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Quality of life impacts on 16-year survival of an older ethnically diverse cohort

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Abstract

Objective—The objective of this study is to examine the prediction of mortality, over 16 years, by the domains and domain elements underlying generic measures of quality of life (QoL).

Methods—The method used was an analysis of mortality in an older (65 + years) representative sample ($N = 2130$) of a multicultural community in North Manhattan. Five conventional QoL domains were measured by in-home, rater-administered, and computer-assisted questionnaire: depressed mood, pain, self-perceived health, and function and social relationships.

Results—Some domain scales that qualitatively express distress, such as depressed mood and widespread pain, significantly predicted *lower* mortality (were protective) and felt isolation trended in that direction, whereas domains indicating quantitative limitations such as impairment of functioning in daily tasks, stair climbing, as well as social disengagements and lack of support network significantly predicted *higher* mortality. Domain elements also mattered; contrary to their domain predictions, increased mortality was predicted by the domain elements of somatic symptoms of depression. Self-perceived poor health reflected the predictive (higher mortality) direction of the limitations cluster.

Conclusions—The internal complexity of QoL is underscored by differential impacts of domains and elements on mortality. Clinical implications include setting distress domains as important clinical goals, whereas strengthening limiting domains could result in lengthening life and secondarily relieving distress. The relative weighting of these goals could be derived from patient preferences and clinical efficacy. Fundamental implications lie in the interaction between the person's qualitative evaluations of choices and the quantitative building of desired choices for a better QoL.

Keywords

quality of life domains; multicultural older community; 16-year mortality; fundamental and clinical implications

Introduction

Improvement of quality of Life (QoL) is a main goal of “patient centered” clinical and public health interventions (Higginson and Carr, 2001); thus, QoL measures are extensively used in outcomes research, clinical appraisals, and monitoring of service standards. The values assigned to improvements in QoL are influenced also by the duration over which the improvement will be enjoyed (Salomon, 2008); yet, there is incomplete knowledge and inconsistent findings (cited in the discussion) about the extent to which expected years of life are determined by the domains of QoL such as affect, pain, social relationships, self-perceived health, function, and cognitive status, all components of the most widely used QoL generic measures (e.g., Short Form-36, EuroQol, EuroQol Group, 1990; Quality of Well-Being Scale, Kaplan *et al.*, 1997; Ware *et al.*, 2000); or noted in QoL condition-specific measures (e.g., Minnesota Living with Heart Failure Questionnaire, Rector and Cohn, 1992; DEMQOL, Smith *et al.*, 2007).

Such inconsistency might stem from insufficient or varying attention to the various domains and domain elements of QoL and to interactions between them. We consequently expected that the analysis of mortality impacts of QoLs could be clarified by simultaneously including a spectrum of domains and domain elements of QoL as potential predictors and that this strategy might lead to better understanding of the internal structure of QoL and thereby to improved approaches to clinical application. Generating information in this area could serve as a guide to interventions that take account of both quality and longevity implications, thus, for example, strengthening communication between patient and provider about approaches that foster patient-centered care (Naik *et al.*, 2012).

Methods

Sample

This study follows a representative multi-ethnic sample of community-dwelling older persons (N = 2128) for 16 years or to death from any cause, relating domains of QoL as measured at baseline, to length of survival. Data were from the Washington Heights-Inwood Community Aging Project or North Manhattan Aging Project (Gurland *et al.*, 1997; Cheng *et al.*, 2008).

Procedures

Trained raters applied a systematic questionnaire, the Comprehensive Assessment and Referral Evaluation (CARE) (Gurland *et al.*, 1977; Gurland, 1994; Gurland and Katz, 2002) in either English or Spanish, assisted by a computer program.

Measures

Homogeneous scales for the CARE were constructed by latent class and factor analysis (Golden *et al.*, 1984b; Teresi *et al.*, 1989). Thus, each scale has distinct content and relationships within a pool of items developed by a multidisciplinary team versed in the prevailing medical, psychiatric, psychological and social service professional. and lay language of discomforts and functioning as it pertains to older populations in the community and in health an care settings. Consequently, the scales are recognizable as potential needs for relieving interventions and as impediments to improving QoL; in the absence of such needs or impediments, certain items reflect positive QoL. Further, psychometric evidence of validity has been published for constructs (Teresi *et al.*, 1984a), concurrent and predictive validity (Teresi *et al.*, 1984b), case detection (Golden *et al.*, 1983), and identification of item bias across ethnicity (Teresi *et al.*, 1995). Mortality data were from the National Death Index (Division of Vital Statistics, National Center for Health Statistics). Measures (Table 1) assessed the following domains: *depressed mood and related somatic complaints, happiness, pain, self-perceived health, function (basic and instrumental activities of daily living (ADL), climbing stairs, range of movement, restriction of desired activities), social relationships (felt isolation, disengagement, support), cognitive impairment, subjective memory, and cardiovascular syndrome.*

Aims

The main aim of the analyses was to determine the impact by QoL domains on survival over a period of 16 years. Selected scales represent each QoL domain. Published findings guided the selection of scales; details and citations are placed in the Discussion section. Two basic models were tested. The first model contains scales and continuous variables, with some exceptions. The second model substitutes variables that were already included in scales but are of substantial interest and have been examined in previous studies, for example, happiness, satisfaction, restricted health limitations, subjective memory, and affective and somatic depression items. Variables have been ordered by QoL domains.

Analyses

The analytic approach for mortality prediction was a Cox proportional hazards model. As an initial check of colinearity among potential predictors, a forward stepwise Cox regression model was performed. Redundant variables were dropped from the subsequent models. Examination of these results provided guidance in selecting variables for the final model. Additional tests of colinearity were performed by examining the tolerance and variance inflation factors. The proportional hazards assumption was checked by including interaction terms of the main effect by log transformed time in the model, and also graphically, including Schoenfeld residuals; several variables found to be in violation were removed. Sensitivity analyses examined the influence of variables that were dropped. Estimates and results were similar among final models and those tested in sensitivity analyses.

Results

Socio-demographic characteristics

Table 2 provides information regarding participants' baseline demographic, clinical, and functional status. Participants had a mean age of 76 years, were mostly women (69.3%), and a high proportion were Latino (46.8%). A relatively large proportion (23.5%) reported that pain caused them to stop ordinary activities. The mean depression score for the sample at baseline was 5.31 (0–22, standard deviation (SD) = 4.17): 20% of the sample scored 5+ on the depression scale, accounting for 80% of those taking medications for emotions; 6.8% reported being sad or depressed most of every day for at least 2 weeks in the past month. By the 16-year endpoint, there were 1507 deaths (70.8% of cohort). The average age of death was 81.45 years (SD = 8.22); the time to death was on average 10.22 years (SD = 5.60). The baseline distribution of demographics and candidate predictors of death is shown in Table 2.

Table 3 shows the results from the Cox regression analyses. For those variables that were coded in the impaired or disordered direction, the impact is portrayed either in terms of shorter survival by significant and larger hazard ratios (HRs) or in the direction of longer survival (protective effects) indicated by HRs below one. For example, an HR of 1.20 translates to an average risk of death 20% higher for those with a limitation than for those without it. Most variables were coded so that higher scores indicated more impairment.

Affect—As shown in Table 3, Model 1, the depression scale was significantly predictive ($p = 0.009$) but acted protectively (HR = 0.978), whereas Model 2 shows that the somatic-free scale of depressed affect was comparably significant and protective. In contrast, the scale of somatic symptoms associated with depression was not significant. Sensitivity analyses unadjusted for other variables showed that the somatic scale was predictive of mortality ($p = 0.008$; HR = 1.077), whereas depressed affect was not significant ($p = 0.121$; HR = 0.968). Further, in Table 4, when demographic, cardiovascular, pain, and felt isolation scales were added to the Cox regression, the somatic scale became marginally significant in the direction of increased mortality ($p = 0.079$; HR = 1.055), but the affective scale remained not significant with the direction of effects being protective ($p = 0.391$; HR = 0.980). The effect of then adding self-reported function, self-perceived health, and disengagement was that the somatic scale lost significance ($p = 0.851$), and the affective scale gained significance in the direction of protective impact ($p = 0.009$; HR = 0.941). Moreover, examination of zero-order correlations between individual items in the depression scale and mortality at 16 years showed that only one out of 19 pure affective items increased mortality ($p < 0.05$), whereas the comparable figure for the somatic scale was four out of 8.

Because the findings of protective effects of the depression scale impact on mortality might seem counter-intuitive, we examined the selected zero-order correlations of depression with other variables posited or found in the literature to be related to depression. All were related to depression in the expected direction ($p < 0.001$): unhappiness (0.208), life dissatisfaction (0.368), gender (0.175), function (0.317), self-perceived health (0.403), energy (0.562), disengagement (0.252), and pain (0.478), whereas the somatic scale was appropriately correlated with severity of self-reported health (0.330).

Pain—Self-reported baseline pain was significantly ($p < 0.001$) protective (HR = 0.961) and, if severe enough to stop ordinary activity (Table 3, Model 2), was equally significant and strongly protective (HR = 0.679) (Table 3). However, often taking medications to relieve pain was not significant.

Self-perceived health—Worse self-perceived health, as a continuous variable, was a significant ($p = 0.007$) predictor of mortality (HR = 1.101) (Table 3, Model 2) while excellent as contrasted with poor self-perceived health was strongly protective ($p = 0.004$; HR = 0.694): that is, the adjusted risk of death was 31% lower.

Function—There was a significant ($p < 0.001$) increased risk of mortality associated with self-report of functional impairment (HR = 1.080), and by the objective testing of range of arm movement (HR = 1.118) treated continuously; however, the HR for the single item, “cannot lift both arms over head at the same time,” was 1.832. Additionally, the item, “must rest after one or two flights of stairs,” was predictive of mortality (HR = 1.341). The health restrictions subscale, which measures health limitations on *desired* levels of activities, was also significant ($p < 0.001$; HR = 1.051).

Social relationships—Felt isolation was not a significant predictor of mortality, but social disengagement was predictive of mortality ($p < 0.001$, HR = 1.054), and social support was protective ($p = 0.003$, HR = 0.966).

Cognitive impairment—Cognitive impairment was not significant nor was subjective memory.

Cardiovascular—The syndrome of cardiovascular symptoms was a significant predictor of mortality ($p < 0.001$, HR = 1.029).

Socio-demographics—As expected, several demographic variables were highly salient ($p < 0.001$) predictors of mortality: older age (HR = 1.076), female status (HR = 0.608), and self-identified Latino status (HR = 0.696). The adjusted average risk of death for women was 39% lower than for men and 30% lower for Latinos than for non-Latino whites. Education and annual household income had negligible but significant ($p = 0.009$) impact on survival.

Time to death—To determine the constancy of shorter and longer term effects, we compared the results over 6 years with that over 16 years: most estimates were consistent; exceptions were significant over 16 years but not over 6 years.

Discussion

Data gathered by the 400 items in the CARE interview questionnaire on health, social, and functional problems of this representative multicultural sample of over 2000 ethnically diverse community residing elders, are a rich source of information for examining the structure and meaning of QoL. We had access to over 20 psychometrically derived scales

with content related to QoL and to numerous domain elements. We opted for a domain level of analysis, not focusing on a global indicator of QoL.

Main findings

The predictive power for 16-year mortality varied among the domains, with distressing–comforting domains (depressed mood, pain, felt isolation, and loneliness), mostly qualitative and nonobservable latent attributes, being weaker predictors of mortality than the limiting–enabling, more quantitative and observable domains (functional capacities, self-reported health, engagement in social activities and tasks, and social support network). These distinctions could parallel distinctive physician or patient preferences for the goals of treatment, bearing on relief of distress or overcoming limitations that influence longevity; a balancing of clinical emphases that threads through all of medicine. The patient’s preferences can be brought out by exploring the values they attach to each of the dimensions. Moreover, each of the domains carries its own need for services.

Depression, somatics, and mortality—The analyses of depression and mortality covered prediction by the full scale of depression, a somatic-free affective scale, an affective-free somatic scale, and distinctive items in the depression scale. Control variables included the other generic QoL domains, cardiac symptoms, and demographic indicators in various combinations. Across this dissection of relationships, the depression and affective scales and items tended to afford a protective influence on mortality, whereas the somatic items and scales predicted increased mortality. This latter mortality effect was nullified when conditioned by scales of functioning. Although the protective direction of the impact on mortality by depression seemed counterintuitive, a check on the directionality of correlations between depression and multiple other scales were all as conventionally expected.

Several research reports have questioned whether depression, as a scale score or as a diagnosis, substantially impacts cardiac mortality (Lane *et al.*, 2001; Sorensen *et al.*, 2005; and Frasure-Smith and Lesperance, 2008). However, Kurdyak *et al.* (2011), followed a cohort of hospitalized cardiac patients in which the controlled HR for mortality in severe versus minimal depression was 1.35. Parashar *et al.* (2006) found adjusted HRs for increased mortality rates of 1.34–1.71 ($p = 0.05$) at 6 months after myocardial infarction (MI) in 1873 patients. Carney *et al.* (2008) found that the HR for all-cause mortality associated with major or minor depression was 1.76 for 5-year survival after MI, and Lett *et al.* (2004), in a review of morbidity and mortality of coronary artery disease, noted that adjusted risk for depression was between 1.5 and 2.5.

Our analysis showed that it is only the somatic component of depression that predicts mortality, perhaps accounting for some of the conflict between published studies. Recent reports by other investigators are along the same lines. Martens *et al.* (2010) confirmed in a sample of 473 patients with MI, the earlier conclusion of De Jonge *et al.* (2006), and of Schiffer *et al.* (2009), that somatic, not cognitive, symptoms of depression are associated with a worse cardiovascular prognosis, possibly by effects on heart rate variability (De Jonge *et al.*, 2006). Smith and Torrance (2012) followed 380 consecutive patients with

congestive heart failure for a median of 2.3 years: somatic symptoms of depression (HR = 1.41, 95% confidence interval (CI):1.05–1.88, $p = 0.02$) were independently associated with increased mortality risk, not explained by exertion fatigue; they recommended that behavioral interventions should focus on somatic manifestations of depression in patients with congestive heart failure.

These findings support the notion that it is the somatic items within most depression measures that may be the driving force in predictions of mortality. Furthermore, our review of measures of depression in common use, as well as Diagnostic and Statistical Manual of Mental Disorders–Fourth Edition criteria for major depression episode, highlighted the admixture of somatic items. For example, 17% of the Beck Depression Inventory Short Form (Beck *et al.*, 1961) items are somatic; 43% of the Hamilton Rating Scale (Hamilton, 1960), 13% of the Geriatric Depression Scale (Yesavage *et al.*, 1983), 44% of the Short Form-36 depression subsection (Ware and Sherbourne, 1992), 56% of the Patient Health Questionnaire 9 (Spitzer *et al.*, 1999), 40% (4/10) of the Montgomery Asberg Depression Rating Scale (Montgomery and Asberg, 1979), and one fourth (3/12) of the EURO-D (Prince *et al.*, 1999) items are also somatic. About one fourth of the CARE Depression Scale (Methods section) was comprised of somatic items. The Diagnostic and Statistical Manual of Mental Disorders–Fourth Edition major depression episode specifies somatic states in 5/9 criteria, as well as the requirement to judge and exclude possible somatic causes.

If, as we find, depression *is* associated with a reduced mortality risk, it would call for a theory of causal pathways: one such candidate, “depressive realism,” first described by Alloy and Abramson (1979) and Dobson and Franche (1989), remains controversial (Moore and Fresco, 2007). This theory argues that depression, within limits of severity, makes a person more accurate in perception of problems, progress, and need for help. Alternatively, depressive complaints may call clinical attention to the need for instituting or adapting treatment, or it may exaggerate the baseline level of illness symptoms.

Pain—As with depression, inconsistencies in findings on pain and mortality have been noted (Torrance *et al.*, 2010), possibly due to differences between samples (Reilly *et al.*, 1990). Several studies have found, as have we, no excess mortality associated with painful syndromes. Andrews *et al.* (2013) found that after adjustment, especially for function, pain did not predict death over 10 years in a nationally representative sample (N = 12,631) of community subjects 60 years and older. Macfarlane *et al.* (2007) replicated the design of his own earlier studies (Macfarlane *et al.*, 2001) on mortality of chronic widespread pain, but, although his previous studies had shown a doubling of cancer and cardiovascular mortality, the replication study (Mini-Finland Health Survey, N = 7182 persons aged 30 years and over, followed for over 14 years) found no increase of mortality and noted a *protective* effect of pain for several disease-specific causes of death including cancer death (relative risk: 0.64; 95% CI: 0.46–0.91). Torrance *et al.* (2010) also reported a *protective* effect of chronic pain on death from cerebrovascular disease, in a postal survey of 3605 randomly selected members of the general population aged over 25 years, and 6940 recruited subjects receiving repeat prescriptions of analgesics; but severe chronic pain (in angina, arthritis, backache, injury, and cancer) was significantly associated with all-cause and cardiac mortality over 10 years. This underlines, as in the case of depression, the added information

obtainable from distinctions within the boundaries of QoL. However, because coexisting depression symptoms were controlled in the analysis of pain impacts, the realism theory cannot readily be carried over to pain. Nevertheless, it may be that readiness to report pain could act to focus and intensify treatment.

Function—There is general agreement with our finding that functional impairment significantly increases mortality. A meta-analysis of 80 studies on the association between varieties of physical activity and mortality, estimated correlations of 0.65 for total activity, 0.74 for leisure activity, 0.64 for ADL and 0.83 for occupational activities (Samitz *et al.*, 2011). Hutchings *et al.* (2011) screened over 4000 papers bearing upon QoL outcomes of femoral fracture: function (ADL) scales were the most commonly used predictors. Our scale relies on self-report, but is cross-validated by observational testing of the range of arm movements: this test procedure, manageable over a range of health problems was predictive of mortality, and one item, “inability to lift arms over head,” ($n = 203$; 9.5% of sample) conferred an 83% higher risk of death: a clinically meaningful mortality impact.

Cognitive impairment—The test of cognitive impairment is one (imperfect) manifestation of dementia, but there are other potential associations of dementia, such as limitations of function, and there are variables that can reflect underlying vulnerability to dementia, such as advanced age or cardiovascular symptoms. Thus, variables that can reflect the causes and consequences of dementia may predict mortality in part because they are associated with dementia and at the same time compete for predicting dementia consequences (like mortality) with cognitive impairment as a more direct indicator of dementia. Thus, in this study, cognitive impairment standing alone does predict 16-year mortality ($HR = 1.117$, $p < 0.001$) but is not significantly predictive when accompanied by the other scales, especially function (Sensitivity analyses available on request).

Self-perceived health—The four-level item was a significant predictor of mortality, and the risk of death for those reporting excellent health was 31% lower than for those reporting poor health, after adjusting for several scales of functioning. Other studies have also found that self-assessed health has substantial predictive power for survival even after controlling for objective health indicators (Dowd and Zajacova, 2007; Huisman *et al.*, 2007; Erdogan-Ciftci *et al.*, 2010). The pathways accounting for the impact on 16-year survival of self-perceived health is suggested by two related analyses: (i) the influence of self-perceived health on mortality at 16 years without adjustment for other variables is 1.219, whereas the addition of other variables as in the model in this paper reduces the HR to 1.101 and (ii) linear regression analyses show that the major influences on self-perceived health are health restrictions (standardized beta = 0.248 ($p < 0.001$)), depression (beta = 0.156 ($p < 0.001$)), pain (beta = 0.120 ($p < 0.001$)), disengagement (beta = 0.106 ($p < 0.001$)), cognitive impairment (beta = 0.064, ($p = 0.007$)), cardiovascular (beta = 0.049 ($p = 0.018$)) and gender (beta = -0.042 ($p = 0.046$)) (Tables available on request).

Social relations—Mortality, adjusted for other covariates, was predicted by the baseline lack of social support and disengagement scales but not by the felt isolation scale: this is in keeping with the impact on death rates by quantitatively limiting relationships, in contrast to

qualitatively distressing states. Aside from the one item on loneliness that is confounded by the contingency of physical limitation, none of the other five loneliness items significantly predicted mortality. Other researchers have noted an association between low social support and mortality. In the Reduction of Atherothrombosis for Continued Health Registry (N = 44,573), living alone (19%) increased the four-year risk of cardiovascular mortality for age 66–80 years (adjusted HR, 1.12 (95% CI: 1.01–1.26)), but not for older persons older than age 80 years (Udell *et al.*, 2012). In a registry (PREMIER) of patients hospitalized with Acute MI in 2003 through 2004, living alone did not, with multivariable adjustment, alter 4-year mortality (Buchholz *et al.*, 2011). Buchholz and Krumholz (2012) discuss several studies connecting living alone to mortality risk, possibly through poor nutrition, noncompliance, and inactivity; this did not apply to loneliness. However, Perissinotto *et al.* (2012) found in a nationally representative sample of older persons that loneliness (feeling left out, isolated, or lacking companionship) as distinct from social support and depression, increased mortality over 6 years (adjusted HR, 1.45 at 95% CI: 1.11–1.88).

Intervention to resolve causal direction—Ambiguities in the direction of influence among health disorders (Gurland *et al.*, 2000) are well known, including issues of reverse causality, confounding coexistent influences, and serial timing of cohort data. Reverse causality might work to increase levels of depression, for example in cardiac disorders, through increased cytokine levels, health restrictions and lack of exercise (Barbour *et al.*, 2007). For these reasons, hypotheses based on statistical associations must be put to the test of intervention. However, an extensive literature review on treating depression in cardiac disorders (Thombs *et al.*, 2008) reported only “modest” reductions in depressive symptoms and no change in cardiac outcomes, whereas the Enhancing Recovery in Coronary Heart Disease Patients trial achieved no impact on survival by cognitive behavioral therapy and antidepressants (Berkman *et al.*, 2003; van Melle *et al.*, 2004).

Limitations of the study

Community sample: Neither medical nor psychiatric diagnoses were included in the analyses, although items in the scale of depressed mood correspond to almost all the criteria for major depressive episode or dysthymia, an objective test of cognitive status was highly related to the diagnosis of dementia, and a cardiovascular scale of ischemia and dyspnea is highly suggestive of cardiac insufficiency. Similarly, the diagnoses underlying pain were not obtained, but the symptom syndrome referenced primarily widespread joint and muscle involvement and also some constellations that classically point to cardiac ischemia. The level of the subject’s functioning is based mainly on self-report but correlates strongly with the objective test of range of upper limb movement. We did not concentrate on acute events, yet, 17.8% of subjects had been hospitalized in the previous year, 5.7% had spent 2 weeks or more ill in bed, 23.8% reported having a heart condition, and 15.5% had chest pain on exertion (relieved by rest or medication in 7.5%). **Validity:** the scope of the research validity of the CARE scales rests in part upon psychometric analyses described under Methods section, and in part upon the derivation of its content. The latter was developed by a multidisciplinary research team, including clinicians, for international studies on the health and social problems of older persons in the community and in long-term care settings (Gurland *et al.*, 1983). Thus, the domains reflect expert interests couched in the lay language

of patients and corresponding to the domains of “generic” and some condition-specific QoL measures. However, there may be no direct way of relating the current findings to those of QoL measures that build on the views of patients or their care givers about their QoL or quality of care, nor to global indices of quality. For analyses of the determinants of QoL and implications for related interventions, multiple domains offer greater transparency in relevance to specific interventions than do global indicators, even when the latter are preference weights applied to domain scores as the raw material. *Effect sizes*: the size of the effect on mortality is shared among 14 competing variables that have an HR of $p = 0.05$ in the Cox model, thus limiting the effect size of each particular variable. However, in practice, an intervention to improve any single variable can be expected to have a larger impact than is reflected in the “shared” HR. Similarly, intervening with several of the significant variables is likely to increase the desired impact on mortality to a greater degree than would be implied by summing their respective HRs.

Conclusions

The internal complexity of QoL is underscored by the differential impacts of domains and domain elements on mortality. Clinical implications include setting distress domains as important therapeutic goals while strengthening limiting domains that could lengthen life and secondarily relieve distress. The relative weighting of these goals could be derived from patient preferences and clinical efficacy. Fundamental challenges to research lie in describing, understanding, and influencing the interaction between the person’s qualitative evaluations of choices and the quantitative building of desired choices for a better QoL (Gurland and Gurland, 2009a, 2009b).

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Key points

- The internal complexity of quality of life is underscored by the differential mortality impacts of its domains and domain elements.
- Patient preferences can weight clinical balancing of relief of distressing (or comforting) domains with the strengthening of the longevity promoting limiting (or enabling) domains.
- Insufficient control of the differing mortality impacts of *elements* within domains may account for some inconsistencies in published studies.
- Expressed degrees of comforting (or distressing) domains may identify desired elements of the choice environment, which the enabling (or limiting) domains build into a living context.

Table 1

Description of measures in the analysis

Domain	Number of items	Description/example of items
Affect		
Depressed mood	22	Regrets; sadness most of day, everyday, or more than 2 weeks; not worth living, and nothing enjoyed
Related somatic items	5	Poor appetite, disrupted sleep, lack of energy, and loss of weight
Happiness	1	Four levels: very happy, fairly happy, not very happy, and not happy at all
Pain		
Physical pain	13	Admits to "arthritis or rheumatism," "painful stiffness or swelling of joints," "painful stiffness or swelling of muscles or tendons," "pain in legs or feet," "painful swelling in arms or hands," "backaches or neck aches," "headaches," "frequent other aches or pains not localized," "frequent other aches or pains in specific parts," and "pain stops ordinary activities"
Widespread pain	3	Joints, muscles, and head
Severe pain	3	Frequent medication use; pain disrupts sleep and activities
Site-specific pain	5	Chest pain on exertion and pain limits walking
Self-perceived health	1	Age peer comparison: four levels: excellent, good, fair, and poor
Function		
Basic and instrumental activities of daily living	15	Level of assistance with meal preparation, shopping, financial matters, bathing/showering, heavy chores, dressing, etc.
Stairs	3	Effort to climb stairs without resting
Constructed range of movement	3	Unable to touch toes, lift arms over head, and reach behind back
Health restricts desired activities	19	Health problems limit leisure activities, light chores, heavy chores, mobility, etc.
Social Relationships		
Felt isolation	6	Lonely, not close, no confidante, and keeps problems to self
Disengagement	13	No hobbies, excursions, exercise, television, volunteering, games, clubs, religious activities
Social support	14	Marital status, household membership, and family contacts
Cognitive impairment (memory)		
Subjective	9	Complaints about lapses and interference with tasks, e.g., chores, shopping, and business
Cognitive test	15	An objective test of cognitive performance
Cardiovascular syndrome	10	Mentions symptoms of heart trouble, high blood pressure, chest pain-discomfort on slight exertion, relieved by rest-medication, continuous-heavy-gripping-central, difficulty-or assistance walking due to pain in chest, prescribed medicine for heart condition or hypertension
Demographics		Age, gender, race/ethnicity, education and income

Table 2Baseline ($n = 2128$) distribution of demographics and candidate predictors of death

	<i>n</i>	%
Demographics		
Female	1475	69.3
Self-reported race		
Latino	996	46.8
African American	717	33.7
White	415	19.5
Age at baseline (mean, SD)	75.99	(5.82)
Education (years) (mean, SD)	8.24	(4.59)
Average annual income of household (mean, SD)+	10,513.3	(7752.39)
Affect		
Depression homogeneous scale (mean, SD)	5.31	(4.17)
Pain		
Physical pain (mean, SD)	4.18	(3.13)
Pain stops ordinary activity—Yes	500	23.5
Self-perceived health		
Self perceived health (versus age peers)		
Excellent	478	22.5
Good	930	43.7
Fair	590	27.7
Poor	130	6.1
Function		
Function reported by subject (mean, SD)	2.79	(3.57)
Unable to touch toes, lift arms over head, reach behind back (mean, SD)	0.37	(0.84)
Social relationships		
Felt isolation (mean, SD)	1.00	(1.23)
Social disengagement (mean, SD)	6.76	(2.57)
Memory		
Care Diagnostic (mean, SD)	2.73	(2.97)
Cardiovascular syndrome		
Cardiovascular (mean, SD)	2.01	(2.08)

SD, standard deviation.

Table 3

Results of Cox proportional hazards models (+ indicates that variables are in the less impairment or higher levels direction)

	Model 1					Model 2				
	B	SE	Sig.	HR	95% CI for HR Lower Upper	B	SE	Sig.	HR	95% CI for HR Lower Upper
Depression										
Depression homogeneous scale (higher score = more severe)(depress1)	-0.023	0.009	0.009	0.978	0.961 0.994	—	—	—	—	—
Happiness (happy_1s) (scored in the unhappy direction)	—	—	—	—	—	-0.014	0.062	0.817	0.986	0.873 1.114
Affective items (g7_1xr) (higher score, more affective disorder)	—	—	—	—	—	-0.060	0.024	0.012	0.942	0.899 0.987
Related somatic items (somatic1) (higher score, reflects greater symptoms)	—	—	—	—	—	-0.013	0.031	0.680	0.987	0.928 1.050
Pain										
Physical pain (high score reflects greater impairment)(pain_1)	-0.039	0.010	<0.001	0.961	0.942 0.981	—	—	—	—	—
Pain stops ordinary activities (0 = no; 1 = yes)(s159s)	—	—	—	—	—	-0.387	0.080	<0.001	0.679	0.580 0.794
Often takes medication to relieve pain (0 = no; 1 = yes)(s160s)	—	—	—	—	—	0.065	0.074	0.381	1.067	0.923 1.232
Self health										
Self perceived health (age peer comparison)(s161h1s)	0.096	0.035	0.007	1.101	1.027 1.180	—	—	—	—	—
Excellent (versus poor)+	—	—	—	—	—	-0.365	0.128	0.004	0.694	0.540 0.893
Good (versus poor)+	—	—	—	—	—	-0.235	0.114	0.039	0.791	0.633 0.989
Fair (versus poor)+	—	—	—	—	—	-0.262	0.111	0.018	0.770	0.620 0.956
Function										
Function reported by subject (high score = greater impairment)(sfcp1r1)	0.077	0.011	<0.001	1.080	1.057 1.103	—	—	—	—	—
Unable to touch toes, lift arms over head, reach behind back (high score = greater impairment)(romp)	0.111	0.035	<0.001	1.118	1.044 1.197	—	—	—	—	—
Activity change to reduce risk (0 = not = limited; 1 limited)(s199s)	—	—	—	—	—	-0.099	0.062	0.111	0.906	0.802 1.023
Observed cannot lift both arms over head at same time (0 = no; 1 = yes)(s209)	—	—	—	—	—	0.605	0.085	<0.001	1.832	1.550 2.165
Health restrictions (restrctrv)	—	—	—	—	—	0.050	0.009	<0.001	1.051	1.033 1.071
Effort to climb stairs (rest after one or two flights versus other)(s194r)										
Must rest after one or two flights of stairs	—	—	—	—	—	0.293	0.067	<0.001	1.341	1.176 1.528
Cannot climb even one flight of stairs without resting	—	—	—	—	—	0.286	0.089	0.001	1.330	1.117 1.585
Social										
Felt isolation (high score reflects greater felt isolation)(isolate_1)	-0.012	0.025	0.632	0.988	0.941 1.038	—	—	—	—	—
Social disengagement (high score reflects greater disengagement)(engage_1)	0.052	0.013	<0.001	1.054	1.028 1.080	—	—	—	—	—

	Model 1						Model 2					
	B	SE	Sig.	HR	Lower	Upper	B	SE	Sig.	HR	Lower	Upper
Social support (high score reflects greater social support)(support_1)+	-0.035	0.012	0.003	0.966	0.944	0.988	—	—	—	—	—	—
Cognitive impairment												
Care diagnostic (high score reflects greater impairment)(cdiagpr1)	0.020	0.011	0.073	1.020	0.998	1.042	—	—	—	—	—	—
Subjective memory (high score reflects greater impairment)(memory_1s)	—	—	—	—	—	—	0.004	0.013	0.754	1.004	0.978	1.031
Cardiovascular (high score = more symptoms)(cardiov1)	0.058	0.013	<0.001	1.059	1.032	1.087	0.040	0.013	0.002	1.041	1.014	1.068
Demographics												
Age at T1 (age_1)	0.073	0.005	<0.001	1.076	1.066	1.087	0.084	0.005	<0.001	1.088	1.077	1.098
Gender (male = 0; female = 1)(gender)	0.497	0.060	<0.001	0.608	0.541	0.684	0.544	0.060	<0.001	0.580	0.516	0.652
Self-reported race (selfrace)												
Latino	-0.362	0.085	<0.001	0.696	0.590	0.822	-0.292	0.084	0.001	0.747	0.633	0.881
African American	0.013	0.076	0.866	1.013	0.873	1.175	0.077	0.075	0.306	1.080	0.932	1.252
Yearly income (income_y) +	0.000	0.000	0.009	1.000	1.000	1.000	0.000	0.000	0.006	1.000	1.000	1.000
Education (years)(educorg1) +	0.019	0.007	0.008	1.019	1.005	1.034	0.014	0.007	0.054	1.014	1.000	1.028

SE, standard error; HR, hazard ratio, CI, confidence interval; B, Beta; Sig, Significance level.

Table 4
Cox regression focusing on somatic-free affective (g7_1xr), and Related affective-free somatic (somatic1) scales

	B	SE	Sig.	HR	95% CI for HR		HR	Sig.	SE	B	SE	Sig.	HR	95% CI for HR	
					Lower	Upper								Lower	Upper
Affective items (g7_1xr)	-0.020	0.023	0.391	0.980	0.936	1.026		0.009	0.024	-0.061	0.024	0.009	0.941	0.898	0.985
Related somatic items (somatic1)	0.054	0.031	0.079	1.055	0.994	1.120		0.851	0.031	-0.006	0.031	0.851	0.994	0.936	1.056
Age at T1 (age_1)	0.091	0.005	<0.001	1.095	1.085	1.105		<0.001	0.005	0.076	0.005	<0.001	1.079	1.069	1.089
Gender (male = 0; female = 1) (gender)	-0.410	0.059	<0.001	0.664	0.592	0.745		<0.001	0.059	-0.463	0.059	<0.001	0.629	0.560	0.707
Self-reported race (selfrace)															
Latino	-0.322	0.084	<0.001	0.725	0.615	0.855		<0.001	0.085	0.356	0.085	<0.001	0.700	0.593	0.827
African American	0.119	0.075	0.113	1.126	0.972	1.305		0.506	0.075	0.050	0.075	0.506	1.051	0.907	1.219
Yearly income (income_y)+	0.000	0.000	<0.001	1.000	1.000	1.000		0.013	0.000	0.000	0.000	0.013	1.000	1.000	1.000
Education (years) (educorg)+	0.007	0.007	0.285	1.007	0.994	1.021		0.017	0.007	0.017	0.007	0.017	1.017	1.003	1.031
Cardiovascular (high score reflects greater cardiovascular problems) (cardiov1)	0.074	0.013	<0.001	1.077	1.050	1.105		<0.001	0.013	0.055	0.013	<0.001	1.056	1.029	1.083
Physical pain (high score reflects greater impairment) (pain_1)	-0.008	0.010	0.451	0.993	0.973	1.012		<0.001	0.010	-0.044	0.010	<0.001	0.957	0.938	0.976
Felt isolation (high score reflects greater isolation) (isolate_1)	-0.006	0.024	0.796	0.994	0.949	1.041		0.921	0.024	-0.002	0.024	0.921	0.998	0.952	1.045
Self perceived health (age peer comparison) (slfhlth1s)	—	—	—	—	—	—		0.010	0.035	0.091	0.035	0.010	1.095	1.021	1.173
Function reported by subject (high score reflects greater impairment) (sfctpr1)	—	—	—	—	—	—		<0.001	0.009	0.100	0.009	<0.001	1.105	1.086	1.124
Social disengagement (high score reflects greater disengagement) (engage_1)	—	—	—	—	—	—		<0.001	0.013	0.055	0.013	<0.001	1.057	1.031	1.083

SE, standard error; HR, hazard ratio, CI, confidence interval; B, Beta; Sig, Significance level.