THE EGYPTIAN POPULATION AND FAMILY PLANNING REVIEW
ISSR,CAIRO UNIV. Vol. 39,No.2,2006

Confirmatory factor analytical study of the (WHOQOL)-Bref: Experience with Egyptian general population and psychiatric samples

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Abstract:

Rationale: Previous reports on the 4- and 6-domain models of the WHOQOL-Bref, did not investigate the possibility that alternative factor models may provide a better explanation of the data. Objectives: to assess the factor structure of the WHOQOL-Bref in a Egyptian general population sample; and use confirmatory factor analysis (CFA) and path analysis (PA) to see how well the model thus generated fits into the WHOQOL-Bref data of Egyptian psychiatric patients and their family caregivers; and compares with the WHO models. Method: In factor analysis (FA), data from 620 general population subjects were used to generate a 5-domain model; in CFA and PA the model was tested on the data of 300 psychiatric outpatients and their caregivers, using four goodness of fit (GOF) indices in AMOS. Results: Two factors ("personal relations" and "environment") from our FA were similar to the WHO's. In CFA, the GOF criteria were met by our model, and WHO's 4-domain model on the psychiatric data. In PA, the two models met the GOF criteria on the general population data.

Conclusion: The findings support the credentials of WHO's 4-domain model as a universal QOL construct; and favor the impression that analysis of WHOQOL-Bref could benefit from including all the items in FA and using overall QOL as a dependent variable.

Key words: Quality of Life- Confirmatory – Factor Analysis – Path Analysis – Egyptian.

Abbreviations: (WHO) World Health Organization's, (QOL) Quality of Life, (CFA) Confirmatory Factor Analysis, (FA) Factor Analysis, (PA) Path Analysis, (SEM) Structural Equation Model, (GOF) Goodness of Fit, (AMOS) Analysis of Moment Structures, (GLS) Generalized Least Squares .

(1) Introduction:

The WHO articulated a 100-item quality of life (QOL) assessment instrument, the WHOQOL-100 [The WHOQOL Group,1998], based on the definition of subjective QOL as an individual's perception of life in the context of the culture and value system in which he or she lives and in his/her relation to his/her goals, expectations, standards and concerns. A 26-item version, the WHOQOL-Bref, was derived from there [Skevington & et., 2004]. This instrument deals with subjective QOL as distinct from objective QOL [Olusina & Ohaeri, 2003]. This is in line with the trend in the literature, whereby in the assessment of QOL, more attention has been focused on an individual's subjective feelings on aspects of life, rather than the traditional views of success and assessments of material well–being [Min & et., 2002]. The instrument was developed in a wide range of languages in different cultural settings and yields comparable scores across cultures [Skevington & et., 2004]. It is made up of domains (or dimensions) and facets (or sub –domains). Domains are broad groupings (e.g., physical, psychological health) of related facets. The items on "overall rating of QOL" (OQOL) and subjective satisfaction with health, are not included in the domains, but are used to constitute the facet on OQOL and general health. There are two models of the WHOQOL –Bref. The initial model was fashioned in line with the WHOQOL – 100 [The WHOQOL Group,1998] to have six domains, namely, physical health, psychological health, level of independence, social relationships, environment, and spiritual. To derive the second (4-domain) model, the domain of level of independence was merged with that of physical health, while the "spiritual" was merged with the psychological.

The widespread international use of the WHOQOL-Bref provides a compelling rationale to assess its factor structure across culturally diverse groups. Although there are many reports of the 4- and 6- domain models [Skevington & et., 2004, Min & et., 2002]], these studies did not investigate the possibility that alternative factor models may provide a better explanation of the data. Hence, in a Nigerian study in which all the 26 items were entered into factor analysis, the resulting eight factors were found to have better structural integrity indices than the WHO's models in confirmatory factor analysis (CFA), and provided a more succinct definition of QOL than could be derived from the WHO factors [Ohaeri & et., 2005, 2006]. The possibility that using all the items of the WHOQOL-Bref in factor analysis could lead to the generation of factors from local data sets that are of comparable usefulness to the established WHO domains, requires further exploration. In this way, we generate factors that can be compared across cultures (i.e., using the WHO domains), while providing additional information about local QOL characteristics (i.e., using factors generated from local data sets). For instance, in a Korean path analytical (PA) study, it was found that the physical and psychological domains made more significant contributions to explaining the variance in QOL, while the independence and spiritual domains made less impact. The authors interpreted this to imply that Koreans regard independence, individualism and spirituality, the weighted values in Western societies, to be less important [Min & et., 2002].

An additional value of factor analytical studies is that, we could gain more insight into the factor structure of the instrument across cultures, and thereby generate factors that could be used to articulate more rigorous definitions of QOL, from which targets for subjective QOL interventions could be delineated.

Based on the above premises, we have collected data, using the WHOQOL-Bref, from three segments of the Egyptian population, namely, a general population sample, community living psychiatric patients in stable condition, and the family caregivers of the psychiatric patients.

The objectives of our study were:

- to assess the factor structure of the WHOQOL-Bref in a Egyptian general population sample;
- to use CFA and see how well the factors from the Egyptian general population fit into the WHOQOL-Bref data of Egyptian psychiatric patients and their family caregivers; and compare the WHO models with our own in these data;
- using PA, to compare the structural integrity of the domain relationships generated by the WHO models, with that generated by the model from the Egyptian general population;
- assess the factors that contribute to OQOL.

In other words, as recommended by the structural equation modeling (SEM) technique [Arbuckle, 2006], our model was developed using the general population data as the calibration data sample, and then confirmed using the data from the psychiatric patients and their family caregivers as the independent validation samples. The following research questions were explored: [The WHOQOL Group,1998]. Does exploratory FA of the Egyptian general population data generate similar factors to the

WHO models; [Skevington & et., 2004] Does the model generated from the Egyptian general population provide a superior fit to the data from the psychiatric patients and their family caregivers, than the WHO models?.

Based on previous experience [Ohaeri & et., 2005], we hypothesized that the Egyptian general population data would yield different factors from the WHO's, and that the model constituted by these factors would have a better fit to the Egyptian data, than the WHO models.

(2) Method:

The procedure for data collection using stratified sample, the clinical and socio-demographic characteristics, and the QOL characteristics of the patients, caregivers and control group have been described in detail elsewhere [Awadalla & et., 2005]. The patients were consecutive attendees at the psychiatric clinics of various hospitals in Egyptian, with a stable and unequivocal case note diagnosis based on the ICD -10, the official classification system of the country. The patients were accompanied by family members who could independently complete the questionnaires in Arabic. Of the 300 patients (mean age 33.8, SD10.3 years), 99 had schizophrenia, 120 had major affective disorders, and 81 had non-psychotic mild/moderate mental disorders. Patients and caregivers (N=300, mean age, 42.7, SD 12.9 years) each completed the WHOQOL-Bref privately, with trained research assistants nearby to assist them. Subjects agreed to participate after the objectives of the study were explained to them.

For the community controls, we recruited subjects in living conditions similar to those of the patients. For the present report, however, we have enlarged the number of control subjects beyond the 211 used for the previous reports, in order to fulfill the requirement for adequate sample size in SEM [Streiner, 2005]. In doing this, we sought to have a general population sample that would reflect the articulate, independently living, disease -free adult age group proportions in the Egyptian general population, whereby the vast majority are in the younger age group, as in other developing countries. Hence, for the general population sample, age range was 15 –64 years, mean 26.1 (SD 7.96) years. The general population sample consisted of 620 subjects (46.5% males, 52.8% females –gender data missing for four subjects) who volunteered to complete the questionnaire. Since they were selected as a calibration sample, the SEM technique dose not require that they should be matched with the patients and caregivers socio-demographically.

(3) Data analysis:

Data were analyzed by the Statistical Package for Social Sciences (SPSS) version 11. SEM operations (CFA, and PA), were done by Analysis of Moment Structures (AMOS) [Arbuckle, 2006].

Factor analysis (FA) was done with the general population data by Principal Component Analysis, with Varimax rotation for factors with Eigen values above one. In the first FA operation, all the 26 items of the WHOQOL-Bref were utilized (ie, including "overall rating of QOL" – OQOL). In the second FA operation, only 24 items were used (i.e., excluding OQOL and health satisfaction – as in the WHO's approach). However, the factors resulting from the later FA were not conceptually meaningful; and hence all subsequent analyses were based on the factors from the first FA operation. For each of the three populations, QOL domain scores were generated by summing up the items of the WHOQOL-Bref in each of the domains of the WHO models, as well as the 5 and 6 domains resulting from our FA operation [Ohaeri & et., 2005]. The internal consistency of each domain was assessed by Cronbach's alpha values, in which the acceptable level was at least 0.7, following standard guide- lines. Cronbach's alpha values for the responses of all subjects were high: 0.88, 0.93, 0.92, respectively, for the general population, psychiatric patients and caregivers.

CFA was then used to compare the "goodness of fit" (GOF) of the model resulting from our FA operation, with the WHO models for each of the three populations. The GOF of the Nigerian model [Ohaeri & et., 2005] was tested for the psychiatric population only, because the data for that model were generated from a psychiatric population. Using a series of multiple regression analyses and Pearson's correlations (with OQOL as dependent variable and the factors from the general population FA as independent variables), we generated a model of relationships among the factors (using the general population data), and then tested the structural integrity of this model in PA [Arbuckle, 2006], for each of the three populations. We analyzed separately, the model resulting from our original six factors (our 6- domain model) and that resulting from combining our fifth and sixth factors (our 5-domain model). A similar PA was done for the WHO models (using a path model generated from the general population data), but using the general facet on health and QOL as the dependent variable. PA for the Nigerian model was done using only the psychiatric population data. Our estimation method was the generalized least squares method (GLS).

(4) Goodness of fit indices:

There are varying opinion in the literature about the number, type and cut-off values for GOF required to be reported [Marsh & et., 2004]. A popular recommendation is to present three or four indices from different areas. Accordingly, we report the following fit indices because of their popularity in the literature:

- Relative chi-square (X^2/df), is the chi-square fit index divided by degrees of freedom, in an attempt to make it less dependent on sample size. (Cut –off values for good fit: <2 –5).
- Goodness-of –fit index (GFI) and adjusted GFI (AGFI) are chi- square based calculations independent of degrees of freedom (Cut-off value > 0.9).
- Root mean square error of approximation (RMSEA): is based on predicted versus observed covariances but penalizing for lack of parsimony, in assessing a model's amount of error. It is popular because it does not require comparison with a null model (Cut-off values: 0.05 –0.08).
- Akaike Information Criteria (AIC), is based on information theory. It is used to compare non-hierarchical and hierarchical (nested) models. AIC close to zero reflects good fit; and between two AIC measures, the lower one reflects the model with the better fit.

In summary, we had four models that were all compared by CFA and PA in the three distinct populations (620 general population subjects, 300 psychiatric patients, and caregivers of psychiatric patients), viz:

- Our six-domain model resulting from our FA operation on the data from 620 general population subjects;
- Our 5-domain model resulting from combining the fifth and sixth factors from
  the above FA operation;
- WHO's 4-domain model;
- WHO's 6-domain model.

five-domain model on the psychiatric patients, and WHO's 4-domain model on the psychiatric patients. It is noteworthy that the Nigerian model performed comparatively well in its application to the data from the psychiatric patients (Table 4).

(7) Path analysis (Table 5 and Fig 1):

As earlier indicated, the path models were generated using the general population data, except in the case of the Nigerian model, where the psychiatric data was used. In step-wise multiple regression analysis, using the factors derived from our general population data as the independent (predictor) variables, and the item of OQOL as the dependent variable, the only direct predictors of OOQL were "life satisfaction" (factor 1) (standardized ß = 0.82) and " sense of enjoyment" (factor 2) (ß = 0.74). The remaining factors made their contribution on QOL through their impact on these two factors. For the WHO 6-domain model, the direct predictors of the general facet on health and QOL were, "environment" (ß = 0.32), "physical health" (ß = 0.26) and "independence" (ß = 0.18), with the remaining factors making their input on QOL through their impact on the three factors. Surprisingly for this conservative culture, the "spiritual" factor was not a direct predictor of QOL. For the WHO 4-domain model, the direct predictors of QOL were "physical health" (ß = 0.39) and "environment" (ß = 0.32).

Unlike in the CFA data, most path model relationships (except our 5-domain model on the general population, 0.03; and the WHO 4-domain model on the general population, 0.07) had RMSEA values over 0.08, indicating significant levels of error; and the X^2/df value was below five for only our 5-domain model applied on the general population, and the WHO 4-domain model applied on the general population (3.9) (Table 5). However, the GFI values were impressive, with virtually all of them over the required 0.9 threshold (i.e., except the Nigerian model, 0.86; and our 6-domain model on the psychiatric patients, 0.88). The AGFI values reached 0.9 level or three path models applied on the general population data, namely, the WHO 4-domain model, and our two models. Using the AIC index, the three most plausible models were, the WHO 4- domain model on the general population (35.8), our 5-domain model on the general population (39.3), and the WHO 4-domain model on the psychiatric patients (56.1). Combining the four GOF indices, the path models that met all the criteria of "good fit" were, our 5-domain model on the general population, and the WHO 4-domain model on the general population.

(5) Results:

Factor analysis (Tables 1 and 2): In FA, six conceptually meaningful factors emerged, accounting for 54.5 % of the variance. Of these, the first four had at least three items each, and were thus stable. In order to enhance stability and conceptual meaning, the fifth factor (with two items) and sixth (with one item) were merged to produce a conceptually meaningful factor of "physical and mental health". Parsimony was observed, as each item loaded on only one factor, with a minimum item loading of 0.45. In view of the constituent items of the remaining factors (Table 1), they were labeled, successively (factors 1-4), "life satisfaction", "sense of enjoyment", "environment", and "social relations". It is noteworthy that, our "social relations" domain was defined by the same three items by which the WHO model of the same label was defined. In addition, our "environment" domain appears to be a tighter definition of the WHO domain of same label (with five of the eight items that define the WHO domain) (Table 1). The internal consistency values of the domains are shown in Table 2. While an appreciable number of our domains (from our 5-domain model) and the WHO 4-domain model reached the 0.7 level, none of the three domains that distinguish the WHO 6-domain model reached the 0.7 level. In other words, the domains of our 5-domain model and WHO's 4-domain model had appreciable internal consistency, while the domains of the WHO 6-domain model had rather low internal consistency in our general population data.

(6) Confirmatory factor analysis (Tables 3 & 4) :

All the models had RMSEA values less than 0.08 (Table 3), an indication that they did not have too much error. All the models performed well for the fit index of X^2/df, with values that ranged from 2.09 (data from application of our general population 5-domain model on psychiatric patients) to 3.81 (data from application of WHO 6-domain model on the general population sample), well below the recommended cut-off value of 5. Although the GFI values were less than the required 0.9, they were appreciably high, being above 0.8. The AGFI values were mostly similar, with the least being 0.78. Using the AIC values, the best performing models were: application of the WHO 4-domain model on the psychiatric patients (650.9), application of the WHO 4-domain model on the family caregivers (715.9), and application of our 5-domain model on the psychiatric patients (737.4). Combining the four criteria for good fit earlier highlighted, the two most fitting models were, our five-domain model on the psychiatric patients, and WHO's 4-domain model on the psychiatric patients. It is noteworthy that the Nigerian model performed comparatively well in its application to the data from the psychiatric patients (Table 4).

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(8) Discussion:

Our study shared the same limitations as similar studies [The WHOQOL Group,1998, Skevington & et., 2004, Min & et., 2002] in the sense that the subjects were not representative of the Egyptian general population. However, our data fulfilled the conditions for SEM, by the fact that our sample sizes were adequate with respect to a 26-item questionnaire [Streiner, 2005], and we generated our models from an appropriate calibration data sample, and tested them in two independent validation data samples. Another strength of our study is that we compared locally generated models with not only the WHO models, but also the model from another (neighboring) country (Nigeria). The robustness of our findings is shown by the fact that they were based on four GOF indices and applied on three different population groups. But our findings should be interpreted in the light of the knowledge that PA cannot be used to establish causality or even to determine whether a specific model is correct; it can only determine whether the data are consistent with the model [Arbuckle, 2006]9].

With respect to our research questions and hypothesis, the highlights of our findings are that, exploratory FA of our general population data generated a domain structure that included two factors ("personal relations" and "environment") which are similar to those of the WHO's; our 5-domain model and WHO's 4-domain model had similar fit indices in CFA in the three population groups; and in PA, the validity or structural integrity of these domains in the general population data was proven by the fact that the relationships within these domains adequately fulfilled the four GOF criteria. These findings indicate the cross-cultural salience of the dimensions of "personal relations" and "environment" in the definition of subjective QOL, and add robustness to the credentials of WHO's 4-domain model as a universal construct of subjective QOL. The finding about the structural integrity of our 5-domain model indicates that it is valid to analyze the WHOQOL-Bref by factor analysis using all the items, and that the item OQOL can also be used as a dependent variable. The theoretical support for our recommendation of OQOL as a dependent variable is as follows. In a critical appraisal of QOL instruments, Gill and Feinstein [Gill, 2004] highlighted the need for two global ratings, one on OQOL and the other on health – related QOL, but recommended that the item on OQOL be analyzed separately, instead of being combined with that on health – related QOL (as in the WHOQOL-Bref). In advancing this position, they noted that, OQOL may encompass not only health – related factors, but also many non - medical phenomena, such as employment, family relationships and spirituality.

The high GOF performance of our 5-domain model and WHO's 4-domain model in the general population data, implies that the predictors of QOL that we derived from these models in multiple regression analysis are worthy of note. According to the WHO model, the direct predictors of QOL are "physical health" and "environment", while "psychological health" and "social relations" play a secondary role. When the WHO 6-domain model was considered, we were surprised that, for such a conservative and religious culture, the "spiritual", psychological and social relations domains did not have a direct impact on QOL. On the other hand, the direct predictors of QOL in our 5-domain model were "life satisfaction" and "sense of enjoyment", with social relations, environment, and physical/mental health playing secondary roles. These are not necessarily conflicting views, in the sense that the one model's views compliments that of the other, and this is in line with the understanding in SEM, that many models can exist in one data set. For instance, the WHO domain's emphasis on material circumstances is an indication that, in the poor material/economic circumstances of the people (as shown by the country's low GDP), the fulfillment of material needs is a highly important contributor to the people's QOL. On the other hand, our 5-domain model's emphasis on "life satisfaction" (which includes the item, "life meaningful" that defines the "spiritual" domain) and "sense of enjoyment", recognizes the cultural emphasis on spiritual matters and the outwardly suppressed individual innate urge for openness. In other words, the different valid models that exist in the WHOQOL-Bref can help us to understand the QOL characteristics of particular cultures or groups. In this instance, while the WHO model helps to define the group's main concerns of QOL from the comparative global perspective, the locally generated model gives us the more intimate local situation [Min & et., 2002].

The findings add robustness to the credentials of WHO's 4-domain model as a universal QOL construct; while supporting the impression that analysis of WHOQOL-Bref will benefit from including all the items in FA and using overall QOL as a dependent variable [Ohaeri & et., 2005, Gill, 2004].

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Table 1: Factor analysis using WHOQOL-Bref data from 620 Egyptian general population members

WHOQOL –Bref items	F1: Life satisfaction	F2: Sense of enjoyment	F3: Environment	F4:Soc relations	F5: Physical &mental health
Energy for life	0.676				
Accept body appearance	0.648				
Able to concentrate	0.622				
Satisfied with information	0.586				
Safety in daily life	0.570				
Activities of daily living	0.570				
Feel life meaningful	0.552				
Satisfied work capacity	0.540				
Satisfaction with self	0.525				
Able to get around	0.491				
Overall QOL		0.749			
Overall health satisfaction		0.672			
Sleep satisfaction		0.565			
Enjoyment of life		0.461			
Leisure opportunities		0.458			
Access to health services			0.732		
Transport satisfaction			0.725		
Money for needs			0.584		
Living place satisfaction			0.557		
Physical environment			0.494		
Support from friends				0.614	
Sexual satisfaction				0.572	
Personal relations				0.570	
Need for medical treatment					0.853
Freedom from pain					0.830
Negative feelings free					0.674**

Note: ** Negative feelings loaded on Factor 6, but added now to Factor 5 for conceptual meaning and good fit in CFA

Table 2: Internal consistency (Cronbach's α). Eigen values and percent of variance for factors from controls and WHO models

Factor labels	No of items	Cronbach's α	Eigen value	% of variance
A. Factors from 620 controls				
F1: Life satisfaction	10	0.853	7.11	27.33
F2: Sense of enjoyment	5	0.730	2.01	7.71
F3: Environmental health	5	0.682	1.45	5.58
F4: Social relations	3	0.449	1.38	5.29
F5: Physical and mental health**	3	0.517	1.18, 1.06	4.54, 4.08
Total: for all items together	26	0.876	-	54.54
B. WHO 4-domain model on controls				
F1: Physical health	7	0.712		
F2: Psychological	6	0.709		
F3: Social relations	3	0.449		
F4: Environment	8	0.744		
C. WHO 6-domain model on controls*				
F1: Physical health	3	0.404		
F2: Psychological	5	0.614		
F3: Independence	4	0.582		

*Items for WHO 6-domain environment and social relations are identical with 4-domain factors; F6 is "life meaningful"

** For factors from control: original F5 (2 items, α value = 0.685, Eigen value, 1.18; % variance =4.08), merged with F6 (Eigen value, 1.06; %variance= 4.08).

Table 3: Confirmatory factor analysis results: estimated by generalized least squares (GLS)

Structural fit indices*	Using 6F & 5F models from 620 Egyptian general popn subjects						Using WHO 4- & 6- domain models					
	Gen popn subjects		Psychiatric patients		Family carers		Gen popn subjects		Psychiat patients		Family carers	
	6F model	5F model	6F model	5F model	6F mod	5F mod	4F mod	6F mod	4F mod	6F mod	4F mod	6F mod
No of parameters	57	56	58	57	57	57	52	54	51	53	52	54
Discrepancy(X^2)	936.6	925.8	638.4	623.4	688.0	717.4	859.3	947.6	548.9	556.4	611.9	664.4
DF	295	297	299	297	298	300	250	249	252	253	251	250
Discrepancy/DF	3.18	3.12	2.14	2.09	2.31	2.39	3.44	3.81	2.18	2.19	2.44	2.66
GFI	0.88	0.89	0.84	0.84	0.82	0.82	0.89	0.87	0.85	0.84	0.83	0.81
Adjusted GFI	0.86	0.86	0.81	0.81	0.79	0.78	0.86	0.85	0.82	0.82	0.79	0.78
AIC	1050.6	1037.8	754.4	737.4	802.0	831.4	963.3	1055.6	650.9	662.4	715.9	772.4
RMSEA	0.059	0.058	0.062	0.061	0.066	0.068	0.063	0.067	0.063	0.063	0.069	0.075

NOTES: DF = degrees of freedom; 6F mod = 6-factor model; 5F mod = 5-factor model; GFI = goodness of fit index; FI = fit index; RMSEA = root mean square error; AIC = Akaike index; Gen popn = general population
* Ideal fit indices are: Discrepancy/DF < 5; GFI, AGFI, >/= 0.9; RMSEA = 0.05 – 0.08; lower AIC

Table 4: Confirmatory factor analysis and path analysis results: application of the Nigerian model on Egyptian psychiatric patients**

Structural fit indices	CFA Egyptian psychiatric patients	Path analysis Egyptian psychiatric patients
No of parameters	63	19
Discrepancy(X^2)	702.03	192.45
DF	294	26
Discrepancy/DF	2.39	7.4
Goodness of fit index (GFI)	0.82	0.86
Adjusted GFI	0.78	0.75
AIC	828.03	230.45
RMSEA	0.068	0.147

* Ideal fit indices are: Discrepancy/DF < 5; GFI, AGFI≥ 0.9; RMSEA = 0.05 – 0.08; lower AIC
** Estimated by generalized least squares

Table 5: Path analysis results: estimations by generalized least squares (GLS)

Structural fit indices	Using 6F & 5F models from 620 Egyptian Gen popn subjects						Using WHO 4- & 6- domain models					
	Gen popn subjects		Psychiatric patients		Family carers		Gen popn subjects		Psychiat patients		Family carers	
	6F model	5F model	6F model	5F model	6F mod	5F mod	4F mod	6F mod	4F mod	6F mod	4F mod	6F mod
No of parameters	16	15	15	16	16	15	12	21	12	21	12	21
Discrepancy(X^2)	62.42	9.26	82.69	63.19	63.24	46.08	11.82	121.51	32.12	95.72	36.27	96.28
DF	12	6	12	6	12	6	3	7	3	7	3	7
Discrepancy/DF	5.2	1.54	6.89	8.7	5.27	7.68	3.94	17.36	10.71	13.67	12.09	13.76
GFI	0.97	0.99	0.88	0.94	0.94	0.95	0.99	0.94	0.96	0.91	0.95	0.91
Adjusted GFI	0.93	0.98	0.72	0.79	0.86	0.82	0.96	0.78	0.78	0.63	0.76	0.63
AIC	94.4	39.3	114.7	82.5	95.2	76.1	35.8	163.5	56.1	137.7	60.3	138.3
RMSEA	0.08	0.03	0.14	0.16	0.12	0.15	0.07	0.16	0.18	0.21	0.22	0.21

NOTES: DF = degrees of freedom; 6F mod = 6-factor model; 5F mod = 5-factor model; GFI = goodness of fit index; RMSEA = root mean square error; AIC = Akaike index; Gen popn = general population
* Ideal fit indices are: Discrepancy/DF < 5; GFI, Adjusted GFI ≥ 0.9; RMSEA = 0.05 – 0.08; lower AIC

Figure 1: Path's 5- domain model:

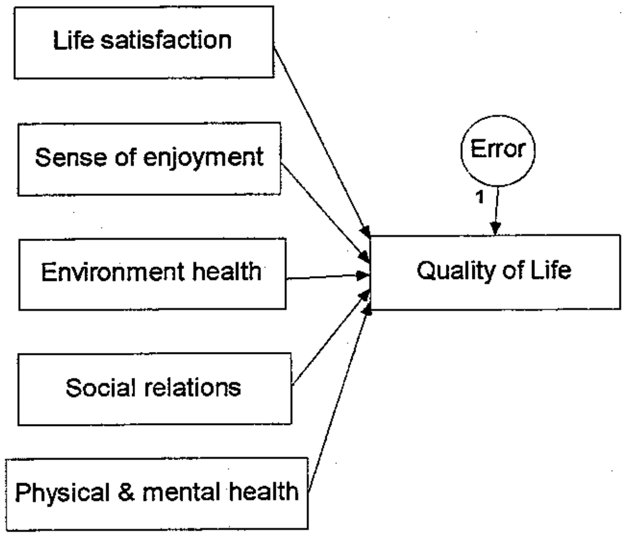
Life satisfaction
Sense of enjoyment
Environment health
Social relations
Physical & mental health
Error
1
Quality of Life

Table 6: Pearson correlations matrix between WHOQOL –Bref items

	RATEQOL	HLTSATIS	PAIN	MEDRX	ENJOYLIF	MEANIN	CONCE	SAFE	ENVIRHLT	DLYENGY	APPEAR	MONEY	INFO	LEISURE	AROUND	SLEEP	ADL	WORKCP	SELFSAT	RELSAT	SEXLIFE	FRSUP	LIVCON	HLTACC	TRANSP	FEEL
RATEQOL	1.000	-0.061	-0.039	0.064	-0.193	-0.130	-0.036	-0.149	-0.133	0.086	0.123	0.060	-0.027	0.026	-0.035	-0.032	-0.057	-0.058	-0.208	-0.085	0.032	-0.274	-0.079	-0.091	-0.171	-0.010
HLTSATIS	-0.061	1.000	0.262	-0.216	0.000	0.449	0.346	0.456	0.179	0.354	0.246	0.275	0.050	0.356	0.323	0.362	0.170	0.290	0.329	0.424	0.357	0.215	0.187	0.279	0.360	0.207
PAIN	-0.039	0.262	1.000	-0.038	-0.156	0.317	0.151	0.218	0.128	0.115	0.151	0.329	0.144	0.225	0.033	0.108	0.194	0.369	0.289	0.416	0.234	0.189	0.040	0.098	0.086	0.248
MEDRX	0.064	-0.216	-0.038	1.000	0.119	-0.113	-0.088	-0.259	0.053	0.017	-0.168	-0.131	-0.177	0.009	-0.030	-0.282	-0.176	-0.193	-0.086	-0.239	-0.176	0.005	-0.081	-0.092	-0.152	-0.097
ENJOYLIF	-0.193	0.000	-0.156	0.119	1.000	0.108	-0.057	-0.008	0.167	0.119	0.126	-0.072	-0.275	0.032	-0.027	0.025	-0.016	-0.049	0.078	-0.036	-0.011	-0.035	-0.020	-0.019	0.036	0.112
MEANIN	-0.130	0.449	0.317	-0.113	0.108	1.000	0.346	0.379	0.435	0.347	0.480	0.303	0.270	0.250	0.320	0.325	0.224	0.373	0.339	0.405	0.351	0.355	0.149	0.235	0.286	0.313
CONCE	-0.036	0.346	0.151	-0.088	-0.057	0.346	1.000	0.289	0.220	0.255	0.138	0.115	0.057	0.097	0.107	0.065	0.041	0.156	0.169	0.063	0.289	0.161	0.002	0.124	0.010	-0.042
SAFE	-0.149	0.456	0.218	-0.259	-0.008	0.379	0.289	1.000	0.309	0.228	0.422	0.295	0.104	0.271	0.293	0.315	0.182	0.328	0.321	0.366	0.129	0.159	0.132	0.211	0.257	0.068
ENVIRHLT	-0.133	0.179	0.128	0.053	0.167	0.435	0.220	0.309	1.000	0.478	0.180	0.019	0.110	0.103	0.203	0.195	0.016	0.136	0.134	0.115	0.135	0.256	0.261	0.262	0.199	0.227
DLYENGY	0.086	0.354	0.115	0.017	0.119	0.347	0.255	0.228	0.478	1.000	0.110	0.083	-0.004	0.224	0.130	0.163	0.020	0.209	0.160	0.181	0.357	0.179	0.151	0.291	0.263	0.203
APPEAR	0.123	0.246	0.151	-0.168	0.126	0.480	0.138	0.422	0.180	0.110	1.000	0.249	0.076	0.115	0.213	0.402	0.264	0.415	0.332	0.280	0.159	0.189	0.136	0.119	0.154	0.256
MONEY	0.060	0.275	0.329	-0.131	-0.072	0.303	0.115	0.295	0.019	0.083	0.249	1.000	0.258	0.368	0.120	0.149	0.199	0.374	0.330	0.389	0.225	0.049	0.093	0.100	0.296	0.205
INFO	-0.027	0.050	0.144	-0.177	-0.275	0.270	0.057	0.104	0.110	-0.004	0.076	0.258	1.000	0.172	0.205	0.102	0.175	0.189	0.059	0.154	0.210	0.246	0.270	0.206	0.119	0.154
LEISURE	0.026	0.356	0.225	0.009	0.032	0.250	0.097	0.271	0.103	0.224	0.115	0.368	0.172	1.000	0.214	0.024	0.191	0.249	0.106	0.226	0.223	0.152	0.033	0.125	0.290	0.196
AROUND	-0.035	0.323	0.033	-0.030	-0.027	0.320	0.107	0.293	0.203	0.130	0.213	0.120	0.205	0.214	1.000	0.346	-0.085	0.186	0.212	0.130	0.241	0.209	0.054	0.124	0.077	0.053
SLEEP	-0.032	0.362	0.108	-0.282	0.025	0.325	0.065	0.315	0.195	0.163	0.402	0.149	0.102	0.024	0.346	1.000	0.214	0.287	0.281	0.244	0.356	0.205	0.344	0.201	0.309	0.170
ADL	-0.057	0.170	0.194	-0.176	-0.016	0.224	0.041	0.182	0.016	0.020	0.264	0.199	0.175	0.191	-0.085	0.214	1.000	0.479	0.330	0.552	0.363	0.228	0.211	0.192	0.353	0.333
WORKCP	-0.058	0.290	0.369	-0.193	-0.049	0.373	0.156	0.328	0.136	0.209	0.415	0.374	0.189	0.249	0.186	0.287	0.479	1.000	0.673	0.511	0.451	0.267	0.299	0.245	0.357	0.345
SELFSAT	-0.208	0.329	0.289	-0.086	0.078	0.339	0.169	0.321	0.134	0.160	0.332	0.330	0.059	0.106	0.212	0.281	0.330	0.673	1.000	0.531	0.274	0.240	0.336	0.380	0.357	0.388
RELSAT	-0.085	0.424	0.416	-0.239	-0.036	0.405	0.063	0.366	0.115	0.181	0.280	0.389	0.154	0.226	0.130	0.244	0.552	0.511	0.531	1.000	0.356	0.246	0.252	0.271	0.475	0.402
SEXLIFE	0.032	0.357	0.234	-0.176	-0.011	0.351	0.289	0.129	0.135	0.357	0.159	0.225	0.210	0.223	0.241	0.356	0.363	0.451	0.274	0.356	1.000	0.485	0.283	0.206	0.168	0.226
FRSUP	-0.274	0.215	0.189	0.005	-0.035	0.355	0.161	0.159	0.256	0.179	0.189	0.049	0.246	0.152	0.209	0.205	0.228	0.267	0.240	0.246	0.485	1.000	0.152	0.114	0.087	0.304
LIVCON	-0.079	0.187	0.040	-0.081	-0.020	0.149	0.002	0.132	0.261	0.151	0.136	0.093	0.270	0.033	0.054	0.344	0.211	0.299	0.336	0.252	0.283	0.152	1.000	0.508	0.306	0.306
HLTACC	-0.091	0.279	0.098	-0.092	-0.019	0.235	0.124	0.211	0.262	0.291	0.119	0.100	0.206	0.125	0.124	0.201	0.192	0.245	0.380	0.271	0.206	0.114	0.508	1.000	0.331	0.363
TRANSP	-0.171	0.360	0.086	-0.152	0.036	0.286	0.010	0.257	0.199	0.263	0.154	0.296	0.119	0.290	0.077	0.309	0.353	0.357	0.357	0.475	0.168	0.087	0.306	0.331	1.000	0.424
FEEL	-0.010	0.207	0.248	-0.097	0.112	0.313	-0.042	0.068	0.227	0.203	0.256	0.205	0.154	0.196	0.053	0.170	0.333	0.345	0.388	0.402	0.226	0.304	0.306	0.363	0.424	1.000