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Jianlin Niu

University of Western Ontario, jniu4@uwo.ca

Roderic Beaujot

University of Western Ontario, rbeaujot@uwo.ca

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**Aggregate level community
characteristics and health**

by
**Roderic Beaujot
and
Jianlin Niu**

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jniu4@uwo.ca

Rbeaujot@uwo.ca

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**Population Studies Centre
University of Western Ontario
London CANADA N6A 5C2**

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Aggregate level community characteristics and health

Abstract:

This study links aggregate data from the 2001 census to individual data from the Canadian Community Health Survey, using dissemination areas as the unit of aggregation. Individual-level considerations are found to be more important to self-perceived health than community-level characteristics. Education and income adequacy are the most important considerations. Sense of belonging to community overshadows the features measured at the aggregate level, be they economic, family, cultural or geographic considerations.

Key words: self-perceived health, economic, cultural, family, geographic, community

It is often proposed that health is affected not only by individual factors, but also by community characteristics. Community questions could affect health, not only by the available services, but also through the extent of social cohesion and social support, or the extent of inequality in given communities. For instance, Wilkinson (1994) proposes that mortality rates across developed societies are no longer related to per capita economic growth, but they are related instead to the amount of income inequality in given societies. He further proposes that health is related to the “social fabric,” especially the extent to which people feel included or excluded, given in part the amount of inequality. While macro comparisons have been made across societies, there are fewer studies that take community-level characteristics into account while studying individual health.

Relationships have been noted between region and health (e.g. Wilkins, Berthelot and Ng, 2002), but few studies have linked health to other measures that can be taken at the aggregate level. Using a measure of respondent’s sense of belonging to their local community, Ross (2002) finds that the differentials associated with reporting very good or excellent health are stronger by the five categories of sense of community belonging than by sex, age, marital status, presence of children under twelve, currently has job, and residential area, but the differentials are stronger by education and by household income.

Our purpose here is to extend this analysis by starting with individual characteristics, then adding characteristics of community that can be located in census profiles, and finally to compare the relative importance of these characteristics in relation to the measure of sense of belonging to community. The goal is to assess whether community conditions impact on individual health status and to compare their relative importance to that of individual characteristics.

Previous research

In the United States, studies have shown that social capital influences the individual’s health-related behaviours, access to services and amenities, and psycho-social processes (Kawachi, 2000, Kawachi and Berkman, 2000, Kawachi, Wilkinson, and Kennedy, 1999). There is a concern that social capital in the United States and elsewhere is declining (Putnam, 1993, 2000) and that this is mainly due to increasing income inequality (Kawachi et al., 1999).

In contrast to the United States, Ross et al. (2000) find that there were no significant associations between mortality and income inequality in Canada. In addition, Tremblay, Ross, and Berthelot (2002) show that there is no strong influence of social environment on individual health status in Canada, a finding contrary to those in the US and Great Britain. They propose that this may be due to the range of social and health policies that prevent health inequalities by region. They noted, however, that social context effects (such as that of social capital) may be best detected at neighbourhood level rather than at the level of health regions.

Other studies have found health differentials by neighbourhood and regions in Canada. Health regions that differ in socio-demographic and economic characteristics also differ in life expectancies, disability-free life expectancies, and life styles such as, smoking, drinking, obesity, and depression (Shields and Tremblay, 2002; Mayer et al., 2002). While mortality differentials by neighbourhood income have decreased between 1971 and 1996, differentials nevertheless persist for some causes of death and have widened for a few other causes (Wilkins, Berthelot and Ng, 2002). An analysis of *Regional socio-economic context and health* (Statistics Canada 2002) finds that individual factors such as education and income, and health-related risk factors, such as obesity, play a larger role than the regional socio-economic context in which the respondent lives. In another study, neighbourhood low income and income inequality have been found to be related to self-perceived health but not to distress and number of chronic conditions (Hou and Chen, 2003).

Studies have found that there is a relationship between a person's social integration and their health status; for instance, those who rated themselves as having good to excellent health are more likely to be economically included, politically participative, and feel stronger sense of belonging (Ravanera and Rajulton, 2001). This is a *selection* effect - those who are healthy select themselves into favourable economic and social positions. But, the relationship could be *causal* - less socially integrated individuals are also at increased risk of poor health outcomes (Kawachi, Wilkinson, and Kennedy, 1999).

Research strategy

Some of the health variations by region or neighbourhood could be due to the concentration of individuals of similar socio-economic status in certain areas (*compositional* effect) and thus, could be accounted for by individual-level characteristics. However, factors inherent to the neighbourhood or region (*contextual* effects) cannot be ruled out. Some of these factors could be variations in socio-economic conditions, such as social cohesion or social capital, income inequality, or availability of health care facilities and services.

The 2000-2001 Canadian Community Health Survey is particularly useful for studying questions relating to family structure, economic security and other individual characteristics (Béland, 2002). Besides the particularly large sample size, there are various measures of health, including self-rated health, specified chronic conditions, long-term activity restriction and major depressive episode.

We have chosen to focus on self-rated health because it is measured for all respondents and it has been found to predict other measures of health (Miilunpalo et al., 1997; Kaplan and Camacho,

1983; Heistaro et al., 2001). The main goal is to see if the addition of aggregate-level considerations contributes to the explanation of health differences as measured through self-perceived health. Economic, cultural and family considerations are introduced, at both the individual and aggregate levels.

The study is modelled on a study of “Community belonging and health,” where Ross (2002) found that “sense of belonging to community” showed a strong relationship with health. The uniqueness of this study is that we have linked the individual respondents from the CCHS with the certain characteristics of their area of residence, as obtained from the 2001 census. After linkage with these aggregated census data, we are able to study the determinants associated with individual, family and community characteristics. The models proceed by considering sets of variables that represent geographic, economic, cultural and family variables, first using variables measured at the individual level, then at the aggregate level, with a final model including all variables.

The total sample size of CCHS is 130,880 persons aged 12 and above. The interviews were taken between September 2000 and November 2001. The sample covers 136 health regions, in the ten provinces and three territories. The sample includes persons living in private dwellings, but it excludes residents of Indian Reserves, or Crown Lands, institution residents, full-time member of the Canadian Armed Forces, and residents of certain remote regions. Telephone interviews were done, with a response rate of 84.7 percent (Gibbons and Waters, 2003:10). The analysis is based on the population aged 18 and over, where the sample size is 118,283 (119,069 after weighting) persons.

A 2001 Census Profile, developed for use in Statistics Canada Research Data Centres, was linked to the CCHS data based on the Postal Code Conversion file. The aggregation unit adopted was the dissemination area. There are 49,153 dissemination areas in the 2001 census, but the Census Profile has suppressed the data from areas with fewer than 40 persons. As a consequence, some 3000 respondents from the CCHS could not be linked to aggregate level data. These cases have been removed from the multi-variate analysis, as have the cases where there are “missing values” on one or the other of the variables in the analysis. Since there were a substantial number of cases with missing value on the measure of income adequacy, the “missing value” category has been retained as a separate category for this variable.

Age needs to be controlled

Self-perceived health is measured in terms of the persons who responded that their health was “excellent or very good” in response to the question asking “In general, would you say your health is: excellent? Very good? Good? Fair? Poor?” As seen in the descriptive results (Table 1), age has a strong relationship to self-perceived health, with systematic declines from 73.83 percent indicating excellent or very good health at age 25-29 compared to 28.65 percent at ages 85 and over. These age differences are probably partly responsible for other differences seen in Table 1, and thus need to be controlled in any analysis.

Economic differences play the largest role

At the individual level, the economic variables are education, income adequacy and work-status (full-time, part-time and not employed). Model 1 with age, sex and these economic variables has the most explained variance, other than the models that combine these factors with other characteristics. There is no difference between full and part-time work, but otherwise these economic considerations have systematic relationship with health. The likelihood of good or excellent health is more than double for persons with bachelor's or higher degrees, compared to less than completed secondary education. There are similar differences for upper middle and highest levels of income adequacy, compared to the lowest level. There is also lower health for those who are not employed.

Cultural differences do not show a strong relation to health

Model 2, which has age, sex and certain cultural considerations, had less explained variance than the economic model. At the individual level, the model included race (white, aboriginal, visible minority), Canadian citizenship (yes, no) and birthplace (Canada, other). The citizenship and birthplace variables are not significant, but there is significantly worse health for the Aboriginal population, and to a lesser extent for those with visible minority status.

Differences on family variables are significant

Health would appear to be more related to economic and family considerations, than to cultural and geographic considerations. At the individual level, there is poorer health especially for those in "other households," but also for those who are not married, while there is better health for those in two-parent families and those with children under 12 (marginally insignificant at 0.001 level, Model 3).

While they are not as strong as the economic questions, the family characteristics, play a role in self-perceived health. At the individual level, it is especially the disadvantage of being single, but also that of being either post-married (divorced, separated or widowed) or common-law. There are advantages of being in a two-parent family, or in a family with children under 12, while there are disadvantages of being in a lone-parent family or in an "other" household.

Geographic differences account for smallest amount of variation

Two geographic variables are introduced, but Model 4 including age, sex and geographic considerations has the lowest explained variance. There is better self-perceived health in the rural fringe areas of census metropolitan areas, and in Ontario, in contrast to poorer health in the northern territories, but other geographic differences are small.

Other aggregate level measures explain only marginally more explained variation

Two factors were used to measure *economic* questions at the aggregate level: employment rate and incidence of low income. Model 5 including age, sex and these two aggregate level economic questions had the highest explained variance among the aggregate models, but this was lower than Model 1 which introduced the individual level economic considerations. There was a

higher likelihood of excellent or very good health for persons from dissemination areas that had high employment rate, or low percentage with low income, but these differences are small in comparison to the individual level differences by education or income adequacy.

At the aggregate level, the *cultural* model included the percent visible minorities and the percent Canadian citizens, in the respondent's dissemination area (Model 6). The explained variance here is the lowest among the models considered.

Among the *family* questions measured at the aggregate level, there are disadvantages to being in areas with a higher percentage of lone-parent families, non-family persons or common law unions (Model 7). While these are not as large as the difference associated with being in an area with a high percentage of persons with low income, they are larger than the other economic and cultural considerations at the aggregate level. Among the aggregate models, the family model has similar explained variance to the economic model.

The sense of belonging to community has a stronger relationship with health than most of the other individual level considerations that were studied. This replicates the Ross (2002) results showing that only education, working status and income adequacy have a stronger relationship to health than sense of belonging to community (Model 8 versus Model 1). It is also of interest that the aggregate level measures become less important once sense of community belonging is added to the model (Model 9), leaving only incidence of low income, visible minority and percentage of common law unions as significant aggregate level variables. That is, the community variable of sense of belonging appears to overshadow the other specific community level measures, be they economic, cultural or family-based.

Controlling for the other variables in the analysis, the urban/rural variable loses its significance, but the provincial differences remain important. Model 9 shows advantages to persons living in Quebec, and disadvantages for persons in the Western provinces. However, the advantages of living in "rural fringe" areas disappear once other variables are controlled.

Conclusion

This analysis confirms the greater importance of individual-level characteristics in comparison to community-level considerations, as determinants of health. The individual-level considerations which are found to be particularly important are education, income adequacy, work status, and sense of belonging to community. The high levels of each of these variables doubles or almost doubles the likelihood of the response of "excellent or very good" health. Controlling for other factors under consideration, persons who are not employed also have poorer health. Among the cultural considerations, there is poorer health for persons with aboriginal origins or visible minority status, but the citizenship (Canadian, other) and birthplace (Canada, other) variables are not significant. Marital status on its own is significant, but not after controlling other variables. Among the family factors, there remain advantages to living in a household with children under 12, and disadvantages to living in "other households," but the other measures of family or household type are no longer significant.

The community-level considerations are generally less important than the individual-level factors. Several aggregate measures lose their significance after controlling for sense of belonging to community: employment rate, rural/urban area, percentage Canadian citizens, percentage non-family persons, percentage of lone-parent families, and percentage of families with children. Among the aggregate measures, only the incidence of low income, percentage visible minorities, and the percentage of common-law unions remain significant.

While the individual characteristics are found to be more important than the characteristics measured at the community level, we would nonetheless suggest that aggregate-level factors remain relevant for further study. We have used dissemination areas; these units represent an intermediate level of aggregation. It may be that smaller areas, especially neighbourhoods, would play a larger role. There would also be advantages to testing larger areas, especially the forward sortation areas from the postal codes, because there would be sufficient respondents per area to undertake two-level analyses. These mixed models would present the advantage of a better separation of the variance components for the individual-level and the aggregate-level. In particular, such analyses would permit a determination of the extent to which the community level variance is accounted for by given community features.

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Table 1: Percent reporting excellent or very good health, by various characteristics, population aged 18 and over, Canada 2000-2001.

| Variables | N | (%)excellent/very good |
|--|---------------|-------------------------------|
| Total | 119069 | 60.36 |
| Age group | | |
| 18-24 | 14963 | 71.48 |
| 25-29 | 10248 | 73.83 |
| 30-34 | 11024 | 72.71 |
| 35-39 | 13239 | 69.04 |
| 40-44 | 13874 | 64.44 |
| 45-49 | 12168 | 60.62 |
| 50-54 | 10508 | 57.59 |
| 55-59 | 8104 | 53.83 |
| 60-64 | 6352 | 46.30 |
| 65-69 | 5873 | 44.01 |
| 70-74 | 5118 | 36.91 |
| 75-79 | 3775 | 32.77 |
| 80-84 | 2335 | 27.75 |
| 85+ | 1487 | 28.65 |
| Education | | |
| Up to secondary | 26700 | 40.75 |
| Secondary graduated | 24085 | 62.09 |
| Some post-secondary | 10418 | 64.02 |
| Trade/college/university degree<bachelor | 36245 | 65.16 |
| Bachelor's degree | 14478 | 74.25 |
| University certificate>bachelor | 6054 | 73.70 |
| Missing | 1088 | 49.36 |
| Income adequacy | | |
| Lowest | 4170 | 43.00 |
| Lower middle | 8084 | 41.70 |
| Middle | 23596 | 51.36 |
| Upper middle | 38149 | 62.59 |
| Highest | 33003 | 72.67 |
| Not stated | 12067 | 55.76 |
| Usual working status | | |
| Full-time | 72150 | 68.75 |
| Part-time | 12761 | 66.48 |
| Not employed | 32845 | 39.59 |
| Missing | 1311 | 59.73 |
| Race | | |
| White | 101607 | 60.92 |
| Aboriginal | 1168 | 43.66 |
| Visible minority | 15359 | 58.39 |
| Missing | 934 | 52.89 |
| Canadian citizen | | |
| No | 26514 | 55.17 |
| Yes | 92554 | 61.85 |

Table 1: Contd.

| Variables | N | (%)excellent/very good |
|---|----------|-------------------------------|
| Foreign born | | |
| No | 92551 | 61.79 |
| Yes | 26517 | 55.37 |
| Marital status | | |
| Single | 26897 | 66.41 |
| Divorced/separated/widowed | 15929 | 45.75 |
| Common-law | 10803 | 65.77 |
| Married | 65330 | 60.56 |
| Missing | 110 | 52.73 |
| With kids under 12yrs in household | | |
| No | 88223 | 57.70 |
| Yes | 30846 | 67.98 |
| Family type | | |
| Two-parent family | 76947 | 63.07 |
| Lone-parent family | 8053 | 57.92 |
| Non-family household | 23051 | 53.85 |
| Other household | 9916 | 56.49 |
| Missing | 1101 | 60.40 |
| Aggregate-level measures | | |
| Rural/Urban Area | | |
| Urban core of CMA | 84716 | 60.68 |
| Urban fringe of CMA | 2694 | 62.77 |
| Rural fringe of CMA | 7764 | 63.14 |
| Urban outside CMA | 10141 | 57.84 |
| Rural outside CMA | 13755 | 58.20 |
| Region | | |
| NFL/PEI/NS/NB | 9197 | 58.79 |
| Quebec | 29013 | 60.02 |
| Ontario | 45562 | 62.17 |
| Man/Sask | 7822 | 57.63 |
| Alberta/BC | 27138 | 59.06 |
| Yukon/NWT/Nunavut | 336 | 55.36 |
| Employment rate | | |
| Low | 38695 | 55.19 |
| Medium | 38820 | 60.35 |
| High | 39319 | 65.30 |
| Missing | 2235 | 63.27 |
| Low income incidence rate | | |
| Low | 39066 | 64.42 |
| Medium | 38750 | 60.85 |
| High | 39019 | 55.65 |
| Missing | 2235 | 63.27 |

Table 1: Contd.

| Variables | N | (%)excellent/very good |
|---|----------|-------------------------------|
| Percentage of visible minority | | |
| Low | 38515 | 59.86 |
| Medium | 38375 | 61.14 |
| High | 39944 | 59.93 |
| Missing | 2235 | 63.27 |
| Percentage of Canadian citizens | | |
| Low | 39677 | 60.25 |
| Medium | 38686 | 61.19 |
| High | 38391 | 59.48 |
| Missing | 2316 | 63.13 |
| Percentage of non-family persons in private households | | |
| Low | 38983 | 64.67 |
| Medium | 39202 | 59.44 |
| High | 38649 | 56.79 |
| Missing | 2235 | 63.27 |
| Percentage of common-law union among the population aged 15+ | | |
| Low | 39592 | 61.72 |
| Medium | 38884 | 59.71 |
| High | 38544 | 59.44 |
| Missing | 2049 | 63.88 |
| Percentage of lone-parent families among census families | | |
| Low | 39058 | 63.18 |
| Medium | 38358 | 60.43 |
| High | 39412 | 57.35 |
| Missing | 2241 | 63.10 |
| Percentage of families with kids at home | | |
| Low | 34124 | 58.65 |
| Medium | 43462 | 60.08 |
| High | 39242 | 62.01 |
| Missing | 2241 | 63.10 |
| Sense of community belonging | | |
| Very strong | 18248 | 63.02 |
| Somewhat strong | 43715 | 62.42 |
| Somewhat weak | 31662 | 59.48 |
| Very weak | 15737 | 54.26 |
| Missing | 9707 | 58.83 |

Source: data from CCHS 2000-2001.

Table 2: Adjusted odds ratios for reporting excellent or very good health by economic, cultural, family and community characteristics, population aged 18 and over, Canada 2000-2001.

| Independent Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Age | 0.98* | 0.97* | 0.97* | 0.97* | 0.97* | 0.97* | 0.97* | 0.97* | 0.98* |
| Female | 1.05* | 0.94* | 0.95* | 0.94* | 0.94* | 0.94* | 0.94* | 0.94* | 1.05 |
| Education (ref.=up to secondary) | | | | | | | | | |
| Secondary graduated | 1.56* | | | | | | | | 1.56* |
| Some post-secondary | 1.53* | | | | | | | | 1.54* |
| Trade/college/university degree < bachelor | 1.73* | | | | | | | | 1.69* |
| Bachelor's degree | 2.42* | | | | | | | | 2.43* |
| University certificate>bachelor | 2.48* | | | | | | | | 2.46* |
| Income adequacy (ref.=lowest) | | | | | | | | | |
| Lower middle | 1.04 | | | | | | | | 1.03 |
| Middle | 1.43* | | | | | | | | 1.36* |
| Upper middle | 1.78* | | | | | | | | 1.64* |
| Highest | 2.33* | | | | | | | | 2.11* |
| Not stated | 1.58* | | | | | | | | 1.50* |
| Usual working status (ref.=full-time) | | | | | | | | | |
| Part-time | 0.97 | | | | | | | | 0.94 |
| Not employed | 0.63* | | | | | | | | 0.63* |
| Race (ref.=white) | | | | | | | | | |
| Aboriginal | | 0.34* | | | | | | | 0.55* |
| Visible minority | | 0.80* | | | | | | | 0.91* |
| Canadian citizen (ref.=no) | | | | | | | | | |
| Yes | | 1.00 | | | | | | | 0.98 |
| Foreign born (ref.=no) | | | | | | | | | |
| Yes | | 0.92 | | | | | | | 0.85 |
| Marital status (ref.=married) | | | | | | | | | |
| Single | | | 0.72* | | | | | | 0.92 |
| Divorced/separated/widowed | | | 0.81* | | | | | | 0.97 |
| Common-law | | | 0.84* | | | | | | 0.94 |
| With kids under 12yrs in the household (ref.=no) | | | | | | | | | |
| Yes | | | 1.02 | | | | | | 1.14* |
| Family type (ref.=two-parent family) | | | | | | | | | |
| Lone-parent family | | | 0.87* | | | | | | 0.99 |
| Non-family household | | | 0.96 | | | | | | 1.07 |
| Other household | | | 0.71* | | | | | | 0.81* |
| Rural/urban area (ref.= urban core of CMA) | | | | | | | | | |
| Urban fringe of CMA | | | | 1.15 | | | | | 1.01 |
| Rural fringe of CMA | | | | 1.12* | | | | | 0.96 |
| Urban outside CMA | | | | 0.95 | | | | | 0.95 |
| Rural outside CMA | | | | 0.98 | | | | | 0.98 |

Table 2: Contd.

| Independent Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Region (ref.=NFL/PEI/NS/NB) | | | | | | | | | |
| Quebec | | | | 1.05 | | | | | 1.15* |
| Ontario | | | | 1.14* | | | | | 1.04 |
| Man/Sask | | | | 0.96 | | | | | 0.90 |
| Alberta/BC | | | | 0.99 | | | | | 0.92 |
| Yukon/NWT/Nunavut | | | | 0.74 | | | | | 0.85 |
| Employment rate (ref.=low) | | | | | | | | | |
| Medium | | | | | 1.06* | | | | 1.00 |
| High | | | | | 1.15* | | | | 1.05 |
| Low income incidence rate (ref.=low) | | | | | | | | | |
| Medium | | | | | 0.87* | | | | 0.99 |
| High | | | | | 0.69* | | | | 0.91* |
| Percentage of visible minorities (ref.=low) | | | | | | | | | |
| Medium | | | | | | 1.02 | | | 0.97 |
| High | | | | | | 0.90* | | | 0.91* |
| Percentage of Canadian citizens (ref.=low) | | | | | | | | | |
| Medium | | | | | | 1.05 | | | 0.99 |
| High | | | | | | 0.95 | | | 0.97 |
| Percentage of non-family persons (ref.=low) | | | | | | | | | |
| Medium | | | | | | | 0.85* | | 0.95 |
| High | | | | | | | 0.80* | | 0.93 |
| Percentage of common-law union (ref.=low) | | | | | | | | | |
| Medium | | | | | | | 0.98 | | 0.97 |
| High | | | | | | | 0.93* | | 0.91* |
| Percentage of lone-parent families (ref.=low) | | | | | | | | | |
| Medium | | | | | | | 0.92* | | 1.00 |
| High | | | | | | | 0.81* | | 0.99 |
| Percentage of families with kids (ref.=low) | | | | | | | | | |
| Medium | | | | | | | 0.97 | | 0.96 |
| High | | | | | | | 0.94 | | 0.95 |
| Sense of community belonging (ref.=very weak) | | | | | | | | | |
| Very strong | | | | | | | | 1.83* | 1.70* |
| Somewhat strong | | | | | | | | 1.50* | 1.34* |
| Somewhat weak | | | | | | | | 1.22* | 1.09* |
| Intercept | 1.51* | 6.87* | 8.30* | 5.90* | 6.94* | 6.54* | 8.50* | 4.91* | 1.87* |
| Nagelkerke R Square | 0.146 | 0.084 | 0.087 | 0.080 | 0.088 | 0.080 | 0.086 | 0.088 | 0.161 |
| Goodness-of-fit | 0.012 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 |

Note: * $p < 0.001$, weighted sample size is 104,782.