ScienceDirect

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

Preference-Based Assessments

Comparative Assessment of Short Form 6-Dimension Health State Preferences Among Lebanese Population Pre- and Post-COVID-19 Pandemic

Samer A. Kharroubi, PhD, Donna Rowen, PhD, Rouba Ballout, MSc

ABSTRACT

Objectives: Lebanon's socio-economic situation has deteriorated significantly in recent years, a decline further exacerbated by the COVID-19 pandemic. This multifaceted crisis may have shaped how individuals perceive and value different health states. The primary objective of this study was to assess and compare health state preferences of the general Lebanese population before and after the COVID-19 pandemic using the Short Form 6-dimension (SF-6D) measure. A secondary objective was to identify key predictors of these preferences, including sociodemographic, health, and lifestyle factors.

Methods: A cross-sectional study was conducted before and after the pandemic. A total of 249 SF-6D-defined health states were valued by 577 participants from the general population using standard gamble. Independent-samples t tests and chi-square analyses examined differences in characteristics, whereas linear regression models identified predictors of SF-6D utility scores.

Results: Data from 553 eligible respondents provided 3308 valuations: 1813 from 303 respondents pre-COVID (July-October 2019) and 1495 from 250 respondents post-COVID (February-July 2022). Results showed a significant shift in health state preferences post-COVID, with higher mean utility scores (pre-COVID: 0.646 ± 0.284; post-COVID: 0.719 ± 0.258). Multiple regression analysis, adjusting for sociodemographic and health state dimensions, identified time (pre/post-COVID) (B = 0.070; $P < .001$), number of children ≤ 14 (B = −0.017; $P < .001$), educational (B = 0.006; $P = .039$), smoking (B = −0.006; $P < .001$), and health conditions such as asthma (B = 0.028; $P = .024$) and liver problems (B = 0.055; $P = .006$) as significant predictors.

Conclusions: This study highlights important shifts in health state preferences in Lebanon post-COVID. The influence of family burden and lifestyle factors on valuations has implications for public health policy, particularly when relying on prepandemic data.

Keywords: COVID-19, health-related quality of life, health state preferences, Lebanon, SF-6D.

VALUE HEALTH REG ISSUES. 2026; 53:101540

Introduction

Health state preferences represent individuals' valuations of different health conditions, typically expressed as utility values, in which 0 corresponds to a health state considered to be as equivalent to being dead, 1 signifies perfect health, and values below 0 signify the health state is regarded as being worse than being dead.[1] These preferences provide essential information for economic evaluations and health policy decisions, allowing comparisons across diseases, treatments, and populations. Over the past decades, preference-based measures have become crucial tools for evaluating the effectiveness of new treatments or public health interventions. Among the most widely used generic measures are the EuroQol 5-dimensional questionnaire (EQ-5D),[2] Health Utilities Index versions 2 and 3 (HUI2 and 3),[3,4] Assessment of Quality of Life (AQoL),[5] and the Short Form 6-dimension (SF-6D), which is derived from the original short form 36 health survey.[6]

On January 30, 2020, the World Health Organization declared the coronavirus disease 2019 (COVID-19) a public health emergency of international concern, and later, on March 11, 2020, a global pandemic.[7] As of February 2025, COVID-19 has resulted in over 777 million confirmed cases and more than 7 million deaths worldwide, significantly affecting public health and health-related quality of life (HRQoL).[8] This unprecedented global event urged researchers to study the impact of COVID-19 on HRQoL worldwide. For instance, a multicountry cross-sectional study across 13 nations found that more than one-third of respondents reported significantly worse HRQoL during the pandemic, especially in the domains of anxiety and depression, with females disproportionately affected.[9] A systematic review of 37 studies further revealed significant decreases in HRQoL among

COVID-19 survivors because of persistent health issues, psychological problems, and financial difficulties. However, improvements were observed after widespread vaccination, primarily by reducing infection rates, disease severity, and pandemic-related stress and anxiety.[10] Furthermore, studies in the Middle East and North Africa (MENA) region found that age, gender, and income were major determinants of HRQoL.[11-13] More specifically, females, older adults, and individuals with lower income exhibited lower HRQoL scores. In Lebanon, however, the available evidence remains limited. One study revealed that HRQoL was positively associated with higher income and negatively associated with household crowding index, older age, being married, and having hypertension.[14] Overall, although there is evidence around impacts on HRQoL after the pandemic, it is unknown how this may have led to people thinking about HRQoL differently, and in particular, how it may affect their preferences when valuing health states.

The SF-6D has become one of the most widely adopted measures for eliciting health state preferences, primarily in the United Kingdom.[6] It has also achieved extensive usage internationally in different countries across the globe, reaching China,[15] Japan,[16] Hong Kong,[17] Brazil,[18] Portugal,[19] Australia,[20] and more recently, Lebanon.[21,22] Its application is expected to continue expanding worldwide. The SF-6D enables standardized comparisons of health utility scores across populations and time periods, making it an effective tool for evaluating the impact of large-scale crises on HRQoL.

Lebanon—a middle-income country in the MENA region—has experienced a series of unprecedented crises in recent years. From the economic collapse of 2019, followed by the COVID-19 pandemic, to the devastating Beirut Port explosion in 2020. In response to the pandemic, the government has implemented several emergency interventions to mitigate the risk. For instance, lockdown measures were taken, in addition to vaccination campaigns around the country. It is possible that these events may have collectively shaped public perceptions of health and the relative value placed on different health states. However, to date, limited studies have examined health state preferences and its predictors in the Lebanese context, particularly through a comparative lens spanning the pre- and postpandemic periods. Therefore, this study aims to

- compare the health state preferences of the Lebanese population before and after the COVID-19 pandemic using the SF-6D instrument,
- identify key predictors of these preferences, including sociodemographic, health, and lifestyle characteristics,
- and generate evidence to support future health policy and planning in Lebanon and similar contexts during public health emergencies.

To our knowledge, this is the first study of its kind in Lebanon and the broader Arab region to use the SF-6D to conduct a comparative analysis of health state preferences based on 2 independent cross-sectional samples collected pre- and post-COVID pandemic. The results will provide valuable insights for public health policymakers and inform evidence-based decisions based on preferences collected prepandemic.

Methods

Study Design and Sampling

A cross-sectional study was conducted that enabled the assessment of changes in health state preferences among the Lebanese population before and after the COVID-19 pandemic. The pre-COVID period was defined as data collected between July and October 2019, before the nationwide protests and the pandemic outbreak. The post-COVID period was defined as data collected between February and July 2022, after the easing of lockdown measures and the return to normal activities.

A single representative sample was planned for the entire study, stratified by age, gender, socioeconomic status, and educational level. Using a 95% confidence interval, a prevalence of 50%, and a 5% margin of error, the total required sample size for both phases combined can be estimated at 577 participants.[23] Of these, 316 participants were recruited during the pre-COVID phase, and 261 participants were recruited during the post-COVID phase.

A stratified cluster random sampling design was used to identify participants. The strata were Lebanese governorates, and each stratum's clusters were selected at the district level, with each cluster consisting of 100 to 150 households. Within each cluster, households were selected using systematic random sampling based on the probability proportional to size technique from the Lebanese Central Administration of Statistics.[24,25] The primary sampling units were households, from which 1 literate adult aged 18 years or older was selected to participate. Individuals with mental or physical incapacities that could impair their ability to read and comprehend the questionnaire were excluded. The Kish technique was used to randomly pick the adult participant when there were multiple eligible subjects living in the same household. The sampling frame distribution of the study sample across the various governorates is provided in Appendix A in Supplemental Materials found at https://doi.org/10.1016/j.vhri.2025.101540.

Notably, this study used the same nationally representative sample that was previously used to develop the Lebanese SF-6D value set, in which a sample of 249 health states defined by the SF-6D were valued by a representative sample of 577 members of the Lebanon general population, using the standard gamble (SG) technique.[22]

Survey and Data Collection

Data collection was conducted in 2 phases. Phase 1 (pre-COVID) began in July 2019 and was initially scheduled to continue until March 2020. However, it was paused in October 2019 after responses were collected from 316 participants because of widespread protests, road closures, escalating political instability, and subsequently, the COVID-19 pandemic and associated lockdown measures. This period (July-October 2019) was therefore defined as the pre-COVID phase, representing the last stable period before the onset of both the national crises and the COVID-19 pandemic. Phase 2 (post-COVID) resumed between February and July 2022, after the easing of lockdown measures and the return to normal activities and completed the remaining sample size, reaching the target of 577 respondents. Accordingly, phase 2 represents the post-COVID phase (February-July 2022).[22]

Health state preferences were elicited using the SF-6D instrument, a preference-based measure derived from 11 items of the SF-36 health survey. The SF-6D defines health across 6 dimensions: physical functioning (6 severity levels), role limitation (4 levels), social functioning (5 levels), pain (6 levels), mental health (5 levels), and vitality (5 levels). These levels produce 18 000 distinct health states, ranging from "111111" (best state across all dimensions) to "645655" (worst possible state, or "pits"). Negative utility values represent health states considered worse than death.[8] The SF-6D questionnaire was translated into Arabic using forward and backward translation methods and was

Table 1. Sociodemographic and clinical characteristics of participants valuations pre-post COVID.

Variables	Total (%) N = 3308	Pre-COVID (%) n = 1813	Post-COVID (%) n = 1495	X^2*	*P* value
Governorate					
Mount Lebanon	1328 (40.1)	246 (18.5)	1082 (81.5)	175.087	<.001
North	652 (19.7)	652 (100)	0		
South	556 (16.8)	556 (100)	0		
Bekaa	419 (12.7)	233 (55.6)	186 (44.4)		
Beirut	353 (10.7)	126 (35.7)	227 (64.3)		
Gender					
Male	1633 (49.4)	868 (53.2)	765 (46.8)	3.557	.059
Female	1675 (50.6)	945 (56.4)	730 (43.6)		
Age (Continuous)					
Mean ± SD		46.75 ± 16.60	51.75 ± 18.08	71.565	<.001†
Age (Categorical)					
18-29	582 (17.6)	378 (64.9)	204 (35.1)		<.001
30-39	593 (17.9)	306 (51.6)	287 (48.4)		
40-49	442 (13.4)	275 (62.2)	167 (37.8)		
50-59	651 (19.7)	376 (57.8)	275 (42.2)		
60+	1040 (31.4)	478 (46)	562 (54)		
Utility					
Mean ± SD		0.646 ± 0.284	0.719 ± 0.258		<.001†
Nationality					
Lebanese	3302 (99.8)	1807 (54.7)	1495 (45.3)	-	.035‡
Non-Lebanese	6 (0.2)	6 (100)	0		
Marital status					
Single	818 (24.7)	503 (61.5)	315 (38.5)	46.489	<.001
Married	2118 (64)	1148 (54.2)	970 (45.8)		
Widowed	234 (7.1)	90 (38.5)	144 (61.5)		
Divorced	132 (4)	66 (50)	66 (50)		
Separated	6 (0.2)	6 (100)	0		
Number of children between 15 and 18					
Mean ± SD		0.34 ± 2.21	0.17 ± 0.45		.003†
Number of children ≤14					
Mean ± SD		0.56 ± 1.02	0.40 ± 0.86		<.001†
Job classification					
Corporate managers	162 (4.9)	96 (59.3)	66 (40.7)	296.863	<.001
Science/engineering/tech prof	419 (12.8)	186 (44.4)	233 (55.6)		
Administrators	467 (14.2)	222 (47.5)	245 (52.5)		
Skilled agricultural and related	113 (3.4)	83 (73.5)	30 (26.5)		
trades workers	443 (13.5)	162 (36.6)	281 (63.4)		
Homemakers	180 (5.5)	96 (53.3)	84 (46.7)		
Students	220 (6.7)	71 (32.3)	149 (67.7)		
Retired person	288 (8.8)	228 (79.2)	60 (20.8)		
Unemployed	441 (13.4)	244 (55.3)	197 (44.7)		
Salespersons	54 (1.6)	48 (88.9)	6 (11.1)		
Craftsman	497 (15.1)	353 (71)	144 (29)		
Other					
Highest degree					
No schooling	83 (2.5)	77 (92.8)	6 (7.2)	101.322	<.001
Elementary	383 (11.7)	221 (57.7)	162 (42.3)		
Intermediate	502 (15.3)	306 (61)	196 (39)		
Secondary	615 (18.8)	363 (59)	252 (41)		
Vocational	210 (6.4)	120 (57.1)	90 (42.9)		
Degree or above	1479 (45.2)	690 (46.7)	789 (53.3)		
Number of people in the household					
Mean ± SD		4.41 ± 1.78	3.64 ± 1.46		<.001†
Number of rooms					
Mean ± SD		4.72 ± 1.75	4.76 ± 1.85		.524†
Type of housing					
Rental	508 (15.4)	256 (50.4)	252 (49.6)	28.022	<.001
Private	2411 (73)	1347 (55.9)	1064 (44.1)		
Living with parents	359 (10.9)	180 (50.1)	179 (49.9)		
Living with roommates	6 (0.2)	6 (100)	0		
Other	18 (0.5)	18 (100)	0		

continued on next page

Table 1. Continued

Variables	Total (%) N = 3308	Pre-COVID (%) n = 1813	Post-COVID (%) n = 1495	X^2*	*P* value
Monthly average income					
<660 000 LL	252 (7.8)	192 (76.2)	60 (23.8)	571.237	<.001
600 000-1 499 000 LL	466 (14.5)	376 (80.7)	90 (19.3)		
1 500 000-2 399 000 LL	592 (18.4)	472 (79.7)	120 (20.3)		
2 400 000-3 299 000 LL	467 (14.5)	192 (41.1)	275 (58.9)		
>3 300 000 LL	1435 (44.7)	509 (35.5)	926 (64.5)		
Medical benefit					
Yes	2446 (74.5)	1233 (50.4)	1213 (49.6)	63.945	<.001
No	838 (25.5)	556 (66.3)	282 (33.7)		
Smoking habit					
At least 1 cigarette per day	1165 (35.4)	675 (57.9)	490 (42.1)	362.951	<.001
Occasionally	739 (22.5)	205 (27.7)	534 (72.3)		
Already quitted	154 (4.7)	53 (34.4)	101 (65.6)		
Never smoked	1232 (37.4)	862 (70)	370 (30)		
Hypertension					
No	2356 (71.4)	1393 (59.1)	963 (40.9)	77.87	<.001
In the past	42 (1.3)	30 (71.4)	12 (28.6)		
In the present	904 (27.4)	384 (42.5)	520 (57.5)		
Diabetes Mellitus					
No	2795 (84.6)	1640 (58.7)	1155 (41.3)	123.303	<.001
In the past	18 (0.5)	12 (66.7)	6 (33.3)		
In the present	489 (14.8)	155 (31.7)	334 (68.3)		
Heart Disease					
No	2866 (86.8)	1609 (56.1)	1257 (43.9)	24.982	<.001
In the past	78 (2.4)	36 (46.2)	42 (53.8)		
In the present	352 (10.7)	156 (44.3)	196 (55.7)		
Not sure/unknown	6 (0.2)	6 (100)	0		
Stroke					
No	3290 (99.6)	1795 (54.6)	1495 (45.4)	10.037	.002‡
In the past	6 (0.2)	6 (100)	0		
In the present	6 (0.2)	6 (100)	0		
Neoplasm					
No	3290 (99.6)	1795 (54.6)	1495 (45.4)	9.964	.002
In the present	12 (0.4)	12 (100)	0		
Malignant neoplasm					
No	3266 (98.9)	1807 (55.3)	1459 (44.7)	43.993	<.001
In the past	18 (0.5)	0	18 (100)		
In the present	18 (0.5)	0	18 (100)		
Asthma					
No	3218 (97.5)	1783 (55.4)	1435 (44.6)	23.794	<.001
In the present	84 (2.5)	24 (28.6)	60 (71.4)		
Lung Disease					
No	3242 (98.2)	1765 (54.4)	1477 (45.6)	8.196	.013‡
In the past	6 (0.2)	6 (100)	0		
In the present	54 (1.6)	36 (66.7)	18 (33.3)		
Rheumatism joint					
No	2978 (90.2)	1597 (53.6)	1381 (46.4)	18.013	<.001‡
In the past	48 (1.5)	30 (62.5)	18 (37.5)		
In the present	270 (8.2)	174 (64.4)	96 (35.6)		
Not sure/unknown	6 (0.2)	6 (100)	0		
Mental disease					
No	3284 (99.6)	1795 (54.7)	1489 (45.3)	9.924	.002
In the present	12 (0.4)	12 (100)	0		
Kidney problems					
No	3255 (98.6)	1778 (54.6)	1477 (45.4)	9.438	.009
In the past	11 (0.3)	11 (100)	0		
In the present	36 (1.1)	18 (50)	18 (50)		

continued on next page

Table 1. Continued

Variables	Total (%) N = 3308	Pre-COVID (%) n = 1813	Post-COVID (%) n = 1495	X^2*	*P* value
Digestive system problems					
No	2990 (90.6)	1621 (54.2)	1369 (45.8)	15.096	.002
In the past	42 (1.3)	30 (71.4)	12 (28.6)		
In the present	258 (7.8)	144 (55.8)	114 (44.2)		
Not sure/unknown	12 (0.4)	12 (100)	0		
Liver problems					
No	3260 (98.7)	1777 (54.5)	1483 (45.5)	5.079	.079
In the past	18 (0.5)	12 (66.7)	6 (33.3)		
In the present	24 (0.7)	18 (75)	6 (25)		
Allergy nose					
No	3032 (91.8)	1621 (53.5)	1411 (46.5)	29.326	<.001
In the past	24 (0.7)	18 (75)	6 (25)		
In the present	234 (7.1)	156 (66.7)	78 (33.3)		
Not sure/unknown	12 (0.4)	12 (100)	0		
Allergy skin					
No	3093 (93.7)	1705 (55.1)	1388 (44.9)	11.841	.003
In the past	42 (1.3)	12 (28.6)	30 (71.4)		
In the present	167 (5.1)	90 (53.9)	77 (46.1)		
Other health conditions					
No	3099 (93.9)	1659 (53.5)	1441 (46.5)	40.498	<.001
In the past	30 (0.9)	30 (100)	0		
In the present	173 (5.2)	119 (68.8)	54 (31.2)		
Doctor visits					
Yes	1448 (43.8)	712 (49.2)	736 (50.8)	33.017	<.001
No	1860 (56.2)	1101 (59.2)	759 (40.8)		
Long-term meds					
Yes	1449 (43.8)	719 (49.6)	730 (50.4)	27.998	<.001
No	1859 (56.2)	1094 (58.8)	765 (41.2)		
Number of hospital admissions					
Mean ± SD		0.23 ± 0.58	0.22 ± 0.51		.563†

LL indicates Lebanese Lira.
*chi square test.
†*t*-test.
‡Fisher's exact test.

validated by Kharroubi et al.[26] Participants each ranked and then valued 6 hypothetical SF-6D health states using the McMaster "ping pong" variant of the SG, with 249 health states valued in total across the interviews.[27] The survey also included sociodemographic information (eg, gender, age, place of residence, education level and marital status) and health-related data (eg, existing conditions, doctor visits, and smoking habits). Graduate students from health-related majors were trained on how to appropriately administer the questionnaire to ensure reliability and avoid bias. The training content included standardized data collection procedures, ethical protocols, informed consent, and the administration of the valuation tasks. Participants had the option to complete the survey in English or Arabic, and informed consent was obtained from all respondents. Ethical approval for the study was obtained from the Institutional Review Board at the corresponding author's institution (Protocol code SBS-2018-0311 and date of approval March 13, 2019).

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 29.0 (SPSS Inc, Chicago, IL, USA). Descriptive statistics were used to summarize the data, with counts and percentages for categorical variables and means and standard deviations for continuous variables. Independent-samples *t* tests and chi-square tests were used to examine differences in sociodemographic and health characteristics between the pre- and post-COVID participants. Additionally, simple and multiple linear regression analyses were applied to identify significant predictors of the health state preferences (ie, elicited SF-6D utility scores) with independent variables, including the period (pre/post-COVID), sociodemographic factors, health-related characteristics, and health state dimensions. Variables found significant in the simple regressions were included in the multiple regression model. A *P* value of less than.05 was considered statistically significant for all analyses.

Results

Sociodemographic and Clinical Characteristics of Participants

A total of 577 participants were initially recruited. Of these, 24 were excluded: 14 because of failure to value the worst health state, and 10 for assigning identical values to all 5 intermediate states.[22] The final analytic sample included 553 respondents (95% response rate), with 10 missing values, yielding 3308 ($553 \times 6 - 10$) observed SG valuations across 249 health states. Among these, 1813 valuations were collected from 303 respondents pre-COVID, and 1495 valuations from 250 respondents post-COVID.

As shown in Table 1 the mean age of participants increased significantly from 46.75 ± 16.60 pre-COVID to 51.75 ± 18.08 post-COVID ($P < .001$). The study sample was older compared with the general population because the sampling approach involved age stratification.[24] The sample was predominantly Lebanese (99.8%), with only 6 non-Lebanese participants (all recruited in the pre-COVID phase; $P = .035$). More than half of the participants were married (64%; $P < .001$), and the average number of children remained under 1 in both phases, although significantly fewer children were reported post-COVID ($P = .003$ for children aged 15-18 and $P < .001$ for children aged ≤14). The most common occupations among the study sample were administrators (14.2%), homemakers (13.5%), salespersons (13.4%), and science professionals (12.8%), with a significantly higher percentage of unemployed participants in the pre-COVID phase ($P < .001$). Educational attainment varied: 2.5%, 11.7%, 15.3%, and 18.8% of the participants had no formal education, primary, intermediate, and secondary education, respectively, whereas the rest had vocational education or university degree. Higher educational levels were more prevalent post-COVID ($P < .001$). Household composition also differed: the average number of people living in the household was significantly lower in the post-COVID phase (3.64 ± 1.46 vs 4.41 ± 1.78; $P < .001$), although the mean number of rooms was the same. The majority of the participants lived in private housing (73%), and 44.7% had a monthly income exceeding 3 300 000 Lebanese Lira (~1875 euro). Lower income levels were significantly more prevalent in the pre-COVID phase ($P < .001$).

In terms of health status, participants gave significantly lower mean utility scores pre-COVID (0.646 ± 0.284) compared with post-COVID (0.719 ± 0.258) ($P < .001$). Recall, utility scores reflect health state preferences, in which 1 denotes perfect health, 0 represents state considered equivalent to being dead, and negative values indicate states perceived as worse than death. Most participants had medical benefits (74.5%); the ones who did not were mostly from the pre-COVID phase ($P < .001$). Almost one-third of the respondents smoke at least 1 cigarette per day (35.4%), with significantly higher smoking rates in the pre-COVID phase, and a higher percentage quit smoking post-COVID ($P < .001$). Regarding medical conditions, hypertension, diabetes, heart disease, rheumatism joint, digestive system problems, and nasal allergies were the most reported among the participants. Differences in doctor visit frequency and long-term medication use were also statistically significant between phases ($P < .001$).

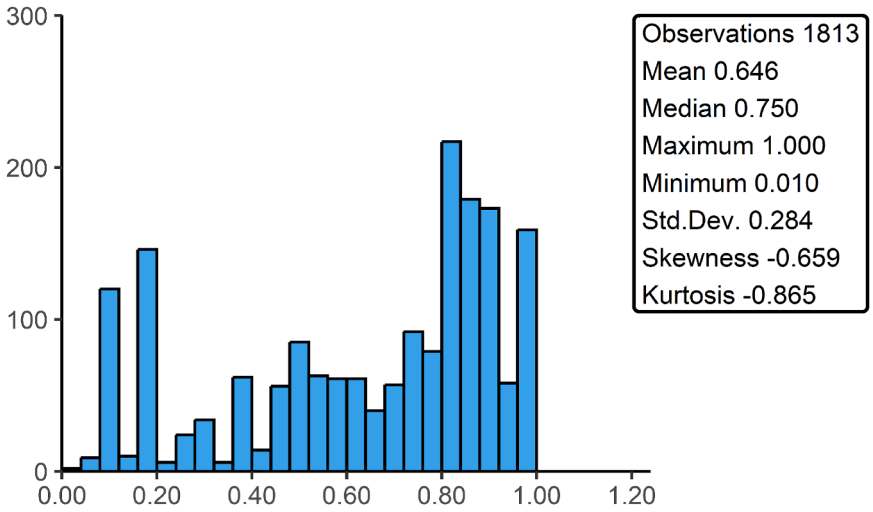
Summary of Variables Significantly Associated With the Utility Index of Participants

Table 2 summarizes the significant factors ($P < .05$) associated with the health state preferences of participants in the pre- and post-COVID phases based on bivariate analyses (t test for binary categorical variables, ANOVA for multicategory variables, and Pearson's correlation for continuous variables). In the pre-COVID phase, significant factors included sociodemographic factors such as governorate, district, place of residence, gender, nationality, marital status, and job classification, as well as medical conditions such as hypertension, heart disease, stroke, rheumatism joint, and mental disease, in addition to all the health state dimensions. In the post-COVID phase, significant factors included sociodemographic characteristics such as district, place of residence, gender, marital status, number of children, job classification, educational level, type of housing, monthly income, and

Table 2. Summary of significant variables after bivariate analysis.

Variables	Utility index	Post-COVID
	Pre-COVID	
Governorate	X	
District	X	X
Place of residence	X	X
Gender	X	X
Age		
Nationality	X	-
Marital status	X	X
Number of children between 15 and 18		X
Number of children ≤14		X
Job classification	X	X
Highest degree		X
Number of people in the household		
Number of rooms		
Type of housing		X
Monthly average income		X
Medical benefits		X
Smoking habits		X
Hypertension	X	
Diabetes mellitus		
Heart disease	X	
Stroke	X	-
Neoplasm		-
Malignant neoplasm	-	
Asthma		
Lung disease		
Rheumatism joint	X	
Mental disease	X	-
Kidney problems		
Digestive system problems		
Liver problems		X
Allergy nose		
Allergy skin		X
Other health conditions		
Doctor visits		
Long term meds		
Hospital admissions		
SF-6D health state dimensions		
Physical functioning	X	X
Role limitation	X	X
Social functioning	X	X
Pain	X	X
Mental health	X	X
Vitality	X	X

Figure 1. Histogram and descriptive statistics for the adjusted health-state valuations pre-COVID.



medical benefits; lifestyle factors, such as smoking habits; medical conditions, such as liver problems and nasal allergies; and health state dimensions.

Comparison Between Utility Scores Pre- and Post-COVID

Figure 1 displays the distribution of health state preferences pre-COVID, with a mean utility score of 0.646 ± 0.284. The distribution was negatively skewed, indicating a concentration of moderate-to-high scores but also a subset of participants giving very low utility scores to health states. The negative kurtosis (−0.864) reflects a relatively flattened distribution, suggesting more variability at the extremes.

Figure 2 shows post-COVID utility scores, which were significantly higher (mean = 0.719 ± 0.258), suggesting higher health state preferences. The distribution was more negatively skewed, with a greater concentration of high utility scores, and the kurtosis (−0.144) indicated a closer to normal distribution with less extreme variability.

Simple and Multiple Linear Regression

Table 3 shows the results of the simple and multiple linear regression to identify predictors of health state preferences. Results revealed that participants in the post-COVID phase gave significantly higher utility scores compared with those in the pre-COVID phase, with a mean increase of 0.073 in the utility scores (B = 0.070; $P < .001$; 95% CI 0.053-0.086; $R^2 = 0.407$) while controlling for relevant variables, including number of children ≤ 14, educational level, number of people in the household, monthly average income, smoking habit, medical conditions, such as asthma and liver problems, and health state dimensions. The analysis also revealed other significant associations, notably with the number of children aged 14 years or younger, educational level, smoking habits, medical conditions, such as asthma and liver problems, and health state dimensions. Specifically, each additional child aged 14 years or younger was associated with a 0.017 decrease in the utility index (B = −0.017; $P < .001$; 95% CI −0.028 to −0.007). Smoking habits also showed

Figure 2. Histogram and descriptive statistics for the adjusted health-state valuations post-COVID.

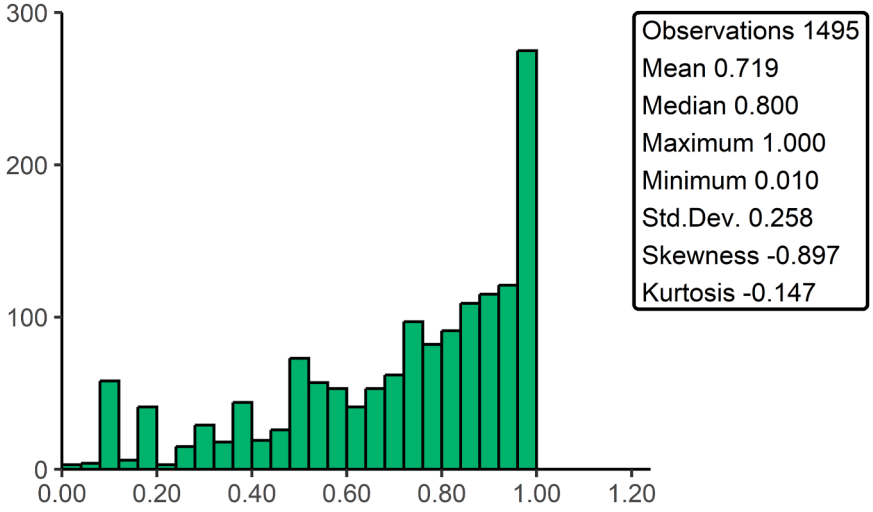


Table 3. Predictors of the health state utility index.

Variables	Simple linear regression			Multiple linear regression		
	B	*P* value	95% CI	B	*P* value	95% CI
Time (Pre/Post)	0.073	<.001	0.054-0.091	0.070	<.001	0.053-0.086
Governorate	−0.007	.053	−0.013 to 0	-		
Gender	0.004	.664	−0.015 to 0.023	-		
Age	0.000	.244	−0.001 to 0.001	-		
Marital status	0.005	.426	−0.008 to 0.019	-		
Number of children between 15 and 18	0.004	.149	−0.001 to 0.01	-		
Number of children ≤14	−0.02	<.001	−0.03 to −0.1	−0.017	<.001	−0.025 to −0.009
Job classification	−0.003	.107	−0.006 to 0.001	-		
Highest degree	0.007	.024	0.001-0.013	0.006	.039	0.000-0.011
Number of people in the household	−0.009	.002	−0.015 to −0.003	−0.004	.077	−0.009 to 0.000
Number of rooms	0.001	.733	−0.004; 0.006	-		
Monthly average income	0.016	<.001	0.009-0.023	0.001	.856	−0.006 to 0.007
Medical benefit	−0.019	.084	−0.041 to 0.003	-		
Smoking habit	0.022	<.001	0.012-0.032	−0.006	<.001	−0.009 to −0.003
Hypertension	0.003	.632	−0.008 to 0.013	-		
Diabetes Mellitus	0.011	.092	−0.002 to 0.024	-		
Asthma	0.039	.01	0.009-0.069	0.028	.024	0.004-0.052
Liver problems	0.058	.026	0.007-0.108	0.055	.006	0.016-0.094
Allergy skin	0.015	.145	−0.005 to 0.036	-		
Doctor visits	−0.012	.227	−0.031 to 0.007	-		
Long term meds	0.007	.493	−0.012 to 0.025	-		
Number of hospital admissions	0.008	.348	−0.009 to 0.025	-		
SF-6D health state dimensions						
Physical functioning	−0.076	<.001	−0.081 to −0.072	−0.039	<.001	−0.045 to −0.034
Role limitation	−0.088	<.001	−0.096 to −0.081	−0.021	<.001	−0.029 to −0.014
Social functioning	−0.076	<.001	−0.082 to −0.070	−0.022	<.001	−0.028 to −0.016
Pain	−0.062	<.001	−0.067 to −0.058	−0.023	<.001	−0.028 to −0.019
Mental health	−0.081	<.001	−0.087 to −0.076	−0.025	<.001	−0.032 to −0.019
Vitality	−0.074	<.001	−0.080 to −0.068	−0.015	<.001	−0.022 to −0.009

SF-6D indicates Short Form 6-dimension.

significant negative associations with utility scores. Higher educational level was positively associated with health state preferences, corresponding to a 0.006 increase in the utility index (B = 0.006; *P* = .039; 95% CI 0.000 to 0.011). Medical conditions, such as asthma and liver problems also showed significant positive associations with utility scores (ie, giving higher values to health states). Regarding the SF-6D health state dimensions, all coefficients displayed the expected negative sign, indicating that poorer health within each dimension corresponded to lower utility valuations. Finally, although we explored age stratification during the analysis, no statistically significant associations were identified when age was categorized. Therefore, age was retained as a continuous variable in the final model.

Discussion

This study conducted a comparative analysis of health state preferences among the Lebanese population before and after COVID-19 pandemic, identifying important predictors. The results revealed a significant increase in population-level health state valuations during the postpandemic phase, as demonstrated by an increase in the mean utility across all health state valuations elicited pre- and post-COVID from 0.646 to 0.719. Time (pre/post-COVID), number of children below 14 years of age, smoking, educational level, health conditions, and health state dimensions emerged as significant predictors of these preferences. These results contribute to the growing body of research on the long-term impacts of COVID-19, especially in the MENA region where data remain limited.

In Lebanon, most studies investigating the impact of COVID-19 on population health have primarily focused on specific population groups during or after the pandemic, often relying on self-reported measures of well-being. Overall, these studies have shown that the pandemic negatively affected the population's quality of life.[14,28] However, to our knowledge, no research in Lebanon has compared population health state preferences before and after the COVID-19 pandemic using independent cross-sectional samples. Our study observed a postpandemic increase in health state valuations that may be attributed to several

factors. Lebanese society is widely recognized for its resilience in the face of crises,[29] and it is plausible that individuals gradually adapted to postpandemic life, resulting in improved perceptions of valued health states. Furthermore, the increase in employment rates, the shift toward remote or flexible work arrangements, and the easing of restrictions may have contributed to a sense of financial and social stability, particularly among middle-income groups.[30,31] Our findings also indicate higher unemployment rates during the prepandemic period, which may also help explain the increase. In addition, after the pandemic, healthcare systems began concentrating on non-COVID-19 health problems, potentially improving access to care and influencing population preferences for HRQoL.

When looking into the sociodemographic factors, the number of children aged 14 years or below was found to be negatively associated with health state valuations (ie, give lower values to health states). Although we do not know how this affects health state preferences in other studies, previous research suggests that increased financial and caregiving responsibilities are linked to lower HRQoL.[32] Parents with multiple children may face greater economic pressure and experience elevated stress, particularly when managing the needs of young or adolescent children—both factors known to influence mental health[33-35] and this may affect how health states are regarded. Consistent with prior research linking higher educational attainment to better self-reported health,[36,37] our findings revealed a positive association between education and health state preferences (ie, give higher values to health states). Gender is also a significant factor affecting HRQoL,[12,38] but our study did not reveal a statistically significant association with gender and health state preferences. Studies reported that age is a significant predictor of HRQoL, with older people experiencing lower valuations to health states.[10,14,39] Our study did not detect this association between age and health state preferences. Similarly, our results showed no significant variation in health state valuations relative to marital status.

With regard to lifestyle factors, a positive association between smoking and higher health state valuations was observed. In Lebanon, smoking, such as waterpipe use, is a popular social activity. Some individuals may associate it with short-term stress relief or life satisfaction, despite its well-established long-term health risks.[40-42] Interestingly, our study found a higher rate of smoking cessation in the post-COVID period, suggesting that the pandemic may have raised awareness of smoking-related health risks.[43] Longitudinal designs should be used in future research to better examine this relationship.

Several limitations should be considered when interpreting our findings. First, the sample was split between pre- and post-COVID participants because of prevailing conditions in the country, including widespread protests, road closures, political instability, and the onset of the pandemic. Future research would benefit from longitudinal designs tracking the same individuals over time to enable more robust comparisons. Second, the cross-sectional design of this study allows for the identification of associations but does not permit the establishment of causal relationships. Third, the absence of psychological variables limits the comprehensiveness of our analysis. Finally, the data relied on self-reported responses, which may be influenced by reporting errors or social desirability bias.

Conclusions

This study offers new perspectives into patterns of health state preferences in Lebanon before and after COVID-19, demonstrating a general increase in population health state valuations of SF-6D health states after the pandemic. Our study's findings have significant policy implications, especially for economic recovery initiatives and public health planning that may rely on pre-COVID preferences. For instance, developing interventions specifically designed for high-risk groups are needed. Moreover, helping working parents by developing policies that promote parental leave, childcare, and work-life balance, can help reduce stress. Future research should perform longitudinal analyses to evaluate long-term changes in HRQoL in Lebanon and across the broader MENA region.

Author Disclosures

Author disclosure forms can be accessed below in the Supplemental Material section.

Supplemental Material

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.vhri.2025.101540.

Article and Author Information

Accepted for Publication: October 12, 2025

Published Online: xxxx

doi: https://doi.org/10.1016/j.vhri.2025.101540

Author Affiliations: Department of Nutrition and Food Sciences, Faculty of Agricultural and Food Sciences, American University of Beirut, Beirut, Lebanon (Kharroubi, Ballout); Sheffield Centre for Health and Related Research (SCHARR), The University of Sheffield, Sheffield, England, UK (Kharroubi, Rowen).

Correspondence: Samer A. Kharroubi, PhD, Department of Nutrition and Food Sciences, Faculty of Agricultural and Food Sciences, American University of Beirut, P.O.BOX: 11-0236, Riad El Solh 1107-2020, Beirut, Lebanon. Email: sk157@aub.edu.lb

Authorship Confirmation: All authors certify that they meet the ICMJE criteria for authorship.

Funding/Support: This study was funded by the University Research Board and the Board Designated Professorship at the American University of Beirut, Lebanon.

Role of the Funder/Sponsor: The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Acknowledgment: The leading author thanks the University Research Board and the Board Designated Professorship at the American University of Beirut for funding this study.

REFERENCES

1. Brazier JE, Ratcliffe J, Tsuchiya A, Solomon J. *Measuring and Valuing Health for Economic Evaluation*. Oxford, United Kingdom: Oxford University Press; 2007.
2. Brooks R. EuroQol: the current state of play. *Health Policy*. 1996;37(1):53.
3. Torrance GW, Feeny DH, Furlong WJ, Barr RD, Zhang Y, Wang QA. Multi--attribute utility function for a comprehensive health status classification system: health Utilities Index Mark 2. *Med Care*. 1996;34(7):702–722.
4. Feeny DH, Furlong WJ, Torrance GW, et al. Multi-attribute and single-attribute utility function for the Health Utility Index Mark 3 system. *Med Care*. 2002;40(20):113.
5. Hawthorne G, Richardson J, Day NA. A comparison of the Assessment of Quality of Life (AQoL) with four other generic utility instruments. *Ann Med*. 2001;33(5):358–370.

6. Brazier JE, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ*. 2002;21(2):271.
7. Archived: WHO timeline - COVID-19. World Health Organization. https://www.who.int/news/item/27-04-2020-who-timeline—covid-19. Accessed March 21, 2025.
8. COVID-19 deaths. WHO COVID-19 dashboard. World Health Organization. https://data.who.int/dashboards/covid19/deaths. Accessed March 21, 2025.
9. Violato M, Pollard J, Lloyd A, et al. The COVID-19 pandemic and health-related quality of life across 13 high- and low-middle-income countries: a cross-sectional analysis. *PLoS Med*. 2023;20(4):e1004146.
10. Xu F, Brodszky V. The impact of COVID-19 on health-related quality of life: a systematic review and evidence-based recommendations. *Discov Psychol*. 2024;4(1):90.
11. Alnasser AHA, Al-Tawfiq JA, Kalif MSH, et al. Impact of COVID-19 severity on health-related quality of life among Saudi adult patients. *Infez Med*. 2022;30(2):223.
12. Mohsen S, El-Masry R, Ali OF, Abdel-Hady D. Quality of life during COVID-19 pandemic: a community-based study in Dakahlia Governorate, Egypt. *Glob Health Res Policy*. 2022;7(1):15.
13. Alinia C, Yaghmaei S, Abdullah FZ, et al. The health-related quality of life in Iranian patients with COVID-19. *BMC Infect Dis*. 2021;21(1):459.
14. Haddad C, Malhab SB, Sacre H, et al. The effects of COVID-19 on the quality of life among a sample of the general Lebanese population. Research Square. https://europepmc.org/api/fulltextRepo?pprId=PPR424599&type=FILE&fileName=EMS140107-pdf.pdf&mimeType=application/pdf. Accessed March 25, 2025.
15. Lam CL, Brazier J, McGhee SM. Valuation of the SF26D health states is feasible, acceptable, reliable, and valid in a Chinese population. *Value Health*. 2008;11(2):295–303.
16. Brazier JE, Fukuhara S, Roberts J, et al. Estimating a preference-based index from the Japanese SF-36. *J Clin Epidemiol*. 2009;62(12):1323–1331.
17. McGhee SM, Brazier J, Lam CL, et al. Quality-adjusted life years: population specific measurement of the quality component. *HK Med J*. 2011;17(suppl 6):S17–S21.
18. Cruz LC, Camey SA, Hoffman JF, et al. Estimating the SF-6Dv1 value set for a Southern Brazilian Population. *Value Health*. 2011;14(5):S108–S114.
19. Ferreira LN, Ferreira PL, Pereira LN, Brazier J, Rowen D. A Portuguese value set for the SF-6Dv1. *Value Health*. 2010;13(5):624–630.
20. Norman R, Viney R, Brazier J, et al. Valuing SF-6Dv1 health states using a discrete choice experiment. *Med Decis Mak*. 2013;34(6):773–786.
21. Dawoud D, El-Dahiyat F, Abojedi A, et al. Translation, cultural adaptation and psychometric validation of the SF-6D measure of health-related quality of life for use in Arabic-Speaking countries. *Res Soc Admin Pharm*. 2020;16(12):1754–1759.
22. Kharroubi SA, Mukuria C, Dawoud D, Rowen D. Estimating the SF-6DV1 value set for a population-based sample in Lebanon. *Value Health Reg Issues*. 2024;42:100977.
23. Sample size calculator. World Health Organization. https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/steps/sample-size-calculator.xls?sfvrsn=ee1f4ae8_2. Accessed March 25, 2025.
24. Living conditions of households: the national survey of household living conditions. Central Administration for Statistics. http://www.cas.gov.lb/index.php/all-publications-en#households-living-conditions-survey-2004. Accessed October 6, 2022.
25. Lebanese Republic Ministry of Social Affairs/Central Administration for Statistics/UNDP, 106-107 http://www.cas.gov.lb/index.php/demographic-and-social-en; published 2006. Accessed October 6, 2022.
26. Kharroubi SA, Beyh Y, Harake MDE, Dawoud D, Rowen D, Brazier J. Examining the feasibility and acceptability of valuing the Arabic version of SF-6D in a Lebanese population. *Int J Environ Res Public Health*. 2020;17(3):1037.
27. Furlong W, Feeny D, Torrance GW, Barr R, Horsman J. *Guide to Design and Development of Health State Utility Instrumentation. Centre for Health. Economics and Policy Analysis Paper Series-Vol. 09*. Hamilton, Canada: McMaster University; 1992:1990. https://ideas.repec.org/p/hpa/wpaper/199009.html. Accessed November 5, 2025.
28. Awada S, Ahmad L, Assi RB, Rafei Z, Omar CA, Hatem G. Health-related quality of life of medical students during the COVID-19 pandemic: a cross-sectional study in Lebanon. *Power Educ*. 2023;16(1):1–13.
29. Trovato MG, El Ariss B. Ongoing crises in Beirut: resistance and resilience as everyday life. *City*. Published April 4, 2025. https://doi.org/10.1080/13604813.2025.2477328.
30. Malousis AT, Zefkilis PN, Daglis T. Employment in the 21st century: pre- and post-COVID-19 changes. *Encyclopedia*. 2023;3(3):853–869.
31. Joyce R, Postel-Vinay F, Spittal P, Xu X. Job Opportunities After the Pandemic. Institute for Fiscal Studies. https://ifs.org.uk/sites/default/files/output_url_files/BN342-Job-opportunities-after-the-pandemic%252520%2525282%252529.pdf; 2022. Accessed November 5, 2025.
32. Xu RH, Wong EL, Su Y, Zhang H, Zhang W, Dong D. Quantifying the effect of financial burden on health-related quality of life among patients with non-Hodgkin's lymphomas. *Cancers*. 2020;12(11):3325.
33. Wippold GM, Tucker CM, Roncoroni J, Henry MA. Impact of stress and loneliness on health-related quality of life among low income senior African Americans. *J Racial Ethn Health Disparities*. 2021;8(4):1089–1097.
34. Parsaei R, Roohafza H, Feizi A, Sadeghi M, Sarrafzadegan N. How different stressors affect quality of life: an application of multilevel latent class analysis on a large sample of industrial employees. *Risk Manag Healthc Policy*. 2020;13:1261–1270.
35. Rohde G, Helseth S, Skarstein S, Småstuen M, Mikkelsen HET, Haraldstad K. Health-related quality of life in parents of adolescents one year into the COVID-19 pandemic: a two-year longitudinal study. *Health Qual Life Outcomes*. 2022;20(1):158.
36. Raghupathi V, Raghupathi W. The influence of education on health: an empirical assessment of OECD countries for the period 1995-2015. *Arch Public Health*. 2020;78:20.
37. Ross CE, Wu CL. The links between education and health. *Am Soc Rev*. 1995;60(5):719–745.
38. Nasim A, Haq NU, Riaz S, et al. Factors and predictors of health-related quality of life of the general population of Pakistan. *Front Public Health*. 2022;10:819088.
39. Arab-Zozani M, Hashemi F, Safari H, Yousefi M, Ameri H. Health-related quality of life and its associated factors in COVID-19 patients. *Osong Public Health Res Perspect*. 2020;11(5):296–302.
40. Rezaei S, Matin BK, Karyani AK, et al. Impact of smoking on health-related quality of life: a general population survey in West Iran. *Asian Pac J Cancer Prev*. 2017;18(11):3179–3185.
41. Cheng X, Jin C. The association between smoking and health-related quality of life among Chinese individuals aged 40 years and older: a cross-sectional study. *Front Public Health*. 2022;10:779789.
42. Perski O, Theodoraki M, Cox S, Kock L, Shahab L, Brown J. Associations between smoking to relieve stress, motivation to stop and quit attempts across the social spectrum: a population survey in England. *PLoS One*. 2022;17(5):e0268447.
43. Villanti AC, Manderski MTB, Gundersen DA, Steinberg MB, Delnevo CD. Reasons to quit and barriers to quitting smoking in US young adults. *Fam Pract*. 2016;33(2):133–139.