Porównanie stanu funkcjonalnego i wybranych cech socjodemograficznych osób uczestniczących i nieuczestniczących w badaniu lekarskim – wyniki projektu PolSenior

Comparison of the functional status and selected sociodemographic characteristics of participants and non-participants in a geriatric substudy of the PolSenior project

Aleksandra Szybalska

Międzynarodowy Instytut Biologii Molekularnej i Komórkowej w Warszawie

Piotr Szczęsnowicz, Edyta Stępniak

Warszawski Uniwersytet Medyczny, Wydział Nauki o Zdrowiu

Przemysław Ślusarczyk

Międzynarodowy Instytut Biologii Molekularnej i Komórkowej w Warszawie

Katarzyna Broczek

Warszawski Uniwersytet Medyczny, Klinika Geriatrii

Małgorzata Mossakowska

Międzynarodowy Instytut Biologii Molekularnej i Komórkowej w Warszawie

Streszczenie

Wstęp. *Porównanie osób uczestniczących i nieuczestniczących w badaniach populacyjnych jest istotne, ponieważ analiza różnic może przyczynić się do zwiększenia wskaźników efektywności realizacji próby oraz poprawy jakości zebranych danych. Celem pracy było porównanie osób zbadanych i niezbadanych przez lekarzy geriatrów w ramach projektu PolSenior pod względem wybranych aspektów socjodemograficznych i stanu funkcjonalnego.* ***Materiał i metody.*** *Analizowano dane z dziewięciu województw, w których u wylosowanych osób w wieku 55-59 oraz 65 i więcej lat oprócz podstawowego badania pielęgniarskiego (N = 3824) wykonano dodatkowo badanie lekarskie (N = 1015). Osoby uczestniczące i nieuczestniczące w badaniu lekarskim porównano pod względem płci, wieku, miejsca zamieszkania, stanu cywilnego, wielkości gospodarstwa domowego, poziomu wykształcenia, typu pracy, sytuacji finansowej, stanu funkcjonalnego, zdolności przejścia 200 metrów, trybu życia oraz samooceny stanu zdrowia.* ***Wyniki.*** *W badaniach lekarskich częściej uczestniczyli mieszkańcy miast, osoby w związkach małżeńskich, zamieszkałe w dwuosobowych gospodarstwach domowych, z wykształceniem ponadpodstawowym, pracownicy umysłowi oraz oceniający pozytywnie swoją sytuację finansową. Najrzadziej badani byli najstarsi respondenci projektu PolSenior. Uczestnicy badania lekarskiego byli bardziej samodzielni w zakresie podstawowych i złożonych czynności życia codziennego. Respondenci prowadzący leżący lub leżąco-siedzący tryb życia albo wymagający pomocy przy przemieszczaniu się byli badani przez lekarzy rzadziej niż osoby o większej mobilności. Nie stwierdzono istotnych różnic pomiędzy porównywanymi podgrupami w zakresie samooceny stanu zdrowia. Analiza metodą regresji logistycznej wykazała, że zamieszkiwanie w mieście, praca umysłowa i sprawność w zakresie złożonych czynności życia codziennego były czynnikami zwiększającymi uczestnictwo w badaniu lekarskim.* ***Wnioski.*** *Cechy socjodemograficzne oraz sprawność funkcjonalna respondentów miały wpływ na uczestnictwo w badaniach lekarskich w projekcie PolSenior. (Gerontol Pol 2015, 3, 143-58)*

Słowa kluczowe: *starzenie, badania populacyjne, efektywność realizacji próby, reprezentatywność, ocena geriatryczna, analiza podgrup*

Adres do korespondencji: ✉ Aleksandra Szybalska; Międzynarodowy Instytut Biologii Molekularnej i Komórkowej w Warszawie; ul. Ks. Trojdena 4; 02-109 Warszawa; ☎ (+48 22) 597 07 82 ; 🖳 a.szybalska@iimcb.gov.pl

Abstract

Background. *The comparison of participants and non-participants in population studies is of importance because analysis of the differences may contribute to augmenting the response rate and the quality of the collected data. The aim of the study was to compare persons examined and unexamined by geriatricians within the PolSenior project in terms of functional status and selected sociodemographic aspects.* **Material and methods.** *A sample of people aged 55-59 years and 65 years and older in nine provinces of Poland underwent a basic nurse study (N = 3824) and an additional medical examination performed by geriatricians (N = 1015). Participants and non-participants in the medical examination were compared in terms of gender, age, place of residence, marital status, household size, education level, type of work, financial situation, functional status, ability to walk 200 meters, lifestyle and self-rated health.* **Results.** *Participants of the medical examination were more often married, urban dwellers, residents of two-person households, with post-primary education, white-collar workers and those positively evaluating their financial status. The oldest respondents of the PolSenior project were the least frequently examined. Participants were more independent in basic and instrumental activities of daily living. Respondents, who were bedridden or staying in bed-sitting, or requiring assistance in walking, were examined by geriatricians less often than people with greater mobility. There were no significant differences between compared subgroups in terms of self-rated health. Logistic regression analysis revealed that living in the city, mental work and independence in instrumental activities of daily living were factors increasing participation in the medical examination.* **Conclusions.** *Sociodemographic characteristics and functional performance of the respondents influenced participation in the geriatric substudy of the PolSenior project. (Gerontol Pol 2015, 3, 143-58)*

Key words: *ageing, population based study, response rate, representativeness, geriatric assessment, substudy analysis*

Introduction

Epidemiological studies emphasize the role of response rate, which for several decades has been exhibiting a downward trend [1-4]. According to Galea and Tracy, the main reasons for response rate reduction should be sought in the increasing percentage of refusals of potential respondents and the difficulty of reaching those meeting study inclusion criteria.

The decrease in interest to participate in scientific population studies is due largely to a recent increase in the total number of studies, including marketing research and surveys conducted by various entities. It should also be noted, that medically oriented studies are often time-consuming and burdensome for the respondents. Such studies include various types of measurements, tests, scales, collection of biological material or observation for many years (longitudinal studies) and as a rule study participation is voluntary. Potential respondents participate, if they consider the studied topics significant and touching on issues that are important from their point of view [1,3].

Lifestyle changes observed over the last few decades in the United States and Western countries, including: greater mobility, higher percentage of working people and longer working hours, changes in the structure of households and the decline in public trust, are indicated as the main difficulties in finding potential research participants [1]. It appears that in post-communist countries, owing to the transformation, changes occur even more rapidly, thus resulting in a decreasing response rates [5-7].

There are many publications showing, that those taking part in studies (participants – P) differ from those non-participating (non-participants – NP) in terms of a number of sociodemographic factors (e.g. gender, age, marital status, financial situation, level of education, place of residence, professional situation) and health status [4,8-16]. Comparative analysis of participating and non-participating groups can contribute to better planning of population studies, leading to the increase of the response rate, avoiding selection bias, and obtaining a representative study group, and therefore to the better quality and validity of the collected data. Selection bias has to be taken into account when conclusions of the study are formulated. This problem seems to be particularly important in epidemiological studies involving the elderly, due to the higher risk of refusal related to advancing age or ill health.

Comparative analye between seniors participating and non-participating in the studies in available literature come mainly from longitudinal observations. They have shown that older people who took part in studies were characterized by better health than NP. In the Netherlands Zutphen Elderly Study, the group of respondents, in comparison to the non-respondents, had a lower proportion of men dependent in basic activities of daily living (5.8% *vs*. 21.2% respectively), with limited mobility (20.2% *vs*. 51.5% respectively), and defining their health status as "not healthy" (2.9% *vs*. 14.1% respectively) [17]. Those who participated both in the interviews and the clinical assessment of the Australian Longitudinal Study of Ageing (ALSA) rated their health as excellent or very good more often, than those who participated solely in the interviews [18].

The Swedish Kungsholmen Project (the Longitudinal Study on Aging and Dementia in Stockholm) showed

that people who took part in the follow-up studies were characterized by a higher cognitive function than short-term respondents. It was also observed that people in advanced age with impaired cognitive functions and a low level of education rarely showed a positive attitude towards the study, and cognitive tests were stressful for them [19]. The interrelationship of stress levels, lower occupational status, fewer years devoted to education, lower results in the National Adult Reading Test (NART) and the Mini Mental State Examination (MMSE) with refusals to participate in the study were also noted by Australian researchers [20]. They also showed that individuals non-participating in the study, including the clinical assessment, were more likely to have had a dementia diagnosis [18,20].

Interestingly, higher mortality rates were noted among NP as compared to P. Among women participating in the Prospective Osteoporosis Risk Assessment, fewer deaths were reported than among NP, in the average follow-up period of 13 years (44% *vs.* 66%) [21]. In the previously mentioned ALSA, full participation in the study was associated with a lower risk of death as compared to the general population and the group of participants not completing all phases of the study [18].

Sociodemographic and health differences between respondents and non-respondents discussed above on the basis of longitudinal studies, may also have implications for cross-sectional studies.

A comparative analysis between respondents and non-respondents using baseline data, and not longitudinal observations, was performed within the study "Good Ageing in Lahti region" (GOAL) and based on Finland's population registers. It has been shown, that the participation rate was highest among people aged 62-66 years, women, individuals married or cohabitating, residing in nonurban areas, reaching higher incomes and those with moderate health [22].

An example of a Polish multidisciplinary, multicenter, cross-sectional study of the elderly is the PolSenior project – "Medical, psychological, sociological and economic aspects of aging in Poland". The research was conducted between 2007 and 2012 on a representative group of elderly Poles, the study sample was randomly recruited in bundles, in a three-stage, stratified proportional draw. The study group consisted of 5695 people divided into seven assumably equinumerous five-year age cohorts, including older cohorts (65-69 years, 70-74 years, 75-79 years, 80-84 years, 85-89 years, 90 years and more) and a cohort of subjects who were just about to enter the older age (55-59 years). A unique feature of the project was the inclusion of a respectively large group of oldest people. Basic field studies were conducted in the respondents' homes by specially trained nurses using medical and socioeconomic questionnaires. In nine provinces of Poland, respondents were offered an additional medical examination by a geriatrician, to which they gave a separate consent [23].

The project as a whole was approved by the Bioethics Committee of the Medical University of Silesia in Katowice. All respondents gave written informed consent to participate in the project. The project outline was published by Bledowski et al., and the research questionnaires are available on-line: http://polsenior.iimcb.gov.pl/en/questionnaire [23].

Aim

The aim of the study was to compare respondents of the PolSenior project examined and unexamined by geriatricians in terms of functional status and selected sociodemographic characteristics, and hence to assess the representativeness of the subgroup subjected to the medical examination.

Due to the fact that the medical examination was performed in less than 1/5 of respondents, identifying the characteristics of this subgroup is important for planning further elaboration of the data obtained by geriatricians and designing new scientific studies. This assessment will indicate whether and to what extent the data can relate to the entire population, or if selection bias must be considered when formulating conclusions.

Material and methods

Among 5695 respondents of the PolSenior project, 3824 lived in nine provinces where, during the basic phase of the study, nurses proposed an additional medical examination. Geriatricians conducted studies in the homes of 1015 people. Exempting the other seven provinces of Poland from the research was due to the lack of opportunities for cooperation with geriatricians.

In this study, comparisons between two subgroups: those examined (participants – P) and unexamined (non-participants – NP) by geriatricians were performed using data derived solely from questionnaires completed during the basic study by nurses.

Both subgroups were compared in terms of gender, age, place of residence, present marital status, household size, education, type of work, and self-reported economic status.

Functional performance was assessed using the Katz Index of Independence in Activities of Daily Living (ADL) [24] and the Lawton Instrumental Activities of

Daily Living Scale (IADL) [25]. Respondents were classified into three groups according to ADL: 5-6 points – independent, 3-4 points – partially dependent, 0-2 points – dependent. On the IADL scale, people who obtained 24 points were defined as independent, 19-23 points as partially dependent, 8-18 points as dependent.

Mobility was rated on the basis of a question, about the respondents' ability to walk a distance of 200 meters. Individuals were qualified into the following categories according to predominant lifestyle: walking, sitting and walking, sitting, staying in bed/sitting, bedridden. Transferring independently or using walking aids or the help of another person was evaluated, based on the nurses' own observations.

Self-rated health was assessed with the ten-point Visual Analog Scale (VAS), where 0 indicated the worst health state imaginable, and 10 – the best [23]. The answers were divided into three categories: 7-10 points, 4-6 points and 0-3 points, which were interpreted respectively as: good, fair, poor health.

Statistical analysis

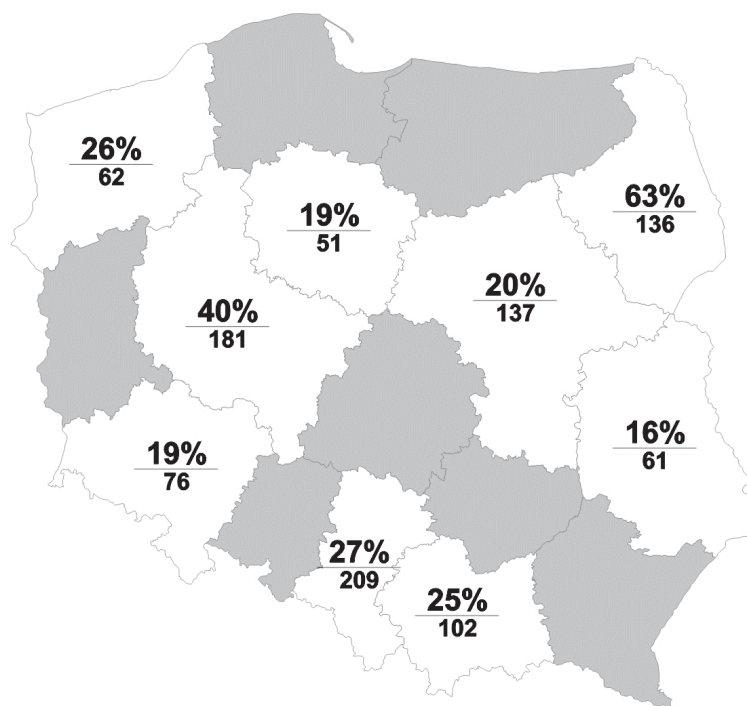Statistical analysis was performed using Statistica 10 (StatSoft, Tulsa, OK., USA) and statistical package R (R Foundation for Statistical Computing, Vienna, Austria). Data was presented as percentages. The numerousness of the groups differed depending on the examined parameters as a result of missing data, due to lack of respondents' answers. Pearson $\chi2$ test was used to study the statistical significance of differences between groups. The linear relationship between the variables was confirmed with the $\chi2$ test for the Cochran-Armitage trend. The threshold of significance was set at $p < 0.05$.

Multivariate analysis was performed using multiple logistic regression. The odds ratio (OR) and their 95% confidence intervals (95% CI) were calculated only for the final model containing significant variables.

Results

Demographic characteristics and socioeconomic status

P subgroup consisted of 1015 people, and NP subgroup of 2809. The participation of the PolSenior project's respondents in the medical examination was 26.5% and varied considerably between nine provinces – from 63.3% in Podlaskie to 15.9% in Lubelskie (figure 1).

% - percentage of PolSenior respondents who underwent additional medical examination by province
[percentages rounded to the nearest whole number]

n - number of individuals who underwent medical examination by province

Figure 1. The share of participants in medical examination performed by geriatricians in nine provinces of Poland within the PolSenior project.

Table I shows the characteristics of both subgroups in terms of selected sociodemographic factors. Significant differences between subgroups in terms of gender were not found. The average age in the P subgroup was 75.0 ± 10.6 years, and in the NP 76.6 ± 11.1 years (p < 0.001). Among the seven age cohorts analyzed, the highest percentage of people examined were in the group of 70-74 years-olds and the lowest among those 90 years old or older (30.9% *vs.* 18.6%, p < 0.001). A significant difference was found when comparing participation in the medical examination of people aged 65-79 years and those aged 80 years and older (29.3% *vs.* 22.8%, p < 0.001).

People living in urban areas were significantly more often examined by geriatricians than rural residents (31.8% *vs.* 18.2%, p < 0.001). It was found that married

Table I. Sociodemographic characteristics of respondents of the PolSenior project: participants (P) and non-participants (NP) in the medical examination performed by geriatricians

Variable	Characteristics	Total	Underwent geriatric examination		P-value
			NO	YES	
		%	%	%	
Gender		n = 3824	n = 2809	n = 1015	
	Male	50.6	49.9	52.6	NS
	Female	49.4	50.1	47.4	NS
Age [years]		n = 3824	n = 2809	n = 1015	
	55-59	13.3	13.0	14.4	NS
	65-69	14.0	13.6	15.4	NS
	70-74	16.9	15.9	19.7	0.007
	75-79	14.4	14.2	15.0	NS
	80-84	13.7	14.0	12.8	NS
	85-89	14.9	15.3	13.9	NS
	90 and over	12.7	14.1	8.9	< 0.001
Place of residence		n = 3824	n = 2809	n = 1015	
	Urban area	61.4	57.1	73.5	< 0.001
	Rural area	38.6	42.9	26.5	< 0.001
Present marital status		n = 3668	n = 2666	n = 1002	
	Never married	3.2	3.5	2.2	NS
	Married	53.7	51.4	59.8	< 0.001
	Widowed	40.3	42.7	34.0	< 0.001
	Divorced/Separated	2.8	2.4	4.0	0.013
Number of persons in the household including the respondent		n = 3682	n = 2678	n = 1004	
	1	22.5	23.1	20.8	NS
	2	37.3	35.1	43.0	< 0.001
	3	13.7	13.4	14.5	NS
	4 and more	26.5	28.3	21.6	< 0.001
Education		n = 3671	n = 2668	n = 1003	
	Higher education	11.3	9.4	16.4	< 0.001
	Secondary	36.1	34.6	40.4	< 0.001
	Primary	41.4	43.4	35.9	< 0.001
	Lack of education	11.2	12.7	7.4	< 0.001
Type of work		n = 3465	n = 2514	n = 951	
	White-collar (non-manual worker)	34.9	30.9	45.5	< 0.001
	Blue-collar (manual worker)	51.7	53.9	46.0	< 0.001
	Farmer	13.4	15.2	8.5	< 0.001
Self-reported economic status		n = 3352	n = 2400	n = 952	
	Enough money for all needs	69.5	67.8	74.0	0.001
	Enough money but not for all needs	26.1	27.5	22.8	0.006
	Not enough money even for the cheapest food and clothes	4.3	4.8	3.3	NS

n = numerousness of groups differed depending on the examined parameters as a result of missing data due to lack of respondents' answers.

people more often participated in the medical examination than those widowed (30.4% *vs.* 23.0%, p < 0.001). Individuals living in two-person households constituted 31.5% participants, while those living in households with four or more inhabitants only 22.3%.

Statistically significant differences were observed in terms of the level of education. The P subgroup consisted of more people with post-primary education compared to the NP subgroup (p < 0.001). The subgroups also differed significantly in terms of type of work. The participants were more often white-collar workers than blue-collar and farmers (35.8%, 24.4%, 17.5%, respectively). Participants were characterized by a higher self-reported economic status compared to NP.

Functional status

Analysis of functional status, gait performance, lifestyle showed statistically significant differences between compared P and NP subgroups (table II). Those examined by geriatricians were characterized by better performance in ADL than NP. The P subgroup consisted of over 5 percentage points more independent people than NP. Only 12.3% of people dependent in ADL took part in the medical examination.

Almost every third IADL independent individual (30.6%) underwent the geriatric assessment as compared to fewer than one in five of dependent subjects (19.4%). Subsequently, the P subgroup consisted of more people able to walk a distance of 200 meters without rest, and less those for whom it was impossible, than NP subgroup (p < 0.001). Differences in geriatric examination participation depending on lifestyle and transferring were found only in subgroups with lowest performance. Individuals who were bedridden or staying in bed/sitting, as well as those requiring the help of another person or walking aid to move, were visited by geriatricians less often.

Table II. Functional status of respondents of the PolSenior project: participants (P) and non-participants (NP) in the medical examination performed by geriatricians

Variable	Characteristics	Total	Underwent geriatric examination		P-value
			NO	YES	
		%	%	%	
ADL score		n = 3769	n = 2769	n = 1000	
	Independent [5-6 pts.]	89.3	87.9	93.2	< 0.001
	Partially dependent [3-4 pts.]	5.5	6.0	4.4	NS
	Dependent [0-2 pts.]	5.2	6.2	2.4	< 0.001
IADL score		n = 3798	n = 2787	n = 1011	
	Independent [24 pts.]	53.5	50.6	61.4	< 0.001
	Partially dependent [19-23 pts.]	20.3	20.6	19.5	NS
	Dependent [8-18 pts.]	26.2	28.7	19.1	< 0.001
Walking a distance of 200 meters		n = 3613	n = 2644	n = 969	
	Able to walk that distance without rest	65.5	63.7	70.7	< 0.001
	Able to walk that distance with rest	21.6	22.0	20.6	NS
	Not able to walk that distance	12.8	14.3	8.7	< 0.001
Lifestyle		n = 3801	n = 2790	n = 1011	
	Walking	44.0	43.5	45.4	NS
	Sitting and walking	42.8	41.9	45.3	NS
	Sitting	5.9	6.3	4.9	NS
	Staying in bed/sitting	5.9	6.5	4.1	0.005
	Bedridden	1.4	1.8	0.4	0.002
Transferring		n = 3351	n = 2409	n = 942	
	Independently	88.0	86.5	91.8	< 0.001
	Using walking aid	8.6	9.2	6.9	0.037
	Using help of other people	1.9	2.2	0.9	0.011
	Bedridden	1.6	2.1	0.4	0.001
Self-rated health		n = 3570	n = 2589	n = 981	
	Good [7-10 pts.]	41.2	41.4	40.6	NS
	Fair [4-6 pts.]	50.1	50.0	50.3	NS
	Poor [0-3 pts.]	8.8	8.6	9.2	NS

n = numerousness of groups differed depending on the examined parameters as a result of missing data due to lack of respondents' answers.

Table III. Results of the multivariate logistic regression analysis of factors associated with participation in the geriatric substudy of the PolSenior project

Variable	Characteristics	OR	OR 95% CI	P-value
IADL score	Dependent [8-18 pts.]	1	-	-
	Partially dependent [19-23 pts.]	1.07	[0.83-1.39]	0.581
	Independent [24 pts.]	1.31	[1.06-1.63]	0.012
Type of work	Farmer	1	-	-
	Blue-collar (manual worker)	1.02	[0.82-1.27]	0.823
	White-collar (non-manual worker)	1.41	[1.09-1.83]	0.009
Place of residence	Rural area	1	-	-
	Urban area	1.93	[1.60-2.33]	< 0.001

Interestingly, there were no statistically significant differences between compared subgroups in terms of self-rated health.

Multiple logistic regression analysis

Multiple logistic regression showed that factors having a significant impact on participation in the medical examination were: place of residence, type of work and independence in IADL (table III). Residents of cities, white-collar workers, respondents independent in IADL were examined by geriatricians more often, compared to the villagers, manual workers or people dependent in IADL.

Discussion

The PolSenior project is the largest cross-sectional population-based study concerned with the multidimensional assessment of the health and functioning of older people in society, conducted in Poland. On the basis of the results of the project recommendations for health and social policies were formulated [26]. The analysis of the quality of this study is important for planning further research projects involving the senior population, as the demand for such investigations is increasing, due to the progressive aging of the population.

The last several decades have seen a decline in the response rate of population studies [1-3]. It should, however, be noted, that the lower response rates are not necessarily equivalent to the low quality or low significance of the studies. In fact, response level depends on the adopted criteria [3]. The PolSenior project can be an example of restrictive criteria adopted by the implementers, resulting in the response rate of 43% in the basic nursing study. In the case of choosing a less restrictive approach, e.g. rejecting from the eligible group potential respondents who could not be contacted by nurses, the total response rate would be about 6 percentage points higher [27]. In assessing the quality and relevance of the research, one should take into account not only the response rate and methods for calculating it, but also the methodology and protocols of the research, including the sampling procedure and research techniques, as well as the characterization of respondents and non-respondents [3].

A high percentage of refusals during the basic research phase (nursing study) of the PolSenior project, especially in urban areas, was the reason for carrying out an additional study in 2010 in two cities (Lodz and Lublin) in order to characterize people who declined to participate. These individuals had lower independence in mobility and daily living, greater visual impairment, more frequent solitary habitation and lower self-rated health and financial situation. Analysis of sociodemographic factors (including gender, age, education level, socio-occupational status) showed no significant differences between respondents and non-respondents of the PolSenior project [27].

The sampling design of the PolSenior project assured the representativeness of the study group in terms of age and place of residence [23]. Analysis of the sociodemographic characteristics and the functional performance of people additionally examined by geriatricians indicates that the representativeness of this subgroup was impaired. Comparison of subgroups P and NP showed that the extending of the research led to the gradual elimination of the oldest, dependent, people in a difficult financial situation, less educated, and widowed from the study group.

A similar analysis was conducted among participants of The Welsh Heart Health Survey, a study addressed to persons aged 18-64 years. Sociodemographic characteristics and selected health factors of consenters and non-consenters to the medical examination – one of the elements of the Welsh Heart Health Survey – were com-

pared. It was found that gender, age, social class, marital status, education, alcohol consumption, physical activity, BMI, eating habits, social activity and perceived control over health status had an impact on consenting to the medical examination [14].

It should be noted that within the PolSenior project the NP subgroup consisted not only of people who did not agree to a medical examination, but also those who initially agreed, but the geriatric substudy was not carried out. Many factors and circumstances seem to influence this situation. These include mortality, especially in the oldest groups, deterioration of health, hospitalization or the respondents' change of residence. An unfavorable circumstance was the longer than assumed interval between the nurse's visit, noting consent to the medical examination, and the geriatrician's visit, caused by, among others, waiting for the results of blood tests carried out in a central laboratory. It should be noted, that there is a small number of geriatricians in Poland, for whom work within the project was an additional burden, often associated with the need to cover long distances and complicated by a limited number of sets of medical equipment available within the PolSenior project [28]. These circumstances constituted additional selection bias, eliminating persons living far from cities. The impact of various factors on the participation in the geriatric examination will be the subject of a separate paper.

Analysis of selected sociodemographic factors showed differences between the subgroups of P and NP within the PolSenior project in terms of all evaluated factors except gender.

People aged 70-74 years took part in the medical examination the most frequently. It should be noted, however, that this age cohort was also most strongly represented throughout the entire PolSenior project. Among P there were 1.5 times fewer oldest (90+) people than among NP. The lower participation of the oldest was also mentioned in the Kungsholmen Project, in which the average age of non-respondents was more than two years higher than respondents [19], while in the present study the difference reached 1.6 years.

The participants of the medical examination within the PolSenior project were more often city dwellers than residents of rural areas, which can be interpreted in two ways. Visiting respondents in cities was easier for doctors, who performed tasks within the PolSenior project during their free time, and time-consuming trips were an additional burden to them. A larger participation rate in cities was also observed in the Dutch population study, Health Examination Survey. However, the authors of that study perceived that the cause of this was the greater distances that the respondents from rural areas had to travel to research centers [8]. On the other hand, one would assume that those who live in cities are more health conscious and therefore more willing to participate in research. This, however, seems to be negated by the results of the basic phase of the PolSenior project carried out by nurses, which showed higher response rates in rural areas than in urban areas [27].

More married people and, hence, more respondents living in two-person households participated in the medical examination within the PolSenior project. The previously mentioned GOAL project also observed that those who were married or cohabiting were more likely to take part in the study [22]. Analysis of the PolSenior project also showed that interest in the medical examination decreased with the increasing number of people living together. It is believed that these were multi-generational households, typical mainly for rural areas.

Participants of the medical examination were characterized by a higher level of education than those who did not participate in the geriatric substudy. A similar pattern was observed among the respondents of GOAL [22] and in longitudinal studies involving older people [19,20]. The P subgroup of the PolSenior project consisted of more people engaged in mental work and assessing their financial situation a positive, which could partly be a consequence of a higher level of education and residing in a city. In the group of respondents of the longitudinal Zutphen Elderly Study there were over twice more senior white-collar workers than among non-respondents [17]. The GOAL study also confirmed the frequent participation of people with higher incomes [22].

Respondents of the PolSenior project examined by geriatricians were characterized by a better functional performance and mobility. This data is consistent with the Zutphen Elderly Study [17].

There were no statistically significant differences between compared subgroups in terms of self-rated health within the PolSenior project, in contrast to other studies [17,18].

In conclusion, the subgroup of people who did not participate in the geriatric substudy of the PolSenior project were characterized by poorer socioeconomic and functional status than those examined by geriatricians. Given that functional performance is dependent on health status, one should assume that people unexamined by geriatricians could have been less healthy, and thus had a greater number of chronic diseases, although this was not confirmed in the health self-assessment. This issue requires further analysis.

It should be noted that the medical examination constituted an additional element of the PolSenior project, delayed in time with respect to the basic research, and its

implementation was influenced by many circumstances, including factors independent from those analyzed in the present study.

Conclusions

Analysis of the geriatric substudy of the PolSenior project allows the following conclusions:

1. The subgroup examined by geriatricians (P) within the PolSenior project differed in terms of selected sociodemographic characteristics and functional performance from non-participants (NP).

2. The subgroup of participants of the medical examination was not representative of all respondents of the PolSenior project and, consistently, of the elderly population in Poland. It can be assumed that the functional status of the Polish population is worse than that of the participants' of the geriatric substudy of the PolSenior project.

3. In population-based studies, there are factors independent of the applied methodology, which may promote the exclusion of people of advanced age, low socioeconomic status and poor functional performance.

4. Extrapolating the results of substudies to the population covered by the research, and subsequently to the general population should be preceded by careful analysis of possible bias and confounding factors.

Conflicts of interest
None

References

1. Galea S, Tracy M. Participation rates in epidemiologic studies. Ann Epidemiol. 2007;17:643-53.

2. Hartge P. Participation in population studies. Epidemiology. 2006;17:252-4.

3. Morton SM, Bandara DK, Robinson EM, et. al. In the 21st Century, what is an acceptable response rate? Aust N Z J Public Health. 2012;36:106-8.

4. Tolonen H, Helakorpi S, Talala K, et al. 25-year trends and socio-demographic differences in response rates: Finnish adult health behaviour survey. Eur J Epidemiol. 2006;21:409-15.

5. Broda G, Rywik S, Polakowska M, et al. Long-term Pol-MONICA-Warsaw project: pattern of blood pressure among the population and the effects of selected factors on the blood pressure level. Pol Arch Med Wewn. 1990;84:253-63. [in Polish]

6. Rywik S, Kupsc W, Piotrowski W, et al. Multicenter national Polish population health status tests-WOBASZ project. Establishment of methods and logistics. Kardiol Pol. 2005;63(Supl 4):605-13. [in Polish]

7. Zdrojewski T, Rutkowski M, Bandosz P, et al. Prevalence and control of cardiovascular risk factors in Poland. Assumptions and objectives of the NATPOL 2011 Survey. Kardiol Pol. 2013;71:381-92.

8. Boshuizen HC, Viet AL, Picavet HS, et. al. Non-response in a survey of cardiovascular risk factors in the Dutch population: determinants and resulting biases. Public Health. 2006;120:297-308.

9. Demarest S, Van der Heyden J, Charafeddine R, et al. Socio-economic differences in participation of households in a Belgian national health survey. Eur J Public Health. 2013;23:981-5.

10. Kjoller M, Thoning H. Characteristics of non-response in the Danish Health Interview Surveys, 1987-1994. Eur J Public Health. 2005;15:528-35.

11. Knudsen AK, Hotopf M, Skogen JC, et al. The health status of nonparticipants in a population-based health study: the Hordaland Health Study. Am J Epidemiol. 2010;172:1306-14.

12. Korkeila K, Suominen S, Ahvenainen J, et al. Non-response and related factors in a nation-wide health survey. Eur J Epidemiol. 2001;17:991-9.

13. Lorant V, Demarest S, Miermans PJ, et al. Survey error in measuring socio-economic risk factors of health status: a comparison of a survey and a census. Int J Epidemiol. 2007;36:1292-9.

14. Pullen E, Nutbeam D, Moore L. Demographic characteristics and health behaviours of consenters to medical examination. Results from the Welsh Heart Health Survey. J Epidemiol Community Health. 1992;46:455-9.

15. Sogaard AJ, Selmer R, Bjertness E, et al. The Oslo Health Study: The impact of self-selection in a large, population-based survey. Int J Equity Health. 2004;3:3.

16. Van Loon AJ, Tijhuis M, Picavet HS, et al. Survey non-response in the Netherlands: effects on prevalence estimates and associations. Ann Epidemiol. 2003;13:105-10.

17. Hoeymans N, Feskens EJ, Van Den Bos GA, et al. Non-response bias in a study of cardiovascular diseases, functional status and self-rated health among elderly men. Age Ageing. 1998;27:35-40.

18. Anstey K, Luszcz M. Selective non-response to clinical assessment in the longitudinal study of aging: implications for estimating population levels of cognitive function and dementia. Int J Geriatr Psychiatry. 2002;17:704-9.

19. von Strauss E, Fratiglioni L, Jorm AF, et al. Attitudes and participation of the elderly in population surveys: data from a longitudinal study on aging and dementia in Stockholm. J Clin Epidemiol. 1998;51:181-7.

20. Jacomb PA, Jorm AF, Korten AE, et al. Predictors of refusal to participate: a longitudinal health survey of the elderly in Australia. BMC Public Health. 2002;2:4.

21. Wihlborg A, Ĺkesson K, Gerdhem P. External validity of a population-based study on osteoporosis and fracture. Acta Orthop. 2014;85:433-7.

22. Nummela O, Sulander T, Helakorpi S, et al. Register-based data indicated nonparticipation bias in a health study among aging people. J Clin Epidemiol. 2011;64:1418-25.

23. Bledowski P, Mossakowska M, Chudek J, et al. Medical, psychological and socioeconomic aspects of aging in Poland: assumptions and objectives of the PolSenior project. Exp Gerontol. 2011;46:1003-9.

24. Katz S, Ford AB, Moskowitz RW, et al. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. JAMA. 1963;185:914-9.

25. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist. 1969;9:179-86.

26. Mossakowska M, Wiecek A, Grodzicki T, et al. Recommendations. In: Mossakowska M, Wiecek A, Bledowski P (eds). Medical, psychological, sociological and economic aspects of aging in Poland. Poznan: Termedia Wydawnictwa Medyczne; 2012. pp.: 561-5. [in Polish]

27. Piechor E, Manikowski A, Mossakowska M, et al. Basic indicators of the implementation of the PolSenior study. In: Mossakowska M, Wiecek A, Bledowski P (eds). Medical, psychological, sociological and economic aspects of aging in Poland. Poznan: Termedia Wydawnictwa Medyczne; 2012. pp.: 51-64. [in Polish]

28. Mossakowska M, Szybalska A, Bledowski P. Course of the study. In: Mossakowska M, Wiecek A, Bledowski P (eds). Medical, psychological, sociological and economic aspects of aging in Poland. Poznan: Termedia Wydawnictwa Medyczne; 2012. pp.: 65-78. [in Polish]