



University of Dundee

How is subjective well-being related to quality of life? Do we need two concepts and both measures?

Skevington, Suzanne M.; Boehnke, Jan

Published in:
Social Science and Medicine

DOI:
[10.1016/j.socscimed.2018.04.005](https://doi.org/10.1016/j.socscimed.2018.04.005)

Publication date:
2018

Licence:
CC BY-NC-ND

Document Version
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

Citation for published version (APA):

Skevington, S. M., & Boehnke, J. (2018). How is subjective well-being related to quality of life? Do we need two concepts and both measures? *Social Science and Medicine*, 206, 22-30.
<https://doi.org/10.1016/j.socscimed.2018.04.005>

General rights

Copyright and moral rights for the publications made accessible in Discovery Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Accepted Manuscript

How is subjective well-being related to quality of life? Do we need two concepts and both measures?

S.M. Skevington, J.R. Böhnke



PII: S0277-9536(18)30164-3

DOI: [10.1016/j.socscimed.2018.04.005](https://doi.org/10.1016/j.socscimed.2018.04.005)

Reference: SSM 11682

To appear in: *Social Science & Medicine*

Received Date: 15 December 2016

Revised Date: 4 March 2018

Accepted Date: 4 April 2018

Please cite this article as: Skevington, S.M., Böhnke, J.R., How is subjective well-being related to quality of life? Do we need two concepts and both measures?, *Social Science & Medicine* (2018), doi: 10.1016/j.socscimed.2018.04.005.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

How is subjective well-being related to quality of life?

Do we need two concepts and both measures?

S. M. Skevington

International Hub for Quality of Life Research

Division of Psychological Sciences and Mental Health

Faculty of Biological, Medical and Health Sciences

University of Manchester, Manchester, UK.

and

J. R. Böhnke

Mental Health and Addiction Research Group

Hull York Medical School and Department of Health Sciences

University of York, York, UK

Corresponding author: Prof S.M. Skevington, Division of Psychological Sciences and Mental Health, Faculty of Biological, Medical and Health Sciences, Univ. of Manchester, Manchester, M13 9PL, UK.

Email suzanne.skevington@manchester.ac.uk

Tel 0161-275-2584.

Author note: Dr Böhnke is now Senior Research Fellow at the School of Nursing and Health Sciences, and Dundee Centre for Health and Related Research, Univ. of Dundee, Dundee, UK.

Disclosures of financial support: The WHOQOL SRPB Centres received fieldwork funding from the World Health Organisation (WHO), Geneva; WHO obtained some funds from the Fetzer Institute, Kalamazoo, USA.

Conflict of Interest: Dr Böhnke is Co-Editor in Chief of Quality of Life Research

Keywords: quality of life, well-being, health, theory, model

1

2

How is subjective well-being related to quality of life?

3

Do we need two concepts and both measures?

4

Keywords: quality of life, well-being, health, theory, model, WHOQOL

ACCEPTED MANUSCRIPT

5 **Abstract**

6 Subjective well-being (SWB) and subjective quality of life (QoL) are key concepts describing
7 experience, capacities, states, behaviours, appraisals, and emotional reactions to
8 circumstances. Used widely in public discourse, policy, and research, their theoretical and
9 empirical relations remain little explored. The present research aimed to develop an
10 integrated model of SWB and QoL through empirically testing its overlapping and exclusive
11 dimensions.

12 Survey data was obtained from $N = 2,533$ in 11 countries. Adults completed the WHOQOL
13 Spirituality, Religion and Personal Beliefs (SRPB) instrument which assesses 33 QoL facets
14 in 6 domains. The facets operationalise components of the hedonic SWB model, extended
15 with eudaimonia, as SWB+. Network analyses, and regression models with random effect for
16 cultural centre, assessed the differential contributions of SWB+ and QoL in predicting
17 general QoL, explanatory power, and model parsimony.

18 When all SWB+ and QoL variables are assessed together, the final model explains more
19 variance in general QoL than either of the competing models; also it shows the most
20 parsimonious fit. This fully integrated model contains only positive feelings from SWB+,
21 with 13 other QoL facets drawn from all six domains when adjusted for health status and
22 educational level.

23 These findings provide the foundation for a new *Life Quality and Well-being (LQW)* model
24 that awaits confirmation. The LQW improves on existing models of SWB+ and QoL by
25 better explaining general QoL than facets of either model on their own. The 14 selected facets
26 potentially offer a new, single measure with considerable conceptual breadth, and
27 international foundations.

28 **How is subjective well-being related to quality of life?**

29 **Do we need two concepts and both measures?**

30 ***1. Introduction***

31 Subjective well-being (SWB) and subjective quality of life (QoL) are often used
32 interchangeably in research, policy, and practice. For example, when announcing a strategy to
33 assess outcomes “*beyond economic prosperity*”, UK Prime Minister David Cameron (2010)
34 commissioned a “*new way of measuring wellbeing in Britain.*” ... “*We’ll start measuring our*
35 *progress as a country, not just by how our economy is growing, but by how our lives are*
36 *improving; not just by our standard of living, but by our quality of life.*”

37 [<https://www.gov.uk/government/speeches/pm-speech-on-wellbeing>]

38 Quality of life and SWB are not interchangeable terms as they are connected to
39 different theoretical concepts (Stewart-Brown, 2015). Undifferentiated discussion and use,
40 create confusion about whether they are theoretically different, similar or the same (Camfield
41 & Skevington, 2008; Peasgood, Brazier, Mukaria et al, 2014), and confounds debates on
42 happiness (World Health Organisation, 2015), and mental health (Böhnke & Croudace, 2016;
43 Hinks, Tinkler & Allin, 2013). Furthermore QoL and SWB support separate measurement
44 fields that are usually underpinned by theory, so measurement choice is complicated.
45 Confusion has not been remedied by an apparent lack of research awareness about findings in
46 the other field. Well-being specialists rarely acknowledge QoL measures (e.g. Triandis, 2000;
47 Diener, Helliwell & Kahneman, 2010), and QoL experts often overlook SWB models, so
48 debate is hindered. As person-centred approaches are now favoured for monitoring and
49 evaluating international outcomes, and informing global policy-making in health care, and
50 beyond (Stiglitz, Sen & Fitoussi, 2009; Skevington & Epton, 2018), an international

51 investigation could accelerate resolution of this conundrum, leading to better decision-
52 making in future.

53 THEORETICAL BACKGROUND: SUBJECTIVE WELL-BEING & QUALITY OF LIFE

54 Historically, philosophy on the ‘good life’ was dichotomised into the pleasures and
55 enjoyment of ‘hedonia’, and the flourishing, purposeful life of ‘eudaimonia’ (Bentham,
56 1789). Representing a largely hedonic position, Diener (1984) defined SWB as central to a
57 person’s experience consisting of positive aspects, and a global assessment of a person’s life.
58 In 1995, negative affect, and cognitive evaluations were added to this definition of SWB:
59 “*Subjective well-being also includes cognitive evaluations or appraisals of life satisfaction as*
60 *a whole, and emotional reactions to life events*” (Diener & Diener, 1995). Developed
61 measures based on SWB models prompted copious research (Busseri & Sadava, 2011; Hinks,
62 Tinkler & Allin, 2013), and showed some cross-cultural support (e.g. Oishi, 2010).
63 Nevertheless, how SWB relates to quality of life (QoL) remains obscure.

64 Among other definitions, subjective QoL was defined in 1994 by an international
65 World Health Organisation (WHO) research collaboration as:

66 *An individual’s perception of their position in life, in the context of the culture and*
67 *value systems in which they live, and in relation to their goals, expectations,*
68 *standards and concerns. It is a broad-ranging concept, incorporating in a complex*
69 *way the person’s physical health, psychological state, level of independence, social*
70 *relationships, personal beliefs, and relationship to salient features of the environment.*

71 (p 43) (The World Health Organisation Quality of Life Assessment Group,
72 (WHOQOL) 1994).

73 This definition underpins the WHO model that was designed to improve QoL measurement
74 cross-culturally (table 1; Skevington, Sartorius, Amir et al, 2004; Bowden & Fox-Rushby,
75 2003).

76 INSERT TABLE 1 HERE

77 Since publication of these definitions, several questions have been raised, and
78 discrepancies highlighted; these issues informed the current research. First, it was proposed to
79 incorporate an existential eudaimonic element on a ‘purposeful and worthwhile life’ into
80 SWB (Keyes, Shmotkin & Ryff, 2002). This was drawn from the psychological well-being
81 (PWB) model (Ryff, 1989), and is related to SWB (Ring, Hofer, McGee, et al, 2006). In the
82 present study we investigate the SWB model expanded by this eudaimonic element, and refer
83 to it as SWB+.

84 Second, another revision of SWB replaced the 1995 version with a more abstract,
85 generic statement: “*An umbrella term for different valuations that people make regarding*
86 *their lives, the events that happen to them, their bodies and minds, and the circumstances in*
87 *which they live*” (Diener, Kahneman, Graham, et al, 2005). Increased similarity between this
88 new SWB definition and the earlier WHO definition (The WHOQOL Group, 1994),
89 suggested that the SWB concept could be converging towards QoL. Revealing greater
90 common ground, this similarity raised questions about whether both constructs might be
91 embraced by a single, unified concept, and if so, whether one instrument could measure it?
92 Investigating these questions has potential to resolve some of the confusion about these
93 concepts and their measures in health, and beyond.

94 Third, the structure of the SWB model was questioned through a major review of
95 findings from over 1000 studies (Busseri & Sadava, 2011). While evidence largely supports
96 core elements of SWB (positive affect, negative affect, and life satisfaction), Busseri and

97 Sadava reported that a significant minority of studies showed small, insignificant associations
98 between SWB components. Examining five plausible configurations of SWB's components,
99 they could not confirm that one single model was the 'best', and concluded that full
100 endorsement was 'premature' (Busseri & Sadava, 2011). For the present study this raised
101 questions about plausible alternative models.

102 Fourth, short-comings in predicting well-being from 'objective' indices like income,
103 wealth, and material goods, led Nobel laureate economists to recommend subjective
104 multidimensional measures like SWB to the global community:

105 *Research has shown that it is possible to collect meaningful and reliable data*
106 *on subjective, as well as objective wellbeing. Subjective wellbeing*
107 *encompasses different aspects (cognitive evaluations of one's life, happiness,*
108 *satisfaction, positive emotions such as joy and pride, and negative emotions*
109 *such as pain and worry): each of them should be measured separately, to*
110 *derive a more comprehensive appreciation of people's lives. (Stiglitz, Sen &*
111 *Fitoussi, 2009)*

112 Despite contemporary interest in evaluating well-being by Western governments
113 (e.g. Office of National Statistics in UK (2011)), relations between models and
114 measures of SWB and QoL have not been closely examined with global data
115 (Skevington & Epton, 2018).

116 Lastly, language versions of the new SWB measures have not been developed using
117 advanced cultural-adaptation procedures that improve equivalence when comparing different
118 language versions (Herdman, Fox-Rushby, & Badia, 1997). The SWB concept and measure
119 were originally designed in USA. As no other cultures contributed to the derivation of
120 conceptual meanings and item wording, subsequent translations are not entirely compatible

121 with the original. The simultaneous ‘spoke-wheel’ cross-cultural methodology designed by
122 the WHOQOL Group and used to develop its suite of measures, is geared to making multiple
123 language versions more equivalent than previously (Skevington, 2002).

124 AIMS OF THIS STUDY

125 We aimed to improve understanding about the empirical relationship between SWB
126 and subjective QoL. Arising from the questions and discrepancies, we predicted that these
127 two perspectives would not be entirely exclusive, and would display evidence of overlapping
128 components. As positive feelings/affect is both important to SWB and QoL, and as happiness
129 stands alone in its own field of study, we predicted this component would be an area of
130 commonality.

131 More importantly we predicted that an overarching subjective framework for SWB
132 and QoL could plausibly be merited, and refer to this as the "*Life Quality and Well-being*"
133 (*LQW*) *model*. Any such model would potentially represent a new perspective that could be
134 prospectively tested. As expected from an overarching concept, we predicted that the LQW
135 model would include a wide-range of facets, possibly drawn from each domain. The present
136 research represents a typical, single-sample test of a pre-defined framework that derives its
137 specific strength from applying an internationally diverse sample.

138 **2. Methods**

139 **2.1 Design**

140 Cross-sectional WHOQOL SRPB data was collected simultaneously within 18
141 cultures world-wide, following an internationally agreed protocol (The World Health
142 Organisation Quality of Life Assessment – Spirituality, Religion and Personal Beliefs Group
143 (WHOQOL SRPB), 2006). Quota sampling was applied to culture (240 adults per centre),

144 age-band (50%; split at 45 years), and gender (50%). Representative sampling was not
145 feasible, as national statistics necessary to design a sampling frame were not available for
146 every participating country.

147 **2.2 Sample**

148 The full WHOQOL SRPB dataset ($N= 5,087$; 18 centres) was originally used to
149 investigate psychometric properties of the WHOQOL SRPB instrument (The WHOQOL
150 SRPB Group, 2006). In the present study we conduct secondary analysis on a subset of this
151 data. Some centres were excluded: (i) where data was entirely missing for a variable crucial
152 to hypothesis testing (i.e. spiritual/general facets: China, Kenya, Argentina); (ii) if 'clean'
153 country samples were unduly small (Japan, $n=43$; Italy, $n=101$), or (iii) if national data was
154 collected by more than one centre, duplicating its contribution (Brazil, India). Where the
155 latter occurred, data from the primary national centre was preferred to maintain comparison
156 with previous research. Selection resulted in analysing $N = 2,533$ cases contributed by 11
157 culturally diverse centres located in *South America*: Porto Alegre, Brazil; Calabria, Uruguay;
158 *Middle East*: Alexandria, Egypt; Beer Sheva, Israel; *Northern Europe*: Vilnius, Lithuania;
159 Bath, UK; *Southern Europe*: Barcelona, Spain; Izmir, Turkey; *South Asia*: Kubang, Malaysia;
160 Bangkok, Thailand; and the *Sub-continent*: Bangalore, India.

161 The total sample contained 51% women, and 48% men, with ages ranging from 16 to
162 90 (53.7% < 45 years). Highest educational level completed was: 18.5% primary, 40.2%
163 secondary, 29.5% tertiary, and 11.4% postgraduate. Forty-four percent reported an illness and
164 the primary illness was classified as: high blood pressure (14%), cardiac (12%),
165 musculoskeletal (9%), cancer (8%), respiratory (6%), broken/fractured bone (6%), diabetes
166 (5%), HIV (2%), rectal growth/bleeding (2%), cataract (1%), Parkinson's disease (1%) or
167 stroke (.4%). The total sample contained agnostics, atheists, Buddhists, Zen Buddhists,

168 Muslims, Hindus, Jews, Christians, and indigenous beliefs (The WHOQOL SRPB Group,
169 2006).

170 Ethical approval for the study was granted by the Ethics committee of the World
171 Health Organisation, Geneva to the WHO Division of Mental Health and Substance Abuse.
172 The protocol conformed to Declaration of Helsinki principles. Local ethical approval was
173 also obtained in all field sites.

174 **2.3 Measures**

175 The original WHOQOL-100 was developed by an international multi-centre
176 collaboration, following standard, agreed protocols, to obtain a validated set of 100 items that
177 assess 25 facets of QoL (The WHOQOL Group, 1998; Monod, Brennan, Rochat, et al, 2011).
178 The WHOQOL SRPB instrument analysed in the current study combines the WHOQOL-100
179 items with an additional module of 32 items organized in eight facets. These extra ‘SRPB’
180 facets elaborate QoL outcomes from spiritual, religious and personal beliefs (The WHOQOL
181 SRPB Group, 2006; see table 1). The WHOQOL SRPB is scored in six QoL domains. The
182 WHOQOL-SRPB aligns with the SWB+ model, as it contains two facets assessing positive
183 and negative feelings (hedonia), and two facets on meaning in life and purpose in life
184 (eudaimonia).

185 All WHOQOL instruments also contain an overarching, general QoL and health facet
186 (g facet). This was developed as an internal validity criterion within the original WHOQOL-
187 100 protocol (The WHOQOL Group, 1998). Several 5-point interval, response scales enable
188 upper to lower poles of well-being to be rated. Some item scores are reversed so that high
189 total scores consistently indicate good QoL.

190 Due to its international, multi-stakeholder development, the WHOQOL-100 and
191 WHOQOL SRPB have high content validity, and relevance. The construct validity of these

192 facets and domains (dimensions) has been the subject of several WHOQOL-100 and
193 WHOQOL SRPB studies. Across these findings, items within facets, and facets within
194 domains correlate highly, and show high reliabilities, but inter-domain correlations are high
195 also, potentially pointing to one or two general QoL latent variables (e.g., O'Connell &
196 Skevington, 2010; Chan, Skevington, & Verplanken, 2017; Krägeloh, Billington, Henning, et
197 al. 2015).

198 Additional data collected with the WHOQOL SRPB were self-reported health (rated
199 from 1=very poor, to 5 very good), present/absent current illness, and socio-demographic
200 variables of gender, age, marital status, and educational level.

201 **2.4 Analysis Plan**

202 With its additional 32 items, the WHOQOL SRPB provides a set of validated facets that
203 are broader than the SWB+ model, and revisiting the WHOQOL SRPB survey (The
204 WHOQOL SRPB Group, 2006) offered a unique chance to conduct an international test of
205 the proposed LQW model. We were interested in the relative importance of the WHOQOL
206 SRPB facets when predicting the g facet; of four items, two are on general QoL, and one each
207 on health, and life satisfaction.

208 While in our study life satisfaction is part of the dependent variable, as seen in some
209 SWB+ models (e.g. Busseri & Sadava, 2011), other WHOQOL SRPB facets were mapped
210 conceptually onto key SWB+ components as potential predictor variables. Positive feelings
211 of happiness and contentment (e.g. '*How much do you experience positive feelings in life?*')
212 operationalize positive affect. Negative feelings (e.g. anxiety and depression) operationalize
213 negative affect (e.g. '*How often do you experience negative feelings?*'). Together these mood
214 facets from the psychological domain represent hedonia (see table 1). It was unclear whether
215 a 'worthwhile life' of eudaimonia would be best operationalized by purpose in life (e.g. '*To*

216 *what extent do you feel that life has a purpose?*'), or meaning in life facets (e.g. *To what*
217 *extent do you find your life to be meaningful?*'); consequently both spiritual facets were
218 included for comparison. Some SWB models incorporate 'cognitive evaluation' which could
219 have been operationalized by the cognitions facet, but this was rejected due to inconsistent
220 inclusion in SWB models (Busseri & Sadava, 2011). Although the WHOQOL SRPB does not
221 directly assess 'subjective well-being' as a facet *per se*, models tested in the present study are
222 commensurate with Diener's indirect assessment of SWB via its components (Diener, Suh,
223 Lucas, et al., 1999).

224 Facets of the WHOQOL SRPB were scored according to the assessment protocol. Health
225 influences assessment of QoL, and is included within the general facet of the WHOQOL
226 SRPB. However as health is not recognised as a formal SWB+ component, it was controlled
227 as a covariate by including the independent health status rating, and current illness measures.
228 Marital status was recoded as living together/married (1) vs. single, separated, divorced or
229 widowed (0). As educational level varies considerably across countries, it was recoded as an
230 ordinal variable: primary (0), secondary (1), and university/post-graduate (2).

231 a. Network Analysis

232 Before conducting the mixed-effects regression, we used a network model (Costantini, et
233 al., 2015; Kossakowski et al., 2016) to descriptively analyse the undirected relationships
234 between all facets and control variables, and also to evaluate the plausibility of the g facet as
235 a dependent variable. Network models represent spatial interrelations between variables in a
236 set, as a collection of 'nodes' (circles represent observed variables) and 'edges' (lines represent
237 the strength of relationships between variables, 'weights'; see figure 1). Two quantitative
238 measures provide insight into the relative associations between variables: (i) the higher the
239 'closeness' of a variable, the more and stronger correlational paths connect this variable to all

240 other network variables, and (ii) the higher the 'betweenness' of a variable, the more shortest
241 paths between two variables pass through this variable (see details in Costantini et al., 2015).
242 The size of both statistics depends on the number of nodes, and weights (correlations)
243 applied, and is not interpreted.

244 To take account of the nested structure of the data, we determined the within-country
245 pair-wise correlation matrix by separating the correlations between variables into their intra-
246 class, within- and between-country correlations (R Core Team, 2017; Revelle, 2017).
247 Network analysis was performed on the estimated within-country correlation matrix
248 (Epskamp et al., 2012). First, a network was estimated of the bivariate correlations - a purely
249 descriptive presentation of the data. Second, we estimated a network of partial correlations,
250 where the correlation between two variables is controlled for all other network variables
251 (with LASSO regularisation to control for overfitting). This network allows us to assess
252 which nodes are still connected to the g facet, after controlling for all variables, i.e. which
253 have uniquely predictive power; also to evaluate whether several item groups exist,
254 representing different content.

255 b. Mixed Model Regression Analysis

256 We then conducted mixed model regression analysis to evaluate the differential
257 predictive value of facets. From total respondents in 11 centres, 87% completed data for
258 every analysed variable. Most missing values were for education level ($n_{\text{Miss}}=179$), then sex-
259 life ($n_{\text{Miss}}=62$), being currently ill ($n_{\text{Miss}}=28$), and faith ($n_{\text{Miss}}=12$). All other variables showed
260 less than 10 missing. Multiple imputation by chained equations was applied (Azur, Stuart,
261 Fangakis, et al., 2011), to provide multivariate predictions of missing values, which assumes
262 data are randomly missing (Rubin, 1976). All variables included in the full regression model
263 were used for the imputation. Fixed effects for survey centre (culture) were added into the

264 prediction (Azur, Stuart, Fangakis, et al., 2011). Ordinary least squares regression was used
265 for continuous variables; ordinal logistic regression for the 5-point health status rating, and
266 educational level. Logistic regression was used for all dichotomous variables (gender, marital
267 status, education, currently ill). Prediction model parameters were estimated through
268 sampling with replacement using 20 "burn-in" iterations, after random starting values for
269 each of 20 imputed data sets were generated.

270 Modelling was conducted in four stages with the aim of comprehensively testing
271 relations between SWB+ and QoL models. First, socio-demographic and health variables
272 alone were examined in model 1, to control for inter-individual differences, and assess the
273 variance in the general facet due to these variables. This variable block was retained within
274 each subsequent model. Second, variance explained by the four key SWB+ components
275 alone, was tested in model 2. For model 3, variance explained by QoL variables that were **not**
276 included in model 2, was now examined. Finally, a full model (model 4) examined the
277 variance explained by every SWB+, QoL and demographic/health variable together. Since
278 relevant facets for each model (SWB+, QoL) are identified by prior theory, variable selection
279 was not performed.

280 Data analysis used a mixed-model with fixed effects for all regressors, and a random
281 effect for survey centre (culture) to account for clustering of sample cultures. To fit the
282 models, first the Monte Carlo error for the estimated coefficients across the 20 imputed
283 datasets was evaluated, providing the variance due to the imputation design. For randomly
284 selected imputed data sets, R^2 was calculated between model predictions, and the non-
285 imputed original g facet scores. Information criteria (AIC, BIC; Sclove, 1987; Wagenmakers
286 & Farrell, 2004) compared models containing more predictors with less, to ascertain whether
287 those with more parameters remained parsimonious (i.e. lower values). Additionally,
288 Likelihood ratio tests compared the absolute fit between models with increasing numbers of

289 predictors, to provide important information about whether the full, final model containing
290 every variable (i.e. model 4), showed improved fit over SWB+ variables alone (model 2), and
291 QoL variables alone (model 3). Regression analyses were performed in Stata 14 (College
292 Station, TX, 2015).

293 **3.0 Results**

294 Figure 1 presents the network based on bivariate correlations between variables. Paths
295 between two variables ("edges") represent direct correlations. Green edges represent positive,
296 and red edges negative correlations; wider edges indicate stronger correlation between two
297 variables. The spatial distance between variables is optimised by an algorithm that translates
298 the correlation structure as closely as possible onto two-dimensional space, with objects
299 farther away from each other also being less closely related. In this case, the extreme is
300 gender, which shows only one very weak correlation with another variable, and is at
301 maximum distance from all other nodes.

302 Panel A shows that all QoL facets are closely and positively related. There are
303 potentially two closely related clusters: one focusing on the SRPB components in the
304 WHOQOL SRPB (top nine nodes), and another with all WHOQOL facets not focused on
305 SRPB components (similar to findings by Krägeloh, et al., 2015). The g facet is the most
306 central variable in this network which is also expressed by measures of closeness (.01;
307 followed by positive feelings (.009), and relations (.009)), and betweenness (208; followed by
308 spirit (82), and bodily image (66)).

309 After controlling for all facets and health variables in Panel B, there are still
310 potentially two clusters in the data, and the g facet assessment sits centrally within this
311 network. The three variables most central to the network are closely linked to this structure:
312 in terms of closeness (shortest and strongest associations); positive feelings (.0018) is most

313 central, followed by the g facet (.0018), and self-esteem (.0016). In terms of betweenness
314 (more connections between two other nodes through this node), again positive feelings is
315 most central (358), followed by the g facet (262), and hope (160). All identified nodes are
316 close to the bridge between the original WHOQOL-100 items, and SRPB modular items in
317 the WHOQOL SRPB. Based on this descriptive evaluation, the g facet is a plausible validity
318 criterion for our regression models, as it is central in the interrelationships between the facets.
319 Furthermore, SRPB facets appear to offer an assessment slightly different from the g facet,
320 including both facets of meaning and purpose in life (eudaimonia).

321 INSERT FIGURE 1 HERE

322 The four regression models are reported in increasing complexity (i.e. left to right) in
323 table 2. Model 1 shows the fit based solely on socio-demographic and health variables. The
324 second model shows demographics with SWB+ variables. The third includes demographics
325 and QoL. Finally, model 4 shows all three aspects together, so examining the *Life Quality*
326 *and Well-being (LQW)* model. Overall fit statistics (bottom rows: table 2) reveal that
327 demographics alone in model 1, show the worst fit (lowest R²; highest AIC and BIC). This
328 was followed by model 2 on SWB+ only; then model 3 on QoL alone. The full, final model 4
329 comprising all three aspects, showed the best fit of all four models. Transforming AIC and
330 BIC values into evidence weights evaluates the relative evidence strength for these four
331 models (Wagenmakers & Farrell, 2004). On both metrics, the evidence weight for model 4
332 approximates to "1", so affirming the comparative advantage of the full model over all others.
333 The advantage attributed to model 4 is further corroborated by the Likelihood Ratio tests
334 which compared increasing complexity across models. In summary, the results show that
335 separate SWB+ and QoL models fit significantly better than demographics alone, but the full,
336 final model 4 fits significantly better than either of the other two models that exclusively test
337 the facets of either concept.

338 Table 2 reports unstandardised regression coefficients, and their respective standard
339 errors (SE; brackets). Demographic variables show that the predictive relationship of
340 educational level changes across models. When neither QoL nor SWB+ are included (model
341 1), highly educated participants reported higher g facet scores compared with those who only
342 completed primary school education. However this effect is not present in model 2, which
343 contains SWB+ predictors. This result shows that when comparing similar well-being levels,
344 educational level does not correlate with the g facet. Also this effect occurs consistently over
345 models 3 and 4 where those with higher and secondary education report lower g facet scores
346 than primary educated participants, but only when broad ranging SWB+ and QoL factors are
347 controlled. Age-band shows small correlations without controlling for QoL, but these vanish
348 when including QoL in models 3 and 4. The variance in the g facet due to age is explained by
349 QoL facets. As expected, both control variables on health (presence of illness; self-rated
350 health) show consistent correlation with the g facet across all four models, although the effect
351 is substantially reduced when SWB+ and/or QoL variables are taken into the models.

352 Thirteen QoL variables correlated positively and significantly with the g facet,
353 irrespective of whether or not well-being variables were included. Furthermore, these
354 variables are selected from across all six QoL domains, as predicted: energy & fatigue, sleep
355 & rest (physical), self-esteem (psychological), dependence on medication & treatment
356 (independence), personal relationships, practical social support, sex-life (social), perceived
357 home environment, financial resources, access to health & social care, opportunities for
358 recreation & leisure (environment), wholeness & integration, inner peace (spiritual). In the
359 QoL model (model 3), physical safety & security and hope & optimism also positively
360 correlated with the g facet, but cease to be significant predictors when combined with SWB+
361 indicators in the final regression (model 4).

362 The picture for SWB+ indicators is different. While all four indicators are significant
363 when run together in a separate model (model 2), only positive feelings showed a significant
364 correlation with the g facet over and above QoL indicators, in the final model (model 4).
365 Variance shared between other indicators of SWB+ (negative feelings, meaning in life,
366 purpose in life) and the g facet appears to be explained by QoL indicators.

367 The random effects of the mixed model (Table 2; SD (Const) and SD (Residual)) show
368 that relevant, but small cluster effects relating to cultural centre were present between 5% and
369 9%, across models. Maximal Monte Carlo error (Table 2; MC error) was observed each time
370 for the model intercept, and the next one in size was every time, only one tenth of the
371 maximal value. This means that values for the four models were small, compared to
372 estimated coefficients, indicating little variation across imputation runs. The maximal
373 variance inflation factor (VIF) derived from an ordinary least squares model as an
374 approximation for the (multi-)collinearity of the predictors, was also acceptable for all
375 models. VIFs quantify collinearity of predictors; high collinearity can lead to loss of
376 statistical power (Cohen, Cohen, West, et al., 2003). However as no high VIF coefficients
377 were connected to any SWB+ variable, collinearity is an unlikely alternative explanation of
378 lost significance for SWB+ variables in model 4.

379 **4. Discussion**

380 A review of positions and open questions about the fields of QoL and SWB research led
381 to an inquiry about whether both concepts are needed, and the degree to which they represent
382 complementary perspectives. Consequently we examined the empirical relationship between
383 the two subjective models using international survey data. As person-centred approaches are
384 increasingly used for monitoring and evaluating service outcomes (State of Connecticut
385 Department of Mental Health and Addiction Services, 2014), and informing global policy
386 decisions (Stiglitz, Sen, & Fitoussi, 2009), this work seems timely.

387 Our findings show that both SWB+ and WHOQOL SRPB QoL facets contribute to
388 the prediction of the g facet, and these range across every WHOQOL domain: energy, sleep
389 (physical domain); positive feelings, self-esteem (psychological); dependence on medication
390 & treatment (independence); personal relationships, social support, sex-life (social
391 relationships); home environment, financial resources, health & social care, recreation &
392 leisure (environment); wholeness, inner peace (spiritual). Several of these variables also
393 played an important role in the descriptive network analysis of facets' interrelations, as well
394 as representing two broad clusters of content identified in that analysis.

395 Our new, improved and streamlined model of *Life Quality and Well-being (LQW)*
396 therefore integrates 14 facets of subjective QoL (including g facet) drawn from both
397 theoretical formulations. Furthermore we confirm that these facets were derived from six
398 internationally important QoL domains, so offering a holistic model that potentially
399 incorporates SWB+ and offering more comprehensive conceptual coverage than the limited
400 psychological and spiritual components of SWB+. This work also streamlines the 33 facets
401 assessed by the WHOQOL SRPB. We report the first step in evolving a novel, integrated
402 model of life quality and well-being (LQW). This result is important as the sample contained
403 11 diverse cultures from most inhabited world regions; hence this model approaches
404 'universal' status.

405 Model results consistently show that subjective health is important to QoL, and also
406 SWB+ where, although investigated, health has not officially been a component. Subjective
407 health is a predictor in all four regression models, and the network model shows that health-
408 related variables are closely linked to physical QoL facets on medication, activity and
409 mobility. We conclude that the new LQW model should routinely include a 'subjective health'
410 assessment, not just to accommodate theoretical credibility, but also to sensitively adjust
411 scores to health status. This should be done irrespective of whether an assessment is intended

412 for health use, or other purposes/populations (Camfield & Skevington, 2008). Similarly we
413 note the need to assess educational level which acts as a literacy indicator, and a proxy for
414 poverty, commensurate with other approaches on socio-economic factors.

415 The regression and network models confirm that positive affect/feelings are a
416 mainstay of both SWB+, and subjective QoL. In network analyses, positive feelings were
417 centrally located, and when assessed in relation to all SWB+ and QoL variables in the final
418 regression model, positive feelings was the only predictive component from four in SWB+,
419 underscoring its central importance in LQW. This result was not unexpected as happiness is
420 routinely assessed in measures and models of well-being, and of QoL within health (e.g.
421 Veenhoven, 2010). It is noteworthy that positive feelings in the WHOQOL combines
422 contentment with happiness, indicating more enduring properties than the ephemeral qualities
423 suggested by mood.

424 In the SWB+ model alone (model 2), all four variables showed significant predictive
425 values. Positive and negative feelings endorsed a sound hedonic component, and meaning
426 and purpose in life evidenced eudaimonia, strongly supporting SWB+ *per se*. However,
427 neither eudaimonic variable or negative feelings subsequently contributed to predicting the
428 g facet in the final LQW model. Instead two unpredicted spiritual qualities of
429 wholeness/integration, and inner peace emerged as significant. These should be tested further
430 as potential components of eudaimonia within SWB+; also in other populations.

431 All three facets of the social relationships domain were included in the LQW model,
432 illustrating the core importance of 'quality ties to others' (Veenhoven, 2010). Among these,
433 the most important predictor in the final model was personal relations, chiming with
434 interpersonal elements in PWB. As PWB predicts SWB configurations (Ryff & Singer,

435 1998), and may be 'universal' (Veenhoven, 2010), new research is warranted to scrutinise
436 relations between the WHOQOL social domain and PWB.

437 Conceptual convergence between the two models was observed between recent
438 definitions of SWB and QoL, as defined by WHO, revealing common ground. Our findings
439 point to a streamlined, unified but multi-dimensional concept, comprised of a subset of the
440 original facets. When reassessed, these facets should represent a foundation for building one
441 single instrument. The findings also show model overlap, and that some components of both
442 concepts have greater predictive value than others. The empirical research underpinning this
443 newly integrated concept has potential to simplify measurement choice for policy-makers in
444 health, and other applied fields. A trans-disciplinary international collaboration is needed to
445 seek consensus on a single unifying definition, from which new policy and measurement
446 initiatives could flow. Guidance for this work is provided by the LQW model research. Fresh
447 cross-cultural data will be necessary to confirm the LQW model, and provide full
448 psychometric testing of any associated measure.

449 Another implication is that where QoL and well-being need to be measured, an
450 approach combining at least these 14 facets, promises to be more comprehensive, and also
451 theoretically grounded. Pending validation, any such instrument would reduce the twin
452 burdens of administering and completing two or more measures. Organisations (e.g. The
453 Organisation for Economic Co-operation & Development) and governments planning well-
454 being surveys should reconsider whether using SWB+ provides sufficient information to
455 draw confident conclusions about life quality and wellbeing. This is especially important
456 when the costs of gathering large scale survey data are considered (e.g. Gibbons et al., 2016;
457 Stochl et al., 2016).

458 As the literature reveals unresolved conceptual problems with configuring the SWB
459 model (Busseri & Sadava, 2011), we cannot exclude the possibility that a different
460 configuration of components might better explain our model. There may also be important
461 dimensions beyond these theoretical frameworks, and available WHOQOL facets that
462 warrant testing, and inclusion. However network analysis corroborates the centrality of the
463 g facet among other WHOQOL facets, and therefore choosing any other facet as the criterion
464 would have effectively reduced validity.

465 Another important observation is that unlike previous approaches, our analysis did not
466 address QoL from a purely operational perspective (Hyland, 1992). Instead the analyses were
467 driven by an inclusive, broad QoL definition (The WHOQOL Group (1994), with an
468 established empirical and theoretical track record. From this perspective, it is arguable that
469 our results indicate a theoretical construct that influences responses to a substantial
470 proportion of the WHOQOL facets. This perspective could guide further investigations into
471 how health, and more broadly personality (e.g. Trompenaars, van Heck, Hodlment et al,
472 2007), and situational aspects (e.g. Kellert, 2009), influence QoL.

473 Another limitation is that we used WHOQOL SRPB facets, not item-level analysis.
474 This is especially noteworthy as our dependent variable contains life satisfaction, which in
475 some models is conceptualised within well-being (Busseri & Sadava, 2011). The analysis
476 focused on the WHOQOL SRPB as a validated instrument, and interrelationships between its
477 facets as used in surveys and clinical practice worldwide. Future investigations into the LQW
478 model should revisit the analysis, and potentially develop item content to identify an optimal
479 set of indicators to operationalize the LQW model (see construct validity citations on
480 WHOQOL SRPB in Methods).

481 Our statistical approach represents an advance in analysing clustered cross-cultural
482 WHOQOL data, and progresses knowledge about what is important to global SWB and QoL.
483 However moderate levels of missing data were necessarily addressed with multiple
484 imputation, and the analysis followed the WHOQOL consortium approach of using the
485 instrument as a conceptually validated instrument for measuring across cultural contexts (see
486 also Gibbons, Skevington & the WHOQOL Group (2017); Theuns et al., (2010)). Despite
487 such limitations, the findings offer insights into a rare cultural range of subjective data.

488 The primary research strength was access to cross-cultural WHOQOL SRPB data
489 collected contemporaneously in 11 countries world-wide that enables some generalisation of
490 results, and tentative global conclusions. Despite its length, the WHOQOL SRPB is suitable
491 to use in this context as scores are reliable across a profile of facets, and cover key
492 components of the LQW model. A shorter version of the WHOQOL SRPB - the WHOQOL
493 SRPB BREF (Skevington, Gunson, & O'Connell, 2012) - is available, containing 34 items
494 that retain the same conceptual breadth as the long-form. This short-form could be used in the
495 interim, to ease administrative burden until a streamlined version potentially containing 14
496 facets is standardised in line with the LQW model. Once fresh cross-cultural data has
497 interrogated the global performance of the *Life Quality and Well-being* model, this tailor-
498 made instrument could provide subjective information useful to national and international
499 policy-makers.

500

501

References

502 Azur, M.J., Stuart, L.A., Fangakis, C., & Leaf, P.J. (2011). Multiple imputation by chained
503 equations: what is it and how does it work? *International Journal of Methods in Psychiatric*
504 *Research*, 20, 1, 40-49 <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3074241/>

505 Bentham, J. (1789). *An Introduction to the Principles of Morals and Legislation.*, London,
506 Methuen.

507 Böhnke, J. R., & Croudace, T. J. (2016). Calibrating well-being, quality of life and common
508 mental disorder items: psychometric epidemiology in public mental health research. *British*
509 *Journal of Psychiatry*, 209, 2, 162. <http://doi.org/10.1192/bjp.bp.115.165530>

510 Bowden, A., & Fox-Rushby, J.A. (2003) A systematic and critical review of the process of
511 translation and adaptation of generic health-related quality of life measures in Africa, Asia,
512 Eastern Europe, the Middle East, South America. *Social Science and Medicine*, 57, 7, 1289-
513 1306.

514 Busseri, M.A., & Sadava, S.W. (2011). A review of the tripartite structure of Subjective
515 Wellbeing: implications for conceptualisation, operationalization, analysis and synthesis.
516 *Personality and Social Psychology Review*, 15, 3, 290-314.

517 Camfield, L., and Skevington, S.M. (2008). On subjective well-being and quality of life.
518 *Journal of Health Psychology*, 13, 6, 764-775.

519 Chan, K., Skevington, S.M., & Verplanken, B. (2017). Cross-cultural application of the
520 WHOQOL SRPB in the Chinese community with diverse spiritual affiliations. *Social*
521 *Indicators Research*, 132, 1, 291-312. DoI 10.1007/S11205-016-1308-3.

- 522 Cohen, J., Cohen, P., West, S.G., & Aiken, L. S. (2003). *Applied multiple*
523 *regression/correlation analysis for the behavioral sciences* (3rd edition). Mahwah, NJ:
524 Lawrence Erlbaum Associates.
- 525 Costantini, G., Epskamp, S., Borsboom, D., Perugini, M., Mõttus, R., Waldorp, L. J., &
526 Cramer, A. O. J. (2015). State of the aRt personality research: A tutorial on network analysis
527 of personality data in R. *Journal of Research in Personality*, *54*, 13–29.
- 528 Diener, E. (1984). Subjective well-being. *Psychological Bulletin*, *124*, 197-229.
- 529 Diener, E., & Diener, C. (1995) The wealth of nations revisited: Income and quality of life.
530 *Social Indicators Research*, 275–286.
- 531 Diener, E., Helliwell, J.F., and Kahneman, D. (Eds) (2010) *International Differences in Well-*
532 *being*. Oxford, Oxford University Press.
- 533 Diener, E., Kahneman D., Graham, C., Sirgy, M.J., Krueger. A., King, L., Michelos, A.C., et
534 al. (2005, November). *Guidelines for national indicators of subjective well-being and ill-*
535 *being*. *Social Indicators Network News (SINET)*, *84*, 4-6: www.soc.duke.edu/resources/sinet
- 536 Diener, E., Suh, E.M., Lucas, R.E. and Smith, H.L. (1999). Subjective wellbeing: three
537 decades of progress. *Psychological Bulletin*, *125*, 276-302.
- 538 Epskamp, S., Cramer, A. O. J., Waldorp, L. J., Schmittmann, V. D., & Borsboom, D. (2012).
539 qgraph: Network visualizations of relationships in psychometric data. *Journal of Statistical*
540 *Software*, *48*, 18.
- 541 Gibbons, C. J., Skevington, S. M. & the WHOQOL Group (2017). Adjusting for cross-
542 cultural differences in computer-adaptive tests of quality of life. *Quality of Life Research*;
543 Online: December 4th doi.org/10.1007/s11136-017-1738-7

- 544 Gibbons, C., Bower, P., Lovell, K., Valderas, J., & Skevington, S. (2016). Electronic quality
545 of life assessment using computer-adaptive testing. *Journal of Medical Internet Research*, 18,
546 e240.
- 547 Herdman, M., Fox-Rushby, J., & Badia, X. (1997). 'Equivalence' and the translation and
548 cultural adaptation of health-related quality of life questionnaires. *Quality of Life Research*, 6,
549 237-247.
- 550 Hinks, S., Tinkler, L., and Allin, P. (2013). Measuring subjective wellbeing and its potential
551 role in policy: perspectives from the UK Office for National Statistics. *Social Indicators*
552 *Research*, 114, 1, 73-86:<http://doi.org/10.1007/s11205-013-0384-x>
- 553 Hyland, M. E. (1992). A reformulation of quality of life for medical science. *Quality of Life*
554 *Research*, 1, 267-272.
- 555 Kellert S. R. (2009). Biodiversity, quality of life and evolutionary psychology. In O. E. Sala,
556 C. Parmesan, & L. Myers (Eds.). *Biodiversity Change and Human Health: From Ecosystem*
557 *Services to Spread of Diseases* (pp. 99-128). Washington, D.C., USA: Island Press.
- 558 Keyes, C.L.M., Shmotkin, D., & Ryff, C.D. (2002). Optimising well-being: the empirical
559 encounter of two traditions. *Journal of Personality and Social Psychology*, 82, 6, 1007-1022.
- 560 Kossakowski, J. J., Epskamp, S., Kieffer, J. M., van Borkulo, C. D., Rhemtulla, M., &
561 Borsboom, D. (2016). The application of a network approach to Health-Related Quality of
562 Life (HRQoL): introducing a new method for assessing HRQoL in healthy adults and cancer
563 patients. *Quality of Life Research*, 25, 781-792.
- 564 Krägeloh, C.U., Billington, D.R., Henning, M.A., & Chai P.P.M. (2015). Spiritual quality of
565 life and spiritual coping: evidence for a two-factor structure of the WHOQOL spirituality,

- 566 religiousness, and personal beliefs module. *Health and Quality of Life Outcomes*, 13, 26-45.
- 567 DoI: 10.1186/S 1255-015-0212x
- 568 Monod, S., Brennan, M., Rochat, E., Martin, E., Rochat, S., & Bula, C.J. (2011). Instruments
569 measuring spirituality in clinical research: a systematic review. *Journal of General Internal
570 Medicine*, 26, 11, 1354-1357.
- 571 O'Connell, K., & Skevington, S.M. (2010). Spiritual, religious and personal beliefs are
572 important and distinctive when assessing quality of life in health: a comparison of theoretical
573 models. *British Journal of Health Psychology*, 15, 4, 729-748. DoI 10.1348/135910709
574 x479799
- 575 Office of National Statistics (2011). *Measuring what Matters: National statistician's
576 reflections on the national debate on measuring national well-being*. Newport, UK, Office of
577 National Statistics.
- 578 Oishi, S. (2010). Culture and wellbeing: conceptual and methodological issues. In Eds E.
579 Diener, J.F.Helliwell, & D. Kahneman, *International Differences in Well-being*. (pp 34-69),
580 Oxford, UK, Oxford University Press.
- 581 Peasgood, T., Brazier, J.E., Mukuria, C., & Rowen, D. (2014). A conceptual comparison of
582 well-being measures used in the UK. Project Report: 26. Policy Research Unit in Economic
583 Evaluation of Health and Care Interventions (EEPRU), University of Sheffield, UK:
584 <http://eprints.whiterose.ac.uk/99497/>
- 585 R Core Team. (2017). R: A language and environment for statistical computing (Version
586 3.4.2). Vienna: R Foundation for Statistical Computing. Abgerufen von [http://www.R-](http://www.R-project.org)
587 [project.org](http://www.R-project.org)

- 588 Revelle, W. (2017). *psych: Procedures for personality and psychological research* (Version
589 1.7-8). Evanston, IL: Northwestern University. [http://personality-](http://personality-project.org/r/psych.manual.pdf)
590 [project.org/r/psych.manual.pdf](http://personality-project.org/r/psych.manual.pdf)
- 591 Ring, L., Hofer, S., McGee H., Hickey, A., & O'Boyle, C. (2006). Individual quality of life:
592 can it be accounted for by psychological or subjective well-being? *Royal College of*
593 *Surgeons in Ireland*, 82, 3, 433-461.
- 594 Rubin, D.B. (1976). Inference and missing data. *Biometrika*, 63, 3, 581-592.
- 595 Ryff, C.D. (1989). Happiness is everything, or is it? Explorations on the meaning of
596 psychological well-being. *Journal of Personality and Social Psychology*, 57, 1069-1081.
- 597 Ryff, C.D., & Singer, B.H. (1998). The contours of positive human health. *Psychological*
598 *Inquiry*, 9, 1, 1-28.
- 599 Sclove, S.L. (1987). Application of model selection criteria to some problems in multivariate
600 analysis. *Psychometrika*, 52, 3, 333-343.
- 601 Skevington SM (2002) Advancing cross-cultural research on quality of life: Observations
602 drawn from the WHOQOL development. *Quality of Life Research*, 11, 2, 135-144.
- 603 Skevington, S.M., & Epton, T. (2018). How will the sustainable development goals deliver
604 changes in wellbeing? A systematic review and meta-analysis to investigate whether
605 WHOQOL-BREF scores respond to change. *British Medical Journal Global Health*, Online
606 January 6th; Open access: e.000609. DoI:10.1136/bmjgh-2017-000609, Suppl 1.
- 607 Skevington, S.M., Gunson, K.S.E., & O'Connell, K.A. (2012). Introducing a short-form of
608 the WHOQOL SRPB: an international instrument for assessing quality of life in spiritual,
609 religious and personal beliefs. *Quality of Life Research*, 22, 5, 1073-1083.

- 610 Skevington, S.M., Sartorius, N., Amir, M. & the WHOQOL Group (2004). Developing
611 methods for assessing quality of life in different cultural settings: the history of the
612 WHOQOL instruments. *Social Psychiatry and Psychiatric Epidemiology*, 39, 1, 1-8. DoI:
613 [10.1007/s00127-004-0700-5](https://doi.org/10.1007/s00127-004-0700-5). PubMed PMID: 15022040.
- 614 State of Connecticut Department of Mental Health and Addiction Services (DMHAS)
615 Consumer Survey (2014, December). *Annual Report* (pp. 63-72).
- 616 Stewart-Brown, S.L. (2015). Public mental health: an interdisciplinary subject? *British*
617 *Journal of Psychiatry*, 207,192-194.
- 618 Stiglitz, J., Sen, A., & Fitoussi, J. (2009). *Report by the Commission on the measurement of*
619 *economic performance and social progress*. Paris, Organisation for Economic Co-operation
620 and Development (OECD). www.stiglitz-sen-fitoussi.fr/
- 621 Stochl, J., Böhnke, J. R., Pickett, K. E., & Croudace, T. J. (2016). An evaluation of
622 computerized adaptive testing for general psychological distress: combining GHQ-12 and
623 Affectometer-2 in an item bank for public mental health research. *BMC Medical Research*
624 *Methodology*, 16, 58.
- 625 Theuns, P., Hofmans, J., Mazaheri, M., Van Acker, F., & Bernheim, J. L. (2010). Cross-
626 national comparability of the WHOQOL-BREF: A measurement invariance approach.
627 *Quality of Life Research*, 19, 219–224.
- 628 Triandis, H.C. (2000). Cultural syndromes and subjective well-being. In (Eds) E. Diener &
629 E.M. Suh; *Culture and Subjective Well-being* (pp 13- 36), Massachusetts, USA,
630 Massachusetts Institute of Technology.

- 631 Trompenaars, F.J., van Heck, G.L., Hodlment, P.P., & de Vries, J. (2007). The relationship
632 between dimensional personality models and quality of life in psychiatric outpatients.
633 *Psychiatry Research, 149*, 81-88.
- 634 Veenhoven, R. (2010). How universal is happiness? In E. Diener, J.F. Helliwell & D.
635 Kahneman (Eds.) *International Differences in Well-being*. (pp 328-350) Oxford, UK: Oxford
636 University Press.
- 637 Wagenmakers, E-J., & Farrell, S. (2004). AIC model selection using Akaike weights.
638 *Psychonomic Bulletin and Review, 11*, 1, 192-196.
- 639 The World Health Organisation (WHO) (2015). *World Happiness Report 2015*. Geneva,
640 Switzerland, World Health Organisation <http://worldhappiness.report/ed/2015/>
- 641 The World Health Organisation Quality of Life Assessment Group. (WHOQOL)(1994). The
642 development of the WHO Quality of Life Assessment Instrument (The WHOQOL). In J
643 Orley and W. Kuyken (Eds.) *Quality of Life Assessment: International perspectives*. (pp 41-
644 60) Berlin, Heidelberg, and New York, Springer-Verlag.
- 645 The World Health Organisation Quality of Life Assessment Group (WHOQOL) (1998). The
646 World Health Organization Quality of Life Assessment (WHOQOL): development and
647 general psychometric properties. *Social Science & Medicine, 46*, (12), 1569-1585.
- 648 The World Health Organisation Quality of Life Assessment Spirituality, Religion and
649 Personal Beliefs Group. (WHOQOL SRPB) (2006). A cross-cultural study of spirituality,
650 religion and personal beliefs as components of quality of life. *Social Science and Medicine*,
651 *62*, 2, 1486-1497.
- 652

653 **Table 1:** Conceptual framework of subjective quality of life for WHOQOL SRPB domains
 654 and facets (adapted from The WHOQOL SRPB Group, 2006).

General Overall Quality of Life and Health

Physical Health	Psychological	Independence	Social Relationships	Environment	Spiritual, Religious & Personal Beliefs
Pain & Discomfort	<i>Positive Feelings</i>	Mobility	Personal Relations	Physical Safety & Security	<i>Purpose in life**</i>
Energy & Fatigue	Thinking, Learning, Memory & Concentration (Cognitions)	Activities of Daily Living	Practical Social Support	Home Environment	Spiritual Connection*
Sleep & Rest	Self-esteem	Dependence on Medication & Treatment	Sex-life	Financial Resources	<i>Meaning in Life*</i>
	Body Image & Attractiveness	Working Capacity		Health & Social Care	Awe & Wonder*
	<i>Negative Feelings</i>			Information & Skills	Wholeness & Integration*
				Recreation & Leisure	Spiritual Strength*
				Physical Environment	Inner Peace*
				Transport	Hope &

Optimism*

Faith*

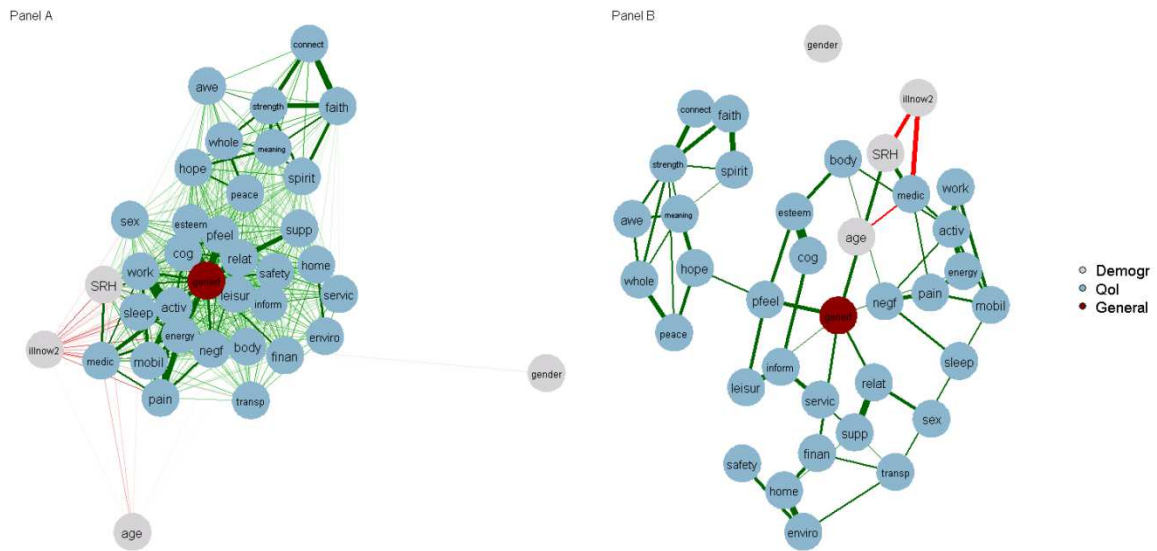
655 Key: *New SRPB facets; **formerly called 'Spirituality'; *Italics* indicate SWB+ model

656 components

657

ACCEPTED MANUSCRIPT

658 **Figure 1.** Network plots presenting the correlational relationships between QoL and control
 659 variables. Panel A shows the observed correlations and Panel B partial correlations (after
 660 LASSO regularization); circles represent facets; red lines indicate negative and green lines
 661 positive correlations; correlations $r < |.10|$ not shown; for abbreviations of facets see table 2



662

663

664 **Table 2:** Results of mixed-effect regression models predicting general QoL and WB based on 20
 665 imputed data sets (with abbreviations for facets in brackets, see figure 1)

	Model 1	Model 2	Model 3	Model 4
	only demographic	demographic + SWB+	demographic + QoL	All
Gender	-.14 (.10)	0.00 (0.08)	-.02 (.07)	-.04 (.07)
Marital status	.17 (.11)	-.05 (0.08)	-.13 (.08)	-.14 (.07)
Secondary education ^b	.19 (.16)	-.14 (0.12)	-.26* (.11)	-.27* (.11)
Univ./ Post-graduate ^b	.54** (.17)	0.04 (0.13)	-.25* (.11)	-.27* (.11)
Age-band (age)	.02*** (.004)	0.008* (0.003)	.002 (.003)	.004 (.003)
Currently ill? (illnow2)	-.53*** (.11)	-.39*** (0.09)	-.16* (.08)	-.16* (.08)
Health status rating (SRH)	1.64*** (.07)	.83*** (0.05)	.53*** (.05)	.49*** (.05)
Pain & discomfort (pain)			-.004 (.01)	.00 (.01)
Energy & fatigue (energy)			.11*** (.02)	.10*** (.02)
Sleep & rest (sleep)			.03** (.01)	.03* (.01)

Cognitions (cog)	-.01 (.02)	-.02 (.02)
Self-esteem (esteem)	.13*** .02	.09*** (.02)
Body Image & appearance (body)	-.001 (.01)	.003 (.01)
Mobility (mobility)	.005 (.01)	.003 (.01)
Activities of daily living (activ)	.01 (.02)	.01 (.02)
Dependence on medication/treatment (medic)	.04** (.01)	.04*** (.01)
Working capacity (work)	.02 (.01)	.02 (.01)
Personal relationships (relat)	.18*** (.02)	.15*** (.02)
Practical social Support (supp)	.04* (.01)	.03* (.01)
Sex-life (sexx)	.05*** (.01)	.04*** (.01)
Physical safety & Security (safety)	.03* (.02)	.02 (.02)
Home environment (home)	.06*** (.02)	.05*** (.02)
Financial resources (finan)	.11***	.11***

	(.01)	(.01)
Health & social care (servic)	.09***	.09***
	(.02)	(.02)
Information & skills (inform)	.01	.01
	(.02)	(.02)
Recreation & leisure (leisur)	.11***	.07***
	(.02)	(.02)
Physical environment (enviro)	-.02	-.02
	(.02)	(.02)
Transport (transp)	.01	.01
	(.01)	(.01)
Spiritual connection (connect)	.01	.01
	(.01)	(.01)
Awe & wonder (awe)	-.02	-.02
	(.01)	(.01)
Wholeness & Integration (whole)	.04*	.03*
	(.02)	(.01)
Inner strength (strength)	-.01	-.02
	(.01)	(.01)
Inner peace (peace)	.04**	.03*
	(.01)	(.01)
Hope & optimism (hope)	.04*	.01
	(.01)	(.01)

Faith (faith)			.003		-.01
			(.01)		(.01)
Positive feelings (pfeel)		.43***			.18***
			(.02)		(.02)
Negative feelings (negf)		.19***			.02
			(.01)		(.01)
Purpose in life (‘Spirituality’) (spirit)		.05**			.01
			(.01)		(.01)
Meaning in life (meaning)		.07***			.03
			(.02)		(.02)
Constant	9.05***	1.96***	-2.21***		-2.16***
	(.39)	(.33)	(.36)		(.36)
SD(Constant) ^a	.73	.39	.37		.38
	(.16)	(.09)	(.09)		(.09)
SD(Residual) ^a	2.43	1.89	1.62		1.59
	(.03)	(.03)	(.02)		(.02)
R ²	.29	.59	.69		.70
AIC	11733	10470	9747		9648
BIC	11791	10551	9969		9893
Evidence weight (AIC/BIC)	--	0 / 0	0 / 0		1 / 1
LR-Test	--	$\chi^2_{\text{Mod2-Mod1}} = 1277.23$ (df=4; p < .001)	$\chi^2_{\text{Mod3-Mod1}} = 2045.44$ (df=28; p < .001)		$\chi^2_{\text{Mod4-Mod2}} = 873.50$ (df=28; p < .001)
					$\chi^2_{\text{Mod4-Mod3}} = 105.29$ (df=4; p < .001)

max(VIF)	2.39 (Education)	2.40 (Education)	3.43 (Activities)	3.51 (Activities)
max(MC error)	.01	.007	.006	.006

666 *Note.* *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; standard errors in parentheses; VIF variance inflation factor based on
667 simple linear regressions; LR-Test Likelihood Ratio Test for model comparison; R^2 , AIC, BIC, and VIF all
668 based on randomly selected imputed data sets; ^ano asterisks provided since standard error based assessment of
669 the relevance of variance components is not recommended; ^bPrimary education as reference category

Acknowledgements

We are indebted to The WHOQOL SRPB Group which is an international collaboration of colleagues and consultants that include: Dr S Bonicato, Foundation of Oncology, La Plata, Argentina; Dr M Fleck, Univ. of the State of Rio Grande, Porto Alegre Brazil and Dept. of Psychiatry, Santa Maria, Brazil; Dr L Schwartzman, Medical Psychology Dept., Univ. of Calabria, Uruguay; Dr N. Kamel, Faculty of Medicine, Univ. of Alexandria, Egypt; Dr M Amir, Univ. of the Negev, Beer Sheva, Israel; Dr O E Omolo, Faculty of Health Scis, Moi Univ., Eldoret, Kenya; Dr G de Girolamo, Laboratory of Epidemiology & Biostatistics, Clinical Inst. of Health, Rome, Italy; Dr N. Midttun, PSI Mental Health Initiative, Vilnius, Lithuania; Dr R Lucas, Univ. of Barcelona, Barcelona, Spain; Dr H Elbi, Medical Faculty, Aegean Univ., Izmir, Turkey; Prof S Skevington, Dept. of Psychology, Univ. of Bath, Bath, UK (now Univ of Manchester); Dr J Fang, School of Public Health, Univ. of Medical Scis, Guangzhou, China; Dr P Chandra, National Inst. of Mental Health & Neuroscis, Bangalore; Dr D B Bisht, Pondicherry, India; Dr M Tazaki, Science Univ. of Tokyo, Tokyo, Japan; Dr H Che Ismail, Univ. of Sains, Kubang, Malaysia; Dr M Kitikorn, Dept. of Psychiatry & Legal Medicine, Preventative Health, Dept. of Mental Health, Ministry of Public Health, Bangkok, Thailand, and the Division of Mental Health & Substance Abuse, World Health Organisation, Geneva. Suzanne Skevington thanks the European Health Psychology Society for the opportunity to present an early draft at their Annual meeting (2014). Also Prof Anita Molzahn, Univ. of Edmonton, and the International Hub for Quality of Life Research (IHQoLR) for comments.

Highlights

- How subjective wellbeing (SWB) relates to quality of life (QoL) is obscure.
- Cross-cultural WHOQOL SRPB data enabled a global evaluation of concepts.
- Network analysis corroborates the central importance of general QoL and SWB+.
- A QoL model with 13 facets explains more general variance than SWB+ alone.
- An integrated Life Quality and Wellbeing model and its measure are supported.