



## Health care system and patient-related factors affecting low cancer screening participation in Poland

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### ABSTRACT

The level of participation in cancer screening is low in the Polish population. The aim of this study was to assess the opinions of centers providing cancer screening as to the reasons for the low frequency of cancer screening in Poland and possible methods to increase participation. In July 2020 433 centers in Poland carried out breast and/or cervical cancer screening. Of these, 136 centers decided to participate in the study. The study was conducted using an original questionnaire. The questions were addressed to opinion of centers about: reasons for the low frequency of cancer screening in Poland, methods to increase the frequency of cancer screening, pricing and motivating factors for providing cancer screening. Among opinions as to possible reasons for the low frequency of cancer screening in Poland related to the care-system, lack of encouragement from general practitioners, lack of invitations for cancer screening and lack of proper social advertising were most prevalent; whereas among reasons related to patients, a low awareness of cancer screening and fear of cancer diagnosis. The main methods that could potentially increase screening participation are considered to be the inclusion of cancer screening in mandatory periodic employee examinations, more activity by general practitioners, better promotion of screening by central institutions, and sending personal invitations. In conclude some interventions should be carried out to motivate people to break down barriers.

### 1. Introduction

Screening tests for cancer are targeted at people without visible symptoms to detect the disease at an early stage with a higher probability of cure. Early diagnosis reduces the likelihood of serious consequences from the illness and its treatment in the future, and offers a greater chance of complete recovery. Screening targets specific age and gender groups. In Poland three cancer screening tests are performed: screening for cervical cancer (Papanicolaou test), breast cancer (mammography) and colorectal cancer (colonoscopy) (Narodowy Fundusz Zdrowia, 2023). Cervical cancer screening, breast cancer screening and colorectal cancer screening are recommended by the European Health Committee (Cancer screening in the European Union, 2023). In Poland cervical cancer screening is offered to women aged 25 to 59, every three years, breast cancer screening among women aged 50 to 69 every two years and colorectal cancer screening is recommended for men and women aged 50 to 65 every ten years (Narodowy Fundusz

Zdrowia, 2023). However, the level of participation in cancer screening amongst the Polish population is low. In 2019, 39 % of Polish women took part in breast cancer screening and 16 % participated in cervical cancer screening (Narodowy Fundusz Zdrowia, 2023). During the COVID-19 pandemic, the rates of participation in cancer screenings were even lower. In the months when severe pandemic restrictions were in force in Poland, the number of mammography and cytology tests decreased by more than 90 % and 87 %, respectively (Andrzejczak et al., 2021). The number of Polish women who undergo mammography and cytology is probably higher than 39 % and 16 % respectively, because some women use a private service provider to carry out these examinations. There are no published data about the participation in colorectal cancer screening in Poland.

For a screening program to be effective it is important that a high percentage of the eligible population takes part in examinations regularly. The extent and intensity of cancer screening programs is related to a decrease in cancer mortality. In countries which introduced cervical

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cancer screening programs several decades ago, for example Nordic countries, the decrease in mortality from this disease was as much as 80 % (Anttila and Nieminen, 2007; Sankaranarayanan et al., 2001). In Iceland, where 100 % of the eligible female population is covered by cervical cancer screening, the 5-year relative survival for women with cervical cancer is the highest in Europe – 85 % (Eurocare 5 Survival Analysis, 2023). In Poland, where participation in cervical cancer screening is very low, the 5-year relative survival rate is only 55 % (Eurocare 5 Survival Analysis, 2023). In Finland women have done cytology every 5 years (7 times in a lifetime) whereas in Germany 50 times in a lifetime (Spaczyński et al., 2007). The world age-standardized rates of corrected cervical cancer mortality in 2000–2004 for Finland and Germany were 1.1 and 2.2, respectively (deaths per 100 000 women-years) (Arbyn et al., 2009). It seems that the higher rate of coverage amongst the eligible population (93 % in Finland vs. 80 % in Germany) is more related to the effectiveness of screening than number of tests.

The coverage of population by breast cancer screening in Poland is higher than in the case of cervical cancer screening, but is still relatively low – 39 %. The world age-standardized rate of corrected breast cancer mortality in Poland is 15.1 (Wojtyła et al., 2021), whereas in Spain, Norway and Sweden the world-age-standardized rate of corrected breast cancer mortality is 11. The levels of coverage for breast cancer screening in these countries is almost twice as high as in Poland (62 %, 72 % and 76 % in Spain, Norway and Sweden respectively) (Zielonke et al., 2021).

The aim of the study was to estimate the opinions of centers providing cancer screening as to the reasons for the low frequency of cancer screening in Poland, possible methods to increase participation, motivating factors for providing cancer screening and its pricing.

## 2. Material and methods

In July 2020 433 centers in Poland carried out breast and/or cervical cancer screening programs financed by National Health Fund (Narodowy Fundusz Zdrowia; NFZ) (Informator o zawartych umowach, 2020). Invitations to participate in this study were sent by email to all 433 centers between August and December 2020. 136 from 433 centers (31 %) from regions across Poland decided to participate in the study. 4 centers (3 %) conduct screening in more than one location. The information about type of cancer screening conducted by each center was collected. 28 centers (20.6 %) conducted breast and cervical cancer screening programs. 83 centers (61 %) provided only breast cancer screening and 25 centers (18.4 %) only provided cervical cancer screening. The comparative analyses were performed between centers providing breast cancer screening or breast cancer and cervical cancer screening (BS/BS + CS) and centers conducting only cervical cancer screening (CS). Centers' opinions were also compared according to type of providing test (mammography, cytology).

The study was conducted using an original questionnaire. A questionnaire was designed in accordance with approved principles, specifically for this study (Burgess, 2001; Boparai et al., 2019). The questionnaire's items were created by public health experts, who had extensive experience in: healthcare policy, organization of oncology care system, and primary and secondary cancer prevention. The comprehensibility and acceptability of the questionnaire was validated by an oncologist, a psycho-oncologist and a public health specialist. The questionnaire consisted of 11 questions. The questions were addressed to opinion of centers providing breast and/or cervical cancer screening programs in five areas: I) reasons for the low frequency of cancer screening in Poland, II) methods to increase the frequency of cancer screening in Poland, III) motivating factors for providing cancer screening, IV) pricing of cancer screening in Poland and V) additional questions. The questionnaire included: one closed multiple-choice question with the possibility for addition of the respondent's own answer for area I), two closed multiple-choice question with the possibility for addition of the respondent's own answer and one single-choice

question for areas II) and III), two questions on a 5-point Likert scale (1-very low, 5-very high) for area IV) and two closed-ended questions for area V). Polish and English versions of the questionnaire are presented in [Supplementary Materials](#).

The questionnaire was addressed to the persons responsible for organizing the cancer screening in the participating centers. Respondents completed the questionnaire on-line. By starting to fill in the questionnaire, respondents gave their consent to participation in the study. The study was voluntary and anonymous.

### 2.1. Statistical analysis

The responses to the questions were characterized by descriptive statistics. To analyze the questions on 5-point Likert scale, subgroups were combined: 1 (very low) with 2 (low) as one category and 4 - (high) with 5- (very high) as one category (3 categories were calculated: high, sufficient and low). All variables were analyzed categorically and to compare the proportions between subgroups a chi-square test was used. A p value < 0.05 was considered to be significant. The analysis was conducted using Statistica (data analysis software system), version 13 (<https://statistica.io>) TIBCO Software Inc., Krakow, Poland (2017).

## 3. Results

All 136 sets of responses were included in the analyses. The I-IV subgroups of questionnaire items were analyzed.

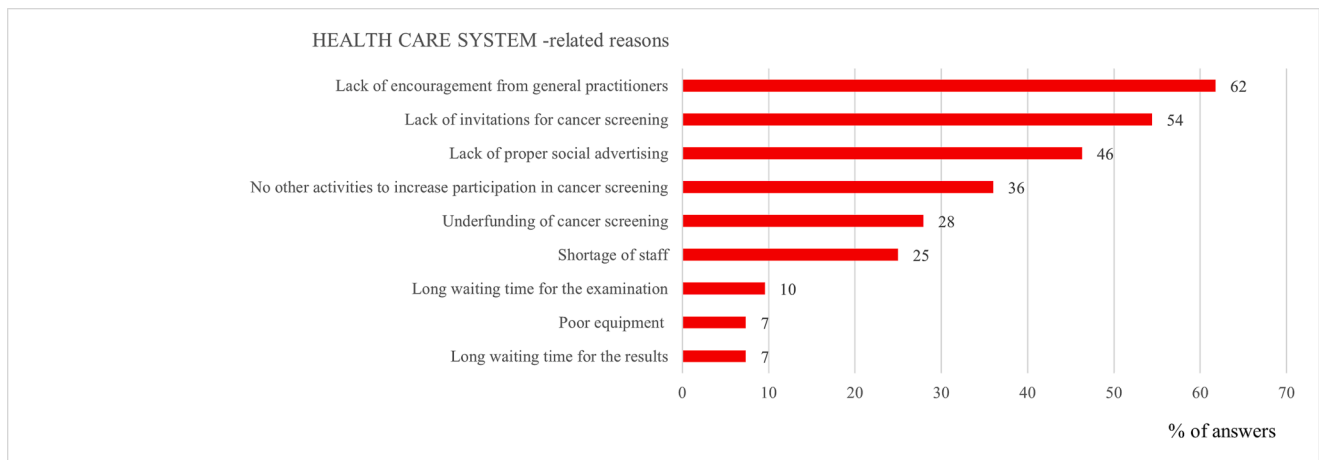
### 3.1. Reasons for the low frequency of cancer screening in Poland

The possible reasons for the low participation rate in cancer screening were divided into care-system and patient-related factors. Among the reasons related to the care system were lack of encouragement from general practitioners (62 %), lack of invitations for cancer screening (54 %) and lack of proper social advertising (46 %). About a quarter of respondents indicated the shortage of staff (25 %) and underfunding of cancer screening (28 %) as possible reasons (Fig. 1A).

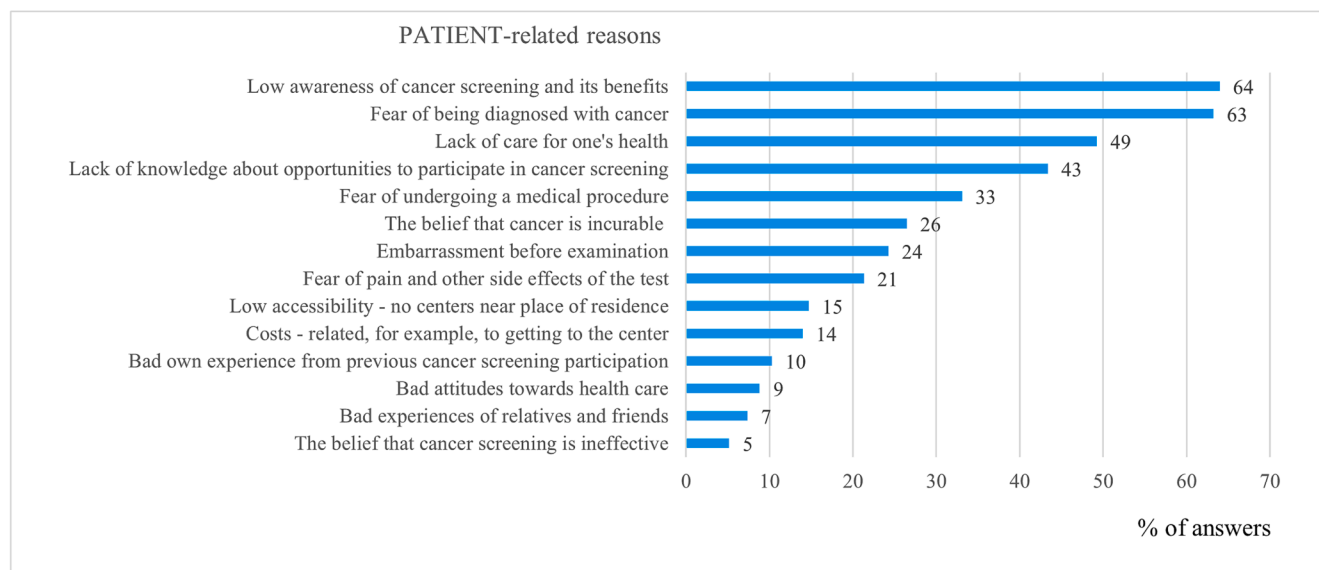
Among reasons related to the patient, low awareness of cancer screening and its benefits and a lack of knowledge about opportunities to participate in cancer screening were indicated by 64 % and 43 % of centers participating in the study, respectively. 63 % of respondents thought that fear of being diagnosed with cancer and 26 % of respondents that the belief that cancer is incurable were reasons for low screening attendance. Respondents from one in three centers considered that a reason for low participation in cancer screening is fear of undergoing a medical procedure and those from one in five centers, fear of pain and other side effects from the test. Respondents also indicated the embarrassment related with the examination (24 %) as a potential issue. Half of participants in the study believed that a lack of care for one's health is a possible reason for non-participation in cancer screening (Fig. 1B).

### 3.2. Methods to increase the frequency of cancer screening in Poland

Most respondents from centers participating in the study (60 %) considered that an appropriate intervention could be the inclusion of cancer screening into mandatory periodic employee examinations. Increasing the role of general practitioners in encouraging participation in cancer screening was the second most popular answer (54 %). Almost half of respondents (45 %) suggested that invitation by postal letter and 30 % of participations, that invitation by telephone (with a fixed examination date) could increase participation, but only 13 % considered that the invitation by email would be beneficial. Almost all respondents, except 9, (93 %) considered that central institutions should actively promote oncology prevention, mostly in the form of invitations directly to the population eligible for screening (84/127; 66 %) or coordinating and conducting educational campaigns (78/127; 61 %) (Table 1).



(A)



(B)

**Fig. 1.** Respondents' (136 centers providing breast and/or cervical cancer screening) opinions of reasons for low levels of population participation in cancer screening connected with health care system- and patient-related factors (answers to multiple-choice question *What in your opinion are the main possible reasons of low participation rate in cancer screening?* in percentages). A. Respondents' opinions of reasons for low levels of population participation in cancer screening connected with health care system-related factors. B. Respondents' opinions of reasons for low levels of population participation in cancer screening connected with patient-related factors.

3.3. *Motivating factors for providing cancer screening*

Among centers included in the analysis, the main motivations for providing a medical service in the form of cancer screening were: the habit of organizing cancer screening (68 %), the mission of the center (59 %), screening being complementary to the center's service (diagnosis and treatment of cancers) (58 %), and having resources (adequate equipment and staff) (50 %).

In the opinion of most respondents (81 %) if additional funding was paid as a bonus for completing a high number of screening tests, this could increase the rate of examinations. Respondents would like to allocate extra funding for cancer screening promotion (60 %), new equipment (58 %), increasing staff salaries (55 %), and staff training (33 %) (Table 2).

3.4. *Pricing of cancer screening in Poland*

Most respondents claimed that the funding of cancer screening is too

low (Table 3). Most centers included in the study would like to get extra support for example for buying equipment and upgrading facilities.

3.5. *Differences between centers providing breast cancer screening or breast cancer and cervical cancer screening (BS/BS + CS) and only cervical cancer screening (CS)*

BS/BS + CS significantly more often than CS indicated that individual invitations would be beneficial (p = 0.04). Although, most of respondents at both centers indicated that central institutions should actively promote the promotion of oncology, centers providing only cervical cancer screening were more likely to indicate the creation of standards for conducting cancer screening as forms of support (p = 0.005). BS/BS + CS significantly more often than CS considered that motivational funding would be beneficial in terms of increasing the rate of screening tests (p = 0.03) and more frequently indicated that investments made in recent years were motivation for them to provide cancer screening (p = 0.002). BS/BS + CS more often than CS reported

**Table 1**

Opinions of respondents (136 centers providing breast and/or cervical cancer screening) about interventions to increase the frequency of cancer screening according to three questions: A. Which interventions could improve screening attendance?; B. Is the role of central institutions (Ministry of Health, the National Health Fund) to actively promote oncology prevention, not just funding?; C. What form the support should be in?

Items	n	%
A. Which interventions could improve screening attendance?*		
Inclusion cancer screening into the mandatory periodical employee examinations	82	60
More activity by general practitioners in encouraging participation in cancer screening	73	54
Invitation by postal letter	61	45
Invitation by telephone (with a fixed examination date)	41	30
Introduce education of cancer screening in secondary schools and universities	37	27
Increase resources allocated to conduct cancer screening	33	24
Invitation by mail	18	13
More intensive educational campaigns to promote cancer screenings (the media)	15	11
More intensive educational campaigns to promote cancer screening	11	8
Increased activity of centers in increasing cancer screening participation	7	5
B. Is the role of central institutions (Ministry of Health, the National Health Fund) to actively promote oncology prevention, not just funding?		
No	9	7
Yes	127	93
C. What form the support should be in?*		
Invitations (by letter, phone, other) directly to the population eligible for cancer screening	84	66
Centrally coordinate and conduct educational campaigns to promote participation in cancer screening	78	61
Technological support - e.g., providing IT tools to facilitate coordination of cancer screening	62	49
Conducting training for staff (radiologists, electroradiology technicians)	45	35
Creating standards for conducting cancer screening	45	35
Conducting training on the management of cancer screening implementation	41	32

\* multiple-choice questions.

that funding of mammography is too low ( $p = 0.03$ ) (Table 4).

#### 4. Discussion

Adequate participation in cancer screening is crucial to reduce cancer mortality. The participation rates in breast and cervical cancer screening amongst eligible women in Poland is low. This study was related to opinions about the possible reasons for low participation rates in cancer screening in Poland expressed by centers that carry out the breast and/or cervical cancer screening program financed by the National Health Fund. Care system and patient-related factors were analyzed. In the judgment of participating centers the main system-related reasons for low participation rates were lack of encouragement from general practitioners (62 %), lack of invitations for cancer screening (54 %) and lack of proper social advertising (46 %). Polish women believed that general practitioners should supervise the schedule of necessary examinations (Dyzmann-Sroka and Trojanowski, 2012). However only 10–16 % of general practitioners were used to control if their patients take part in cervical cancer screening (Gazdecka-Szpecht, 2023). In previous studies, only a small proportion of patients report have discussed cancer screening during a visit to a general practitioner, for example 15–16 % of Polish patients and 21 % of Hungarian patients (Millward Brown, 2023; Ministerstwo Zdrowia, 2023; Gyulai et al., 2018). It would be preferable if general practitioners themselves actively addressed this issue with their patients. Some epidemiological opinion polls showed that women will willingly participate in breast cancer screening with the encouragement of their general practitioners (Dyzmann-Sroka and Trojanowski, 2012). 77 % of

**Table 2**

Opinions of respondents (136 centers providing breast and/or cervical cancer screening) about motivations for providing a medical service in the form of cancer screening according to three questions: A. Which motivative factors have led center to provide a medical service in form of cancer screening?; B. Could the additional funding for centers paid as a bonus for high number of screening tests even more increased the rate of examinations?; C. What purpose would the additional funding be allocated?

Items	n	%
A. Which motivative factors have led center to provide a medical service in form of cancer screening?*		
Complementary field to the center's service (diagnosis and treatment of cancers)	79	58
Having resources (adequate equipment and staff)	68	50
Investments made in recent years	41	30
Requirement of the governing body	23	17
Habit of organizing cancer screening	93	68
Mission of center	80	59
Cost-effectiveness	12	9
B. Could the additional funding for centers paid as a bonus for high number of screening tests even more increased the rate of examinations?		
No	26	19
Yes	110	81
C. What purpose would the additional funding be allocated? *		
Extra funding for cancer screening promotion	66	60
Increasing employment	35	32
Increasing staffs' salary	60	55
Staff training	36	33
Infrastructure development	20	18
New equipment	64	58
Improving the financial situation of the center	11	10

\* multiple-choice questions.

**Table 3**

Opinions of respondents (136 centers providing breast and/or cervical cancer screening) about the funding of A. mammography screening; B. cytology screening.

In your opinion, the funds paid to the centers by the NFZ are sufficient for screening services?	n	%
A. Mammography		
are too high	15	13.5
are sufficient	10	9.0
are too low	86	77.5
B. Cytology		
are too high	8	15.1
are sufficient	6	11.3
are too low	39	73.6

Polish general practitioners declared they would be ready to perform cytology screening, but in Poland cervical cancer screening is carried out by gynecologists (Nessler et al., 2021), so practitioners should encourage women to go to the gynecologist. Gyulai et al. (2018) prepared an intervention protocol in which general practitioners motivated women who previously refused to participation in cervical cancer screening. Almost 30 % of women, who initially did not want to go into screening, decided to undergo cervical cancer screening after advice from their general practitioner (Gyulai et al., 2018). General practitioners can have a key role in mobilization of the population to participate in cancer screening. The current study showed that 54 % of participating screening centers indicated more activity by general practitioners in encouraging participation in cancer screening as a potential intervention to increase the cancer screening frequency.

In Poland currently no personal invitations are sent for breast and cervical cancer screening. More than 50 % of analyzed centers in the current study mentioned the lack of invitations as a one of major health care system-related reasons for the low rate of participation in cancer screening. Musa et al. in a meta-analysis (Musa et al., 2017) showed that sending invitation letters (alone or with phone contact) significantly

**Table 4**

Differences in respondents' (136 centers providing cancer screening) opinion about motivations for providing cancer screening and methods to increase cancer participation rates between breast cancer screening centers (BS/BS + CS; 83 centers providing breast cancer screening and 28 centers providing breast cancer screening and cervical cancer screening) and cervical cancer only screening centers (CS; 25 centers providing only cervical cancer screening).

Items	BS/BS + CS (n = 111)		CS (n = 25)		p*
	n	%	n	%	
Which interventions could improve screening attendance?					
Inclusion cancer screening into the mandatory periodical employee examinations	65	59	17	68	0.38
More activity by general practitioners in encouraging participation in cancer screening	58	52	15	60	0.48
Invitation by postal letter	54	49	7	28	0.06
Invitation by telephone (with a fixed examination date)	34	31	7	28	0.80
Introduce education of cancer screening in secondary schools and universities	28	25	9	36	0.27
Increase resources allocated to conduct cancer screening	27	24	6	24	0.97
Invitation by mail	17	15	1	4	0.13
More intensive educational campaigns to promote cancer screenings (the media)	13	12	2	8	0.59
More intensive educational campaigns to promote cancer screening	7	6	4	16	0.11
Increased activity of centers in increasing cancer screening participation	5	5	2	8	0.47
Is the role of central institutions (Ministry of Health, the National Health Fund) to actively promote oncology prevention, not just funding?					
No	7	6	2	8	0.76
Yes	104	94	23	92	
What form the support should be in?*					
Invitations (by letter, phone, other) directly to the population eligible for cancer screening	73	70	11	48	0.04
Centrally coordinate and conduct educational campaigns to promote participation in cancer screening	61	59	17	74	0.17
Technological support - e.g., providing IT tools to facilitate coordination of cancer screening	50	48	12	52	0.72
Conducting training for staff (radiologists, electroradiology technicians)	38	37	7	30	0.58
Creating standards for conducting cancer screening	31	30	14	61	0.005
Conducting training on the management of cancer screening implementation	34	33	7	30	0.83
Which motivative factors have led center to provide a medical service in form of cancer screening?*					
Complementary field to the center's service (diagnosis and treatment of cancers)	62	56	17	68	0.27
Having resources (adequate equipment and staff)	58	52	10	40	0.27
Investments made in recent years	40	36	1	4	0.002
Requirement of the governing body	17	15	6	24	0.30
Habit of organizing cancer screening	80	72	13	52	0.05
Mission of center	66	59	14	56	0.75
Cost-effectiveness	9	8	3	12	0.54
Could the additional funding for centers paid as a bonus for high number of screening tests even more increased the rate of examinations?					
No	25	23	1	4	0.03
Yes	86	77	24	96	
What purpose would the additional funding be allocated? *					
Extra funding for cancer screening promotion	51	59	15	63	0.78
Increasing employment	30	35	5	21	0.19
Increasing staffs' salary	46	53	14	58	0.67
Staff training	25	29	11	46	0.12
Infrastructure development	14	16	6	25	0.33
New equipment	51	59	13	54	0.65

**Table 4 (continued)**

Items	BS/BS + CS (n = 111)		CS (n = 25)		p*
	n	%	n	%	
Improving the financial situation of the center	10	12	1	4	0.28
In your opinion, the funds paid to the centers by the NFZ are sufficient for mammography?					
are too high	15	14	2	8	0.03
are sufficient	10	9	7	28	
are too low	86	77	16	64	
In your opinion, the funds paid to the centers by the NFZ are sufficient for cytology?					
are too high	19	17	4	16	0.49
are sufficient	19	17	2	8	
are too low	73	66	19	76	

\*p-value was calculated using chi-square test.

BS/BS + CS - breast cancer screening or breast cancer and cervical cancer screening centers.

CS - only cervical cancer screening centers.

increased cervical cancer screening participation. Some studies demonstrated that sending invitation letters increased cervical screening participation rates by as much as by two-fold (Decker et al., 2013; Abdullah and Su, 2013). In some regions of Poland, during periods when the invitations for cervical cancer screening had been sent, an increasing in number of tests conducted was observed (Spaczyński et al., 2010). Active phone call invitations could increase the participation rate in cancer screening. On average three phone calls resulted in 70 % of women coming in for a mammography. 33 % of women decided to participate in exam after only one phone call (Szwalek and Szwalek, 2019). Dyzmann-Sroka et al. (2012) showed that the most effective source of information about a breast cancer screening program is provided by personal invitation letters. In the current study respondents considered that increasing participation in cancer screening could be achieved via invitations by postal letter (45 % of respondents), by telephone (30 %) and by email (13 %). Fixed appointment times instead of open invitations, and flexible appointments (evenings/weekends) were noted to improve participation in breast and cervical cancer screening (Jepson et al., 2000; Everett et al., 2011; Offman et al., 2013). Polish centers participating in this study considered that fixing the date of a screening examination could increase the probability of participation. Reminders can reduce the risk of forgetting an appointment. The review study (Young and Robb, 2021) showed that an extra postal and phone reminder or a text message before an exam appointment increased participation in breast and cervical cancer screening. In England breast cancer screening participation increased by 3 % when a postal reminder was sent one week before an exam (Allgood et al., 2016). A text message reminder sent two days before an appointment for mammography was associated with a 5 % increase in attendance (Kerison et al., 2015). A study conducted in Sweden showed that a phone reminder when no response was received to an invitation for cervical cancer screening increased participation by about 30 % when compared to a group that did not receive a phone reminder (Eaker et al., 2004).

Social advertisement seems to be an important factor to improve participation in cancer screening (Mullins et al., 2008; Durkin et al., 2020). Almost half of analyzed centers in this study highlighted the lack of proper social advertising as a potential reason for low participation in cancer screening in Poland. In this study almost all respondents (93 %) indicated that a significant role of central institutions such as the Ministry of Health and National Health Fund is creating adequate social advertisement. One form of support from central institutions should be organization and coordination of educational campaigns to promote participation in cancer screening. In the opinion of analyzed centers, low awareness of cancer screening was one of the most frequently indicated patient-related reason for low participation in cancer screening in Poland. It seems that adequate education of the population is an

important issue. However some Polish studies demonstrated that the knowledge of cancer screening among Polish people is more extensive. A previous study conducted among Polish students showed that most correctly identified the test for cervical cancer detection and were familiar with the basis of cytology. But, only 40 % of students knew that in Poland screening for cervical cancer is carried out on women aged 25–59 years every three years (Osowiecka et al., 2021). Dyzman-Sroka et al. (2012) reported that more than 90 % of Polish women knew that mammography is the best exam to detect early-stage breast cancer and that this test is available to them. Studies from other countries also showed that in general people are aware of the existence of cancer screening programs (Carrasco-Garrido et al., 2014; Ford et al., 2006; Rakowski et al., 2006). Objectively, studies conducted on the Polish general population have reported that knowledge of cancer screening is rather good. In the present study, the question about the reasons for non-participation in cancer screening was answered by representatives of centers providing cancer screening. According to their subjective opinion, the reason for the low participation rate in screening may be lack of knowledge. It is likely that their opinion may have been based on conversations with those who participate in screening. There is a question as to why women aware of cancer screening choose not to participate. 63 % of centers who participated in this study considered that fear of being diagnosed with cancer is one of the main patient-related reasons for non-participation. People who felt fear, worry and disgust were less likely to participate in cancer screening (Young and Robb, 2021). Respondents from a third of centers considered that a reason for low participation in cancer screening is fear of undergoing a medical procedure and those from a fifth of centers, fear of pain and other side effects of the test. It seems that not only information on the importance of, and opportunities for participation in cancer screening are needed, but also descriptions of the procedures themselves (organization, safety, painlessness, side effects, etc.). Musa et al. (2017) showed that educational interventions significantly increased cervical cancer screening participation.

Among reasons related to the patient, 24 % of respondents indicated the embarrassment related to the examination may be a reason for low participation in cancer screening. Screening for breast and cervical cancer involves examination of intimate parts of the body. The embarrassment associated with this could cause difficulty when talking about these examinations with a physician and with relatives and friends. Some authors (Theisen, 2004; Betancourt et al., 2010; Flynn et al., 2011) showed that shame, fear and anxiety were the most frequent emotions accompanying cervical cancer and breast cancer screening tests.

Flynn et al. (Flynn et al., 2011) showed that screening emotions and screening fatalism had a negative influence on clinical breast exam compliance. A quarter of the centers analyzed in this study considered that people do not take part in screening because they believe that cancer is incurable. However concern about cancer at a moderate level could have a motivating effect on the decision on take part in breast, cervical and colorectal cancer screening (Hay et al., 2006; Sutton et al., 2000; Waller et al., 2009; Andersen et al., 2003). People who had someone in their close family and/or friends affected by cancer, more often participated in colorectal and prostate cancer screening, but not in breast cancer screening, that those who did not (Andersen et al., 2003; Eisinger et al., 2011).

Finally in this study the majority of respondents felt that people should be persuaded to undergo cancer screening, for example by inclusion of cancer screening into the mandatory periodic employee examinations (60 %), by more active encouragement by general practitioners (54 %) and by central institutions using postal letters for screening invitations (45 %).

Moreover, respondents claimed that the funding of cancer screening is too low and that additional funding for centers paid as a bonus for high number of screening tests could increase the rate of examination. Centers providing breast cancer screening (BS/BS + CS) significantly more often than centers providing only cervical cancer screening (CS)

indicated that funding of mammography is not sufficient and that introduction of motivational funding and individual invitations would be beneficial for increasing screening rates.

#### 4.1. Study limitations

The original questionnaire, designed specifically for this study, was used. No standardized questionnaire was available and validation of this questionnaire was not possible. However, the questionnaire's items were created by public health experts and consulted by an oncologist, a psycho-oncologist and a public health specialist. The response rate was low at 31 %. In Poland there is carried out third type of screening test – colonoscopy. This study did not include colorectal cancer screening due to the lack of available data published by the National Health Fund. There is a lack of this kind of studies in Poland and abroad. Therefore it was difficult to compare the results with other studies. Some parts of the discussion were based on subjective feelings and opinions.

## 5. Conclusions

In this study, the participating centers that perform breast and/or cervical cancer screening pointed out low awareness of cancer screening and fear of cancer diagnosis as the main patient-related reasons that may limit participation in cancer screening in Poland. Among the reasons related to the care system most often they indicated lack of encouragement from general practitioners, lack of invitations for cancer screening and lack of proper social advertising. Based on respondents' opinion the main methods that could potentially increase screening participation amongst the Polish population were inclusion of cancer screening in the mandatory periodic employee examinations, more activity by general practitioners in encouraging participation in cancer screening, better promotion of screening by central institutions, and sending personal invitations by postal letter or by telephone (probably with a fixed examination date).

#### Author contributions

The conception and design of the study, A.A. and E.Ż.; methodology, A.A., M.R., E.E., K.O.; acquisition of data, A.A.; analysis and interpretation of data, A.A., K.O., M.R., E.Ż.; drafting the article, A.A.; M.R. and K.O.; revising it critically for important intellectual content, E.Ż.; final approval of the version to be submitted, A.A., M.R., E.Ż. and K.O.

#### Ethical approval

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#### Competing interests

None declared.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

Data will be made available on request.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2023.102442>.

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