Medical, psychological and socioeconomic aspects of aging in Poland: Assumptions and objectives of the PolSenior project

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ABSTRACT

Abstract: Both descriptive and longitudinal studies of aging are nowadays a subject of growing interest in different countries worldwide. However, in Poland and other Central–Eastern European countries, such comprehensive, nationally representative, multidimensional studies were never performed in the past in elderly population. The present paper describes the PolSenior project including its objectives, sample selection and structure, methods, fieldwork procedures and study flow. The aim of the project was to examine medical, psychological and socioeconomic aspects of aging in Poland. The research sample included 5695 respondents (2899 males and 2796 females) split into six equally sized age groups of elderly individuals (65–69 years, 70–74 years, 75–79 years, 80–84 years, 85–89 years, 90+ years) and one group of subjects just about to enter old age (55–59 years). Subjects were recruited using three stage stratified, proportional draw. The response rate was 42% and ranged from 32% to 61% between provinces. The study consisted of three visits performed by trained nurses including questionnaire survey, comprehensive geriatric assessment and blood and urine sampling. The questionnaire consisted of medical and specific socioeconomic questions. The comprehensive geriatric assessment included blood pressure and anthropometric measurements, as well as selected scales and tests routinely used in the examination of elderly subjects. Blood and urine samples were collected from 4737 and 4526 individuals, respectively. More than 50 biochemical parameters were measured, and DNA was isolated and banked. In a selected group of 1018 subjects, a medical examination by a physician was performed. The self-rated health was lower in females than in males in age groups 70–84, but similar in individuals of both sexes aged 65–69 and 85 years. Besides providing data on health and functioning of elderly population, the PolSenior project aims to analyze interrelationships between different elements of health and social status, and between genetics and health status in advanced age. The results of the PolSenior project will facilitate prioritizing the state’s public health and social policies in elderly population. Such a program provides also an excellent starting point for longitudinal studies and a basis for comparative analysis between Poland and other European countries or regions.

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1. Introduction

The intense aging of today’s societies results mainly from an increasing life span and declining birth rate. To obtain proper insights into the aging process, multi- and interdisciplinary studies are needed, that frame research questions and hypotheses, based on the interplay between social, economic, medical, and genetic factors of aging. One of the very first such studies, the Supplement on Aging (SOA), was performed in 1984 in USA including subjects aged 55 years and over (Kovar et al., 1989). Their health and social status was described in order to provide information about how psychosocial and environmental factors interact with health determinants to influence the
The PolSenior project is a multicenter, publicly funded research project commissioned by the Ministry of Science and Higher Education. It is the largest-ever scientific research program focused on elderly subjects performed in Poland, involving 40 research groups. The implementation of the project was planned over a period of 36 months (October 2007 to October 2010). Project coordination was entrusted to the International Institute of Molecular and Cell Biology (IIIMCB) in Warsaw. The Study Scientific Board was created to formulate the final protocol, elaborate survey questions, select blood and urine parameters for analysis, prepare instructions for nurse trainers, monitor study flow, control the work of the Central Laboratory and regulation of access to the Central Database. The study was composed of the following components performed by nurses:

1. Questionnaire survey consisting of four parts.
2. Elements of comprehensive geriatric assessment, including selected scales and tests routinely used in the examination of elderly subjects.

Additionally, in 9 of 16 provinces of Poland, a detailed medical examination by physicians trained in geriatrics was performed in those participants who have accepted the proposal of further geriatric assessment. Restricting this part of the study to 9 of 16 provinces was due to limited availability of geriatricians and financial resources. The PolSenior project had also two substudies. The first, performed by architects, included screening of the architectural environment of elderly subjects in the province of Upper Silesia (e.g. how participant housing was compatible with their functional status). The second substudy was run in the city of Warsaw by a physical education specialist and concerned the impact of physical training on the physical ability of elderly subjects. The scope and geographic range of the substudies corresponded to the primary project proposals accepted for realization by the Ministry of Science and Higher Education.

The recruitment of interviewers and transportation of biological material to the Central Laboratory, as well as core data entering was subcontracted to PBS DGA company, an agency with expertise in research projects for private and public sectors. Interviewers were recruited among professionally active nurses who worked mostly within local communities. All nurses participating in the study underwent training for the purpose of the PolSenior project.

The fieldwork consisted of three nurse home visits. The medical part of the questionnaire was completed during the first visit, while the socioeconomic part during the second one. Blood and urine samples were taken during the third visit. The questionnaire concerning nutrition and quality of life was given to the respondents during the first visit, and they were asked to complete it by themselves, by the second visit. Interviewers were obliged to report all cases of elderly abuse or neglect to local authorities and social service on the local level or to the study coordinator.

Considering that some of the respondents were not able to actively participate in the project due to health problems or disability e.g., hearing loss, caregivers were asked to assume their part with regard to factual information (e.g., sociodemographic information, number of children, medical history).

2.2. Subject recruitment

The planned size of the research sample was 5950 elderly respondents, divided into six age groups of equal size (65–69 years, 70–74 years, 75–79 years, 80–84 years, 85–89 years, 90+ years), with one additional reference group consisting of subjects who were just about to enter old age (55–59 years old).

Research participants were randomly recruited in bundles, in a stratified, proportional draw performed in three stages. The first stage draw identified local administrative units, including urban, rural, and urban–rural municipalities. Towns and cities were divided into five groups, depending on size: ≤20,000 residents, >20,000–50,000 residents, >50,000–200,000 residents, 200,000–500,000 residents, >500 residents. During the second stage, streets in urban municipalities, and villages in rural municipalities were drawn. In case of mixed urban–rural municipalities, streets and villages were drawn, respectively. The third stage of the draw enabled random identification of individuals in bundles and was executed using the national PESEL database (Universal Electronic System for Registration of the Population) run by the Ministry of Internal Affairs and
2.3. Questionnaire and selected geriatric scales and tests

The first part of the survey started with a rough assessment of the participant's hearing and vision followed by the Mini Mental State Examination (MMSE; Folstein test) performed to determine participants with cognitive impairment. Additionally to the MMSE score, the maximal possible score (MPS) was calculated for each individual by subtracting points for the activities that were impossible for the subject to perform from the maximal score of 30 (e.g. a participant with severe visual impairment had MPS of 30–3 = 27 points). The ratio of the participant score to MPS was then calculated and expressed as a percentage. If the result was lower than 70% MPS, the subject was considered cognitively impaired. Questions about respondent's opinions were not asked of these participants in the further course of the study to eliminate potentially unreliable answers. In such cases, the caregivers were asked to answer the questions regarding factual information and subjective questions were omitted.

Thereafter, medical part of the questionnaire, which included detailed questions about present health status and history of diseases, hospitalizations, and current medications, was completed.

Functional status was assessed using Katz's index of Activities of Daily Living (ADL) and Lawton's scale for Instrumental Activities of Daily Living (IADL). The Clock Drawing Test was used as an extra element of cognitive function screening, in addition to the MMSE. A 15-item version of the Geriatric Depression Scale (GDS) was used to screen depression. The risk of malnutrition was estimated with the full version of the Mini Nutritional Assessment questionnaire (MNA) and the risk of falls was assessed with questions on postural instability and falls during the past 12 months, as well as using the Timed “Up and Go” Test (TUG). Additionally, the Pain Assessment Scale (PAS) was used to document the presence and severity of pain. Moreover, questions concerning symptoms of dyspnea, oedema, regularity of bowel movements, woman's health, self-rated health and many others were asked. A separate sections of the medical interview were dedicated to behavioral risks, such as alcohol consumption and tobacco smoking.

The socioeconomic part of the questionnaire included questions concerning the personal and family situation, economic status, household structure, leisure activities, hobbies, and social life, among others. Special attention was paid to the level of professional activity of the respondents (past and present), opportunities and willingness of its continuation, and age-related discrimination at work. Moreover, information about help needed and the degree of needs coverage, the accessibility and satisfaction with social and healthcare services, and discrimination against seniors in healthcare facilities were assessed.


Current nutritional data and the short version of the World Health Organization Quality of Life instrument (WHOQOL-BREF) were part of an additional self-completed questionnaire. The nutritional assessment included dietary habits and approximate intake of selected food products in the past and present collected using a dietary diary method for three consecutive days.

2.4. Blood pressure and anthropometric parameter measurements

Automatic blood pressure monitors (A&D UA-787 Plus, validated by the British Hypertension Society) were used to measure arterial blood pressure and pulse. The measurement was performed three times during the first and the second visit. Each measurement was performed with the participant in a seated position, on the right upper arm, after at least 5 min of rest and at 2 min intervals. The results were recorded in the medical questionnaire and in a special form given by the nurse to the participant with interpretation of the results. Before collecting blood samples on the third visit, an additional blood pressure measurement was performed.

Anthropometric parameters included body height, body weight, waist and hip circumferences, and body fat content assessed by biompedance analysis.

2.5. Medical examination

The medical examination by geriatricians was conducted in subjects who after completing the scheduled visits by nurses as described above, were willing to take part in extended research and who gave a separate written consent. In addition to medical history and physical examination, the assessment included an electrocardiogram, spirometry, pulse oxymetry, and blood flow measurement in lower extremities using Doppler sonography. Hand grip strength measurement and Tinetti Balance Test were performed.

The screening for sleep apnea was accompanied by a questionnaire concerning sleep quality, breathing problems during sleep, and the Epworth Sleepiness Scale (ESS). Patients diagnosed with cognitive impairment were informed about indications for further diagnostic process and referred to a neurologist and neuropsychologist, and for a brain CT on voluntary bases. Additionally, in selected willing individuals, bone densitometry was performed, and total body composition was assessed.

2.6. Blood/urine analysis and banking of biological material

Thirty-six milliliters of venous blood was collected from respondents using a vacuum tube system. Blood samples were delivered within 2 h. to local laboratories, where standard full blood count was performed, and serum/plasma samples were separated. All blood and urine samples were frozen and delivered to the Central Laboratory (Mossawaski Medical Research Centre, Polish Academy of Sciences, Warsaw).

The Central Laboratory was responsible for preparing aliquot materials for further analysis, isolated DNA and banked the remaining biological material for research. The list of parameters analyzed is presented in Table 1. The results of routine biochemical laboratory parameters were sent to the participants. In the case of out-of-reference values, a letter of advice to consult a primary care physician was attached.

The antioxidant system was also analyzed, and genetic tests were performed in subgroups of patients, e.g. length of telomeres, mtDNA, dynamics of control points and fragile sites, DNA repair, cell division

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Laboratory analysis in the PolSenior project.</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Routine blood analysis: blood count, glucose, total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, sodium, potassium, calcium, phosphate, iron, creatinine, urea, uric acid, albumin, total bilirubin, GGT, GOT, alkaline phosphatase, homocystein, hs-CRP</td>
</tr>
<tr>
<td>2.</td>
<td>Hormones: intact-PTH, FSH, LH, estradiol, testosterone, sex hormone binding globulin (SHBG), TSH, FT3, insulin, melatonin</td>
</tr>
<tr>
<td>3.</td>
<td>Viral infections markers: HBs antigen, anti-HCV antibodies</td>
</tr>
<tr>
<td>4.</td>
<td>Urine analysis: albumin (low range albumin), creatinine</td>
</tr>
<tr>
<td>5.</td>
<td>Additional analysis: folic acid, vitamin B12, ferritin, 25(OH)-D3, cystatin C, adiponectin, NT-pro-BNP, brain-derived neurotrophic factor (BDNF), 8-isoprostans, interleukin 6, IGF-1, insulin-like growth factor binding protein 3 (IGF-BP3), aldosterone, paraoxonase 1 activity (PON1), anti-oxid lipid antibodies, anti-citrin antibodies, FSA (in men), CA 125 (in women)</td>
</tr>
<tr>
<td>6.</td>
<td>Analysis performed in the subgroup of participants who agreed to densitometry: osteoprotegerin, cross-linked N-telopeptides of type I collagen (NtX), DHEA-S, ghrelin</td>
</tr>
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and apoptosis in peripheral blood lymphocytes, and gene polymorphisms that potentially impact life expectancy. Selection of participants for the genetic testing was determined by the type of tests and logistic limitations. Some of the genetic results have already been published (Polosak et al., 2010; Roszkowska-Gancarz et al., 2010).

2.7. Ethical and legal issues

The PolSenior project was approved by the Bioethics Commission of the Medical University of Silesia in Katowice. The approval concerned the collection and storage of biological material and all tests performed. Before enrollment in the study, each respondent or their caregiver signed an informed consent form. Separate agreements were signed to draw blood and collect urine samples. Moreover, an additional approval was needed to store biological material for further scientific research, including genetic research. The lack of an agreement for blood/urine sample collection did not exclude the respondent from participating in other parts of the project.

Each respondent was assigned a unique identification number to ensure confidentiality of personal data collected during the survey. All questionnaires and all blood and urine samples were coded with the same number. The data were anonymously stored in a Central Database that allows an in-depth analysis of the material and facilitates drawing conclusions.

2.8. Statistical issues

As the study analyzed equivalent strata of age groups, the sample did not reflect the structure of the elderly population (65 and over), therefore for epidemiological analyses, it was necessary to calculate weights’ adjustments. The design factor was equal to the dwelling sampling fraction reciprocal in the h-th stratum. The stratum was defined by age, gender and size of residence estimated for Polish population in 2009. Weights were then adjusted with the use of non-response rates estimated for each stratum separately.

3. Results

3.1. Flow of the study

Letters of invitation were sent to the potential 15,574 participants drawn from the PESEL registry, announcing nurse’s visit. Of 13,376 residents eligible for the study 5695 participated in at least one medical part of the questionnaire, which gives the response rate of 42.58%. Among the rest of eligible subjects, there were 77.24% direct refusals and 22.76% cases of “closed door” defined as the study nurse being unable to contact the respondent during three attempts (Fig. 1).

3.2. Characteristics of the study group

The recruited numbers of individuals for the project from different provinces in Poland are presented in Fig. 2. The total number of participants was 5695 (2899 males and 2796 females), accounting for 95.7% of the planned sample. Among the participants were 4979 people aged 65 and over (2567 males and 2412 females). The structure of the study sample, including age groups and gender is shown in Table 2.

![Fig. 1. Study flow.](image)

![Fig. 2. Number of individuals recruited and response rate according to territorial division of Poland.](image)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>55–59</td>
<td>332</td>
<td>384</td>
</tr>
<tr>
<td>65–69</td>
<td>375</td>
<td>407</td>
</tr>
<tr>
<td>70–74</td>
<td>481</td>
<td>442</td>
</tr>
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<td>75–79</td>
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<td>402</td>
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<tr>
<td>80–84</td>
<td>420</td>
<td>371</td>
</tr>
<tr>
<td>85–89</td>
<td>471</td>
<td>400</td>
</tr>
<tr>
<td>90 and over</td>
<td>378</td>
<td>390</td>
</tr>
<tr>
<td>Total</td>
<td>2899</td>
<td>2796</td>
</tr>
</tbody>
</table>

Table 2: Age structure of the study group.
The sociodemographic characteristics of the elderly group (65 years and over) are presented in Table 3. Males were better educated than females, and their self-reported economic status was higher. There were more single and widowed females than males who declared living alone (27.53% vs. 13.91%). Interestingly, more than one-third of individuals living with others inhabited only with their spouse (1411; 37.80%). As shown in Fig. 3, in the oldest group of respondents the percentage of solitary dwelling was almost equal in both genders (24.5% males and 27.1% females). Analysis of the number of household members indicated than females, and their self-reported economic status was higher. There were more single and widowed females than males who declared living alone (27.53% vs. 13.91%). Interestingly, more than one-third of individuals living with others inhabited only with their spouse (1411; 37.80%). As shown in Fig. 3, in the oldest group of respondents the percentage of solitary dwelling was almost equal in both genders (24.5% males and 27.1% females). Analysis of the number of household members revealed that one in three men over the age of 90 lived only with his spouse, while the majority of females lived with other family members. Thus, over the half of the oldest men lived alone or only with an elderly spouse.

### 3.3. Self-rated health

Assessment of self-rated health (SRH) was based on visual analogue scale (VAS), where 0 meant the worst health one could imagine and 10 the best. The results presented in Fig. 4. show SRH deterioration in females occurring 10 years earlier than in males. Individuals of both genders aged 85 and over declared similar health status. Moreover, we showed in the multiple regression analysis that economic status and educational level, potentially modifiable factors, independently influenced well-being of the elderly. It is especially important, since other studies showed that low SRH was among predictors of mortality, and disability (van den Brink et al., 2005; Ford et al., 2008; Tsimbos, 2010).

In a multivariate stepwise backward regression analysis, including socioeconomic aspects, it was shown that low SRH in the group aged 65 and over was associated with female gender \( \text{OR}=0.805 \) 95% CI \((0.715–0.906)\], age \( \text{OR}=0.976 \) for 1 year increase \((0.969–0.983)\], prior \( \text{OR}=0.621 \) \((0.465–0.829)\], lower education level \( \text{OR}=0.808 \) \((0.717–0.910)\] and solitary dwelling \( \text{OR}=0.868 \) \((0.755–0.997)\], but not with place of residence.

### 4. Discussion and concluding remarks

This paper presents PolSenior study design and flow as well as demographic characteristics of the study population. Until the final comprehensive analyses of health and social data will be available, we would like to announce the broad spectrum of the PolSenior study.

The population of the oldest individuals has been increasing quickly in recent years, however the current knowledge regarding the health and social status of this population segment is limited. Both health-related and social needs of the oldest individuals remain largely uncovered as shown by other authors (Boumediel et al., 2005; Lo et al., 2005; Simon et al., 2005), PolSenior study attempts to determine such uncovered needs including a large group of respondents aged 90 years and over, the fastest growing segment of the population.

Results presented in this paper focus on self-rated health and its socioeconomic correlates. As might be expected, the SRH deteriorated along with aging and was worse in females. However, the observed gender SRH difference was disappearing in groups older than 85 years. Moreover, we showed in the multiple regression analysis that economic status and educational level, potentially modifiable factors, independently influenced well-being of the elderly. It is especially important, since other studies showed that low SRH was among predictors of mortality, and disability (van den Brink et al., 2005; Ford et al., 2008; Tsimbos, 2010).

It is well known that elderly women live more frequently alone than men. Although, it was true for the younger groups of respondents, we have shown that the solitary dwelling was comparable in both genders in the oldest group (90+). Of interest, among non-solitary dwellers, most women lived with younger family members.
while the majority of men cohabited with a coeval spouse only. Thus, we suggest that a higher percentage of households of oldest men than women require monitoring of social needs and support, if necessary.

The PolSenior study has unique value, since such a project has not been conducted previously in Poland and other post-communist countries. The only other study was limited to the population of Polish centenarians (Mossakowska et al., 2007; Mossakowska et al., 2008).

The PolSenior study provides comprehensive information about the health and living conditions of the elderly, especially rapidly growing population of the oldest old. It was feasible, as the study design assumed recruitment of six age cohorts of equal size.

The main limitation of PolSenior study is the response rate (42.58%). Thus, it was impossible to avoid some selection bias. The response rate varied from 46% in the age cohort 70–74 years to 40% in the cohort 90+, however, the response rate was almost equal for both sexes (43% in males vs. 42% in females). The response rate in large epidemiological WOBASZ study previously performed in Poland was higher (Broda and Rywik, 2005). However, that study enrolled mostly younger population. This fact, as well as considerable number of “closed doors” may partially explain lower response rate in the PolSenior Study.

In addition to its general medical and social research components, the PolSenior study also covers many basic science issues. It characterizes the interrelationships between genetics and health status in advanced age. Moreover, banked biological material will be used for future studies, both under the current and other projects. The study should also provide a starting point for longitudinal studies and a basis for comparative analysis and mapping of the situation of Polish seniors against a European background.

Furthermore, we expect that the PolSenior study will result in reliable and valuable data that can correctly prioritize the state’s public health and social policies regarding the population of old people. These policies should consider not only the needs of those who become increasingly dependent because of functional disability, but also those who stay physically fit and active in their advanced age. It is important to create conditions that will extend the period during which people can maintain their autonomy and functional independence.

The PolSenior study will play a role in improving public knowledge about aging, old age, and related issues, including awareness of the inevitable increase in spending on healthcare and social services in the coming decades. We hope that the project will promote geriatric medicine among doctors and make medical practitioners and social services more sensitive to the specific problems of geriatric patients. Finally, the study may consequently improve the quality of life in old age because of the cooperation of many researchers in various fields, including medicine, molecular biology, sociology, psychology, economics, and demography.

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