

**COMPARING HEALTH IN THE
US AND CANADA:
LOW INCOME GROUPS ARE LESS
DISADVANTAGED IN THE FROZEN NORTH**

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ABSTRACT

Aims

To compare health in Canada and the United States using a preference-based measure.

Methods

The Joint Canada/United States Survey of health conducted a comprehensive cross-sectional telephone survey on the health of community-dwelling residents in Canada and the US (n = 8688). The survey included a preference-based measure, the Health Utilities Index Mark 3 (HUI3), and compared the mean HUI3 overall scores for the two countries. A series of linear regressions using normalized weights were conducted and overall HUI3 scores were estimated as a function of a set of potential confounders with a country dummy variable.

Results

Canadians (mean HUI3 = 0.88, median = 0.97, sd = 0.20, min = -0.24, max = 1.00) are slightly healthier than Americans (mean HUI3 = 0.87, median = 0.97, sd = 0.21, min = -0.26, max = 1.00). Income is associated with health in both countries. Canadians in the lowest income quintile (mean HUI3 = 0.81, median = 0.91, sd = 0.26, min = -0.24, max = 1.00) are healthier than Americans in the lowest quintile (mean HUI3 = 0.77, median = 0.91, sd = 0.29, min = -0.26, max = 1.00). Across lower levels of education, Canadians (less than high school HUI3 = 0.81, high school = 0.89) are also healthier than Americans (less than high school HUI3 = 0.74, high school = 0.86). Canadians in the survey were slightly younger, with more males (mean age 45.11 and 49% males), compared to the US (mean age 45.35 and 48% males). Results from regressions are similar. Differences in health are explained by age, gender, education, health insurance, marital status and country of residence. HUI3 scores are lower for respondents who are single, older, have less education and/or have no insurance.

Discussion

On average, health status in Canada and in the US is approximately equal. The HUI3 is a useful measure of population health status. HUI3 is able to identify and distinguish

differences in general health status among groups and between countries. The regression models are useful in explaining country differences in health status.

INTRODUCTION

The Joint Canada/United States Survey of Health (JCUSH) 2002-03 conducted a comprehensive cross sectional telephone survey on the health of community-dwelling residents in Canada and the United States. The survey content was drawn from the Canadian Community Health Survey (CCHS) and the U.S. National Health Interview Survey (NHIS). The survey compared the health status of Canadians and Americans by collecting the same information in the same manner for residents of both countries (Statistics Canada 2002-03; Sanmartin and White 2004; Sanmartin et al. 2004). The survey included a comprehensive list of demographic health status indicators, including the Health Utilities Index Mark 3 (HUI3), lifestyle factors and questions on access to health (<http://www.statcan.ca:8096/bsolc/english/bsolc?catno=82M0022X>; <http://www.statcan.ca/english/freepub/82M0022XIE/2003001/pumf.htm>). The survey provides a way to make a direct comparison of health status in the two countries using the same instruments and methods.

To date, few studies have been based on comprehensive health surveys of two or more countries applying the same methods and instruments. The Organization for Economic Co-operation and Development (OECD) regularly publishes studies assessing health in member countries (OECD 2003). Health status indicators include life expectancy, mortality rates, chronic conditions and self-reported health status obtained by asking respondents about their general health as excellent, very good, good, fair or poor.

A limited number of health status and health-related quality-of-life measures have been used for cross-country comparisons of population health. Murray et al 2002 and Murray and Evan 2003 provide a comprehensive discussion of the issues involved in comparing population health across countries. They also provide comparisons using a variety of approaches. The World Health Organization developed a 41-item quality-of-life instrument called the World Health Organization Quality of Life (WHOQOL). The WHOQOL-Bref is an abbreviated version containing 26 items. Domains include physical health and well-being, psychological health and well-being, social relations and environment. Studies included a 14-country examination to help refine the importance of the items in a cross-cultural context (Saxena and Billington 2001).

Other studies have focused on intra-country and international health comparisons using generic health status measures. The Short-Form 36 Health Survey (SF-36) system has been used for disease-specific conditions across countries (Alonso et al. 2004) as well as cross-country comparisons based on translated versions of the instrument (Wagner et al. 1998).

Preference-based measures such as the EQ-5D have been used in national health surveys in the U.K., in other European countries and in the U.S.. The HUI3 has been used to assess the population health of Canadians in provincial (Ontario Health Survey 1990) and national (National Population Health Survey 1994/1995 and ongoing) surveys. Studies have also compared English and French Canadians (Kopec et al. 2000) and several other cultural groups in the Canadian population (Kopec et al. 2001).

The differences in instruments and methodologies proved to be limitations in previous studies. Moreover, evaluations of population health at the national level have usually only examined a single country. In general, direct comparisons between countries with a continuous measure could not be made. The JCUSH overcomes these hurdles. The objective of this paper, therefore, is to compare mean HUI3 overall scores between Canada and the United States. In addition, the paper conducts a series of linear regressions using normalized weights to examine the differences in HUI3 scores between the two countries. Finally, survey results are used to assess the construct validity of HUI3 as a measure of population health status.

METHODS

Study design

The JCUSH was conducted as a one-time telephone survey in both Canada and the US. The interviews were conducted from Statistics Canada's regional offices between November 2002 and March 2003. The target population consisted of Canadian and American adults aged 18 or older residing in households. If the respondent selected was unable to respond on his or her own behalf, the survey allowed for a proxy respondent (proxy reporting status). Among the groups excluded from the target population were

populations from institutions, full-time members of the Canadian or American Armed Forces and residents of the Canadian or US territories.

The sample was stratified according to Canadian province and by four US geographic regions (North-East, Mid-West, West and South). The sample was allocated proportionally within each stratum based on population size where households were selected based on a Random Digit Dialing (RDD) process. Sampling was stratified for three age groups (18-44, 45-64 and 65 or over) according to gender.

The survey content was drawn from the National Health Interview Survey (NHIS) in the US and from the Canadian Community Health Survey (CCHS) in Canada. The primary objective of the CCHS is to provide cross sectional estimates of health determinants, health status and health system utilization at the provincial and regional levels. The CCHS began in 2000 and consists of a two-year collection cycle with two distinct surveys. The first survey collected information at the health regional level and the second survey at the provincial level (Beland 2002).

Health Utilities Index Mark 3 (HUI3)

HUI3 is a multi-attribute utility measure that includes both a health-status descriptive system that provides information on health status, and a multiplicative, multi-attribute utility function that provides overall utility scores for HUI3 health states on the conventional dead = 0.00 to perfect health = 1.00 scale (Feeny et al. 1992; Torrance et al. 1996; Furlong et al. 2001). The dimensions of health status or attributes included in HUI3 are vision, hearing, speech, ambulation, dexterity, emotion, cognition and pain. There are five or six levels per attribute (Horsman et al. 2003). The multiplicative scoring function for HUI3 is based on preference scores obtained from a random sample of respondents age 16 or older in Hamilton, Ontario, Canada (Feeny et al. 2002). Scores range from -0.36 (the all-worst HUI3 state) to 0.00 for dead to 1.00 for perfect health.

Differences of 0.03 or more in overall HUI3 utility scores are regarded as clearly clinically important (Grootendorst et al. 2000; Drummond 2001; Horsman et al. 2003). Differences of 0.01 may be important, especially in the context of population health (Drummond 2001). In addition to overall scores, HUI3 provides single-attribute utility

scores for each attribute on a scale where the lowest level (most severely impaired) has a score 0.00 and normal (no impairment) has a score of 1.00. Differences of 0.05 or more in single-attribute scores are regarded as clearly clinically important (Maddigan et al 2003, 2004; Horsman et al 2003). For purposes of this paper, with its focus on population health rather than clinical applications, clinically important differences will instead be referred to as quantitatively important differences.

STATISTICAL ANALYSES

Descriptive Statistics

HUI3 descriptive statistics (mean, median, minimum, maximum, standard deviation) were calculated and compared between the US and Canada. Additional health status indicators included the following:

- self-reported health, chronic conditions, functional status and depression;
- life style factors such as smoking, obesity and physical activity levels;
- use of health care services such as visits to physicians and hospitals, use of dental services and prescription drugs, insurance status and unmet health care needs; and
- demographic and socio-economic information.

Determinants of Health

The study estimated a series of linear regressions using normalized weights in order to standardize the comparison because of slight differences in the age and gender distributions in the US and Canadian surveys. The normalized weights were derived by dividing each weight by the global average weight to average one; this was done to reduce the bias in the estimates' variance (Trottier et al. 2000).

Overall HUI3 scores were estimated as a function of a set of potential confounders with a country dummy variable. The list of confounders includes age, gender, data based on proxy reporting, education, marital status, body mass index, income and country of residence.

Gender, proxy report and country are dummy variables that indicate whether respondents were male or female, did or did not have a proxy report, and Canadian or American residence.

Respondents were asked about their household income from all sources and to specify a figure. Respondents who did not specify a figure were asked if the income of the household fell into a series of categories, including: no income, less than \$5000, \$5000 to \$9999, \$10,000 to \$14,999, \$15,000 to \$19,999, \$20,000 to \$29,999, \$30,000 to \$39,999, \$40,000 to \$49,999, \$50,000 to \$59,999, \$60,000 to \$79,999, and greater than \$80,000.

The other confounders were further deconstructed into several dummy variables. Four separate dummies were used to categorize age: 18-44, 45-64, 65-74 and 75+. Education had separate dummies for groups with less than high school, high school, technical school/community college, and university education. Marital status was broken down to married/common law, widowed, divorced or single. Body Mass Index (BMI) was based on World Health Organization standards and categorized as follows: BMI <18.5 (underweight), $18.5 \leq \text{BMI} < 25$ (normal weight), $25 \leq \text{BMI} < 30$ (overweight), and BMI ≥ 30 (obese). Income had separate dummies to reflect income quintiles: those in the lowest 20%, lower middle 20%, middle 20%, higher middle 20% and highest 20%.

Eight separate regressions were modelled. The first estimated HUI3 overall scores controlling for gender and age. The second controlled for gender, age, proxy reporting and education. The third was the same as the second model with the addition of the marital status variable. The fourth is an extension of the third model with the inclusion of BMI and income. The remaining regressions are extensions of each of the four models with the inclusion of a country dummy variable.

The Joint Survey also provides an opportunity to assess the construct validity of the HUI3 system. In this paper we will explore construct validity in a number of ways. First, HUI3 scores will be compared among “known” groups. For instance, we would expect mean scores for those with unhealthy life style factors, those who are smokers, obese and physically inactive, to have lower mean scores than the scores for non-smokers, not obese and physically active. Moreover, we would expect respondents with higher education or income to have higher mean scores than those at lower levels of education or income. We

would also expect mean single-attribute HUI3 ambulation scores for those reporting difficulties with mobility to be lower than mean scores for those reporting no difficulties with mobility.

RESULTS

A total of 8688 people responded to the Survey of which 3505 (40%) were from Canada and 5183 (60%) from the United States. Response rates were 66% in Canada and 50% in the US. Canadians (mean HUI3 = 0.88, standard deviation = 0.20) were slightly healthier than Americans (mean HUI3 = 0.87, standard deviation = 0.21). Canadians in the survey were slightly younger with more males (mean age 45.11 and 49% males) compared to the US (mean age 45.35 and 48% males).

General Health Status

HUI3 overall scores measured general health status between Canada and the U S, which was further examined according to age (Table 1), gender (Table 2), mobility limitation (Table 3) and depression (Table 4 and 5).

Self-rated health status was based on respondents' assessment of health as excellent, very good, good, fair or poor. Mean HUI3 overall scores were similar in both countries for each category of self-rated health across age groups (Table 1). HUI3 mean overall scores in Canada for all age groups ranged from 0.96 for excellent to 0.42 for poor. The range in the US was 0.95 (excellent) to 0.35 (poor). Quantitatively important differences in health between the US and Canada were found for 18-44 year olds in fair health (difference 0.07) and poor health (difference 0.04). The largest difference was between 45-64 year olds in poor health (difference 0.15).

There was a similar range of mean scores between males (Canada = 0.96 to 0.50, US = 0.95 to 0.39) and females (Canada = 0.95 to 0.33, US = 0.95 to 0.31) in both countries (Table 2). However, the mean scores for females in poor health (Canada = 0.33, US = 0.31) were lower than for males (Canada = 0.50, US = 0.39). Quantitatively important differences in health were found between Canadian and American males in poor health (0.11).

The study categorized mobility limitation into five levels according to the degree of difficulty in walking 10 steps: cannot do; very difficult; somewhat difficult; a little difficult; not at all difficult (Table 3). Mean HUI3 ambulation single-attribute scores in Canada (both sexes) ranged from 0.26 (cannot do) to 1.00 (not at all difficult). In the US the scores ranged from 0.43 (cannot do) to 0.99 (not at all difficult). Mean scores for both sexes in the lowest category were higher in the US (cannot do = 0.43) than in Canada (cannot do = 0.26).

HUI3 emotion scores were compared for respondents with and without depressive episodes in the past year (Tables 4 and 5). The mean emotion score for Canadians and Americans with a depressive episode were at 0.74 and 0.79 for all age groups and sexes. For the most part, females with depressive symptoms in both countries had higher emotion scores across age groups compared to their male counterparts. For those with depressive episodes, for both genders, emotion scores were similar between countries for ages 18-44 (Canada = 0.76, US = 0.77) but there were quantitatively important differences for ages 45-64 (Canada = 0.71, US = 0.84) and 65+ (Canada = 0.96, US = 0.67). As expected, emotion scores for respondents without depression were higher (Canada = 0.96, US = 0.95). Both males and females shared similar emotion scores in the two countries. Across age groups, Canadians generally had equal or higher emotion scores than Americans.

Risk Factors

Risk and life style factors were assessed by smoking (Tables 6 and 7) and BMI (Table 8). Results reported in Table 6 indicate that mean HUI3 overall scores for Canadian (0.84) and American (0.83) smokers were almost the same for all age groups. As expected, non-smokers (Canada = 0.88, US = 0.86) had higher overall scores (Table 7). Smokers (both sexes) in the youngest age category, 18-44, had the highest overall scores (Canada = 0.87, US = 0.86) while the lowest health scores belonged to the oldest age category, 65+ (Canada = 0.75, US = 0.78). For the same age categories, non-smokers had higher scores compared to smokers and the differences were quantitatively important.

Mean overall scores in Canada and the US were the same for respondents who were normal weight (0.90) and overweight (0.88) (Table 8). Canadians who were underweight

(0.87) or obese (0.86) had higher overall scores compared to Americans (0.82; 0.83). Generally, Canadian males and females in most BMI classes had equal or higher overall scores than Americans.

Income Differences

The study examined general health status (Table 9, 10), mobility (Table 11) and risk factors (Table 12, 13) while controlling for household income. Household income was ranked and categorized into five levels; 1st (lowest) to 5th (highest).

The lowest scores were found in the lowest income quintile across all categories of self-rated health (fair/poor: Canada = 0.47, US = 0.66; good: Canada = 0.84, US = 0.81; very good/excellent: Canada = 0.91, US = 0.94) (Table 9). As expected, overall scores were higher in higher income quintiles and for higher self-rated health status. Scores were lowest in fair/poor health, intermediate in good health and highest in very good/excellent health. Quantitatively important differences in scores between the two countries were greatest for respondents with fair/poor health. The differences in scores were smaller for those in good and very good/excellent health. For those who rated their health as good, Americans had lower scores than Canadians for all income quintiles except the highest income level. Generally, mean HUI3 overall scores for Americans with fair/poor and very good/excellent health for all income categories were higher than those for Canadians.

Table 10 examines overall health across income classes. In both countries, the lowest income group had the lowest scores (Canada = 0.81, US = 0.77). Mean scores were successively higher for each higher income group. Clinically important differences in scores between the countries were found for only the 1st (lowest) income quintile (0.04). Canadians had higher scores in the bottom two income groups (lowest = 0.81; 2nd lowest = 0.87) compared to Americans (lowest = 0.77; 2nd lowest = 0.85).

HUI3 ambulation single-attribute utility scores were calculated for respondents with severe mobility (difficulty walking 10 steps) by household income (Table 11). Single-attribute utility scores for ambulation in the US were higher for each higher income group, peaking at the third income bracket (Ambulation = 0.88). Results for Canadian

ambulation scores were mixed. The highest ambulation score (Ambulation = 1.00) was for the highest (5th) income level. The lowest score (Ambulation = 0.30) was for the 4th highest income group. At the lowest income bracket, ambulation scores (ambulation = 0.68) were higher than for the 2nd and 3rd income groups. When comparing scores between and within countries, there were quantitatively important differences across all income groups, except between the 2nd and 3rd groups in Canada.

HUI3 overall scores for obese respondents are displayed in Table 12. Both countries had similar overall scores at each income level with higher scores for higher income groups. HUI3 scores were lowest for both countries at the poorest income level (Canada = 0.76, US = 0.70).

Overall scores for respondents who were current daily smokers are shown in Table 13. The scores exhibited similar patterns as previously described by income group (Tables 9-12). Scores were lowest in the bottom bracket (Canada = 0.76, US = 0.73) and higher for each successive income level. In Canada, the peak score (0.92) occurred in the 4th income bracket while in the US, the high (0.93) was in the top bracket. Quantitatively important differences between Canada and the US were found for all income groups except the 3rd income quintile.

Access to Physician Services

Mean HUI3 overall scores for individuals with and without a regular medical doctor are displayed in Table 14. Table 15 displays results according to gender and age. In both countries, individuals without a medical doctor had higher overall scores (Canada = 0.92, US = 0.89) than did individuals with a regular doctor (Canada = 0.88, US = 0.86; Table 14). In the US, individuals without a regular doctor and with or without insurance were healthier (insured = 0.87, uninsured = 0.89) than those with a regular doctor (insured = 0.81, uninsured = 0.87).

In Canada and the US, the youngest age category (18-44) for both genders had the highest overall scores for respondents with a regular medical doctor (Canada = 0.90, US = 0.91) and without a regular medical doctor (Canada = 0.93, US = 0.90) (Table 15). The scores were lower for older respondents with or without regular a physician. Generally,

females in both countries with or without a physician had lower scores compared to males. Canadians, males and females separately plus both sexes combined, were slightly healthier than Americans.

Self-rated health for individuals who did and did not contact a physician in the past 12 months are displayed in Table 16. For Canadians and Americans, those who did contact and did not contact a physician and who had excellent, very good, and good self-rated health had similar HUI3 scores. In both countries, scores for respondents who rated themselves as fair and who did not contact a medical doctor (Canada = 0.86, US = 0.79) were noticeably higher than for those who did contact a doctor (Canada = 0.69, US = 0.68). Canadians with poor health who did not contact a doctor (0.30) had substantially lower scores than Canadians with poor health who did have contact (0.43). Americans who did not contact a physician (0.43) had higher scores than those who made contact (0.32). Canadians in poor health fared better than Americans when physician contact was made. Conversely, Canadians were worse off than Americans in poor health when there was no contact with a medical doctor.

Unmet Health Care

Table 17 reports scores for individuals who reported and did not report an unmet health care need. Scores between Canada (0.75) and the United States (0.74) were similar for those who reported an unmet need. Individuals in the US with and without insurance also had similar scores (insured = 0.75, uninsured = 0.73). Scores for those who did not report an unmet health care need were higher in both countries (Canada = 0.90, US = 0.89).

HUI3 overall scores for individuals reporting and not reporting an unmet health care need based on gender and age group were also calculated (Table 18). For those who reported an unmet need, Canadian women in all age groups (18-44 = 0.79, 45-64 = 0.69, 65+ = 0.67) were healthier than American women (18-44 = 0.78, 45-64 = 0.64, 65+ = 0.53). For the youngest age group (18-44) only, American men were healthier than Canadian men (Canada = 0.77, US = 0.81). When both genders were combined, Americans had higher overall scores than Canadians in the youngest age group (Canada = 0.78, US = 0.80). In all other age groups, Canadians (45-64 = 0.73, 65+ = 0.64) fared better than Americans (45-64 = 0.66, 65+ = 0.54).

For those that did not report an unmet need, females from both countries had similar scores in all age groups. Males in both countries also shared similar scores but had larger differences in scores for respondents 65 or over (Canada = 0.83, US = 0.91). When including both genders, Canadians (45-64 = 0.89, 65+ = 0.87) were, in general, slightly healthier than Americans (45-64 = 0.87, 65+ = 0.80) in older age groups but had the same scores (0.93) in the youngest age category (18-44).

Table 19 shows results for individuals who reported and did not report an unmet health care need by household income quintile. As expected, people in the lowest income group and who reported an unmet need were the least healthy in both countries (Canada = 0.66, US = 0.65). In Canada, health was higher with each successive income group; the 4th and 5th (highest) income groups shared the same score (0.83). In the US, health peaked at the 3rd income group (0.85) and tapered off slightly thereafter (4th = 0.82, 5th = 0.84).

The range of scores (Canada = 0.84-0.94, US = 0.81-0.94) was smaller for respondents from both countries who did not report an unmet health care need. Canadians (0.84) and Americans (0.81) in the lowest income group were the least healthy. For respondents who reported an unmet need, health was higher in both countries at each successive income level. These scores were noticeably higher than the scores for respondents who reported an unmet need.

Types of Insurance

We also examined health status for individuals with and without various types of health insurance: dental; prescription medication; eye glasses/contacts; hospital (Table 20). Insured individuals from both countries had similar high scores ranging from 0.88-0.90. Canadians had the highest scores for individuals with dental and hospital insurance (0.90). Americans with dental insurance had the highest score (0.89), with slightly lower scores in the other categories (0.88).

Uninsured respondents in both countries had lower scores in all insurance categories compared to insured individuals. Canadians (0.85) and Americans (0.83) had the lowest scores for respondents without hospital insurance among those without insurance. Canadians without insurance coverage for prescription medications had the highest score

(0.88) whereas Americans without insurance for eye glasses/contacts had the highest scores (0.86).

Education

Education was categorized into four levels: less than high school, high school, technical school/college, university degree (Table 21). Health scores for Canadians were similar for the top three levels of education (high school = 0.89, technical school/college = 0.89, bachelor degree = 0.92). American health scores followed a similar pattern (high school = 0.86, technical school/college = 0.87, bachelor degree = 0.92). In both countries, the lowest scores were obtained for respondents with the least education (Canada less than high school = 0.81, US less than high school = 0.74). Overall HUI3 scores were higher for each successive category, with the highest scores for those with a university degree (Canada = 0.92, US = 0.92). Important differences in health were found between Canadian and American respondents for the bottom two levels of education (less than high school = 0.07, high school = 0.03).

DETERMINANTS OF HEALTH

Models 1 and 2

The first equation estimated HUI3 overall scores controlling for gender and age (Table 22). The coefficients on age and female gender were negative. Health was lower in each successive age category. The oldest respondents (those 75+) were found to be the least healthy with a coefficient value of -0.169. Although gender was found to be statistically significant, the effect was not large. However, large differences were found between each age category. In an extension, model 2, a country dummy variable was added. The results were similar. Older and female respondents, and Americans overall, were found to be less healthy.

Models 3 and 4

The third model controlled for gender, age, proxy reporting and education. Individuals who were older, female, proxy-reported and with less education were found to be less healthy. For respondents who had proxy reports and less education, the differences in

health were quantitatively important and statistically significant (Table 22). The oldest respondents (75+) were found to be the least healthy, whereas respondents with the most education were the healthiest. The fourth model extended the third by including the country variable. Conclusions from that model were similar in that Americans were found to be less healthy than Canadians.

Models 5 and 6

Variables included in the fifth model were gender, age, proxy reporting, education and marital status. As expected, respondents found to be less healthy were older, female, had less education and were not married. All variables were found to have statistical significance and were quantitatively important. The addition of the country variable to this model generated comparable results. Americans were less healthy than Canadians and the effect was quantitatively important and statistically significant.

Models 7 and 8

The final model had independent variables for gender, age, proxy reporting, education, marital status, income and BMI. Similar to results for the other models, those respondents found to be healthier were more educated, younger, married, male and had higher income. The inclusion of the country variable indicated that Canadians were healthier than Americans. All variables in the model were statistically significant and quantitatively important except for respondents who were overweight (BMI 25-29).

DISCUSSION

A comprehensive cross-country comparison of health status was made between Canada and the United States. Previous works focused on disease-specific measures or used mainly categorical measures. This study was valuable because it generated a direct comparison of the two countries using the same instruments and method.

It was found that respondents from both countries who were exposed to, or engaged in, unhealthy life style behaviours (respondents who were smokers, obese and had limited mobility) had poorer health. This is consistent with findings in which such life style behaviours were linked to illness and health (Lantz et al. 2001).

HUI3 overall scores were higher for people without a regular medical doctor compared to those with a physician. This probably reflects the likelihood that respondents without a physician were younger and healthier. In addition, those without health problems were less likely to access physician services. HUI3 overall scores were also higher for Americans without health insurance compared to Americans with coverage. These uninsured respondents were younger and less likely to engage in poor life style behaviours.

Mean HUI3 overall scores in this study are slightly lower than those reported by Maddigan *et al* (2004) - 0.88 versus 0.90. The sample from Maddigan *et al* comprised Canadian respondents from the 1996-1997 Canadian National Population Health Survey (NPHS) Cycle 2. Response rates (82.6%) and sample size (66,093) in the NPHS were substantially higher than those in the Joint Survey (66%, 8,688).

Similar to findings reported by Hopman *et al* (2000), Canadians are slightly healthier than Americans. Hopman *et al* used the Medical Outcomes Study 36-item Short Form (SF-36) to evaluate HRQL. Canadian norms were higher than US norms in every SF-36 domain and both summary scores. The magnitude of the differences between Canada and the US was small. Similarly, in this study differences in HUI3 overall scores between the two countries were also small.

Canadians were slightly healthier than Americans. This was found across all education and income levels. HUI3 scores were higher for higher income categories. Such a relationship between health and income has been well documented (Wagstaff and van Doorslaer 2000, Lantz et al. 2001). McLeod et al. (2003) reported that household income was the best predictor of health status, being strongly and consistently associated with health status. For this study, Canadians and Americans in the lowest income bracket had the poorest health. At the lowest income bracket, the difference in health between Canadians and Americans was quantitatively important.

The difference in health status for respondents from both countries who had a university degree was not quantitatively important. For other education levels (less than high school, high school, technical/college) there were important differences in health between the

two countries. The largest difference was observed for respondents with less than high school education. This was consistent with previous work where educational attainment had positive effects on health (Ross and Wu 1995; Ross and Mirowsky 1999). Both quantitatively importance and statistical significance were found for education in the determinants of health regression models. Clearly, the level of education has an important impact on health.

The positive relationships between education and income and health status in this study are similar to the findings reported by Luo et al. 2005. Luo et al. also found that Americans with higher levels of education and household income were healthier than those with less education and income.

However, mean HUI3 overall scores for Americans in this study (0.87) were noticeably higher than those reported by Luo et al. (0.81). Both studies had similar target populations of respondents 18 years or older residing in the community. Response rates in this study (50%) were lower than those in Luo et al. (59%). Sample size in the latter survey was lower (4048) compared to this study (5183). Both studies shared similar characteristics with a higher proportion of females than males (52% female) and a mean age of 45.

However, oversampling of respondents of the two largest minorities was not included in the Joint Survey. Luo et al. suggested that lower scores in their study may have arisen from differences in population subgroups and the result of differential item functioning. Differential item functioning is present if respondents have identical health status but answer a questionnaire item differently because of their different backgrounds (age, gender, race/ethnicity, language).

Probably more importantly, Luo et al. note that the modes of administration differed between the two surveys. HUI3 data in the survey reported on by Luo et al. were collected using a self-complete paper-and-pencil questionnaire. In contrast, the Joint Survey collected HUI3 data via telephone using an interviewer-administered questionnaire. A comparison of results from the Ontario Health Survey for two HUI3 attributes (pain and emotion), collected using both paper-and-pencil, self complete and in-person interviewer administration, reveals that the burden of morbidity reported on the

self-complete questionnaire generally exceeded the burden reported on the interviewer-administrated questionnaire (Grootendorst et al. 1997). One can speculate that mode effects are most likely to matter for attributes such as emotion and pain and might matter relatively little for attributes such as vision, dexterity and ambulation. Mean single-attribute utility scores for emotion and pain based on the self-complete mode of administration in the Ontario Health Survey were 0.96 and 0.86; for the interviewer-administered mode the means were 0.98 and 0.93. If these results on the effects of the mode of administration for HUI3 from the Ontario Health Survey generalize to comparing the two HUI3 surveys in the U.S., it is plausible that the mode of administration could account for most or all of the observed differences in mean scores.

The determinants of health models found that social structures in age, gender and marital status were important factors (Walters et al. 2002). Women experienced poorer health relative to men (Denton et al. 2004), however, the magnitude of the gender variable was smallest when all three variables were compared.

The coefficient for proxy reporting status was the largest in the final regression models (7 and 8). It is likely that the necessity of relying on a proxy respondent is linked to a disability that prevented the subject from responding on his/her own behalf. This is reflected in the large and negative regression coefficient.

Limitations of the Joint Survey include the somewhat modest response rates, 66% (Canada) and 50% (US), and that the response rate was higher in one country than the other. It is possible that non-response bias could affect the US-Canada comparison. However, if those with lower health status were less likely to respond than healthier respondents, then the Joint Survey could have understated the difference between the two countries.

On average, health status in Canada and the US was approximately equal. The HUI3 was a useful measure of health status. HUI3 was able to identify and distinguish differences in general health status among groups and between countries. The determinants of health models were useful in explaining country differences in health status. Findings in this study support evidence about the relationship between life style behaviour and health,

income and health, and education and health. This study provided a direct comparison between the countries because it used the same methodology and instruments. Future studies would overcome comparability limitations if they used methods similar to those used by the Joint survey.

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Table 1
Self-rated Health Status and Overall HUI3 Utility Scores by Age Group

	Canada	U.S.	Canada	U.S.
	mean	mean	% of	% of
	HUI3	HUI3	people	people
18-44				
excellent	0.96	0.95	30%	32%
very				
good	0.93	0.93	41%	35%
good	0.89	0.88	24%	25%
fair	0.69	0.76	4%	7%
poor	0.26	0.30	1%	1%
45-64				
excellent	0.95	0.95	23%	23%
very				
good	0.93	0.91	35%	34%
good	0.87	0.84	30%	27%
fair	0.72	0.69	8%	11%
poor	0.50	0.35	4%	5%
65+				
excellent	0.94	0.92	9%	15%
very				
good	0.89	0.87	28%	27%
good	0.84	0.81	37%	31%
fair	0.67	0.67	19%	19%
poor	0.40	0.37	7%	8%
All				
excellent	0.96	0.95	24%	27%
very				
good	0.92	0.92	37%	33%
good	0.87	0.86	28%	26%
fair	0.69	0.71	8%	10%
poor	0.42	0.35	3%	4%

Table 2
Self-rated Health Status by Gender

	Canada	US	Canada	US
	mean	mean	% of	% of
	HUI3	HUI3	people	people
Males				
excellent	0.96	0.95	25%	28%
very				
good	0.93	0.92	36%	32%
good	0.88	0.86	27%	27%
fair	0.71	0.73	8%	9%
poor	0.50	0.39	4%	4%
Females				
excellent	0.95	0.95	23%	25%
very				
good	0.92	0.91	37%	33%
good	0.87	0.85	29%	26%
fair	0.68	0.69	8%	11%
poor	0.33	0.31	3%	5%

Table 3
Mobility Limitation (Difficulty Walking 10 Steps) by Gender

Single-Attribute HUI3 Ambulation Utility Scores

	Canada				
	Cannot do	Very difficult	Somewhat difficult	A little difficult	Not at ALL Difficult
Males					
SCORE	0.27	0.60	0.81	0.97	1.00
Females					
SCORE	0.25	0.53	0.86	0.96	0.99
All					
SCORE	0.26	0.64	0.84	0.96	1.00
	US				
	Cannot do	Very difficult	Somewhat difficult	A little difficult	Not at All difficult
Males					
SCORE	0.38	0.65	0.85	0.92	1.00
Females					
SCORE	0.46	0.64	0.87	0.94	0.99
All					
SCORE	0.43	0.64	0.86	0.93	0.99

Table 4
Mean HUI3 Emotion Scores for Individuals with Depressive Episode in Past Year

	Males		Females		All	
	HUI3	HUI3	HUI3	HUI3	HUI3	HUI3
	EMOTION	EMOTION	EMOTION	EMOTION	EMOTION	EMOTION
	Canada	US	Canada	US	Canada	US
18-44						
SCORE	0.65	0.72	0.89	0.82	0.76	0.77
45-64						
SCORE	0.89	0.83	0.64	0.85	0.71	0.84
65+						
SCORE	0.91	0.59	1.00	0.73	0.96	0.67
ALL						
SCORE	0.73	0.76	0.76	0.82	0.74	0.79

Table 5
Mean HUI3 Emotion Scores for Individuals without Depressive Episode in Past Year

	Males		Females		All	
	HUI3	HUI3	HUI3	HUI3	HUI3	HUI3
	EMOTION	EMOTION	EMOTION	EMOTION	EMOTION	EMOTION
	Canada	US	Canada	US	Canada	US
18-44						
SCORE	0.96	0.95	0.95	0.95	0.95	0.95
45-64						
SCORE	0.97	0.94	0.97	0.93	0.97	0.93
65+						
SCORE	0.96	0.95	0.97	0.96	0.96	0.95
ALL						
SCORE	0.96	0.94	0.97	0.95	0.96	0.95

Table 6
Mean Overall HUI3 Scores for Daily Smokers

	Canada	US
	mean	mean
	HUI3	HUI3
Males		
18-44	0.88	0.87
45-64	0.86	0.77
65+	0.69	0.82
All	0.86	0.83
	mean	mean
Females	HUI3	HUI3
18-44	0.86	0.85
45-64	0.76	0.81
65+	0.80	0.75
All	0.82	0.83
	mean	mean
All	HUI3	HUI3
18-44	0.87	0.86
45-64	0.81	0.79
65+	0.75	0.78
All	0.84	0.83

Table 7
Mean Overall HUI3 Scores for Non-current Daily Smokers

	Canada	US
	mean	mean
Males	HUI3	HUI3
18-44	0.92	0.92
45-64	0.90	0.86
65+	0.83	0.8
All	0.89	0.87
	mean	mean
Females	HUI3	HUI3
18-44	0.91	0.89
45-64	0.88	0.84
65+	0.79	0.78
All	0.88	0.85
	mean	mean
All	HUI3	HUI3
18-44	0.91	0.91
45-64	0.89	0.85
65+	0.81	0.79
All	0.88	0.86

Table 8
Mean Overall HUI3 Scores by BMI and Gender

	Canada	US
	mean	mean
	HUI3	HUI3
Males		
Normal weight	0.91	0.89
Insufficient weight	0.95	0.76
Overweight	0.89	0.89
Obese	0.88	0.86
Females		
Normal weight	0.89	0.90
Insufficient weight	0.85	0.84
Overweight	0.86	0.86
Obese	0.82	0.80
All		
Normal weight	0.90	0.90
Insufficient weight	0.87	0.82
Overweight	0.88	0.88
Obese	0.86	0.83

Table 9
Self-rated Health by Household Income

Income quintile	Fair/poor health		Good health		Very good/excellent health	
	Canada	US	Canada	US	Canada	US
	mean HUI3	mean HUI3	mean HUI3	mean HUI3	mean HUI3	mean HUI3
1st(lowest)	0.47	0.66	0.84	0.81	0.91	0.94
2 nd	0.53	0.69	0.88	0.86	0.93	0.94
3 rd	0.63	0.70	0.87	0.86	0.94	0.95
4 th	0.66	0.71	0.89	0.86	0.93	0.95
5th(highest)	0.64	0.70	0.90	0.92	0.94	0.95

Table 10
Health by Household Income

	Canada	US
Income	mean	mean
quintile	HUI3	HUI3
1st(lowest)	0.81	0.77
2nd	0.87	0.85
3rd	0.90	0.90
4th	0.92	0.91
5th(highest)	0.93	0.93
overall		
mean	0.88	0.87

Table 11
HUI3 Single-attribute Ambulation Scores for Respondents with Severe Mobility
Limitation by Household Income

	Canada				
Income quintile	1st(lowest)	2nd	3rd	4th	5th(highest)
HUI3 Ambulation single-attribute utility score	0.68	0.53	0.50	0.30	1.00
	US				
Income quintile	1st(lowest)	2nd	3rd	4th	5th(highest)
HUI3 Ambulation single-attribute utility score	0.54	0.78	0.88	0.61	0.81

Table 12
Overall HUI3 Scores for Obese Respondents by Household Income

Income quintile	Canada	US
	mean HUI3	mean HUI3
1st(lowest)	0.76	0.70
2 nd	0.84	0.82
3 rd	0.88	0.87
4 th	0.92	0.90
5th(highest)	0.91	0.90

Table 13
Overall HUI3 Utility Scores for Current Daily Smokers by Household Income

	Canada	US
Income	mean	mean
quintile	HUI3	HUI3
1st(lowest)	0.76	0.73
2nd	0.88	0.85
3rd	0.86	0.86
4th	0.92	0.87
5th(highest)	0.90	0.93

Table 14
Overall HUI3 Utility Scores for Individuals with/without A Regular Medical Doctor

	Canada	US		
		All	Insured	Uninsured
	mean HUI3	mean HUI3	mean HUI3	mean HUI3
No	0.92	0.89	0.87	0.89
Yes	0.88	0.86	0.81	0.87

Table 15
Overall HUI3 Utility Scores for Individuals with/without A Regular Medical Doctor
by Gender and Age Group

With a regular MD			Without a regular MD		
	Canada	US		Canada	US
	mean	mean		mean	mean
	HUI3	HUI3	Males	HUI3	HUI3
Males					
18-44	0.91	0.91	18-44	0.93	0.91
45-64	0.89	0.85	45-64	0.90	0.88
65+	0.82	0.80	65+	0.73	0.71
All	0.89	0.87	All	0.92	0.89
Females			Females		
18-44	0.90	0.90	18-44	0.93	0.89
45-64	0.86	0.84	45-64	0.91	0.84
65+	0.78	0.77	65+	0.77	0.81
All	0.87	0.86	All	??	0.88
All			All		
18-44	0.90	0.91	18-44	0.93	0.90
45-64	0.87	0.84	45-64	0.90	0.86
65+	0.80	0.78	65+	0.75	0.76
All	0.88	0.86	All	0.92	0.89

Table 16
Overall HUI3 Utility Scores for Individuals who Contacted and Did Not Contact A Physician in the Past 12 Months by Self-Rated Health Status

	Did contact		Did not contact		
	Canada	US	Canada	US	
	mean	mean	mean	mean	
	HUI3	HUI3	HUI3	HUI3	
Excellent	0.95	0.95	Excellent	0.97	0.95
Very			Very		
Good	0.92	0.92	Good	0.92	0.92
Good	0.86	0.84	Good	0.89	0.88
Fair	0.69	0.68	Fair	0.86	0.79
Poor	0.43	0.32	Poor	0.30	0.43

Table 17
Overall HUI3 Utility Scores for Individuals Reporting/Not Reporting An Unmet Health Care Need

Reporting unmet need				
Canada	US			
	All	Insured	Uninsured	
	mean	mean	mean	
mean HUI3	HUI3	HUI3	HUI3	
0.75	0.74	0.75	0.73	
Not reporting unmet need				
Canada	US			
	All	Insured	Uninsured	
	mean	mean	mean	
mean HUI3	HUI3	HUI3	HUI3	
0.90	0.89	0.90	0.89	

Table 18
Overall HUI3 Scores for Individuals Reporting/Not Reporting An Unmet Health Care Need by Gender

	Report		Not Report	
	Canada	US	Canada	US
	mean	mean	mean	mean
	HUI3	HUI3	HUI3	HUI3
Males				
18-44	0.77	0.81	0.93	0.93
45-64	0.78	0.68	0.90	0.87
65+	0.62	0.55	0.83	0.91
Females				
18-44	0.79	0.78	0.92	0.92
45-64	0.69	0.64	0.89	0.87
65+	0.67	0.53	0.79	0.79
All				
18-44	0.78	0.8	0.93	0.93
45-64	0.73	0.66	0.89	0.87
65+	0.64	0.54	0.81	0.80

Table 19
Overall HUI3 Scores for Individuals Reporting/Not Reporting An Unmet Healthcare Need by Household Income Quintile

Income quintile	Report		Not reporting	
	Canada	US	Canada	US
	mean	mean	mean	mean
	HUI3	HUI3	HUI3	HUI3
1st(lowest)	0.66	0.65	0.84	0.81
2 nd	0.73	0.77	0.88	0.87
3 rd	0.80	0.85	0.91	0.90
4 th	0.83	0.82	0.93	0.92
5th(highest)	0.83	0.84	0.94	0.94

Table 20
Overall HUI3 Scores for Individuals With/Without Various Types of Insurance

	With		Without	
	Canada	US	Canada	US
	mean	mean	mean	mean
	HUI3	HUI3	HUI3	HUI3
Dental	0.90	0.89	0.86	0.83
Prescription medication	0.88	0.88	0.88	0.84
Eye glasses/contacts	0.89	0.88	0.87	0.86
Hospital	0.90	0.88	0.85	0.83

Table 21
Education

	Canada	US
	mean	mean
Education	HUI3	HUI3
less than		
HS	0.81	0.74
HS	0.89	0.86
tech/coll	0.89	0.87
Univ.		
degree	0.92	0.92

Table 22
Determinants of Health Models

Model 1 HUI3=f(age, gender)				
	Estimated	Standard	T-	P-
	Coefficient	Error	Statistic	Value
Constant	0.929	0.007	124.564	0.000
Gender	-0.015	0.005	-3.395	0.001
Age	-0.056	0.005	-11.095	0.000
Age1	-0.088	0.008	-10.809	0.000
Age2	-0.169	0.009	-17.856	0.000
Adjusted R ²	0.05			
Model 2 HUI3=f(gender, age, country)				
	Estimated	Standard	T-	P-
	Coefficient	Error	Statistic	Value
Constant	0.955	0.016	60.845	0.000
Gender	-0.015	0.005	-3.383	0.001
Age	-0.056	0.005	-11.102	0.000
Age1	-0.088	0.008	-10.809	0.000
Age2	-0.169	0.009	-17.854	0.000
Country	-0.014	0.007	-1.919	0.055
Adjusted R ²	0.051			
Model 3 HUI3=f(gender, age, proxy reporting, education)				
	Estimated	Standard	T-	P-
	Coefficient	Error	Statistic	Value
Constant	0.962	0.017	56.067	0.000
Gender	-0.018	0.004	-3.986	0.000
Age	-0.058	0.005	-11.721	0.000
Age1	-0.072	0.008	-9.119	0.000
Age2	-0.138	0.009	-14.868	0.000
proxy	-0.120	0.013	-8.896	0.000
HS	0.083	0.007	12.140	0.000
Tech/coll	0.090	0.008	11.051	0.000
Univ	0.135	0.007	19.628	0.000
Adjusted R ²	0.103			

Model 4 HUI3=f(gender, age, proxy reporting, education, country)

	Estimated Coefficient	Standard Error	T-Statistic	P-Value
Constant	1.000	0.021	46.815	0.000
Gender	-0.017	0.004	-3.957	0.000
Age	-0.058	0.005	-11.729	0.000
Age1	-0.072	0.008	-9.109	0.000
Age2	-0.138	0.009	-14.852	0.000
proxy	-0.119	0.013	-8.801	0.000
HS	0.084	0.007	12.297	0.000
Tech/coll	0.090	0.008	11.033	0.000
Univ	0.137	0.007	19.791	0.000
Country	-0.021	0.007	-2.958	0.003

Adjusted R² 0.104

Model 5 HUI3=f(gender, age, proxy reporting, education, marital status)

	Estimated Coefficient	Standard Error	T-Statistic	P-Value
Constant	0.9690	0.017	56.229	0.000
Gender	-0.0120	0.004	-2.691	0.007
Age	-0.0520	0.005	-10.228	0.000
Age1	-0.0660	0.008	-7.993	0.000
Age2	-0.1220	0.010	-11.900	0.000
Proxy	-0.1250	0.013	-9.313	0.000
HS	0.0820	0.007	11.996	0.000
Tech/coll	0.0890	0.008	10.883	0.000
Univ	0.1320	0.007	19.177	0.000
Widow	-0.0520	0.011	-4.900	0.000
Div	-0.0600	0.007	-8.070	0.000
Single	-0.0120	0.006	-1.938	0.053

Adjusted R² 0.111

Model 6 HUI3=f(gender, age, proxy reporting, education, marital status, country)

	Estimated Coefficient	Standard Error	T-Statistic	P-Value
Constant	1.003	0.0210	46.887	0.000
Gender	-0.012	0.0040	-2.678	0.007
Age	-0.053	0.0050	-10.259	0.000
Age1	-0.066	0.0080	-8.000	0.000
Age2	-0.122	0.0100	-11.906	0.000
Proxy	-0.124	0.0130	-9.221	0.000
HS	0.083	0.0070	12.139	0.000
College	0.089	0.0080	10.856	0.000
Univ	0.133	0.0070	19.323	0.000
Widow	-0.051	0.0110	-4.866	0.000
Div	-0.059	0.0070	-7.988	0.000
Single	-0.012	0.0060	-19.790	0.048
Country	-0.019	0.0070	-2.705	0.007

Adjusted R² 0.112

Model 7 HUI3=f(gender, proxy reporting, age, education, BMI, marital status, income)

	Estimated Coefficient	Standard Error	T-Statistic	P-Value
Constant	1.013	0.018	57.214	0.000
Gender	-0.011	0.004	-2.391	0.017
Proxy	-0.129	0.013	-9.767	0.000
HS	0.067	0.007	9.861	0.000
College	0.068	0.008	8.270	0.000
Univ	0.097	0.007	13.302	0.000
Widow	-0.042	0.010	-3.983	0.000
Div	-0.047	0.007	-6.420	0.000
Single	-0.010	0.006	-1.780	0.075
Y1	-0.069	0.007	-10.410	0.000
Y2	-0.020	0.006	-3.1700	0.002
Y4	0.015	0.007	2.234	0.026
Y5	0.026	0.007	3.773	0.000
BMI0	-0.046	0.015	-3.115	0.002
BMI1	-0.007	0.005	-1.477	0.140
BMI2	-0.063	0.006	-10.752	0.000
Age	-0.055	0.005	-10.737	0.000
Age1	-0.062	0.008	-7.637	0.000
Age2	-0.121	0.010	-11.911	0.000

Adjusted R² 0.142

Model 8 HUI3=f(gender, proxy reporting, age, education, BMI, marital status, income, country)

	Estimated Coefficient	Standard Error	T-Statistic	P-Value
Constant	1.041	0.022	48.036	0.000
Gender	-0.011	0.004	-2.375	0.018
Proxy	-0.128	0.013	-9.689	0.000
HS	0.068	0.007	9.985	0.000
College	0.068	0.008	8.270	0.000
Univ	0.098	0.007	13.436	0.000
Widow	-0.041	0.010	-3.958	0.000
Div	-0.047	0.007	-6.354	0.000
Single	-0.011	0.006	-1.810	0.070
Y1	-0.070	0.007	-10.459	0.000
Y2	-0.020	0.006	-3.229	0.001
Y4	0.014	0.007	2.134	0.033
Y5	0.025	0.007	3.689	0.000
BMI0	-0.046	0.015	-3.135	0.002
BMI1	-0.007	0.005	-1.437	0.151
BMI2	-0.063	0.006	-10.636	0.000
Age	-0.055	0.005	-10.764	0.000
Age1	-0.062	0.008	-7.651	0.000
Age2	-0.121	0.010	-11.918	0.000
Country	-0.015	0.007	-2.200	0.028
Adjusted R ²	0.142			

Legend

Y1=lowest income	BMI0 <18.5 (underweight)	AGE 45-64
Y2=lower middle income quintile	BMI1 25-29 (overweight)	AGE1 65-74
Y4=higher middle income quintile	BMI2 >=30 (obese)	AGE2 75+
Y5=highest income quintile	Country=US	Gender=Female

Omitted categories: Y3=middle income quintile; BMI 18.5-24 (normal weight); AGE 18-44; less than high school; male; married