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## Cross-cultural comparison of correlates of quality of life and health status: the Whitehall II Study (UK) and the Western New York Health Study (US)

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**Abstract** Measures of quality of life (QoL) have been found to be predictors of mortality and morbidity; however, there is still limited understanding of the multifaceted nature of these measures and of potential correlates. Using two large populations from the UK and US, we aimed to evaluate and compare measured levels of QoL and the key factors correlated with these levels. Participants were 6,472 white subjects (1,829 women) from the Whitehall II Study (mean age 55.8 years) and 3,684 white subjects (1,903 women) from the Western New York Health Study (mean age 58.7 years). QoL was assessed in both using the physical and mental health component summaries of the short form-36 questionnaire (SF-36). Analysis of covariance was used to compare gender-specific mean scores for the two populations across several potential correlates (including socio-demographic, lifestyle and co-morbidity factors). Levels of reported physical QoL tended to be

higher in the UK population (51.2 vs. 48.6) while mental QoL was higher in the US group (53.1 vs. 51.1). Age, sleep duration and depressive symptoms were the main factors correlated with both physical and mental QoL in both samples. Increasing age was associated with poorer physical health but higher mental health scores in both populations ( $P < 0.001$ ). Sleep duration below 6 or above 8 h was associated with lower levels of QoL. Depressive symptoms were strongly associated with poorer mental health scores ( $P < 0.001$ ) while higher BMI, lower physical activity levels and presence of cardiovascular disease were associated with poorer physical health in both samples and gender ( $P < 0.05$ ). There were consistent findings for correlates of QoL in this cross-cultural comparison of two populations from the UK and US. Strongest associations were between lifestyle and co-morbidity factors and the physical health component of the SF-36 rather than the

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mental health component. This is a novel finding which warrants further consideration.

**Keywords** Quality of life · Health status · Sleep · Depressive symptoms · Cross-cultural comparison · Epidemiology · SF-36

## Introduction

Self assessed measures of quality of life (QoL) and health status have been associated with development of disease, disability and mortality, and are now considered as key parameters in the process of policy making, allocation of services and provision of care [1–3]. These measures capture a multidimensional perspective of *an individual's* state of health and wellbeing and therefore incorporate a comprehensive definition of health as defined by the World Health Organisation: ‘a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity’ [4].

Different studies have suggested that self assessed QoL and health status are modified by different factors including age, education, physical activity and depressive symptoms [1, 5–8]. Nevertheless, the majority of available measures of QoL yield results that are generally culture-specific and lack validation in multiple populations, except for a few, which include the short form 36 (SF-36) [9]. These challenges in optimally measuring QoL have limited the capacity to understand the interplay *between personal and social* factors with QoL and how this might vary across populations.

Hence, in this report, we performed a cross-cultural comparison of reported QoL in two countries: the United Kingdom and the United States of America, with the aim to evaluate and compare measured QoL and the factors correlated. The QoL of people living in these two countries has been ranked among the top 20 in the world [10], yet they have different welfare and health care systems, which could impact QoL [11].

## Methods

### Study population

We used two large population-based studies: the Whitehall II study from the UK and the Western New York Health Study ( $n = 3,684$ ) from the United States.

#### *Whitehall II Study (WHS)*

The UK participants in this report were sourced from the WHS, recruited from 20 civil service departments based in

London, in 1985–1988 (phase 1). The initial response rate was 73%, and the final cohort consisted of 10,308 participants (3,413 women and 6,895 men). Follow-up screening was carried out in 1991–1993 (phase 3), 1997–1999 (phase 5), 2002–2004 (phase 7), and postal questionnaires were sent to participants in 1989 (phase 2), 1995 (phase 4), 2001 (phase 6) and 2006 (phase 8). The participation rates of the original cohort ( $n = 10,308$ ) were 83, 76 and 68% at phases 3, 5, and 7, respectively. More details of this study can be found elsewhere [13, 14]. For the current analyses we used data from 6,472 white participants with available information who attended phase 5 of the WHS.

#### *Western New York Health Study (WNYHS)*

The US participants were taken from a sample of those enrolled as control participants in the WNYHS (detailed description can be found elsewhere [15]) In short, this is a series of case–control studies. Potential controls had to fulfil the following eligible criteria: (1) residents of Erie and Niagara counties; (2) age 35–79 years, (3) no cancer history. The participants were identified from two sources: (a) Department of Motor Vehicles of New York State for participants aged 35–64 years, (b) Health care financing administration (HCFA) lists for those aged 65–79 years. Six thousand eight hundred and thirty seven potential participants were identified, contacted and deemed eligible between 1996 and 2001. Of those 4,065 agreed to participate and were examined, for a participation rate of 59.5%. For the current analyses we used data from 3,684 white participants with available information, as previously described in detail [16].

#### Short form-36 (SF-36)

The SF-36 is an instrument used in different populations to measure QoL and health status [17–19]. This form yields an 8-scale profile of functional health and well-being scores as well as psychometrically-based physical and mental health summary measures and a preference-based health utility index. Participants respond to 36 items aggregated to form subscales that measure the respondents' impression of their health-related functioning in eight areas: physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems and mental health. Scales are scored on a 0–100 scale, with higher scores indicating better QoL. The first four subscales indicate respondents' physical health status (PCS), while the last four indicate mental health status (MCS). Factor analysis has been applied to the scales to create a physical and mental health component summary, which are standardized as *t* scores (mean of 50 and

standard deviation of 10) and have higher reliability than the individual scales [20]. Therefore, in the current study, QoL assessment was based on these two component summaries (physical and mental).

## Correlates

All factors listed below were considered as potential correlates and were categorised separately by study to allow comparability between the two samples.

### *Socio-demographic factors*

Age was categorised into  $\leq 50$ , 51–60 and  $>60$  years. Marital status was classified into married and unmarried. Socio-economic status (SES) was determined by individual's income or their employment grade. In the WHS, participants' last known civil service employment grade was used and divided in order of decreasing salary as follows: (1) administrative, (2) professional/executive and (3) clerical/support. In the Western New York Study, individuals' annual household income was categorised into three groups of decreasing income:  $> \$70,000$ ,  $\$30,000$ – $70,000$ , and  $< \$30,000$ . In order to make it comparable both groups were further categorized as either lowest, medium or highest SES.

### *Lifestyle factors*

Body mass index (BMI) was calculated as weight (kg)/height ( $m^2$ ) and was classified into  $< 25$  (normal weight), 25–29.9 (overweight) and  $\geq 30$  (*obesity*). Waist circumference was divided into tertiles based on the sample-specific distribution.

Smoking status was classified into current smoker and non-current smoker. Alcohol consumption was recorded in the previous week in the WHS, and in the last 30 days in the Western New York study; and divided into three categories: non-current drinker, low (below median) and high (above median) intake.

For physical activity, UK participants were asked to record the number of occasions/hours they had spent engaging in a series of specific activities over the previous 4 weeks. These activities were classified into light, moderate, or vigorous activities on the basis of their energy expenditure (metabolic equivalents). In the present study, the UK sample was categorized into two categories according to the energy expenditure: high vigorous activity (subjects who reported at least 1.5 h of vigorous activity per week); low vigorous activity (subjects who reported  $< 1.5$  h or absent of vigorous activity per week) [16]. In the US sample, physical activity was determined by participants completing the 7 day physical activity recall questionnaire

used in the Stanford Five-City project [21]. For comparison, US participants were divided at the median into high and low physical activity group.

In the UK sample, sleep duration was elicited by the question “How many hours of sleep do you have on an average week night?” Response categories were 5 h or less, 6, 7, 8, and 9 h or more. In the US sample, sleep duration in the past week was ascertained with the 7-day physical activity recall questionnaire [21]. By the question “On the average, how many hours did you sleep each night during the last 5 weekday nights (Sunday–Thursday)?” To allow comparability response categories were collapsed into three groups: short sleep duration ( $< 6$  h), average (6–8 h), and long sleep duration ( $> 8$  h).

### *Comorbidity*

In the UK sample, psychiatric morbidity including depressive symptoms was assessed with a modified general health questionnaire (GHQ) score. In the US sample, the presence of depressive symptoms was assessed by using the Center for Epidemiologic Studies Depression Scale (CES-D) [35]; participants were divided in two groups based on the cut point for major depressive symptoms (score  $\geq 22$ ).

In both samples, blood pressure was measured three times in the sitting position using a standard mercury sphygmomanometer by trained and certified technicians. The mean of the second and third measures were used in the analyses. Hypertension was defined as blood pressure  $\geq 140/90$  mmHg or regular use of antihypertensive medications. In both samples, fasting glucose concentrations were determined by glucose oxidase methods. Diabetes was defined either as fasting glucose  $\geq 126$  mg/dl or use of antidiabetic medications. Finally, in both samples personal medical history was obtained to determine the prevalence of cardiovascular disease (CVD), such as prior myocardial infarction, coronary artery bypass graft surgery, angioplasty or diagnosed angina pectoris, stroke, and use of cardiovascular medications.

### *Statistical analysis*

All analyses were conducted using the statistical package for social sciences (SPSS version 17.0). Descriptive analyses were performed for all selected variables. Covariates were selected based on previous publications. We computed age-adjusted and fully adjusted one way analyses of covariance (ANCOVA) by using selected variables as independent variables and the two SF-36 component summaries of (physical and mental health) as dependent variables, separately for the two studies and for women and men. All variables presented in the sections above were included in the multivariate model. The general linear

model procedure was used to compare adjusted mean scores of physical and mental health across categories of selected variables and for *pairwise* comparisons rather than comparisons with a selected reference category. Adjustment for multiple comparisons was done by Bonferroni method.

## Results

### Characteristics of study participants

In the UK study, women constituted a smaller percent of the sample than in the US sample (28.3% vs. 51.7%) (Table 1). Compared to participants in the WNYHS, those in the WHS tended to be younger (mean age 55.8 vs. 58.7), less likely to be married (21.4% vs. 24.1%) and had fewer people in the lowest SES (11.4% vs. 33.7%). Levels of lifestyle factors were also different. The UK sample was leaner (mean BMI 26.1 vs. 28.2 kg/m<sup>2</sup> and mean waist circumference 88.7 vs. 92.8 cm), smoked less (proportion of current smokers 10.7% vs. 14%) and had higher levels of physical activity.

The WNYHS participants tended to drink less (fewer units of alcohol and smaller proportion of drinkers) and had a greater proportion of “short” and “long” sleepers and a

higher proportion of participants suffering from hypertension and diabetes. The US sample had a lower prevalence of depressive symptoms and a lower proportion of participants with established CVD (13.6% vs. 15.5%).

### Correlates of quality of life (QoL)

#### *SF-36 scores*

Measured physical QoL tended to be higher in the UK sample (51.2 vs. 48.6) while mental QoL was higher in the US sample (53.1 vs. 51.1).

#### *Age-adjusted mean scores*

When we evaluated the associations between age-adjusted mean SF-36 physical and mental health scores, several factors were significantly and consistently related to the SF-36 scores (QoL) (Tables 2, 3).

#### *Fully-adjusted mean scores*

In analyses where we further adjusted for the variables included, age, sleep duration and presence of depressive symptoms appeared as the most consistent and relevant correlates of QoL in both populations and in men and

**Table 1** Baseline characteristics of the two populations included: WHS, London, UK (phase 5: 1997–1999); WNYHS, Buffalo, USA (1996–2001)

| Variable                                   | WHS ( <i>n</i> = 6,472) | WNYHS ( <i>n</i> = 3,684) |
|--|-------------------------|---------------------------|
| Mean age (years)                           | 55.8 (6.1)              | 58.7 (11.9)               |
| Women (%)                                  | 28.3                    | 51.7                      |
| Not married (%)                            | 21.4                    | 24.1                      |
| Lowest SES <sup>a</sup> (%)                | 11.4                    | 33.7                      |
| Sleep duration (%) [h]                     |                         |                           |
| <6   | 7.5                     | 13.7                      |
| 6–8  | 91.1                    | 80.0                      |
| >8   | 1.4                     | 6.6                       |
| Body mass index (kg/m <sup>2</sup> )       | 26.1 (3.9)              | 28.2 (5.5)                |
| Waist circumference (cm)                   | 88.7 (11.8)             | 92.8 (14.9)               |
| Current smoker (%)                         | 10.7                    | 14.0                      |
| Current drinker (%)                        | 86.0                    | 67.2                      |
| Daily alcohol consumption <sup>b</sup> (U) | 2.4 (2.2)               | 0.63 (1.5)                |
| Low physical activity (%)                  | 55.9                    | 50.2                      |
| SF-36 score                                |                         |                           |
| Physical                                   | 51.2 (8.0)              | 48.6 (9.3)                |
| Mental                                     | 51.1 (9.4)              | 53.1 (8.3)                |
| Depressive symptoms (%)                    | 12.4                    | 9.8                       |
| Systolic blood pressure (mmHg)             | 122.9 (16.3)            | 122.2 (16.8)              |
| Diastolic blood pressure (mmHg)            | 77.5 (10.6)             | 72.7 (9.9)                |
| Hypertension <sup>c</sup> (%)              | 29.2                    | 35.6                      |
| Diabetes <sup>d</sup> (%)                  | 2.5                     | 8.5                       |
| CVD (%)                                    | 15.5                    | 13.6                      |

Data are expressed as the mean (SD) or as percentages

<sup>a</sup> SES (socio-economic status) based on the lowest employment grade in the WHS and lowest annual household income in the WNYHS

<sup>b</sup> Computed among current drinkers only

<sup>c</sup> Defined as blood pressure  $\geq 140/90$  mmHg or regular use of antihypertensive medications

<sup>d</sup> Defined as fasting glucose  $\geq 126$  mg/dl ( $\geq 7.0$  mmol/l) or use of antidiabetic medications

**Table 2** Age-adjusted mean scores (SE) of the SF-36 components summaries by gender and selected correlates: WHS

| Variable                 | N     | Men (n = 4,643) |        |             | Women (n = 1,829) |             |             |        |             |        |
|--------------------------|-------|-----------------|--------|-------------|-------------------|-------------|-------------|--------|-------------|--------|
|                          |       | Mean (SE)**     | P      | Mean (SE)** | P                 | Mean (SE)** | P           |        |             |        |
|                          |       | Physical        |        | Mental      |                   | Physical    |             | Mental |             |        |
| Age (years)              |       |                 |        |             |                   |             |             |        |             |        |
| ≤50                      | 973   | 53.1 (0.22)     | <0.001 | 48.7 (0.28) | 0.001             | 346         | 51.5 (0.51) | <0.001 | 46.5 (0.55) | <0.001 |
| 51–60                    | 2,301 | 52.2 (0.15)     |        | 51.3 (0.18) |                   | 864         | 49.2 (0.33) |        | 49.2 (0.35) |        |
| >60                      | 1,263 | 50.7 (0.20)     |        | 54.4 (0.25) |                   | 619         | 47.4 (0.39) |        | 52.5 (0.42) |        |
| Sleep (h)                |       |                 |        |             |                   |             |             |        |             |        |
| <6                       | 285   | 49.4 (0.41)     | <0.001 | 46.6 (0.51) | 0.001             | 177         | 45.9 (0.70) | 0.001  | 43.7 (0.74) | 0.001  |
| 6–8                      | 4,200 | 52.2 (0.11)     |        | 52.0 (0.13) |                   | 1,533       | 49.5 (0.24) |        | 50.4 (0.25) |        |
| >8                       | 52    | 50.5 (0.97)     |        | 50.8 (1.20) |                   | 37          | 45.3 (1.54) |        | 49.1 (1.63) |        |
| Marital status           |       |                 |        |             |                   |             |             |        |             |        |
| Married                  | 3,831 | 52.0 (0.11)     | 0.91   | 52.1 (0.14) | 0.001             | 1,074       | 48.8 (0.29) | 0.22   | 50.6 (0.31) | <0.001 |
| Not married              | 675   | 52.0 (0.27)     |        | 49.3 (0.34) |                   | 660         | 49.4 (0.38) |        | 48.8 (0.40) |        |
| Socioeconomic status     |       |                 |        |             |                   |             |             |        |             |        |
| Lowest                   | 202   | 51.5 (0.52)     | 0.011  | 48.2 (0.64) | <0.001            | 534         | 48.8 (0.44) | 0.005  | 49.6 (0.47) | 0.045  |
| Medium                   | 2,335 | 52.3 (0.14)     |        | 51.4 (0.20) |                   | 403         | 48.6 (0.32) |        | 49.4 (0.35) |        |
| Highest                  | 1,885 | 51.6 (0.16)     |        | 52.0 (0.17) |                   | 875         | 50.4 (0.48) |        | 50.9 (0.52) |        |
| BMI (kg/m <sup>2</sup> ) |       |                 |        |             |                   |             |             |        |             |        |
| <25                      | 1,490 | 52.7 (0.18)     | <0.001 | 51.6 (0.23) | 0.54              | 657         | 50.9 (0.36) | <0.001 | 48.9 (0.41) | 0.17   |
| 25–29.9                  | 1,698 | 52.2 (0.16)     |        | 51.7 (0.21) |                   | 485         | 49.4 (0.42) |        | 49.9 (0.48) |        |
| ≥30                      | 431   | 49.6 (0.33)     |        | 51.2 (0.42) |                   | 260         | 46.0 (0.57) |        | 50.1 (0.65) |        |
| Waist (tertile)          |       |                 |        |             |                   |             |             |        |             |        |
| 1 (lowest)               | 638   | 53.1 (0.27)     | <0.001 | 51.9 (0.34) | 0.41              | 872         | 50.5 (0.31) | <0.001 | 49.1 (0.36) | 0.39   |
| 2                        | 1,264 | 52.6 (0.19)     |        | 51.6 (0.25) |                   | 250         | 48.3 (0.58) |        | 49.3 (0.66) |        |
| 3 (highest)              | 1,313 | 50.9 (0.19)     |        | 51.3 (0.24) |                   | 184         | 46.1 (0.68) |        | 50.3 (0.78) |        |
| Smoking status           |       |                 |        |             |                   |             |             |        |             |        |
| Non-current smoker       | 4,205 | 52.1 (0.11)     | <0.001 | 51.6 (0.14) | 0.74              | 1,558       | 49.2 (0.24) | 0.08   | 50.1 (0.26) | 0.001  |
| Current smoker           | 426   | 50.4 (0.34)     |        | 51.5 (0.43) |                   | 262         | 48.1 (0.60) |        | 47.8 (0.64) |        |
| Drinking status          |       |                 |        |             |                   |             |             |        |             |        |
| Non-current drinker      | 465   | 51.1 (0.33)     | 0.022  | 50.5 (0.41) | 0.016             | 432         | 46.5 (0.47) | <0.001 | 49.5 (0.51) | 0.14   |
| Low                      | 1,900 | 52.1 (0.16)     |        | 51.7 (0.41) |                   | 983         | 49.4 (0.30) |        | 50.2 (0.33) |        |
| High                     | 2,245 | 52.0 (0.15)     |        | 51.8 (0.19) |                   | 384         | 51.1 (0.48) |        | 49.1 (0.52) |        |
| Physical activity        |       |                 |        |             |                   |             |             |        |             |        |
| High                     | 2,255 | 52.6 (0.15)     | <0.001 | 52.1 (0.19) | 0.001             | 598         | 50.6 (0.39) | <0.001 | 50.6 (0.42) | 0.014  |
| Low                      | 2,388 | 51.4 (0.14)     |        | 51.2 (0.18) |                   | 1,231       | 48.3 (0.27) |        | 49.4 (0.29) |        |
| Depressive symptoms      |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 4,041 | 52.1 (0.11)     | 0.016  | 53.1 (0.12) | <0.001            | 1,548       | 49.4 (0.24) | 0.002  | 51.8 (0.23) | <0.001 |
| Yes                      | 539   | 51.3 (0.31)     |        | 40.0 (0.34) |                   | 251         | 47.4 (0.61) |        | 37.3 (0.56) |        |
| Hypertension             |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 3,000 | 52.3 (0.13)     | <0.001 | 51.8 (0.16) | 0.013             | 1,159       | 49.8 (0.28) | <0.001 | 49.2 (0.31) | 0.001  |
| Yes                      | 1,265 | 51.1 (0.20)     |        | 51.1 (0.25) |                   | 453         | 47.9 (0.46) |        | 51.2 (0.50) |        |
| Diabetes                 |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 4,058 | 52.1 (0.11)     | <0.001 | 51.7 (0.14) | 0.17              | 1,519       | 49.6 (0.24) | 0.48   | 49.7 (0.27) | 0.92   |
| Yes                      | 117   | 48.6 (0.65)     |        | 50.5 (0.82) |                   | 28          | 48.3 (1.78) |        | 49.9 (1.99) |        |
| Cardiovascular dis.      |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 3,931 | 52.4 (0.11)     | <0.001 | 51.8 (0.14) | <0.001            | 1,531       | 49.6 (0.25) | <0.001 | 49.7 (0.27) | 0.33   |
| Yes                      | 704   | 49.6 (0.27)     |        | 50.4 (0.34) |                   | 295         | 46.0 (0.57) |        | 50.3 (0.61) |        |

Estimated marginal means adjusted for age

\*\* Higher scores indicate better health and *functioning* (except for sleep). P value indicates the significant linear trend ( $P \leq 0.05$ )

**Table 3** Age-adjusted mean scores (SE) of the SF-36 components summaries by gender and selected correlates: WNYHS

| Variable                 | N     | Men (n = 1,781) |        |             | Women (n = 1,903) |             |             |        |             |        |
|--------------------------|-------|-----------------|--------|-------------|-------------------|-------------|-------------|--------|-------------|--------|
|                          |       | Mean (SE)**     | P      | Mean (SE)** | P                 | Mean (SE)** | P           |        |             |        |
|                          |       | Physical        |        | Mental      |                   | Physical    | Mental      |        |             |        |
| Age (years)              |       |                 |        |             |                   |             |             |        |             |        |
| ≤50                      | 463   | 52.0 (0.39)     | <0.001 | 52.2 (0.36) | <0.001            | 632         | 50.4 (0.38) | <0.001 | 50.8 (0.34) | <0.001 |
| 51–60                    | 321   | 49.8 (0.47)     |        | 53.9 (0.36) |                   | 435         | 48.9 (0.46) |        | 52.1 (0.41) |        |
| >60                      | 924   | 47.4 (0.28)     |        | 54.6 (0.25) |                   | 739         | 45.8 (0.35) |        | 53.9 (0.31) |        |
| Sleep (h)                |       |                 |        |             |                   |             |             |        |             |        |
| <6                       | 245   | 47.5 (0.53)     | <0.001 | 52.4 (0.49) | 0.003             | 231         | 44.9 (0.62) | <0.001 | 50.6 (0.56) | 0.002  |
| 6–8                      | 1,337 | 49.6 (0.23)     |        | 54.2 (0.21) |                   | 1,459       | 48.9 (0.25) |        | 52.7 (0.22) |        |
| >8                       | 120   | 46.6 (0.76)     |        | 53.2 (0.71) |                   | 112         | 45.8 (0.89) |        | 52.1 (0.80) |        |
| Marital status           |       |                 |        |             |                   |             |             |        |             |        |
| Married                  | 1,426 | 49.3 (0.22)     | 0.04   | 54.3 (0.20) | <0.001            | 1,253       | 48.4 (0.27) | 0.19   | 52.9 (0.24) | <0.001 |
| Not married              | 276   | 48.2 (0.50)     |        | 51.3 (0.46) |                   | 549         | 47.7 (0.41) |        | 51.1 (0.37) |        |
| Socioeconomic status     |       |                 |        |             |                   |             |             |        |             |        |
| Lowest                   | 344   | 47.6 (0.39)     | <0.001 | 52.6 (0.36) | <0.001            | 325         | 46.9 (0.42) | <0.001 | 51.3 (0.38) | 0.005  |
| Medium                   | 797   | 49.2 (0.29)     |        | 53.9 (0.27) |                   | 736         | 48.7 (0.35) |        | 53.9 (0.27) |        |
| Highest                  | 492   | 51.3 (0.46)     |        | 55.1 (0.43) |                   | 596         | 50.5 (0.54) |        | 55.1 (0.46) |        |
| BMI (kg/m <sup>2</sup> ) |       |                 |        |             |                   |             |             |        |             |        |
| <25                      | 396   | 50.0 (0.41)     | <0.001 | 53.3 (0.39) | 0.16              | 646         | 50.6 (0.36) | <0.001 | 51.9 (0.33) | 0.10   |
| 25–29.9                  | 773   | 49.7 (0.30)     |        | 54.2 (0.28) |                   | 568         | 49.3 (0.38) |        | 52.9 (0.36) |        |
| ≥30                      | 496   | 47.6 (0.37)     |        | 53.5 (0.35) |                   | 531         | 44.5 (0.39) |        | 52.4 (0.37) |        |
| Waist (tertile)          |       |                 |        |             |                   |             |             |        |             |        |
| 1 (Lowest)               | 234   | 50.9 (0.54)     | <0.001 | 53.8 (0.51) | 0.64              | 964         | 50.6 (0.28) | <0.001 | 52.4 (0.27) | 0.97   |
| 2                        | 680   | 50.3 (0.31)     |        | 54.0 (0.30) |                   | 461         | 47.9 (0.41) |        | 52.3 (0.39) |        |
| 3 (Highest)              | 751   | 47.8 (0.30)     |        | 53.6 (0.28) |                   | 321         | 43.2 (0.49) |        | 52.3 (0.47) |        |
| Smoking status           |       |                 |        |             |                   |             |             |        |             |        |
| Non-current smoker       | 1,481 | 49.6 (0.22)     | <0.001 | 54.0 (0.20) | 0.023             | 1,543       | 48.3 (0.24) | 0.09   | 52.5 (0.22) | 0.05   |
| Current smoker           | 224   | 46.0 (0.56)     |        | 52.7 (0.53) |                   | 259         | 47.2 (0.59) |        | 51.4 (0.53) |        |
| Drinking status          |       |                 |        |             |                   |             |             |        |             |        |
| Non-current drinker      | 456   | 47.4 (0.40)     | <0.001 | 52.5 (0.37) | <0.001            | 740         | 46.2 (0.36) | <0.001 | 51.7 (0.32) | 0.027  |
| Low                      | 215   | 49.1 (0.58)     |        | 53.1 (0.54) |                   | 330         | 48.5 (0.53) |        | 52.4 (0.45) |        |
| High                     | 1,080 | 49.8 (0.26)     |        | 54.5 (0.24) |                   | 822         | 49.8 (0.34) |        | 52.9 (0.30) |        |
| Physical activity        |       |                 |        |             |                   |             |             |        |             |        |
| High                     | 937   | 50.7 (0.27)     | <0.001 | 54.3 (0.25) | 0.002             | 826         | 50.0 (0.33) | <0.001 | 52.5 (0.30) | 0.47   |
| Low                      | 768   | 47.1 (0.30)     |        | 53.2 (0.28) |                   | 977         | 46.6 (0.30) |        | 52.2 (0.27) |        |
| Depressive symptoms      |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 1,445 | 49.7 (0.21)     | <0.001 | 54.9 (0.18) | <0.001            | 1,446       | 48.9 (0.25) | <0.001 | 54.0 (0.19) | <0.001 |
| Yes                      | 115   | 44.2 (0.76)     |        | 42.8 (0.64) |                   | 198         | 44.0 (0.66) |        | 41.7 (0.52) |        |
| Hypertension             |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 1,037 | 49.5 (0.26)     | 0.010  | 53.9 (0.24) | 0.46              | 1,239       | 49.2 (0.27) | <0.001 | 52.4 (0.25) | 0.71   |
| Yes                      | 671   | 48.4 (0.33)     |        | 53.6 (0.31) |                   | 567         | 45.8 (0.42) |        | 52.2 (0.38) |        |
| Diabetes                 |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 1,347 | 49.5 (0.23)     | <0.001 | 53.9 (0.21) | 0.37              | 1,530       | 48.8 (0.24) | <0.001 | 52.4 (0.22) | 0.25   |
| Yes                      | 285   | 47.1 (0.50)     |        | 53.4 (0.47) |                   | 167         | 43.6 (0.73) |        | 51.6 (0.67) |        |
| CVD                      |       |                 |        |             |                   |             |             |        |             |        |
| No                       | 1,343 | 49.8 (0.23)     | <0.001 | 54.0 (0.21) | 0.022             | 1,693       | 48.4 (0.23) | <0.001 | 52.4 (0.21) | 0.14   |
| Yes                      | 365   | 46.5 (0.45)     |        | 52.1 (0.42) |                   | 112         | 44.5 (0.92) |        | 51.2 (0.83) |        |

Estimated marginal means adjusted for age

\*\* Higher scores indicate better health and functioning (except for sleep). P value indicates the significant linear trend ( $P \leq 0.05$ )

**Table 4** Fully-adjusted mean scores (SE) of the SF-36 components summaries by gender and selected correlates: WHS

| Variable                 | N     | Men (n = 4,643) <sup>a</sup> |        |             | Women (n = 1,829) <sup>a</sup> |             |             |        |             |        |
|--------------------------|-------|------------------------------|--------|-------------|--------------------------------|-------------|-------------|--------|-------------|--------|
|                          |       | Mean (SE)**                  | P      | Mean (SE)** | P                              | Mean (SE)** | P           |        |             |        |
|                          |       | Physical                     |        | Mental      |                                | Physical    |             | Mental |             |        |
| Age (years)              |       |                              |        |             |                                |             |             |        |             |        |
| ≤50                      | 973   | 50.2 (0.67)                  | <0.001 | 42.7 (0.77) | <0.001                         | 346         | 47.8 (1.38) | 0.003  | 41.2 (1.35) | <0.001 |
| 51–60                    | 2,301 | 49.6 (0.63)                  |        | 44.9 (0.75) |                                | 864         | 46.5 (1.33) |        | 42.5 (1.30) |        |
| >60                      | 1,263 | 48.3 (0.66)                  |        | 47.5 (0.78) |                                | 619         | 45.2 (1.35) |        | 45.2 (1.31) |        |
| Sleep (h)                |       |                              |        |             |                                |             |             |        |             |        |
| <6                       | 285   | 48.6 (0.66)                  | 0.019  | 43.5 (0.77) | <0.001                         | 177         | 46.4 (1.33) | 0.001  | 40.1 (1.30) | <0.001 |
| 6–8                      | 4,200 | 49.9 (0.51)                  |        | 46.4 (0.60) |                                | 1,533       | 49.0 (1.14) |        | 45.3 (1.12) |        |
| >8                       | 52    | 49.7 (1.22)                  |        | 45.2 (1.45) |                                | 37          | 44.1 (2.16) |        | 43.5 (2.11) |        |
| Marital status           |       |                              |        |             |                                |             |             |        |             |        |
| Married                  | 3,831 | 49.1 (0.63)                  | 0.10   | 45.4 (0.75) | 0.11                           | 1,074       | 46.0 (1.31) | 0.038  | 43.5 (1.28) | 0.043  |
| Not married              | 675   | 49.7 (0.67)                  |        | 44.7 (0.79) |                                | 660         | 47.1 (1.33) |        | 42.4 (1.30) |        |
| Socioeconomic status     |       |                              |        |             |                                |             |             |        |             |        |
| Lowest                   | 202   | 48.6 (0.79)                  | 0.88   | 44.3 (0.91) | 0.23                           | 534         | 46.3 (1.32) | 0.15   | 43.3 (1.30) | 0.28   |
| Medium                   | 2,335 | 48.5 (0.63)                  |        | 45.5 (0.73) |                                | 403         | 45.6 (1.38) |        | 43.8 (1.36) |        |
| Highest                  | 1,885 | 48.4 (0.61)                  |        | 45.4 (0.91) |                                | 875         | 45.1 (1.27) |        | 42.9 (1.25) |        |
| BMI (kg/m <sup>2</sup> ) |       |                              |        |             |                                |             |             |        |             |        |
| <25                      | 1,490 | 50.2 (0.65)                  | <0.001 | 44.8 (0.76) | 0.45                           | 657         | 48.4 (1.34) | <0.001 | 42.7 (1.31) | 0.75   |
| 25–29.9                  | 1,698 | 50.0 (0.64)                  |        | 44.9 (0.76) |                                | 485         | 47.1 (1.35) |        | 42.9 (1.32) |        |
| ≥30                      | 431   | 47.9 (0.69)                  |        | 45.4 (0.82) |                                | 260         | 44.0 (1.37) |        | 43.2 (1.34) |        |
| Smoking status           |       |                              |        |             |                                |             |             |        |             |        |
| Non-current smoker       | 4,205 | 50.3 (0.61)                  | <0.001 | 44.8 (0.72) | 0.25                           | 1,558       | 46.8 (1.24) | 0.52   | 43.7 (1.21) | 0.07   |
| Current smoker           | 426   | 48.4 (0.72)                  |        | 45.4 (0.85) |                                | 262         | 46.3 (1.45) |        | 42.2 (1.42) |        |
| Drinking status          |       |                              |        |             |                                |             |             |        |             |        |
| Non-current drinker      | 465   | 48.1 (0.69)                  | 0.22   | 45.0 (0.80) | 0.84                           | 432         | 43.5 (1.34) | <0.001 | 43.7 (1.32) | 0.59   |
| Low                      | 1,900 | 48.7 (0.62)                  |        | 45.0 (0.72) |                                | 983         | 46.0 (1.39) |        | 43.0 (1.27) |        |
| High                     | 2,245 | 48.8 (0.62)                  |        | 45.1 (0.72) |                                | 384         | 47.5 (1.35) |        | 43.3 (1.33) |        |
| Physical activity        |       |                              |        |             |                                |             |             |        |             |        |
| High                     | 2,255 | 49.9 (0.65)                  | <0.001 | 45.2 (0.77) | 0.20                           | 598         | 47.3 (0.36) | 0.005  | 43.1 (1.33) | 0.56   |
| Low                      | 2,388 | 48.9 (0.63)                  |        | 44.9 (0.75) |                                | 1,231       | 45.7 (0.28) |        | 42.8 (1.25) |        |
| Depressive symptoms      |       |                              |        |             |                                |             |             |        |             |        |
| No                       | 4,041 | 49.5 (0.62)                  | 0.55   | 51.4 (0.74) | <0.001                         | 1,548       | 47.1 (1.27) | 0.14   | 50.0 (1.25) | <0.001 |
| Yes                      | 539   | 49.3 (0.69)                  |        | 38.7 (0.82) |                                | 251         | 45.9 (1.42) |        | 35.9 (1.39) |        |
| Hypertension             |       |                              |        |             |                                |             |             |        |             |        |
| No                       | 3,000 | 49.4 (0.64)                  | 0.80   | 45.2 (0.78) | 0.46                           | 1,159       | 46.7 (1.31) | 0.58   | 41.8 (1.28) | 0.001  |
| Yes                      | 1,265 | 49.4 (0.66)                  |        | 44.9 (0.74) |                                | 453         | 46.3 (1.37) |        | 44.1 (1.34) |        |
| Diabetes                 |       |                              |        |             |                                |             |             |        |             |        |
| No                       | 4,058 | 50.4 (0.52)                  | 0.012  | 45.1 (0.61) | 0.87                           | 1,519       | 46.4 (0.83) | 0.91   | 42.8 (0.81) | 0.87   |
| Yes                      | 117   | 48.4 (0.92)                  |        | 45.0 (1.09) |                                | 28          | 46.6 (2.18) |        | 43.1 (2.13) |        |
| CVD                      |       |                              |        |             |                                |             |             |        |             |        |
| No                       | 3,931 | 50.3 (0.65)                  | <0.001 | 45.0 (0.73) | 0.85                           | 1,531       | 46.9 (1.35) | 0.011  | 43.4 (1.32) | 0.44   |
| Yes                      | 704   | 48.5 (0.64)                  |        | 45.1 (0.75) |                                | 295         | 46.1 (1.32) |        | 42.8 (1.29) |        |

Estimated marginal means adjusted for age

\*\* Higher scores indicate better health and functioning (except for sleep). P value indicates the significant linear trend ( $P \leq 0.05$ )

<sup>a</sup> Male  $R^2 = 0.32$ , female  $R^2 = 0.27$



**Table 5** Fully-adjusted mean scores (SE) of the SF-36 components summaries by gender and selected correlates: WNYHS

| Variable                 | N     | Men (n = 1,781) <sup>***</sup> |        |             | Women (n = 1,903) <sup>***</sup> |             |             |        |             |        |
|--------------------------|-------|--------------------------------|--------|-------------|----------------------------------|-------------|-------------|--------|-------------|--------|
|                          |       | Mean (SE)**                    | P      | Mean (SE)** | P                                | Mean (SE)** | P           |        |             |        |
|                          |       | Physical                       |        | Mental      |                                  | Physical    |             | Mental |             |        |
| Age (years)              |       |                                |        |             |                                  |             |             |        |             |        |
| ≤50                      | 463   | 46.0 (0.71)                    | 0.002  | 45.6 (0.62) | <0.001                           | 632         | 45.0 (0.87) | 0.029  | 45.3 (0.77) | <0.001 |
| 51–60                    | 321   | 44.6 (0.76)                    |        | 47.4 (0.66) |                                  | 435         | 44.2 (0.87) |        | 47.0 (0.77) |        |
| >60                      | 924   | 44.1 (0.64)                    |        | 48.9 (0.57) |                                  | 739         | 43.3 (0.82) |        | 48.6 (0.73) |        |
| Sleep (h)                |       |                                |        |             |                                  |             |             |        |             |        |
| <6                       | 245   | 44.8 (0.74)                    | 0.032  | 47.2 (0.65) | 0.46                             | 231         | 43.1 (0.92) | <0.001 | 46.2 (0.81) | 0.23   |
| 6–8                      | 1,337 | 45.9 (0.59)                    |        | 47.7 (0.52) |                                  | 1,459       | 45.7 (0.75) |        | 46.9 (0.66) |        |
| >8                       | 120   | 44.1 (0.97)                    |        | 47.0 (0.86) |                                  | 112         | 43.7 (1.15) |        | 47.9 (1.01) |        |
| Marital status           |       |                                |        |             |                                  |             |             |        |             |        |
| Married                  | 1,426 | 44.7 (0.60)                    | 0.46   | 47.9 (0.53) | 0.04                             | 1,253       | 44.0 (0.79) | 0.71   | 47.6 (0.70) | 0.012  |
| Not married              | 276   | 45.1 (0.77)                    |        | 46.8 (0.68) |                                  | 549         | 44.2 (0.86) |        | 46.4 (0.76) |        |
| Socioeconomic status     |       |                                |        |             |                                  |             |             |        |             |        |
| Lowest                   | 344   | 43.6 (0.67)                    | <0.001 | 46.7 (0.59) | 0.07                             | 325         | 42.7 (0.82) | 0.003  | 46.9 (0.72) | 0.90   |
| Medium                   | 797   | 44.6 (0.65)                    |        | 47.2 (0.58) |                                  | 736         | 44.4 (0.82) |        | 47.1 (0.72) |        |
| Highest                  | 492   | 46.7 (0.78)                    |        | 48.0 (0.69) |                                  | 596         | 45.3 (0.95) |        | 46.9 (0.84) |        |
| BMI (kg/m <sup>2</sup> ) |       |                                |        |             |                                  |             |             |        |             |        |
| <25                      | 396   | 45.3 (0.73)                    | 0.033  | 47.0 (0.65) | 0.42                             | 646         | 46.1 (0.86) | <0.001 | 46.3 (0.76) | 0.06   |
| 25–29.9                  | 773   | 45.3 (0.67)                    |        | 47.6 (0.60) |                                  | 568         | 45.0 (0.86) |        | 47.4 (0.75) |        |
| ≥30 (C)                  | 496   | 43.9 (0.67)                    |        | 47.3 (0.59) |                                  | 531         | 41.3 (0.82) |        | 47.3 (0.73) |        |
| Smoking status           |       |                                |        |             |                                  |             |             |        |             |        |
| Non-current smoker       | 1,481 | 46.3 (0.60)                    | <0.001 | 47.5 (0.53) | 0.57                             | 1,543       | 44.6 (0.75) | 0.13   | 47.2 (0.66) | 0.43   |
| Current smoker           | 224   | 43.5 (0.78)                    |        | 47.1 (0.69) |                                  | 259         | 43.6 (0.92) |        | 46.8 (0.81) |        |
| Drinking status          |       |                                |        |             |                                  |             |             |        |             |        |
| Non-current drinker      | 456   | 44.1 (0.68)                    | 0.031  | 46.9 (0.60) | 0.033                            | 740         | 43.2 (0.82) | 0.013  | 47.3 (0.72) | 0.49   |
| Low                      | 215   | 45.3 (0.84)                    |        | 47.0 (0.55) |                                  | 330         | 44.5 (0.90) |        | 46.6 (0.79) |        |
| High                     | 1,080 | 45.4 (0.63)                    |        | 48.0 (0.56) |                                  | 822         | 44.7 (0.83) |        | 47.1 (0.73) |        |
| Physical activity        |       |                                |        |             |                                  |             |             |        |             |        |
| High                     | 937   | 46.3 (0.66)                    | <0.001 | 47.8 (0.59) | 0.006                            | 826         | 45.7 (0.82) | <0.001 | 47.2 (0.73) | 0.20   |
| Low                      | 768   | 43.5 (0.64)                    |        | 46.8 (0.57) |                                  | 977         | 42.6 (0.79) |        | 46.7 (0.70) |        |
| Depressive symptoms      |       |                                |        |             |                                  |             |             |        |             |        |
| No                       | 1,445 | 46.9 (0.57)                    | <0.001 | 53.2 (0.51) | <0.001                           | 1,446       | 45.7 (0.74) | <0.001 | 53.2 (0.67) | <0.001 |
| Yes                      | 115   | 42.9 (0.87)                    |        | 41.4 (0.77) |                                  | 198         | 42.6 (0.95) |        | 40.9 (0.84) |        |
| Hypertension             |       |                                |        |             |                                  |             |             |        |             |        |
| No                       | 1,037 | 45.5 (0.65)                    | 0.006  | 47.3 (0.57) | 0.77                             | 1,239       | 45.0 (0.81) | 0.001  | 46.7 (0.71) | 0.30   |
| Yes                      | 671   | 44.3 (0.67)                    |        | 47.5 (0.59) |                                  | 567         | 43.3 (0.84) |        | 47.2 (0.74) |        |
| Diabetes                 |       |                                |        |             |                                  |             |             |        |             |        |
| No                       | 1,347 | 45.5 (0.61)                    | 0.006  | 47.3 (0.54) | 0.83                             | 1,530       | 44.6 (0.72) | 0.29   | 47.1 (0.63) | 0.85   |
| Yes                      | 285   | 44.4 (0.76)                    |        | 47.3 (0.67) |                                  | 167         | 43.7 (1.03) |        | 46.9 (0.91) |        |
| CVD                      |       |                                |        |             |                                  |             |             |        |             |        |
| No                       | 1,343 | 43.7 (0.74)                    | <0.001 | 47.2 (0.65) | 0.63                             | 1,693       | 42.6 (1.16) | 0.003  | 46.4 (1.02) | 0.19   |
| Yes                      | 365   | 46.1 (0.61)                    |        | 47.4 (0.54) |                                  | 112         | 45.7 (0.65) |        | 47.6 (0.58) |        |

Estimated fully adjusted marginal means

\*\* Higher scores indicate better health and functioning (*except for sleep*). P value indicates the significant linear trend ( $P \leq 0.05$ )

<sup>a</sup> Male  $R^2 = 0.25$ , female  $R^2 = 0.22$

women (Tables 4, 5). Specifically, increasing age was associated with poorer physical health but with higher mental health scores ( $P < 0.001$ ) in both samples.

Sleep duration had an inverted *u* shaped significant association with the SF-36 scores. In fact, both short and long duration of sleep were consistently associated with lower scores in both the UK and US sample. This association was significant for both mental and physical SF-36 scores in men and women in the UK sample while in the US sample sleep duration tended to only affect physical QoL.

A contrasting scenario was observed for the presence of depressive symptoms, which was significantly associated with both physical and mental QoL in both men and women of the US sample but only with mental QoL scores in the UK participants.

Other factors were significantly associated with either one dimension of QoL in both populations or with both but within a single population or only in men or women and overall, lifestyle variables and co-morbidities were more associated with the physical than the mental QoL component (Tables 4, 5).

## Discussion

Overall we found that levels of physical QoL tended to be higher in the UK population while mental QoL was higher in the US group perhaps reflecting intrinsic differences present in the two populations selected. Beyond the levels of QoL, we found consistent findings from this cross-cultural comparison of correlates of QoL, with age, sleep duration and presence of depressive symptoms being the most consistent and relevant correlates.

### Socio-demographic correlates

Of the correlates evaluated, the most consistent finding was that increasing age was strongly associated with poorer physical QoL but with significantly higher mental QoL in both men and women from both the UK and US samples. The reduced physical score in the older age group can be explained by a general deterioration in body functions and capabilities; however the improved mental health score might be due to better coping abilities and adaptation in this age group [22]. In fact, this finding supports previous studies suggesting that older people tend to have internal mechanisms available to accommodate better to hardship or negative circumstances than those who are younger [23].

With regard to SES, people from a lower socio-economic group had lower scores of QoL in general. However, this trend was only significant in the US sample in the fully-adjusted models, which could mean that the gradient

seen in the UK sample in the only age-adjusted models is 'explained' by the other correlates in the analyses. Furthermore, this could also be attributed to the differential classification of social status in our study because we divided the UK sample based on their employment grades, while we used household income as a measure of SES for the US sample. In addition, the different nature of the two populations (occupational vs. communitywide sample) is likely to play a role. It may also be that SES is less strongly associated with QoL in the UK because the magnitude of differences in access to health care by SES might be lower than in the US.

### Lifestyle factors

In the present study, lifestyle variables were more strongly associated with the physical rather than the mental component of QoL. This is somewhat inconsistent with previous research, which suggests, for example, that regular physical exercise may improve mental health wellbeing as well as physical health [24–28]. One possible explanation may be that our classification of physical activity levels into high and low, might not fully capture the true effect of physical activity. The cross-sectional nature of the present analyses does not allow detection of the causal direction of the association for example whether physical activity might have a longer-term protective effect on mental QoL.

Our results show that people who sleep between 6 and 8 h/day tend to have both better physical and mental health scores than those who slept on average <6 or more than 8 h/day. This finding is supported by a growing body of evidence where short (<6 h) and long duration of sleep (>8 h) are related to poorer self perceived mental and physical health, as well as increased risk of adverse health outcomes and higher total mortality [16, 29–31]. This finding highlights the need to pay closer attention to the societal changes in sleep patterns that have occurred in the last years and which might have a substantial role in the current global epidemics of cardiometabolic disorders.

With regard to drinking habits, in the current study, non-current drinkers of both genders and countries reported consistently poorer physical and mental QoL scores than current drinkers. Non-current drinkers may include subjects who no longer drink because of pre-existing diseases, which confounds the relationship between health status and alcohol consumption [15, 32, 33].

Current smoking appears to be strongly related to physical functioning in men in both studies, but there appears to be no strong evidence of an association with physical health in women or with mental health in either sex. The most likely explanation of the gender difference in the association with physical health in these two, middle-aged cohorts will be the strength of the exposure. Men are

more likely to have been heavy smokers and have smoked for longer than women.

### Co-morbidities

Depressive symptoms were strongly associated with poorer mental QoL in both samples and genders and with poorer physical QoL in American men and women. Presence of CVD was consistently associated with poorer physical health in both samples and genders, while prevalent hypertension seemed to affect only the physical QoL of US participants. Diabetes on the other hand only affected the physical QoL in men of both samples, perhaps reflecting the gender distribution in prevalence of diabetes in the two populations -and the level of severity. As with the lack of effect of physical activity on mental QoL, it is possible that the cross-sectional nature of the present analyses does not allow us to detect longer-term deleterious effects that co-morbidities might have on mental QoL.

### Limitations and strengths

Despite a large amount of research on the measurement and validity of health related QoL, there have only been a handful of studies on factors associated with QoL [12, 34]. The present study attempted to address this issue by examining two well-characterised populations. By performing a cross-cultural comparison, we attempted to further establish the correlation between certain selected variables and QoL. To our knowledge, our study is the first of its kind to investigate determinants of QoL using the standardised SF-36 questionnaire while taking into account other covariates in a cross-cultural setting. Beyond this, different limitations in the present study warrant consideration. Firstly, while the cross-cultural design of this study allowed us to examine the associations between QoL and multiple factors, it does not allow us to establish the causality and temporality of the observed relationships. Secondly, both samples were also limited to Caucasians, and originated from developed western societies; which might reduce the generalizability of our findings to different ethnic backgrounds and socio-economic settings. Thirdly, although we have included a comprehensive range of factors associated with QoL, additional key factors (e.g. stress, social support, job satisfaction, social integration, personality) have not been measured in both of these samples, and we were not able to compare them between our included populations. Fourthly, given the cross-sectional nature of the study, it is not possible to disentangle the chronological order or causal nature of the associations found, nor to fully understand the effects of cumulative experience of factors evaluated across the lifecourse. Lastly, questions asked in both studies varied slightly which might

lead to discrepancies, challenging the comparability of the two populations.

### Conclusions

In conclusion, consistent findings from this cross-cultural comparison between two populations from the UK and US corroborate the multifaceted nature of measures of QoL. Increasing age was associated with poorer physical health but with higher mental health scores. Lifestyle and co-morbidity factors mainly affected the physical health component and had little impact on the mental health component. These are novel findings that warrant further consideration and suggest additional aspects to consider when trying to improve or maintain the QoL of a population. Beyond our results, larger evaluations and comparisons in different populations are warranted to better understand crucial factors impacting QoL, factors that could be targeted to improve health outcomes in populations.

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**Conflict of interest** All authors have no competing interests to declare.

**Ethical approval** Original ethical approval was obtained from the University College London Medical School committee on the ethics of human research for the WHS and from the University at Buffalo (State University of New York) institutional review board for the WNYHS. All participants provided informed consent.

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