCHS respondents in 98% of CTs it is probable that there were CCHS respondents in the CTs displayed in Figure 3. However, as only 53% of DAs had CCHS respondents there may not be individuals from each DA shown in Figure 2. Because of confidentiality concerns we cannot present results showing which CTs and DAs have respondents. CTs in the lowest quintile are concentrated on the east side of the city, but DAs, while more prevalent on the east side of the City, are also on the west side of the City. Thus, the areas from which estimates of CT and DA quintiles were drawn are quite different. Because they are larger, CTs may contain areas of affluence or deprivation falling within their boundaries. For example, 21% of CTs in the Vancouver CMA contain DAs in both the highest and lowest median family income quintile.

The results show a gradient in which increasing SES quintiles were associated with increasing prevalence of fair or poor self-rated health across all spatial units and SES measures (see Figure 4). In the highest SES quintile the prevalence of fair or poor self-rated health ranged from 5.2% (DA, DIHWPQ) to 6.6% (CT, SEFI). In the lowest SES quintile the prevalence of reporting fair or poor self-rated health ranged from 14.2% (DA, median income) to 15.1% (DA and CT, DIHWPQ). Although CT and DA analyses involved people living in different areas of the Vancouver CMA, the results are consistent. However, a wider gradient is evident for the DIHWPQ and SEFI than income. For the indices there is a wider gradient at the DA level.

Figure 1. Map of Vancouver Census Metropolitan Area and health authorities

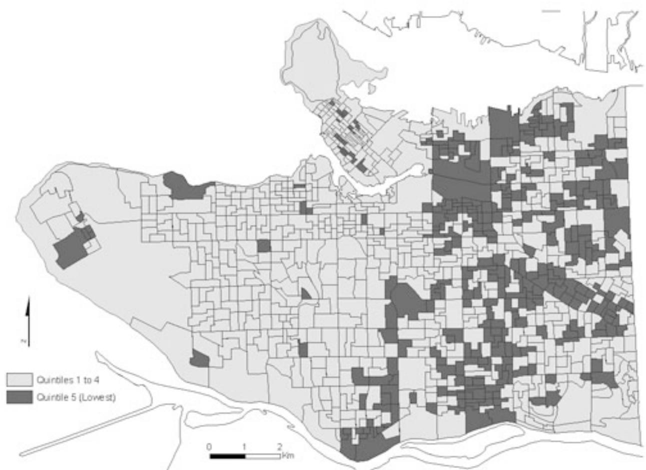

Figure 2. City of Vancouver dissemination areas with median family income (2001) in the lowest quintile of the Vancouver Census Metropolitan Area

Multilevel results

The results of the multilevel models predicting a response of fair or poor self-rated health are presented in Tables I (CT) and II (DA). The results in the first section of Table I include only individual-level characteristics unadjusted for area level characteristics. Being female statistically significantly increased the relative odds of self-reporting fair or poor health (odds ratio [OR] = 1.44; 95% confidence interval [CI] 1.50, 3.25). Increasing age was statistically significantly associated with increasing odds of reporting fair or poor health compared with the 30-44 age group. Low income adequacy was associated with increased odds and upper income adequacy with reduced odds of reporting fair or poor self-rated health compared with the middle income category. The first section of Table II presents the results for the same set of individual level characteristics, but individuals are grouped

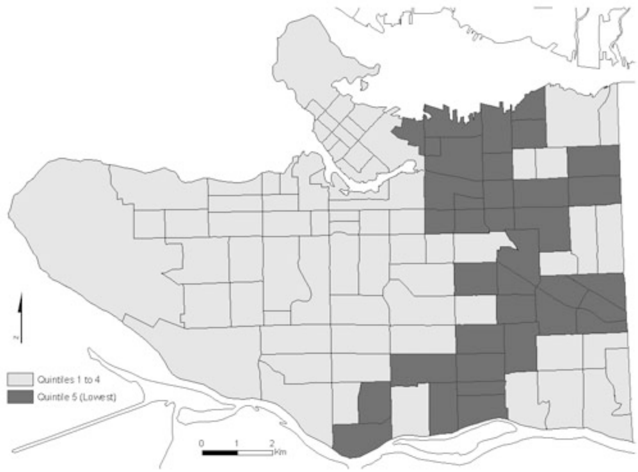

Figure 3. City of Vancouver census tracts with median family income (2001) in the lowest quintile of the Vancouver Census Metropolitan Area

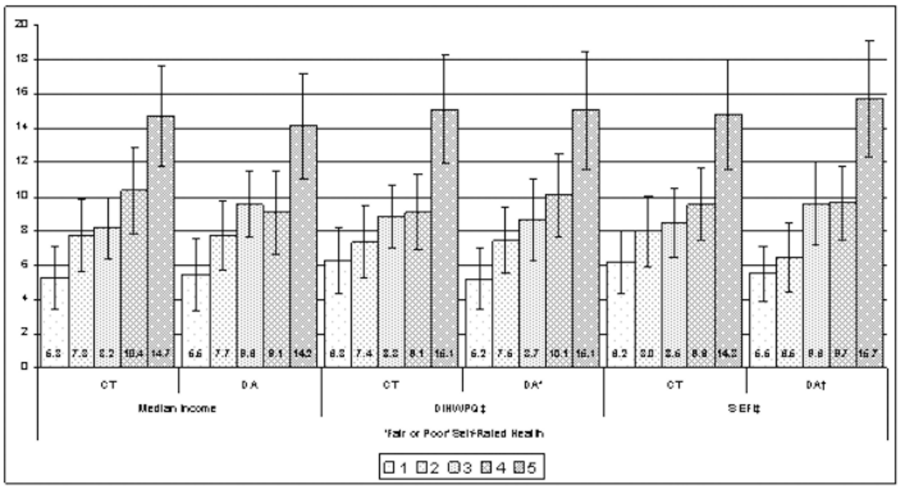

Figure 4. Prevalence of reporting "fair or poor" self-rated health by quintiles of socio-economic status (%)

* Quintile 1(value = 5.2%) has a coefficient between 16.6% and 33.3%, which is considered marginal according to Statistics Canada data quality guidelines.

† Quintile 1(value = 5.5%) has a coefficient between 16.6% and 33.3%, which is considered marginal according to Statistics Canada data quality guidelines.

‡ DIHWPQ (Deprivation Index for Health and Welfare Planning in Quebec); SEFI (Socio-economic Factor Index)

on the basis of DA of residence. The magnitude and significance levels of individual characteristics are comparable at both the CT and DA level. In both models, the odds of having a post-secondary degree were not significantly different from the reference category (having some post-secondary education but no degree).

The second section (model 2) of Table I shows the result of the CT model with only level 2 variables, unadjusted for individual characteristics. The constant (intercept) is the odds of a respondent living in a middle-income quintile having a poor health outcome. The constant is identical for models 2a (income) and 2b (SEFI) at both the CT and DA level. The third section (model 3) of Tables I and II displays the results of the full model adjusted for both level 1 and level 2 characteristics. Level 2 effects are attenuated with the addition of individual-level characteristics. Living in the lowest quintile CT was associated with a relative odds of reporting fair or poor self-rated health of 0.409 (95% CI 0.31, 0.55), and with the inclusion of individual characteristics the relative odds were attenuated at 0.46 (95% CI 0.34, 0.62).

For model 3a (median family income) level 2 effects were stronger in magnitude at the CT than the DA level (Tables I and II model 3a) after individual variables had been controlled for. For those living in the highest-income quintile (relative to a middle-income quintile) the ORs of reporting fair or poor self-rated health were 0.7 (95% CI 0.50, 0.99) at the DA level and 0.50 (95% CI 0.34, 0.62) at the CT level. Comparison of the full models (models 3a, 3b, 3c) at the DA and CT level indicated that using the DA level may be a more robust predictor of area effects of health for the deprivation indices. For example, living in the highest quintile for both the DIHWPQ and SEFI decreased the odds of reporting fair or poor self-rated health across all models but was only statistically significant at the DA level. As well, the magnitude of the ORs for the highest quintile was attenuated for the CTs compared with that of the DAs (e.g., 0.82 DA vs. 0.69 for SEFI quintile 1).

DISCUSSION

The first purpose of our paper was to determine whether estimates of inequalities in health differ between levels of census geography. Our results suggest that DAs provide better estimates of small-area variation in health outcomes than CTs. While a similar social gradient was found for both areal units, gradients were wider for DA quintiles than CT quintiles. This is likely because DAs are smaller areal units and, as such, have more homogeneous clusters of social characteristics. Maps displaying quintiles of median family income at the DA and CT level (Figures 2 and 3) show that the spatial areas from which individuals are drawn in order that estimates can be calculated are considerably different.

Further, we find that quintiles of deprivation reveal stronger gradients in health than median family income at the DA and CT level. Because indices tap multiple aspects of deprivation (e.g., education and employment) they likely perform better than the single indicator of income. There are several DAs around the University of British Columbia that have low income, reflecting a clustering of students. While these populations may currently have low

TABLE I

Model Results for "Fair or Poor" Self-Rated Health, Census Tract Level

Level 1 (Individual)		Model 1 Odds	Confidence Interval	p	Model 2(a) Odds	Confidence Interval	p	Model 2(b) Odds	Confidence Interval	p	Model 2(c) Odds
Female		1.439	(1.499,3.252)	0.008							
Age	18-29	0.866	(0.578,1.299)	0.487							
	45-59	1.847	(1.335, 2.555)	0.000							
	60-74	3.334	(2.408, 4.618)	0.000							
Married		0.684	(0.531, 0.881)	0.004							
No high school		2.208	(1.499, 3.252)	0.000							
Post-secondary		0.834	(0.617, 1.127)	0.239							
Low income		1.450	(1.017, 2.066)	0.040							
Upper Income		0.595	(0.447, 0.793)	0.001							
Level 2 (Census Tract)											
Constant					0.095	(0.081, 0.113)	0.000	0.09	(0.076,0.107)	0.000	0.086
Income	Quintile 1				0.409	(0.306, 0.547)	0.000				
	Quintile 5				1.613	(1.156, 2.252)	0.006				
Manitoba	Quintile 1							0.651	(0.458, 0.927)	0.018	
	Quintile 5							1.906	(1.361, 2.670)	0.000	
Pamaplon	Quintile 1										0.674
	Quintile 5										2.051

Model 1 Unadjusted for neighbourhood characteristics
Model 2 Unadjusted for individual characteristics
Model 3 Adjusted for both individual and neighbourhood characteristics

TABLE II

Model Results for "Fair or Poor" Self-Rated Health, Dissemination Area Level

Level 1 (Individual)		Model 1 Odds	Confidence Interval	p	Model 2(a) Odds	Confidence Interval	p	Model 2(b) Odds	Confidence Interval	p	Model 2(c) Odds
Female		1.291	(1.018,1.636)	0.035							
Age	18 - 29	1.004	(0.697,1.448)	0.982							
	45 - 59	1.831	(1.367,2.453)	0.000							
	60 - 74	3.177	(2.239,4.507)	0.000							
Married		1.008	(0.742,1.370)	0.960							
No high school		2.378	(1.611,3.511)	0.000							
Post-secondary		0.823	(0.619,1.094)	0.181							
Low Income		1.617	(1.125,2.325)	0.010							
Upper Income		0.624	(0.485,0.802)	0.000							
Level 2 (Dissemination Area)											
Constant					0.095	(0.082,0.110)	0.000	0.090	(0.077,0.104)	0.000	0.093
Income	Quintile 1				0.593	(0.434,0.809)	0.001				
	Quintile 5				1.525	(1.138,2.043)	0.005				
Manitoba	Quintile 1							0.629	(0.471,0.840)	0.002	
	Quintile 5							1.949	(1.438,2.642)	0.000	
Pamaplon	Quintile 1										0.538
	Quintile 5										1.816

Model 1 Unadjusted for neighbourhood characteristics
Model 2 Unadjusted for individual characteristics
Model 3 Adjusted for both individual and neighbourhood characteristics

incomes, they will likely be upwardly mobile. There are other areas in the Vancouver CMA with elderly residents who may have significant wealth (equity in real estate) but low incomes. In both cases, these groups may have higher health status than expected on the basis of income estimates alone.

The second purpose of this paper was to compare place effects between two widely used levels of census geography (CTs and DAs). Ross,[3] comparing "natural" neighbourhoods and CTs, found little difference in neigbourhood effects using multilevel analysis. While we used different outcome measures and predictor variables, our study found little evidence of a systematic difference in place effects by level of census geography. This is interesting because in our study there are considerable differences in the sizes of the areal units and the sample size per areal unit. Statistical power in multilevel modeling can be compromised when there are fewer than 10 level 2 units.[36] The multilevel models run had 378 CTs and 1,731 DAs at level 2, which is well above the minimum threshold for the factors related to statistical power to influence model results.

We also found that after individual variables had been controlled for, small-area deprivation independently influenced the relative odds of reporting fair or poor self-rated health. The results are consistent across all three measures of deprivation and using two levels of spatial units. This is one of the first studies to assess such place effects in the Vancouver CMA.

One limitation of this study is that different populations were used to calculate health status and area-level deprivation. For example, we included only individuals 18-74 in our analysis but used socio-economic data for all individuals in the Vancouver CMA. Thus, the socio-economic profile of those included in our study may be different from that of the estimates. Another limitation is that HLM analysis treats spatial units (DAs and CTs) as isolated units when they are, in fact, integrated components of an urban system. Nonetheless, this study adds to the growing body of literature showing place effects on health status.

TABLE I, continued

Model 2(c) Confidence Interval	p	Model 3(a) Odds	Model 3(a) Confidence Interval	p	Model 3(b) Odds	Model 3(b) CI	p	Model 3(c) Odds	Model 3(c) CI	p
		1.447	(1.104, 1.898)	0.008	1.441	(1.106,1.879)	0.007	1.4410	(1.106,1.878)	0.010
		0.876	(0.580, 1.323)	0.528	0.882	(2.407,4.610)	0.544	0.8860	(0.591,1.328)	0.560
		1.884	(1.351, 2.627)	0.000	1.847	(1.010,2.033)	0.000	1.8400	(1.331,2.544)	0.000
		3.513	(2.516, 4.906)	0.000	3.331	(0.452,0.806)	0.000	3.3450	(2.417,4.630)	0.000
		0.696	(0.540, 0.898)	0.006	0.713	(0.555,0.915)	0.008	1.4410	(1.106,1.878)	0.010
		2.112	(1.427, 3.125)	0.000	2.160	(1.470,3.174)	0.000	2.1540	(1.465,3.168)	0.000
		0.848	(0.624, 1.154)	0.296	0.827	(0.613,1.117)	0.217	0.8350	(0.618,1.128)	0.240
		1.438	(1.012, 2.042)	0.042	1.433	(1.010,2.033)	0.001	1.4320	(1.011,2.030)	0.040
		0.617	(0.459, 0.828)	0.002	0.604	(0.452,0.806)	0.001	0.6100	(0.456,0.816)	0.000
(0.072,0.103)	0.000	0.071	(0.048, 0.104)	0.000	0.066	(0.046,0.096)	0.000	0.0650	(0.044,0.094)	0.000
		0.459	(0.342, 0.616)	0.000						
		1.322	(0.944, 1.853)	0.105						
					0.819	(0.571,1.174)	0.278			
					1.570	(1.126,2.189)	0.009			
(0.482, 0.944)	0.022							0.8170	(0.580,1.152)	0.250
(1.482, 2.837)	0.000							1.6130	(1.169,2.226)	0.000

TABLE II, continued

Model 2(c) Confidence Interval	p	Model 3(a) Odds	Model 3(a) Confidence Interval	p	Model 3(b) Odds	Model 3(b) CI	p	Model 3(c) Odds	Model 3(c) CI	p
		1.287	(1.017,1.628)	0.036	1.292	(1.016,1.642)	0.036	1.210	(0.955,1.534)	0.114
		0.912	(0.631,1.319)	0.625	1.019	(0.706,1.471)	0.921	0.851	(0.584,1.241)	0.402
		1.743	(1.303,2.331)	0.000	1.851	(1.379,2.485)	0.000	1.665	(1.238,2.239)	0.001
		2.959	(2.073,4.224)	0.000	3.238	(2.274,4.612)	0.000	3.129	(2.203,4.445)	0.000
		0.975	(0.718,1.325)	0.873	1.024	(0.750,1.396)	0.921	1.026	(0.747,1.409)	0.876
		2.468	(1.675,3.636)	0.000	2.302	(1.564,3.390)	0.000	2.738	(1.830,4.098)	0.000
		0.833	(0.628,1.106)	0.207	0.819	(0.614,1.093)	0.176	0.896	(0.673,1.194)	0.454
		1.600	(1.113,2.299)	0.011	1.599	(1.117,2.290)	0.011	1.530	(1.046,2.239)	0.029
		0.621	(0.482,0.801)	0.000	0.632	(0.490,0.816)	0.001	0.676	(0.528,0.866)	0.002
(0.080,0.109)	0.000	0.062	(0.043,0.090)	0.000	0.056	(0.038,0.082)	0.000	0.060	(0.040,0.088)	0.000
		0.700	(0.495,0.990)	0.044						
		1.243	(0.899,1.718)	0.188						
					0.689	(0.510,0.930)	0.015			
					1.537	(1.118,2.112)	0.009			
(0.395,0.731)	0.000							0.606	(0.435,0.844)	0.004
(1.342,2.458)	0.000							1.361	(0.985,1.878)	0.061

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RÉSUMÉ

Contexte : Cette étude visait à déterminer i) la mesure dans laquelle, à l'échelle d'un petit secteur, les estimations de l'état de santé dépendent du choix de l'unité spatiale et des variables du statut socioéconomique (SSE), et ii) la mesure dans laquelle l'influence du lieu sur l'état de santé dépend aussi de ces choix.

Méthode : Nos données proviennent d'un sous-ensemble de répondants de l'Enquête sur la santé dans les collectivités canadiennes 2.1 (2003) âgés de 18 à 74 ans et habitant la région métropolitaine de recensement de Vancouver. Nous avons estimé leur état de santé général à l'aide d'un élément de l'enquête relatif à l'autoévaluation de la santé. Les données par petit secteur sont tirées du Recensement 2001 de Statistique Canada à deux échelles spatiales : le secteur de recensement (SR) (2 500 à 8 000 habitants en moyenne) et l'aire de diffusion (AD) (400 à 700 habitants en moyenne). Les quintiles de SSE ont été élaborés d'après le revenu familial médian et deux indices de pauvreté. L'effet du lieu a été calculé par modélisation non linéaire hiérarchique.

Résultats : On observe un gradient de prévalence inverse entre l'état de santé évalué « moyen ou mauvais » et le quintile de SSE, tant à l'échelle des AD qu'à celle des SR. En rajustant les données selon l'âge, le sexe, le revenu familial et l'instruction, la modélisation hiérarchique a montré que la probabilité d'évaluer son état de santé comme étant mauvais ou moyen augmentait chez les répondants vivant dans un SR ou une AD du quintile inférieur, comparée aux réponses des répondants des SR ou des AD des quintiles de statut socioéconomique plus élevé.

Interprétation : Les regroupements par AD ou par SR ne produisent que de faibles écarts dans les estimations de l'état de santé selon le quintile de SSE. Le gradient est un peu plus prononcé pour les aires de diffusion. L'influence du lieu est un peu plus forte avec les indices de pauvreté qu'avec la mesure du revenu médian.