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Health Utilities Index Mark 3 Scores for Major Chronic Conditions: Population Norms for Canada Based on the 2013 and 2014 Canadian Community Health Survey

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Health Utilities Index Mark 3 Scores for Major Chronic Conditions: Population Norms for Canada Based on the 2013 and 2014 Canadian Community Health Survey

by Jason R. Guertin, Brittany Humphries, David Feeny and Jean-Eric Tarride

Abstract

Background: Utility scores are frequently used as preference weights when estimating quality-adjusted life years within cost-utility analyses or health-adjusted life expectancies. Though previous Canadian estimates for specific chronic conditions have been produced, these may no longer reflect current patient populations.

Data and methods: Data from the 2013 and 2014 Canadian Community Health Survey were used to provide Canadian utility score norms for 17 chronic conditions. Utility scores were estimated using the Health Utilities Index Mark 3 instrument and were reported as weighted average (95% confidence intervals [95% CI]) values. In addition to age- and sex-stratified analyses, results were also stratified according to the number of reported chronic conditions (i.e., “none” to “five or more”). All results were weighted using sampling and bootstrapped weights provided by Statistics Canada.

Results: Utility scores were estimated for 123,654 (97.2%) respondents (weighted frequency = 29,337,370 [97.7%]). Of the chronic conditions that were examined, asthma had the least detrimental effect (weighted average utility score = 0.803 [95% CI: 0.795 to 0.811]) on respondents' utility scores, and Alzheimer's disease or any other dementia had the most detrimental effect (weighted average utility score = 0.374 [95% CI: 0.323 to 0.426]). Respondents who reported suffering from no chronic conditions had, on average, the highest utility scores (weighted average utility score = 0.928 [95% CI: 0.926 to 0.930]). Estimates dropped as a function of the number of reported chronic conditions.

Interpretation: Utility scores differed between various chronic conditions and as a function of the number of reported chronic conditions. Results also highlighted several differences with previously published Canadian utility norms.

Keywords: Canada; Canadian Community Health Survey (CCHS); chronic disease; health status; Health Utilities Index Mark 3 (HUI3); multiple chronic conditions; utility scores

Health-related quality of life (HRQoL) has many definitions.¹ One common definition for HRQoL within the health economic literature is the “values assigned to different health states.” Those values are also known as utility scores.² By convention, a utility score of 1.00 is assigned to a perfect health state, and a utility score of 0.00 is assigned to a dead state. Health states considered worse than dead are assigned a negative value.^{3,4}

Though always the same individual metric, utility scores have several applications within the HRQoL and economic literature. First, they can be used as a simple composite measure to represent the excess burden associated with a particular condition when compared with individuals who do not suffer from that condition. Notable Canadian examples include studies by Jones et al.⁵ that compared individuals with and without multiple sclerosis, and studies by Bowker et al.⁶ that compared individuals with and without diabetes and/or cancer. Second, utility scores can be combined with life expectancy tables to provide a health-adjusted life expectancy (HALE) that takes into account the expected duration of life, as well as the health states in which the members of a given population are expected to live.⁷⁻¹¹ Finally, similar to their use in estimating HALE, utility scores

can be used within the context of economic evaluations to quantify the incremental effectiveness of various interventions by way of quality-adjusted life years gained or lost.¹²⁻¹⁶

One area of research common to the three uses of utility scores is the provision of population-wide utility score norms. In a Canadian context, utility score norms are useful since they serve as benchmark values against which subsets of the populations can be compared. In addition, utility score norms are critical inputs for Canadian economic evaluations and disease-specific HALE tables.¹⁷ Many groups have provided Canadian utility score norms for a single chronic condition,¹⁸⁻²² but few teams—notably Mittmann et al.²³ and Schultz and Kopec²⁴—have provided Canadian utility score norms for multiple chronic conditions (i.e., 20 and 21 chronic conditions, respectively). The utility score norms provided by these studies are of particular importance since they highlight the relative detrimental effect that each of these multiple conditions has on each other. However, one concern with both sets of norms is that the values they provide may be outdated since they are based on responses to cycles 1 and 2 of the National Population Health Survey, which are over 20 years old.^{25,26} Additionally, norms provided by Mittmann et al.²³ used the provisional conversion

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algorithm based on the Health Utilities Index Mark 2 weights, which is not necessarily equivalent to scores based on the Health Utilities Index Mark 3 (HUI3). Furthermore, although both studies provide sex- and age-stratified results,^{23,24} finer granularity regarding the stratified analyses should be favoured because it may better highlight age- and sex-specific effects of diseases.

This study provides updated Canadian utility score norms for a broad range of chronic conditions. It extends prior work aimed at providing age- and sex-specific utility score norms for Canada, as well as for each province and territory.²⁷

Methods

Survey design

As with the prior study,²⁷ data from the two-year combined 2013 and 2014 Canadian Community Health Survey (CCHS) were used.^{28,29} A detailed description of this survey can be found elsewhere.³⁰ Briefly, Statistics Canada administered the CCHS to a representative sample of the Canadian household population aged 12 years or older living in the 10 provinces and 3 territories. Individuals on Indian reserves and on Crown lands, institutionalized Canadian residents, full-time members of the Canadian Forces, and residents of certain remote regions were excluded. Statistics Canada estimated that the 2013 and 2014 CCHS covered approximately 98% of the Canadian population.³¹ For the 2013 and 2014 CCHS, 147,009 households agreed to participate in the survey, and 128,310 individuals responded (response rate of 87.3%). Interviews were conducted in person using computer-assisted personal interviewing, or by telephone using computer-assisted telephone interviewing.³¹

Health Utilities Index Mark 3 (HUI3)

Respondents' utility scores were assessed using the HUI3 instrument of the HUI system.³²⁻³⁴ The HUI3 combines a generic comprehensive health status classification system and a generic HRQoL utility scoring system. It is one of the indirect

methods for utility score assessment recommended by the Canadian Agency for Drugs and Technologies in Health in its 2017 guidelines for the economic evaluation of healthcare technologies.¹³ The HUI3 examines eight health attributes—vision, hearing, speech, ambulation, dexterity, emotion, cognition and pain or discomfort. Each attribute has five or six levels. Combinations of the different attributes and levels create 972,000 unique health states. Utility scores for the HUI3 range from -0.36 to 1.00, with 1.00 representing a perfect health state and 0.00 representing a dead state. Utility scores for states worse than dead are represented by negative values. The minimum clinically important difference (MCID) for the HUI3 has been estimated at 0.03, though others have used a MCID of 0.01.^{34,35}

Chronic conditions

Several chronic conditions were examined within the 2013 and 2014 CCHS.^{28,29} Chronic conditions examined for this current study included Alzheimer's disease or any other dementia, anxiety disorder, arthritis, asthma, back problems, bowel disease (including Crohn's disease, incontinence, irritable bowel disease, ulcerative colitis and other), (current) cancer, chronic obstructive pulmonary disease (COPD), diabetes, effects of a stroke, heart disease, high blood pressure, migraines, mood disorder, scoliosis, stomach or intestinal ulcers, and urinary incontinence. Respondents were asked to report conditions that lasted or were expected to last for at least six months and that had been diagnosed by a health professional. Of note, the prevalence of certain chronic conditions was not assessed among younger respondents (e.g., respondents younger than age 35 were not asked whether they suffered from Alzheimer's disease or other dementia), and respondents who indicated that they currently had cancer were not asked to report which type. Also, though respondents who had diabetes were not asked to report whether they had type 1 or type 2 diabetes, responses to other questions via the derived variable "CCDDIA" were

What is already known on this subject?

- Utility scores vary between health states and are negatively correlated to the severity of the health state.
- Canadian utility score norms have been produced in the past, but are based on data that are over 20 years old.

What does this study add?

- This study provides recent Canadian utility score norms based on the 2013 and 2014 Canadian Community Health Survey.
- Though the rank ordering of the chronic conditions in estimates in this study and in previous studies are similar, minimum clinically important differences were observed.
- Repeat assessments of population-level norms are required to confirm or refute potential variations in the utilities associated with chronic conditions over time.

used by Statistics Canada to determine whether a participant had type 1 or type 2 diabetes.

In addition to an individual examination of each chronic condition, the number of chronic conditions that respondents reported suffering from was examined through the use of a categorical variable (i.e., reported suffering from zero, one, two, three, four, or five or more chronic conditions).

Statistical analyses

Descriptive statistics were used to describe the sociodemographic and clinical characteristics of respondents. Descriptive statistics were presented as absolute and relative frequencies, with the exception of respondents' age at the time of answering the survey and the number of reported chronic conditions, which were presented as averages (95% confidence interval [95% CI]) and abso-

lute and relative frequencies of mutually exclusive categories.

Utility scores were derived by Statistics Canada from answers to specific HUI3 instrument questions.³⁰ Respondents who refused to answer any of these questions were assigned a missing value. Average (95% CI) and median (interquartile range [IQR]) utility scores were estimated for each of the 17 examined chronic conditions. Though each condition was examined separately, they were not mutually exclusive. As a result, respondents included within each analysis could report suffering from additional chronic conditions. The average (95% CI) and median (IQR) utility scores of respondents as a function of the number of reported chronic conditions (from none to five or more) were also examined. Both sets of utility score analyses were further stratified by sex and age.

All descriptive statistics were weighted to comply with Statistics Canada vetting rules. Sampling weights and bootstrapped weights, which were used to estimate the bootstrapped 95% CI, were provided by Statistics Canada and used to extrapolate the results to the Canadian household population covered by the 2013 and 2014 CCHS. All analyses were conducted with the program SAS, version 9.3 (Cary, North Carolina), and survey-specific procedures were used when appropriate.

Results

Sociodemographic and clinical characteristics

A total of 128,310 individuals answered the 2013 and 2014 CCHS and were weighted to represent a weighted sample of 30,014,589 household Canadians.³⁰ Sociodemographic characteristics of this population have been previously described.²⁷ In this study, the chronic condition status of this population was further examined (Table 1). A slightly greater proportion of the weighted sample was female (weighted frequency count = 15,199,574 [50.6%]), and the average age at the time of survey response was 44.8 years old (95% CI: 44.7 to 44.9).

Table 1
Sociodemographic characteristics and reported chronic conditions, household population aged 12 and older, Canada, 2013 and 2014

Characteristic	Weighted frequency	Relative weighted frequency (%)	95% confidence interval	
			from	to
Total	30,014,589	100.00
Sex				
Male	14,815,015	49.40	49.40	49.40
Female	15,199,574	50.60	50.60	50.60
Age, mean	...	44.80	44.70	44.90
Age groups				
12 to 19	3,180,697	10.60	10.60	10.60
20 to 24	2,419,203	8.10	7.80	8.30
25 to 29	2,373,260	7.90	7.70	8.10
30 to 34	2,321,576	7.70	7.40	8.00
35 to 39	2,296,321	7.70	7.40	7.90
40 to 44	2,415,306	8.00	7.80	8.30
45 to 49	2,334,694	7.80	7.40	8.20
50 to 54	2,708,861	9.00	8.70	9.40
55 to 59	2,576,617	8.60	8.30	8.90
60 to 64	2,184,281	7.30	6.90	7.60
65 to 69	1,822,033	6.10	5.90	6.20
70 to 74	1,301,405	4.30	4.20	4.50
75 to 79	946,319	3.20	3.00	3.30
80 to 84	656,358	2.20	2.10	2.30
85 and older	477,658	1.60	1.50	1.70
Chronic condition†				
Alzheimer's disease or any other dementia				
Yes	138,713	0.50	0.40	0.50
Not applicable	10,294,736	34.30	34.00	34.60
Anxiety disorder	2,059,048	6.90	6.60	7.10
Arthritis				
Yes	4,677,551	15.60	15.30	15.90
Not applicable	713,821	2.40	2.30	2.50
Asthma	2,405,419	8.00	7.80	8.30
Back problems	5,476,049	18.20	17.90	18.60
Bowel disease	1,368,929	4.60	4.40	4.80
Crohn's disease	122,178	0.40	0.40	0.50
Incontinence	50,016	0.20	0.10	0.20
Irritable bowel disease	798,089	2.70	2.50	2.80
Ulcerative colitis	150,481	0.50	0.40	0.60
Cancer‡	552,843	1.80	1.70	2.00
COPD				
Yes	817,894	2.70	2.60	2.90
Not applicable	10,294,736	34.30	34.00	34.60
Diabetes	1,988,216	6.60	6.40	6.90
Type 1	86,396	0.30	0.20	0.30
Type 2	1,833,219	6.10	5.90	6.30
Gestational	21,593	0.10	0.00	0.10
Not stated	47,009	0.20	0.10	0.20
Effects of a stroke	333,606	1.10	1.00	1.20
Heart disease	1,455,958	4.90	4.70	5.00
High blood pressure	5,297,278	17.60	17.30	18.00
Migraines	2,987,249	10.00	9.70	10.20
Mood disorder	2,304,130	7.70	7.40	7.90
Scoliosis	982,555	3.30	3.10	3.40
Stomach or intestinal ulcers	758,148	2.50	2.30	2.70
Urinary incontinence				
Yes	1,039,464	3.50	3.30	3.60
Not applicable	5,599,900	18.70	18.40	18.90
Other	228,577	0.80	0.70	0.90
Not stated	61,349	0.20	0.10	0.30
Don't know or refusal	19,589	0.10	0.00	0.10

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Table 1
Sociodemographic characteristics and reported chronic conditions, household population aged 12 and older, Canada, 2013 and 2014

Characteristic	Weighted frequency	Relative weighted frequency (%)	95% confidence interval	
			from	to
Number of chronic conditions				
0	13,516,957	45.00	44.50	45.50
1	7,516,640	25.10	24.60	25.50
2	4,310,331	14.40	14.10	14.70
3	2,311,443	7.70	7.50	7.90
4	1,210,740	4.00	3.90	4.20
5 or more	1,148,478	3.80	3.70	4.00
Number of chronic conditions, mean	...	1.15	1.14	1.17

... not applicable

† some chronic conditions (e.g., arthritis) were not asked to all respondents; these conditions are identified within the table

‡ respondents reported currently suffering from cancer

COPD = Chronic obstructive pulmonary disease

Source: 2013 and 2014 Canadian Community Health Survey.

Results indicate that back problems (weighted frequency count = 5,476,049 [18.2%]) and high blood pressure (weighted frequency count = 5,297,278 [17.6%]) were the two most frequently reported chronic conditions within the weighted sample, whereas Alzheimer's disease or any other dementia was the least frequently reported chronic condition (weighted frequency count = 138,713 [0.5%]). The average number of reported chronic conditions was 1.15 (95% CI: 1.14 to 1.17). Over half of the weighted sample reported suffering from at least one chronic condition (weighted frequency count = 16,497,632 [55.0%]). In addition, the number of chronic conditions reported by respondents was also examined within a subset of respondents

Table 2
Number of chronic diseases reported by respondents according to the examined chronic conditions, household population aged 12 and older, Canada, 2013 and 2014

Chronic condition†	Number of chronic conditions‡			Only one chronic condition§			Two chronic conditions			Three chronic conditions			Four chronic conditions			Five or more chronic conditions		
	Average	95% confidence interval		Relative weighted frequency	95% confidence interval		Relative weighted frequency	95% confidence interval		Relative weighted frequency	95% confidence interval		Relative weighted frequency	95% confidence interval		Relative weighted frequency	95% confidence interval	
		from	to		from	to		from	to		from	to		from	to		from	to
Asthma	2.75	2.69	2.81	34.0	32.5	35.6	22.6	21.2	23.9	15.1	14.0	16.1	11.2	10.2	12.2	17.1	15.9	18.3
High blood pressure	2.74	2.71	2.78	25.7	24.7	26.6	28.2	27.3	29.2	19.8	19.0	20.5	12.3	11.6	13.0	14.0	13.3	14.7
Migraines	2.62	2.57	2.68	32.9	31.3	34.5	26.1	24.6	27.5	16.9	15.7	18.1	10.2	9.3	11.2	13.9	12.9	14.9
Scoliosis	2.94	2.84	3.04	23.5	21.0	25.9	26.5	24.1	29.0	19.3	17.1	21.5	13.7	11.8	15.6	17.0	15.2	18.8
Diabetes	3.14	3.08	3.20	17.0	15.4	18.6	26.9	25.3	28.4	21.8	20.5	23.2	15.0	13.8	16.2	19.3	18.2	20.5
Cancer††	3.10	3.00	3.21	19.0	16.2	21.8	25.7	22.7	28.8	21.5	18.6	24.4	14.0	12.2	15.8	19.8	17.5	22
Back problems	2.82	2.78	2.86	25.2	24.2	26.3	25.6	24.6	26.6	20.4	19.6	21.3	13.4	12.7	14.1	15.3	14.5	16
Bowel disease	3.29	3.20	3.37	19.6	17.9	21.3	22.5	20.6	24.4	19.9	18.1	21.7	14.3	13.0	15.7	23.7	21.9	25.4
Heart disease	3.54	3.47	3.61	11.9	10.7	13.1	22.0	20.5	23.5	21.6	20.1	23.0	19.3	17.7	20.8	25.3	23.7	26.9
Arthritis	3.08	3.04	3.11	17.8	17.0	18.7	25.2	24.3	26.1	23.3	22.4	24.2	15.6	14.8	16.3	18.1	17.3	18.9
Stomach or intestinal ulcers	3.58	3.42	3.74	17.6	14.0	21.2	19.6	16.9	22.2	19.8	16.7	22.8	14.0	12.0	16.0	29.1	26.0	32.2
Anxiety disorder	3.26	3.19	3.33	16.9	15.5	18.3	26.5	24.8	28.3	19.4	18.0	20.8	14.1	12.8	15.4	23.1	21.5	24.7
COPD	4.22	4.11	4.33	6.7	5.4	8.0	15.0	13.1	16.8	19.6	17.7	21.5	18.7	16.7	20.7	40.0	37.6	42.4
Mood disorder	3.32	3.26	3.38	15.6	14.3	17.0	25.1	23.6	26.5	20.2	18.8	21.5	15.6	14.4	16.9	23.5	22.2	24.9
Urinary incontinence	3.93	3.84	4.02	8.8	7.4	10.2	17.7	16.1	19.4	21.3	19.7	22.9	16.8	15.3	18.3	35.4	33.3	37.6
Effects of a stroke	4.29	4.10	4.48	7.2	5.3	9.0	17.2	14.1	20.4	17.4	14.5	20.3	17.4	14.4	20.5	40.8	36.8	44.9
Alzheimer's disease or any other dementia	4.13	3.88	4.38	7.9	5.1	10.7	15.3	11.5	19.0	21.9	16.0	27.8	18.2	13.1	23.3	36.7	30.7	42.7

† chronic conditions are not mutually exclusive

‡ the minimum number of chronic conditions reported by the respondent is 1 (i.e., the examined chronic condition)

§ identifies respondents who reported suffering only from the examined chronic condition

†† respondents reported to be currently suffering from cancer

COPD = Chronic obstructive pulmonary disease

Source: 2013 and 2014 Canadian Community Health Survey.

who reported suffering from each of the examined conditions (Table 2). Results showed that most respondents who reported suffering from at least one of the examined chronic conditions reported suffering from multiple chronic conditions. Results highlighted that multi-comorbidity was most prevalent among respondents who reported suffering from COPD and among those who reported suffering from the effects of a stroke. Among respondents who reported suffering from COPD, 93.3% (92.0% to 94.6%) reported suffering from at least one other chronic condition. Among respondents who reported suffering from the effects of a stroke, 92.9% (91.0% to 94.7%) reported suffering from at least one other chronic condition. Multi-comorbidity was the least frequently reported among respondents who reported suffering from asthma—66.0% (64.4% to 67.5%) of respondents who reported suffering from asthma reported suffering from at least one other chronic condition.

Utility score measures

Utility scores could not be estimated for all respondents of the 2013 and 2014 CCHS. Utility scores were estimated for 123,654 respondents (96.4%), who represent a weighted sample of 29,337,370 Canadians (97.7%). Predictors of non-response within this sample have been previously examined.²⁷

Table 3 provides weighted average (95% CI) utility scores for each of the 17 examined chronic conditions (age- and sex-stratified averages [95% CI] and median [IQR] utility score norms for each chronic condition are available within supplementary tables 1 to 17 available at <http://hdl.handle.net/20.500.11794/30544> and <http://www.chepa.org/docs/default-source/online-appendices/health-utilities-index-mark-3-scores-for-major-chronic-conditions---supplementary-tables.pdf?sfvrsn=2>). Results highlight the fact that utility score norms vary among the various chronic conditions; results ranged from a high of 0.803 (0.795 to 0.811) for respondents who reported

Table 3

Utility score norms for each of the chronic conditions examined in the 2013 and 2014 Canadian Community Health Survey, household population aged 12 and older, Canada, 2013 and 2014

Chronic condition	Male			Female			Total population		
	Average	95% confidence interval		Average	95% confidence interval		Average	95% confidence interval	
		from	to		from	to		from	to
Asthma	0.826	0.814	0.838	0.786	0.775	0.797	0.803	0.795	0.811
High blood pressure	0.811	0.802	0.820	0.775	0.767	0.782	0.793	0.787	0.799
Migraines	0.766	0.750	0.783	0.785	0.776	0.794	0.780	0.771	0.788
Scoliosis	0.782	0.755	0.809	0.775	0.759	0.791	0.777	0.764	0.791
Diabetes	0.792	0.780	0.805	0.734	0.719	0.750	0.766	0.757	0.776
Cancer [†]	0.755	0.726	0.783	0.763	0.740	0.786	0.759	0.741	0.777
Back problems	0.747	0.738	0.756	0.727	0.719	0.736	0.736	0.730	0.742
Bowel disease	0.749	0.724	0.773	0.730	0.715	0.745	0.735	0.723	0.748
Heart disease	0.753	0.734	0.772	0.672	0.652	0.691	0.719	0.705	0.732
Arthritis	0.712	0.700	0.725	0.717	0.709	0.724	0.715	0.708	0.722
Stomach or intestinal ulcers	0.694	0.650	0.738	0.692	0.664	0.720	0.693	0.668	0.719
Anxiety disorder	0.665	0.640	0.689	0.683	0.671	0.696	0.677	0.665	0.689
COPD	0.672	0.647	0.696	0.631	0.610	0.652	0.649	0.633	0.665
Mood disorder	0.643	0.624	0.662	0.643	0.630	0.656	0.643	0.632	0.654
Urinary incontinence	0.608	0.567	0.649	0.626	0.608	0.645	0.621	0.603	0.639
Effects of a stroke	0.626	0.591	0.661	0.536	0.494	0.578	0.581	0.553	0.608
Alzheimer's disease or any other dementia	0.458	0.383	0.532	0.301	0.238	0.364	0.374	0.323	0.426

[†] respondents reported to be currently suffering from cancer

COPD = Chronic obstructive pulmonary disease

Source: 2013 and 2014 Canadian Community Health Survey.

suffering from asthma to a low of 0.374 (0.323 to 0.426) for respondents who reported suffering from Alzheimer's disease or other dementia.

Figure 1 provides the weighted average utility scores according to respondent age, stratified by the number of reported chronic conditions. Results highlight that the average weighted utility score drops according to the number of reported chronic conditions, from a high of 0.928 (0.926 to 0.930) when respondents reported suffering from no chronic condition to a low of 0.490 (0.475 to 0.505) when respondents reported suffering from five or more chronic conditions. This general tendency was reflected within most of the examined age categories and was more pronounced among respondents aged 70 years and older. Supplementary tables 18 to 23 provide the age- and sex-stratified analyses according to the number of reported chronic conditions, as well as the median (IQR) utility score norms of each stratum (available at <http://hdl.handle.net/20.500.11794/30544>

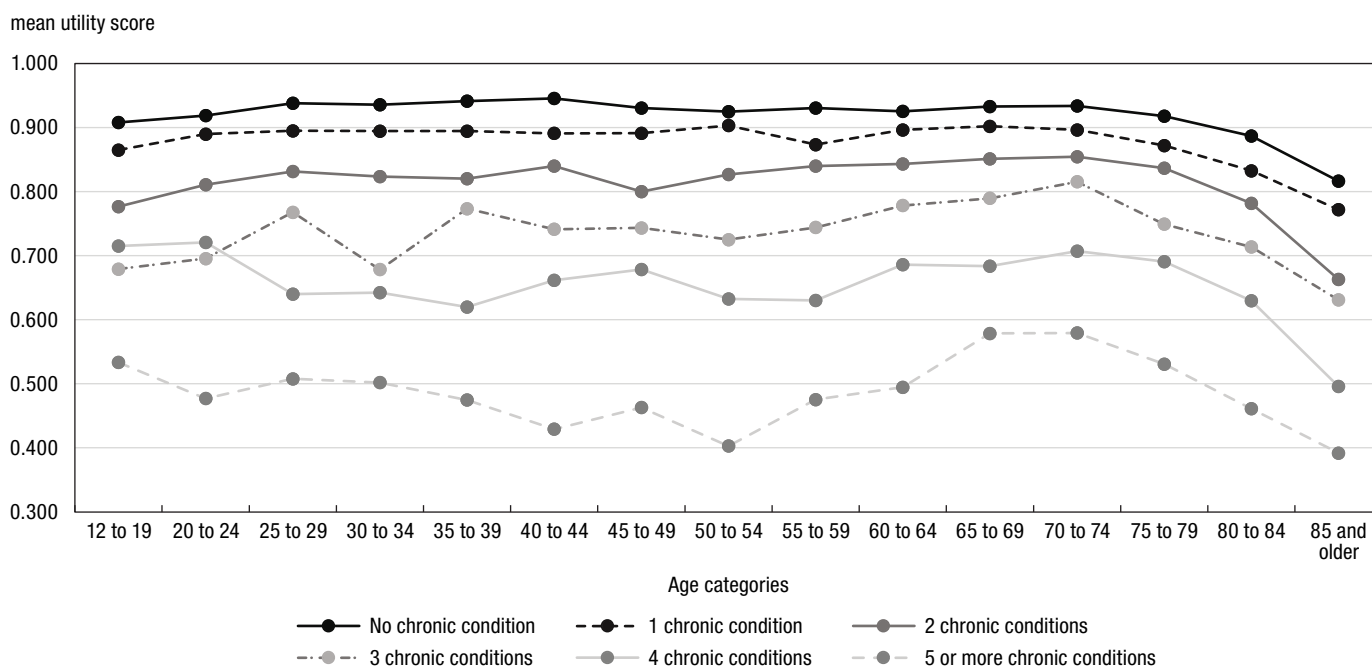
and <http://www.chepa.org/docs/default-source/online-appendices/health-utilities-index-mark-3-scores-for-major-chronic-conditions---supplementary-tables.pdf?sfvrsn=2>).

Discussion

This study expands on previous work aimed at updating utility score norms in Canada.²⁷ Specifically, age- and sex-stratified utility score norms for the Canadian household population are provided according to chronic conditions. Results indicate that the 2013 and 2014 Canadian household population reported suffering from an average of 1.15 (95% CI: 1.14 to 1.17) chronic conditions (Table 1). The weighted average utility score for respondents who reported suffering from a single chronic condition (i.e., 0.887 [0.884 to 0.930]) was closest, and within the MCID for the HUI3, to the weighted average utility score of the 2013 and 2014 Canadian household population that was previously reported (i.e., 0.863 [95% CI: 0.861 to 0.865]).²⁷

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Figure 1
Weighted average utility scores of respondents stratified by the number of chronic conditions they reported, household population aged 12 and older, Canada, 2013 and 2014



Source: Statistics Canada, 2013 and 2014 Canadian Community Health Survey.

In addition, these results echo relationships between utility scores and specific chronic conditions that have been observed by others. For example, similar to results obtained by Mittmann et al.²³ and Schultz and Kopec,^{23,24} respondents of the 2013 and 2014 CCHS considered asthma the least detrimental and Alzheimer’s disease or any other dementia the most detrimental of the 17 examined chronic conditions.

Similar to findings observed in other studies,^{23,36} results obtained in this study highlighted that the average utility score decreased with each additional reported chronic condition (Figure 1). Although the results had greater variability among respondents who reported suffering from multiple chronic conditions (i.e., two or more), results in Figure 1 tended to indicate that the average utility scores within each stratum were independent of respondents’ age when younger than 70 years old, but decreased sharply afterwards. Additional studies are required to validate these trends.

To the best of the researchers’ knowledge, this is the first Canadian study to

examine this relationship in a non-restricted population since the study by Mittmann et al.²³ Interestingly, compared with those results, weighted average utility scores for respondents who reported suffering from none or only one of the examined chronic conditions did not differ (i.e., were within the MCID for the HUI3). However, estimates were generally lower than previously reported values, with differences increasing as respondents reported additional chronic conditions. These differences may be partly explained by the inclusion of alternative sets of chronic conditions, the use of unweighted averages, and differences in scoring algorithms (provisional algorithm based on the HUI2 weights versus the final HUI3 version) compared with the study by Mittmann et al.²³ Additional work is required to confirm any real difference between both sets of results.

This study has limitations that must be recognized.

First, some subsets of the Canadian population were not asked to participate in the 2013 and 2014 CCHS (e.g.,

institutionalized Canadian residents and full-time members of the Canadian Forces).³¹ In addition, utility scores could not be estimated for all respondents of the survey (4,656 respondents [3.6%]; weighted frequency = 677,219 [2.3%]). Although the results may not extend beyond the study population, the 2013 and 2014 CCHS covers most household Canadians aged 12 years or older, and utility scores could be estimated for the vast majority of respondents.

Second, 13% of participants did not answer the 2013 and 2014 CCHS. There is no information on why potential participants refused to answer the survey or who those potential participants were. For example, it is unclear whether respondents of the CCHS were healthier than non-respondents (e.g., higher prevalence of severe comorbidities such as Alzheimer’s disease in non-respondents than in respondents). As a result, the risk of respondent bias cannot be excluded. Despite this risk, the response rate to the 2013 and 2014 CCHS was quite high, at 87.3%.

Third, results are based on self-reported responses, which may be prone to bias if respondents are confused by the wording of certain questions or if the questions do not grant enough specificity to differentiate a disease status fully. For example, cancer status in this study was based on respondents' answer to the 2013 and 2014 CCHS question, "(CCC_Q131) Do you have cancer?"^{28,29} This wording does not provide any detail regarding the type or severity of cancer, which could influence respondents' utility scores. Furthermore, the 2013 and 2014 CCHS asks respondents to report only the prevalence of a disease. Information is not available on the severity of the disease or time since diagnosis. Therefore, it was not possible to further stratify respondents' utility scores according to these characteristics.

Fourth, the utility score norms that are provided were estimated using the HUI3 instrument. Though the HUI3 instru-

ment is one of the most frequently used utility score instruments,³⁷ other instruments (e.g., EuroQol-5 dimensions³⁸ or Short Form-6 dimensions³⁹) could have been considered. However, unlike other instruments, the HUI3 is the only one that has been used with an unrestricted representative sample of the Canadian household population.

Finally, comparisons between these results and those obtained in other jurisdictions were not conducted, despite the fact that utility norms for specific chronic conditions have been produced elsewhere.⁴⁰⁻⁴⁵ The decision not to compare these results was motivated by the fact that differences could be explained by the use of alternative instruments and that algorithms converting responses to the instruments to utility scores vary between jurisdictions and can produce different results.⁴⁶

In conclusion, the results of this study further update Canadian utility score

norms. This information will be useful to Canadian clinicians, researchers and decision makers. Despite the value of the update, the longevity of these updated results remains unclear. As previously mentioned, other groups have provided Canadian utility score norms for specific chronic conditions. Justification for providing this update was based on the fact that many of these norms were derived from data collected over 20 years ago. Although differences between the current study and previous studies were found, some greater than the MCID for the HUI3, it is unclear how frequently such differences would appear. Future research examining trends, or lack thereof, in utility scores over time is needed. Until then, groups who conduct population-wide surveys that include utility score instruments (e.g., Statistics Canada) should be encouraged to periodically and systematically disclose these norms. ■

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