ScienceDirect

Contents lists available at sciencedirect.com
Journal homepage: www.elsevier.com/locate/vhri

Patient-Reported Outcomes

EQ-5D-5L Population Norms and Health Inequality in Colombia

Henry H. Bailey, PhD, Mathieu F. Janssen, PhD, Rodrigo O. Varela, PhD, Jhon A. Moreno, MEd

ABSTRACT

Objectives: The EQ-5D-3L and EQ-5D-5L instruments have been used in studies of patient and demographic groups in Colombia, but to date there are no 5L population norms. This study aimed to produce a set of EQ-5D-5L population norms for Colombia and to see what insights into health inequality in Colombia can be discerned from these norms.

Methods: The EQ-5D-5L self-reported health questionnaire was included in a survey of a representative sample of 3400 adults aged 18 to 64 in Colombia. EQ-5D-5L states, mean EQ VAS, and index values were obtained by sex, age, education, income group, ethnicity, residence, employment status, health insurance status, and household size. EQ-5D-5L index values from Uruguay were used. Regression models were used to investigate inequality.

Results: The mean EQ VAS value was 85.3, the mean index value was 0.953, and 52.2% of the sample reported being in state 11111. Self-reported health was higher for men, declined in higher age groups, and was lower for lower-income and education groups. The EQ-5D-5L instrument was observed to be more sensitive than the EQ-5D-3L instrument in Colombia. The dimensions with the highest prevalence of reported problems were anxiety/depression and pain/discomfort. The main drivers of inequality were age, sex, income, and education.

Conclusions: The population norms developed in this study can be used as baseline values for future studies of patient or treatment groups, and for investigations into the health of specific demographic groups.

Keywords: EQ-5D-5L, Colombia.

VALUE HEALTH REG ISSUES. 2021; 26:24–32

Introduction

The EQ-5D health classification system is a preference-based health outcomes measure that is used in healthcare decision making in many countries.[1] The EQ-5D instrument captures health status in 5 dimensions presented in this order: mobility, ability to perform self-care (bathing, dressing, etc), ability to perform usual activities (work, study, leisure, etc), pain/discomfort, and anxiety/depression. In the 3-level version of the instrument (EQ-5D-3L), each dimension can have 1 of 3 levels: 1: no problems, 2: some problems, or 3: extreme problems (or unable to perform in the cases of self-care and usual activities).

Recently, the EuroQol Group has introduced a 5-level version of the instrument (EQ-5D-5L) with 2 intermediate levels, so each dimension can have 1: no problems, 2: slight, 3: moderate, 4: severe, and 5: extreme problems. For example, an individual in EQ-5D-5L state 12453 would have no problems walking, slight problems bathing and dressing herself, severe problems with usual activities, extreme pain/discomfort, and moderate anxiety/depression. The EQ-5D instrument also includes a visual analog scale on which a respondent indicates their assessment of their own health on a scale ranging from 0 (worst health imaginable) to 100 (best health imaginable). This is known as the EQ VAS value. Each EQ-5D-5L health state has a societal value associated with it. This is known as the index value, and it is obtained through a national valuation study in which a sample of respondents from the country perform preference-based valuation tasks involving a subset of EQ-5D states. The values obtained in these tasks are then used to estimate values for the full set of 5^5 = 3125 EQ-5D-5L states. The index value captures the value that society places on an EQ-5D-5L state relative to all other EQ-5D-5L states. The EQ-5D-5L instrument therefore provides 3 measures for a respondent: an EQ-5D-5L state that gives the level on each dimension, an EQ VAS value that is the individual's subjective assessment of their own health, and an EQ-5D-5L index value that gives the societal value of the individual's EQ-5D-5L state.

The EQ-5D-5L system is used in several ways. EQ VAS and index values can be used to track a single patient or a group of patients through an illness or a treatment regimen. Rates of reporting problems on each of the 5 dimensions, along with EQ VAS and index values, can be used to compare different patient groups, demographic groups, or patients in different treatment arms in clinical studies.[2] EQ-5D index values (both 3L and 5L) are used as the basis for quality-adjusted life-year (QALY) adjustments in cost utility analysis.[3] EQ-5D is used to communicate with patients and to help them to calibrate expectations about treatment

outcomes[4] and has been proposed as a performance measurement tool in healthcare.[5]

To use EQ-5D effectively, a local value set and a set of population norms are required. A value set provides the index value for each EQ-5D state. This reflects the preferences of the population among the health states. These vary among countries and are related to national culture and other factors—it is possible to use the EQ-5D valuations from other countries, but this should be done with caution.[6] Population norms provide the health status of the general population. These are the baseline values against which the health of patient groups or specific demographic groups (eg, people in certain income groups or geographic regions) can be compared.

EQ-5D instruments have been used for many years in developed countries.[7] The use of these tools is growing in developing countries, including countries Latin America and the Caribbean.[8-12] The Instituto de Evaluación Technológica en Salud in Colombia recommends the use of EQ-5D as a tool to value health outcomes in health technology assessment.[13] Several studies have already been carried out in Colombia using EQ-5D-3L and EQ-5D-5L.

EQ-5D-3L has been used in Colombia to evaluate the health of specific segments of the population, for example, children and adolescents[14] and elderly people.[15] These studies used the EQ-5D dimensions. One large recent study produced levels on each EQ-5D-3L dimension for 38 730 Colombian citizens aged 20 to 69,[16] but this was based on 2007 data and it did not include index or EQ VAS values. Another study produced some EQ-5D-3L data for 10 876 Colombian citizens aged 18 to 44 and 45 to 60.[17]

EQ-5D-3L has been used in Colombia to investigate the health status of patient groups. One study of 6693 patients with rheumatic disease included EQ-5D-3L and EQ VAS.[18] In another study of 4020 Colombian citizens, 2274 respondents reported their levels on the 5 dimensions of EQ-5D-3L.[19]

EQ-5D-3L has been used to perform cost per QALY analysis in Colombia, using index values from other countries. One multicountry study of a cardiac drug included EQ-5D states reported by Colombian patients to which index values from the UK value set were applied.[20] Another cost per QALY study of Colombian patients with overactive bladder used EQ-5D-3L states reported by Colombian patients using index values from another multicountry study.[21]

EQ-5D-5L has been applied in a study of hemodialysis patients in Medellín using the levels on EQ-5D-5L values, but no index or EQ VAS values.[22] EQ-5D-5L has also been used with index values to investigate the health status of Colombian patients with HIV.[23,24] Both of these studies used index values from Spain.

Currently neither index values nor population norms exist for EQ-5D-5L in Colombia. The objective of this study is to provide Colombian population norms for EQ-5D-5L. The EQ-5D-5L studies undertaken in Colombia thus far, and future studies using this instrument, would benefit from the population norms in this study as a baseline for comparison.

Methods

The version of the standard EQ-5D-5L questionnaire[1,2] previously linguistically validated for Colombia was included in the 2013 Adult Population Survey of the Global Entrepreneurship Monitor (GEM) for Colombia. The Adult Population Survey is a survey of the perceptions about entrepreneurship. Further details of the GEM study are provided elsewhere.[25] Data were collected through telephone interviews with 3100 adults in urban areas and face-to-face interviews with 300 adults in rural areas. Stratified random sampling by sex, age group, and geographic area was used. For urban areas, the sampling frame was the commercial telephone directories for 2010, 2011, and 2012. A household was selected randomly through the Computer Aided Telephone Interview system and a respondent was selected from the names of all the people living in that household that fit into the profile for the survey based on a random number table. Up to 5 telephone contact attempts were made in all cases where initial contact was not possible. For the rural areas, the sampling frame was the DANE (National Statistical Department of Colombia) neighborhood lists. Respondents were selected using a random number–based tool provided by DANE.

The GEM survey sampled respondents aged between 18 and 64. These were grouped into 6 categories: 18 to 24, 25 to 34, 35 to 44, 45 to 54, and 55 to 64. Four categories were used for education level: less than complete secondary, complete secondary, technical/vocational, and university. Four categories were used for ethnicity: white, afro-Colombian, indigenous, and other. The survey covered all of Colombia. Residence was grouped into urban and rural. Urban was further split into Bogotá, the capital, with 2000 respondents and another category, “other urban” comprising 1100 respondents from the other state capitals: Baranquilla, Cartagena, Santa Marta, Sincelejo, Medellín, Ibagué, Bucaramanga, Cúcuta, Cali, and Pasto. Employment status was grouped into working, unemployed, those who chose not to work, and students and retirees. Respondents were grouped according to whether they had private health insurance or not. The GEM survey also included data on the number of people in the respondent’s household, so this was also included in the analysis. Household size was grouped into 5 categories with values of 1, 2, 3 to 4, 5 to 7, and over 7.

Mean EQ VAS and index values levels along with ceiling levels were calculated for all of the categories of all of the variables. The ceiling is the proportion of respondents who report being in state 11111 with no problems on any dimension. There are no EQ-5D-5L or -3L index values for Colombia. In situations where EQ-5D value sets do not exist, researchers are advised to use values from a similar country.[26] Previous studies using EQ-5D-5L index values in Colombia have been based on the value set for Spain.[27] For this study, we used the index values from the Uruguay valuation study[10] because this is currently the only EQ-5D-5L value set for a Latin American country. Analysis of variance (ANOVA) and *t* tests were used to test the statistical significance of differences between the mean EQ VAS and index values among the categories.

Age and sex are known to be important drivers of health status.[28] Ceiling levels and mean EQ VAS and index values were calculated by age and sex subgroups. The most common states were identified, and the list of states that account for 90% of the respondents was compiled.

Regression models were used to test the effect of the demographic variables with controls for age and sex. Because of the skewed nature of EQ VAS scores, generalized linear models (GLM) with log link and Poisson distribution were used.[29] Where independent variables had more than 2 categories, they were dichotomized to 2 levels to isolate the most disadvantaged group that had been identified based on mean VAS scores.

Inequality was evaluated using several approaches. Mean EQ VAS index and ceiling levels and the GLM results provide some insight into health inequalities. In addition to this, logit regression models were used to test the odds ratios for reporting any problem on the EQ-5D dimensions, associated with demographic variables. Kakwani indices were also obtained for the EQ VAS values. The Kakwani index[30] is an indicator of health inequality on a 0-1 scale that is similar to a Gini coefficient with a higher value indicating greater inequality.

Table 1. Sample characteristics, EQ VAS, and EQ-5D-5L index values by demographic group.

	Sample				EQ VAS values			EQ-5D-5L index values			Ceiling (%)
	Male	Female	Total	%	Mean	SE	*P* val	Mean	SE	*P* val	
Sex							.000			.001	
Male			1664	49	86.8	0.396		0.957	0.002		57.1
Female			1736	51	83.9	0.490		0.949	0.002		47.5
Total			3400		85.3	0.317		0.953	0.001		52.2
Age group							.000			.000	
18-24	391	310	701	21	89.1	0.584		0.970	0.002		64.3
25-34	403	443	846	25	87.3	0.580		0.962	0.002		56.9
35-44	330	384	714	21	85.8	0.674		0.957	0.003		52.0
45-54	313	356	669	20	81.5	0.810		0.939	0.003		42.4
55-64	227	243	470	14	80.8	0.951		0.927	0.005		40.3
	1664	1736	3400								
Education							.000			.000	
< Complete secondary	147	190	337	10	79.7	1.402		0.921	0.006		41.7
Complete secondary	643	707	1350	40	84.2	0.540		0.952	0.002		52.2
Technical/vocational	462	468	930	27	87.6	0.516		0.961	0.002		55.4
University	406	363	769	23	86.9	0.526		0.960	0.002		52.9
	1658	1728	3386								
Ethnicity							.144			.012	
White	986	803	1789	66	85.9	0.405		0.958	0.002		53.3
Afro	223	239	462	17	84.8	0.965		0.947	0.004		52.8
Indigenous	181	176	357	13	83.3	1.032		0.943	0.005		46.3
Other	63	48	111	4	83.9	1.775		0.945	0.010		51.8
	1453	1266	2719								
Residence							.894			.984	
Bogota	1000	1000	2000	59	85.2	0.393		0.953	0.002		50.3
Other urban	519	581	1100	32	85.5	0.608		0.953	0.003		55.2
Rural	145	155	300	9	85.2	1.046		0.953	0.004		54.2
	1664	1736	3400								
Income group							.000			.001	
Lowest $33^{1}/_{3}$ %	701	939	1640	50	83.9	0.510		0.948	0.002		50.1
Middle $33^{1}/_{3}$ %	333	307	640	20	84.9	0.713		0.955	0.003		50.6
Highest $33^{1}/_{3}$ %	576	409	985	30	88.0	0.437		0.960	0.002		56.0
	1610	1655	3265								
Employment status							.209*			.701*	
Working	1419	1140	2559	76	85.8	0.35		0.956	0.001		52.7
Unemployed	134	268	402	12	86.6	0.93		0.957	0.003		55.7
Choose not to work	12	166	178	5	82.2	1.51		0.939	0.006		41.5
Retired or student	77	136	213	6	81.2	1.45		0.932	0.008		50.1
	1642	1710	3352								
Health insurance status							.022			.747	
Private health insurance	1232	1171	2403	74	85.8	0.357		0.953	0.003		53.4
No private health insurance	366	500	866	26	84.2	0.704		0.952	0.002		49.1
	1598	1671	3269								
Size of household							.320			.217	
1	79	43	122	4	83.6	1.792		0.932	0.010		43.8

continued on next page

Table 1. Continued

	Sample				EQ VAS values			EQ-5D-5L index values			Ceiling (%)
	Male	Female	Total	%	Mean	SE	*P* val	Mean	SE	*P* val	
2	180	187	367	11	83.9	0.926		0.953	0.003		48.5
3-4	818	831	1649	49	85.8	0.444		0.955	0.002		53.4
5-7	497	569	1066	31	85.2	0.576		0.953	0.003		53.0
>7	90	106	196	6	85.1	1.516		0.955	0.006		50.8
	1664	1736	3400								

VAS indicates visual analog scale.
**P* values refer to *t* tests for working and unemployed, they do not include the other 2 employment status categories.

For all analyses, a *P* value of .05 or less was used as the criterion for statistical significance. All analyses were conducted using STATA 14 (College Park, TX).

Results

Eighteen respondents did not provide EQ VAS values and 35 respondents had at least one dimension missing (no EQ-5D state). The demographic characteristics of the sample are displayed in Table 1, along with the ceiling levels, mean EQ VAS, and index values by demographic group. The *P* values in Table 1 are associated with ANOVA tests of the mean EQ VAS and index values among the categories for each demographic variable. Where a demographic variable only had 2 categories, *t* tests were used. All of the variables in Table 1 failed Bartlett's test of equality of variances, so Welch's ANOVA and *t* tests for data with unequal variances were used.

Men were observed to have higher EQ VAS, index values, and ceiling levels than women. All 3 measures declined consistently as

Table 2. Mean EQ VAS, index values, and ceiling levels by age group and sex.

EQ VAS Values								
Age group	Male				Female			
	Mean EQ VAS	Standard error	95% CI		Mean EQ VAS	Standard error	95% CI	
18-24	89.197	0.758	87.711	90.683	88.929	0.912	87.140	90.717
25-34	89.731	0.649	88.459	91.004	85.072	0.926	83.256	86.889
35-44	86.064	0.979	84.143	87.984	85.572	0.930	83.749	87.395
45-54	83.859	0.978	81.941	85.777	79.323	1.248	76.876	81.770
55-64	82.480	1.160	80.204	84.756	79.295	1.487	76.378	82.213
EQ-5D-5L index values								
Age group	Male				Female			
	Mean index	Standard error	95% CI		Mean index	Standard error	95% CI	
18-24	0.968	0.003	0.961	0.975	0.973	0.002	0.969	0.977
25-34	0.967	0.003	0.960	0.973	0.958	0.003	0.952	0.964
35-44	0.961	0.004	0.954	0.967	0.954	0.004	0.947	0.961
45-54	0.945	0.005	0.935	0.956	0.933	0.005	0.924	0.942
55-64	0.935	0.006	0.922	0.948	0.920	0.007	0.906	0.934

Ceiling		
Age group	Male (%)	Female (%)
18-24	65.6	62.5
25-34	64.0	50.5
35-44	55.5	49.0
45-54	49.0	36.5
55-64	44.0	36.7

CI indicates confidence interval; VAS, visual analog scale.

Table 3. The most commonly reported states (90% of the sample).

EQ-5D-5L state	Frequency	Cumulative %
11111	1758	52
11112	295	61
11121	227	68
11122	144	72
11113	92	75
11131	49	76
11123	48	78
21121	48	79
11132	39	80
11133	36	81
21122	35	82
11222	25	83
21222	25	84
11212	24	85
21111	24	85
11211	21	86
11221	19	86
11114	16	87
21221	13	87
21123	10	88
21223	10	88
31121	10	88
31122	9	88
11231	8	89
11232	8	89
11223	7	89
21131	7	89
21232	7	90

age increased and increased with income. The differences were statistically significant. All 3 measures increased with education level, but were higher for technical/vocational than university graduates.

For ethnicity, the indigenous category had the lowest mean EQ VAS and index values, but the ANOVA only returned a significant *P* value for the index values. The ceiling level for the indigenous category was considerably lower than the ceiling levels of the other 3 ethnicity categories.

Place of residence did not have a significant effect on EQ VAS and index values; however, rural respondents reported higher ceiling levels than urban respondents. Unemployed respondents had higher mean EQ VAS and index values than working respondents, but the differences were not significant at the 5% level. The ceiling level of the unemployed category was also higher than that of the working category. In Table 1, the *P* value for employment status is associated with a *t* test using values for working and unemployed categories only, even though this variable had 4 categories. This approach was taken because the "choose not to work" category allows for respondents who might have made this choice on the basis of poor health, as well as for other healthy respondents who choose not to work for other reasons. Similarly, the group "retired or student" would potentially bring together the very youngest and oldest respondents.

Respondents covered by private health insurance reported higher ceiling, mean EQ VAS, and index values than those not covered by private insurance with a significant *t* statistic for EQ VAS. All 3 measures in Table 1 increased with household size up to households with 3 to 4 inhabitants, and then declined at higher numbers of inhabitants. The F statistics were not significant at the 5% level, but this was borderline ($P = .058$) for the index value.

The distributions of EQ VAS and index values are shown in Appendix 1 (in Supplemental Materials found at https://doi.org/10.1016/j.vhri.2020.12.002). These histograms show the normal patterns observed in other countries with modes at the maximum levels (1 and 100, respectively, for index and EQ VAS values), both histograms skewed to the left and spikes in the EQ VAS values at multiples of 5 and 10.

Mean EQ-VAS and index values along with ceiling levels are presented by age group and sex in Table 2. All 3 variables followed the pattern of higher values for men than for women, with declines for both men and women as age increases. However, confidence intervals for adjacent values overlapped except in the cases of men: 25 to 34 vs 35 to 44 and women: 18 to 24 vs 25 to 34 and 35 to 44 vs 45 to 54. For the EQ VAS values reported by men, the mean for the age group 25 to 34 was higher than that for the 18-24 age group, but the confidence intervals also overlapped.

Table 3 shows the list of states observed for 90% of the sample. The most common state was 11111 (52%). Nine percent of the sample reported mild problems with anxiety/depression as the only health decrement on the EQ-5D-5L instrument (11112), 7% of the sample reported mild problems with pain/discomfort as their only problem, and a further 4% of the sample reported mild problems on both of these dimensions (11122). A total of 216 states of the 3125 possible EQ-5D-5L states were observed in this study, with the 28 states shown in Table 3 making up 90% of the sample.

Table 4 shows the rates of reporting problems on each dimension of the EQ-5D-5L instrument. The general patterns in Table 4 are increasing rates of reporting problems as age increases, higher rates of reporting problems for women than for men (except for the youngest age group in mobility and 3 age groups in self-care), and pain/discomfort along with anxiety/depression being the dimensions with the highest rates of reported problems.

The results of the generalized linear models for the EQ VAS score are presented in Appendix 2 (see Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.vhri.2020.12.002). In model 1, the independent variables were selected based on the demographic factor having a significant *P* value for the *t* test or ANOVA with the dependent variable in Table 1. In model 2, the independent variables were based on the 4 demographic factors that had significant *P* values with both VAS and index values in Table 1. In model 2, all of the variables had coefficients with *P* values of less than .001.

Table 5 presents the results of the logit models for the 5 dimensions.

Table 6 shows the Kakwani indices and decompositions for the EQ VAS values. The Kakwani index is 0.104; 3.43 percent of the inequality in health is associated with demographic variables, and 27.78% of the inequality by this measure is associated with EQ-5D dimensions. Over 70% of this share is associated with pain/discomfort and anxiety/depression.

Table 4. The rates of reporting problems on the 5 levels for each dimension by age and sex.

	Male					Total male (%)	Female					Total female (%)	Total (%)
	18-24 (%)	25-34 (%)	35-44 (%)	45-54 (%)	55-64 (%)		18-24 (%)	25-34 (%)	35-44 (%)	45-54 (%)	55-64 (%)		
Mobility													
1	94.4	96.0	90.0	80.8	75.8	88.8	97.4	93.2	86.7	74.4	69.0	85.3	87.0
2	3.1	2.7	6.4	10.6	15.9	6.8	1.6	4.1	9.6	17.4	18.2	9.6	8.2
3	2.1	0.5	2.7	7.7	5.7	3.4	0.7	2.3	2.9	6.5	8.7	3.9	3.6
4	0.3	0.3	0.9	1.0	1.8	0.7	0.0	0.2	0.8	1.1	3.3	0.9	0.8
5	0.3	0.5	0.0	0.0	0.9	0.3	0.3	0.2	0.0	0.6	0.8	0.4	0.3
Levels 2-5	5.6	4.0	10.0	19.2	24.2	11.2	2.6	6.8	13.3	25.6	31.0	14.7	100
Self-care													
1	97.7	98.3	97.6	94.9	96.5	97.1	99.7	98.2	97.7	95.2	90.5	96.6	96.8
2	1.3	0.8	1.2	2.2	3.1	1.6	0.3	0.9	1.8	3.1	4.2	1.9	1.7
3	0.5	0.8	0.9	1.9	0.4	0.9	0.0	0.5	0.5	1.4	3.7	1.0	1.0
4	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.2	0.0	0.0	1.2	0.2	0.2
5	0.5	0.3	0.3	0.6	0.0	0.4	0.0	0.2	0.0	0.3	0.4	0.2	0.3
Levels 2-5	2.3	1.7	2.4	5.1	3.5	2.9	0.3	1.8	2.3	4.8	9.5	3.4	100
Usual activities													
1	90.8	92.5	88.8	85.0	84.1	88.8	95.2	91.8	88.3	77.5	74.4	86.3	87.5
2	7.2	4.7	8.8	9.3	7.9	7.4	4.2	5.7	7.8	15.5	16.1	9.4	8.4
3	1.5	2.0	2.1	4.2	6.2	2.9	0.3	2.0	3.1	6.5	7.0	3.6	3.2
4	0.3	0.5	0.3	1.0	0.9	0.5	0.3	0.2	0.5	0.3	1.2	0.5	0.5
5	0.3	0.3	0.0	0.6	0.9	0.4	0.0	0.2	0.3	0.3	1.2	0.4	0.4
Levels 2-5	9.2	7.5	11.2	15.0	15.9	11.2	4.9	8.2	11.7	22.5	25.6	13.7	100
Pain/discomfort													
1	84.9	81.3	70.9	67.3	58.9	74.4	80.6	70.0	64.2	47.2	44.9	62.4	68.3
2	10.5	13.9	22.4	20.5	24.8	17.5	13.9	20.9	24.8	36.2	31.7	25.2	21.4
3	4.1	4.0	5.2	9.6	11.1	6.3	4.9	6.8	8.1	13.5	18.9	9.8	8.1
4	0.3	0.5	1.2	1.9	4.4	1.4	0.7	2.1	2.1	2.3	3.3	2.0	1.7
5	0.3	0.3	0.3	0.6	0.9	0.4	0.0	0.2	0.8	0.8	1.2	0.6	0.5
Levels 2-5	15.1	18.7	29.1	32.7	41.2	25.6	19.4	30.0	35.8	52.8	55.1	37.6	100
Anxiety/depression													
1	76.5	76.6	68.2	65.0	63.7	70.9	74.4	62.2	67.2	57.9	62.5	64.7	67.7
2	17.1	15.7	22.7	22.2	19.5	19.2	21.4	22.9	21.5	24.9	25.8	23.1	21.2
3	5.7	5.5	7.9	10.0	13.3	7.9	3.9	13.4	8.9	13.6	7.1	9.9	8.9
4	0.5	1.3	0.6	2.6	2.7	1.4	0.3	1.1	1.8	2.5	3.8	1.8	1.6
5	0.3	1.0	0.6	0.3	0.9	0.6	0.0	0.5	0.5	1.1	0.8	0.6	0.6
Levels 2-5	23.5	23.4	31.8	35.1	36.3	29.1	25.6	37.8	32.8	42.1	37.5	35.3	100

Discussion

The pattern of men having a higher health status and women exhibiting faster declines in health status with age has been observed in other countries; however, in Colombia the gap between women and men was not observed to be as wide as in some other countries.[28,31]

Comparisons of results from population norm studies between countries should be made with caution. Not all population norm studies are based on representative samples; for example, this study did not include any respondents over age 64. Mean index values would also be driven by the value set that was used to generate them. It is possible to compare EQ VAS results for demographic groups. To this end, the Colombia EQ VAS values by age group can be compared with a set of values from 18 countries[29] using the same age groupings, and the Colombian EQ VAS values are relatively high compared to those values. For all of the age groups in Table 1, the Colombian index and EQ VAS values would rank consistently in the top 4 among these countries.

Table 5. Odds ratios for demographic groups reporting problems on levels 2 through 5 for each dimension of EQ-5D.

	Age group	Sex	Working/ unemployed	Income group	Education	Indigenous	Rural	Uninsured	Household size
Mobility									
OR	1.673†	1.061	0.976	0.926	0.781†	1.323	1.068	0.983	1.030
95% CI	1.496-1.871	0.807-1.394	0.624-1.528	0.777-1.104	0.663-0.920	0.923-1.896	0.676-1.686	0.718-1.345	0.877-1.210
Self-care									
OR	1.459†	0.952	0.722	0.816	0.662*	1.951*	0.826	1.760	0.946
95% CI	1.183-1.799	0.563-1.607	0.327-1.590	0.577-1.153	0.483-0.908	1.069-3.564	0.323-2.113	0.930-3.331	0.701-1.277
Usual activities									
OR	1.316†	1.217	1.097	0.885	0.924	1.330	0.964	1.232	1.093
95% CI	1.186-1.462	0.935-1.584	0.713-1.688	0.747-1.048	0.788-1.084	0.936-1.888	0.607-1.530	0.897-1.691	0.933-1.281
Pain/ discomfort									
OR	1.360†	1.814†	1.216	0.938	0.985	1.143	0.878	1.030	0.963
95% CI	1.262-1.466	1.503-2.189	0.899-1.643	0.832-1.057	0.878-1.104	0.876-1.490	0.629-1.225	0.824-1.286	0.860-1.077
Anxiety/ depression									
OR	1.136†	1.323†	0.963	0.942	0.980	1.269	0.947	0.845	0.896*
95% CI	1.057-1.221	1.100-1.590	0.726-1.277	0.839-1.058	0.875-1.096	0.981-1.640	0.686-1.307	0.683-1.046	0.804-1.000

CI indicates confidence interval; OR, odds ratio.
*$P \leq .05$.
†$P < .01$.

Compared with the Colombia EQ-5D-3L population studies[16,17] the ceiling levels in this EQ-5D-5L study were much lower. The 3L ceiling levels ranged by age group from 83.0% to 57.2% compared with 64.3% to 40.3% in this 5L study. This may reflect the increased sensitivity of the 5-level instrument. Details of levels and dimensions are given in one of the 3L studies.[16] The difference in ceiling levels between this 5L study and the 3L study is driven by the ceiling levels for the pain/discomfort and anxiety/depression dimensions. For the self-care and usual activities dimensions in Table 3, the rates of reporting level 1 are very similar (less than 2% difference) to those reported in the 3L study.[16] For mobility, women reported a higher rate of level 1 in the 5L study (85.3% vs 76.4%). However, for pain/discomfort, the 5L ceiling levels for men and women, respectively, were 74.4% and 62.4%, whereas for the respective ceilings for 3L were 95.3% and 97.2%. For anxiety depression, the ceilings were 70.9% and 64.7% for men and women, respectively, compared with 94.5% and 89.8% in the 3L study. After 11111, the most commonly reported states followed a very similar pattern to the 3L studies, with mild to moderate problems on anxiety/depression and pain/discomfort being the most commonly observed states involving health decrements. Table 1 shows that 28 states are required to account for 90% of the sample. In the 3L studies, 10 states accounted for 93% and 94% of the samples, respectively. This further highlights the increased sensitivity of the 5L instrument in this population.

The Uruguay valuation study also provided EQ-5D-5L population norms data, and it (naturally) also applied Uruguayan index values. Direct comparison is not possible, because the Uruguayan population norms are reported in 3 age groups. However, ceiling levels for the 5 dimensions are very similar (all within 1%-2%) to this study. Further, the rates of reporting each of the levels 2 to 5 on the 5 dimensions were very similar for the 2 countries. Given this similarity and given that both studies used the same value set, the overall mean index values for the 2 countries are also very similar at 0.954 and 0.953. The mean values for the 3 age groups in Uruguay are comparable to those for the 5 age groups in the Colombian study. The mean EQ VAS values by age group in Uruguay ranged from 72 to 83, which are lower than the corresponding values for Colombia.

This study provided some insight into health inequality in Colombia. Table 1 suggests that residence (urban/rural), health insurance status, and household size are not significant drivers of self-reported health using EQ-5D-5L. For ethnicity, indigenous people report lower values on all 3 measures in Table 1, but the Welch's ANOVA test returned a nonsignificant statistic for the EQ VAS value. Income and education were found to be the main drivers of differences in health in Table 1 (aside from age and sex). The GLMs in Appendix 2 show that for EQ VAS values, being in the oldest, female, lowest education, and lowest income groups have significant coefficients (see Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.vhri.2020.12.002).

Table 4 shows that among the dimensions, women report more pain/discomfort than men in all age groups. Inequality between the sexes and age groups increases between the 35-to-44 and 45-to-54 age groups, where women report much higher rates of pain/discomfort and mobility than men. This difference persists into the higher age group.

For the relationships between demographic variables and dimensions in Table 5, age group had significant odds ratios for all 5 dimensions. Sex had significant odds ratios for pain/discomfort and anxiety/depression, education had significant odds ratios for mobility and self-care, as did indigenous ethnicity for self-care and household size for anxiety/depression.

In a study of 17 countries,[29] the Kakwani indices ranged from 0.090 (Korea) to 0.157 (Hungary). Colombia's value of 0.1047 would place it in the second quartile. The demographic variables in Table 6 were chosen to allow comparison with other countries.[29] The explained share associated with demographics of 3.43% is relatively low compared with those countries (range 3.0%-27.6%). Eight percent of the explained share of inequality is accounted for by sex in Table 6. The median in the study of 17 countries was 3. Only 2 countries had a higher share associated with sex. The medians for age and education were 78% and 16%,

Table 6. Kakwani index and decomposition for the EQ VAS values.

Inequality index	Explained share	Sex	Age	Education
0.1047	3.43%	8.01%	86.49%	5.50%

Explained share	Mobility	Self-care	Usual activities	Pain/discomfort	Anxiety/depression
27.78%	7.60%	6.36%	16.04%	38.36%	32.64%

VAS indicates visual analog scale.

respectively, so in Colombia education has a relatively low effect on health inequality compared to the 17 other countries. When income was added as a variable, it only explained 4.17% of the inequality. The explained share associated with EQ-5D dimensions of 27.78% would place Colombia in the second quartile (range 14.6%-54.3%). Compared with the other countries, the proportion of explained share associated with pain/discomfort and anxiety/depression would be relatively high for Colombia, whereas the proportion associated with mobility would be relatively low.

This study had some limitations. The age limit of the sample was 64. Index values were taken from another country and may not reflect the preferences of the Colombian population.

The use of commercial telephone directories (which include mobile and fixed line numbers) as a sample frame may have affected the representativeness of the sample; however, by 2013, mobile phone penetration in Colombia was 104%.[32] Having a representative sample is not necessary for a population norms study; indeed, some population norms studies oversample some groups.[28] Marital status is known to affect health,[28] but the survey did not include this variable. This study has also raised questions for further research. Further investigation may be warranted into the lower health status of the indigenous population and the lower ceiling value for working people compared to the unemployed. Preliminary inspection of the data suggests that the pain/discomfort dimension might be the driver of this difference. The lower health status of women was found to be associated with pain/discomfort and anxiety/depression. Further investigation into this difference can shed light on the drivers of higher levels of problems on these 2 dimensions. Although this finding has been observed in some other countries, several possible causes have been identified.[33–36] Finally, an EQ-5D-5L valuation study should be undertaken for Colombia. Given the interest in the use of EQ-5D as evidenced by the number of published studies and abstracts that include EQ-5D instruments in Colombia, this should be a priority.

Conclusion

This study has produced a set of EQ-5D-5L population norms for Colombia. These can be used as baseline values as a basis for comparison of the health status of patient and/or demographic groups. Researchers in Colombia who have EQ-5D-5L data (states) can apply the Uruguayan values to the states in their data and make comparisons with the population (index value) norms for Colombia in this study until the eventual creation of an EQ-5D value set for Colombia.

Supplemental Material

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.vhri.2020.12.002.

Article and Author Information

Accepted for Publication: December 27, 2020

Published Online: March 25, 2021

doi: https://doi.org/10.1016/j.vhri.2020.12.002

Author Affiliations: Department of Economics, The University of the West Indies, St. Augustine, Trinidad and Tobago (Bailey); Arthur Lok Jack Global School of Business, The University of the West Indies, St. Augustine, Trinidad and Tobago (Bailey); Section Medical Psychology and Psychotherapy, Department of Psychiatry, Erasmus MC, Rotterdam, The Netherlands (Janssen); Center for Entrepreneurship Development, Universidad Icesi, Cali, Colombia (Varela, Moreno).

Correspondence: Henry Hugh Bailey, Department of Economics, Faculty of Social Sciences Building, Room 107, The University of the West Indies, St. Augustine Campus, Trinidad and Tobago. Email: hhbailey@gmail.com

Author Contributions: *Concept and design*: Bailey, Janssen
Acquisition of data: Varela, Moreno-Barragan
Analysis and interpretation of data: Bailey, Janssen, Varela, Moreno-Barragan
Drafting of the manuscript: Bailey, Janssen, Varela, Moreno-Barragan
Statistical analysis: Bailey, Janssen

Conflict of Interest Disclosures: The authors reported no conflicts of interest.

Funding/Support: The authors received no financial support for this research.

Acknowledgment: The authors thank the EuroQol Research Foundation for covering the open access fee for this article.

REFERENCES

1. EuroQol Group. https://euroqol.org. Accessed October 16, 2020.
2. EuroQol. https://euroqol.org/eq-5d-instruments/how-can-eq-5d-be-used/. Accessed October 16, 2020.
3. Brazier J, Ratcliffe J, Salomon J, Tsuchiya A. *Measuring and Valuing Health Benefits for Economic Evaluation*. 2nd ed. Oxford: Oxford University Press; 2017.
4. Wiering B, de Boer D, Delnoij D. Meeting patient expectations: patient expectations and recovery after hip or knee surgery. *Musculoskelet Surg*. 2018;102(3):231–240.
5. Devlin N, Parkin D, Browne J. Using the EQ-5D as a performance measurement tool in the NHS. *Health Econ*. 2010;19(8):886–905.
6. Bailey H, Kind P. Preliminary findings of an investigation into the relationship between national culture and EQ-5D value sets. *Qual Life Res*. 2010;19(8):1145–1154.
7. Brooks R. *The EuroQol Group after 25 Years*. Dordrecht: Springer; 2013.
8. Augustovski F, Irazola V, Velazquez A, Gibbons L, Craig B. Argentine valuation of the EQ-5D health states. *Value Health*. 2009;12(4):587–596.
9. Santos M, Cintra M, Monteiro A, et al. Brazilian valuation of EQ-5D-3L health states: results from a saturation study. *Med Decis Making*. 2016;36(2):253–263.
10. Augustovski F, Rey-Ares L, Irazola V, et al. An EQ-5D-5L value set based on Uruguayan populations preferences. *Qual Life Res*. 2016;25(2):323–333.
11. Zarate V, Kind P, Valenzuela P, et al. Social valuation of EQ-5D health states: the Chilean case. *Value Health*. 2011;14(8):1135–1141.
12. Bailey H, Stolk E, Kind P. Toward explicit prioritization for the Caribbean: an EQ-5D value set for Trinidad and Tobago. *Value Health Reg Issues*. 2017;11:60–67.

13. Instituto de Evaluación Technológica en Salud. *Guidelines for the economic evaluation of healthcare technologies in Colombia*. 2014.
14. Gaitán-López D, Correa-Bautista J, Vinaccia S, Ramirez-Velez R. Self-report health-related quality of life among children and adolescents from Bogotá, Colombia. The FUPRECOL study. *Colomb Med (Cali)*. 2017;48(1):12–18.
15. Gutiérrez C, Rubio A, Borda M, et al. Perception of health-related quality of life using the EURO-QOL in older adults in Bogotá, Colombia. *Eur Geriatr Med*. 2016;7(4):340–345.
16. Barceló R, España J. Estado de salud de los Colombianos: una aplicación del EQ-5D-3L. *Arch Med Universidad Manizales*. 2018;8(1):134–145.
17. Rojas-Reyes M, Gomez-Restrepo C, Rodriguez V, et al. Calidad de vida relacionada con salud en la población Colombiana: ¿cómo valoran los colombianos su estado de salud? *Rev Salud Pública (Bogotá)*. 2017;19(3).
18. Londoño J, Peláez Ballestas I, et al. Prevalence of rheumatic disease in Colombia according to the Colombian Rheumatology Association (COPCORD) strategy. Prevalence study of rheumatic disease in Colombian population older than 18 years. *Colomb J Rheumatol*. 2018;25(4):245–256.
19. Santos A, Cuervo F, Angarita I, et al. Calidad de vida evaluada por EQ-5D-3L de los enfermos reumáticos en Colombia. *Medicina*. 2018;40(1):90–91.
20. Mc Murray J, Trueman D, Hancock E, et al. Cost-effectiveness of sacubitril/valsartan in the treatment of heart failure with reduced ejection fraction. *Heart*. 2018;104:1006–1013.
21. Parise H, Espinosa R, Dea K, et al. Cost effectiveness of mirabegron compared with antimuscarinic agents for the treatment of adults with overactive bladder in Colombia. *Pharmacoeconomics*. 2020;4:79–90.
22. Higuita-Gutiérrez LF, Velasco-Castaño JJ, Jiménez Quiceno JN. Health-related quality of life in patients with chronic kidney disease in hemodialysis in Medellín (Colombia). *Patient Prefer Adherence*. 2019;13:2061–2070.
23. Keaei M, Kuhlmann J, Conde R, et al. Health-related quality of life of patients with HIV/AIDS in Bogota, Colombia. *Value Health Reg Issues*. 2016;11:68–72.
24. Van Duin MJ, Conde R, Wijnen B, et al. The impact of comorbidities on costs, utilities and health-related quality of life among HIV patients in a clinical setting in Bogotá. *Expert Rev Pharmacoecon Outcomes Res*. 2017;17(3):303–310.
25. GEM Consortium. https://www.gemconsortium.org. Accessed October 16, 2020.
26. Szende A, Oppe M, Devlin N, eds. *EQ-5D Value Sets: Inventory, Comparative Review and User Guide*. Dordrecht: Springer; 2007.
27. Ramos-Goni J, Craig B, Oppe M, et al. Handling data quality issues to estimate the Spanish EQ-5D-5Lvalue set using a hybrid interval regression approach. *Value Health*. 2018;21:596–604.
28. Szende A, Janssen B, Cabases J, eds. *Self-Reported Health: An International Perspective based on EQ-5D*. Dordrecht: Springer; 2014.
29. Willan A, Briggs A. *Statistical Analysis of Cost-Effectiveness Data*. West Sussex, England: John Wiley & Sons, Ltd; 2006.
30. Kakwani N, Wagstaff A, Doorsaler E. Socioeconomic inequalities in health: measurement, computation and statistical inference. *J Econom*. 1997;77:87–103.
31. Bailey H, Janssen M, La Foucade A, Kind P. EQ-5D-5L population norms and health inequalities for Trinidad and Tobago. *PLoS One*. 2019;14(4), e0214283.
32. World Economic Forum 2016. What is the future of telecommunications in Latin America? https://www.weforum.org/agenda/2016/06/has-telecom-privatization-in-latin-america-been-a-success/. Accessed October 16, 2020.
33. Hibbard J, Pope C. 1986 Another look at sex differences in the use of medical care: illness orientation and the types of morbidities for which services are used. *Women Health*. 1986;11(2):21–36.
34. Malmusi D, Artazcoz L, Benach J, Borrell C. Perception or real illness? How chronic conditions contribute to gender inequalities in self-rated health. *Eur J Public Health*. 2012;22(6):781–786.
35. Grant J. The epidemiology of chronic generalized musculoskeletal pain. *Best Pract Res Clin Rheumatol*. 2003;17(4):547–561.
36. Rollman G, Lautenbacher S. Sex differences in musculoskeletal pain. *Clin J Pain*. 2001;17(1):20–24.