Original Article

Self-rated health and its relationship to functional status and well-being in a group of elderly Guatemalan subjects

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This study examined the association of self-rated health with physical function and emotional well-being, while controlling for differences in sex, age and anthropometry. Subjects were participants in a multicentre study originated by the International Union of Nutritional Sciences (IUNS). A total of 151 elderly Guatemalan subjects were examined using a questionnaire which included information on self-rated health, activities of daily living, well-being, and a common battery of anthropometric variables. Adjusted odds ratios (OR) obtained with polytomous logistic regression showed that subjects with the highest score on the well-being index compared with those with the lowest were 1.67 times more likely (P-value <0.001, confidence interval (C.I.) = 1.31–2.14) to rate themselves in 'good' health versus 'fair' and 'poor' health. Subjects with the highest score versus those with the lowest on the mobility index were 1.15 times more likely (P-value <0.05, (C.I.) = 1.00–1.32) to rate themselves in 'good' health versus the other health ratings. These are the first results to examine the relationship of self-rated health to physical function and emotional well-being of elderly, free-living Guatemalans.

Key words: activities of daily living, elderly, Guatemala, International Union of Nutritional Sciences (IUNS), mortality, self-rated health, well-being.

Introduction

As adults grow older, their definition of health broadens to encompass more than just physical health.[1] Health becomes more functionally based and includes the abilities older persons need to maintain their lifestyle through the performance of everyday activities appropriate for their age and sex.[2,3] In the domain of chronic disease, measures of physical function and emotional well-being have added an important dimension to our understanding of the impact of illness on quality of the patient's life.[4,5] These indicators also predict the ultimate impact of chronic diseases in terms of survival.[6] Even in free-living, elderly populations, a strong association between functional disability and early mortality has been reported by several studies.[7–9]

Functional capabilities of community-dwelling elderly are also affected by anthropometric indices.[10] Analysis of the National Health and Nutrition Examination Survey-I Epidemiologic Follow-up Study (NHEFS) (1982–84) showed that the greater the extreme of body mass index (BMI), either higher or lower, the greater the risk for functional impairment.[11] The distribution of the body's fat has also been shown to be a determinant of the risks for cardiovascular disease,[12–15] hypertension,[14] diabetes[16] and lipidemia patterns.[17,18]

Global self-ratings of health are among the most commonly assessed and simplest measures for ascertaining an individual's health. Numerous studies have demonstrated their power as independent predictors of survival among the aged.[19–24] Idler and Kasl conclude that health perceptions have direct and independent effects on survival but that these effects work through unknown processes. Several explanations for this association from direct psychological mediation of ill-health to subconscious perception of occult pathology have been proffered.[25] Among the explanations of why self-rated health affects survival in the elderly is that negative perceptions of health can stimulate the release of chemicals that compromise the immune system. Poor self-perceptions may index occult disease not yet represented by diagnoses or self-reports of symptoms.[25] Such perceptions may prevent individuals from taking actions to protect and maintain their health, resulting in poorer health status. To date, the operation of these mechanisms remains to be robustly confirmed.

Although there have been several major longitudinal studies exploring the relationships between self-ratings of health, functional ability and well-being among North American elderly,[26–28] little information has been gathered among the aged from other continents. An understanding of the correlates of self-rated health may suggest the mechanism through which self-rated health affects survival of the elderly living in tropical latitudes. Among the Central American countries, Guatemala has the greatest number of elderly

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inhabitants;[29,30] of Guatemala's 9.7 million inhabitants, 3.2% are 65 years or older, and by the year 2025 the proportion of elderly will increase to 4.9%. Therefore, the aim of this study was to examine the association of self-rated health with functional health status and well-being while controlling for differences in age, sex and anthropometric indicators of body composition. Specifically, we report the correlates of self-reported health among a group of free-living elderly subjects, residing in a semirural, suburban community outside of Guatemala's capital city.

Subjects and methods

Characteristics of the study population

The present study was conducted as part of the 'second round' of baseline studies for the multicentric 'Food Habits in Later Life: A Cross-Cultural Study' (FHLL) under the auspices of Committee II/8 of the International Union of Nutritional Sciences (IUNS).[31–34] The universal common protocol and procedures were used. All procedures were approved by the Human Subjects Committee of the Center for Studies of Sensory Impairment, Ageing, and Metabolism, the research branch of the National Committee for the Blind and Deaf in Guatemala. Verbal consent was obtained from subjects after the details of the study were explained to them. The subjects received no remuneration for their participation.

The study population was from the low-income community of Jocotenango, situated approximately 50 kms from the capital, and comprised 198 free-living subjects aged ≥ 60 years. The subjects were primarily mestizos, that is, persons from a mixture of Spanish and indigenous descent with several indigenous subjects from the post-Mayan, Kakchiquel, linguistic and ethnic group. A recently up-dated census list of older persons residing in Jocotenango was obtained from the local health centre and contained 198 names. Our goal was to interview all persons ≥ 60 years living in the community (saturation sample). We were able to contact and enroll all subjects, however obtained information on self-rated health, activities of daily living and well-being for 151 subjects (76.3% of saturation sample).

Of the 151 subjects studied, 46 (30.5%) were male and 105 (69.5%) were female. The mean age of the male subjects was 73 ± 8 years and of the female subjects 70 ± 8 years. The mean age difference between sexes was statistically significant ($P < 0.05$). The mean values for body mass index (BMI) were measured in kg/m^2, however, did not vary significantly between sexes ($P > 0.05$). They were 23.7 ± 3.1 kg/m^2 for males and 24.2 ± 4.7 kg/m^2 for females. We compared the data on sex, age and BMI for the study sample and saturation sample subjects to determine if there were differences in the distribution of these parameters, using the χ-squared test and Student's *t*-test, respectively. Results of this comparison are presented in Table 1.

Self-rated health

As part of a general structured interview conducted in the subjects' own homes, several questions were asked about self-rated health (SRH), activities of daily living (ADL), and well-being (WB). The questionnaire was developed and tested by the IUNS Committee II/4 on Nutrition and Ageing. Further details of the questionnaire can be found in the published IUNS Study protocol.[33,34] The instruments were translated from English into colloquial, Guatemalan Spanish, by a bilingual Guatemalan professional and then back-translated by a bilingual North American, unfamiliar with the original text. The interviews with the questionnaire variables related to SRH, ADL, WB were administered by a single, native, Spanish-speaking, Guatemalan medical student (Carolina Gonzalez). The SRH was evaluated using the response to the question, *"How would you rate health at the present time?"* with the possible responses being poor, fair, good, and excellent.[35,36]

Activities of daily living

Physical function was assessed using an instrument adapted from the WHO 11 Country Study.[37] The 15-item check-list, shown in Table 2, included questions about physical functional limitations (items 1–4), basic activities of daily living including self-care (items 5–11), and instrumental activities of daily living (items 12–15). For each item, the level of competence was measured on a four-point scale. Degree of difficulty scores were assigned to categories defined in terms of the ability to perform an activity within a numerical range from one to four. A score of one denoted that the subject was unable to perform the activity, whereas a score of four indicated that the subject could accomplish the activity without any difficulty. The other two possible responses indicated the ability to perform activities only with outside help

Table 2. Items used for assessing activities of daily living

1.	Walk between rooms
2.	Use stairs
3.	Walk at least 400m
4.	Get to places out of walking distance (e.g., bus stop, shops)
5.	Use the toilet
6.	Wash and bathe yourself
7.	Dress and undress
8.	Take care of your appearance
9.	Get in and out of bed
10.	Do your own cooking
11.	Feed yourself
12.	Do light housework
13.	Do heavy housework
14.	Take medicine by yourself
15.	Manage finances

Table 1. Comparison of sex, age and body mass index (BMI) for saturation sample (n = 198) and study sample (n = 151)

Variable	Saturation sample	Study sample	*P*-value
Sex (M:F)	30.8%: 69.2%	30.5%: 69.5%	>0.05[b]
Age (years)	69.9 ± 8.02[a]	70.7 ± 8.19[a]	>0.05[c]
BMI (kg/m^2)	24.3 ± 4.37[a]	23.4 ± 5.99[a]	>0.05[c]

[a] Mean ± standard deviation. [b] χ-squared test. [c] Student's *t*-test. M, male; F, female; BMI, body mass index.

(score = 2) and with difficulty, but without help (score = 3). The aggregate scores on the ADL questions ranged from 15 to 60.

Because of the association between physical function and mortality demonstrated in other studies, we were particularly interested in the mobility of our subjects. From the ADL questions, a mobility index (MI) was calculated as the sum of items 1–4 in Table 2, based on a model used in the Euronut Survey in Europe on Nutrition and the Elderly, a Concerted Action (SENECA) Study on Nutrition and the Elderly.[38] Subjects' scores were summed and used as a continuous variable in the modelling procedure. Scores ranged from 4 to 16, with higher scores indicating better mobility. Descriptive and tabular results of ADL and MI scores for this population have been presented in full in another publication focusing on the nutritional aspects of this survey component in Guatemala.[39]

Well-being

In addition to physical function, well-being was included to help describe the subject's emotional status.[40] Well-being was measured by a seven-item, binary-coded, closed-ended questionnaire.[33,41,42] Item scores were summed to develop the WB index with aggregate scores ranging from seven to 14. Aggregate scores were used as a continuous variable in the modelling procedure with higher scores indicating a higher sense of WB. Questions were recoded so that a positive response was indicated by a higher score (e.g., "Do you worry more than usual about little things?" Yes = 1; No = 2 and "Do you laugh easily?" No = 1; Yes = 2). The questions included were as follows: Do you worry more than usual about little things?; Have you lost interest in doing things you usually cared about or enjoyed in the past?; Have you ever felt so sad or depressed that you thought you wanted to die?; Do you feel tired most of the time?; Are you happy with every day of your life?; Do you laugh easily?; Do you enjoy listening to music?

Anthropometry

Methodology for collection of anthropometric variables has been described in detail in the IUNS Study protocol,[33,34] as well as in another publication from the present study.[39] In brief, all anthropometric measurements were collected in triplicate by trained anthropometrists. Summary measurements of BMI (kg/m^2) and waist-to-hip ratio (WHR) were calculated from the means of height and weight, and waist and hip circumference measurements, respectively. The BMI and WHR were included in the modelling procedure as proxies for subjects' nutritional health status.

Statistical methods

Initially, we investigated bivariate relationships between SRH and its potential predictive factors using Student's *t*-test and χ^2 analyses. More in-depth analyses were also peformed to further investigate the many complex processes and relationships that affect an individual's SRH using (multivariable) logistic regression.

Multivariate analysis

The following variables were selected for multivariate analyses: subjects' sex, age, BMI (kg/m^2), WHR, and scores on the ADL, mobility and well-being indices. The selection of these variables was based on the study objectives and the results from the bivariate analysis. For SRH, 'excellent' and 'good' response categories were combined as a result of the small number (n = 8) of 'excellent' responses and to improve the predictive power of the model. This category will be referred to as 'good' responses for the rest of the paper.

The objective was to model the conditional probability of a 'good' response (as compared to the conditional probability of a 'fair' and a 'poor' response) for individuals in the population given their functional health status and their specific demographic and anthropometric characteristics.

For multivariate analyses, we defined our response variable to take the following values as:

1 – If the subject responded 'poor' to the question on self-perceived health;
2 – If the subject responded 'fair' to this question; and
3 – If the subject responded 'excellent' or 'good' to this question.

Assuming the three categories of the outcome variable to be ordinal, a polytomous logistic regression model was fitted to the data using the BMDP statistical software (University of Calfornia Press, CA, USA). A general expression for the conditional probability in the ordinal model is:

$$P(Y > j) = e^{\alpha j + \beta x}/1 + e^{\alpha j + \beta x}$$

where j is the intercept for the jth category of SRH, and x is the vector of covariates.[39] A nominal model was also fitted to confirm the consistency of the results.

We used orthogonal polynomial contrasts to test for linear, quadratic, cubic, and higher order effects in multiple logistic regression models.[43,44] Results showed that the assumption of linearity of the continuous covariates in the logit was justified, except for the WHR. Consequently, the WHR was dichotomised using cut-off values of 0.80 and 0.90 for women and men, respectively, following recommendations of Deurenberg and Westrate.[45]

Model selection

The objective of the model building process was to obtain a 'good fit' for the data, with the least number of predictive variables. To find the most parsimonious model, both forward and backward stepwise methods (using a *P*-value of 0.15 as a criterion for variable removal and 0.10 as a criterion for variable entry) were employed.[42] The computed *P*-values were based on the likelihood-ratio test.[42,43] The estimated coefficients for sex, age, BMI, ADL, and WHR were not statistically significant in each of the two comparisons and therefore, were not included in the final model. After the most parsimonious main effects model was selected, the χ^2 goodness-of-fit statistic was computed to assess the fit of the model.[43]

Interactions

All possible two-factor interactions among the variables in the final main effects model were checked for by sequentially including their product terms into the final model. We limited our investigation of interaction to two-factor effects as a result of the relatively small sample size.

Results

Table 3 shows descriptive statistics for sex according to categories of SRH status. Scores for the WB index ranged from eight to 14 points, with an average score of 11.4 (SD = 1.5 points). For MI, the range was 4–16 points with an average score of 13.9 (SD = 2.5). Slightly more than 30% of respondents received the maximum score of 16 points for the MI. Table 4 shows results of the Mantel–Haenzel Test for linear association for both the WB and mobility indices with categories of SRH status.

Table 5 shows the results from the ordinal polytomous logistic regression model of subjects' health ratings and their association to well-being, mobility and control variables. Subjects with the highest score on the WB index were 1.67 times more likely than subjects with the lowest score to say their health was 'good' compared with 'fair' and 'poor'. Subjects with the highest score on the MI versus those with the lowest were also 1.15 times more likely to say their health was 'good' versus the other health ratings. The adjusted OR was also calculated according to the scale values of the WB and mobility indices by multiplying the difference of the scale scores by the model coefficients and exponentiating the results. Using this method, the lower limit of the 95% confidence interval gives us an adjusted OR of 6.45 which provides a 'conservative bound' on the estimated effect of WB on SRH. The effect of MI on SRH using this method gave an adjusted OR of 1.00. None of the control variables reached statistical significance in the modelling procedure.

Summary results for the three comparisons of SRH status for the nominal model are shown in Table 6 to confirm the consistency of the results from the ordinal model. The nominal model produces almost identical adjusted OR for the comparison of the 'good' versus 'fair' self-ratings of health, while the results for the 'good' versus 'poor' and 'fair' versus 'poor' self-ratings of health are not identical but within the 95% confidence limits for the point estimate. It is important to recognize, however, that the direction of the results in both models is consistent (e.g., WB is a stronger predictor of SRH than MI).

Overall, results show that the selected model fits the data adequately ($\chi^2 = 86.79$; d.f. = 76, $P = 0.187$). The global χ^2 test to control for biases as a result of multiple comparisons was significant (G = 30.973, d.f. = 2, P-value < 0.001). This means we can reject the null hypothesis that all slopes are zero. Coefficients of all interaction terms failed to achieve statistical significance at the 10% level. As a result of the moderate sample size, however, insufficient power to detect interactions may exist.

Discussion

The limitations of the present study have not been understated. This was an initial inquiry into predictors of functional status based on data gathered from a survey instrument with a common protocol, used in a multicentre collaborative study.[33,34] It was not designed prospectively to inquire about self-rated health, physical function and emotional well-being, and hence did not incorporate all of the variables for covering the more contemporary models. Furthermore, it pretends to be descriptive of associations at best, and makes no pretext to understand the mechanisms of the findings. Bearing these caveats and limitations in mind, it is interesting that the foregoing analyses demonstrate a statistically significant association between SRH and WB. An association between SRH and mobility was also demonstrated with statistical significance of $P = 0.05$. Nevertheless, subjects with high scores on both the well-being and mobility indices perceived their global health to be superior to those subjects who had lower scores. Therefore, for this group of Guatemalan elderly people, an individual's self-evaluation of health is substantially influenced by his or her level of emotional well-being and physical function.

Similar findings have been reported by previous studies.[20,23,28,40] In a longitudinal study examining predictors of well-being and functioning in a population of elderly Mexican–Americans and Anglos, Markides and Lee reported an association between well-being and self-rated health that was in the same direction, but was not significant at the 0.05 level.[27]

Grand *et al.* showed that the self-assessment of health is largely dependent on an individual's functional ability and psychosocial processes as evaluated by analysis of life satisfaction.[46] This group's findings were in agreement with the mechanism suggested by Kaplan and Camacho,[21] namely, that subjects' self-rating of health depends on different psychosocial processes. The subject either accepts or denies the status of 'sick person'. This affects the subject's health through the body's ability to resist disease. The predictive role played by psychosocial variables in our sample seems to support this mechanism.

Grand *et al.* confirm that psychosocial variables and measures of disability (in terms of ADL) are the strongest predictors of self-rated health.[46] In the context of Latin culture, moreover, findings from focus groups conducted among of

Table 4. Test of linear association for age, well-being and mobility with categories of self-rated health

Variable	χ^{2a}	P-value[b]
Age	0.77	>0.05
Well-being	23.17	<0.001
Mobility	13.01	<0.001

[a]Degrees of freedom = 1 for each Mantel–Haenzel Test. [b]Test for linear association between a variable and self-rated health status.

Table 3. Descriptive statistics for sex according to categories of self-rated health

Sex	Poor health	Fair health	Good health[a]	χ^{2b}	P-value[c]
Male	13.0%	39.2%	47.8%	4.22	> 0.05
Female	16.2%	53.3%	30.5%		

[a] Refers to 'excellent' (n = 8) and 'good' (n = 46) responses combined. [b] Degrees of freedom = 2 for each χ-square test. [c] Test for association between sex and self-rated health.

Table 5. Model estimates for polytomous logistic regression ordinal model and 95% confidence intervals for good *vs* fair and poor self-rated health categories

Variable	Coefficient	OR[a]	*P*-value[b]	95% C.I.
Well-being	0.51	1.67	<0.001	1.31–2.14
Mobility	0.14	1.15	0.05	1.00–1.32
Sex	–0.40	0.67	0.27	0.32–1.38
Age	0.02	1.02	0.56	0.96–1.07
BMI	–0.04	0.96	0.35	0.89–1.04
WHR	0.35	1.42	0.29	0.74–2.73

[a] Each odds ratio (OR) estimate is adjusted for all other variables in the model. [b] Statistically significant at the 5% level. *P*-values shown are adjusted for multiple comparisons. All *P*-values are based on two-tailed tests. BMI, body mass index; WHR, waist-to-hip ratio; C.I., confidence intervals.

Table 6. Summary of polytomous logistic regression nominal model estimates and 95% confidence intervals for categories of self-rated health

Self-health rating	Coefficient	Variable[a]	OR[b]	*P*-value[c]	95% C.I.
Good *vs* fair	0.47	WB	1.60	<0.01	1.19–2.15
	0.12	MI	1.13	>0.05	0.93–1.37
Good *vs* poor	0.73	WB	2.08	0.001	1.35–3.20
	0.22	MI	1.25	0.05	0.99–1.57
Fair *vs* poor	0.26	WB	1.30	>0.05	0.89–1.90
	0.10	MI	1.11	>0.05	0.93–1.32

[a] WB = well-being index; MI = mobility index. [b] Each odds ratio (OR) estimate is adjusted for all other variables in the model. [c] Statistically significant at the 5% level. *P*-values shown are adjusted for multiple comparisons. All *P*-values are based on two-tailed tests. C.I., confidence intervals.

385 disabled Mexican–American elderly demonstrated that these elderly subjects exhibited increased concerns with respect to posing a burden to their families and expressed a desire to maintain independence.[48] With respect to self-rated health, our Guatemalan findings represent one of the first accounts among elderly from a developing, Latin–American country.

The lack of statistical significance for demographic (e.g., age, sex) and body composition (e.g., BMI and WHR) variables was unexpected. One explanation for why the anthropometric indicators were not significant in this model may reside in the fact that, among this group of elderly subjects, the dispersion of BMI values is concentrated about the mean, whereas the other predictor variables correspond more consistently with subjects from the USA.[48,49] The majority of BMI values for both men and women were in the acceptable weight to modest overweight categories.[39] In addition, a number of other studies in Guatemala have shown that this population remains physically active and independent well into their seventh decade, helping to explain the large number of lean individuals.[50,51]

Although statistical examination may not be able to reveal how SRH is conceived of in people's minds, that is we reveal little in terms of mechanism, the model presented here makes an important first-step contribution to the study of SRH. The above analyses indicate a variation in self-rating of health among Guatemalan elderly with respect to different physical and psychological dimensions. In a companion publication, the overall independence and mobility of this population is described.[39] On examination of individual items of the well-being index, more than two-thirds of subjects 'worry more than usual about little things' and have at some time 'felt so sad or depressed that they thought they wanted to die'. In contrast, almost three-quarters of subjects reported that they are happy every day of their lives, laugh easily, and enjoy listening to music. These are apparent contradictions emanating from questions on the same instrument asked during a single interview sitting. Many would be the speculations for how such internal inconsistencies might arise, but the design of the survey does not permit us to address any of them. This is due, once again, to the several acknowledged limitations. First, information on socioeconomic status was not available for inclusion in analyses. Although several longitudinal studies exploring the correlates of SRH did control for indicators of socioeconomic status (e.g., income and education),[19,21–23] none of these studies showed an independent effect of these variables on self-rated health in predicting mortality. In addition, through observation of subjects in our sample by investigators, it appears that the level of income and education are distributed relatively homogeneously among this group. Furthermore, our findings are based on a cross-sectional study and therefore leave open the question of direction of causality in this population. The cross-sectional findings, however, parallel those from longitudinal studies in North American populations[26,27] as does the strength of associations.[28]

The present findings in community-dwelling Guatemalan elderly imply that emotional well-being and mobility are strongly associated with SRH. The relationships among these health indicators, however, may be interpreted in a reciprocal (reverse causality) context as well, that is, that improved self-perceptions of health may have a positive effect on well-being and ratings of mobility. Evaluation of the causal associations between SRH, WB and mobility, as well as their relationship to mortality, requires *longitudinal* data for which a follow-up study is currently being conducted. Although our

experience is very preliminary, we feel that the payoff in health status research among the elderly, at least in a developing country such as Guatemala, will most likely come from studies, which emphasize measures of functional status and other psychosocial indicators of well-being.

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