Revista Electrónica Actividad Física y Ciencias

Vol. 2, Nº 2. Año 2010

CALCULATION OF SCORES AND DESCRIPTIVE STATISTICS FOR WHOQOL INSTRUMENTS USING MICROSOFT EXCEL

Bruno Pedroso
Universidade Estadual de Campinas (UNICAMP) – Brazil
brunops3@brturbo.com.br
Luiz Alberto Pilatti
Universidade Tecnológica Federal do Paraná (UTFPR) - Brazil
Gustavo Luis Gutierrez
Universidade Estadual de Campinas (UNICAMP) - Brazil
Celso Bilynkievycz dos Santos
Universidade Tecnológica Federal do Paraná (UTFPR) - Brazil
Claudia Tania Picinin
Universidade Tecnológica Federal do Paraná (UTFPR) - Brazil

CÁLCULO DE PUNTUACIONES Y ESTADÍSTICA DESPCRIPTIVA PARA INSTRUMENTOS WHOQOL UTILIZANDO MICROSOFT EXCEL

RESUMEN

El objetivo de este trabajo es construir herramientas para calcular las puntuaciones y la estadística descriptiva de los instrumentos WHOQOL. Para calcular el resultado de dichos instrumentos, el grupo WHOQOL recomienda el uso de SPSS, un paquete estadístico analítico de micro computadora que, sin embargo, no está disponible a nivel mundial. Las herramientas propuestas en este estudio fueron desarrolladas del software Microsoft Excel 2003 siguiendo la sintaxis propuesta por el Grupo WHOQOL. Todas las herramientas fueron probadas por investigadores de una acreditada universidad en Brasil y estuvieron también sujetas a una simulación con el software SPSS 12.0, en donde los resultados fueron exactamente los mismos. La sintaxis utilizada en la construcción de las herramientas está disponible, lo cual permite su adaptación para ser aplicada en otros instrumentos. De estos resultados se concluyó que es posible la provisión de herramientas gratuitas para el análisis de datos, sin requerir el uso del software SPSS.
Palabras claves: Calidad de Vida, WHOQOL, Estadística Descriptiva.

ABSTRACT

The objective of this paper is to build tools for calculating the scores and descriptive statistics of the instruments WHOQOL. To calculate the results of WHOQOL instruments, the WHOQOL group recommends the use of SPSS, an analytical microcomputer statistical package however is not readily available world-wide. The tools proposed in this study were developed from the software Microsoft Excel 2003, following the syntax proposed by WHOQOL Group. All tools were tested by researchers from an accredited university in

Brazil. They were also subjected to a simulation with the software SPSS 12.0, where the results were exactly the same. The syntax used in the construction of the tools is available, allowing its adaptation for application on other instruments. It was concluded that, from these results, the provision of free tools for data analysis was possible, without requiring the use of SPSS software.
Keywords: quality of life, WHOQOL, descriptive statistics.

1. Introduction

The term “health” was, in 1946, defined by the World Health Organization (WHO) as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (Saxena, O’Connell & Underwood, 2002, p. 81). The paradigm that health is the opposite of sickness was still prevalent in the mid-1970s.

Even if there is some conformity of opinions on the importance of evaluating the quality of life, such concept presents divergence. The multidimensional concept of quality of life includes various indicators, proposed by authors that have shaped different conceptual constructions. This fact makes that the importance attributed to indicators promote the existence of distinct concepts (Fleck, 2008).

The fact that there is no consensus on the concept of quality of life is a major challenge in the development of tools to evaluate the quality of life, while it is not possible to clearly state which elements these instruments measure (Fleck, 2008).

From that premise, the starting point to build the World Health Organization (WHO) instrument for assessing the quality of life has been to conceptualize quality of life. In the concept adopted, quality of life is perceived as “individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (The WHOQOL Group, 1998a, p. 1569).

Using this concept as a base, WHO has committed itself to the construction of WHOQOL instruments, which evaluate the quality of life, not only in global terms as WHOQOL-100, WHOQOL-bref and WHOQOL-SRPB, but also in terms of specific issues, such as WHOQOL-HIV, WHOQOL-HIV-bref and WHOQOL-OLD. Currently WHOQOL instruments are available in over 50 languages (WHO Field Centre for Quality of Life of Bath, 2008).

To obtain the results of WHOQOL instruments applications, the WHOQOL Group recommends the software Statistical Package for the Social Sciences (SPSS), a statistical software that requires expertise for its use. The SPSS is not freely distributed.

From this perspective, this study aims - following the syntax proposed by WHOQOL Group - to construct tools that perform the calculation of scores and descriptive statistics of the instruments WHOQOL from the Microsoft Excel, a software that is accessible globally. The specific objective is the proposal of clarifying the procedures for calculating the scores of WHOQOL instruments, which are implicitly disposed in the documents published by the WHOQOL Group.

2. The precursor instrument: WHOQOL-100

The development of an instrument for evaluation of quality of life purposed by WHO was conducted in 15 centers simultaneously, based in 14 countries. After developing the project WHOQOL, new centers were built.

The development methodology of WHOQOL was sectioned into four major stages: clarifying the concept of quality of life, qualitative pilot study, development of a pilot and finally, field implementation. For the integrated centers, after the completion of the instrument, a protocol was established which consisted in its translation, preparation of the test pilot, development of the response scales and administration of the pilot (The WHOQOL Group, 1998a).

2.1 WHOQOL-100 questions elaboration

From the suggestions made by each of the development centers, 1800 questions were gathered. After the elimination of redundant or equivalent questions, the number of questions was reduced to 1000. Then, a classification of questions regarding quality of life and culture was done in each center of development (The WHOQOL Group, 1995). That resulted in the selection of 235 questions, sectioned in 29 facets, for the pilot instrument of WHOQOL-100. According to The WHOQOL Group (1995, p. 1407), the criteria for the establishment of WHOQOL-100 were:

- Be based as far as possible on the suggestions of patients and health personnel participating in the focus groups;
- Give rise to answers that are illuminating about respondents' quality of life, as defined in this project;
- Reflect the meaning conveyed in the facet definition;
- Cover, in combination with other questions for a given facet, the key aspects of that facet as described in the facet definition;
- Use simple language, avoiding ambiguity in terms of either wording or phraseology.
- Be shorter rather than longer;
- Avoid double negatives;
- Be amenable to a rating scale;
- Ask about a single issue/facet;
- Avoid any explicit reference point either in terms of time or in terms of some comparison point (e.g. the ideal or before I was ill);
- Be applicable to individuals with a range of impairment;
- Be phrased as questions and not statements;

– Reflect the typology of questions adopted for the project.

After conducting the pilot, the best questions for each facet were selected in order to establish internal consistency and discriminant validity of the instrument. One hundred questions were selected and placed in 24 facets. The facets were grouped into six major domains (The WHOQOL Group, 1995).

2.2 Response scale for WHOQOL-100

All questions of WHOQOL-100 are closed. It used a Likert-type response scale, composed of five elements, ranging from 1 to 5. These extremes represent 0% and 100%, respectively. There are four different types of response scales, as can be seen in Table 1:

TABLE 1 Response scale of WHOQOL-100

SCALE	0%	25%	50%	75%	100%
INTENSITY	Not at all	A little	A moderate amount	Very much	An extreme amount
	Not at all	Slightly	Moderately	Very	Extremely
EVALUATION	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
	Very poor	Poor	Neither poor nor good	Good	Very good
	Very unhappy	Unhappy	Neither happy nor unhappy	Happy	Very happy
CAPACITY	Not at all	A little	Moderately	Mostly	Completely
FREQUENCY	Never	Seldom	Quite often	Very often	Always

Source: Adapted from The WHOQOL Group (1998b)

2.3 WHOQOL-100 scores calculation

The results of the WHOQOL-100 implementation are expressed through the scores of each facet and domain. The WHO recommends the use of SPSS statistical software to calculate the results of WHOQOL-100.

Even if the SPSS syntax for the WHOQOL-100 is of public domain, the Group WHOQOL only discloses the syntax code lines, without explaining the criteria for calculating the scores of domains and facets of WHOQOL-100. In an attempt to suppress this omission, the lines of code of SPSS syntax were translated in this study, explaining what the procedures used to calculate the scores of domains and facets of WHOQOL-100 are. Thus, one can say that the results of the WHOQOL-100 are resolved as follows:

- Verification of all questions completed with values between 1 and 5;
- Reversal of the 18 questions whose answer scale is inverted;
- Scores of facets calculation from the simple arithmetic average of questions that compound each facet, followed by a multiplication by four. The multiplication by four is used so that, in case of a question has not been answered, the score of a facet compensates the invalidation of the question through the product by the number of valid questions that the facet should have. It will be computed only those aspects that have at least three valid items;
- Scores of each domain are calculated through the simple arithmetic average of the facets scores that compound each area. In domains composed of up to five facets, this will be calculated only if the number of facets not calculated is not equal to or greater than two. In domains consisting of more than five facets, the domain will be calculated only if the number of facets not calculated is not equal to or greater than three. In the case of facets in reversed scale (all questions within the facet have reversed response scale), there will be an inversion of that facet to proceed the calculation;
- Scores of domains and facets are converted to a scale from 0 to 100;

- Total number of items answered by each respondent is counted. In the calculation are computed only those respondents who completed at least 80 items correctly (80% of the instrument items).

The WHOQOL-100 results are expressed in two scales, a variant scale between 4 and 20 points, due to the fact that the facets scores calculation is achieved by multiplying the average of questions that constitute each facet by four. Once each domain is calculated by the simple arithmetic average of facets that compound it. The results are expressed on the same scale of facets. The results are also expressed on a scale from 0 to 100.

2.4 Questions and facets response scale conversion

The conversion of questions is used in order to standardize all the answers of the instrument, so that the most positive response is 5. Therefore, the most negative response must be 1. Thus, all questions of each facet are converted to the same scale, where the gradual increase in response is equivalent in the same proportion to the increase in the result of the facet.

In cases where all four questions that constitute a facet are arranged in inverted scale, that same logic is used, but only in the domain calculation. That is, the result of these facets is expressed in the original scale: without inversion (the closer to 1, the more positive the result; the closer to 5, the more negative the result). However, when calculating the scores of areas where such facets are found, the score of the latter is converted.

For the conversion of the response scale of questions, the minimum value of the inverted scale question should be replaced by the maximum value of the normal scale question, and the maximum value of the inverted scale question should be replaced by a

minimum value of the normal scale question. The same should occur with intermediate values, following this same logic. Thus, the only value that remains unchanged is the central value, which will remain the same in both normal and inverted scales.

It is necessary to be attentive to this fact, because when comparing the results between the facets, the score of a facet with inverted scale can not be directly compared to the score of a facet with normal scale. The answers 1, 2, 3, 4 and 5 are to take the values 5, 4, 3, 2 and 1, respectively. The same procedure is used in the conversion of inverted facets, where the scores 4, 8, 12, 16 and 20 are to take the values 20, 16, 12, 8 and 4, respectively. Intermediate values are converted in the same proportion.

2.5 WHOQOL-100 questions, domains and facets

The WHOQOL-100 is sectioned into 24 groups of four questions each, receiving the name of "facets". The group of facets constitutes a "domain". Unlike the composition of facets, the six WHOQOL-100 domains are not constituted by the same number of facets, and may vary from one to eight.

The questions that compound WHOQOL-100 are not arranged in the questionnaire in a logical sequence by domain or facet. They are grouped by type of answer scale. The distribution of WHOQOL-100 facets and areas are listed in Table 2:

TABLE 2 Domains and facets of WHOQOL-100

DOMAINS	FACETS
Domain I – Physical	1. Pain and discomfort
	2. Energy e fatigue
	3. Sleep and rest
Domain II – Psychological	4. Positive feelings
	5. Thinking, learning, memory and concentration
	6. Self-esteem
	7. Bodily image and appearance
	8. Negative feelings
Domain III – Level of	9. Mobility

Independence	10. Activities of daily living
	11. Dependence on medication or treatments
	12. Work capacity
Domain IV – Social Relationships	13. Personal relationships
	14. Social support
	15. Sexual activity
Domain V – Environment	16. Physical safety and security
	17. Home environment
	18. Financial resources
	19. Health and social care: accessibility and quality
	20. Opportunities for acquiring new information and skills
	21. Participation in and opportunities for recreation/ leisure activities
	22. Physical environment (pollution/noise/traffic/climate)
	23. Transport
Domain VI – Spiritual/Religion/Personal Beliefs	24. Spiritual/Religion/Personal Beliefs

Source: The WHOQOL Group (The WHOQOL Group, 1998a)

WHOQOL-100 has a facet that is not included in any domain, the facet Overall Quality of Life and General Health Perceptions (The WHOQOL Group, 1998b). This aspect deals with a self-assessment of quality of life, where the respondents express their point of view concerning their satisfaction with their lives, health and quality of life.

3. Other WHOQOL instruments

3.1 WHOQOL-bref

Aiming to provide a tool that demand less time to its filling out, and with satisfactory psychometric characteristics, the WHOQOL Group developed the abbreviated version WHOQOL-100, the WHOQOL-bref (The WHOQOL Group, 1996).

The WHOQOL-bref is composed of 26 questions - two questions on self-assessment of quality of life and 24 issues representing each facet of WHOQOL-100. To compound the questions of WHOQOL-bref, it was selected the question of each facet that

present the highest correlation with the average score of all facets (The WHOQOL Group, 1998c).

After the selection of issues, an analysis was conducted to see if they, factually, represented the corresponding facets.

In six facets, the question selected was replaced by another question of the corresponding facet, for, under the bias of experts, there was another question that could best define these six facets (The WHOQOL Group, 1998c).

The facets belonging to the domain Level of Independence were incorporated into the Physical domain and the domain facet belonging to the Spiritual / Religion / Personal Beliefs was incorporated into the Psychological field. Thus, the WHOQOL-bref is composed of four domains: Physical, Psychological, Social Relationships and Environment, completing the configuration expressed in Table 3:

TABLE 3 Domains and facets of WHOQOL-bref

DOMAINS	FACETS
Domain I – Physical	1. Pain and discomfort
	2. Energy e fatigue
	3. Sleep and rest
	4. Mobility
	5. Activities of daily living
	6. Dependence on medication or treatments
	7. Work capacity
Domain II – Psychological	8. Positive feelings
	9. Thinking, learning, memory and concentration
	10. Self-esteem
	11. Bodily image and appearance
	12. Negative feelings
	13. Spiritual/Religion/Personal Beliefs
Domain III – Social Relationships	14. Personal relationships
	15. Social support
	16. Sexual activity
Domain IV – Environment	17. Physical safety and security
	18. Home environment
	19. Financial resources
	20. Health and social care: accessibility and quality
	21. Opportunities for acquiring new information and skills

	22. Participation in and opportunities for recreation/ leisure activities
	23. Physical environment (pollution/noise/traffic/climate)
	24. Transport

Source: The WHOQOL Group (1998c)

The calculation of scores of WHOQOL-bref follows the same logic of WHOQOL-100, except for the calculation of scores of facets. In WHOQOL-bref each facet is represented by a single question, and therefore the scores of facets are not calculated (The WHOQOL Group, 1996).

3.2 WHOQO-HIV and WHOQOL-HIV-bref

Aiming to create a tool for assessing the quality of life directed to people living with HIV, researchers from the Joint United Nations Program on HIV / AIDS (UNAIDS) and WHO carried out studies in people with HIV in nine different countries. The result of this study was the instrument WHOQOL-HIV, an additional module specifically designed for people with HIV or AIDS (WHO Field Centre for the Study of Quality of Life of Bath, 2008).

WHOQOL-HIV evaluates the quality of life from six domains and 29 facets. The domains and facets are the same as in WHOQOL-100, with the addition of five specific facets for people living with HIV. The facet of WHOQOL-100 that evaluates the quality of life from the perspective of the assessed person, not included in any domain, remains in WHOQOL-HIV.

The specific facets for people with HIV, as well as the facets from WHOQOL-100, are composed of four questions (O'Connell et al., 2004). In face of this description, the

additional facets of WHOQOL-HIV will be included in the domains already existent in WHOQOL-100, featuring the following configuration (Table 4):

TABLE 4 Domains and facets exclusive of WHOQOL-HIV

DOMAINS	FACETS
Domain I – Physical	50. Symptoms of PLWHA
Domain IV – Social Relationships	51. Social Inclusion
Domain VI – Spiritual/Religion/Personal Beliefs	52. Forgiveness and Blame
	53. Concerns about the Future
	54. Death and Dying

Source: Adapted from O'Connell et al. (2004)

The calculation of WHOQOL-HIV results is similar to the method used in WHOQOL-100. However, some criteria used in WHOQOL-100 were not inherited by WHOQOL-HIV. The results of the WHOQOL-HIV are presented as follows:

- Verification of all questions completed with values between 1 and 5;
- Reversal of all the questions whose answers scale is inverted. Concerning the facets in inverted scale, all the questions pertaining to these facets are individually inverted;
- Scores of facets are calculated from the sum of the four questions of each facet, followed by a division by four, being represented in a scale of 1 to 5;
- Scores of domains are calculated by the sum of the scores of "n" facets that compound each area, divided by the number of the domain facets. The result is multiplied by four, being represented in a scale of 4 a 20;

Under the same reason for the development of WHOQOL-bref, the WHOQOL Group developed an abbreviated version of WHOQOL-HIV. The WHOQOL-HIV-bref is based on WHOQOL-bref, in a way each facet is represented by one single question. The 26 questions of WHOQOL-bref are repeated in WHOQOL-HIV-bref, being added to these

five questions that represent the additional facets of WHOQOL-HIV (The WHOQOL-HIV Group, 2002). Contrary to what occurs in WHOQOL-bref, the facets belonging to the domains Level of Independence and Spiritual / Religion / Personal Beliefs are not incorporated to the Physical and Psychological domains, having, therefore, the same configuration of the domains of WHOQOL-HIV. The calculation of scores of WHOQOL-HIV-bref follows the same logic present in WHOQOL-bref.

3.3 WHOQOL-OLD

In order to adapt the WHOQOL for application with elderly, the WHOQOL Group developed an additional module to instruments WHOQOL-100 and WHOQOL-Focus, called WHOQOL-OLD. Unlike the WHOQOL-HIV, WHOQOL-OLD does not supplement WHOQOL-100 or WHOQOL-bref. WHOQOL-OLD is an additional module, but it must be applied in conjunction with WHOQOL-100 or WHOQOL-bref (Power et al., 2005). WHOQOL-OLD is composed of 24 questions sectioned into six facets: Sensory abilities; Autonomy; Past, present and future activities; Social participation; Death and dying; Intimacy.

The calculation of scores of WHOQOL-OLD has some peculiarities regarding other WHOQOL instruments and it is calculated from the following logic:

- Verification of all the questions completed with values between 1 and 5;
- Reversal of the questions whose response scale is inverted. In the case of facets in inverted scale, all questions pertaining to these facets are reversed individually;
- Scores of facets are calculated in three different ways. The raw score is calculated from the sum of all questions pertaining to each of these facets, returning a result

ranging between 4 and 20. The standardized score is calculated by dividing the raw score of the facet by the number of questions of the facet (four), returning a result ranging between 1 and 5. The score transformed is calculated from the conversion of raw scores to a scale of 0 to 100;

- Total score of WHOQOL-OLD is calculated, also, in three ways. Through the sum of the 24 questions of the instrument is obtained the raw score, ranging between 24 and 120. The division of gross score by the number of questions of the instrument (24) represents the standardized score, ranging between 1 and 5. The conversion of raw score into a scale of 0 to 100 represents the score transformed.

3.4 WHOQOL SRPB

The progeny of WHOQOL-SRPB study occurred when it was realized that the spiritual aspects, religion and personal beliefs were of major importance in assessing the quality of life around the world. According to Fleck and Skevington (Fleck & Skevington, 2007), the WHOQOL-SRPB is a transcultural study to develop a measure to assess how spirituality, religion and personal beliefs (SRPB) are related to the quality of life (QOL) concerning health and health care. In studies subsequently to the development of WHOQOL-100 and WHOQOL-bref, it was confirmed that the domain Spiritual / Religion / Personal Beliefs in these instruments was conceptually and empirically inadequate. In face of this weakness, the WHOQOL Group guided the development of a study to assess the way in which the domain under consideration is related to quality of life (The WHOQOL-SRPB Group, 2006).

The WHOQOL-SRPB is not an instrument for assessing the spirituality, but an instrument that widely contemplates the construct Spiritual / Religion / Personal Beliefs, briefly represented in WHOQOL-100 and WHOQOL-bref (The WHOQOL-SRPB Group, 2006).

In this perspective, the WHOQOL-SRPB supplements the WHOQOL-100 with eight additional facets to the domain Spiritual / Religion / Personal Beliefs. The other domains of WHOQOL-100 remain unchanged. The additional facets of WHOQOL-SRPB are: Spiritual Connection; Meaning and Purpose In Life; Experiences of Awe and Wonder; Wholeness and Integration; Spiritual Strength; Inner Peace; Hope & Optimism; Faith.

The calculation of domain scores and facets of WHOQOL-SRPB follows the same logic as in WHOQOL-HIV, so that the scores of facets are presented on a scale from 1 to 5, and domain scores are presented on a scale from 4 to 20 (The WHOQOL-SRPB Group, 2005).

4. Tools construction procedures

In the perspective of making the proposed tools possible of reproduction and enabling that the same logic be adaptable to other instruments, the syntax used in the construction is made available. Each code line is followed by a brief explanation on the logic employed in it. The code lines below refer to the tool for calculating the scores and descriptive statistics of WHOQOL-100. The other tools follow the same logic, respecting SPSS syntax, proposed by the WHOQOL Group, of each instrument.

a) Counting of unanswered questions:

=IF(COUNTBLANK(B3:CW3)=0;"";IF(COUNTBLANK(B3:CW3)=100;"";COUNTBLANK(B3:CW3)))

where B3 and CW3 represent, the first and the hundredth questions of the instrument, respectively. If the number of questions unanswered is null or equal to 100, the cell does not return any results. If there is any question unanswered, the number of questions not answered will be expressed.

b) Counting of questions answered incorrectly:

=IF(COUNTBLANK(B3:CW3)=100;"";IF(((COUNTIF(B3:CW3;">5"))+(COUNTIF(B3:BW3;"<1")+(COUNTIF(B3:CW3;"*"))))=0;"";(COUNTIF(B3:CW3;">5"))+(COUNTIF(B3:BW3;"<1"))+(COUNTIF(B3:CW3;"*"))))

where verification of any question was answered with a numerical value not located in the interval between 1 and 5, or answered with a non-numeric value. The number of questions not answered must always be null. If any irregularity is confirmed, the researcher must correct it.

c) Criteria for respondent discarding:

=IF(AND(COUNTBLANK(B3:CW3)>20;COUNTBLANK(B3:CW3)<=99);"EXCLUDE_RESPONDENT";IF(COUNTBLANK(B3:CW3)=100;"";IF(EI3="";"EXCLUDE_RESPONDENT";"")))

where the researcher is instructed to exclude the respondent if the number of questions not answered is over 20, or if two or more domains could not be calculated. If it is confirmed that the respondent should, effectively, be removed from the sample, the cell returns the message "remove respondent”.

d) Calculation of facets scores:

=IF(((COUNTIF(B3;"<1")+COUNTIF(B3;">5")+COUNTBLANK(B3))+(COUNTIF(C3;"<1")+COUNTIF(C3;">5")+COUNTBLANK(C3))+(COUNTIF(D3;"<1")+COUNTIF(D3;">5")+COUNTBLANK(D3))+(COUNTIF(CI3;"<1")+COUNTIF(CI3;">5")+COUNTBLANK(CI3)))>=2;"";(AVERAGE(B3;C3;D3;CI3))*4)

where B3, C3, D3 and CI3 represent the four questions pertaining to facet 1. The facet is calculated only if at least three of these four questions have been answered correctly.

e) Scores Calculation of facets composed of questions with response scale reversed:

=IF(((COUNTIF(E3;"<1")+COUNTIF(E3;">5")+COUNTBLANK(E3))+(COUNTIF(F3;"<1")+COUNTIF(F3;">5")+COUNTBLANK(F3))+(COUNTIF(AO3;"<1")+COUNTIF(AO3;">5")+COUNTBLANK(AO3))+(COUNTIF(BE3;"<1")+COUNTIF(BE3;">5")+COUNTBLANK(BE3)))>=2;"";(AVERAGE(IF(E3="";AVERAGE(6-F3;AO3;BE3);6-E3);IF(F3="";AVERAGE(6-E3;AO3;BE3);6-F3);AO3;BE3))*4)

where E3, F3, AO3 and BE3 represent the four questions pertaining to facet 2. The facet is calculated only if at least three of these four questions have been answered correctly. The questions which the response scale is reversed should be subtracted from six units. Following the logic exemplified in facet 1, in case any reversed question is not answered, a value 6 is assigned. To avoid this error, it should be specified that, if a reversed question is not answered, that question should be excluded from the facet calculation.

f) Calculation of domain score:

=IF(COUNTBLANK(DN3:DP3)>=2;"";IF(COUNTBLANK(B3:CW3)>=20;"";AVERAGE(DN3:DP3)))

where DN3 and DP3 represent the first and last facet belonging to the domain 4, respectively. The domain will be calculated only if the number of facets not calculated is

less than two (except in the area 5, where it is calculated only if the number of facets not calculated is less than three).

g) Calculation of domain scores composed by reversed facets:

=IF(COUNTBLANK(DB3:DD3)>=2;"";IF(COUNTBLANK(B3:CW3)>=20;"";AVERAGE(IF(DB3="";AVERAGE(DC3;DD3);24-DB3);DC3;DD3)))

where DB3, DC and DD3 represent the facets belonging to the domain 1. The field will be calculated only if the number of facets not calculated is less than two (except in the area 5, where it is calculated only if the number of facets not calculated is less than three). The reversed facets must be subtracted from 24 units, due to the same issue reported in the score calculation of facets composed of questions with reversed response scale.

h) Calculation of Quality of Life "Total" score:

=IF(COUNTBLANK(EB3:EG3)>=2;"";IF(AND(DB3="";DI3="";DL3="");AVERAGE(DC3:DH3;DJ3;DK3;DM3:DZ3);IF(AND(DB3="";DI3="");AVERAGE(DC3:DH3;DJ3;24-DL3;DK3;DM3:DZ3);IF(AND(DI3="";DL3="");AVERAGE(24-DB3;DC3:DH3;DJ3;DK3;DM3:DZ3);IF(AND(DB3="";DL3="");AVERAGE(DC3:DH3;DJ3;24-DI3;DK3;DM3:DZ3);AVERAGE(IF(DB3="";AVERAGE(DC3:DH3;24-DI3;DJ3;DK3;24-DL3;DM3:DZ3);24-DB3);IF(DI3="";AVERAGE(24-DB3;DC3:DH3;DJ3;DK3;24-DL3;DM3:DZ3);24-DI3);IF(DL3="";AVERAGE(24-DB3;DC3:DH3;24-DI3;DJ3;DK3;DZ3);24-DL3);DC3:DH3;DJ3;DK3;DM3:DZ3))))))

where EB3 and EG3 represent respectively the domain 1 and domain 6 and DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY and DZ represent the 25 facets. The total score is calculated only if the number of areas not calculated is less than two. The reversed facets must be subtracted from 24 units.

i) Calculation of descriptive statistics of a variable (average, standard deviation, coefficient of variation, minimum, maximum and range):

=AVERAGE(Tabulação!B3:B1002)

=STDEV(Tabulação!B3:B1002)

=((STDEV(Tabulação!B3:B1002))/(AVERAGE(Tabulação!B3:B1002)))*100

=MIN(Tabulação!B3:B1002)

=MAX(Tabulação!B3:B1002)

=(MAX(Tabulação!B3:B1002))-(MIN(Tabulação!B3:B1002))

where B3 and B1002 represent the answer/score of a specific question, facet, domain or total of the first and last respondent, respectively.

The tools were built from the software Microsoft Excel 2003. They were also tested in versions 2000, XP and 2007. The results were the same in all versions.

To ensure the validity of the tools, two researchers in Production Engineering at an accredited university from Brazil tested their use. It was also sent to two graduate students in System Analysis and Development at the same university, in order to check the existence of any errors in syntax. The suggestions from the researchers were evaluated and, when relevant, respected. The errors identified were properly corrected.

5. Results

The tools proposed automatically performed all of the calculations proposed by the WHOQOL Group. The researchers who use them need only to fill in the answers given by the respondents in the specified cells. To calculate the facets score, the same criteria for exclusion of respondents proposed in the syntax of each instrument were used, with some

modifications that were established to facilitate the detection and correction of errors. The logic used to construct these tools was as follows:

- The cells in which answers are correct (answered with values situated in the range between 1 and 5) are represented by green-colored filling;
- If a respondent failed to meet a number of questions equal to or over 20% of the total number of questions in the instrument, the researcher will be instructed to exclude such a respondent. The number of questions not answered is reported to researchers and the questions not answered will be highlighted (white color of the filling);
- If any response has been filled with some value not listed among the range between 1 to 5, the number of invalid responses will be forwarded to the researcher and the invalid answers will be highlighted (red color of the filling);
- Questions of reversed scale are fully converted;
- The calculation of domain scores and facets follows the syntax proposed for each instrument, as described previously;
- If two or more domains are not calculated, the researcher is instructed to exclude the respondent from the sample;
- A "Total" score for the respondent is calculated. Such score consists of the simple arithmetic average of the scores of all facets of each instrument;
- The descriptive statistics of each question, facet, domain and "Total" is calculated. The figures presented in descriptive statistics are the mean, standard deviation, minimum, maximum, coefficient of variation and range;

– The average score of facets and domains are converted to a scale of 0 to 100, and are displayed graphically.

After the insertion of data, for using the results, researchers can copy the scores of each individual respondent, the results of descriptive statistics and graphics. However, the researchers cannot change these results. The only area that allows values insertion and editing is the tabulation area for the responses from respondents.

To validate the tool, simulations with data from real applications of each instrument WHOQOL were performed, comparing the results obtained using the tools proposed with those obtained with SPSS 12.0. The results returned from both software packages in all the instruments under investigation, were exactly the same, thereby ensuring the reliability of the tools under investigation.

Developed tools are available for downloads in English and Portuguese language on website: http://www.brunopedroso.com.br/whoqol.html.

6. Final considerations

WHOQOL instruments are the most widely used instruments for assessing the quality of life in the world. Despite being widely disseminated, the difficulty of interpreting its syntax and use of the SPSS software to calculate the results are limiting factors.

With the expectation of removing these limitations, this study transcribed textually the SPSS syntax, detailing all steps used to obtain the results of WHOQOL instruments. Tools from the software Microsoft Excel 2003 were also built to perform the calculation of scores and descriptive statistics of WHOQOL instruments.

The tools were tested in different versions of this software - 2000, XP and 2007. It was confirmed that they were compatible with all versions tested, with no differences in results. Another procedure adopted was to subject them to testing by researchers from an accredited university from Brazil. The results were similar to the syntax proposed by the WHO for the SPSS software.

In an attempt to make the tools reproducible and, looking ahead the possibility of the logic employed in the construction of the tools being applied to other instruments, parts of the developed syntax were released, which allow for its full development. The syntax is followed by a clarification of variables and the logic used in each line of code.

It concludes that was possible to make available tools, constructed in a globally accessible software, which allows to use WHOQOL instruments without requiring the use of SPSS.

References

Fleck, M. P. A. (2008). Problemas conceituais em qualidade de vida. In Fleck M. P. A. et al. (Eds.). *A avaliação de qualidade de vida: guia para profissionais da saúde* (pp. 19-28). Porto Alegre: Artmed.

Fleck, M. P. A. & Skevington, S. (2007). Explicando o significado do WHOQOL-SRPB. *Revista de Psiquiatria Clínica, 34*(Supl.1), 146-149.

O'Connell, K.; Saxena S. & Skevington, S.M. for the WHOQOL-HIV Group. (2004) WHOQOL-HIV for quality of life assessment among people living with HIV and AIDS: results from a field test. *AIDS Care, 16*(7), 882-889.

Power M. et al. (2005). Development of the WHOQOL-Old module. *Quality of Life Research, 14*(10), 2197-2214.

Saxena, S.; O'Connell, K & Underwood, L. (2002). A Commentary: Cross-Cultural Quality-of-Life Assessment at the End of Life. *Gerontologist, 42*(Spec. 3), 81-85.

The WHOQOL Group. (1995). The World Health Organization Quality Of Life assessment (WHOQOL): Position Paper From The World Health Organization. *Social Science & Medicine, 41*(10), 1403-1409.

The WHOQOL Group. (1996). *WHOQOL-bref: introduction, administration, scoring and generic version of assessment*. Geneva.

The WHOQOL Group. (1998a). The World Health Organization Quality of Life assessment (WHOQOL): development and general psychometric properties. *Social Science & Medicine, 46*(12), 1569-1585.

The WHOQOL Group. (1998b). *WHOQOL User Manual*. Geneva.

The WHOQOL Group. (1998c). Development of the World Health Organization WHOQOL-BREF Quality of Life Assessment. *Psychological Medicine, 28*(3), 551-558.

The WHOQOL-HIV Group. (2002). *WHOQOL-HIV Instrument Users Manual*. Geneva.

The WHOQOL-SRPB Group. (2005). *WHOQOL-SRPB Users Manual*. Geneva.

The WHOQOL-SRPB Group. (2006). A cross-cultural study of spirituality, religion, and personal beliefs as components of quality of life. *Social Science & Medicine, 62*(6), 1486-1497.

WHO Field Centre for the Study of Quality of Life of Bath. (2008). *About the WHO Field Centre for the Study of Quality of Life*. Retrieved on September 20, 2008 from: http://www.bath.ac.uk/whoqol/about.cfm.