

Development and validation of the Somali WHOQOL-BREF among refugees living in the USA

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Abstract

Purpose This study is the first translation and validation of the WHOQOL-BREF for general use in Somali refugee populations.

Methods A community sample of 303 Somali refugees living in the USA responded to the WHOQOL-BREF following translation, adaptation, and validation guidelines established by the World Health Organization. Psychometric properties of the quality of life instrument were assessed including tests of the four-domain factor structure using multiple regression and principal component analysis.

Results Principal component analysis demonstrated an acceptable fit between PCA components and original WHOQOL-BREF domains. Four components had eigenvalues greater than one and explained 63.4 % of the observed variance. Most scale items loaded like the original WHOQOL-BREF domains, with the notable difference among four items of physical health that loaded more strongly under the environment domain. Construct validity of the scale was confirmed by higher intercorrelations of each WHOQOL-BREF item with its intended domain (all $r^2 > 0.50$) than with other domains. Multiple regression analyses of the domain scores on overall quality of life (Q1) and health satisfaction (Q2) explained half of the observed variance in each measure. Item correlations showed good internal consistency ($0.65 \geq$ Cronbach's $\alpha \leq 0.82$).

Conclusions Validation of this first Somali version of the WHOQOL-BREF provides further evidence that this instrument can be a valid measure for cross-cultural

comparative studies of quality of life. Policies that address health disparities can be more broadly evaluated if quality of life is systematically measured in the community. This is particularly important for evaluating policy impact and implications for refugee populations.

Keywords Quality of life · WHOQOL-BREF · Questionnaire validation · Refugees · Somali

Introduction

Somali refugees and immigrants struggle with several daily stressors during their resettlement in the USA, but little is known about their overall quality of life. It is estimated that at least 40,000 Somalis have settled in Columbus, Ohio, creating the second largest Somali community in the USA [1]. Community organizations have found that, in addition to the direct adverse effects of war in Somalia, their quality of life is greatly affected by the social strains of resettlement, despite their nomadic heritage. Social strain and social disadvantages can have a significant impact on the health of vulnerable communities, consequently diminishing their overall quality of life [2]. Policy and practices designed to address these health disparities can be more broadly evaluated using valid cross-cultural measures of quality of life. Therefore, the aim of this study was to translate, adapt, and validate the 26-question version of the World Health Organization Quality of Life Instrument (WHOQOL-BREF) for use in Somali-speaking populations. The WHOQOL-BREF was developed for use across different cultures, but it is also effective in comparing subgroups within the same culture and to measure changes in quality of life over time [3]. This international instrument is appropriate for large research studies, clinical

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trials, medical care, healthcare audits, and policy making. The WHOQOL-BREF is available in more than 50 languages but has never been translated to Somali or used in Somali populations.

The WHOQOL-BREF is the shorter version of the WHOQOL-100, a cross-culturally valid assessment of well-being [4]. The WHOQOL-100 was developed through collaboration of 15 sites around the world working simultaneously through the ‘spoke-wheel’ methodology [5]. In other words, all sites worked concurrently on the same stage of instrument development pooling ideas, results, and communicating to achieve a high level of semantic and conceptual equivalence between the different language versions. Another unique feature of the WHOQOL development was the iterative input provided by quality of life researchers, health professionals, and patients at all stages of instrument development.

When a quality of life measure is translated to another language and culture, the translation may be distorted using quality of life constructs that are valid in the source language, but not in the target language. For instance, “depression” is experienced differently across cultures and is therefore described differently [6]. This led the WHOQOL development team to mandate a standard WHO translation method: the iterative process of forward- and backward-translation complemented by a review process made by monolingual and bilingual translators to establish semantic, conceptual, and technical equivalence in different language versions of health-related measures. The World Health Organization (WHO) developed the WHOQOL-100 and WHOQOL-BREF to stimulate the promotion of a holistic, cross-cultural approach to health and health care. The WHO has defined quality of life as “an individual’s self-perception in the context of their culture and value systems, and their personal goals, standards, and concerns. It is a broad-ranging concept including both negative and positive dimensions and the complex way the person’s physical health, psychological state, level of independence, social relationships, personal beliefs, and relationships relate to prominent features of the environment” [7]. This development and validation of a Somali version of the WHOQOL-BREF was created to encourage its use in evaluating the impact of health-related quality of life interventions for Somali-speaking populations around the world, including refugee populations.

Methods

Study sample

Somali community members were recruited for participation by Somali community organizations in Columbus, Ohio. Following the sampling and validation protocol

established in the WHOQOL user manual and WHO translation method [8], a convenience sample was constructed to include an equal gender and age distribution centered on 45 years of age and a 5:1 ratio between participants self-reporting as healthy (without current illness) or having a current illness. The final sample was composed of 303 Somali subjects with 253 respondents with a current illness and 50 respondents without current illness. Participants 15 years of age and older were interviewed because Somalis consider this the start of adulthood. Demographic variables such as education and marital status were collected on all participants, where two education categories included “less than primary school,” or “secondary school or more” were constructed based on the bimodal distribution. Marital groups included single, married, and divorced/widowed.

Fieldwork

Translation and data collection took place between September 2012 and June 2013. The English version of the WHOQOL-BREF was first translated into Somali and then back-translated, as required by the WHO translation method [8]. In this process, the Somali version was initially translated by two professional, bilingual Somali translators and pretested on a group of three Somali speakers with no English skills and little formal education. Since it was practically impossible to find monolingual Somali speakers living in the USA, the initial version was pretested with these Somali speakers who were also fluent in Italian. This group who reflected on each of the 26 questions found most questions to be comprehensible and suggested only minor adaptations. The professional, bilingual Somali translators then reworded the affected questions appropriately. The revised Somali version was then back-translated into English by a third professional Somali bilingual translator. The original English version was then compared to the re-translated WHOQOL-BREF in a collective meeting with the initial Somali bilingual translators and the Somali bilingual back-translator. They compared the few differences in wording found in both languages until equivalence in both languages was reached to the degree possible. The differences related to language equivalence that were most relevant are described below:

- The concept of “quality of life” was ambiguous; the Somali expression “standard of life” was used instead.
- Question 6 (Q6), “To what extent do you feel your life to be meaningful” is difficult to grasp culturally. Interviewers were instructed how to explain this question.

- For Q7, “How well are you able to concentrate,” the team specified the term “your life” as the object of concentration.
- In Q10, “Do you have enough energy for everyday life” the word “energy” was substituted by the Somali word “training” to avoid confusion with electricity.
- Q15 “How well are you able to get around” was difficult to translate because the idea that people might have difficulties moving around does not make sense to Somalis, probably as a result of their nomadic heritage. Interviewers were instructed how to explain this question.
- Cultural differences in the appropriateness of personal boundaries made the following questions awkward to ask: Q11, “Are you able to accept your bodily appearance?”; Q20, “How satisfied are you with your personal relationships?”; and Q21, “How satisfied are you with your sex life?” The translation team retained the meaning to maintain the questionnaire’s integrity and expected many participants to opt out of answering these questions. Surprisingly, most participants answered these questions.
- Q26, “How often do you have negative feelings such as blue mood, despair, anxiety, depression”; it was not possible to translate “blue mood,” so this expression was omitted.

The final version of the translated Somali WHOQOL-BREF was administered by four college-educated Somali interviewers trained to pilot test the questionnaire for validation. They were trained to provide standard, accurate explanations for the meaning of any perceived ambiguities, such as the concept of “quality of life” or “meaningful life” as indicated above. The four interviewers were trained to ensure that their clarifications were accurate and consistent. These interviewers naturally functioned as “cultural brokers” between Somali refugees and Americans because of their college education and deeper integration into American society. The trust these interviewers received from the Somali community facilitated the recruitment of study participants. While initial recruitment usually occurred in common meeting places for Somalis, such as the mosque, shopping mall, and clubs, the majority of interviews were conducted later in participants’ homes. Somalis are considered a very hard-to-reach population due to their refugee status and because they are extremely suspicious of the surrounding community they live in, including potential research participation [9, 10]. It was thus not possible to keep record of the number of potential respondents who refused to participate in this study. This suspiciousness also led us to abandon our goal of reaching randomly selected participants for a re-test within a two week window (although not required by the WHOQOL-

BREF protocol). The entire fieldwork process and challenges will be described in detail elsewhere.

WHOQOL-BREF

The WHOQOL-BREF was designed to be self-administered, interviewer-assisted, or interviewer-administered based on situational needs. It covers a broad range of quality of life facets related to four domains: physical health, psychological health, social relationships, and the environment (see Table 1). There are also two questions that measure overall quality of life (Q1) and overall health satisfaction (Q2). All 26 questions are based on self-report, and each domain includes three to eight questions. Explicit instructions for administration and scoring of WHOQOL-BREF can be found in the WHO resource document [8]. Domain scores are scaled in a positive direction, with a higher score denoting higher quality of life. Questionnaires with more than 20 % of the items missing are discarded. The time frame for responses is 2 weeks. As trained interviewers completed the questionnaires, missing data were insignificant and no participants were completely excluded from analysis.

Analysis

All statistical analyses were conducted using IBM® SPSS® Statistics 21.0 and are reported using language from the original English version of the WHOQOL-BREF. All

Table 1 The four domains of the WHOQOL-BREF [8]

WHOQOL-BREF Domain	Facets incorporated within domain
Physical Q3, Q4, Q10, Q15, Q16, Q17, Q18	Activities of daily living, dependence on medicinal substances and medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, work capacity
Psychological Q5, Q6, Q7, Q11, Q19, Q26	Bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality/religion/personal beliefs, thinking/learning/memory/concentration
Social Q20, Q21, Q22	Personal relationships, social support, sexual activity
Environmental Q8, Q9, Q12, Q13, Q14, Q23, Q24, Q25	Financial resources, freedom/physical safety/security, health and social care: accessibility and quality, home environment, opportunities for acquiring new information and skills, participation in and opportunities for recreation/leisure activities, physical environment (pollution/noise/traffic/climate), transport

analyses using domain used standardized scores ranging from 0 to 100. We followed earlier analytical procedures reported by the WHOQOL Group, such as testing for discriminant validity by comparing groups, examining construct validity via item–domain correlation and principal component analysis (PCA). Multiple linear regression analysis was used to determine the contribution made by the separate domains and items on overall quality of life (Q1) and health satisfaction (Q2). For comparison between groups, Chi-square (χ^2) and Student's *t* test were used. Pearson's correlations were calculated to investigate intercorrelations of individual items and domains. PCA with orthogonal varimax rotation was used to explain the variance in item variables except Q1 and Q2, in addition to the components structure of the WHOQOL-BREF. Four factors were forced to facilitate comparison with the original WHOQOL-BREF component structure. Factor loadings greater than or equal to 0.50 were used to interpret components [11]. PCA returns a unique mathematical solution that extracts maximum variance from each component, where components are typically uncorrelated [12]. The varimax orthogonal rotation accounts for all the variance in the observed variables and results in components that avoid multicollinearity. Intercorrelations of the original WHOQOL-BREF domains with the PCA factors were also estimated. Sampling adequacy of the data for PCA was checked using Kaiser–Meyer–Olkin (KMO) [13]. The value of KMO was high (0.94), meeting the acceptability criterion of the 0.6 threshold [14].

Ethics

This study was approved by the Wright State University Institutional Review Board in Dayton, Ohio. All participants gave informed consent (either in Somali or English) prior to responding to the WHOQOL-BREF and were aware that they could refuse to participate, suspend their participation at any time, or skip individual questions without penalty. Participants received a \$25 gift card to a popular Somali grocery store to compensate them for their time.

Results

Respondent characteristics

The total study sample consisted of 303 Somali individuals. The ratio between respondents currently with illness ($n = 253$) and currently without illness ($n = 50$) was 5:1 as dictated by validation instructions provided by WHO. Diabetes, mental illnesses, asthma, and conditions such as high blood pressure and high cholesterol were the most

frequently reported illnesses (see Table 2). Less common illnesses (categorized as “other”) included cancer, heart problems, amputations, and deafness. Almost half (43.5 %, $n = 110$) of those reporting an illness listed at least two different illnesses and 12.6 % ($n = 32$) reported three different illnesses or more. Ten participants who self-reported having an illness were unwilling to disclose the condition they had. The mean age of the study sample was 47.7 (SD 18.2, range 15–93 years). Confirming the sample's construction of equal age and gender distributions groups, there were no statistically significant differences between currently with/without illness groups for age and gender (see Table 3). Significant differences between “currently with illness” and “without illness” groups were found in education ($p < 0.001$, less education in those reporting illness) and marital status ($p < 0.01$, more divorced/widowed in those reporting illness). One-fifth (20.4 %, $n = 65$) of the total sample was illiterate.

Construct validity

Distribution of all domain scores showed a tendency to skewness toward lower scores for all domains, but it was weaker for the social domain (See Table 4). For the total sample, the Pearson's correlation coefficients between the WHOQOL-BREF domains ranged from 0.55 to 0.76 (see Table 5). The lowest correlation was between the physical and social domains ($r = 0.55$), while the highest correlation was between the psychological and environmental domains ($r = 0.76$). The environmental and physical domains also showed a high correlation ($r = 0.72$).

The intercorrelations of each WHOQOL-BREF item with each domain showed that most items correlated significantly ($p < 0.01$) with their original domains (see Table 6). Correlation coefficients were equally high for all

Table 2 Most frequent self-reported illnesses and conditions ($n = 253$)

Illnesses and conditions	Frequency	Prevalence (%)
High blood pressure	83	19.0
Diabetes	66	15.2
Mental illness (depression, PTSD, anxiety)	37	8.5
Asthma, bronchitis	32	7.3
High cholesterol	29	6.7
Arthritis/joint pain	29	6.7
Gastritis, abdominal pain	29	6.7
Back pain	14	3.2
Other	116	26.7
Total	435	100.0

More than one response possible; 45.5 % of respondents reported two or more conditions

Table 3 Socio-demographic characteristics of respondents ($n = 303$)

Characteristics	Illness	No illness	t test or χ^2	p value
Mean age (years, SD)	47.7 (18.4 \times)	42.3 (16.7)	$t = -1.9$	ns
Range (years)	15–93	19–86		
Gender (n , %)				
Male	129 (51)	28 (56.0)	0.4, $df = 1$	ns
Female	124 (49)	22 (49.2)		
Education (n , %) ^a				
Primary or less	124 (49.8)	11 (22.4)	12.3, $df = 1$	$p < 0.001$
Secondary and beyond	125 (50.2)	38 (77.5)		
Marital status (n , %) ^b				
Single	42 (17.2)	12 (24.5)	5.8, $df = 2$	$p < 0.05$
Married	133 (54.5)	31 (63.3)		
Divorced/widowed ^c	69 (28.3)	6 (12.2)		

ns nonsignificant

^a Respondents with illness $n = 249$ (4 missing), respondents without illness $n = 49$ (1 missing)

^b Respondents with illness $n = 244$ (9 missing), respondents without illness $n = 49$ (1 missing)

^c “Widowed” cells had expected count less than 5 and were therefore collapsed with “divorced”

Table 4 Data distribution for the WHOQOL-BREF domains in the total sample ($n = 303$)

Domains	Mean (SD)	95 % CI	Kurtosis	Skewness	Test of normal distribution ^a
Physical	44.69 (18.30)	42.62–46.76	0.78	0.46	0.16*
Psychological	52.83 (18.44)	50.74–54.91	−0.29	0.59	0.18*
Social	50.04 (20.36)	47.74–52.34	−0.37	0.05	0.12*
Environmental	46.32 (16.87)	44.46–48.17	−0.01	0.57	0.17*

^a Kolmogorov–Smirnov test with Lilliefors’s significance correction

* $p < 0.0001$

three items of the social domain ($0.79 \geq r \leq 0.83$). Correlation coefficients were mostly high for items within physical domain ($0.72 \geq r \leq 0.84$), with only two items having moderate correlations ($r = 0.50$ and $r = 0.65$ for Q4 and Q3, respectively). Correlation coefficients were high for the psychological domain ($0.76 \geq r \leq 0.80$), with only one moderate item ($r = 0.53$ for Q26). The environmental domain showed moderate to high correlations with items ($0.55 \geq r \leq 0.81$), with only one low item ($r = 0.44$ for Q9). It is important to note that no item had a stronger correlation with the other domains than their original domain.

Cronbach’s alpha was used to measure reliability. For this measure, the internal consistency of each domain score is based on the correlations between all responses to each of the items from which the domains are comprised (e.g., Q10–Q22 with social domain). A high alpha (> 0.90) suggests item redundancy and a scale that might be too narrow in scope [15]. Cronbach’s alpha between 0.70 and 0.90 reflects good internal consistency [16]. All item–domain correlations showed good internal consistency,

although the consistency was marginal for the physical domain (See Table 6). Overall quality of life (Q1) correlated moderately with the environmental ($r = 0.64$) and psychological domains ($r = 0.66$). Health satisfaction (Q2) correlated moderately with the physical ($r = 0.66$) and environmental domains ($r = 0.65$).

Multiple regression analyses of the domain scores on overall quality of life (Q1) and health satisfaction (Q2) items are shown in Table 7. When Q1 was modeled as the dependent variable, all four domains independently made a significant contribution to explaining the variance for overall quality of life: the psychological domain made the strongest contribution (standardized β coefficient = 0.26), followed by the environmental (standardized β coefficient = 0.23) and physical (standardized β coefficient = 0.17) domains. Together, these four domains accounted for almost 50 % on the total variance in overall quality of life (adjusted $r^2 = 0.48$). When Q2 was modeled as the dependent variable, the physical domain contributed most strongly to the variance (standardized β coefficient = 0.35), followed by the environmental (standardized

Table 5 Intercorrelations of the WHOQOL-BREF domains ($n = 303$)

Domains	Physical	Psychological	Social	Environmental
Physical	1	0.70*	0.55*	0.72*
Psychological	0.70*	1	0.60*	0.76*
Social	0.55*	0.60*	1	0.64*
Environmental	0.72*	0.76*	0.64*	1

* Correlation coefficients significant at 0.01 level (two-tailed)

β coefficient = 0.27) and social (standardized β coefficient = 0.11) domains. Together, the four domains accounted for 50 % of the total variance in health satisfaction (adjusted $r^2 = 0.49$).

Principal component analysis

Principal component analysis (PCA) was conducted to estimate factors or components that empirically summarize the correlations among the variables. The PCA using orthogonal varimax rotation is shown in Table 8. Prior to rotation, all four forced components presented eigenvalues greater than one and explained 63.5 % of the total variance (not shown). After rotation, eight items (with factor loadings $\geq |0.50|$) loaded onto the first component explaining 20.26 % of the variance. Half of the variables (Q12, Q13, Q14, and Q25) were originally operationalized under the environmental domain in the WHOQOL-BREF, while the other half was originally operationalized under the physical

Table 6 Intercorrelations of the WHOQOL-BREF individual items and domains ($n = 303$)

	Q1	Q2	Physical	Psychological	Social	Environmental
Q1. Overall quality of life			0.60	0.64	0.05	0.64
Q2. Health satisfaction		0.68	0.66	0.59	0.52	0.65
Q3. Extent of physical pain	0.23	0.31	0.65	0.25	0.19	0.22
Q4. Dependence on medical treatment	0.14	0.26	0.50	0.03 ^{NS}	0.05 ^{NS}	0.08 ^{NS}
Q5. Enjoy life	0.57	0.60	0.61	0.77	0.48	0.60
Q6. Meaningful life	0.50	0.40	0.46	0.80	0.49	0.60
Q7. Ability to concentrate	0.55	0.46	0.52	0.80	0.48	0.62
Q8. Feeling safe	0.50	0.40	0.42	0.58	0.43	0.62
Q9. Healthy physical environment	0.20	0.13	0.10	0.36	0.30	0.44
Q10. Energy for everyday life	0.62	0.60	0.77	0.73	0.55	0.72
Q11. Acceptance of bodily appearance	0.57	0.52	0.51	0.76	0.52	0.62
Q12. Financial resources	0.39	0.52	0.60	0.40	0.32	0.69
Q13. Availability of information	0.49	0.50	0.66	0.64	0.48	0.81
Q14. Opportunity for leisure activities	0.54	0.54	0.68	0.64	0.42	0.73
Q15. Ability to move and get around	0.54	0.53	0.78	0.69	0.53	0.73
Q16. Satisfaction with sleep	0.48	0.50	0.72	0.64	0.50	0.66
Q17. Ability to perform daily living activities	0.53	0.60	0.81	0.67	0.54	0.70
Q18. Capacity of work	0.55	0.60	0.84	0.70	0.50	0.69
Q19. Self-satisfaction	0.47	0.49	0.62	0.80	0.53	0.66
Q20. Personal relationships	0.50	0.42	0.47	0.56	0.83	0.56
Q21. Sexual life	0.44	0.5	0.49	0.46	0.81	0.50
Q22. Support from friends	0.44	0.4	0.43	0.51	0.79	0.54
Q23. Conditions of living place	0.50	0.47	0.44	0.52	0.51	0.69
Q24. Access to health services	0.33	0.43	0.33	0.35	0.40	0.55
Q25. Adequate transportation	0.48	0.48	0.56	0.58	0.52	0.72
Q26. Negative feelings	0.24	0.23	0.46	0.53	0.19	0.28
Cronbach's alpha			0.65	0.71	0.76	0.82

Number in bold—original item to domain

Physical domain items = Q3, Q4, Q10, Q15, Q16, Q17, and Q18

Psychological domain items = Q5, Q6, Q7, Q11, Q19, and Q26

Social domain items = Q20, Q21, and Q22

Environmental domain items = Q8, Q9, Q12, Q13, Q14, Q2, Q24, and Q25

^{NS} Not significant ($p > 0.05$)

Table 7 Regression analysis of the WHOQOL-BREF domains on overall scores ($n = 303$)

	Domains	Standardized B coefficient	95 % CI for regression coefficient	Significance ^a
Q1. Overall quality of life	Psychological	0.26	0.006–.021	<0.010
	Environmental	0.23	0.005–0.22	<0.001
	Physical	0.17	0.002–0.16	<0.010
	Social	0.14	0.002–.012	<0.020
	Adjusted $r^2 = 0.482$			
Q2. Health satisfaction	Physical	0.35	0.012–.026	<0.001
	Environmental	0.27	0.008–.026	<0.002
	Social	0.11	0.001–.0110	<0.030
	Psychological	0.08	0.001–0.150	ns
	Adjusted $r^2 = 0.499$			

ns nonsignificant, CI confidence interval

^a Student's t test

domain. Because the loadings were stronger for the environmental items, the first principal component was interpreted as the “environmental component.” Loadings for the second component, which account for 19.73 % of the variance, are more related to the original psychological domain and are thus interpreted as the “psychological component.” The third component explained 13.97 % of variance and was interpreted as the “social component” as it contained all three items originally belonging to the social domain. The fourth component accounted for 9.53 % of the variance and was comprised of two very high loadings (0.85 and 0.79 for Q3 and Q4, respectively) from the physical domain that are related to sickness, “extent of physical pain” (Q3) and “dependence on medical treatment” (Q4), as well as the item related to “negative feelings” (Q26). We thus interpreted the last component as the “sickness or physical component.” To compare the integrity of the four components, we correlated the original WHOQOL-BREF domains against the four components. Each component correlated most significantly with its original WHOQOL-BREF domain, suggesting an acceptable fit between PCA components and original WHOQOL-BREF domains (see Table 9).

Discriminant validity

The construct validity of a scale can be confirmed by discriminatory tests exploring associations between subgroups [15]. Student's t tests showed highly significant mean differences between with/without current illness subgroups for both overall quality of life (Q1) and satisfaction with health (Q2) (see Table 10). The social domain indicated a larger magnitude of difference between the subgroups, followed by physical, environmental, and psychological domains. Student's t tests

indicated significant differentiating power for all domains (all $p < 0.0001$).

Discussion

Psychometric properties of the Somali WHOQOL-BREF

This study was the first to translate, adapt, and validate the WHOQOL-BREF to the Somali language using a sample of 303 Somali respondents following the method prescribed by the WHO. This study examined the psychometric properties of the Somali version of WHOQOL-BREF among healthy adults and adults with a range of different health conditions from the Somali community in Columbus, Ohio. It confirms the validity of the WHOQOL-BREF in addition to providing insight into how Somalis living in the USA perceive quality of life. Very few studies have used the WHOQOL-BREF among refugees or resettled refugees [17–19].

The WHOQOL-BREF was developed by the World Health Organization in such a way that questions could be added to increase cultural adaptation [20, 21], as long as the original 26 standard questions are retained [3, 5]. We purposefully did not add any new questions to facilitate future comparison of data collected from other ethnicities and within communities over time in light of potential policy and practice change related to health disparities. For instance, the appropriate language instrument could be administered to Somalis, Hispanics, African-Americans and Anglo-Americans to compare health-related quality of life in the same neighborhood. We could then compare quality of life of Somali people living in different regions of the USA (e.g., Columbus, Boston, and Minneapolis) or

Table 8 PCA factor loadings of items in the WHOQOL-BREF with four components ($n = 303$)

Domains and items (original item numbers)	Rotated components			
	1 “Environmental component”	2 “Psychological component”	3 “Social component”	4 “Sickness/physical component”
Total of variance explained (%)	20.26	19.73	13.97	9.53
<i>Physical domain</i>				
Q3. Extent of physical pain	−0.18	−0.06	−0.15	0.85
Q4. Dependence on medical treatment	−0.23	0.25	−0.08	0.79
Q10. Energy for everyday life	0.56	0.52	0.29	−0.17
Q15. Ability to move and get around	0.70	0.42	0.23	−0.12
Q16. Satisfaction with sleep	0.46	0.54	0.27	−0.05
Q17. Ability to perform daily living activities	0.57	0.44	0.33	−0.20
Q18. Capacity for work	0.62	0.43	0.26	−0.29
<i>Psychological domain</i>				
Q5. Enjoy life	0.47	0.51	0.23	−0.19
Q6. Meaningful life	0.24	0.72	0.26	0.07
Q7. Ability to concentrate	0.31	0.73	0.23	0.09
Q11. Acceptance of bodily appearance	0.34	0.56	0.36	0.05
Q19. Self-satisfaction	0.39	0.66	0.30	−0.04
Q26. Negative feelings	−0.05	− 0.52	0.07	0.64
<i>Social domain</i>				
Q20. Personal relationships	0.15	0.41	0.68	−0.03
Q21. Sexual life	0.24	0.20	0.65	−0.14
Q22. Support from friends	0.15	0.30	0.72	−0.04
<i>Environmental domain</i>				
Q8. Feeling safe	0.29	0.52	0.30	0.10
Q9. Healthy physical environment	0.03	0.48	0.23	0.49
Q12. Financial resources	0.83	−0.03	0.17	−0.15
Q13. Availability of Information	0.75	0.35	0.22	−0.02
Q14. Opportunity for leisure activities	0.72	0.33	0.16	−0.15
Q23. Conditions of living place	0.32	0.30	0.57	−0.01
Q24. Access to health services	0.21	0.03	0.68	−0.02
Q25. Adequate transportation	0.56	0.30	0.35	−0.07

Extraction method: principal component analysis

Rotation method: Varimax with Kaiser normalization

Values in bold indicate loadings above |0.50|

in different parts of the world (USA, UK, and Canada). Much of the research to date using the WHOQOL-BREF emphasizes specific disease conditions, such as dementia, cancer, and HIV [22–24]. Researchers agree that more quality of life assessments in community samples are warranted [25–27], and we believe they can provide unique insight into health disparities in and across cultural groups. The World Health Organization anticipated that the WHOQOL-BREF would be used for health policy research [7, 28], and we propose that the instrument also be used to evaluate social policies designed to reduce health disparities.

After transforming the raw mean scores according to WHO guidelines [8], it became evident that Somali refugees perceived quality of life higher for the psychological and social domains as compared to the environmental and physical domains. Environmental and physical domain scores were below 50 on the 0–100 scale. These quality of life values are lower than most means found for WHOQOL-BREF domains in other countries, which are usually greater than 50 on the 0–100 scale [5, 25, 29]. This pattern was maintained when respondents with current illness were compared to respondents without illness. This discriminatory power supports the purported strength of WHOQOL-

Table 9 Intercorrelations of WHOQOL-BREF transformed domains with PCA components ($n = 303$)

Domains/PCA factors	Component 1 “Environmental”	Component 2 “Psychological”	Component 3 “Social”	Component 4 “Sickness/physical”
Physical	0.64**	0.40**	0.30**	−0.51**
Psychological	0.40**	0.82**	0.29**	−0.14**
Social	0.21**	0.36**	0.82**	−0.09
Environment	0.71**	0.41**	0.49**	0.04

** Correlation coefficients significant at 0.01 level (two-tailed)

Table 10 WHOQOL-BREF domain and overall item mean scores in the total sample ($n = 303$), with current illness ($n = 253$) and without current illness ($n = 50$)

Domains	Total sample mean (SD)	Illness mean (SD)	Without illness mean (SD)	Difference, 95 % CI*
Q1: Overall QOL	2.92 (0.97)	2.75 (0.88)	3.85 (0.90)	1.1, 0.778–1.32
Q2: Satisfaction with health	2.70 (1.03)	2.47 (0.85)	3.85 (1.07)	1.38, 1.11–1.65
Physical health	44.69 (18.30)	41.38 (16.09)	61.44 (19.74)	20.06, 14.96–25.16
Psychological	52.83 (18.44)	50.24 (16.94)	65.92 (20.28)	15.68, 10.34–21.02
Social	50.04 (20.36)	46.40 (18.96)	68.46 (17.13)	22.06, 16.37–27.74
Environment	46.32 (16.42)	43.59 (14.78)	60.12 (17.46)	16.53, 11.88–21.17

CI confidence interval

* Student’s t test indicate that all means differences were significant ($p < 0.0001$)

BREF in its inclusion of both the environmental and social domains, which many quality of life instruments lack [29].

Construct validity

The construct validity of the Somali WHOQOL-BREF is supported by correlation analysis because each scale item was more correlated with the intended domain than any other domain. Each domain is clearly represented: this means that the scores of this new instrument version are more easily interpreted in cross-cultural comparisons because items are clearly identified with the intended domain. Correlation analysis between items and domains showed that in the total sample ($n = 303$) all items had a stronger correlation (>0.42) to the intended domain than any other domain. Items that assessed overall quality of life (Q1) and health satisfaction (Q2) were also significantly correlated with each other ($r_{Q1,Q2} = 0.68$). Results of regression analysis demonstrated that psychological and environmental domains contributed most to the variance of overall quality of life followed by physical and social domains. The physical domain contributed the most to health satisfaction closely followed by the environmental domain, with little variance explained by the other two domains. These findings illustrate that overall quality of life in this Somali sample is strongly related to psychological factors in combination with various others, while health satisfaction is more directly associated to physical and environmental factors. It is well documented that

health satisfaction is strongly associated with physical factors [30, 31], but less so with environmental factors and there is less literature that associates it with the environment.

A PCA with the total sample was conducted as part of the construct validation procedure. After extensive literature review, Guadagnoli and Velicer [32] concluded that solutions generated from PCA differ little from those derived from factor analytic techniques. In our study, the four components explained 63.4 % of the observed variance. However, the loadings for the four components extracted from the PCA are slightly different than the original WHOQOL-BREF. Most scale items loaded like the four original WHOQOL-BREF domains. The greatest difference was found among four items of physical health: ability to move and get around (Q15), capacity for work (Q18), ability to perform daily living activities (Q17), and energy for everyday life (Q10) that loaded strongly under the environment domain. Because of the “loss” of these four components to the “environmental component,” the last component, which was strongly related to the physical domain items, “sickness” was added to the component name as the three strong loadings dealt with of extent of physical pain (Q3), dependence on medical treatment (Q4), and negative feelings (Q26).

In this study, “feeling safe” (Q8, originally from the environmental domain), energy for everyday life (Q10), and “satisfaction with sleep” (Q16, the latter two originally from the physical domain) loaded significantly with the

“psychological component” of the PCA. When dealing with the everyday experience of refugees, we hypothesize that feeling safe and satisfaction with sleep could be expressed as psychological because they have gone through previous traumatic experiences [33, 34]. Our third co-author, a native Somali, explained that the word “safe” is often used in the environmental context, but also has a psychological connotation in Somali. For instance, “are we safe?” was a transitional expression used by the Somali youth after the 1990 civil war, not knowing when or what they would eat or whether they could “feel safe” tomorrow. Further, Somalis have always migrated and dispersed globally for centuries, a reflection of the nomadic lifestyle they were acculturated to in their native land. Nowadays, Somalis perpetuate transnational networks and exchanges of remittances, goods, and information across most countries of the world [35, 36]. This nomadic heritage reflects potential adaptation to an ecologically insecure environment. Nomads have developed mechanisms of social security—of “feeling safe”—to deal with the insecurities of constant mobility. This nomadic lifestyle can also be indicative of the “physical” and “psychological” connections Somalis maintain with their surrounding environment, such as “ability to move and get around” (Q15), “energy for everyday life” (Q10), and “feeling safe”(Q8). In other words, the nomadic lifestyle may tie the psychological and physical health to the environment.

Internal consistency

The Cronbach’s alpha scores, reflecting the reliabilities of the domains in the total sample, were satisfactory. For the environmental, psychological, and social domains, the reliability coefficients were equal or higher than 0.70, which is considered “good” [15]. The social domain exhibited a lower value of 0.67, which is considered still “acceptable.”

Study limitations

Limitations of this study include a convenience community sample with no information regarding those who refused to participate. Conducting research with resettled refugees can often be difficult, since they are a hard-to-reach population. Lack of non-respondent data and low external validity precludes generalizability of findings to the entire Somali population. The current findings are restricted to the Somali diaspora. That is, Somalis living outside of Somalia are most likely refugees and most likely have the same experiences moving from Somalia to another country. Further studies are needed to generalize these findings to Somali general population. The heterogeneity of the community sample was acquired through a variety of disease

and disability diagnoses. However, the absence of a clinical sample is indicative that the “very sick” were not well represented. Since data are self-reported, findings also reflect response bias, decreasing generalizability of findings. Additionally, ten participants chose not to disclose their illness although they self-reported having an illness. Nonetheless, with this initial validation of the Somali version of the instrument, we provided further evidence that the WHOQOL-BREF can be a valid measure for cross-cultural comparative studies on quality of life. We advocate that quality of life be measured more systematically in the community in a robust way to evaluate policies designed to diminish health disparities.

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