EQ-5D-5L Polish population norms

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Abstract

Introduction: The new, five-level version of the EQ-5D (EQ-5D-5L) questionnaire has better psychometric properties than the standard three-level version (EQ-5D-3L), including a reduced ceiling effect. Currently, there are few existing population norms for the EQ-5D-5L. The aims of this study were to provide population norms for the EQ-5D-5L in Poland, based on a representative sample of adults, and to compare those with norms from other countries.

Material and methods: Members of the general public, selected through multistage stratified sampling, filled in paper-and-pencil EQ-5D-5L questionnaires in the presence of an interviewer. EQ-5D-5L index values were estimated using an interim value set, based on a crosswalk methodology. Descriptive statistics were calculated for the EQ-5D-5L index. The distribution of answers was obtained for the descriptive part of the EQ-5D-5L.

Results: The sample was representative of the Polish population in terms of age, gender, geographical region, education, and socio-professional group. Population norms were developed based on 3963 questionnaires with no missing data. At least one slight, moderate, severe, and extreme health limitation was reported by 61.5%, 31.1%, 12.4%, and 1.6% of the respondents, respectively. Polish society is characterized by poorer health, as compared to its direct neighbor, Germany, especially with regard to the individuals’ perception of pain, as well as anxiety and depression.

Conclusions: Polish population norms for the EQ-5D-5L should encourage clinicians, economists, and policymakers in Poland to use this questionnaire on a broader scale.

Key words: health-related quality of life, patient-reported outcomes, normative values, reference values.

Introduction

Of the many definitions of health, the most widely known is that of the World Health Organization (WHO). In 1946, the WHO defined health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” [1]. This definition was subject to controversy and considered to lack operational value [2]; that was until the development of the health-related quality of life (HRQoL) instruments. Although quality of life holds different meanings for different people, it is generally agreed that the relevant aspects thereof generally include physical, mental, and social well-being [3].

Within the existing HRQoL instruments, one can distinguish between generic and disease-specific instruments [4]. A generic instrument measures general health status, including physical symptoms, function, and...
the emotional dimensions of health that are relevant to all health states, including those of healthy individuals [5]. These types of measures are useful for comparisons between diseases and interventions, but because of their broad scope, they may not be sensitive enough for use within specific populations under study. A number of generic measures have been developed and are used, including the Medical Outcomes Study Short Form-36 (SF-36) [6–8], the Short Form-12 (SF-12) [9], the EQ-5D [10], the Nottingham Health Profile (NHP) [11], and the Sickness Impact Profile (SIP) [12]. In contrast, disease-specific instruments are tailored to ask about specific aspects of health that are affected by the condition of interest, but because of their specificity, comparisons between populations with different diseases are rarely possible [4].

The EQ-5D is a widely used, standardized, preference-based measure of health that provides a simple, generic measure for clinical and economic assessment [10, 13]. A five-level version of the EQ-5D (EQ-5D-5L) was developed, so as to improve the sensitivity and other psychometric properties of the original, three-level version (EQ-5D-3L) [14, 15].

Data concerning population norms for generic questionnaires complement the methods of collecting data about morbidity [16, 17]. The EQ-5D could be useful for clinicians, economists, public health specialists, and policymakers. To date, more than thirty sets of population norms for the EQ-5D-3L questionnaire have been published [16, 18–21]. In contrast, there are few EQ-5D-5L population norms. We were able to identify only three studies on this topic [22–24]. Kim et al. [22] confirmed the known-groups, convergent, and discriminant validity, and the reliability of the EQ-5D-5L, in a study on the general population of South Korea. In addition, they found that the ceiling effect of the five-level version was lower than that of the EQ-5D-3L, although the difference was modest. In contrast, based on a study of German society, Hinz et al. [23] warned that EQ-5D-5L usefulness in general population surveys may be limited, due to the skewness of results. Further evidence of the applicability of the EQ-5D-5L for measuring population health was provided by Craig et al. [24], in their study on the general population of the United States. They pointed out that having five levels permits the respondents to not have to “upcode” their health problems.

Existing Polish 3L normative data [21] are often used in clinical and economic analyses [25–27]; however, Poland lacks EQ-5D-5L population norms. The aim of this study was to obtain nationally representative normative data for the EQ-5D-5L questionnaire in Poland.

Material and methods

Sampling design

Sample recruitment and interviewing was carried out by a market research company (Public Opinion Research Center, CBOS). In order to obtain a representative sample, the Polish adult population was divided into 65 strata, based on geographical characteristics (i.e., the country’s administrative division (16 provinces), as well as the type and size of given localities in each province (from 3 to 9 strata in each voivodeship – most in the provinces of Silesia and Mazovia)). The pre-determined study sample was proportionally allocated into strata, so as to reflect the general population structure. Random sampling was carried out in several stages. First, towns/cities and villages were sampled. Then, small areas (one or several adjacent streets) within the previously drawn towns/cities and villages were randomly selected. Finally, a sample of eight people was drawn from each of the selected areas, based on the Polish Resident Identification Number (PESEL). These persons had to occupy different dwellings and live in separate households. The maximum estimation error for the sample was ±1.55%, which means that if the frequency of a given category in the sample was 50%, the true value in the population lies, with 95% probability, between 48.45% and 51.55%.

Survey

Respondents were presented with a set of quality of life questionnaires, including the EQ-5D-5L, and answered general demographic questions. We used the official Polish version of the EQ-5D-5L (with slight amendments introduced by the EuroQol Group in February 2014). The EQ-5D-5L descriptive system consists of the same five dimensions as those of the EQ-5D-3L, which are as follows: mobility (MO), self-care (SC), usual activities (UA), pain/discomfort (PD), and anxiety/depression (AD). However, unlike the EQ-5D-3L, which has three levels of severity (i.e., no problems, some problems, and extreme problems), the EQ-5D-5L comprises five such levels (i.e., no problems, slight problems, moderate problems, severe problems, and extreme problems) [14]. Responses for all of the five dimensions can be combined to form a 5-digit number describing the respondent’s health state (from “11111”, meaning “no problems at all”, to “55555”, meaning “extreme problems” in all five dimensions). A total of 3125 possible health states are defined in this way. The EQ-5D health states may be converted into a single summary index by applying a formula that attaches values to each of the levels in each dimension. In order to calculate the EQ-5D-5L’s index values, we used an interim EQ-5D-5L value set for
Poland [28], based on a crosswalk methodology that was developed by the EuroQol Group [29] and applied to the existing Polish EQ-5D-3L’s time trade-off value set [30].

Data collection

The qualified interviewers were required to try to contact each randomly selected respondent at least three times, in order to carry out an interview. No substitutes were permitted. The respondents received a paper-and-pencil version of the questionnaire to fill in on their own. Answers to questions concerning demographic characteristics were collected using the Computer Aided Personal Interviewing (CAPI) technique. Using this technique, an interviewer guided the respondent, who used the computer to answer the questions. A total of 10% of the interviews were subjected to quality control.

Analysis

We calculated the following descriptive statistics: the mean and the standard deviation, and the 25th, 50th, and 75th percentile for the EQ-5D-5L index, and the distribution of answers to the questions in the descriptive part of the EQ-5D-5L. Estimations were presented for the whole sample, as well as for the predefined age groups (18–24, 25–34, 35–44, 45–54, 55–65, 64–75, and 75+ years) in the EuroQol Group’s standardized format, to facilitate comparative research [16]. The analysis was carried out using the statistical software, StatsDirect 2.7.8 (StatsDirect Ltd, England). The results were also qualitatively compared (no formal statistical analysis was performed) with existing EQ-5D-5L population norms for other countries, in terms of the prevalence of “no problems” responses in each dimension [22–24].

Results

A total of 3978 respondents from the general Polish adult population completed the EQ-5D-5L questionnaire from March to June 2014. Fifteen questionnaires (0.4%) were deficient. There were eight, six, five, four, and three missing answers for the dimensions UA, SC, AD, PD, and MO, respectively. The Polish population norms were ultimately estimated on the basis of 3963 questionnaires with complete answers. The sample approximated to the general adult Polish population in terms of age, gender, geographic region, education, and socio-professional group (Table I). The respondents were aged 18–87 years (mean age = 48.3 years, SD = 17.9), and there was a slight predominance of women (53.2%).

Tables II–IV depict the frequency of problems for particular EQ-5D-5L dimensions, presented

| Parameter                     | Sample (N = 3963) | Polish adult population* (N = 31 500 297) |
|-------------------------------|-------------------|------------------------------------------|
| **Gender:**                   |                   |                                          |
| Male                          | 1853              | 1530                                     |
| Female                        | 2110              | 1630                                     |
| **Age group [years]:**        |                   |                                          |
| 18–24                         | 456               | 7558                                     |
| 25–34                         | 617               | 7558                                     |
| 35–44                         | 654               | 7558                                     |
| 45–54                         | 612               | 7558                                     |
| 55–64                         | 797               | 7558                                     |
| 65–74                         | 525               | 7558                                     |
| 75+                           | 302               | 7558                                     |
| **Region (voivodeship):**     |                   |                                          |
| Lower Silesian                | 347               | 7558                                     |
| Kuyavian-Pomeranian           | 218               | 7558                                     |
| Lublin                        | 198               | 7558                                     |
| Lubusz                         | 95                | 7558                                     |
| Lodz                          | 275               | 7558                                     |
| Lesser Poland                 | 362               | 7558                                     |
| Masovian                      | 490               | 7558                                     |
| Opole                         | 97                | 7558                                     |
| Subcarpathian                 | 228               | 7558                                     |
| Podlaskie                     | 132               | 7558                                     |
| Pomeranian                    | 203               | 7558                                     |
| Silesian                      | 514               | 7558                                     |
| Świętokrzyskie                | 130               | 7558                                     |
| Warmian-Masurian              | 150               | 7558                                     |
| Greater Poland                | 352               | 7558                                     |
| West Pomeranian               | 172               | 7558                                     |
| **Place of living:**          |                   |                                          |
| Town                          | 2550              | 7558                                     |
| Country                       | 1413              | 7558                                     |
| **Educational level**:        |                   |                                          |
| Low                           | 710               | 7558                                     |
| Medium                        | 2286              | 7558                                     |
| High                          | 967               | 7558                                     |
| **Occupational status:**      |                   |                                          |
| Employed                      | 1881              | 7558                                     |
| Unemployed                    | 261               | 7558                                     |
| Retired                       | 976               | 7558                                     |
| Student                       | 285               | 7558                                     |
| Domestic                      | 135               | 7558                                     |
| Other                         | 335               | 7558                                     |
Table II. Problems in EQ-5D-5L dimensions (raw numbers, proportions) by age group: total population

| Parameter          | Age          | Total |
|--------------------|--------------|-------|
|                    | 18–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ | n   | %    | n   | %    | n   | %    | n   | %    | n   | %    | n   | %    | n   | %    |
| Mobility           |        |       |       |       |       |       |       |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| No problems        | 431    | 94.5  | 584   | 94.7  | 607   | 92.8  | 495   | 80.9 | 507   | 63.6  | 238   | 45.3  | 80   | 26.5 | 2942 | 74.2 |
| Slight problems    | 19     | 4.2   | 22    | 3.6   | 30    | 4.6   | 64    | 10.5 | 136   | 17.1  | 123   | 23.4  | 46   | 15.2 | 440  | 11.1 |
| Moderate problems  | 6      | 1.3   | 1.0   | 1.4   | 31    | 5.1   | 88    | 11.0 | 90    | 17.1  | 72    | 23.8  | 302  | 7.6  |
| Severe problems    | 0      | 0     | 0.6   | 1.2   | 18    | 3.0   | 60    | 7.5  | 66    | 12.6  | 99    | 32.8  | 255  | 6.4  |
| Incapacity         | 0      | 0     | 1     | 0.2   | 0     | 0.7   | 6     | 0.8  | 8     | 1.5   | 5     | 1.7   | 24   | 0.6  |
| Self-care          |        |       |       |       |       |       |       |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| No problems        | 450    | 98.7  | 608   | 98.5  | 639   | 97.7  | 582   | 95.1 | 702   | 88.1  | 437   | 83.2  | 184  | 60.9 | 3602 | 90.9 |
| Slight problems    | 4      | 0.9   | 0.6   | 1.7   | 15    | 2.5   | 45    | 5.6  | 46    | 7.8   | 46    | 15.2  | 166  | 4.2  |
| Moderate problems  | 2      | 0.4   | 0.6   | 0.5   | 9     | 1.5   | 38    | 4.8  | 32    | 6.1   | 43    | 14.2  | 131  | 3.3  |
| Severe problems    | 0      | 0     | 0.2   | 1.0   | 0.2   | 1.5   | 8     | 1.5  | 26    | 8.6   | 51    | 1.3   |
| Incapacity         | 0      | 0     | 0     | 0     | 0     | 0     | 7     | 1.3  | 3     | 1.0   | 13    | 0.3   |
| Usual activities   |        |       |       |       |       |       |       |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| No problems        | 440    | 96.5  | 594   | 96.3  | 614   | 93.9  | 535   | 87.4 | 610   | 76.5  | 354   | 67.4  | 128  | 42.4 | 3275 | 82.6 |
| Slight problems    | 13     | 2.9   | 2.4   | 3.0   | 4.6   | 7.4   | 118   | 14.8 | 173   | 30.0  | 18   | 33.0  | 55   | 18.2 | 367  | 9.3  |
| Moderate problems  | 3      | 0.7   | 1.0   | 1.4   | 7     | 2.8   | 45    | 5.6  | 56    | 10.7  | 73    | 24.2  | 209  | 5.3  |
| Severe problems    | 0      | 0     | 0.3   | 0.2   | 0.2   | 1.2   | 12    | 2.0  | 19    | 3.9   | 42    | 8.6   |
| Incapacity         | 0      | 0     | 0     | 0     | 0     | 0     | 3     | 0.5  | 4     | 0.8   | 6     | 1.1   | 5    | 1.7  | 17   | 0.4  |
| Pain/discomfort    |        |       |       |       |       |       |       |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| No problems        | 356    | 78.1  | 446   | 72.3  | 394   | 60.2  | 275   | 44.9 | 266   | 33.4  | 119   | 19.2  | 37   | 12.3 | 1893 | 47.8 |
| Slight             | 78     | 17.1  | 136   | 22.0  | 185   | 28.3  | 208   | 34.0 | 253   | 31.7  | 173   | 28.8  | 55   | 18.2 | 1088 | 27.5 |
| Moderate           | 19     | 4.2   | 27    | 4.4   | 61    | 9.3   | 98    | 16.0 | 193   | 24.2  | 160   | 25.5  | 124  | 41.1 |
| Severe             | 3      | 0.7   | 1.1   | 1.4   | 21    | 4.4   | 84    | 10.5 | 68    | 13.0  | 79    | 26.2  |
| Extreme            | 0      | 0     | 0.2   | 0     | 0     | 0     | 4     | 0.7  | 1     | 0.1   | 5     | 1.0   | 7    | 2.3  |
| Anxiety/depression |        |       |       |       |       |       |       |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| No                 | 356    | 78.1  | 446   | 72.3  | 429   | 65.6  | 356   | 58.2 | 395   | 49.6  | 230   | 34.3  | 106  | 35.1 | 2318 | 58.5 |
| Slight             | 82     | 18.0  | 130   | 21.1  | 180   | 27.5  | 181   | 29.6 | 247   | 31.0  | 176   | 33.5  | 88   | 29.1 | 1084 | 27.4 |
| Moderate           | 13     | 2.9   | 31    | 5.0   | 38    | 5.8   | 52    | 8.5  | 114   | 14.3  | 89    | 17.0  | 86   | 28.5 |
| Severe             | 4      | 0.9   | 7     | 1.1   | 5     | 0.8   | 21    | 3.4  | 36    | 4.5   | 28    | 3.5   | 21   | 7.0  |
| Extreme            | 1      | 0.2   | 3     | 0.5   | 2     | 0.3   | 2     | 0.3  | 5     | 0.6   | 2     | 0.4   | 1    | 0.3  |

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### Table III. Problems in EQ-5D-5L dimensions (raw numbers, proportions) by age group: males

| Parameter | 18-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | 75+ | Total |
|-----------|-------|-------|-------|-------|-------|-------|-----|-------|
| Mobility  | No problems | 238 | 311 | 302 | 295 | 379 | 228 | 100 | 1853 |
|           | Slight problems | 9 | 3.8 | 11 | 3.6 | 35 | 11.9 | 56 | 18.1 | 119 |
|           | Moderate problems | 3 | 1.3 | 3 | 1.0 | 12 | 4.1 | 37 | 12.7 | 77 |
|           | Severe problems | 0 | 0.0 | 2 | 0.6 | 6 | 2.0 | 27 | 9.2 | 108 |
|           | Incapacity | 236 | 99.2 | 305 | 98.1 | 294 | 97.7 | 284 | 94.6 | 377 |
| Self-care | No problems | 226 | 95.0 | 294 | 94.5 | 282 | 93.4 | 241 | 81.0 | 30 |
|           | Slight problems | 9 | 3.8 | 11 | 3.5 | 11 | 3.6 | 56 | 18.1 | 13 |
|           | Moderate problems | 3 | 1.3 | 3 | 1.0 | 10 | 3.3 | 37 | 12.7 | 1 |
|           | Severe problems | 0 | 0.0 | 2 | 0.6 | 6 | 2.0 | 27 | 9.2 | 1 |
|           | Incapacity | 236 | 99.0 | 305 | 98.1 | 294 | 97.7 | 284 | 94.6 | 377 |
| Usual activities | No problems | 232 | 97.5 | 298 | 95.8 | 281 | 93.0 | 266 | 90.2 | 377 |
|           | Slight problems | 2 | 0.9 | 4 | 1.3 | 5 | 1.7 | 15 | 5.1 | 21 |
|           | Moderate problems | 2 | 0.9 | 4 | 1.3 | 5 | 1.7 | 15 | 5.1 | 21 |
|           | Severe problems | 0 | 0.0 | 2 | 0.7 | 6 | 2.0 | 16 | 5.5 | 21 |
|           | Incapacity | 236 | 97.5 | 305 | 98.1 | 294 | 97.7 | 284 | 94.6 | 377 |
| Pain/discomfort | No problems | 193 | 81.1 | 235 | 75.6 | 206 | 68.2 | 178 | 60.3 | 270 |
|           | Slight | 39 | 16.4 | 625 | 19.9 | 77 | 25.5 | 80 | 26.8 | 20 |
|           | Moderate | 4 | 1.7 | 11 | 3.5 | 16 | 5.3 | 5 | 1.7 | 1 |
|           | Severe | 2 | 0.8 | 2 | 0.6 | 6 | 2.0 | 9 | 3.0 | 1 |
|           | Extremity | 0 | 0.0 | 1 | 0.3 | 0 | 0.0 | 4 | 1.3 | 0 |
| Anxiety/depression | No | 193 | 81.1 | 235 | 75.6 | 206 | 68.2 | 178 | 60.3 | 270 |
|           | Slight | 39 | 16.4 | 625 | 19.9 | 77 | 25.5 | 80 | 26.8 | 20 |
|           | Moderate | 4 | 1.7 | 11 | 3.5 | 16 | 5.3 | 5 | 1.7 | 1 |
|           | Severe | 2 | 0.8 | 2 | 0.6 | 6 | 2.0 | 9 | 3.0 | 1 |
|           | Extremity | 0 | 0.0 | 1 | 0.3 | 0 | 0.0 | 4 | 1.3 | 0 |
### Table IV. Problems in EQ-5D-5L dimensions (raw numbers, proportions) by age group: females

| Parameter          | 18–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+ | Total |
|--------------------|-------|-------|-------|-------|-------|-------|-----|-------|
|                    | n     | %     | n     | %     | n     | %     | n   | %     | n     | %     | n     | %     | n     | %     |
| Total              | 218   | 100.0 | 306   | 100.0 | 352   | 100.0 | 317 | 100.0 | 418   | 100.0 | 297   | 100.0 | 202  | 100.0 | 2110  |
| Mobility           |       |       |       |       |       |       |     |       |       |       |       |       |     |       |
| No problems        | 205   | 94.0  | 290   | 94.8  | 325   | 92.3  | 256 | 80.8  | 266   | 63.6  | 119   | 40.1  | 48   | 23.8  | 1509  |
| Slight problems    | 10    | 4.6   | 11    | 3.6   | 19    | 5.4   | 29  | 9.1   | 30    | 9.4   | 86    | 29.1  | 20   | 10.3  | 267   |
| Moderate problems  | 3     | 1.4   | 1     | 0.3   | 6     | 1.7   | 10  | 3.2   | 19    | 4.5   | 36    | 12.1  | 69   | 34.2  | 183   |
| Severe problems    | 0     | 0.0   | 0     | 0.0   | 0     | 0.0   | 10  | 3.2   | 19    | 4.5   | 36    | 12.1  | 69   | 34.2  | 183   |
| Incapacity         | 0     | 0.0   | 0     | 0.0   | 0     | 0.0   | 3   | 1.0   | 2     | 0.6   | 5     | 1.7   | 3    | 1.5   | 13    |
| Self-care          |       |       |       |       |       |       |     |       |       |       |       |       |     |       |
| No problems        | 214   | 98.2  | 303   | 99.0  | 344   | 97.7  | 298 | 94.0  | 375   | 97.7  | 244   | 81.9  | 124  | 61.4  | 1902  |
| Slight problems    | 2     | 0.9   | 1     | 0.3   | 5     | 1.4   | 10  | 3.2   | 23    | 5.9   | 27    | 9.1   | 33   | 16.3  | 101   |
| Moderate problems  | 2     | 0.9   | 2     | 0.7   | 3     | 0.9   | 7   | 2.3   | 14    | 3.7   | 16    | 5.4   | 28   | 13.9  | 72    |
| Severe problems    | 0     | 0.0   | 0     | 0.0   | 0     | 0.0   | 1   | 0.3   | 6     | 1.4   | 5     | 1.7   | 15   | 7.4   | 27    |
| Incapacity         | 0     | 0.0   | 0     | 0.0   | 0     | 0.0   | 1   | 0.3   | 2     | 0.6   | 5     | 1.7   | 2    | 1.0   | 8     |
| Usual activities   |       |       |       |       |       |       |     |       |       |       |       |       |     |       |
| No problems        | 208   | 95.4  | 296   | 96.7  | 333   | 94.6  | 269 | 84.9  | 332   | 89.4  | 190   | 64.9  | 84   | 41.6  | 1712  |
| Slight problems    | 9     | 4.1   | 7     | 2.3   | 15    | 4.3   | 26  | 8.2   | 60    | 17.9  | 53    | 17.8  | 40   | 19.8  | 210   |
| Moderate problems  | 1     | 0.5   | 0     | 0.0   | 1     | 0.3   | 8   | 2.5   | 6     | 1.4   | 11    | 3.7   | 26   | 12.9  | 52    |
| Severe problems    | 0     | 0.0   | 0     | 0.0   | 0     | 0.0   | 1   | 0.3   | 1     | 0.2   | 5     | 1.7   | 2    | 1.0   | 8     |
| Incapacity         | 0     | 0.0   | 0     | 0.0   | 0     | 0.0   | 1   | 0.3   | 0     | 0.0   | 5     | 1.7   | 2    | 1.0   | 8     |
| Pain/discomfort    |       |       |       |       |       |       |     |       |       |       |       |       |     |       |
| No                 | 166   | 76.1  | 210   | 68.6  | 200   | 56.8  | 131 | 41.3  | 132   | 33.9  | 51    | 17.2  | 27   | 13.4  | 917   |
| Slight             | 41    | 18.8  | 77    | 25.2  | 108   | 30.7  | 110 | 34.7  | 144   | 34.4  | 100   | 33.7  | 32   | 15.8  | 612   |
| Moderate           | 10    | 4.6   | 15    | 4.9   | 35    | 9.9   | 53  | 16.7  | 102   | 24.4  | 99    | 33.3  | 78   | 38.6  | 392   |
| Severe             | 1     | 0.5   | 3     | 1.0   | 9     | 2.6   | 20  | 6.3   | 39    | 9.3   | 42    | 14.1  | 60   | 29.7  | 174   |
| Extreme            | 0     | 0.0   | 1     | 0.3   | 0     | 0.0   | 3   | 1.0   | 1     | 0.2   | 5     | 1.7   | 5    | 2.5   | 15    |
| Anxiety/depression |       |       |       |       |       |       |     |       |       |       |       |       |     |       |
| No                 | 163   | 74.8  | 211   | 69.0  | 223   | 63.4  | 178 | 56.2  | 199   | 47.6  | 116   | 39.1  | 68   | 33.7  | 1158  |
| Slight             | 43    | 19.7  | 68    | 22.2  | 103   | 29.3  | 93  | 29.3  | 137   | 32.8  | 104   | 35.0  | 59   | 29.2  | 607   |
| Moderate           | 9     | 4.1   | 20    | 6.5   | 22    | 6.3   | 32  | 10.1  | 62    | 14.8  | 56    | 18.9  | 58   | 28.7  | 259   |
| Severe             | 2     | 0.9   | 5     | 1.6   | 3     | 0.9   | 12  | 3.8   | 19    | 4.5   | 19    | 6.4   | 16   | 7.9   | 76    |
| Extreme            | 1     | 0.5   | 2     | 0.7   | 1     | 0.3   | 2   | 0.6   | 1     | 0.2   | 2     | 0.7   | 1    | 0.5   | 10    |
according to age group for the total population, and men and women, respectively. Perfect health (the “11111” health state) was reported by 1526 (38.5%) respondents, and significantly more often by men than women (43.2% vs. 34.4%; \(p < 0.0001\), Fisher’s exact test). At least one slight, moderate, severe, and extreme health limitation was reported by 61.5%, 31.1%, 12.4%, and 1.6% of the respondents, respectively. For all of the dimensions, the distribution of the answers was skewed (with a high frequency of the “no problems” answers), and the number of reported limitations increased for the subsequent age groups (18–24, 25–34, 35–44, 45–54, 55–65, 64–75, and 75+ years). The frequency of limitations was higher for the PD and AD dimensions (52.2% and 41.5%), as compared to the 25.8%, 17.4%, and 9.1% obtained for MO, UA, and SC, respectively. Women of all age groups reported limitations related to AD and PD more frequently than did men (except for the group aged > 75 years, for PD).

Similar trends were observed for the EQ-5D-5L index values (Table V). Among all age groups, except for the group aged 55–64 years, mean health state utilities were found to be higher among men than among women.

In the between-countries comparison, the South Korean population had the highest prevalence of the “no problems” answers for the majority of the EQ-5D-5L dimensions, as compared to the German, United States, and Polish populations (Figure 1). In terms of the MO, SC, and UA dimensions, Poland resembles its immediate neighbor, Germany. However, Germans reported lack of limitations in the PD and AD dimensions at a considerably higher rate (38.1% and 32.3% relatively more often, respectively), and they also reported being in “perfect health” 23.4% more often than did the Polish population.

**Discussion**

Based on a representative sample of the Polish population, we estimated population norms with regard to age and gender, for the descriptive part of the EQ-5D-5L questionnaire, as well as for the EQ-5D-5L index. The normative population data that have been obtained can be used as reference values.

The use of an interim value set, based on a cross-walk methodology, to estimate the EQ-5D-5L index, was a major limitation of the study [28]. It would be desirable to use a directly measured

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**Table V. EQ-5D-5L index values based on Polish Interim EQ-5D-5L Value Set, by age group and gender**

| EQ-5D-5L index value | Total | Age        |      |      |      |      |
|----------------------|-------|------------|------|------|------|------|
|                      |       | 18–24      | 25–34| 35–44| 45–54| 55–64|
| Mean                 | 0.963 | 0.953      | 0.938| 0.898| 0.856| 0.813|
| Standard error       | 0.003 | 0.003      | 0.003| 0.006| 0.005| 0.008|
| 25\(^{th}\) percentile | 0.933 | 0.915      | 0.887| 0.873| 0.816| 0.755|
| 50\(^{th}\) percentile | 1.000 | 1.000      | 0.940| 0.915| 0.887| 0.848|
| 75\(^{th}\) percentile | 1.000 | 1.000      | 1.000| 0.915| 0.891| 0.864|
| Males                |       |            |      |      |      |      |
| Mean                 | 0.967 | 0.958      | 0.942| 0.910| 0.851| 0.837|
| Standard error       | 0.004 | 0.005      | 0.005| 0.007| 0.008| 0.011|
| 25\(^{th}\) percentile | 0.940 | 0.915      | 0.894| 0.873| 0.814| 0.784|
| 50\(^{th}\) percentile | 1.000 | 1.000      | 1.000| 0.915| 0.887| 0.868|
| 75\(^{th}\) percentile | 1.000 | 1.000      | 1.000| 1.000| 0.940| 0.876|
| Females              |       |            |      |      |      |      |
| Mean                 | 0.959 | 0.948      | 0.934| 0.887| 0.861| 0.793|
| Standard error       | 0.004 | 0.005      | 0.004| 0.009| 0.007| 0.011|
| 25\(^{th}\) percentile | 0.915 | 0.915      | 0.887| 0.868| 0.816| 0.749|
| 50\(^{th}\) percentile | 1.000 | 1.000      | 0.940| 0.915| 0.887| 0.842|
| 75\(^{th}\) percentile | 1.000 | 1.000      | 1.000| 1.000| 0.940| 0.887| 0.851| 1.000|
value set; however, work on the EuroQol Group’s new official valuation protocol is still in progress [31, 32]. EQ-5D-5L index norms should be re-estimated when a directly measured Polish value set becomes available.

Some of the strengths of the present study are the sampling design, which ensures sample reliability and representativeness, and the relatively large sample size, which is the largest of all in the published studies on EQ-5D-5L population norms [22–24]. The fact that a paper-and-pencil questionnaire was used in this study is not insignificant. Although it would have been easier to conduct a telephone or online survey, in order to establish population norms (as is the case of the United States study, where adults were recruited via the Internet from an established panel [24]), we were aware of the fact that the majority of EQ-5D users in Poland choose a paper-and-pencil version of the questionnaire in their studies.

Within the Polish population, similarly to the German and South Korean studies on EQ-5D-5L, quality of life was particularly poor among elderly and female respondents [22, 23]. We have noticed that the number of reported limitations increases in successive age groups (18–24, 25–34, 35–44, 45–54, 55–65, 64–75, and 75+ years) and that the EQ-5D-5L index has an almost linear downward age trend. These findings are also common in studies based on other quality of life questionnaires, such as the EQ-5D-3L [16, 19, 21, 33–36], the SF-36 [37], and the SF-12 [38]. In our sample, women reported limitations with regard to anxiety/depression and pain/discomfort more frequently than did men. Kim et al. [22] found similar gender-specific differences in quality of life within the Korean population, with the addition of the mobility dimension. Hinz et al. [23] identified male gender as an independent factor of better HRQoL in the German population. Some studies using the three-level EQ-5D reached similar conclusions [36, 39, 40], though others did not show gender differences [41]. In the Polish population, the highest frequency of reported problems was with regard to the pain and discomfort dimension. This finding was common in EQ-5D-5L [22–24] and EQ-5D-3L studies [16] in other populations.

Since the EQ-5D-5L is a generic questionnaire, it enables a comparison of the Polish population’s state of health with that of citizens of other countries. In general, South Korean society was characterized by the best health status, according to all EQ-5D-5L dimensions, as well as the summary index [22]. This result can be partially explained by cultural and ethnic differences. Simply, Asians are more likely to report being in full health, given the same health status [42]. German, United States, and Polish citizens had similar frequency of “no problem” responses in the mobility and self-care dimensions. Americans had more limitations in performing usual activities than did Poles [24]. Polish society was characterized by poorer health than their neighbors, Germans, especially with regard to the perception of pain and discomfort, as well as anxiety and depression [23]. This finding was also confirmed in a study of Polish immigrants living in Germany [43]. Similar differences in PD and AD dimensions can be observed in population studies using the three-level EQ-5D [21, 33], with Polish society closely resembling other Central European populations, such as Slovenian [35] and Hungarian populations [34].
Estimated EQ-SD-5L norms could contribute to improvement of the overall health status of the Polish population. Population norms can be used by clinicians as reference data, for instance to enable comparisons of information about a patient with a specific condition with that of an average person of the same age and gender in the general population. Such norms can also be used by researchers to form control groups in case series or other types of uncontrolled studies [25]. Public health specialists and epidemiologists may use population norms to assess the health needs of Polish society and the burden of a given disease, and to study and explain cross-country or within-country differences in self-reported health. Pharmacoeconomists and health technology assessment (HTA) analysts could use EQ-SD-5L population norms during national adaptations of global health economic models, to ensure that they better reflect the characteristics of Polish society [26, 27]. In short, such data could be used by various stakeholders, to indirectly improve the health status of the populations [16].

Future studies in Poland should include an EQ-SD-5L valuation study based on a direct elicitation of preferences for different health states (i.e., the time trade-off method, a discrete choice experiment. of preferences for different health states) [31, 32, 44]. Further cross-country comparisons should be conducted as population norms for other countries become available.

In conclusion, Polish EQ-SD-5L population norms for different age and gender subgroups have been estimated, and can be used as reference values in future studies concerning health-related quality of life.

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**Conflict of interest**

The authors declare no conflict of interest.

**References**

1. Grad FP. The Preamble of the Constitution of the World Health Organization. Bull World Health Organ 2002; 80: 981-4.
2. Callahan D. The WHO definition of ‘health’. Stud Hastings Cent 1973; 1: 77-88.
3. Fayers PM, Machin D. Quality of life: the assessment, analysis and interpretation of patient-reported outcomes. John Wiley & Sons, Ltd., Chichester 2007.
4. Bryant D, Schumemann H, Brozek J, Laeschke R, Guyatt G. Patient reported outcomes: general principles of development and interpretability. Pol Arch Med Wewn 2007; 117: 5-11.
5. Jackowski D, Guyatt G. A guide to health measurement. Clin Orthop Relat Res 2003; 413: 80-9.
6. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992; 30: 473-83.
7. McHorney CA, Ware JE Jr, Raczek AE. The MOS 36-item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Med Care 1993; 31: 247-63.
8. McHorney CA, Ware JE Jr, Lu JF, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. Med Care 1994; 32: 40-66.
9. Ware J Jr, Kosinski M, Keller SD. A 12-item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Med Care 1996; 34: 220-33.
10. Brooks R. EuroQol: the current state of play. Health Policy 1996; 37: 53-72.
11. Hunt SM, McKenna SP, McEwen J, Williams J, Papp E. The Nottingham Health Profile: subjective health status and medical consultations. Soc Sci Med A 1981; 15: 221-9.
12. Bergner M, Bobbitt RA, Carter WB, Gilson BS. The Sickness Impact Profile: development and final revision of a health status measure. Med Care 1981; 19: 787-805.
13. Dudzinska M, Tarach JS, Burroughs TE, et al. Validation of the Polish version of Diabetes Quality of Life – Brief Clinical Inventory (DQ-BCI) among patients with type 2 diabetes. Arch Med Sci 2014; 10: 891-8.
14. Herdmann M, Gudex C, Lloyd A, et al. Development and preliminary testing of the new five-level version of EQ-SD (EQ-SD-5L). Qual Life Res 2011; 20: 1727-36.
15. Janssen MF, Pickard AS, Golicki D, et al. Measurement properties of the EQ-SD-5L compared to the EQ-SD-3L across eight patient groups: a multi-country study. Qual Life Res 2013; 22: 1717-27.
16. Szende A, Janssen B, Cabases J. Self-reported population health: an international perspective based on EQ-SD. Dordrecht Springer, 2014.
17. Watrowski R, Rohde A. Validation of the Polish version of the Hospital Anxiety and Depression Scale in three populations of gynecologic patients. Arch Med Sci 2014; 10: 517-24.
18. Abdin E, Subramaniam M, Vaingankar JA, Luo N, Chong SA. Measuring health-related quality of life among adults in Singapore: population norms for the EQ-SD. Qual Life Res 2013; 22: 2983-91.
19. Ferreira LN, Perreira PL, Pereira LN, Oppel M. EQ-SD Portuguese population norms. Qual Life Res 2014; 23: 425-30.
20. Clemens S, Begum N, Harper C, Whitby JA, Scuffham PA. A comparison of EQ-SD-3L population norms in Queensland, Australia, estimated using utility value sets from Australia, the UK and USA. Qual Life Res 2014; 23: 2375-81.
21. Golicki D, Niewada M. General population reference values for 3-level EQ-SD (EQ-SD-3L) questionnaire in Poland. Pol Arch Med Wewn 2015; 125: 18-26.
22. Kim TH, Jo MW, Lee SJ, Kim SH, Chung SM. Psychometric properties of the EQ-SD-5L in the general population of South Korea. Qual Life Res 2013; 22: 2245-53.
23. Hinz A, Kohlmann T, Stobel-Richter Y, Zenger M, Brahler E. The quality of life questionnaire EQ-SD-5L: psychometric properties and normative values for the general German population. Qual Life Res 2014; 23: 443-7.
24. Craig BM, Pickard AS, Lubetkin EI. Health problems are more common, but less severe when measured using newer EQ-SD versions. J Clin Epidemiol 2014; 67: 93-9.
25. Żuraw W, Golicki D, Jurecka A, Tykli-Szymańska A. Quality of life among polish Fabry patients – a cross-sectional study. Central Eur J Med 2014; 6: 741-49.
26. Kawalec P, Holko P, Paszulewicz A. Cost-utility analysis of Ruconest® (conestat alfa) compared to Berinert® P (human C1 esterase inhibitor) in the treatment of acute, life-threatening angioedema attacks in patients with hereditary angioedema. Postep Dermatol Alergol 2013; 30: 152-8.

27. Sovic N, Pajak A, Jankowski P, et al. Cost-effectiveness of a cardiovascular disease primary prevention programme in a primary care setting. Results of the Polish part of the EUROACTION project. Kardiol Pol 2013; 71: 702-11.

28. Golicki D, Niewada M, van Hout B, Janssen MF, Pickard AS. Interim EQ-5D-5L value set for Poland: first crosswalk value set in Central and Eastern Europe. Value Health Regional Issues 2014; 4C: 19-23.

29. van Hout B, Janssen MF, Feng YS, et al. Interim scoring for the EQ-5D-5L: mapping the EQ-5D-5L to EQ-5D-3L value sets. Value Health 2012; 15: 708-15.

30. Golicki D, Jakubczyk M, Niewada M, Wrona W, Buschbach JJ. Valuation of EQ-5D health states in Poland: first TTO-based social value set in Central and Eastern Europe. Value Health 2010; 13: 289-97.

31. Devlin NJ, Krabbe PF. The development of new research methods for the evaluation of EQ-5D-5L. Eur J Health Econ 2013; 14 Suppl 1: S1-3.

32. Oppe M, Devlin NJ, van Hout B, Krabbe PF, de Charro F. A program of methodological research to arrive at the new international EQ-5D-5L valuation protocol. Value Health 2014; 17: 445-53.

33. Konig HH, Bernert S, Angermeyer MC, et al. Comparison of population health status in six European countries: results of a representative survey using the EQ-5D questionnaire. Med Care 2009; 47: 255-61.

34. Szende A, Nemeth R. [Health-related quality of life of the Hungarian population]. Orv Hetil 2003; 144: 1667-74.

35. Prevolnik Rupel V, Rebolj M (eds.). The Slovenian VAS tariff based on valuations of EQ-5D health states from the general population. 17th Plenary Meeting of the EuroQol Group; 2001; Navarra, Spain: Universidad Publica de Navarra.

36. Kind P, Dolan P, Gudex C, Williams A. Variations in population health status: results from a United Kingdom national questionnaire survey. BMJ 1998; 316: 736-41.

37. Laguardia J, Campos MR, Travassos CM, Najar AL, Anjos LA, Vasconcellos MM. Psychometric evaluation of the SF-36 (v2) questionnaire in a probability sample of Brazilian households: results of the survey PesquisaDimensoes-Sociais das Desigualdades (PDSD), Brazil, 2008. Health Qual Life Outcomes 2011; 9: 61.

38. Kontodimopoulos N, Pappa E, Niakas D, Tountas Y. Validity of SF-12 summary scores in a Greek general population. Health Qual Life Outcomes 2007; 5: 55.

39. Burstrom K, Johannesson M, Diderichsen F. Swedish population health-related quality of life results using the EQ-5D. Qual Life Res 2001; 10: 621-35.

40. Sun S, Chen J, Johannesson M, et al. Population health status in China: EQ-5D results, by age, sex and socio-economic status, from the National Health Services Survey 2008. Qual Life Res 2011; 20: 309-20.

41. Wang H, Kindig DA, Mullahy J. Variation in Chinese population health related quality of life: results from a EuroQol study in Beijing, China. Qual Life Res 2005; 14: 119-32.

42. Fu AZ, Kattan MW. Racial and ethnic differences in preference-based health status measure. Curr Med Res Opin 2006; 22: 2439-48.

43. Morawa E, Senf W, Erim Y. [Mental health of Polish immigrants compared to that of the Polish and German populations]. Z Psychiatr Psychother 2013; 59: 209-17.

44. Mulhern B, Bansback N, Brazier J, et al. Preparatory study for the revaluation of the EQ-5D tariff: methodology report. Health Technol Assess 2014; 18: vii-xxvi, 1-191.