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Income-related inequity in health and Health care utilization in Canada

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Michel Grignon[a,b,c], Jeremiah Hurley[a,b], Li Wang[b,d]

[a] Department of Economics, McMaster University
[b] Centre for Health Economics and Policy Analysis, McMaster University
[c] Department of Health Aging & Society, McMaster University
[d] Doctoral student, Health Research Methodology, McMaster University

McMaster University

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Abstract

We use data from two independent large cross-sections of the Canadian population, the Canadian Communities Health Survey for 2000-01 and 2005 to estimate income-related inequity in health and health care use. We apply the Horizontal Inequity Index to self-assessed health and self-reported visits to a family doctor, a specialist, and a dentist, as well as the number of nights in hospital as our measures of utilization. Beside self-reports in the survey we use administrative data on a sub-sample (in Ontario) to measure the money value of services used and include day procedures, that are typically not measured through self-reports. We find pro-rich inequity in health as well as strong pro-rich inequity in the utilization of specialist and dental care services. The poor use more inpatient services, and the total value of physician and hospital services is income-neutral in Ontario. Income-related inequities in health and health care utilization did not change in Canada between 2000 and 2005.

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1 Introduction

Canada is an interesting case study of social inequities in health and health care utilization. Core services (by which mean in the remainder of this paper medically necessary physician services and hospital care) are free of charge at the point of use and financed out of governments general revenue, and, as a result, and a core value of the system is to guarantee universal access to these services without financial barriers (Marchildon [2005]). Prescription drugs and long-term care are partially publicly financed, with variations across provinces and by age as well as wealth (Marchildon [2005]); income or social position might play a role in utilization of these services. Last, dental care is not publicly covered (Marchildon [2005]) and it is expected that income is a major determinant of utilization and access to dental care.

In this study, our goal is to measure income-related inequities for Canada as a whole on a wide range of services and for two different years (2000 and 2005), to assess possible changes over time. We also add to previous studies a measure of inequity in the dollar value of utilization of hospital care and physician services (for Ontario only), allowing us to measure the inequity in the distribution of Medicare services.

We measure income-related inequity based on the now well-established indicators of the concentration index and horizontal inequity index, which implies standardizing the distribution of health and utilization across income levels by measures of determinants of health (inequity in health) or need (inequity in utilization). We also decompose the indexes into socio-economic contributors (education, immigration status, etc.) to examine the role of social inequalities in the production of inequalities.

2 Previous literature on inequities and inequalities in health and utilization in Canada

2.1 Inequalities in health status

There is considerable disparity in mortality across income groups in Canada: the annual age-standardized mortality rate of the poorest quartile of Manitobans was 1.6 higher than that of the richest quartile in the 1980s (Mustard et al. [1997]), and Wilkins et al. [2008] show a 5.6 years difference in life expectancy at 25 between the richest and the poorest quintile in 1991.

Health-Canada, finds a 4.6 years gap in health-adjusted life expectancy among males and a 3.2 years gap among females across three income groups in 2000. Prus [2007] finds a positive (pro-rich) income-related concentration index of the Health Utility Index (a quantitative measure of health-related well-being). McGrail [2007] uses the Joint US-Canada Survey of Health for 2002-03 and find that the CI for (good) health in Canada stands at 0.026, slightly lower than the US level. Income itself is the main contributor to this inequality (in both countries), followed by education, self-reporting unmet need for health

care, and exercise.

2.2 Inequity in health care utilization in Canada

In this section, we review empirical findings on income (or standard of living)-related inequalities and inequity in health and health care utilization in Canada.

Hospital Care

Although findings based on data from the 1980s found that the probability of admission to a hospital was increasing with income (Newbold et al. [1995]), or that hospital utilization was not related to income (Asada and Kephart [2007]), recent studies consistently show that inpatient hospital care is distributed pro-poor (Allin [2008], van Doorslaer et al. [2004]).

Physician Services

GP utilization is income neutral but this is driven by two counter-acting patterns of inequity: pro-rich probability of contact and pro-poor conditional use.

Specialist services are distributed pro-rich (probability and conditional use) (Allin [2008], van Doorslaer et al. [2004]) and Asada and Kephart [2007] find a pro-rich distribution in the probability of visit to a specialist but income neutral conditional number of specialist visits.

The probability of a visit to any doctor (GP and specialists combined) was higher among those who live in families with income higher than $50,000 in 1996 controlling for current health status and utilization two years before. However, among those with at least one visit during the year these same income groups used fewer doctor services (Dunlop et al. [2000]).

Dental care services

Allin [2008] and Grignon et al. [2010] show that income-related inequity is much higher for dental care than for core health care services.

Prescription Drugs

Zhong [2007] uses a crude self-reported measure of prescription drug utilization found in surveys and finds a pro-rich value for the Horizontal Index (HI) in the probability of any utilization among non seniors but barely among seniors (who are publicly covered).

3 Methods

3.1 Design

We use a logistic regression to calculate the HI for binary variables but OLS for the decomposition analysis (a comparison between OLS and logistic estimates of the HI indicates both methods yield similar values, and the decomposition does not work well with non linear estimates). We use OLS for count variables

(conditional utilization), both for the estimation of the HI and the decomposition (a comparison of HI estimated using OLS and negative binomial shows the values for the index are very similar across methods).

We use two independent cross-sections of the Canadian Communities Health Survey (CCHS) conducted in 2000-01 (September 2000 to November 2001) and in 2005 (January to December 2005).

CCHS sample is random of approximately 130,000 respondents (131,535 for 2000-2001 and 132,947 for 2005), representative of the Canadian, community-dwelling, non-aboriginal population (at the federal and provincial levels). The sampling frame is multistage stratified: geographic areas followed by dwellings in each area, and member aged 12+ in each dwelling.

The sampling frame targets household residents only, excluding institutionalized individuals, those on Indian Reserves, Canadian Force Bases, and living in remote areas (overall, the excluded population is less than 2% of the total). Response rates to CCHS are around 80%.

In addition to surveys, we access administrative data for Ontario (for 1999-2001), the largest Canadian province. The data set is exhaustive (single payer for physician and hospital services) and records all contacts with a physician or a hospital. Each record is linked to a patient identifier and provides information on the type of service provided, the type of provider (GP or specialist or inpatient), its cost, the date the service was delivered, and length of stay for inpatient care. Based on that information we calculate the number of visits or stays in the past 12 months as well as the number of nights spent in hospital in the past 12 months, and the total dollar value of services received during that period.

The administrative data can be linked to the CCHS on an individual basis: respondents to the survey were asked to provide their OHIP number in order to allow Statistics Canada to link their survey responses to their OHIP records, and 95% agreed. As a result, the analysis of administrative data is conducted on a sub-sample (N=29,671) of the analysis of CCHS 2000-01. Analysing this linked administrative and survey data for the province of Ontario is useful in three ways: we can check how much self-reported health care utilization differs from administratively recorded utilization. We can capture the distribution of day procedures, which are missing from self-reported inpatient care and is of increasing importance. Last, we can measure inequity in the dollar value of services received rather than in the mere quantity of visits or nights spent in hospital. Assuming the dollar value of a service reflects its intensity or quality, this provides an interesting complementary picture to the calculation of equity based on self-reported number of visits or nights in hospital.

3.2 Variables

Standard of living

We chose current (yearly) income as our measure of standard of living, instead of total expenditure (consumption) or assets, because: a) these measures are not available in the survey on health and health care utilization in Canada, and b) income reflects standard of living more accurately than expenditures or

assets in a rich country such as Canada, where affluent households can save money in addition to spending more than the poor (making expenditure a spurious indicator of relative standard of living) and where most households own basic assets. Of course, yearly income is a second best and we would have preferred using permanent income (the long-term component around which yearly income varies in a somewhat random fashion).

We calculate an equivalent income per individual as the ratio of household income to the number of consumption units in the household. Consumption units are: 1 + 0.5 per adult member (beside the first adult) + 0.3 per child in the household.

Approximately 10% of respondents refused to provide any information on income and were dropped. Some gave categorical income only and we imputed their continuous income based on the category and socio-economic characteristics.

We enter income as the natural logarithm of the reported or imputed numerical value to estimate the Horizontal Inequity (HI) index.

Health status

We use self-assessed health ("To start, in general, would you say your health is..") to measure income-related inequity in health status. CCHS collects self-assessed health in five response categories: excellent, very good, good, fair and poor.

The CI/HI method requires us to dichotomise health status by choosing a cut-off point (health status being deemed favourable above the cut-off). We conducted our analysis with a cut-off at "very good" ("excellent" and "very good" are lumped together in "favourable"); this separates the population into two sub-populations of comparable sizes (62/38% in 2000 and 60/40% in 2005). Setting the cut-off at "excellent" ("excellent" versus all other categories) or at "good" (lumping "excellent", "very good" and "good" in "favourable") would create unbalanced categories, "favourable" representing less than a quarter of the sample in the first case, and 88% in the second case.

Health-care utilization

We measure income-related inequity in GP, specialist, and dentist visits, and inpatient nights in the past 12 months (see below for the exact wording). For each type of service we measure inequity in the following:

1. probability to use the service: a dichotomous variable taking a value of 1 if the respondent self-report at least one visit or night in the past 12 months in the case of surveys or if the administrative record for the respondent indicates at least one visit or inpatient night in the 12 months prior to the interview date for that respondent.

2. intensity of utilization: the number of visits or nights self-reported by respondents who self-reported at least one visit or night spent in hospital in the past 12 months in the case of survey data; or the number of visits or nights identified in the administrative file in the 12 month period prior

to the interview for respondents who were identified with at least one visit or night in the same file.

Health care utilization is measured as the number of visits to:

1. a GP ("Not counting when you were an overnight patient, in the past twelve months, how many times have you seen or talked on the telephone about your physical, emotional of mental health with a family doctor, pediatrician, or general practitioner?"), the respondent being allowed to provide any number between 0 and 366, but being asked a checking question if the answer is above 12.

2. a specialist ("Not counting when you were an overnight patient, in the past twelve months, how many times have you seen or talked on the telephone about your physical, emotional of mental health with any other medical doctor (such as a surgeon, allergist, orthopedist, gynaecologist, or psychiatrist)?"), the respondent being allowed to provide any number between 0 and 300, but being asked a checking question if the answer is above 7.

3. a dentist ("Not counting when you were an overnight patient, in the past twelve months, how many times have you seen or talked on the telephone about your physical, emotional of mental health with a dentist or orthodontist?), the respondent being allowed to provide any number between 0 and 99, but being asked a checking question if the answer is above 4.

Last, respondents are asked about inpatient stays through two questions:

1. "In the past twelve months, have you been a patient overnight in a hospital, nursing home, or convalescent home?", the respondent being allowed to answer Yes or No.

2. Then, to those who answered yes to question 1: "For how many nights in the past twelve months?", the respondent being allowed to provide any number between 0 and 366, but being asked a checking question if the answer is above 100.

Standardization variables

We standardize health status by age and sex. We create a variable interacting age in categories and sex (see table 1 for the categories and descriptive statistics).

Table 1: Descriptives statistics

Variable	Mean or % (2000-01)	Mean or % (2005)
Log Income	10.35	10.52
Education		
Primary	25%	20%
Secondary	28%	25%
Higher	46%	55%
Labour force status (1)		
Inactive or unemployed	25%	29%
Student	6%	15%
Employed and self-employed	69%	55%
Immigration status		
Immigrant, less than 10 years	6%	6%
Immigrant between 10 and 30 years	4%	5%
Canadian born or immigrant more than 30 years	89%	89%
Race-ethnicity (2)		
White	88%	94%
Non-white	12%	6%
Attitude toward health		
Took the flu shot	25%	52%
Location of residence		
Urban core	71%	71%
Urban fringe	2%	2%
Rural fringe within CMA/CA	7%	8%
Urban area outside CMA/CA	8%	7%
Rural area outside CMA/CA	11%	11%
Province of residence		
Newfoundland and Labrador	2%	2%
PEI	0%	0%
Nova Scotia	3%	3%
New Brunswick	3%	2%
Québec	24%	24%
Ontario	39%	38%
Manitoba	4%	4%
Saskatchewan	3%	3%
Alberta	10%	10%
British Columbia	13%	13%
Self-assessed health		
Excellent	26%	22%
Very good	36%	38%
Good	26%	28%
Fair	9%	8%
Poor	3%	3%

Table 1: Descriptives statistics (continued)		
Variable	Mean or % (2000-01)	Mean or % (2005-06)
Age and sex		
Male 16-29	17%	17%
Male 30-44	11%	10%
Male 45-59	15%	16%
Male 60-69	4%	4%
Male 70+	2%	2%
Female 16-29	17%	17%
Female 30-44	11%	10%
Female 45-59	15%	16%
Female 60-69	5%	4%
Female 70+	3%	4%
Number of chronic conditions		
None	35%	30%
One	27%	26%
Two or three	27%	29%
Four and more	11%	15%
Self-perceived ability to cope with stress		
Excellent	17%	11%
Very good	21%	24%
Good	38%	42%
Fair	20%	20%
Poor	4%	4%
Have been injured in the past 14 days		
Yes	13%	13%
Number of days with disability in the past 12 months		
None	84%	83%
One day	6%	7%
Two days or more	10%	9%
Activity has been restricted in the past 12 months		
Never	75%	77%
Sometime	14%	13%
Often	10%	10%
Smoking status		
Current smoker	33%	28%
Former smoker	39%	41%
Never smoker	28%	31%

(1) The variation over time in the proportion of students is due to a change in the way the variable is coded: it is likely that respondents who were enrolled in post-secondary education in CCHS 1.1 were classified as "Employed" due to part-time employment, whereas they were coded as "Student" in CCHS 3.1.

(2) The variation in the proportion non white is likely due to our exclusion criteria: in the overall data (before any exclusion), the proportion "non white" decreases from 11% to 9%, as opposed to 12% to 6% in our data set (after

exclusion).

For health care utilization, we standardize by age and sex, self-assessed health, as well as other variables describing the need for health care (see table 1 for the categories and descriptive statistics):

- Number of self-reported chronic conditions (conditions are self-reported in a list of 18 and prompted by the following question: "Were you ever diagnosed by a physician with the following condition?)
- Self-assessed ability to cope with stress: excellent, very good, good, fair, and poor.
- Self-reported injury: dichotomous variable taking a value of 1 if the respondent self-reports any injuries in the past 12 months due to repetitive strain and which were serious enough to limit normal activities.
- Number of disability days in the past two weeks ("Not counting days spent in bed During those 14 days, were there any days that the respondent cut down on things they normally do, because of illness or injury? - If yes, how many days?)
- Restriction of activity: this is a variable created by Statistics Canada on the basis of several questions on long-term conditions affecting daily activities at home, at work or school, and for leisure.
- Smoking habit: currently smokes (daily or occasional smoker), used to smoke, never smoked.

Decomposition variables

We decompose the level of income-related inequity into its socio-economic components (descriptive statistics are shown in table 1): education, work status, immigration status, marital status, race, urban location, province of residence, attitude toward risk (ever has taken the flu shot).

Final sample size: We drop respondents from the territories (where health care delivery and funding is different from the rest of the country, approximately 2,500), the 12 to 15 year old (approximately 7,000), those with missing data on income (14,000) and other variables (approximately 7,000) to get sample sizes of 104,091 observations in 2000 and 100,959 in 2005.

4 Main findings and evolutions (2000-2005)

Income-related inequity in health

In a regression of the binary variable "favourable health" on income controlling for standardization and decomposition variables, a statistically significant positive gradient shows (for both survey years). The gradient is stronger in 2005 than in 2000. A negative gradient is also statistically significant for "non favourable health" (defined as responses "poor" and "fair" to the question on self-assessed health) but the absolute value is smaller.

Table 2: Inequity Indexes of health and healthcare use, Canada 2000-01 and 2005

Distribution variable	2000-01		2005	
	CI	HI	CI	HI
Favourable health	+0.0867	+0.0869	+0.0838	+0.0850
Poor health	-0.0385	-0.0400	-0.0334	-0.0338
Probability of Physician visit	+0.0021	+0.0103	+0.0076	+0.0157
Conditional number of Physician visits	-0.0831	-0.0173	-0.0697	-0.0145
Probability of Hospitalization	-0.1366	-0.0512	-0.1370	-0.0542
Conditional number of hospital nights	-0.1220	-0.0509	-0.1013	-0.0211
Probability of Dentist visit	+0.1242	+0.1118	+0.1136	+0.0996
Conditional number of Dentist visits	+0.0135	+0.0213	+0.0880	+0.0128
Probability of GP visit	+0.0019	+0.0101	+0.0740	+0.0157
Conditional number of GP visits	-0.0989	-0.0374	-0.0903	-0.0387
Probability of SP visit	+0.0118	+0.0525	+0.0130	+0.0546
Conditional number of SP visits	-0.0360	+0.0138	-0.0041	+0.0277

As shown in table 2, the HI index of income-related inequity in favourable health is around +0.09 in both years and the difference is not significant from a policy perspective. The HI of income-related inequity in poor health is negative and the absolute value is approximately half that of the HI for favourable health. Because the unstandardized distribution across quintiles (not presented, available upon request) indicates a stronger gradient for poor health than for favourable health, the larger absolute value of the HI for favourable health suggests that the standardization by age wiped out most of the link between income and poor health (the elderly are more likely to be among the 40% poorest of the population, and in poor health).

The decomposition analysis (not presented but available on request) shows that income is the largest contributor to inequity in both favourable and poor health. Education and work status contribute as well.

Income-related inequity in health care utilization:

Table 2 shows that even though Canada has a health care system with no financial barriers to access to care, income still positively influences the probability of visiting a physician (GP or specialist) for a given level of need. The effect is 3.5 times larger for specialist care than for GP. The probability of visiting a dentist is strongly linked to income (almost twice as much as that of seeing a specialist), which is consistent with the lack of any public coverage for dental care in Canada. None of the differences across years are significant from a policy perspective.

The poor are more likely to be hospitalized for the same level of need in Canada, and income-related inequity is as strongly pro-poor as the pro-rich inequity in seeing a specialist. Again, the change between 2000 and 2005 is small and not significant.

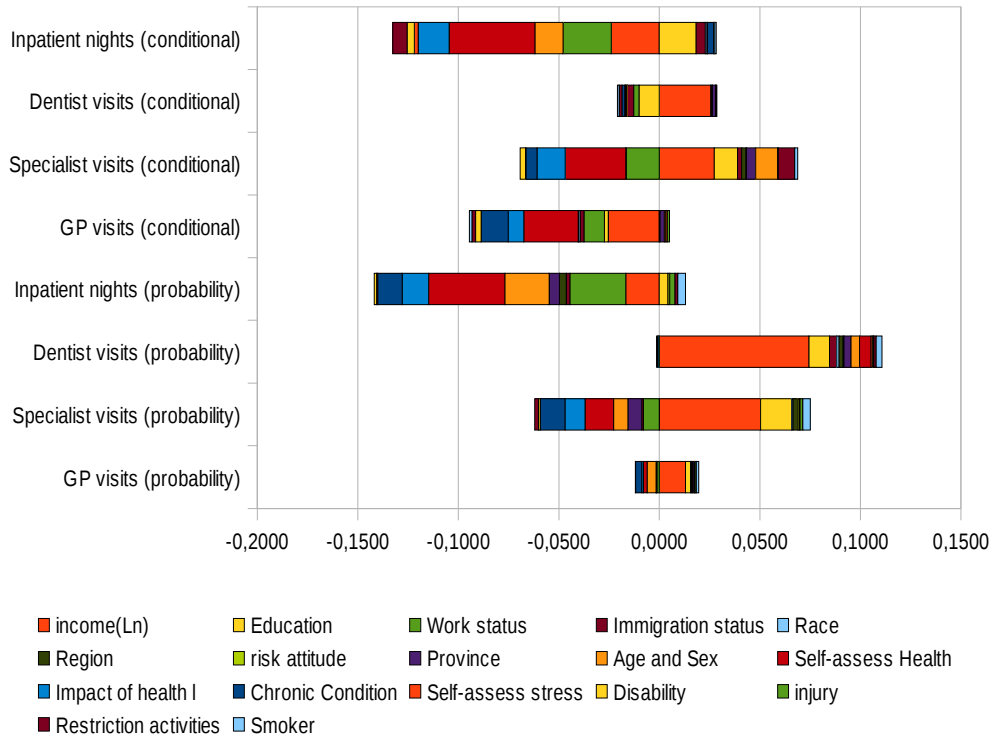
Horizontal inequity is considerably smaller for conditional utilization and reinforces the pro-rich bias for specialist and dentist visits and the pro-poor

bias for hospital care. Overall, specialist and dentist visits show a strong pro-rich inequity and inpatient care shows a strong pro-poor inequity.

GP visits are the only exception: whereas the probability of visiting a GP is pro-rich, the conditional number of visits to a GP (for those who made the decision to visit at least once during the year) is markedly pro-poor. Because the pro-poor absolute value is larger than the pro-rich value on the probability, there is pro-poor inequity in the total number of visits to a GP.

The decomposition analysis for 2005 (graph 1) shows that income is the main contributing factor by far. Education reinforces the pro-rich bias in conditional use of specialist services, but partially offsets the pro-rich bias in conditional dental care services. It also partially offsets the pro-poor bias in the conditional number of inpatient nights. Work status contributes to the pro-poor bias in the probability of hospitalization and in the conditional number of visits to a GP. It also mitigates the pro-rich bias in the conditional number of visits to a specialist.

Decomposition of the Concentration Index for health care utilization -- Canada 2005



5 Dollar value of utilization (core services in Ontario)

The HI estimated on the Ontario sub-sample of the survey (self-reports) are very similar to those estimated on the same sub-sample but based on administrative records. The only significant difference is for the conditional number of inpatient nights: the gradient is significantly negative based on self-reports but not significantly different from 0 based on administrative records.

Table 3: HI of dollar values of utilization (Ontario, 2000-01)

Type of service	Probability	Conditional expenditure	Total expenditure
Inpatient Care	-0.06	0	0
Day Procedure	+0.03	0	0
GP Visits	0	-0.02	-0.02
SP Visits	+0.02	0	+0.03
Total	+0.01	0	0

Claims data also allow us to measure inequity in the dollar value of utilization as well as in the use of day procedures, a service not captured by self-reports. The main conclusion from table 3 is that overall, spending for physician and hospital-based services is income neutral in Ontario: the HI for total expenditures is not significantly different from 0 (and the absolute value is very small). Total value of services is not income-related (once standardized for need) in inpatient care and day procedures, is slightly pro-poor for GP services (-0.02) and slightly pro-rich for specialist services. The probability to use inpatient care is pro-poor, but is partially offset by a pro-rich bias in the probability to use day procedures; the probability to use specialist services is pro-rich but the value of services received by those who visit specialists is not income-related. Last, GPs tend to provide more value to the poor, for the same level of need.

6 Discussion

A first limitation of our analysis is that we exclude the institutionalized population. This is a small population (less than 1% of the Canadian population, Ramage-Martin [2007]) but it is in very poor health and its exclusion can bias our conclusions on health inequity toward 0. Also, we use yearly income as our measure of standard of living, which measures permanent income with error. Again, this biases the estimate of the income gradient of health and use toward 0 and leads to underestimated values for inequity in Canada. A third limitation, common to all analyses of inequity in health and health care use, is that we base our description of health status on self-assessment and may not capture fully the distribution of health status and need for care in the population.

Our main findings are as follows:

- Health status is biased pro-rich in Canada: the probability to be in favourable health is influenced by income and, secondarily, education and work status. It is of course very likely that the relationship runs in both directions (individuals in poorer health are more likely to be out of the labour force or less productive and, as a result, poorer).
- Health care utilization of services covered by the public scheme, even though free of charge at the point of use is influenced by income. The total value of services distributed to the population is income neutral, but the pattern of utilization varies with income. The rich are more likely to see a specialist and the poor are more likely to be hospitalized for inpatient care. The conditional value and quantity of services received by doctors is much less income biased.
- The probability of dental care services is strongly pro-rich.

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