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Comparison of three societally derived health-state classification values among older African Americans with depressive symptoms

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Abstract

Purpose—To compare societal values across three health-state classification systems in older African Americans with depression and to describe the association of these instruments to depression severity.

Methods—We summarized baseline values for EQ-5D (US weights) and HUI2/3 (Canadian weights) and their subscales for 118 older African American participants enrolled in a randomized depression treatment trial and calculated correlations between the different instruments. We evaluated ceiling and floor effects for each instrument by comparing the proportion at the highest and lowest possible score for each tool. Also, utility scores were assessed by level of depression severity (mild, moderate, moderate severe, severe) scores as measured by the Patient Health Questionnaire (PHQ-9).

Results—Mean utility values were 0.58 (SD = 0.21) for EQ-5D, 0.52 (SD = 0.21) for HUI2, and 0.36 (SD = 0.31) for HUI3. For the EQ-5D, 72 % of participants reported having some problems on the anxiety/depression domain. On the emotion domain for the HUI2, 23 % reported the highest level of impairment compared to only 3 % on the HUI3. No participant scored at the floor for the EQ-5D, HUI2, or HUI3 index; one participant scored at the ceiling value on the HUI3 index. Correlations ranged from 0.63 to 0.82 (all of which were significant at an alpha level of 0.05). In general, utility scores trended inversely with depression level.

Conclusion—Small differences in the three preference-weighted health-state classification systems were evident for this sample of older African Americans with depressive symptoms, with HUI scores lower than EQ-5D. For this sample, utility scores were lower (i.e., poorer) than the general United States population with depression on each utility measure.

Keywords

Utility; Quality of life; EQ-5D; HUI3; Cost-effectiveness analysis

Introduction

Depression is the leading cause of disability worldwide affecting an estimated 121 million people [1]. In late life, depression poses as an even greater public health problem as it is typically under detected and undertreated [2]. In the United States, it is estimated that over seven million older adults suffer from depression, making it the most prevalent mental health condition among this group [3]. Depression is also one of the most costly chronic diseases estimated at \$43.7 billion a year in the United States and close to 118 billion euro (\$169 billion USD) in Europe [4, 5]. Also, older adults with depression incur significantly greater healthcare expenditures than those without symptoms [2, 6]. As the number of persons entering old age is increasing worldwide in unprecedented numbers, attention to their mental health needs is a global priority [7]. Of older adults in the United States, African Americans are at particular risk for depression compared to Whites due to their disproportionate high rates of chronic illness, functional disability, health problems, and exposure to multiple social structural jeopardies including low income and poor neighborhood quality, all factors associated with depression risk [8–10]. Prevalence rates for older African Americans with chronic illness or in rehabilitation have been shown to be as high as 30 %. This is higher than the 5–15 % rates cited previously for the general population at-large or for older Caucasians [11].

Due to the high cost and prevalence of depression in older adults worldwide, improvements in both pharmacological and non-pharmacological interventions are needed. Existing pharmacologic and non-pharmacologic treatments are not universally effective, and new approaches are necessary that resonate with the cultural values, norms, and treatment preferences of an increasingly diverse older population worldwide. Within minority populations such as the African American community in the United States, depression is often viewed as stigmatizing and a sign of personal weakness [9, 12, 13]. For these older adults, non-pharmacological interventions may be more acceptable and better address their needs and treatment preferences.

Along with the clinical and cultural challenges of developing successful interventions to treat depression for diverse older adults worldwide, there are increasing demands from payers and policy makers to understand the cost, health-related quality of life (HRQOL) and cost-effectiveness of new and existing treatments. One of the most common ways to assess HRQOL is with preference-based classification systems. These approaches are designed for use cross-nationally to allow for harmonization of outcome measures and facilitate cross-study comparisons that can inform policy. Multi-attribute preference-based classification systems describe self-reported health states as a single index value or utility score. To derive a single index or utility score, such systems combine health status measures with a societal value or utility for each state of health. From an index or utility score, quality-adjusted life years (QALYs) can be derived. This is particularly important because QALYs, which take into account length and quality of life, are the recommended outcome measure for use in cost-effectiveness studies [15]. Three of the most commonly used preference-based

classification tools worldwide are the EuroQol-5D (EQ-5D) and Health Utilities Index Mark 2 and Mark 3 (HUI2/3) [16, 17].

While the EQ-5D and HUI2/3 can be used to derive health index scores, their respective items, response options, and scoring patterns differ such that scores for each index may vary for a particular individual and study sample. These inherent differences can significantly impact the results of cost-effectiveness analyses and make comparisons between studies and across samples of diverse older adults difficult. A few studies have reported differences in index scores derived from EQ-5D and HUI2/3 for individuals with depression; however, these studies did not include minority populations such as older African Americans [18–21]. Furthermore, although it is recognized that differences exist among these instruments, there are no guidelines concerning the selection of an instrument for use with a particular minority sample or elderly depressed population. While HRQOL measures are used worldwide, little research has been conducted to evaluate their utility with various subgroups and minority populations. As older adults worldwide are characterized by extreme heterogeneity, attention to the performance of these measures for distinct subgroups would extend their usefulness in multi-site and cross-national studies.

This study provides a descriptive profile of three health utility measures as a first step in a larger program of research to evaluate cost-effectiveness of a depression intervention for older African Americans. The present study compares the distribution of scores for the EQ-5D and HUI2/3 and their subscales, the relationships among scales, and the association of each scale to depression severity using baseline data of participants, older African Americans, who enrolled in a non-pharmacologic depression treatment trial, Beat the Blues (BTB). BTB employs trained senior center social worker staff to meet with participants in their homes to identify care management concerns, make referrals and linkages, provide depression education, develop tailored action plans to accomplish identified behavioral goals and enhance engagement in pleasurable activities, and teach stress reduction techniques for managing daily stressors (e.g., deep breathing) [14]. This study adds incrementally to HRQOL research by evaluating the performance of three common utility measures with one of the fastest growing minority groups among the older adult population in the United States, African Americans. As the purpose was descriptive, no hypotheses were posited concerning the associations among subscales and utility measures. We did expect however that participant would have relatively low scores on the emotion domain of each utility measure as this was a depression study. Also, based on previous research on the quality of life impact of depression, it was hypothesized that as depression severity increased, utility values for each instrument would decrease (worsen).

Methods

The BTB received approval from the Institutional Review Board (IRB) at Thomas Jefferson University (Control #06F.551). Ethical approval was also received by the IRB at Johns Hopkins University (Control #NA-00046775) upon appointment of the Principal Investigator (Gitlin L.N.).

Participants

Study participants were recruited from three sources: an in-home support program for homebound older adults who require home health and homemaker services; membership of the senior center; and individuals at large from the community who contacted the participating senior center in response to print media and presentations to churches and community groups. To be eligible for participation in the trial, participants had to be: (1) African American; (2) 55 years of age, (3) English speaking, (4) cognitively intact (MMSE 24), and (5) with depressive symptoms as measured by a score 5 on the Patient Health

Questionnaire (PHQ-9) on two test occasions within 2 weeks apart. Individuals were excluded if they had a life-limiting illness (life expectancy < 8 months), were involved in another depression trial, or lived in an assisted living or nursing home facility. Individuals who were on anti-depressant medications or receiving other mental health treatment were eligible for inclusion. This study includes 118 participants who were enrolled in the trial and were administered the HRQOL measures.

Measures

Depression was measured using the PHQ-9, a brief, validated, nine-item, depression scale widely used in clinical practice and trials. Using a recall period of 2 weeks, each item of the PHQ-9 was scored from 0 (not at all) to 3 (nearly everyday). Two scores were derived: (1) a total score of severity of symptoms ranging from 0 to 27 and (2) a diagnostic category that maps onto the DSM-IV (minimal to no symptoms (PHQ Score 1–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27)) [22].

The EQ-5D and HUI2/3 are standard health-state classification indices used extensively in cost-effectiveness and quality of life research [16, 17]. The EQ-5D consists of five domains (mobility, pain, depression/anxiety, daily function, bathing) each scored along one of the 3 levels (no problems, some problems, extreme problems). The instrument is capable of defining 243 unique health states. For the BTB trial, respondents were asked to describe their health on the day of the interview, and the USA scoring algorithm was applied for EQ-5D [23].

HUI2 consists of 6 attributes, excluding fertility, of four or five levels and is capable of defining 24,000 unique health states. HUI3 consists of 7 attributes, excluding fertility, defined by five or six levels and is capable of defining 972,000 unique health states. A recall period of 1 week is used for both the HUI2/3. For both HUI2 and HUI3, a scoring algorithm was developed in accordance with specifications provided by McMaster University. The specifications reflect the preferences of the Canadian general population [17].

Both the EQ-5D and HUI2/3 produce health utility values that range between 0 and 1, where 0 represents death and 1 represents perfect health. Scores below 0 represent health states worse than death.¹

Statistical analysis

Demographic characteristics of study participants were described using means, standard deviations, and proportions. Summary statistics were derived for each preference-weighted health-state classification system. To assess the distribution of responses, the proportion of responses in each domain of each instrument was calculated. To determine floor and ceiling effects for each instrument, the proportion of participants with the lowest and highest possible scores was calculated.

Spearman's correlation coefficients were calculated to assess the degree of association between overall EQ-5D and HUI2/3 scores. Finally, utility scores were stratified by PHQ-9 category of depression. Kruskal–Wallis analysis of variance was used to determine whether there were differences in the distribution of scores based on PHQ-9 categories. This was done for each instrument.

¹The lowest possible score for the EQ-5D is –0.594, HUI2 –0.03, and HUI3 –0.36.

Results

Of the 118 participants, most were female (81 %) with a high school or higher education level (83 %). Participants were on average 68 years of age ($SD = 8.3$) and had a mean PHQ-9 score of 12.7 ($SD = 5.1$) reflecting moderate depression. Less than a quarter of participants were taking anti-depressant (21 %) or anti-anxiety (17 %) medications, whereas close to half (43 %) were on a pain medication (Table 1).

Distribution of responses for utility instruments

Mean utility scores were 0.58 ($SD = 0.21$) for EQ-5D, 0.52 ($SD = 0.21$) for HUI2, and 0.36 ($SD = 0.31$) for HUI3.

For the EQ-5D, most participants (>50 %) responded having some problems with mobility, usual activities, pain/ discomfort, and anxiety/depression. As this was a depression trial, for the anxiety/depression domain, 19 % reported having severe problems, while 72 % responded having some problems, and 9 % indicated no problems.

A similar pattern of responses was observed for the HUI2 and HUI3 for all domains. As to the emotion domain, for the HUI2, 23 % of participants reported the highest level (worst health) compared to only 3 % on the HUI3.

No individual scored at the floor (poorest level) value for either the EQ-5D, HUI2, or HUI3. One participant scored at the ceiling value (highest positive level of health) and only on the HUI3 (Table 2).

Relationships between utility scores and depression

Spearman correlations between the EQ-5D and HUI2 (0.63) and EQ-5D and HUI3 (0.67) were both statistically significant ($p < 0.001$). The HUI2 and HUI3 showed the highest degree of correlation (0.82; $p < 0.001$).

Health utility scores stratified by PHQ-9 depression severity categories show that each instrument demonstrated a downward trend in health-state values for each depression severity level except for one. The severe depression group appeared to increase slightly (e.g., better health) relative to the moderately severe group in health utility score, although their scores were still low. This pattern was consistent across measures (Table 2). Kruskal–Wallis analysis of variance indicated statistically significant differences in the distribution of scores across PHQ-9 depression severity categories for the HUI2 and HUI3 instruments ($p = 0.007$ and 0.014 , respectively), but this was not statistically significant for the EQ-5D ($p = 0.067$).

Discussion

To our knowledge, this is the first study to examine the performance of three commonly used health utility indices in a depressed older African American population, one of the fastest growing minority elderly groups in the United States. Scores on each health utility measure suggest that the target sample experienced some health problems. As expected, most subjects reported having some or severe problems in the anxiety/depression and emotion domains. However, there are differences in index scores of each utility instrument. Both the EQ-5D (0.58) and HUI2 (0.52) mean scores were relatively similar, yet the HUI3 was much lower (0.36), reflecting a poorer health state. This finding is consistent with other studies that have reported large differences between EQ-5D and HUI3 [18, 24, 25]. Differences in scores may be attributed to several factors including variation in the methodology for deriving health-state preferences (standard gamble versus time trade-off),

the utility scoring function (additive vs. multiplicative), and the domains used by each instrument [25].

Previous studies of various chronic conditions using these utility measures, although not focused on older depressed African Americans, provide a point of comparison for our findings. These studies reveal a wide range of EQ-5D index scores (high of 0.94 to a low of 0.22) [26, 27]. Lamers et al. evaluated EQ-5D scores in 616 mental health patients in the Netherlands between the ages of 18–65 [20]. Although the study population was younger than the BTB population, the distribution of EQ-5D scores is similar. For the anxiety/depression domain, 59 % of patients in the Netherlands study reported some problems (level 2), and 33 % reported extreme problems (level 3). Similarly, in our study, 72 % of subjects reported some problems (level 2), and 18 % of subjects reported extreme problems (level 3). Lamers et al. report a mean EQ-5D index score of 0.51 (SD = 0.29) compared to a mean EQ-5D index score 0.58 (SD = 0.21) in this study [20].

Luo et al. evaluated EQ-5D, HUI2, and HUI3 scores for different chronic medical conditions using a United States population-based health survey [18]. The study population was designed to mirror that of the US population, with 14 % of the study population being over the age of 65. Approximately 18 % of the study population had a diagnosis of depression. Unfortunately, Luo et al. did not report the distributions of responses across domains [18]. Health utility indices of the depressed population were 0.75 (EQ-5D), 0.75 (HUI2), and 0.65 (HUI3). These scores are higher than those reported in our study, suggesting that the BTB sample is in a worse health state. As anticipated, our results suggest that utility scores for older depressed African Americans are lower (e.g., poorer) than the general United States population with depression. This finding may be explained by the older age and greater disease burden experienced by BTB participants and is consistent with health disparities research showing poorer health among older African Americans compared to their White counterparts. It may also be explained by the health disparities experienced by this population in the form of reduced access and quality of healthcare. Prior studies have shown that disadvantaged and minority populations are more likely to receive lower quality care or no care, with older African Americans undertreated for depression in primary care settings [10, 28, 29]. Thus, all three measures appear to be detecting the greater disease burden experienced by this population and hence confirm their utility with this group.

Finally, Macran et al. evaluated EQ-5D and HUI3 scores from the York Health Survey. The study population was representative of the general population in York, UK, and only 30 % of respondents were over the age of 65. The distribution of EQ-5D domain responses was skewed toward level 1 (no problems). For the domain assessing anxiety and depression, 79.9 % reported no problems (level 1), in comparison with our study sample in which only 9.3 % of respondents reported having no problems in this domain (level 1). Our study sample reported much higher levels of depression on this domain: 72 % reported indicating have some anxiety/depression (level 2) and 18.6 % reported extreme anxiety/depression. Distribution of responses for the HUI3 in the Macran et al. study was also skewed toward lower levels indicating the population was in better health than our study sample. On the emotion domain of the HUI3, 88 % of Macran's respondents reported a level 1 or 2, in contrast to the BTB sample in which only 42 % reported a level 1 or 2.

Macran et al. also reported overall mean utility scores for respondents on a population level and sub-population level. For the population between the age of 65–74 (18 % of study population), the mean EQ-5D score was 0.78, and the mean HUI3 score was 0.80. The BTB population reported much lower (poorer) utility scores (EQ-5D = 0.58, HUI3 = 0.36). However, given that the BTB sample represents a depressed underserved population, this difference is not surprising. It suggests that these instruments are effective for discriminating

health states experienced by older African Americans [24]. In addition, potential differences in care and access to care between the United States and United Kingdom could contribute to these discrepancies [28, 30].

Overall, this descriptive study suggests that the EQ-5D, HUI2, and HUI3 are moderately correlated with each other for this sample. In addition, our reported correlations are similar to those of other studies, suggesting that these instruments equally performed well in our sample [31, 32]. A comparison of the health utility instruments and PHQ-9 scores revealed that, as severity of depression increases, utility scores decrease or worsen. This trend is true except for those with severe depression, whose health states across all three instruments trend slightly upwards (suggesting slightly better health). Reasons for this finding are unclear but may be due to the small sample size (“severe depression” category $n = 14$), and it is not clear whether the small difference in health is clinically meaningful. Alternately, this difference may reflect an adaptive response to depression, that is, use of positive coping skills that are used more so among severely depressed individuals and which in turn offset negative health states. We also posit that those who are most severely depressed may have more frequent healthcare encounters during which their other health problems are addressed. Finally, in another study, we examined predictors of EQ-5D health utility score [33]. We found that PHQ-9 depression score entered in a multivariate model as a continuous independent variable was significantly predictive of health utility. This analysis suggests a linear relationship between health utility and depression which may be obscured by a small sample when the PHQ-9 scores are categorized into severity levels as reported in this paper. Future research is warranted to evaluate the relationship between depression severity and utility measures.

As all three tools performed relatively well in our population, results do not definitively point to the adoption of one utility measure over another. Yet, there are several considerations to take into account when selecting which tool to use. Of importance is evaluating the domains of the tool and how they relate to the study population. HUI3 has more item and response variations and thus may be more sensitive to health states. The HUI3 may also be more sensitive in elderly populations as its domains are of high relevance for an aging population (e.g., hearing, mobility, speech, vision, and dexterity) and include salient domains not included in the other two utility measures. From a practical standpoint, the EQ-5D is much simpler to implement into a data collection form, and anecdotal comments from study interviewers suggest that participants found the EQ-5D easy to respond to and not burdensome. In contrast, interviewers reported that participants had significant difficulties with the HUI2 and HUI3 items and similarly, interviewers may require specialized training to assure accuracy in administration. Although the HUI3 contains the most relevant domains for capturing quality of life in a depressed older African American population, the ease of administration of the EQ-5D possibly outweighs the theoretical advantage of the HUI3.

Several limitations to our study should be noted. First, this is a cross-sectional analysis, and thus, we are only able to examine associations at a single time point. A longitudinal analysis is warranted to determine the predictive ability of PHQ-9 score on utility scores derived from each of these instruments over time and consistency of health utility values. Another limitation concerns generalizability. As our population was composed of low-income older African Americans from an urban area, it is unclear whether study results can be generalized to other African Americans throughout the United States. A related point is that participants volunteered for this study versus use of random selection, also possibly limiting generalizability. Finally, we are unable to discern from this study which instrument performs best with this target population. However, results are consistent with other studies showing

that the HUI3 yields lower health-state scores, suggesting it may be more sensitive to the types of declines that older adults experience regardless of their racial or ethnic profile.

In conclusion, understanding variation in health utility measures is important for informing cost-effectiveness analyses, outcomes research studies, and the allocation of healthcare resources, and specifically as it concerns minority populations with health disparities. Though utility values have been descriptively reported in the literature, none of this work has examined depression in older African Americans. Our results show that the EQ-5D, HUI2, and HUI3 scores are moderately to highly correlated, providing preliminary evidence of concurrent validity in an older depressed African American population. Findings also indicate that utility scores for this study sample are lower (i.e., poorer) than the general United States population with depression, indicating that this sample is in worse health. This is consistent with what we might expect given the age, disease burden, and health disparities experienced by this population. Our study provides preliminary evidence that these health utility measures are useful to characterize this population and can be used in cost analyses in which health state is the critical dependent variable. As older African Americans, similar to other minority populations, are often excluded from HRQOL research, our descriptive study provides important foundational knowledge. Future research on the performance of these measures from a longitudinal perspective is warranted with this and other minority populations, so that effective health state and cost comparisons can be made for an increasingly diversified aging population.

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Table 1Background characteristics of sample ($N = 118$)

	Mean (+SD)	Percentage (<i>n</i>)	Min	Max
Age ^a	68.3 (8.3)		55.6	96.1
Female		80.5 (95)		
PHQ-9	12.7 (5.1)			
Education				
<High school		17.0 (20)		
High school		28.8 (34)		
>High school		54.2 (64)		
Level of financial difficulty				
Not difficult at all		22.0 (26)		
Not very difficult		12.7 (15)		
Somewhat difficult		39.0 (46)		
Very difficult		26.3 (31)		
Married/living as married		8.5 (10)		
Living alone		60.2 (71)		
Medications				
Anti-depressant ^a		21.4 (25)		
Anti-anxiety ^b		17.2 (20)		
Anti-pain ^a		42.7 (50)		

^a $N = 117$,^b $N = 116$

Table 2

Percentage of responses by domain of EQ-5D, HUI2 and HUI3, and level of health state ($N = 118$)^a

EQ-5D	1			2		3	
Mobility	28.8			70.3		0.9	
Self-care	66.1			33.1		0.9	
Usual activities	26.3			71.2		2.5	
Pain/discomfort	5.9			63.6		30.5	
Anxiety/depression	9.3			72.0		18.6	
HUI2	1	2	3	4	5		
Sensation	11.0	70.3	17.0	1.7	–		
Mobility	13.6	51.7	28.0	6.8	0.0		
Emotion	14.4	45.8	15.3	1.7	22.9		
Cognition	28.0	64.4	5.9	1.7	–		
Self-care	77.1	5.1	11.0	6.8	–		
Pain	16.1	10.2	47.5	19.5	6.8		
HUI3	1	2	3	4	5	6	
Vision	11.9	74.6	2.5	5.9	3.4	1.7	
Hearing	96.6	0.9	0.9	1.7	0.0	0.0	
Speech	93.2	5.9	0.9	0.0	0.0	–	
Cognition	28.0	14.4	17.0	32.2	6.8	1.7	
Emotion	17.0	25.4	38.1	16.1	3.4	–	
Pain	16.1	10.2	25.4	22.0	26.3	–	
Ambulation	41.5	15.3	31.4	5.9	5.1	0.9	
Dexterity	83.9	5.9	1.7	5.1	2.5	0.9	

^aEQ-5D domains are rated as 1 = no problems, 2 = some problems and 3 = severe problems. The HUI2 and HUI3 each have either 4, 5, or 6 possible levels of severity for each domain, with higher numbers representing more severe/debilitated states (i.e., 1 corresponds to no impairment in the domain, and the highest number (4, 5, or 6, depending on the domain) corresponds to complete impairment in the domain)