Exploring the Influence of Income and Geography on Access to Services for Older Adults in British Columbia: A Multivariate Analysis Using the Canadian Community Health Survey (Cycle 3.1)

Diane E. Allan,[1] Laura M. Funk,[1] R. Colin Reid,[2] and Denise Cloutier-Fisher[3]

RÉSUMÉ

Les recherches existantes sur les modes d'utilisation des soins de santé des Canadiens âgés suggèrent que habituellement le revenu ne restreint pas l'accès d'une personne. Cependant, le rôle que joue le revenu en influençant l'accès aux services de santé par les personnes âgées vivant en milieux ruraux est relativement inconnu. Cet article examine la relation entre le revenu et l'utilisation des services de santé chez les personnes âgées dans les zones rurales et urbaines de la Colombie-Britannique. Les données ont été extraites de l'Enquête sur la santé dans les collectivités canadiennes (ESCC) de Statistique Canada, cycle 3.1. Avec une régression multivariable, on a examiné l'influence du revenu sur l'accessibilité de 3 424 personnes âgés de 65 ans et plus. Les résultats suggèrent que (1) de faible revenu n'influence pas l'accès aux services de soins de santé, et (2) que cela est vrai pour les adultes âgés urbaines et ruraux. Dans tous les cas, les prédicteurs les plus importants et cohérents d'accès sont ceux qui ont mesuré le besoin de soins de santé.

ABSTRACT

Existing research on the health care utilization patterns of older Canadians suggests that income does not usually restrict an individual's access to care. However, the role that income plays in influencing access to health services by older adults living in rural areas is relatively unknown. This article examines the relationship between income and health service utilization among older adults in rural and urban areas of British Columbia. Data were drawn from Statistics Canada's Canadian Community Health Survey, Cycle 3.1. Multivariate regression techniques were employed to examine the influence of relative income on accessibility for 3,424 persons aged 65 and over. Results suggest that (1) relative income does not influence access to health care services; and (2) this is true for both urban and rural older adults. The most important and consistent predictors of access in all cases were those that measured health care need.

[1] Centre on Aging, University of Victoria

[2] Health Studies, University of British Columbia Okanagan

[3] Centre on Aging and Department of Geography, University of Victoria

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Correspondence and requests for offprints should be sent to / La correspondance et les demandes de tirés-à-part doivent être adressées à:

Diane E. Allan, M.A.
Centre on Aging, University of Victoria
Sedgewick A, PO Box 1700 STN CSC
Victoria, BC V8W 2Y2
(dallan@uvic.ca)

Introduction

The provision of medically necessary services (i.e., those provided by doctors and hospitals) for Canadians is governed by the terms of the Canada Health Act (1984). The purpose of this Act is to guarantee access to these services based on the principles of universality, portability, public administration, comprehensiveness, and accessibility. Under such a system, "need" should

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be a more defining factor in the receipt of health services among Canadian residents, compared with income (i.e., one's ability to pay) (Romanow, 2002). Current research suggests that, in terms of income, the principle of accessibility is generally being met in Canada (Finkelstein, 2001; Roos, Burchill, & Carriere, 2003; Sin, Svenson, Cowie, & Man, 2003; Veugelers & Yip, 2003). In other words, service utilization appears to be predicated on need, and income is not a barrier to care for urban Canadians. However, the role of income for those living in rural areas characterized by sparse populations, fewer services, and greater distances is less well known. The purpose of this article is to examine the relationship between income and health service utilization among older adults and to make some comparisons between the experiences of those living in rural and urban areas of British Columbia.

Review of the Literature

This literature review is developed in three sections, the first focusing on population and contextual characteristics of rural Canada. This section is followed by an examination of the issues related to the knowledge base related to access to health care services in Canada. A final, third section describes the research focus.

Rural Canada

Approximately 30 per cent of Canada's population resides in rural and remote areas (i.e., communities of less than 10,000 that are not heavily influenced by proximate urban areas) that cover 95 per cent of the country (Kirby & LeBreton, 2002). Stated differently, almost three quarters of Canadians are concentrated in urban areas that cover only five per cent of Canada's land mass. In terms of geographic distribution, many rural communities now have senior populations well above the provincial and national averages of 14 per cent, as of the 2006 Census (Hodge, 2008). Thus, although the absolute numbers of seniors living in rural areas may be small, the relative proportions living in small communities could be dramatically higher compared with the populations of urban areas.

Access to Health Care Services

Access to health care is a key determinant of health alongside lifestyle, the environment, and biology or genetics (Marmot & Wilkinson, 2002). The provision of appropriate health care services at the right time and in the right place promotes health and well-being for older populations. Barriers to accessing services can arise at the individual or personal level as well as at the community level. From an individual standpoint, having poor health, a higher number of chronic conditions, reduced mobility, and lower income may restrict opportunities to access local health and social services. From a community perspective, a lack of available services, lack of transportation infrastructure, poorly organized or integrated services, and high costs can pose significant barriers to accessing local health services (Cloutier-Fisher & Skinner, 2006). Considered together, a range of personal and community attributes exert unique influences on the health and well-being of older adults living in rural and urban areas. There are, of course, important variations depending on the particular kind of health care service under consideration as well as on the urban-rural context. For example, some current research indicates that older adults living in rural communities face greater challenges in terms of access to adequate home care or acute care services, whereas urban older adults may have enhanced access to home care and acute care (Allan & Cloutier-Fisher, 2006; Hodge, 2008).

In Canada, the provision of medically necessary health care (for all ages) is a provincially mandated responsibility guided by the terms of the Canada Health Act (1984). Theoretically, through this Act, access to services provided by physicians and hospitals is guaranteed: "All Canadians should have access to such care regardless of their income" (Kirby & LeBreton, 2002, p. 4). In practice, although the Act removes economic barriers to access, it does not address access in relation to physical or geographic barriers, barriers that may be particularly salient for those Canadians residing in rural and remote areas. Thus, a lack of health care options and reduced availability, coupled with higher proportions of seniors, can jeopardize geographic access in rural and remote communities (Allan & Cloutier-Fisher, 2006; Dansky, Brannon, Shea, Vasey, & Dirani, 1998).

Governments and health service providers face economic, logistical, and ethical challenges in delivering equitable and adequate health services to rural residents, and existing research demonstrates that there is considerable geographic variation in access to services (Allan & Cloutier-Fisher, 2006; Cloutier-Fisher, Penning, Zheng, & Druyts, 2006; Lin, Allan, & Penning, 2002). In many cases, the end result is less than adequate accessibility for rural residents. For instance, Buske (2000) reported that more than 90 per cent of residents in rural areas (defined as 10,000 or fewer residents) of Canada had access to ambulatory, basic laboratory services, and X-ray services, while under two thirds had access to ultrasound, fluoroscopy, blood banks, and chemotherapy, and only nine per cent had access to CT scans and nuclear medicine.

In Canada, research examining differential access to services for older rural and urban adults is limited. Some of this research indicates that health care utilization

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patterns are influenced by geographic access to services. For example, older adults living in rural communities tend to be hospitalized longer than older adults in urban settings due to a lack of hospitals close to their homes, a lack of specialists, or, alternatively, due to the reduced availability of post-hospital supportive services (Allan & Cloutier-Fisher, 2006; Bay & Maher, 1989; Martin Matthews, 1988).

Research on the use of physicians in rural areas has conveyed mixed results. In some areas, having fewer doctors practicing in rural areas has resulted in lower numbers of annual visits among rural elders compared to their urban counterparts (Allan & Cloutier-Fisher, 2006; Keating, 1991). Stuart and Shea (1996), however, reported that older rural adults use more physician services but fewer specialist services when compared with urban elders. Still other research has demonstrated that many rural older adults appear to compensate for a lack of physician services with a higher use of home support and home nursing care services than urban residents, but these services must be available to be used (Allan & Cloutier-Fisher, 2006).

When rural and urban areas are more carefully delineated into further subcategories such as rural and remote or rural-urban fringe (rural areas proximate to larger urban service centers), different patterns may be revealed. Although results from the United States are less clear in terms of differential access, they do suggest a direct relationship between accessibility and service use for older adults. For example, rural older adults use more physician services (in direct contrast to the aforementioned Canadian research), but fewer specialist services than urban older adults (Stuart & Shea, 1996). In a related finding, Dansky et al. (1998) observed that service use among 6,956 older adults receiving Medicare benefits differed by geographic area (five types ranging from large metropolitan core areas to completely rural areas). Older adults in large metropolitan core counties had the highest levels of physician use while those in large metropolitan fringe counties had the highest number of in-patient days. The most rural counties showed the highest use of home health services and lowest number of in-patient days (Dansky et al., 1998).

A recent document by the BC Centre for Health Services Policy and Research (2002) indicated that the highest rates of physician service utilization and acute care hospitalizations were concentrated in urban centers. Further, an examination of the influence of regionalization on health service use within urban and rural areas of British Columbia has suggested that income may indeed be a factor in terms of accessing health services, but that the impact of income differs by geographic area (Allan & Penning, 2001). Specifically, an income gradient in utilization was evident in the urban areas, whereby those with the lowest incomes had the greatest number of visits to both general practitioners and specialists, as well as having the greatest number of inpatient and outpatient hospital separations.

In the rural areas, a different utilization gradient, however, was found: those in the lowest income quintile received the least number of services while those in the second highest income quintile received the greatest number of services. Although not specifically focusing on older populations, these findings intimate the potential for greater vulnerability among older rural populations, since rural residents with lower income are shown to have reduced access to services (and older populations tend to have lower incomes) (Allan & Penning, 2001).

Although the authors of the just-described study did control for age and gender, they did not control for health status (Allan & Penning, 2001). Health status is also another key variable providing clues to the need for care. Controlling for health status in studies examining the effects of income on access to health care services is important to understand the influence of the socio-economic gradient in health. Despite the universal nature of Canada's health care system, a general income-related inequality in health status exists (Coyte, Evans, Barer, & Marmor, 1995). This is most often attributed to psychosocial mechanisms influencing the experience of absolute and relative deprivation as opposed to differential access to services (Brunner & Marmot, 2002; Wilkinson, 1997). Indeed, it is well established that health improves as income increases (Chappell, Gee, McDonald, & Stone, 2003; Evans & Stoddart, 1990) and that this association is evident among individuals of all ages, being the strongest in young-middle years, but still evident into old age (House et al., 1994; Marmot & Wilkinson, 2002).

Low income and poorer health status may be usefully understood as contributing to greater vulnerability. Following up on the link between vulnerability and need (defined by low income and/or poorer health) and use of health care services, we would expect a positive correlation. Health Canada (Romanow, 2002), for example, states that "… people with lower socioeconomic status tend to have more visits to a family practitioner than the general population" (Coyte et al., 1995, p. 14). Some policy makers have raised alarm bells about "high users" of health care services, but this is not meaningful without considering the "appropriateness" of the services that are utilized to meet the needs of the individual using them.

Need, accessibility, and service utilization are all related, but they are not the same. Having poor health will predispose individuals to need help or care, but

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without being able to overcome personal and geographic accessibility barriers, health care utilization may not occur. Measures of accessibility in relation to health care services have received significant attention in the research literature spurred in the past decade by health care reform in many industrialized nations, and concerns over health inequalities at local, provincial, national, and global scales (Buske, 2000; Fakhoury & Roos, 1996; Gesler, Savitz, & Wittie, 1998; Lin et al. et al., 2002; Martin, Wrigley, Barnett, & Roderick, 2002; Parker & Campbell, 1998; Ricketts, Randolph, Howard, Pathman, & Carey, 2001; Tataryn, Roos, & Black, 1995). Despite widespread and growing interest in issues of equity in access to care, there is still no widely accepted, standard means of conceptualizing or operationalizing access to health services (Millman, 1993), although actual service utilization rates have gained currency as an indicator of "revealed" accessibility (Joseph & Phillips, 1984). For example, the annual number of physician visits measures revealed accessibility over a period of time because it indicates the degree to which people are accessing primary care physicians. In Canada, such administrative data are easy to work with because they are collected for physician billing purposes. These utilization rates or revealed accessibility measures are much more readily available than "potential accessibility" measures (e.g., simple of general practitioner (GP) population ratios, crow-fly distances, avoidable hospitalizations) and therefore tend to be the predominant measures used in health care accessibility studies. With few exceptions (Tataryn et al., 1995; Newbold, Eyles, & Birch, 1995; Newbold, Eyles, Birch, & Spencer, 1998; Peacock, Devlin, & McGee, 1999), regardless of the definition used, a general limitation of accessibility measures is that they are not always considered in combination with, or in relation to, need for care.

Although the refinement of accessibility measures is ongoing, it remains important to address accessibility in relation to health. For example, are those with poor health and health care needs able to access necessary health services? Without having a better understanding of this relationship, sophisticated measures of accessibility are of little use. It is through relating health need to accessibility and utilization patterns that the interpretation of findings becomes meaningful.

Independent variables for the present study were selected based on the service utilization model proposed by Andersen and and Newman (1973). In this model, service utilization is a function of predisposing, enabling, and need factors. For the purposes of this article, predisposing factors include age and gender; enabling factors include relative income, education, and marital status; and need factors include self-perceived health status, self-perceived mental health status, and a composite measure of functional ability (commonly known as the health utility index [HUI]).

Research Focus

According to the principle of accessibility, those with similar health care needs should be able to access similar services regardless of income. Yet, given the sparse populations, fewer services, greater distances of rural areas and the large geography of Canada, upholding this principle can be challenging (Allan & Cloutier-Fisher, 2006; Cloutier-Fisher et al., 2006). The purpose of this research is to determine: (1) whether relative income influences access to health care services among older persons; and (2) whether this is true for both urban and rural older adults residing in British Columbia. The specific strengths of this article are that it incorporates consideration of not only socio-economic influences on access, but also need and geographic influences as well. In addition, we examine utilization of three types of services with different associated access issues: (a) nights in hospital (communities may or may not have a local hospital); (b) medical visits (ability to see a physician or GP on a regular basis); and (c) home care (the lowest access barriers because home care comes to individuals, but local availability of home care can be problematic).

Methods

Data

Data for our analysis were drawn from the Canadian Community Health Survey (CCHS; Cycle 3.1; 2005-06) conducted by Statistics Canada (2005). The CCHS was designed as a cross-sectional survey to collect data from Canadians aged 12 and older, regarding their health status, health services utilization, and health determinants. For the CCHS, one person aged 12 or older from each household was randomly selected to be interviewed using computer-assisted telephone interviews. The entire sample involved all 10 provinces and three territories; however, those living on Indian Reserves, Canadian Forces Bases, and some remote locations of Ontario and Quebec were not included (the latter should not influence the findings as our focus is on British Columbia). Additional details regarding the sampling procedure can be found in the CCHS Public Use Microdata Files published by Statistics Canada (2006).

It should be noted that Statistics Canada provides a weight variable with their data sets that considers the probability of selection and response rates and recommends that all analyses be conducted using this weight variable. For the purposes of analyzing the data and generating population estimates, this weighting technique is appropriate. However, when used to calculate

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statistical significance, the weight variable produces statistically significant results that are largely an artifact of the inflated sample size. Accordingly, a scaled weight is derived and applied in this study when the focus turns to assessing statistical significance. Essentially, the scaled weight is a derived variable that represents the original weight variable divided by the mean of the original weight variable. This scaled weight lets us weight the data without increasing the sample size.

In British Columbia, 18,090 individuals took part in the third health region level survey (CCHS 3.1). Of these, the 3,424 persons aged 65 and older constituted the sample for this research. Although there are many definitions of "rural", the CCHS incorporates a rural variable that represents Statistics Canada's "Census Rural Area". Census Rural Areas are defined as areas of fewer than 1,000 people, or places with densities of fewer than 400 or more people per square kilometer. Of the 3,424 older adults in our sample, 13.1 per cent (n = 449) were classified as rural according to this scheme. The remaining 86.9 per cent were classified as urban.

Measures

Dependent Variables

To examine a diverse range of services, we used three measures of revealed accessibility (or utilization) as the dependent variables in this study: (a) number of nights spent in the hospital, (b) number of visits to a medical doctor, and (c) receipt or non-receipt of home care services.

(a) *Number of nights spent in hospital*. All CCHS respondents were asked, "In the past 12 months, have you been a patient overnight in a hospital, nursing home, or convalescent home?" Only those who reported staying at least one night in hospital were asked a follow-up question: "For how many nights in the past 12 months?" This is a continuous variable. A logged version of this variable was created to correct for skewness and used in all subsequent statistical tests.

(b) *Number of medical doctor visits*. Respondents were also asked to report the number of consultations they had with medical doctors in the past 12 months, including phone consultations. This is a continuous variable. Similar to number of nights spent in hospital, a logged version of this variable was created to correct for skewness and used in all subsequent statistical tests.

(c) *Receipt of home care services*. Respondents were asked about receipt of home care services (e.g., health care, respite, palliative, personal care services received at home) in the past 12 months. A dichotomous, derived variable was created by Statistics Canada to reflect the receipt of either government-subsidized or privately paid home care services (1 = yes; 0 = no).

Independent Variables

A. Predisposing Variables

(1) *Age*. Age is a continuous variable.

(2) *Gender*. Gender is a dichotomous variable (female coded as 1 and male coded as 0).

B. Enabling Variables

(1) *Relative income*. A measure of relative income was derived by Statistics Canada that compares a respondent's total household income with a 2004 low-income cut-off based on both household and community size. After this adjustment was made, deciles were created to reflect a measure of household income relative to household incomes of all other respondents nationally and within each province. Specific details regarding the calculation of these variables can be found in the CCHS 3.1 documentation (Statistics Canada, 2006). The 10 levels range from low to high, indicating that those with higher scores have higher incomes relative to other respondents in the province.

It should be noted that approximately 25 per cent of respondents did not report their income. Accordingly, a measure of relative income distribution could not be derived for these individuals. Given the primary emphasis on income in these analyses, a decision was made to treat the cases as missing rather than to undertake some form of imputation. A similar protocol for missing data was used by Peacock et al. (1999) in their examination of the distribution of health care services in relation to income in New Zealand.

Additional analyses were conducted comparing those who reported incomes and those who did not. Comparisons involved all predisposing, enabling, and need variables, as well as the health service utilization measures. Results suggested significant differences between the two groups for all variables, with the exception of receipt of home care and number of nights spent in the hospital. In brief, those not reporting an income were more likely to be older, female, not married, to have less education, and to report a greater number of doctor visits, and poorer health (i.e., HUI, self-perceived health, and self-perceived mental health). Full details of these comparisons are available upon request.

(2) *Education*. Respondents were asked to state their highest level of attained education. A derived four-category variable was created, as follows, to reflect: (a) less than secondary school graduation, (b) secondary school graduation, (c) some post-secondary education, and (d) post-secondary degree or diploma.

(3) *Marital status*. Responses to a question on marital status were dichotomized into married (coded as 1) and not married (coded as 0).

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C. Need Variables

(1) *Self-perceived health status*. All respondents were asked, "Over the past year, how would you rate your health?" Responses were scored using a 5-point scale ranging from excellent (coded as 1) to poor (coded as 5). Given the small number of respondents who reported their health as poor (5), this category was combined with those who reported their health as fair, resulting in a 4-point scale of self-perceived health status.

(2) *Self-perceived mental health status*. Similar to self-perceived health, respondents were asked, "Over the past year, how would you rate your mental health?" Responses were also scored using a 5-point scale ranging from excellent (coded as 1) to poor (coded as 5). Once again, categories 4 and 5 were collapsed, resulting in a 4-point scale.

(3) *Health utility index (HUI)*. The HUI is a composite health status index developed by researchers at the Centre for Health Economics and Policy Analysis at McMaster University (Furlong et al., 1998). It describes a respondent's overall functioning taking into account vision, hearing, speech, mobility, dexterity, cognition, emotion, and pain and discomfort. Using an algorithm, a single score representing the combination of these health domains is derived. The score ranges from –0.360 to 1.000 with negative scores representing health states worse than death [as defined by Statistics Canada], 0 representing death, and 1.000 representing perfect health. The HUI is a reliable and valid instrument and is used worldwide (Horsman, Furlong, Feeny, & Torrance, 2003).

Analytic Methods

To examine the influence of relative income on measures of health care accessibility, logistic and ordinary least squares (OLS) regression techniques were employed. Each measure of accessibility (number of hospital nights, number of medical doctor visits, and receipt or non-receipt of home care) was individually regressed on the independent variables. Specifically, predisposing, enabling, and need variables were entered into the equation in separate blocks so that the relative impact of each on the total model could be estimated.

Descriptive characteristics for each of the variables included in the models are presented in Table 1. In Tables 2 to 5, Model 1 reports the results of each dependent variable regressed on only the predisposing variables; Model 2 reports the results of each dependent variable

Table 1: Sample characteristics (weighted): Rural and urban

Variable	Rural (*n* = 71,572)	Urban (*n* = 476,585)
Predisposing		
Age ($\bar{X}$)	73.20 (*SD* = 6.91)	74.72 (*SD* = 7.02)
Female (1 = female; 0 = male) (%)	52.4	54.2
Enabling		
Married (%)	70.9	62.8
Income distribution (1 = low; 10 = high) ($\bar{X}$)	4.89 (SD = 2.56)	4.09 (*SD* = 2.59)
Education (%)		
Less than secondary school graduation	31.1	32.9
Secondary school graduation	10.9	17.0
Some post-secondary education	10.1	7.3
Post-secondary degree/Diploma	47.9	42.9
Need		
Health Utility Index ($\bar{X}$)	0.78 (*SD* = 0.26)	0.79 (*SD* = 0.25)
Perceived health (%)		
Excellent	21.0	11.5
Very good	26.4	28.2
Good	28.4	33.1
Fair/Poor	24.3	27.2
Perceived mental health (%)		
Excellent	36.4	31.7
Very good	34.7	33.8
Good	23.8	29.0
Fair/Poor	5.2	5.4
Health services utilization		
Number of medical doctor visits ($\bar{X}$)	4.89 (SD = 5.30)	6.12 (*SD* = 6.82)
Number of hospital nights ($\bar{X}$)	1.35 (*SD* = 6.56)	1.38 9 (*SD* = 9.69)
Received home care (1 = yes; 0 = no) (%)	15.9	17.5

$\bar{X}$ = mean
***SD* = standard deviation**

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regressed on the predisposing and enabling variables; and Model 3 reports the results of each dependent variable regressed on the predisposing, enabling, and need variables together.

The primary aim of this article, as stated, is to examine the influence of income and geography on health service use and to compare these relationships among older rural adults and older urban adults. Inclusion of the interaction between income and geography in the models would make it possible to examine the research questions. However, since regression analyses only permit the examination of one independent variable while controlling for all the other variables in the model, it would be impossible to examine the influence of the other covariates in relation to gender. Accordingly, we decided to include both income and geography (i.e., rural-urban communities) in the regression equation and then run separate models for rural and urban older adults. This strategy resulted in a total of six regression models (three rural and three urban).

Prior to conducting the regression analyses, all variables were checked for normality. As we have noted, a logged version of number of nights spent in hospital was computed to deal with skewness. There were no issues with multicollinearity. All analyses were conducted using the remote access service offered by Statistics Canada. (Syntax files created by researchers are sent to the remote site with output returned to the researchers.)

Results

Table 1 presents the descriptive characteristics (mean, standard deviation, and coding scheme) for each variable separately for rural and urban respondents.

Dependent Variables

Overall, respondents reporting an overnight stay spent an average of 1.38 nights per year in the hospital. A t-test to assess rural-urban differences in nights spent in hospital revealed no significant differences between rural ($\bar{X} = 1.35$) and urban ($\bar{X} = 1.38$) respondents. In terms of number of physician visits, those seeing a physician reported an average of 5.96 visits to a general practitioner each year. A t-test to examine differences between rural ($\bar{X} = 4.89$) and urban ($\bar{X} = 6.12$) older adults revealed no significant differences, although urban residents reported one more visit per year compared with rural residents on average. For home care services, 17.3 per cent of older adults reported receiving such services. The difference between the receipt of home care services between respondents from rural (15.9%) and urban (17.5%) areas was not statistically significant. Similar to the number of medical doctor visits, urban residents reported one more visit than rural residents on average.

Independent Variables

A. *Predisposing*: The average age of respondents was 74.52. The difference in age between rural ($\bar{X} = 73.20$) and urban ($\bar{X} = 74.72$) older adults was statistically significant (t = 4.27, $p < .001$). For gender, slightly more females (54.0%; coded as 1) than males (46.0%; coded as 0) participated in the survey. This trend was consistent when examined by urban areas (54.2% female and 45.8% male) and rural areas (52.4% female and 47.6% male). Further, the gender difference between rural (54.2% female) and urban (52.4% female) older adults was not significant.

B. *Enabling*: Overall, the average income distribution was 4.2. Interestingly, the figure was significantly higher ($\chi^2 = 50.29$, $df = 9$, $p < .001$) for rural older adults ($\bar{X} = 4.89$) compared to urban older adults ($\bar{X} = 4.09$) Furthermore, 43.5 per cent of the sample reported having a post-secondary degree or diploma. Differences revealed that (47.9%) of those living in rural areas had a post-secondary degree or diploma compared with (42.9%) of older adults in urban areas. These differences were significant (χ^2 =14.79, $df = 3$, $p < .01$). In terms of marital status, just under two thirds (63.9%) of the sample reported being married. The results were significantly different when examined by rural and urban area ($\chi^2 = 11.09$, $df = 1$, $p < .001$). Almost 71 per cent of rural older adults indicated being married compared with 63 per cent of urban older adults.

C. *Need*: Approximately 41 per cent of all respondents reported their health as either excellent or very good. Significant differences in self-perceived health were observed with 47.4 per cent of rural older adults reporting excellent or very good health compared with 39.7 per cent of urban older adults ($\chi^2 = 31.52$, $df = 3$, $p < .001$). Overall, 66.2 per cent of older adults rated their mental health as excellent or very good. A difference in self-perceived mental health status between rural older adults (71.1% reporting excellent or very good mental health) and urban older adults (65.5% reporting excellent or very good mental health) was not statistically significant. The HUI score ranged from –0.25 to 1.00. No significant differences in HUI were observed between rural ($\bar{X} = .78$) and urban ($\bar{X} = .79$) older adults.

Table 2 presents the results of the OLS regressions for rural and urban older adults' nights spent in hospital. The overall models for urban ($F = 1.96$, $df = 249$, $p = .052$) and rural ($F = 1.90$, $df = 33$, $p = .106$) older adults were not significant. Level of relative income was not related to nights spent in hospital for either rural or

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Table 2: OLS regression analyses of number of nights spent in hospital: Rural and urban

	Model 1	Model 2	Model 3
Predictors	**b(se)**	**b(se)**	**b(se)**
A. Rural (*n* = 33)			
Predisposing			
Age	.04 (.02)*	.04(.02)*	.04(.02)
Gender	.80 (.30)*	.74 (.30)*	.77(.33)*
Enabling			
Income distribution		.09(.08)	.08(.10)
Marital status		−.25(.37)	−.23(.41)
Education		−.19(.11)	−.16(.14)
Need			
Perceived health			.07(.22)
Perceived mental health			.04(.19)
Health utility index			.19(.73)
A	−1.93(1.39)	−1.76(1.67)	−2.16(2.36)
R^2 (adj.)	.26	.27	.19
F(*df*1, *df*2)	6.77(2,31)**	3.35(5,28)*	1.90(8,25)
B. Urban (*n* = 249)			
Predisposing			
Age	.02(.01)*	.02(.01)	.01(.01)
Gender	−.02(.14)	−.11(.15)	−.13(.15)
Enabling			
Income distribution		−.04(.03)	−.04(.04)
Marital status		−.10(.16)	−.10(.16)
Education		−.08(.06)	−.05(.06)
Need			
Perceived health			.16(.09)
Perceived mental health			−.03(.08)
Health utility index			−.26(.27)
A	−.11(.73)	.76(.86)	.75(.97)
R^2 (adj.)	.01	.02	.03
F(*df*1, *df*2)	2.67(2,247)	2.04(5,244)	1.96(8,241)

A = constant
***df* = degree of freedom**
b = unstandardized regression coefficient
se = standard error.
***R*² = coefficient of determination (adjusted)**
***F* = Fisher's *F* ratio**
***p* < .05; **p* <.01; ***p* <.001**

urban older adults. Only gender was significant as a predisposing variable ($p < .05$); rural females tended to spend more nights in the hospital than rural males. For urban older adults, none of the predisposing, enabling, or need variables was significantly related to number of nights spent in hospital.

Regression results for number of medical doctor visits in the past 12 months are presented in Table 3. Both rural ($F = 8.92$, $df = 286$, $p < .001$) and urban ($F = 47.21$, $df = 1,832$, $p < .01$) models are significant. Gender remains important as a predisposing variable in Model 3 for doctor visits in urban areas, but does not emerge in Model 3 for rural older adults.

Females residing in urban areas were more likely to report a higher number of medical doctor consultations. Enabling variables of relative income and education were significantly related to number of consultations in Model 2 for urban older adults: those with lower relative income and lower education reported more consultations. However, with the introduction of need-related variables in Model 3, these relationships disappeared. Relative income was also unrelated to medical doctor consultations for rural older adults in any of the models. The most important and significant variables in both rural and urban models included the need variables of self-perceived health status ($p < .01$

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Table 3: OLS regression analyses of number of medical doctor visits: Rural and urban

Predictors	Model 1 b(se)	Model 2 b(se)	Model 3 b(se)
A. Rural (n = 286)			
Predisposing			
Age	.02(.01)*	.02(.01)*	.00(.01)
Gender	.16(.10)	.14(.10)	.16(.09)
Enabling			
Income distribution		−.02(.03)	−.01(.02)
Marital status		.16(.11)	.12(.11)
Education		−.08(.04)*	−.04(.04)
Need			
Perceived health			.17(.05)**
Perceived mental health			.02(.06)
Health utility index			−1.03(.22)***
A	−.04(.56)	.24(.64)	1.61(.72)*
R^2 (adj.)	.02	.04	.18
F(df1, df2)	4.00*(2,284)	3.10* (5,281)	8.92***(8,278)
B. Urban (n = 1,832)			
Predisposing			
Age	.01(.00)**	.01(.00)*	.00(.00)
Gender	.18(.04)***	.16(.04)***	.14(.04)***
Enabling			
Income distribution		−.02(.01)*	.00(.01)
Marital status		.05(.05)	.05(.04)
Education		−.04(.02)*	−.00(.01)
Need			
Perceived health			.31(.02)***
Perceived mental health			−.05(.02)*
Health utility index			−.42(.08)***
A	.80(.22)***	1.11(.25)***	.92(.27)**
R^2 (adj.)	.02	.02	.17
F(df1,df2)	15.14***(2,1830)	9.17***(5,1827)	47.21**(8,1824)

A = **constant**
df = **degree of freedom**
***R*²** = **coefficient of determination** (**adjusted**)
F = **Fisher's *F* ratio**
***p* < .05; **p* < .01; ***p* < .001**

for rural; $p < .001$ for urban) and the HUI ($p < .001$ for rural; $p < .001$for urban). Not surprisingly, both rural and urban older adults reporting poorer levels of subjective health and a poorer HUI also reported a greater number of medical consultations.

Results from the logistic regression analyses for receipt of home care services are presented in Table 4. Once again, both rural ($\chi^2 = 54.93$, $df = 8$, $p < .001$) and urban ($\chi^2 = 364.03$, $df = 8$, $p < .001$) models are significant overall. As an enabling variable, relative income was not significant in the rural model, but just reached significance in the urban model ($p = .041$): those with higher relative income were not as likely to receive home care services. For both rural and urban older adults, the predisposing variable of age predicted home care use ($p < .01$ for rural; $p < .001$ for urban); while gender was important in Model 1 and 2 for urban older adults, but it lost significance when the need variables were added. Again, the need variables of poorer self-perceived health ($p < .05$ for rural; $p < .001$ for urban), and poorer health according to the HUI ($p < .01$ for rural; $p < .001$ for urban), were significant for both urban and rural older adults.

Discussion

As we have explained, the purpose of this article was to explore the relationship between relative income and indicators of accessibility to health care for older adults living in rural and urban areas. The health services we

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Table 4: Logistic regression analyses of receipt/non-receipt of home care: Rural and urban

	Model 1	Model 2	Model 3
Predictors	**b(se)**	**b(se)**	**b(se)**
A. Rural (*n* = 528)			
Predisposing			
Age	.12(.03)***	.12(.03)***	.09(.03)**
Gender	.57(.38)	.51(.38)	.64(.41)
Enabling			
Income distribution		−.01(.09)	.05(.10)
Marital status		−.01(.41)	−.35(.44)
Education		−.19(.14)	−.09(.16)
Need			
Perceived health			.61(.24)*
Perceived mental health			.17(.22)
Health utility index			−2.29(.80)**
A	−11.23(1.97)***	−10.66(2.31)***	−8.87(3.01)**
χ^2 (df)	25.71(2)***	27.74(5)***	54.93(8)***
B. Urban (*n* = 2,033)			
Predisposing			
Age	.13(.01)***	.13(.01)***	.12(.01)***
Gender	.44(.14)**	.32(.15)*	.21(.15)
Enabling			
Income distribution		−.11(.03)**	−.07(.04)*
Marital status		.03(.15)	.10(.16)
Education		.02(.05)	.08(.06)
Need			
Perceived health			.41(.09)***
Perceived mental health			−.09(.08)
Health utility index			−2.20(.27)***
A	−11.92(.77)***	−10.89(.87)***	−9.93(1.04)***
χ^2(df)	215.56(2)***	226.70(5)***	364.03(8)***

***p* < .05; ****p* < .01; *****p* < .001

examined were number of nights spent in hospital, number of annual medical doctor visits, and the receipt or non-receipt of home care services.

Each of these variables has been characterized by different levels of access. By examining separate models by rural and urban geography, we can strengthen our understanding of the different influences on patterns of access and service utilization in rural and urban communities. The separate models for examining the service use patterns of rural and urban older adults suggest that (1) relative income has very little influence on access to these services in a Canadian context, whether we are talking about rural or urban areas and regardless of health service; and (2) this is true for both urban and rural older adults as well.

Income is significantly related to service use in Models 1 and 2 but drops out when predisposing and enabling variables are added to the models. This finding is consistent with recent Canadian research in the area that has examined the relationship between income and health service utilization (Allan & Cloutier-Fisher, 2006; Cloutier-Fisher et al., 2006; Dansky et al., 1998). The lesser importance of income is predictable, especially in terms of use of hospital services for two reasons: first, that access is guaranteed under the terms of the Canada Health Act, and second, the need for hospital services is less discretionary. On the other hand, income would be expected to have a greater influence on physician visits and receipt of home care because of the well-established links between increased vulnerability and poorer health that are associated with low income status and the less discretionary nature of these services.

Ultimately, the results from this study reveal that income is not particularly influential in comparison to the need variables (self-reported health status, perceived mental health, and the HUI) in the case of home care use or doctor visits, although income is significant as a predictor of receipt of home care for urban older adults.

Although a strong relationship between income and service use did not emerge, other differences between

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older adults living in rural and urban areas impact their use of health care services. Across the board, the most important and consistent predictors of service utilization (i.e., revealed access) are the need variables (i.e., self-perceived health, self-perceived mental health, and the HUI) as already mentioned. Among the need variables considered here, HUI may be more meaningful than self-reported health in predicting service use because it takes into account a wider range of health-related variables, notably overall functioning, vision, hearing, speech, mobility, dexterity, cognition, pain, and discomfort, a broad array of conditions that adds depth to understanding what might predispose individuals to use health services. The regression coefficients for this variable tend to be larger as well.

Yet, although need was a significant predictor of service utilization, it contributes only minimally to explaining the variance in the use of health services, within each of the six regression models and three dependent variables. Perceived mental health is the least meaningful predictor of utilization for doctor visits or receipt of home care. If health care systems are responsive to individual needs, need variables would be expected to explain a larger proportion of access and utilization. This might be an important place to begin to re-conceptualize how health care systems can be configured to provide the right care or more appropriate care, for individuals and populations. From the determinants of health literature, the health care system itself is an important determinant of health, but genetics, lifestyle, and socio-economic factors are generally perceived to be more meaningful. For these reasons, other studies that have modeled health service utilization have also been plagued by low R^2 values (Evashwick, Rowe, Diehr, & Branch, 1984; Strain, 1990).

Another explanation for the small variance could be the use of health measures selected for inclusion in this study. For example, self-perceived health is a very robust predictor of overall health (Dorly, Deeg, & Bath, 2003), yet it may not be as robust an indicator of need for health care. With age, there is an expectation that the onset of certain health conditions is normal. And, older adults tend to be more satisfied with their health in relative terms despite living with a number of serious chronic conditions (Cott, Gignac, & Badley, 1999). Therefore, within the context of trying to explain health service utilization, more-accurate measures of need might be ascertained. For example, objective measures of the number and severity of chronic conditions, or the absence or presence of specific health conditions singly, or in combination, (e.g., diabetes, cancer, heart disease) may prove to be better predictors of health service utilization than the subjective measures we used in this study.

Noteworthy differences between the regression results for urban and rural populations include rural (but not urban) females being more likely than males to spend a greater number of nights in the hospital, as noted. With respect to physician use, gender is important for urban older adults (but not rural older adults). Females reported a higher number of annual physician consultations than males. This is consistent with the literature as well.

Other methodological limitations of this study are noteworthy. As identified earlier, the concepts of "accessibility" and "rural" can be difficult to define and can be measured in many different ways. Thus, it is probable that different measures of either of these constructs could alter the findings of this article substantially. In addition, within this article there is an assumption that rural areas and urban areas are internally homogeneous. This assumption masks the regional variation that does exist (i.e., all urban and rural areas are not created equal; some rural areas might have greater or lesser problems with access to care and may serve different proportions of seniors with different income levels).

What these comments suggest is the importance of considering the health of individuals and populations within specific community or place-based contexts. In this way, it is important not to use broad categories like *urban* and *rural* but to delineate different kinds of rural and urban communities along a range of factors that might include distance from larger urban centers, measures that consider the health infrastructure and its level of development, economic well-being, number of practitioners per capita, and so on.

Similarly, the use of a dichotomous variable to delineate rural and urban areas is an oversimplification of geographic diversity. In fact, degree of rurality or urbanity might be more appropriate in permitting a more detailed investigation into potential differences along the rural-urban continuum. Statistics Canada does derive such a measure (five categories of community, notably (a) urban core; (b) urban fringe; (c) rural fringe; (d) urban area outside Census Metropolitan Areas/Census Agglomerations (CMAs/CAs); and (e) rural area outside CMAs/CAs). These delineations are based on postal codes; however, the limited number of cases within some of the categories can make multivariate analyses difficult if not impossible.

Quantitatively, future research in this area could employ different statistical models (e.g., multiple logistic regression or Poisson regressions for hospital use). In the examination of service use for rural and urban older adults, it may be prudent to explore multi-level models that can take some of the aforementioned place-based variables into account. Qualitatively, there are opportunities for further understanding in a deeper investigation into the health-seeking behaviors and health beliefs of older men and women in

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different geographic settings to elaborate on the meaning of certain services for their health and well-being.

Limitations also exist regarding the income measure we have used. First, a large proportion of the income figures were missing from the source data. Following a protocol similar to Peacock et al. (1999) wherein those researchers felt that imputation of a primary variable would be inappropriate, we decided to treat the missing income values as missing in all subsequent analyses. However, it is important to acknowledge that the differences identified earlier between those who reported an income and those who did not might influence the findings if the latter group had been included in the analyses. For example, those not reporting an income were found to be older, female, unmarried, and have a lower education, more physician visits, and poorer health. Given these characteristics, it is likely that the inclusion of those not reporting an income in the analyses would strengthen the relationship between income and utilization and possibly lead to further significant relationships.

A second issue with income is the manner in which it was derived by Statistics Canada. This particular measure involved the calculation of a relative distribution based on a low-income cutoff, household size, and community size. Other measures of income, such as access to other sources of financial resources, personal income, or receipt of Old Age Security (OAS) and Guaranteed Annual Income System (GAINS) might be a better measure in the context of an individual's health, especially when it could mean life or death. This is particularly important in studies of older adult populations, many of whom are on fixed and/or limited incomes. Access to other sources of income in the face of illness might not be captured in the current measure of relative income.

An additional limitation of note includes recall error that arises from self-reporting. Survey respondents are asked to report number of physician visits, number of nights spent in hospital, and number of home care visits in the past 12 months. The home care variable is dichotomized by Statistics Canada into receipt or nonreceipt, so recall error is likely not an issue with this measure. However, it is possible that number of hospital nights and physician visits are mis-reported by respondents.

Finally, in terms of statistical power, there may be an issue with number of nights spent in hospital. A much smaller proportion of individuals was hospitalized among the sample of older adults. Thus, within these analyses, the sample size varies according to the type of care received. With the number of independent variables included in this particular model, the smaller sample size decreases statistical power. For consistency, a decision was made to include the same variables in each of the models.

Conclusions

Overall, this study demonstrates that in British Columbia, in general, income does not appear to prevent urban or rural older adults from accessing medically necessary health care services of physicians and hospitals. However, there are differences that do exist between the rural and urban samples that should be examined further in future studies. For example, as we have noted, the models need to be expanded and adjusted as a means of increasing the amount of variance explained, while at the same time testing various alternate definitions of income, need, access, and rurality or urbanity. Additionally, future studies should aim to examine access and income at finer geographic scales (e.g., health region, local health area, specific community, neighborhoods) since it is important to consider the experiences of older adults within the specific community contexts in which they are living out their lives in pursuit of independence and health and well-being.

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