PREDICTORS OF BREAST AND CERVICAL CANCER SCREENING UPTAKE PRIOR TO THE INTRODUCTION OF CENTRALISED NATIONWIDE SCREENING IN POLAND

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Abstract

Background

Introduction of nationwide breast and cervical screening programmes in Poland (2006) created an unprecedented opportunity to explore the predictors of breast and cervical cancer prophylactic behaviours in a society unexposed to population screening. The study aims to add to the body of knowledge on predictors that could be common for other countries in a similar geo-political situation, aiming to introduce nationwide breast and cervical screening programmes.

Methods

A data subset (N=4,290) from a large representative survey (N=7,948) on cancer knowledge and prophylaxis, conducted by the Cancer Oncology Institute in Warsaw close to the introduction of nationwide breast and cervical cancer screening, was used in this thesis. Behaviours and knowledge were described and logistic regression used to identify predictors of mammography and cytology uptake.

Results

Women's level of cancer knowledge was evenly distributed (49.2% low and 50.8% high scores). However, knowledge on cervical cancer was lower than for breast. Higher knowledge was linked to higher education, better material conditions, cancer diagnosis, or practicing any type of the studied prophylaxis and lower levels of knowledge was associated with being aged 18-24 or ≥70 y.o., being widowed, and living in village. Even though 93% (N=3,970) of respondents were aware of the need for breast self-examination (BSE), only 32.3% regularly practiced BSE. Majority (92.3%, N=3,943) knew that mammography can allow early cancer detection but only 52.5% ≥ 50 y.o. (32.1% all ages) declared ever having it. Similarly, 90.7% (N=3,871) knew that cytology allows early detection of cancer and 78.8% have ever undertaken it cytology but only 53.6% had it done every 1-3 years. Up to 4% indicated test unavailability of either test as the reason for non-attendance. The most common barriers included: feeling of no need for such test (37.9-44.9%) and lack of referral (28.7%-39.2%). Women with the highest education levels, the

ones living in cities above 100,000 inhabitants, or with highest cancer knowledge were the most likely to ever get screened for breast and cervical cancers. Additionally BSE was found to predict mammography whilst cytology was also predicted by: household size, marital status, having a family member or a friend with cancer.

Conclusions

Low screening uptake could be reflective of the fact that there was no nationally available screening but only a small proportion reported non-attendance due to unavailability of tests. This suggests that the uptake was driven by other factors (e.g., cancer knowledge, education) than population screening availability. Particular attention should be paid to the provision of cancer related knowledge. A follow up study is recommended to assess whether women's knowledge and screening behaviours improved since the conduct of this survey.

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DEDICATION

This thesis is dedicated to my husband for his limitless support and patience that helped me through the duration of this project and to my grandmother whose incredible character and belief in my capabilities motivated me to complete the work.

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STRUCTURE OF THE THESIS

The objectives of the introductory chapter are to: present a rationale for the thesis, its aims and objectives and a brief overview of methodology

The second chapter of the thesis provides the background for this study describing topics relevant to cancer screening and its uptake during and where relevant beyond the study period (2006). The study rationale is supported by a review of the literature on the historical context of health care system in relation to cancer screening, inequalities in health outcomes related to cancer screening, breast and cervical cancer epidemiology, as well as topics covered by the questionnaire such as: women's knowledge of breast and cervical cancer, screening behaviours, cues to take up screening and various theories related to practicing cancer screening behaviours.

The third chapter describes the methodology of the study design and profile of the collected data is discussed in detail followed by chapter 4 that discusses the overall study results. Finally, chapter 5 provides a summary of the findings, discusses study strengths and limitations and provides conclusions and recommendations.

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LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation / term	**Definition**
BMI	Body Mass Index
BSE	Breast self-examination
BRCA1, BRCA2	Mutations of human genes known as tumour suppressors associated with increased risk of breast cancer
CI	Confidence interval
CRUK	Cancer Research UK
D.F.	Degrees of freedom
D.eff.	Design effects
EMTREE	A hierarchically structured, controlled vocabulary used for subject indexing in EMBASE
HR	Hazard Ratio
HSCIC	Health and Social Care Information Centre
HTA	Health Technology Assessment
IARC	International Agency for Cancer Research
MeSH	Medical Subject Headings - a list of terms for indexing and searching content listed in PubMed.
NHS	National Health Service
NR	Not reported
N/A	Not applicable
OR	Odds ratio
PAP	Papanicolaou test
PBS DGA	Pracownia Badań Społecznych (PBS DGA)
PSU	Primary Sampling Unit
RR	Risk Ratio
S.D. (or Std. Dev.)	Standard Deviation

Abbreviation / term	**Definition**
S.E.	Standard Error
UK	United Kingdom
WHO	World Health Organization
ZOZ	Zakład Opieki Zdrowotnej – Healthcare Centre

GLOSSARY

- Barriers – physical or structural concerns or perceived emotions related to behaviours that might interfere with the uptake of breast or cervical cancer screening (Champion, 1999)
- Cervical screening – term cervical screening used throughout this thesis relates to early detection of pre-cancerous lesions using a Papanicolaou smear (Pap) – a screening tool detecting cervical abnormalities.
- Breast screening – term breast screening refers to mammography, an X-ray technique used to screen the breast tissue in order to identify changes of breast tissue that might be suggestive of cancerous or pre-cancerous cells.
- Coverage of screening – the proportion of individuals eligible for screening within a population invited for screening in a specified time period (Jepson et al., 2000).
- Cues to action – term cues to action refers to anything that prompts an individual to think or act upon a specific health related issue (i.e. TV commercials prompting to take a specific action or having a family member suffering from a specific condition) (Witte, 2001).
- Determinants – factors significantly influencing the screening uptake (e.g., individual's characteristics, type of screening and methods involved, other) (Jepson et al., 2000)
- "Grey literature" – a body of material not available through the usual publication channels (Auger, 1994). It can include government reports, and non-profit organisation reports, academic papers; conference abstracts posters and papers, PowerPoint presentations, conference proceedings, evaluation reports, guidelines and others
- Health literacy – ability to process and understand basic health information necessary to take appropriate health decisions (National Network of Libraries of Medicine, 2013).
- Human Papilloma Virus (HPV) – epitheliotropic agent that may induces benign skin and mucous membrane papillomas. More than 100 HPV (types) have been identified with a

subset of them being sexually transmitted. Several of its types have a strong relationship with development of cervical cancer. HPV DNA is found in majority or all cervical cancers (DeVita Jr et al., 2011a).

- Nulliparity – a state without offspring

- Opportunistic screening – is done through disease testing of symptom free individuals when they visit a healthcare professional for reasons different than the condition screened for (Australian Population Health Development Principal Committee Screening Subcommittee, 2008)

- Population based screening – systematically targets all individuals meeting screening target criteria defined by protocols, policy, and other governing documentation. All screening activities are planned and coordinated as well as monitored and evaluated with careful consideration for appropriate resource use (Australian Population Health Development Principal Committee Screening Subcommittee, 2008)

- Secondary data – is data that has been collected for a different purpose from the research activity they were used (Olsen, 2008, Vogt and Johnson, 2011). In this study term secondary data refers to the sub-sample of data that was generated as a part of a study: *Knowledge about cancer and health prophylaxis*

THE AUTHOR'S ROLE IN THE STUDY

This study was conducted as a part of a Ph.D. course at the University of Salford, Centre for Public Health Research. Ph.D. supervision was firstly provided by late Professor Deborah Baker (Professor and Director at Centre for Public Health Research) and Mr Steve Barrow Honorary Senior Research Fellow and after Professor Baker passed away by Professor Lindsey Dugdill, Professor of Public Health, and Doctor Margaret Coffey, Reader in Public Health.

Prior to enrolling in a Ph.D. course at the University of Salford (February-August 2006) I worked as an intern-junior researcher at the Maria Skłodowska-Curie Memorial Cancer Centre and Institute of Oncology in Warsaw (later referred to as Cancer Oncology Institute), Poland in the Cancer Epidemiology and Prevention Division team led by Professor Zatoński. During my time there I became aware of the problem of breast and cervical cancers and especially that women (patients coming to the centre) often verbally expressed various reasons for not practicing prophylactic behaviours.

2006 marked the introduction of nationwide breast and cervical screening for Polish women which created an unprecedented opportunity to explore women's knowledge and behaviours in a society prior to the introduction of organised cancer prevention. The data used in this project came from a nationally representative study that examined Polish respondent's knowledge and behaviours related to the elements of a healthy lifestyle included in the European Code against Cancer. The survey was designed by Professor Zatoński's team and conducted by Pracownia Badań Społecznych (PBS DGA) the largest Polish contract research company having experience in the field of social research (PBS DGA, 2013).

An unpublished data set relevant to this Ph.D. project was kindly shared with me by Professor Zatoński as he was aware of my further career steps. The relevant sub-sample, of female subjects was extracted and prepared for analysis. Such re-use of already existing data (secondary data analysis) has been practiced before by many researchers (Atkinson and Brandolini, 2001, Safran et al., 2006, Seal and Kerac, 2007) as it gives an opportunity to reduce burden, improve benefit/harm ratio and is more cost effective (Law, 2005). Such an approach is currently being widely encouraged by research bodies such as for example the Economic and Social Research Council (ESRC) (2010).

CHAPTER 1 INTRODUCTION TO THE STUDY

Non-communicable diseases such as cancers account for most of the global burden of disease (World Health Organization (WHO), 2011). In 2008 about 12.7 million cancer cases and 7.6 million cancer deaths were registered worldwide (Ferlay et al., 2010). It is expected that the number of deaths due to cancer will rise to 21.4 million cases and 13.5 million deaths by 2030 (American Cancer Society, 2011). However, up to about 40% of all cancer deaths could be avoided by the implementation of disease prevention programmes, disease monitoring, decrease in the use of substances such as tobacco or alcohol, improvement of diet and physical activity, and the elimination of environmental carcinogens (WHO, 2007a, WHO, 2013, Cancer Research UK (CRUK), 2013).

Breast and cervical cancers are the most common cancers in women worldwide (Mauad et al., 2009, WHO, 2011, Nilaweera et al., 2012) with WHO's most recent (2008) worldwide estimates of 458,000 deaths due to breast cancer and 275,000 due cervical cancer (GLOBOCAN, 2008a). About 20-60% of breast and cervical cancer deaths could be avoided with the help of cancer screening programmes (Centers for Disease Control and Prevention (CDC), 2008, NHS Cancer Screening Programmes, 2008) and the use of vaccinations such as against Human Papilloma virus (WHO, 2007b). Three quarters of all cancer deaths worldwide occur in low and middle income countries (WHO, 2007b) including middle income countries from former Soviet bloc such as for example Estonia, Hungary, Poland, Romania, or Burlgaria (Gottret and Schieber, 2006) where there are often no population based cancer screening programmes or they are still in their very early stages. For example Romania and Bulgaria are yet to introduce population based breast and cervical screening programmes (OECD, 2012) but Poland and Estonia have already started the implementation of both screening types in response to high mortality rates in comparison to countries with existing population based screening programmes (i.e. Finland, UK) (Ministerstwo Zdrowia, 2005a,b, Social Minister's regulation [Estonia], 2007, Ministerstwo Zdrowia, 2012).

Despite the progress in research on health inequalities, limited evidence exists regarding the way in which the patient's decision to take up (or not) the opportunity of cancer screening is formed and what factors have the strongest influence on participation in such prophylactic initiatives (House of Commons Health Committee, 2009). This can be seen especially in countries with a complicated historic and political past where nationwide and cost free prophylaxis is not available or is in its early stages, as it is the case of Poland (for example see Dowling et al., 2010). Knowledge, behavioural factors and individual characteristics are frequently identified in an attempt to explain health related behaviours (please see sections 2.6-2.7). The goal of this thesis is to explore knowledge, behaviours and other factors that might influence uptake of cervical and breast cancer screening in Poland, at the time of their introduction in 2006. The knowledge gained through this study will help to evaluate some of the screening challenges (e.g. barriers to screening) and behavioural screening predictors (e.g., reasons for lack of uptake, practice of BSE) in Poland and contribute to knowledge that could be used in countries aiming to introduce nationwide disease preventative programmes (e.g., Bulgaria or Romania).

1.1. Study rationale

In 2008, in Poland there were more than 140,000 new cancer cases and 92,000 cancer deaths (GLOBOCAN, 2008b). It has been estimated that every fourth Pole will develop a neoplasm during their lifetime and every fifth will die due to that reason (Polski Komitet Zwalcznia Raka)[i] [ii]. Breast cancer prevalence in Poland equals to 425.6 cases per 100,000 people and cervical cancer to 164.6 per 100,000 people (Lutz et al., 2003). In most of the developed world prevention and effective treatment are the main methods in the fight against cancer ( ). However, some groups of people may have limited or unequal access to relevant preventative measures which could contribute to health inequalities (Van der Meer and Mackenbach, 1998) and in case of cancer morbidity this could mean a higher risk of premature mortality especially

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[i] http://www.um.torun.pl/torun/baza/pierwsza.php?status=1&news_id=6394

[ii] http://www.diagnosis.pl/polski-komitet-zwalczania-raka-5183.html

amongst the more disadvantaged populations i.e. communities living in post-Soviet states that often experience a lower standard of care but also lack nationally available disease screening (see Vrdoljak et al., 2011). Various researchers noted that a significant disparity in the public's health still exists between Western and Central/Eastern Europe (Ádany et al., 2011, Carlson, 1998, Sagan et al., 2011) also affecting outcomes related to breast and cervical cancers (Jemal et al., 2010, Autier et al., 2010). It has been stipulated that as collapsing communism forced post-Soviet states to open their markets to capitalism, the structure and welfare of the Eastern European societies changed considerably and in some cases worsened (Szaflarski and Cubbins, 2004). This worsening scenario was also observed in the context of health care provision as in many countries it was split between public and private sectors meaning that some people were not able to afford private health services (Sotiropoulos et al., 2003, Cerami, 2008).

Political and socio-economic factors can influence not only accessibility of healthcare but also screening uptake and the general health of the country's population (International Agency for Research on Cancer (IARC) Working Group on the Evaluation of Cancer-Preventive Strategies, 2005; Steptoe and Wardle, 2001) specifically in a country like Poland affected in the past by turbulent external (World Wars I & II) and internal challenges (transition from communism). Such major changes could result in the country's authorities and women themselves having a different understanding of, and approach to, health prophylaxis compared to countries that did not suffer changes of such magnitude (Mackenbach et al., 2008). Familiarity with screening predictors could help to inform interventions aiming to ascertain desired levels of uptake, especially those targeted at groups of women less likely to participate (Chumworathayi, 2012; Everett et al., 2011). As stated previously, breast and cervical cancers are amongst the leading causes of female mortality around the world but the majority of countries in Western and Northern Europe have seen a significant decrease in mortality due to these neoplasms since the 1970's (e.g., reduction in mortality of breast cancer ranged: 11%-45% and reduction in mortality of cervical cancer ranged 0.3%-15.6%) which have not been observed in Poland and other countries in Central and Eastern Europe (Arbyn et al., 2009; Autier et al., 2010). This decrease in Western European countries follows the first introductions of nationwide screening programmes. The beginning of these changing trends can be observed around the time of the national roll-out of the screening and it has not been noted for the countries without such initiatives (for examples of the relevant mortality trends please refer to Autier et al., 2010 and Arbyn et al., 2009). Such initiatives may be not only of country's attempt to decrease cancer mortality but also could raise women's awareness of cancer risks and potentially lead to change of health behaviours. Whenever appropriate, information available for other European countries that began breast and cervical screening many years ago (e.g. UK, Finland, Norway) is discussed in this thesis. Such contextualisation of screening has been used before (see for example a policy brief prepared by Holland et al., 2006 for WHO) to gain a wider overview of the screening situation as well as facilitate learning from past experiences of other countries.

In accordance with the Act of 1 July 2005 (Ministerstwo Zdrowia, 2005a) that followed the guidance of the European Code against Cancer Poland began a programme *National Programme for Cancer Control* to be implemented in the years 2006-2015 (Ministerstwo Zdrowia, 2005b). The adoption of the above legislation gave a guarantee of stable state funding for this programme with the aim of developing cancer prevention strategies, increasing early detection and the availability of treatments in line with the current level of medical advances. This is anticipated to lead to approximately 10% lower cancer incidence and improvements in the cancer treatment techniques to those comparable in Western and Northern Europe with a 50% five year survival rate in women and 40% in men by 2015 (Opolskie Centrum Onkologii, 2013, Ministerstwo Zdrowia, 2005b).

The programme focuses in particular on: development of primary prevention of cancer (i.e. smoking cessation and improvements in nutrition); implementation of population based screening programmes (i.e. breast cancer, cervical cancer, colorectal cancer etc.); improvement of access to early cancer detection methods; modernisation of diagnostic and therapeutic equipment and procedures for high quality diagnosis and cancer treatment, standardization of the treatment procedures; promotion of combination therapy methods; development and promotion of modern methods of rehabilitation and palliative care; limitation of long term consequences of cancer treatment; improvement of the operations of cancer data collection, improvements in education of health professionals and society about of knowledge about the prevention; and early detection and treatment of cancer (Ministerstwo Zdrowia, 2005a,b).

In 2006, following the objectives of the National Programme for Cancer Control, Poland introduced nationwide population-based and state funded breast and cervical screening programmes. The programmes' roll out was initiated in 2007 with the aim to reduce mortality and improve the health of the population, and at the same time to decrease the gap between health outcomes in Poland and Western Europe. However, a nationwide and cost free screening programme may not be effective in achieving its objectives if the population that the programme is aiming at does not, or only a small proportion of it, participate in it (Mauad et al., 2009). Health behaviours, such as attendance to prophylactic cancer screening tests in transitional regions such as Poland may be influenced by different factors than in the Western European countries. It has been previously noted that women from Eastern European populations from post-Soviet states developed a different way of perceiving their own health, worse prioritisation of their health needs leading to lower self-rated health to those reported in Western societies (Szaflarski and Cubbins, 2004). The citizens of many of those post-Soviet states remain insufficiently involved in their health care (Fister and McKee, 2005) and this may be particularly relevant for initiatives such as screening that require individuals to take a decision to attend it.

Since the 1950's many researchers have tried to explain and predict behaviour by constructing theoretical frameworks (see section 2.7.) to identify its determinants (Noar and Zimmerman, 2005; Ogden, 2003; Taylor et al., 2006). Health behaviours are complex and subject to variability between not only populations of different countries but also within regions or even groups with different socio-economic status (Adler and Newman, 2002; Whitehead, 1992; Mladovsky et al., 2009; Palencia et al., 2010). They have been found to comprise some of the following components: knowledge, past behaviours and experiences, cues to action, health beliefs, attitudes, and many other factors that can be used as predictors for health related behaviours amongst the target screening populations (Noar and Zimmerman, 2005; Day et al., 2010; Ogden, 2003; Taylor et al., 2006). Many of these factors have been used in theoretical models aiming to predict or influence health behaviours such as screening uptake (sections 2.6-2.7).

Various international and multi-ethnic studies have been conducted on the factors that may influence the level of uptake of breast and cervical cancer screening such as women's knowledge, behaviours, attitudes, cues to action and other factors related to screening have been carried out in the past (for example Fylan, 1998; Austin, et al., 2002; McCaffery et al., 2003; Elmore et al., 2005; Thomas et al., 2005; Jepson et al., 2000; Thomas et al., 2005; Weller and Campbell, 2009; Byrd et al., 2007). However, only a few studies examining the Polish population have been found, and their data either did not take into account both breast and cervical screening or the sample was small and purposive (for example: Chojnacka-Szawłowska, 1998; Zych, et al., 2006; Gronwald et al., 2006 described in more detail in chapter 2).

Understanding the predictors of behaviour is particularly important for population-based disease screening initiatives which are often very costly, labour intense, and if not taken up by the target population, ineffective and burdensome for governments (Jepson et al., 2000). Identification of factors that may affect screening uptake in Polish society can help to generate evidence needed for improving population health, by gaining an understanding of which factors need to be particularly paid attention to in order to design screening programmes for this specific population. The results of this study will provide a basis for making inferences not only about cancer screening predictors in Poland but also for countries with a similar geo-political background that are still yet to introduce nationwide cancer screening initiatives. Romania or Bulgaria can serve as examples of such countries. Autier et al. (2010) noted that even though many countries saw a significant decrease in breast cancer mortality between 1989 and 2006, Bulgaria experienced only a small decrease (-0.8%) and Romania conversely experienced a significant increase of 17% (Autier et al., 2010). Similar trends were shown for the years 1970-2004 with regards to cervical cancer mortality, as in Romania mortality rose by 0.4% annual percentage of change and in Bulgaria by 3.5% (not significant statistically after 1988) (Arbyn et al., 2009).

The study is timely as to-date no nationally representative studies exploring Polish women's knowledge and behaviours related to breast and cervical cancer and their prophylaxis exist. Despite the fact that the Polish screening programme has now been rolled out nationally, only

31%-39.8% of Polish women have taken up mammography and 76.7% cytology (Central Statistical Office of Poland, 2012c; Madej et al., 2010). The data analysed and described in this study was collected immediately before the nationwide rollout of cervical and breast screening programmes in Poland providing a unique opportunity to study elements of screening behaviour amongst women in a society with a difficult historical and political past (that made transition to democracy less than 25 years ago). This thesis explores factors that have been suggested by the scientific community as those having potential to influence the uptake of cancer screening initiatives such as: type of cancer, cancer screening knowledge, current and past screening behaviours, and various socio-demographic and economic characteristics (Jepson et al., 2000 or Consedine et al., 2004).

1.2. Aim of the study

The aim of this study was to identify which factors may serve as potential predictors of the uptake of breast and cervical cancer prophylaxis and assess the levels of knowledge and behaviours related to screening behaviours in Poland on the brink of the introduction of centralised and nationwide screening programmes for breast and cervical cancer detection. The study also aimed to assess different socio-demographic and socio-economic circumstances as potential facilitators or barriers to screening.

1.3. Research questions

The questions that this thesis will answer are:

1. What were Polish women’s knowledge levels related to breast and cervical cancers and their prophylaxis and how did their knowledge relate to known evidence of prophylaxis?
2. Did Polish women practice positive breast and cervical screening behaviours (mammography, cytology, and BSE)?
3. Which factors did Polish women consider as barriers to attending breast and cervical screening?

4. What factors (e.g., socio-demographics, socio-economics, cancer and cancer screening knowledge) can be considered predictors of breast and cervical cancer screening behaviours in Poland?

1.4. Objectives

The specific objectives were to:

- Identify and characterise socio-demographic and socio-economic factors associated with uptake of the screening services by Polish women in relation to knowledge, behaviours, and other factors on the brink of the introduction of a national screening programmes for breast and cervical cancer detection
- Explore and describe the knowledge, behaviours, past experiences and other factors (i.e. motivators/cues to action) relating to cervical and breast cancers and their screening among Polish women
- Explore and identify potential cancer screening behaviour predictors
- Explore and identify potential cancer screening behaviour barriers

1.5. Research methodology

Data described in this thesis was extracted from a large nationally representative survey conducted in Poland in 2006: *Wiedza o nowotworach i profilaktyce -Knowledge about cancer and health prophylaxis.* It was carried out by the Social Research Laboratory (Pracownia Badań Społecznych-PBS DGA) for the Epidemiology Division at the Cancer Oncology Institute in Warsaw, Poland. The structured questionnaire was completed at women's homes with the help of trained nurses (interviewers). It collected data relevant to respondents' knowledge, behaviours and past experiences related to all cancer types and general health prophylaxis. In this thesis, only the data from sections of the questionnaire relevant to breast and cervical neoplasms and their prophylaxis, answered by women, were extracted and analysed in a quantitative way (secondary data analysis). Further details of the methodology used to collect the data have been given in chapter 3.

1.6. Summary

Chapter one has given the introduction and orientation of the study, the research problem, aims and objectives, an overview of the methodology and the further outlay of the research report. The next chapter will provide a review of literature on the topics relating to the study.

Chapter 2 Literature review

2.1. Introduction

2.1.1. Aims of the literature review

The main aim of this review was to examine the literature on the factors with a potential to affect the uptake of breast and cervical cancer screening with particular focus on screening in Poland. It was also intended to provide a conceptual framework for the analysis of the study results and further definition of the research questions (section 1.3). Topics discussed in this chapter covered relevant literature on: breast and cervical cancer epidemiology and predictors of breast and cervical screening. The review also explored the role of health care system in Poland and its historical changes. It provided broader background for understanding the existing and future challenges of introducing screening in countries without centralised and population based screening, especially those that transitioned from communism to democracy and as a result experienced many economic, political, and social changes (e.g., Bulgaria or Romania).

The following topics were covered:

- Health care system in Poland and its historical context
- Epidemiology of breast and cervical cancer
- Breast and cervical cancer prevention and detection
- Determinants of breast and cervical cancer screening
- Knowledge, behaviours, cues to action and other factors related to breast and cervical cancer screening
- Concepts, constructs, and theories associated with screening behaviour

2.1.2. Methods used to identify the relevant literature

The main body of literature concerning the investigation of breast and cervical cancer screening and factors affecting their uptake consisted predominantly of peer reviewed articles found in electronic databases such as PubMed, PsychINFO, ISI Web of Science, and EMBASE with Medline, ERIC, CINAHL and Google Scholar. Some of the terms used to search for the relevant literature included but were not limited to a combination of terms: “access”, “attitudes”, “awareness”, “beliefs”, “behaviour/behavior”, “behavioural/behavioral theory”, “breast”, “cancer”, “cancer screening”, “cervical”, “cervix”, “determinants”, “health”, “health belief theories”, “health belief model”, “income”, “inequities”, “inequalities”, “knowledge”, “perceptions”, “Poland”, “Polish”, “predictors”, “screening”, “socio-economic”, “uptake”, (including searches that mapped onto related subjects in particular databases). To ensure that the relevant literature was identified also search terms in Polish were employed (following the logic of the searches conducted in English).

Additionally, a search for “grey” or otherwise not listed literature (i.e. reports, conference abstracts, government and health services’ documents) was employed with help of the freely available search engines such as Google (.com, .co.uk, and .pl), WHO and other governmental websites. Also several additional publications and information leaflets were obtained directly from Polish health care centres, through personal contacts or gleaned from the reference sections of identified material. Main searches for relevant publications were done in English and Polish. However, if a relevant article was identified through the main search, also articles in other languages, spoken by the researcher, were taken into consideration (i.e. articles in Spanish or French). Even though no specific time cut-off points were selected for the searches it was intended to review publications relatively recent to the conduct of the survey analysed in this thesis (2006) and which were later supplemented with more recent publications.

Throughout this work, where appropriate, the information on breast and cervical screening is put in context of countries that have extensive experience of both types of the screening (i.e. UK with nationwide screening from the late 1980’s). It was not intended to make direct comparisons with Poland but merely to provide context to screening initiatives by highlighting the challenges and identify the potential benefits that the national screening programme could achieve in Poland**.**

2.2. Historical background of the health care system in Poland

Poland is the largest (312,679 square kilometres) amongst Central Eastern European countries with a population of 38.5 million people. It has a democratic parliament composed of upper and lower houses that are elected every four years and a president and prime minister heading the government elected every 5 years (Sagan et al., 2011). Territorial administration is divided into three levels: the top level - województwo (voivodship or region) (please see figure 7), the middle level - powiat (district), and the lowest level - gmina (municipality) (Sagan et al., 2011).

Even though Poland is now a democratic republic it has not always been this way. Since the end of World War II, Poland remained under Soviet influence and followed the same health imperatives as the rest of the Soviet world, providing free generally available health services (both primary and secondary care) (Balabanova and McKee, 2002) and therefore it faced the same advantages and disadvantages. For example McKee (2004) noted that in the 1920-1950s, Russia's health situation was a legacy from imperial times and that Lenin's political commitment incorporated a goal to control epidemics and improve health care. Provision of basic health services to a widely spread population noticeably improved health outcomes as it helped to control and even eradicate some endemic diseases (i.e. smallpox) (McKee, 2004). This brought many beneficial changes to the people of the Soviet Union and its satellite states such as Poland.

Figure 1 Regional division of the territory of Poland (16 voivodships)[iii]

However, at the beginning of the 1990's, after the fall of the Soviet-style model Poland and many other post-Soviet countries had to undergo a full transition to a freely elected parliament with a market economy and experienced a number of fundamental reforms of many sectors, including health care (Sagan et al., 2011; Kuszewski and Gericke, 2005). Changes of such magnitude created conditions for instability in public health in most of the affected countries of the Central and Eastern Europe (Carlson, 1998; Fister and McKee, 2005; Jenkins et al., 2005). Health care improvements such as the development of new vaccinations and use of advanced technologies and training of highly qualified specialists in the West were financially challenging and impossible to match by the falling economy of the Soviet world (McKee, 2004). The health

[iii] Source: d-maps.com (free maps) http://d-maps.com/carte.php?num_car=18758&lang=en

improvements previously implemented could not be supported by the socialistic system (McKee, 2004) and unstable economic growth contributed to income and social inequalities linked with increased morbidity and mortality (Jenkins et al., 2005). Western Europe was advantageous in comparison to post-communist countries in all above aspects (Carlson, 1998). Inequalities in socio-economic spheres of life increased but the information on inequalities in healthcare utilisation is still limited (Plug et al., 2012; Balabanova and McKee, 2002).

Poland was the first country among the Central and Eastern European countries to reintroduce democracy after over 40 years of communism (Kuszewski and Gericke, 2005). It provided universal free health care (Siemashko system) prior to its transition from communism in 1989. The early 1990's brought an economic shock and many government resources had to be restructured (Łoś, 2006). In 1991 a new structure of health care organisation was introduced, and the Independent Public Health Care Facilities - SPZOZ – (*Samodzielny Publiczny Zakład Opieki Zdrowotnej)* became the bodies responsible for buying medical services, administering and managing public health funds (Golinowska and Kozierkiewicz, 2008).

In 1997, Polish Constitution guaranteed that every Polish person has the right to health care financed from public funds (Golinowska and Kozierkiewicz, 2008); but as Poland was undergoing serious economic changes it also faced two major reforms of the national health system (Ministerstwo Zdrowia, 2001-2003). In 1999, a new reform of Polish health care was implemented, and sixteen new regional *Health Funds* with one additional occupational health fund for uniformed public employees (i.e. army, police and others) were formed (Golinowska and Kozierkiewicz, 2008). The funds, according to the Law of Universal Health Insurance, were responsible for the management of health services by signing contracts with health care units. Citizens could freely choose their health provider independently of their habitual residence (Golinowska and Kozierkiewicz, 2008).

The reform was widely criticised by patients, medical communities, and politicians (from the parties opposing those in power) (Golinowska and Kozierkiewicz, 2008) as it influenced the free access to health services (Łoś, 2006) by diminishing accessibility to conceptually free health care resulting from the lack of clearly defined scope and type of available services (Golinowska and Kozierkiewicz, 2008). Even though the government worked to solve the challenges associated with the implementation of this reform (e.g. improving administration of and access to the health services), the lack of relatively quick visible health care improvements, financial problems of the regional funds, and high prices in private health care caused patients to mistrust towards the health care sector (Golinowska and Kozierkiewicz, 2008; Kuszewski and Gericke, 2005). This led to wide spread criticism and an unfavourable image reinforced by the mass media (Golinowska and Kozierkiewicz, 2008; Kuszewski and Gericke, 2005). As a result of these problems the funds merged once again in the second health care reform in 2003 to form a single National Health Fund (NHF) (Kuszewski and Gericke, 2005). Since then due to rising employment and fast economic growth the financial problems of Polish health care have decreased (Kuszewski and Gericke, 2005). However, some hospitals were still in debt and the financial situation of the Polish health system was delicate in 2005 (Sagan et al., 2011). Privatisation of public hospitals was proposed in order to overcome the financial problems. This proposal has been widely opposed by society due to fears of creating deeper inequities and inequalities in health care access amongst poorer and or more disadvantaged layers of the society (Sagan et al., 2011). However, privatization is taking place and as Sagan et al. (2011) noted the results of this will only be possible to assess with time (Sagan et al., 2011).

Since the last reforms Polish health care is divided between public and private financing. Both public and private health care are still often financed by both formal and informal payments i.e. gifts prior or after the treatment (Lewis, 2007; Kuszewski and Gericke, 2005). Those informal payments are considered a legacy of post-Soviet societies (Allin et al., 2006), as the medical professionals used to supplement their low salaries by either working at several establishments or accepting such informal payments as an expression of patient’s gratitude (Golinowska and Kozierkiewicz, 2008). Such informal payments could be a factor strengthening the disparities in access to and quality of care between the different socio-economic layers of Polish society, as well as slowing down the needed improvements (Chawla et al., 1998).

Since Poland became a member of the European Union in 2004 it started actively working towards meeting European guidelines on the improvement of accessibility, the level of modern treatments available, and creating nationwide disease preventative initiatives, such as screening programmes for the most common cancers and circulatory system disorders (Ministerstwo Zdrowia, 2005b; Ministerstwo Zdrowia, 2012). These nationwide programmes focus on disease prevention and health promotion and are fully funded by the state through mandatory income tax contributions (Kuszewski and Gericke, 2005; Ministerstwo Zdrowia, 2001-2003). Through the implementation of successful population screening, cancer education and decrease of preventable environmental risk factors, they aim to limit the rising incidence of breast cancer and improve detection of cervical cancers improving outcomes of these cancers in Poland (Ministerstwo Zdrowia, 2005b). Studies such as the survey analysed in this thesis help to uncover and understand which factors may predict or act as barriers or motivators to achieving desired screening uptake levels and therefore serve to inform the relevant policies.

2.3. Breast cancer epidemiology

2.3.1. Incidence and mortality

Breast cancer is a type of cancer originating in the milk ducts (ductal breast cancer) or lobules (lobular breast cancer) of breast tissue. It may be invasive or non-invasive. In rare cases, breast cancer can originate in other types of breast tissue (Sandeep et al., 2012). It is the most common cancer in women, accounting for about 23% new female cancers diagnosed each year around the world (Madej et al., 2010; GLOBOCAN, 2008a). The incidence of breast cancer is rising around the world (IAEA, 2011) as well as in Poland and other post-Soviet states (Autier et al., 2010). These rising trends have been mostly associated with lifestyle ‘westernisation’ (e.g., dietary change, physical inactivity, Hormone Replacement Therapy (HRT) exposure, late parity etc) (IAEA, 2011) and improving detection rates related to screening (Autier et al., 2010). The crude annual incidence of breast cancer in the world in 2008 has been estimated as 89.1 per 100,000 population and in Poland, as 48.9 per 100,000 population with population of over 38 million

(Central Statistical Office of Poland, 2012a; GLOBOCAN, 2008a). Age standardised mortality rates from this cancer in 2008 in Poland were 14.7 per 100,000 people (GLOBOCAN, 2008a).

Table 1 below shows changes of breast cancer mortality between 1987-9 and 2004-6 in many countries in Europe. Decline in mortality is seen in some countries at the time of the introduction of national screening. For example in England and Wales mortality decline began in 1989 after the introduction of breast screening programmes available nationally for women aged 50-64 (Autier et al., 2010; CRUK, 2012). It decreased from 41.9% in 1987-9 to 28.1% in 2004-6. Other countries (e.g., Norway, Iceland, Luxembourg, and Ireland) also saw similar decreases in mortality (Autier et al., 2010). However, countries in Eastern Europe (without centralised screening) such as Poland, did not observe similar decline or the data needed to assess these trends was unavailable (Olsen et al., 2013; Autier et al., 2010). Therefore the development and implementation of national breast screening in Eastern Europe countries such as Poland were suggested as having the potential to bring measurable benefits to the screened population as earlier detection could mean earlier and more successful treatment resulting in decreased mortality (Autier et al., 2010).

Table 1 Changes in breast cancer mortality between 1989 and 2006 in European countries ranked according to overall decline in mortality (reproduced from Autier et al. 2010)

			Mortality change for all ages (%)		Mortality change 1989-2006 by age group (%)								
	Mean mortality*		For 1989-2006				Annual change			Overall change			
Country	**1987-9**	**2004-6**	**Annual**	**Overall**	**Year for start of decline**	**Annual change 1999-2006**	**<50**	**50-69**	**≥70**	**<50**	**50-69**	**≥70**	**cause of death data quality§**
Iceland	33.1	23.5	−3.4	−44.5	1995	1.1	−8.1	−2.5	−3.1	−76.3	−35.0	−41.5	High
England and Wales	41.9	28.1	−2.5	−34.9	1989	−2.0	−3.2	−3.0	−1.5	−42.1	−40.1	−22.6	High
Luxembourg	36.3	22.9	−2.4	−34.1	1988	−2.8	−5.3	−2.5	−1.3	−60.0	−34.9	−19.9	Medium
Scotland	39.3	29	−2.1	−29.9	1990	−1.4	−2.9	−2.7	−0.7	−39.1	−37.2	−11.9	High
Northern Ireland	37	28.1	−2.0	−29.2	1991	−1.2	−3.8	−2.6	0	−48.2	−36.2	−0.7	High
Austria	31.8	24.5	−1.8	−26.8	1990	−1.6	−4.0	−1.7	−1.1	−50.3	−25.3	−16.9	Medium
Spain	23.7	18.9	−1.8	−26.8	1992	−2.2	−3.4	−2.1	−0.3	−44.7	−30.3	−4.6	Medium
Ireland	40.3	30.5	−1.8	−26.4	1991	−2.3	−3.2	−1.9	−1.0	−42.7	−27.2	−15.7	High
Netherlands	39	30.1	−1.7	−25.1	1993	−2.7	−1.7	−1.9	−1.4	−25.3	−27.8	−20.9	Medium
Norway	27.4	21.5	−1.6	−24.3	1995	−2.2	−2.5	−1.5	−1.4	−35.2	−22.6	−20.8	Medium
Italy	29.7	23.2	−1.5	−22.8	1991	−1.6	−2.7	−1.7	−0.7	−36.7	−24.9	−11.0	Medium
Switzerland	30.5	24	−1.5	−22.7	1985	−1.1	−2.2	−1.2	−1.7	−30.9	−18.5	−24.7	Medium
Germany	31.3	26.2	−1.4	−21.3	1999	−1.5	−3.5	−1.3	−0.5	−45.5	−20.2	−8.9	Medium
Denmark	40.5	32	−1.4	−20.8	1995	−2.6	−3.8	−1.7	0.1	−48.5	−25.7	1.3	Medium
Belgium	37.5	29.7	−1.3	−20.3	1986	−2.4	−2.7	−1.5	−0.4	−36.7	−22.0	−7.2	Medium
Portugal	23.9	NA	−1.1	−17.8	1992	−0.9	−2.7	−1.4	0.4	−36.9	−21.5	6.5	Low
Czech Republic	30.6	26.4	−1.1	−17.8	1994	−1.2	−3.7	−1.7	0.5	−47.2	−25.5	8.6	Medium
Slovenia	30.7	26.3	−1.0	−16.1	1993	−2.1	−4.1	−1.1	0.5	−51.3	−17.3	9.1	High
Sweden	25.6	22	−1.0	−16.0	1972	−0.6	−2.6	−1.0	−0.3	−35.7	−15.9	−4.3	Medium

	Mean mortality*		Mortality change for all ages (%)				Mortality change 1989-2006 by age group (%)						
			For 1989-2006				Annual change			Overall change			
Country	1987-9	2004-6	Annual	Overall	Year for start of decline	Annual change 1999-2006	<50	50-69	≥70	<50	50-69	≥70	cause of death data quality§
Finland	24.5	21.4	−0.7	−11.7	1990	−1.5	−2.3	−0.7	0	−32.6	−10.8	0.1	High
Hungary	32.4	29	−0.7	−11.4	1994	−3.1	−2.4	−0.5	−0.1	−34.4	−8.3	−2.4	High
France	28.5	25.6	−0.7	−10.7	1994	−1.4	−0.9	−0.9	−0.1	−14.3	−14.9	−1.6	Medium
Poland	**21.5**	**21.1**	**−0.4**	**−5.9**	**None**	**−0.1**	**−2.5**	**−0.3**	**0.8**	**−34.5**	**−4.3**	**14.6**	**Low**
Slovakia	23.6	23.4	−0.1	−1.5	2000	−3.2	−2.1	−0.1	1.1	−30.7	−1.9	20.5	High
Bulgaria	21.3	22.2	0	−0.8	1988	0.8	−1.7	0.1	0.9	−25.5	2.3	16.2	Medium
Lithuania	22.9	23.2	0	−0.7	None	−1.1	−2.7	−0.3	2.7	−37.0	−4.3	58.1	High
Greece	21.9	22.2	0.1	1.4	NR	0.2	−3.0	−1.1	3.5	−40.6	−17.8	80.2	Low
Estonia	20.9	23.6	0.5	9.6	NR	−3.1	−2.0	0.6	2.2	−29.0	11.4	44.9	High
Latvia	22.5	25.1	0.6	11.4	NR	0	−0.9	0.6	2.2	−13.7	10.2	43.6	High
Romania	19.9	23.1	0.9	16.6	NR	0	−1.1	0.8	2.8	−17.6	14.3	59.3	High
Summary statistics													
Median	30.1	24	−1.2	−19.0	NR	−1.5	−2.7	−1.4	−0.1	−36.8	−20.8	−2.0	NR
Minimum	19.9	18.9	−3.4	−44.5	NR	−3.2	−8.1	−3.0	−3.1	−76.3	−40.1	−41.5	NR
Maximum	41.9	32	0.9	16.6	NR	1.1	−0.9	0.8	3.5	−13.7	14.3	80.2	NR

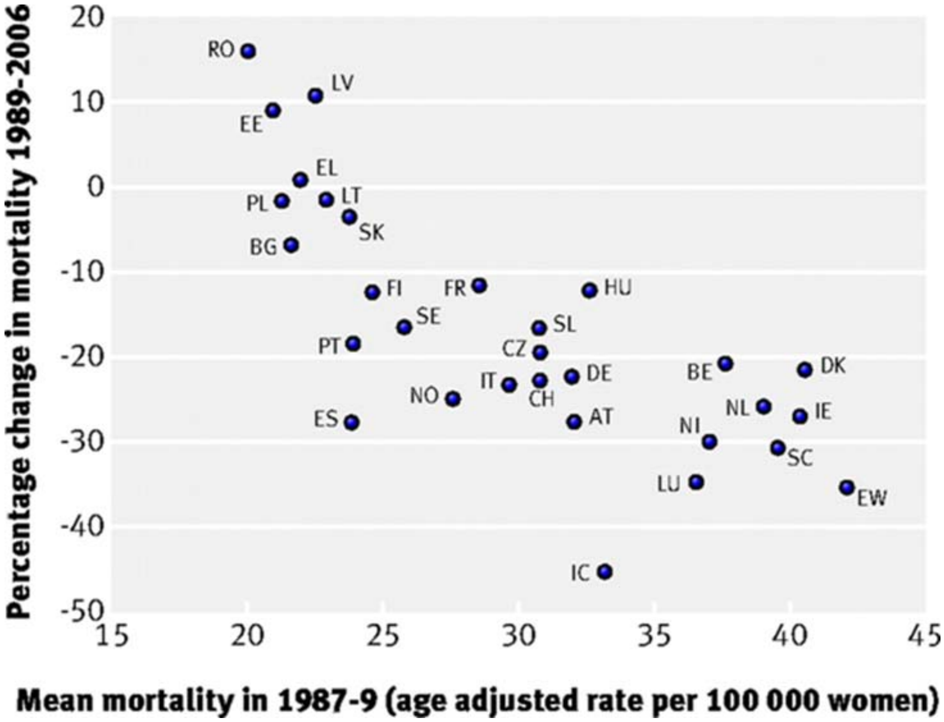
NA= not available; NR=not relevant.

*Age adjusted (European standard) rate per 100 000 women.

†Data for 2004-5 for Spain, Hungary, Slovakia, and Estonia; data for 2004 for Belgium; data for 2006 for Italy; 2003 was the last year of data for Portugal.

§Quality of information on cause of death according to WHO (Autier et al., 2010).

Figure 2 Percentage changes in breast cancer mortality in Europe during 1989-2006 according to the mean breast cancer mortality in 1987-9 (reproduced from Autier et al. 2010)



Key:
AT=Austria; BE=Belgium; BG=Bulgaria; CH=Switzerland; CZ=Czech Republic; DE=Germany; DK=Denmark; EL=Greece; EE=Estonia; ES=Spain; EW=England and Wales; FI=Finland; FR=France; HU=Hungary; IC=Iceland; IE=Republic of Ireland; IT=Italy; LT=Lithuania; LU=Luxemburg; LV=Latvia; NI=Northern Ireland; NL=Netherlands; NO=Norway; PL=Poland; PT=Portugal; RO=Romania; SC=Scotland; SE=Sweden; SI=Slovenia; SK=Slovakia

Figure 2 depicts the changes in breast cancer mortality between years 1987 and 2006 (presented numerically in table 1). Countries with centralised and population based screening such as England and Wales, Iceland, Scotland, Northern Ireland, and others experienced a much more pronounced decrease of breast cancer mortalities than the countries which did not have such initiatives (e.g. Poland, Bulgaria, Estonia, Romania, etc). Also, the countries in Eastern Europe have lower mortality making the difference between the countries even more contrasting. However, WHO noted in a recent report (2012) on world health statistics that currently only 34 countries worldwide (including UK) record high-quality data on the mortality cause and lower mortality rates may be due to potential underreporting or insufficient quality of data in those countries (WHO, 2012c).

In order to provide greater detail on breast cancer mortality rates in Poland and complement the evidence reported by Autier et al. (2010) above, the data from online WHO Cancer Mortality Database (WHO, 2012b) was compared with the United Kingdom, a Western European country that had both types of screening programmes since the late 1980's (breast screening for women 50-64 once every three years and cervical screening for women aged 25 to 64 every three to five years) (Cancer Research UK, 2009; NHS Cancer Screening Programmes, 2008). These comparisons were done for three age groups: 20-44, 45-69, and 70 and over to take into consideration the fact that as there was no population-based screening in Poland and some women from age groups other than the target screening population could have been screened during ad hoc screening actions. The breast and cervical cancer mortality trends showed mirroring trends of breast cancer mortality in Poland and the UK for the youngest age group (20-44) and a narrowing gap for the remaining age groups but mainly due to rising mortality in Poland. The figures below (Figures 3-5) depict that around the time of the introduction of national cancer screening in the UK (1988) mortality started rapidly decreasing.

Figure 3 Comparison of breast cancer mortality trends 1959-2010 between Poland and the United Kingdom (standardized rates per 100,000 population) for women aged 20-44 (data was sourced from online Cancer Mortality Database, WHO, 2012)

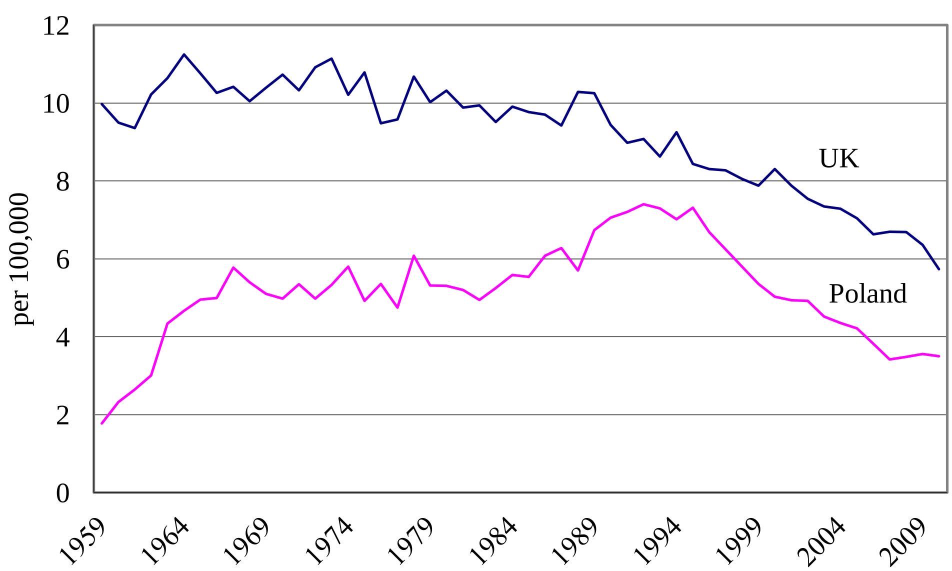
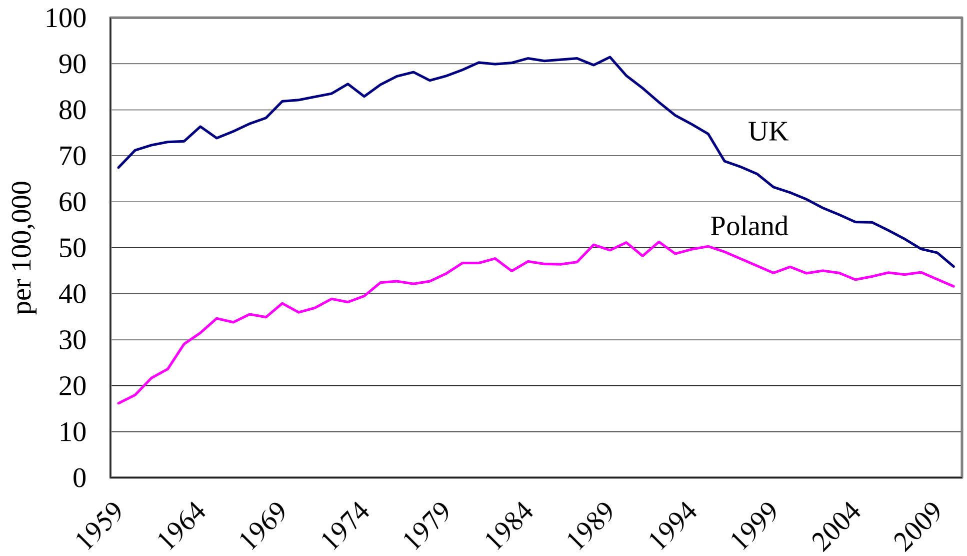
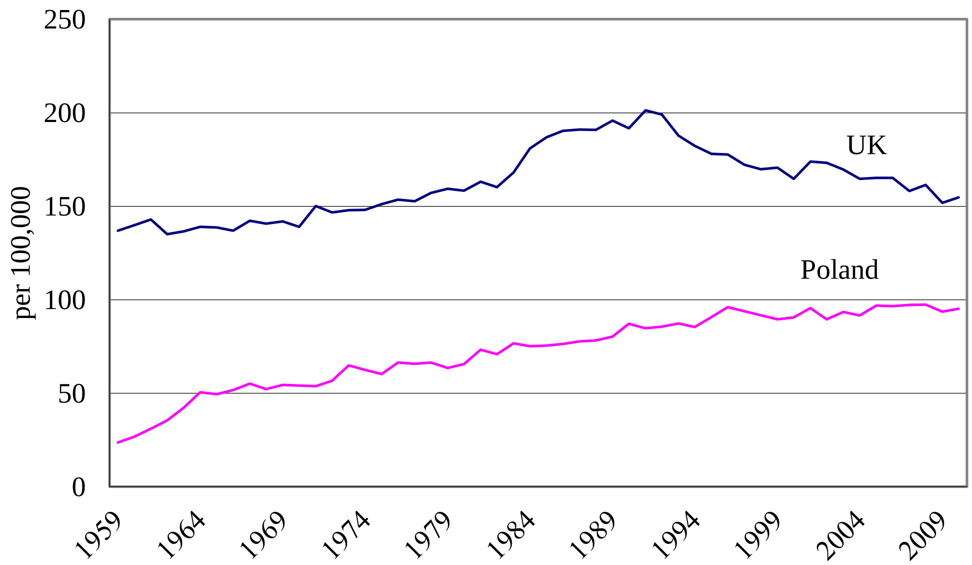


Figure 4 Comparison of breast cancer mortality trends 1959-2010 between Poland and the United Kingdom (standardized rates per 100,000 population) for women aged 45-69 (data was sourced from online Cancer Mortality Database, WHO, 2012)



The decline in mortality was especially notable in the 45-69 age group (from 91.5 per 100,000 in 1989, through 62.0 per 100,000 in 2000, to 45.9 per 100,000 in 2010). However, no such decrease can be observed in Poland before the introduction of nationwide screening in 2006 and after the introduction the decrease was only from 44.6 per 100,000 in 2006, to 41.6 per 100,000 in 2010. In the 20-44 age group the most pronounced decrease was seen in both countries from 1989 (in the UK: from 10.3 per 100,000 in 1989 to 5.7 per 100,000 in 2010; in Poland: from 6.7 per 100,000 in 1989, to 3.5 per 100,000 in 2010).

Figure 5 Comparison of breast cancer mortality trends 1959-2010 between Poland and the United Kingdom (standardized rates per 100,000 population) for women aged 70 or over (data was sourced from Cancer Mortality Database, WHO, 2012 available online)



Mortality among women aged 70 or over differed between the two countries as there was some decrease in mortality in the UK (from 195.8 per 100,000 in 1989, through 164.6 per 100,000 in 2000, to 154.7 per 100,000 in 2010) and in Poland an increase can be seen (from 80.3 per 100,000 in 1989, through 90.6 per 100,000 in 2000, to 95.3 per 100,000 in 2010). However, neither age group 20-44 nor over 70 were included in the nationwide breast screening. Increasing mortality trends in Poland could be associated with 'westernisation' of the lifestyle (e.g., increase of highly caloric foods, decrease of physical activity, later parity etc) (International Atomic Energy Agency (IAEA), 2011; Autrier et al., 2010) (for risk factors see section 2.3.2). Poland has been indicated by WHO (2012) as one of the countries with low quality data (WHO, 2012c). Therefore, lower mortality in Poland than in the UK presented above (for cervical cancer mortality trends please see section 2.4.1.) recorded before the 1970's may be related to underreporting or insufficient quality data that is often seen in post-Soviet states (Anderson et al., 1994) rather than actual low mortality from these cancers.

2.3.2. Risk factors

Breast cancer incidence and mortality vary greatly around the world with higher rates presenting in the more developed countries (Key et al., 2001; Parkin and Fernández, 2006). Even though, the aetiology of breast cancer is unknown, numerous factors have been described previously as being associated with increased or decreased risk of cancer development (Jardines et al., 2011). Those risk factors have been divided into: hereditary, endocrine, reproductive, environmental and life-style factors (e.g., diet, physical activity, toxic substance exposure) (Garcia-Solis and Aceves, 2005) which are described in more detail below. Where appropriate the evidence available prior to 2006 is highlighted and any information that came into light since then discussed. The reviewed publications were assessed by exploring several characteristics that are widely considered as quality indicators (Greenhalgh, 1997; Guyatt et al., 2008; Hemingway and Brereton 2009; York: Centre for Reviews and Dissemination, 2008). The following characteristics contributed to strengthening of the evidence: study size, representativeness of the included subjects or studies for literature reviews/meta-analyses (inclusion/exclusion criteria), rigour of data collection and data analysis, smaller or less severe number of biases/study limitations, and journal quality (e.g., high impact factor) (Greenhalgh, 1997; Guyatt et al., 2008; Hemingway and Brereton 2009; York: Centre for Reviews and Dissemination, 2008). The characteristics that contributed to weakening of the evidence were characteristics inverse to items that increased the study quality. The overall strength of evidence depended on the quality and number of studies discussed in each of the sections. The strength of evidence obtained from the review of the literature was assessed for each of the sub-sections and displayed as ranging from one ('♦') for the lowest level of quality of evidence to the highest number of four points ('♦♦♦♦') for the highest quality of available evidence. The categories were described as '♦'- unclear evidence or evidence coming from studies with small very specific populations, '♦♦'- mixed evidence with majority of publications indicating at least some level of association, '♦♦♦'- studies providing strong evidence indicating existence of association, '♦♦♦♦'- studies providing very strong evidence indicating at association (for detail please see tables 2 and 5).

2.3.2.1. *GENDER AND AGE*

Gender is indisputably one of the most important risk factors for the occurrence of breast cancer, as less than 1% of new breast cancers are observed in the male population (Walker, 2009). Another of the most widely known risk factors for the development of breast cancer is increasing age (Martin and Boyd, 2008; Benson et al.; 2009, CDC, 2010). Breast cancer risk increases with age, doubling with every decade of life until the menopause (i.e. approximately around the fifth decade of woman's life). In European countries median age at the beginning of menopause ranges from 50.1 to 52.8 years, in Americas from 43.8 to 53 years, and in Asia from 42.1 to 49.5 years (Palacios et al., 2010). Polish women have been found to experience menopause at median age 50.3-52.9 years (Szwejser and Szostek, 2012; Kaczmarek, 2007, Kaczmarek and Szwed, 2001; Chmara-Pawlinska and Szwed, 2004). After menopause the risk decreases and flattens reaching a plateau in women aged 80 years or over (Benson et al., 2009; Dixon, 2012; Key et al., 2001; McPherson et al., 2000; Walker, 2009).

Increasing age as a risk factor for breast cancer has also been widely studied, not only by the scientific community, but also by governments and other policy makers, in order to inform the formation and implementation of screening services for women from specific age groups (for example: Canadian Task Force on Preventive Health Care et al., 2011 or U.S. Preventive Services Task Force, 2009). In 2011, the Canadian Task Force reviewed the existing evidence to provide recommendations on screening for breast cancer in women aged 40–74 years that were assumed to be an average risk group. They also concluded that according to the existing evidence of the relative risk of death from breast cancer mammographic screening recommendations should be made for women aged 50–69 years and 70–74 years every two to three years and not for women aged 40–49 years, as the absolute benefit for them is lower due to lower risk in comparison to their older counterparts (Canadian Task Force on Preventive Health Care et al., 2011). There was no sufficient data for those over 75 years old (Canadian Task Force on Preventive Health Care et al., 2011). Further information on mammography and screening age can be found in the section 2.5.1.

2.3.2.2. *Family history and genetic factors*

Family history of breast cancer has been established by many different studies as a strong risk factor for breast cancer (Pharoah et al., 1997; Easton, 2002). For example an increase of breast cancer risk has been seen especially amongst first degree relatives (e.g., mother daughter, father, son, and sibling) of pre-menopausal breast cancer patients. The risk was found to be 9 times higher in women with bilateral cancer and a first degree relative affected by it, in comparison to a 5 fold risk for bilateral breast cancer patients who did not have a first degree relative affected by breast cancer (Walker, 2009). The level of that risk differs between individuals and also depends on the number and type of relatives affected, as well as the age at which they developed the disease. Pharoah et al. (1997) summarised the available published evidence on family history as a risk factor and for age specific risks. Relative risk (RR) for women with any relative affected by breast cancer was 1.9 (95% CI, 1.7-2.0); for a first-degree relative 2.1 (95% CI 2.0-2.2) (i.e. mother, RR=2.0 (95% CI 1.8-2.1); sister, RR=2.3 (95% CI 2.1-2.4); daughter, RR=1.8 (95% CI 1.6-2.0); mother and sister, RR=3.6 (95% CI 2.5-5.0); and a second-degree relative (grand parent, grandchild, uncle, aunt), RR=1.5 (95% CI 1.4-1.6) (Pharoah et al., 1997). Also, later studies confirmed that family history is strongly associated with breast cancer. For example Virnig et al. (2010) conducted a structured literature review on the incidence of ductal carcinoma in situ (DCIS), commissioned by the National Institutes of Health Office of Medical Applications of Research in the US. They found that breast cancer in a first degree relative or another family member is associated with increased odds ratio (OR) of DCIS (pooled OR=1.97, 95% CI=1.10- 3.52) (Virnig et al., 2010; National Collaborating Centre for Primary Care, 2006).

This familial predisposition to breast cancer has been linked so far in about 10% - 25% of cases to two main gene mutations BRCA1 and BRCA2, the most prominent amongst families with high risk (Key et al., 2001; McPherson et al., 2000; Antoniou and Easton, 2006; Edlich et al., 2006). These genetic mutations are linked to DNA repair mechanisms and account for approximately 3/4 of hereditary breast cancer cases (Benson et al., 2009). Both of the mentioned mutations have been found in large proportions (46.9%-67%) of Polish families with high risk of breast cancer (families with more than one relative with breast cancer)

(Gorski et al., 2004; Rogozinska-Szczepka et al., 2004; Ratajska et al., 2008). Often members of the families that suffer from breast cancer also experience increased occurrence of other cancers (i.e. ovarian, prostatic, and colon) that are attributable to the same genetic mutation (Key et al., 2001; Liede et al., 2004; McPherson et al., 2000). In fact BRCA1 or BRCA2 mutations have been attributed to 11% to 40% lifetime ovarian cancer risk (Simard et al., 1994; Antoniou et al., 2003; Chen and Parmigiani, 2007). It has been suggested that women with the increased risk of breast cancer should stay particularly breast aware and potentially consider prophylactic mastectomy (National Collaborating Centre for Primary Care (NCCPC), 2006; Maria Skłodowska-Curie Memorial Cancer Centre and Institute of Oncology, 2006). For information on screening methods and recommendations please refer to section 2.5.1.

2.3.2.3. Age at menarche, menopause, and other reproductive factors

Reproductive factors and the risk of breast cancer have been explored by many researchers. An increased risk has been observed in women who experience early menarche (younger than 12 years old) and late menopause (after age of 55 years old) as those factors link to the prolonged exposure of the woman's body to oestrogens (Key et al., 2001; Walker, 2009; Lacey et al., 2013; Okobia and Bunker, 2005; Collaborative Group on Hormonal Factors in Breast Cancer, 2012). Those who had their menopause after the age of 55 had double the likelihood of developing breast cancer of women with menopause at 45 years of age (Kelsey, 1993; Key et al., 2001; McPherson et al., 2012; McPherson et al., 2000; Clavel-Chapelon and Gerber, 2002; Walker, 2009). A literature review by Velie et al. (2005) reported that the majority of studies show modest inverse breast cancer risk relationship with younger age at menarche but some of them showed that this effect is more pronounced in premenopausal women. The authors indicated that the breast cancer risk decrease for each year of delayed menarche was estimated to be 9% in premenopausal and 4% in post menopausal women (Velie et al., 2005). The association of the increased breast cancer and the above described factors has been linked to the prolonged exposure of the woman's body to oestrogens known to have a negative effect on breast cancer risk (Key et al., 2001; Walker, 2009; Lacey et al., 2013; Okobia and Bunker, 2005).

Older age at first childbirth (over 30 years old) and nulliparity were also found to increase the risk of breast cancer (Key et al., 2001; McPherson et al., 2000; Clavel-Chapelon and Gerber, 2002; Velie et al., 2005; Schonfeld et al., 2011; Hoskins et al., 2005; Kobayashi et al., 2012). Schonfeld et al. (2011) showed that the overall aggregated hazard ratio (HR) for nulliparous women was 1.27 (95% CI 1.21-1.34) when compared with parous women (Schonfeld et al., 2011). Velie et al. (2005) noted that the increased risk in nulliparous women was not observed until 40 years of age (Velie et al., 2005). A 50% risk reduction was observed for women who had a first full-term birth before the age of 20 (Kobayashi et al., 2012). However, first delivery after the age of 35 showed an increase of risk by 22% (Kobayashi et al., 2012). Velie et al. (2005) reported that there was a risk increase after first full-term pregnancy that peaked at 5 years post-partum which later transformed into long term protection that was attained at 15 years after delivery (Velie et al., 2005). This long term protection was observed to increase with the number of full term pregnancies (Velie et al., 2005; Kelsey, 1993; Ma et al., 2006; Kobayashi et al., 2012; Redondo et al., 2012).

2.3.2.4. Use of exogenous hormones

Similarly as for reproductive factors, the use of exogenous hormones may result in prolonged exposure to oestrogen and evidence exists that the use of exogenous hormone therapy such as oral contraceptives (OC) and hormone replacement therapy (HRT) may increase breast cancer (Gadducci et al., 2005). However, this association has not been equivocal across the studies (Medard and Ostrowska, 2007; Althuis et al., 2004).

Oral contraception

Several reviews found that during the use of oral contraception and within 5-10 years after cessation there was 25% increase in the RR of breast cancer but after that time the risk was that of non-users (Key et al., 2001; Collaborative Group on Hormonal Factors in Breast Cancer, 1996; Cibula et al., 2010). Ever having used OC was significantly associated with increased breast cancer risk in women with first degree relatives affected by breast cancer (RR, 3.3; 95% CI 1.6-6.7), but not among those with second degree relatives (RR, 1.2; 95% CI, 0.8-2.0) (Grabrick et al., 2000). Key et al. (2001) noted that the use of combined OC was linked to a larger number of localised cancers but they hypothesised that it was due to more frequent monitoring of the OC users (Key et al., 2001). They also suggested that due to the rarity of breast cancer in young women, the use of OC would not significantly increase the risk but it can have such potential in older women (Key et al., 2001). Later the Clinical Effectiveness Unit (CEU) (2011) review of the existing published evidence on benefits and risks of OC confirmed earlier findings by Key et al. by noting that there is approximately 24% increase in the risk of breast cancer increasing rapidly after OC initiation and decreasing to that of non users after OC is stopped (CEU, 2011). They noted that the evidence to date is unclear as to whether confounding variables played a role in the estimation of these risks, but also highlighted that women may be informed by their physicians that OC use has not been found to be associated with increase of long-term risk (CEU, 2011). It has been estimated that in Poland 5.1%-12% of women use this method of contraception (Center for Reproductive Rights, 2003; Binkowska et al., 2005).

Hormone replacement therapy

HRT use has been found to have an association with increased risk of breast cancer (McPherson et al., 2012; Steinberg et al., 1991; La Vecchia et al., 1995; Walker, 2009) and in Poland, at the time of data collection approximately 30.5%-33.8% of women aged 50 and older have ever received HRT (Mogilnaya et al., 2005; Zolnierczuk-Kieliszek et al., 2006). McPherson et al. (2000) found that current users of HRT and users in the past 4 years had their RR of developing breast cancer increased by a factor of 1.023 (1.011-1.036) for every year of therapy (McPherson et al., 2000). The level of the increase corresponds to the delay of menopause and in those who never used the treatment the increase factor was 1.028 (1.021-1.034) for every year after menopause. The risk was higher in users of combined therapy that included oestrogen and progestogen. McPherson et al. (2000) found however that use of HRT did not increase the risk of breast cancer mortality, although subsequently the increased risk of developing breast cancer due to HRT use was later confirmed by many studies (Beral and Million Women Study Collaborators, 2003; Narod, 2011; Krolik and Milnerowicz, 2012; Shantakumar et al., 2007). It was found that current users of HRT were at a higher risk of breast cancers than those who never received such treatment. The risk also increased with the duration of use (Beral and Million Women Study Collaborators, 2003).

Current and longer than 5 years use was shown to produce a moderately elevated risk (RR 1.2-1.50) (Humphrey, 2002) but 2 years after cessation of treatment this risk increase was found to return again to the levels comparable to risk levels of never users (Narod, 2011). Similarly as in case of the OC use, the risk of breast cancer is higher for combined formulations of oestrogen and progesterone than for those with oestrogen only (Narod, 2011). A recent Cochrane Review provided further evidence that at a mean of 11 years' follow-up combined HRT was significantly associated with the increased risk of breast cancer (RR 1.25, 95% CI 1.08-1.45) (Marjoribanks et al., 2012).

2.3.2.5. Radiation exposure

Radiation exposure can vary greatly from none, through to one off, or very small doses (i.e. dental X-rays) to frequent or high dose exposures (i.e. atomic bomb survivors, oncologic patients in radiotherapy) (Key et al., 2001; McPherson et al., 2000). Higher risk of breast cancer was observed among women exposed to ionizing radiation and diagnostic X-rays (McPherson et al., 2000; Key et al., 2001; Ron, 2003; Pijpe et al., 2012; Gronwald et al., 2008). Preston et al. (2002) pooled results from 8 cohort studies that explored breast cancer incidence rates following radiation exposure and found a linear relationship between the dose level and the increased risk, but they also highlighted the importance of age as well as age at exposure (Preston et al., 2002).

In a later study, Heyes et al. (2009) also found some risk to be associated with mammography but they concluded that the benefits outweigh the risks and suggested that caution needs to be exercised in those with high familial risk (Heyes et al., 2009). However, the other studies confirmed that exposure to diagnostic radiation can cause an increased risk of breast cancer, especially amongst women with BRCA1 and BRCA2 gene mutations as (Pijpe et al., 2012; Gronwald et al., 2008). Mammography earlier than at 30 years of age in women with either of these mutations was linked with higher breast cancer risk (HR 1.43, 95% CI, 0.85-2.40) (Pijpe et al., 2012). In a Polish study Gronwald et al. (2008) found that in BRCA1/2 mutation carriers with breast cancer OR of having chest X-rays under 30 years of age was 1.8 (95% CI, 1.2–2.9) in comparison to affected non-carriers (Gronwald et al., 2008). The level of the risk increase was found to be associated with the dose of radiation (Pijpe et al., 2012).

2.3.2.6. Diet and other lifestyle factors

A number of studies pointed towards an association between various lifestyle and environmental exposures as having an influence on the level of risk of breast cancer. For example factors such as diet, level of physical activity, and other lifestyle factors, have been widely discussed as those that could possibly be modified in order to decrease breast cancer risks.

Dietary factors

Typical Polish cuisine consists of foods that were influenced by many neighbouring countries and past occupants (Weichselbaum et al., 2005). Traditional foods include cabbage/sauerkraut, pickles, different meats (with pork being the preferred meat type) potatoes, bread and cereal-based dishes (Weichselbaum et al., 2005). Polish society consume diets with relatively high energy levels (on average 3,000 kcal in comparison to recommended 2,000 kcal per day), high in fats (especially of animal origin), low in fibre and high in alcohol (Gawęcki and Hryniewiecki, 2007). Some authors noted that due to such dietary patterns a significant proportion (1/3 according to Gawęcki and Hryniewiecki) of the Polish population suffers from conditions related to incorrect nutritional habits such as circulatory disorders, obesity, diabetes mellitus type 2, neoplasms, osteoporosis etc (Gawęcki and Hryniewiecki, 2007; Kunachowicz et al., 1998; Zatonski et al., 2008).

The role of diet and especially fat, fruit and vegetable consumption, as well as alcohol and tobacco intake in cancer aetiology has been suggested by the scientific community, in part because of the large international variation in cancer rates and the antioxidant properties of selected nutrients such as the influence on for example inflammatory and immune response as well as metabolic detoxification (Romieu, 2011; Vera-Ramirez et al., 2013; Kapiszewska, 2006). Other protective elements of cancer preventive foods include folic acid, vitamin D, selenium, vitamin B12, chlorophyll and antioxidants found commonly in plants (Kapiszewska, 2006; Divisi et al., 2006; Fernandez et al., 2006; Demetriou et al., 2012).

Studies exploring the potential effects of foods with a high fat content have reported contradicting evidence in relation to breast cancer risk. For example fat intake and its influence on risk of breast cancer was studied in the late 1990's and a link was not found (Hunter et al., 1996; McPherson et al., 2000). However, in later studies, a high-fat diet was found to be significantly related to the increased risk of breast cancer (Schulz et al., 2008; Di Pietro et al., 2007; Prentice et al., 2006). Wang et al. (2008) reported that overall high fat consumption in lowest vs. highest intake quartile resulted in higher breast cancer risk (adjusted OR=1.35, 95% CI=1.10–1.65, $P_{trend}<0.01$) (Wang et al., 2008). Thiebaut et al. (2007) showed that postmenopausal women in the highest quintile of percent energy from fat intake were more likely to have invasive breast cancer OR=1.11 (95% CI=1.00 to 1.24; $P_{trend}=0.017$) (Thiebaut et al., 2007). Other studies also pointed towards evidence that a higher content of body fat is a risk factor for breast cancer in postmenopausal women (Inumaru et al., 2011; Rohan et al., 2013) but likely a protective factor in premenopausal women (Inumaru et al., 2011; Berstad et al., 2010; Pathak and Whittemore, 1992). A recent study by Rohan et al. (2013) reported that anthropometric indices of obesity (95% CI 1.97, 1.45–2.68), waist circumference (95% CI 1.97, 1.46–2.65), and waist-hip ratio (95% CI 1.91, 1.41–2.58) were all associated with higher risk of breast cancer (Rohan et al., 2013). The mechanisms of this association of high fat intake and the increased risk of breast cancer have been attributed to high density energy that can cause weight gain, or fluctuations in sex hormones which then can impact other factors such as sex hormone levels at different stages of woman's life (Romieu, 2011) and especially in postmenopausal women (Jevtic et al., 2010; Gonzalez, 2006; McPherson et al., 2000). It has been estimated that between 2003 and 2005 22.4 % of Polish women aged 20-74 years old were obese and 27.9 % overweight (Ministerstwo Zdrowia. Departament Polityki Zdrowotnej, 2007-2009).

Not only the quantity but also quality (type) of fat intake has been shown to have an influence on the cancer risk. For example, monounsaturated fat consumption was reported to be significantly associated with lower risk of breast cancer (OR=0.52; 95% CI, 0.30-0.92) (Garcia-Segovia et al., 2006). In particular intake of ≥8.8 g/day olive oil resulted in lower odds of developing breast cancer (OR=0.27, 95% CI 0.17-0.42) (Garcia-Segovia et al., 2006). Fatty trans acids have been found to be associated with the increased risk of breast cancer in a study by Chajès et al. (2008) with a large sample of women (n=19,934). The odds ratio of the highest versus lowest quintile between the trans-monounsaturated fatty acids palmitoleic acid and elaidic acid was OR=1.75 (95% CI 1.08-2.83). Nonetheless the researchers noted that their study results could be subject to chance and other studies to bias (Chajes et al., 2008). Other researchers reported similar findings that women consuming more hydrogenated fats (OR=1.58, 95% CI=1.20-2.10) or vegetable/corn oil with high content of linoleic acid (OR=1.30, 95% CI=1.06-1.58) had higher OR of having breast cancer in comparison to women using olive/canola oil high in oleic acid (Wang et al., 2008). A relatively recent meta-analysis confirmed the previous findings and concluded that a link exists (irrespective of country of origin) between olive oil consumption and lower odds of any cancer type (log OR=-0.41, 95% CI, -0.53-0.29) and log OR=-0.45 (95% CI, 0.78-0.12) for breast cancer (Psaltopoulou et al., 2011). Even though in Poland since 1990's consumption of plant based oils increased and animal fats decreased, the daily consumption of fatty trans acids is much higher than in the rest of Europe (2.8–6.9g vs. 1.2-6.7g) being much higher than the recommended 2g per day (Cichosz and Czeczot, 2012; Instytut Żywności i Żywienia)

Lower breast cancer incidence in women on a low fat diet has been hypothesised to be linked directly not only with the amount of consumed fat but also with lower weight and higher consumption of fruit and vegetables, as antioxidants and fibre could play a protective role against breast cancer (Romieu, 2011; Pal et al., 2012). The influence of fruit and vegetables on cancers has been studied for the past 30 years (Key, 2011) and the negative correlation between a diet high in fruit and vegetables and various cancers has been well established (Pal et al., 2012; Giacosa et al., 2012). However, their association with breast cancer has been inconsistent throughout the studies (Fung et al., 2005; Masala et al., 2012).

At the time of the data collection analysed in this thesis several reviews, meta-analyses and other studies noted lower breast cancer risk as well as cancer survival amongst those with higher vegetable and fruit consumption (Gandini et al., 2000; Maizes, 2005; Ahn et al., 2004). Maizes (2005) noted that cruciferous vegetables (such as: broccoli, cabbage, kale etc) contain phytochemicals which modulate the activity of cellular enzymes involved metabolism of oestrogen (Maizes, 2005). It was also hypothesized that cruciferous vegetables may alter steroid hormone metabolism, response of oestrogen receptor, as well as stabilize cellular proliferation therefore having positive influence on breast cancer risk (Maizes, 2005).

Although Cummings et al. (2009) found in a review that 5 out of 6 prospective studies exploring fruit and vegetable intake noted no statistically significant association with breast cancer (Cummings et al., 2009). Also a recent review conducted by Key (2011) showed that the association between vegetable intake is very small or non-existent (Key, 2011). Nonetheless the author noted that the benefit of increased vegetable and fruit consumption could still be identified especially for vegetables with high content of isoflavones that might have protective effect on breast cancer (Key, 2011). Other studies showed that in particular the ratio of fruit/vegetable to meat intake have influence on the incidence of breast cancer as omega-3 fatty acids found in fish inhibit the growth breast cancer tissue and fibre can bind the carcinogenic metabolites (Kapiszewska, 2006; Divisi et al., 2006; Fernandez et al., 2006; Aune et al., 2012; Demetriou et al., 2012). A Polish study by Kruk (2006) examined dietary as well as physical activity differences between women who had mastectomy and a control group (Kruk, 2006). Kruk found that women who consumed vegetables and fruits more often and were lightly or moderately physically active had significantly decreased risk of breast cancer (light activity OR=0.18, 95% CI=0.06–0.50, moderate activity: OR=0.20, 95% CI=0.08–0.50, P_{trend}<0,001) (Kruk, 2006). However no such observation was made for women who were highly active physically (Kruk, 2006). Key (2011) highlighted that current nutritional advice relevant to cancer prevention should recommend an adequate fruit and vegetable intake but also should highlight the role of obesity and high alcohol intakes (Key, 2011).

Alcohol and tobacco consumption

Alcohol and tobacco intake have been hypothesised to be linked to breast cancer since the 1980’s (Rosenberg et al., 1982) and later confirmed by other researchers. Seitz (2012) hypothesized that this link can be attributed to the ability of these substances to influence the cell cycle that may promote the carcinogenic effect (Seitz, 2012).

Alcohol consumption

Prior to 2006, when this study data was collected, studies have found alcohol consumption to have a moderate influence on breast cancer (Longnecker, 1994; McPherson et al., 2000; Key et al., 2001). Pöschl and Seitz (2004) showed that many epidemiological studies have found a clear association of chronic use of alcohol, even in moderate amounts, with an increased risk for breast cancer. They reported that 84% of the reviewed case–control and 76% of cohort studies demonstrated that ethanol use is significantly related to the higher breast cancer risk than that of non users (Poschl and Seitz, 2004). They also added that 4% of all incidents of breast cancer in the US occurred primarily due to alcohol consumption (Poschl and Seitz, 2004). In a later study Seitz et al. (2012) estimated in their meta-analysis that one alcoholic beverage per day (light alcohol intake) increases the breast cancer by approximately 4% and heavy alcohol consumption (>3 drinks per day) increases the risk by 40-50% equating to 5% of breast cancers in Northern Europe attributable to alcohol intake (Seitz et al., 2012). More recent studies have also confirmed that a causal relationship exists between higher intake of alcohol and breast cancer risk (Secretan et al., 2009; IARC, 2010) and Inumaru et al. (2011) reported that alcohol consumption is positively correlated with increased breast cancer risk in both pre- and postmenopausal women (Inumaru et al., 2011). Seitz et al. (2012) stipulated that it is due to alcohol increasing oestrogen levels being directly linked with breast cancer risk (Seitz et al., 2012).

Alcohol consumption and its consequences are very important factors to take into consideration when talking about health in Poland. High levels of alcohol consumption amongst Poles stem from many years of political changes and social uncertainty as well as the fact that prior to the 1980's the Polish socialist government used alcohol as a tool of socialist propaganda (Bielinska-Kwapisz and Mielecka-Kubien, 2011; Moskalewicz and Świątkiewicz, 2000). Alcohol was an important element used to remedy economic problems as it was significantly contributing (9%-20%) to country's revenue (Bielinska-Kwapisz and Mielecka-Kubien, 2011; Moskalewicz and Świątkiewicz, 2000). Any information related to alcohol and its associated problems was often censored (Bielinska-Kwapisz and Mielecka-Kubien, 2011; Moskalewicz and Świątkiewicz, 2000). The amount of alcohol consumed in Poland has changed over time. In 1950's it was 4.2 litres of pure alcohol per capita, peaking in 1980's at 11.2 litres and decreasing to 8.2 litres in 2005 (Bielinska-Kwapisz and Mielecka-Kubien, 2011) with the latest (2009) estimate of alcohol consumption in Poland equalling to 13.60 litres of pure alcohol per captia per year (WHO, 2012a).

Tobacco consumption

WHO (2009) estimated that approximately 9 million Polish people smoke, accounting for about 29% of the adult population (WHO, 2009). A national survey showed that in 2007 34% of men and 23% of women declared to smoke daily (WHO, 2009). Later Zatoński et al. (2012) examined active smoking prevalence across 28 European countries and found that in Poland 46% of men and 30.9% women aged 25-64 smoke translating to 7th worst place for Polish men and 6th for Polish women across the studied nations (Zatonski et al., 2012) and the trends remain stable throughout the years (Fronczak et al., 2012). Fronczak et al. (2012) observed that the environmental exposure to tobacco decreased over time and decreases with increasing age of the study subjects and has an inverse relationship with educational level (Fronczak et al., 2012).

Many authors explored the relationship of tobacco exposure and the risk of breast cancer (Kuper et al., 2002; Morabia, 2002; Terry and Rohan, 2002; Mucha et al., 2006; Coyle, 2004; Johnson et al., 2011). Prior to 2006 several authors found some level of breast cancer risk increase to be associated with tobacco use. Morabia (2002) noted in a meta-analysis that risk increase among different levels of tobacco exposure (passive, active, past) resulted in breast cancer ORs ranging from 1.1 to 3.5 (Morabia, 2002). Kuper et al., (2002) indicated that RR for heavy smokers versus never smokers ranged from 0.9 to 1.2 and no evidence was found for the effect of heavy or long term smoking on the breast cancer risk (Kuper et al., 2002). However, Terry and Rohan (2002) reported that smoking for a long time (i.e., >20 years), smoking before a first full-term pregnancy, or being passively exposed to smoke increases the risk of breast cancer (Terry and Rohan, 2002). Mucha et al. (2006) estimated in a meta-analysis that women who smoked heavily were 2.75 times (95% CI, 2.14-3.52) more likely to experience breast cancer than non smokers (Mucha et al., 2006). Similarly, Johnson et al. (2009) noted that early age of smoking initiation, higher pack-years and longer duration of smoking accounted for 15% to 40% increase in risk. Additionally women with N-acetyltransferase 2 gene (NAT2) slow acetylation genotypes who were long-term smokers had their breast cancer risk increased by 35% to 50% (Johnson et al., 2011).

The evidence throughout the studies is inconsistent and some authors (Kuper et al., 2002; Morabia, 2002; Terry and Rohan, 2002) suggested that it may be reasonable to consider that the linkage of tobacco use to the carcinogenesis of breast may be different to organs such as the lungs, that are directly exposed to smoke, because breast tissue is exposed only to the tobacco metabolites, modified inside the body before reaching the mammary gland (Morabia, 2002; Kuper et al., 2002). Kuper et al. suggested that even though smoking has anti-oestrogenic effects and the smokers experience earlier menopause, which would have a protective effect, the toxic substances such as 7,12-dimethylbenz [a]anthracene, similar to those found in cigarettes have been found to have a carcinogenic effect in animal studies and mutagens from smoke have been found in the breast of non lactating women (Kuper et al., 2002).

Physical exercise and body weight

Some studies have pointed to the role of physical exercise in a significant reduction of breast cancer risk, ranging from 20% to 80% (Monninkhof et al., 2007; Kruk, 2007, Friedenreich and Cust, 2008). The majority of evidence published, prior to the introduction of the population based screening in Poland, supported the opinion that increased physical exercise may play an important role on reducing risk (30-82% risk reduction) of breast cancer development (Fintor, 1999). In the late 1990's Fintor (1999) hypothesized that this reduction may be direct and indirect as body fat plays a role in oestrogen production and oestradiol exposure over time seems to increase the risk of breast cancer. Additionally, the increased physical activity stimulates the immune system helping to fight cancerous cells with the greatest benefit of exercise seen amongst post-menopausal women (Fintor, 1999). Later studies confirmed this, specifying that the fact the relationship between body fat and breast cancer is linked to the ability of leptin to stimulate normal cell or tumour cell growth by enhancing production of in situ oestradiol and progression promotion of oestrogen-dependent breast cancer (Catalano et al., 2004; Ollberding et al., 2013). Other main candidate systems that link adiposity and cancer risk are insulin and the insulin-like growth factor-1 axis, endogenous reproductive hormones, and chronic inflammation (Patterson et al., 2013). In a review of the evidence published up to 2010, Friedenreich (2010) reviewed observational epidemiologic studies as well as randomized exercise intervention trials in order to gain understanding of the link between physical exercise and breast cancer risk and found that the average reduction in breast cancer risk was 25% between the most and the least active women. Friedenreich found that the strength of this association was most notable for recreational and household activities sustained over a lifetime of at least moderate intensity (Friedenreich, 2010). The exercise effect was more pronounced in women with normal body weight (BMI<25), without family history of breast cancer and those who experienced childbirth (Friedenreich, 2010).

Later studies provided more conclusive evidence that moderate to heavy levels of physical activity have an inverse association with breast cancer development (for examples please refer to Anzuini et al., 2011; Friedenreich and Lynch, 2011). However, some of the studies specified that regular physical activity is a likely protective factor, but only in postmenopausal women, as there is lack of evidence for pre-menopausal women (Inumaru et al., 2011).

In Poland the information on the physical activity is very limited (Wolfram et al., 2008). However the available evidence indicates that levels of physical activity in Poland are inadequate as, for example, Kaleta and Jegier (2005) found that only 2.3% of the population engaged in leisure-time physical activity, 23.3% engaged in physical activity at work and 10.9% during housework (Kaleta and Jegier, 2005). Similarly, Drygas et al. (2008) found low activity levels amongst Polish people, as only about 17% occasionally practiced any form of exercise (Drygas et al., 2008). Later, in 2009, the European Commission's Directorate General for Education and Culture commissioned the Eurobarometer survey which was conducted in the 27 European Union Member States (European Commission, 2010). The researchers found that Poland was 6th amongst the countries (Bulgaria, Greece, Hungary, Romania, and Italy) with the lowest levels of participation in any form of sport (66% of Polish people reported not to do any sport) (European Commission, 2010).

2.3.2.7. Socio-economic factors

The transition of the Polish economy influenced women’s financial situation (Pascall and Kwak, 2009). As the job market was changing some of the job posts disappeared and more women than men were left without employment. Similarly, employers preferred to hire men for executive roles due to the possibility of maternity leave and the requirement of long working hours which working mothers could not meet (Pascall and Kwak, 2009). In 2003, 20.4% of Polish women were economically inactive (Central Statistical Office of Poland, 2011) and on average they are paid 23% less than their male counterparts (Dębski et al., 2010). The employment situation improved over time and in 2010, 10% of women were unemployed (Central Statistical Office of Poland, 2011). Unemployment and low level of completed education were found to be strong contributors to Polish women's health problems including from respiratory, circulatory and neurotic disorders (Wroblewska, 2003).

Socio-economic status has been well established as a predictor of breast cancer (Strumylaite et al., 2010). It was found that Polish women in poor financial situation are more likely to report their health state as less than good (Wroblewska, 2003). Women from lower socio-economic backgrounds may have nutritional deficiencies, be overweight or have higher abuse of toxic substances (WHO, 2005; Pampel et al., 2010). Breast cancer incidence is higher amongst women from groups with higher socio-economic status (Vainshtein, 2008; Borugian et al., 2011) whilst mortality is more common in more disadvantaged ones (Vainshtein, 2008). Women with higher socio-economic status also get screened more often which may explain the higher incidence of breast cancer amongst those women. In addition, poorer women may have reduced access to the most advanced surgical and medical techniques (Segnan, 1997; Pruitt et al., 2009; Center for Substance Abuse Treatment, 2011).

2.3.2.8. SUMMARY OF BREAST CANCER RISK FACTORS

Numerous factors have been studied as predictors of breast cancer. It was noted that early menarche (younger than 12 years old), late menopause (after the age of 55 years old), increased concentrations of endogenous oestradiol (e.g., oral contraceptives, hormonal therapy), mutations in a number of genes (i.e. tumour suppressing genes such as: BRCA1, BRCA2), family history of breast cancer, obesity in postmenopausal women and alcohol use all play an important role in the increase of the risk of breast cancer (Inumaru et al., 2011; Rohan et al., 2013; Jevtic et al., 2010; Gonzalez, 2006; McPherson et al., 2000; Walker, 2009; Pharoah et al., 1997; Easton, 2002). Factors such as childbearing, early age at first childbirth, higher number of childbirths, and breast feeding have been linked with decreased risk of breast cancer (Kelsey, 1993; Key et al., 2001; McPherson et al., 2012; McPherson et al., 2000; Clavel-Chapelon and Gerber, 2002; Walker, 2009; Lacey et al., 2013; Okobia and Bunker, 2005; Collaborative Group on Hormonal Factors in Breast Cancer, 2012). A higher risk of breast cancer was also observed among women exposed to ionizing radiation and diagnostic X-rays. Lower breast cancer incidence in women on low fat diets has been hypothesised to be linked directly with lower weight and also with a higher consumption of fruit and vegetables, but the association with breast cancer has been inconsistent throughout the studies. However, the amount of evidence in favour of the higher vegetable and fruit consumption outweighs the number of studies with inconsistent results. The association of smoking and increased risk of breast cancer has been inconsistent prior to 2002, but later studies have shown that the risks were significantly higher among smokers.

Table 2 Summary of factors associated with increased and decreased risk of breast cancer in 2006 at the time of the data collection by strength of evidence identified from the literature

Level of available evidence found in the published literature has been marked from the lowest '♦ ' to the highest '♦ ♦ ♦ ♦' according to the following criteria:

♦ Unclear evidence or evidence coming from studies with small very specific populations

♦ ♦ Mixed evidence with majority of publications indicating at least some level of association

♦ ♦ ♦ Studies providing strong evidence indicating existence of association

♦ ♦ ♦ ♦ Studies providing very strong evidence indicating at association

Factors associated with increased risk of breast cancer:

- Age ♦ ♦ ♦ ♦
- Early menarche ♦ ♦ ♦ ♦
- Late menopause ♦ ♦ ♦ ♦
- Nulliparity and late pregnancy ♦ ♦ ♦ ♦
- Family history and BRCA mutations ♦ ♦ ♦ ♦
- Use of exogenous hormones: HRT, oral contraception♦ ♦ ♦
- Use of tobacco ♦ ♦
- Use of alcohol ♦ ♦ ♦
- Diet high in fats ♦ ♦ ♦
- X-rays and ionising radiation ♦ ♦ ♦
- High socio-economic status ♦ ♦ ♦ ♦

Factors associated with decreased risk of breast cancer:

- Diet rich in fruits and vegetables (despite the mixed evidence as high fruit and vegetable consumption was widely associated with high levels of antioxidants and general positive influence on health) ♦ ♦
- Appropriate body weight ♦ ♦ ♦
- Increased physical activity ♦ ♦ ♦

2.4. Cervical cancer epidemiology

2.4.1. Incidence and mortality

Cervical cancer originates in the cells of the cervix of the womb. It is often referred to as carcinoma in situ with only localized changes or an invasive cancer that started spreading to other organs (NHS Wales, WHO, 2006). In contrast to other types of cancer, cervical cancer can often be prevented (Alliance for Cervical Cancer Prevention (ACCP), 2004). Its slow progression gives an opportunity to treat precancerous changes if detected early (time to develop invasive cervical cancer has been estimated as approximately 10 years) (ACCP, 2004).

Cancer of the cervix uteri is estimated to be the second most common cancer in women around the world with the most recent estimates of world incidence in 2008 of 530,000. It accounts for 13% of all female cancers (GLOBOCAN, 2008a). The incidence of cervical cancer in Eastern Europe is approximately four times higher than in Western European countries (Friedman, 2011) and such East-West health disparities between Europe have been previously noted by many researchers (Krzyzanowski and Bobak, 1997; Mackenbach, 2006; Zatonski, 2007; Zatonski and Bhala, 2012) and is also reflected in cervical cancer incidence and mortality rates (Bardin et al., 2008; Bobak and Marmot, 1996).

In Poland cervical cancer is the third leading cause of death in women, after breast and lung cancers. In the year 2000 it accounted for approximately 5.4% of all female deaths and survival rates are amongst the worst in Europe (52.2%) (Jokiel and Bielska-Lasota, 2005). Whilst the years 1980-2000 brought a decrease in the incidence (from 25.2 to 20.1 per 100,000 population), the mortality remained practically unchanged (from 10.9 to 10.0 per 100,000 population) (Jokiel and Bielska-Lasota, 2005). Shortly after the implementation of the National Cancer Prevention Program and the introduction of a nationwide cervical cancer screening programme (2006) a noticeable increase in morbidity and mortality was observed. However, since 2008 some decline of absolute numbers of mortality and morbidity since 2009 were reported (Bojar et al., 2012). The estimated crude incidence rate of cervical cancer was lower than previously (19.1 per 100,000) but it was higher than worldwide (15.8 per 100,000) (table 3) (WHO, 2010). Some researchers hypothesized that if that trend continued, incidence would reach approximately 7-8 per 100,000 by 2025 (Didkowska et al., 2009).

Table 3 Incidence of cervical cancer in Poland, Eastern Europe and the World (WHO, 2010)

Indicator	Poland	Eastern Europe	World
Crude incidence rate[1]	19.1	19.9	15.8
Age-standardized incidence rate[1]	12.3	14.5	15.3
Cumulative risk (%). Ages 0-74 years[1]	1.4	1.4	1.6
Annual number of new cancer cases	3,770	31,013	529,828

[1] Rates per 100,000 women per year. Standardized rates have been estimated using the direct method and the World population as the reference.

The crude mortality rate of cervical cancer remained unchanged in 2008 (10.4 per 100,000) which was again higher than that worldwide (8.2 per 100,000) (table 4) (WHO, 2010).

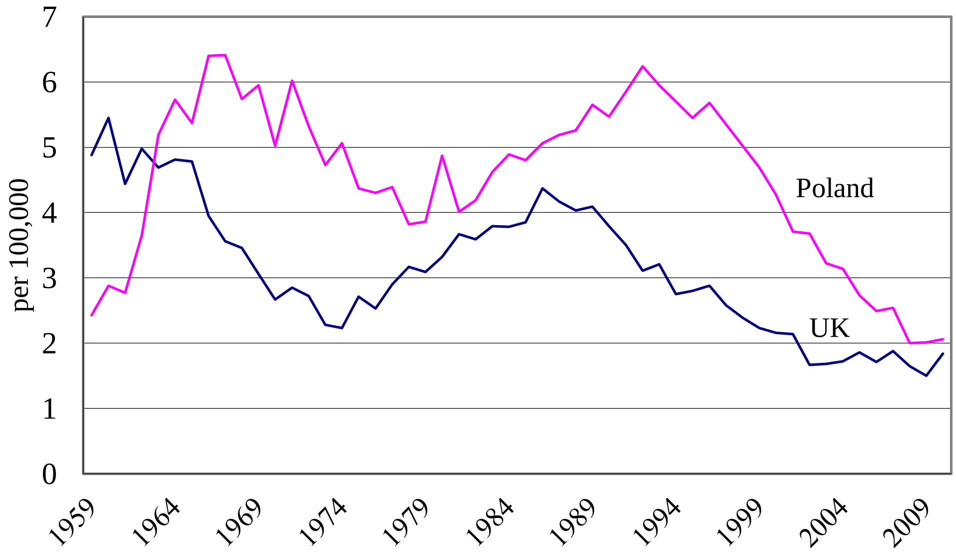
Table 4 Mortality of cervical cancer in Poland, Eastern Europe and the World (WHO, 2010)

Indicator	Poland	Eastern Europe	World
Crude mortality rate[1]	10.4	10.2	8.2
Age-standardized mortality rate[1]	6.2	6.3	7.8
Cumulative risk (%). Ages 0-74 years[1]	0.7	0.7	0.9
Annual number of deaths	2,059	15,817	275,128

[1] Rates per 100,000 women per year. Standardized rates have been estimated using the direct method and the World population as the reference.

Additionally, a comparison of cervical cancer mortality rates between UK and Poland for three age groups was done (20-44, 45-69, and ≥70 years old). Notable widening mortality gap was observed between the two countries in all age groups (Figures 6-8). Before the introduction of the national and centralised call-recall screening system (1988) in the UK, the mortality trends were unstable for 20-44 age group as in 1959 there were 4.9 cervical cancer deaths per 100,000, dropping to 2.9 per 100,000 in 1977 and then increasing again to 4.2 per 100,000 in 1988. After the call-recall system was introduced the mortality started decreasing again to 2.2 per 100,000 in 2000 and then to 1.8 in 2010. In Poland similar trends can be observed in this age group but several years later. In 1992 the cervical cancer mortality peaked at 6.2 per 100,000 but decreased to 4.3 per 100,000 in 2000 and then to 2.06 per 100,000 in 2010.

Figure 6 Comparison of cervix uteri cancer mortality trends 1958-2010 between Poland and the United Kingdom (standardized rates per 100,000 population) for women aged 20-44 (data was sourced from Cancer Mortality Database,WHO, 2012)



In other age groups a much slower mortality decrease in Poland than in the UK resulting in a widening gap between these countries. In the 45-69 age group (figure 5) mortality peaked at 29.2 per 100,000 in 1972 and steadily decreased to 16.8 per 100,000 in 2010. Decrease can be also seen for the 70+ age group (figure 6) but there was larger variation in the rates reported from one year to another peaking at 35.1 per 100,000 in 1974 decreasing eventually to 21.6 per 100,000 in 2010, respectively. In the UK the decrease in mortality over time in those two age groups was more steady and larger than that in Poland. In the 45-69 age group it was the highest in 1968 at 20.2 per 100,000 decreasing steadily to 4 per 100,000 in 2010 and in ≥70 years old group it peaked at 32.7 per 100,000 in 1958 and decreased to 8.6 per 100,000 in 2010.

Figure 7 Comparison of cervix uteri cancer mortality trends 1958-2010 between Poland and the United Kingdom (standardized rates per 100,000 population) for women aged 45-69 (data was sourced from Cancer Mortality Database,WHO, 2012)

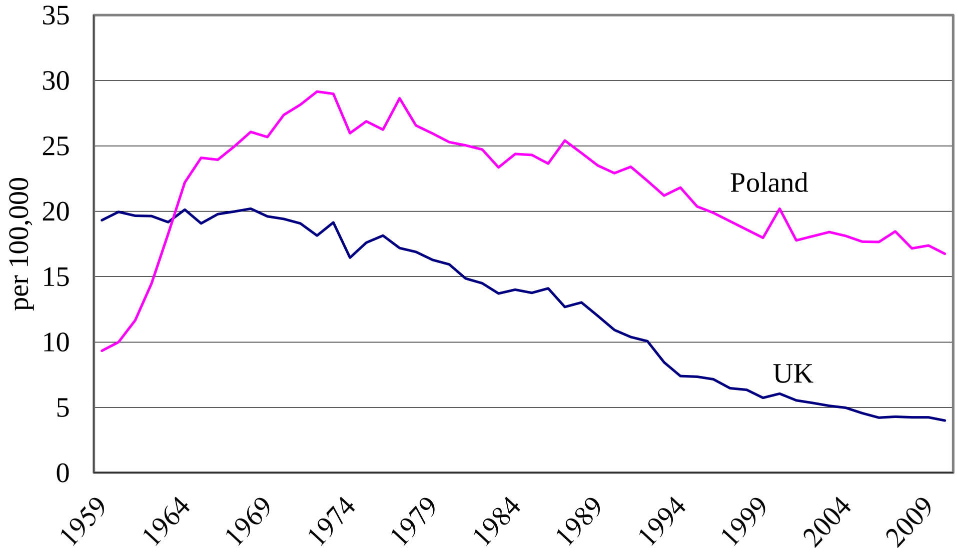
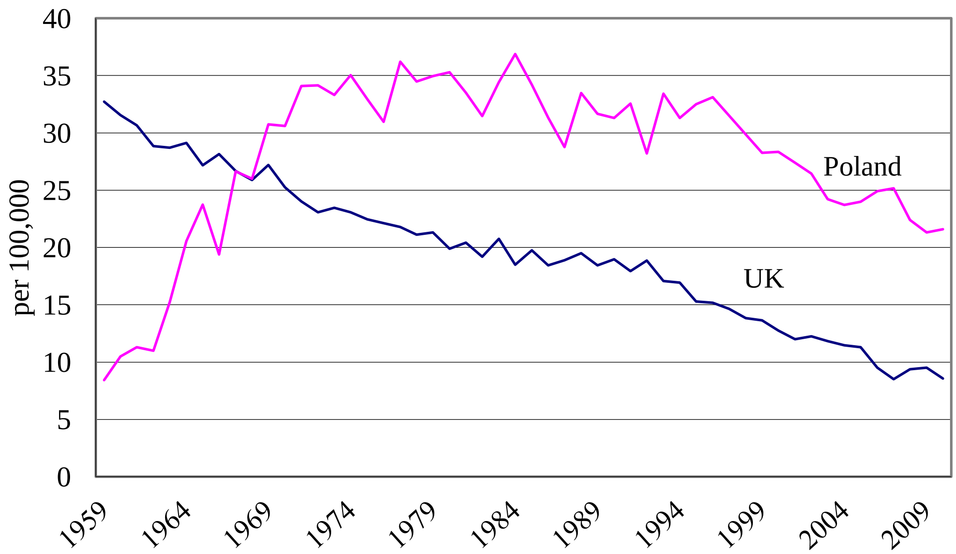


Figure 8 Comparison of cervix uteri cancer mortality trends 1958-2010 between Poland and the United Kingdom (standardized rates per 100,000 population) for women aged 70 or over (data was sourced from Cancer Mortality Database,WHO, 2012)



Mortality due to cervical cancers could decrease as a consequence of decrease in incidence (Didkowska et al., 2009) achieved by introducing screening initiatives as suggested by Nowakowski et al. (2011). Nowakowski noted that in countries with nationwide screening the number of pre-invasive cancers are higher and in situ lower as pre invasive lesions are detected much earlier, get treated and do not progress to the invasive state (Nowakowski and Kotarski, 2011). Similarly, as it was already noted in section 2.3.1 the low mortality rates noted for Poland prior to 1970s may be related to underreporting (Anderson et al., 1994; WHO, 2012c).

2.4.2. Risk factors

2.4.2.1. Human Papilloma Virus infection

It is recognized that the major risk factor for cervical cancer is infection with Human Papilloma Virus (HPV) which may damage the cells of the cervix leading to cervical cancer (Mocarska et al., 2012; NHS Choices, 2011; Bosch et al., 2002). The name HPV stems from the fact that some types cause warts, or papillomas, which are of a benign nature. Many genotypes of HPV have been identified and strains were classified according to their potential to cause cervical lesions as “high-risk” or “low-risk”. Those categories refer to their association with cervical lesions. Pre-malignant or malignant lesions are usually linked to high-risk HPV and benign ones to low risk HPV (Munoz et al., 2003). Among the known variants, more than 40 are transferred from one person the other during sexual intercourse. Symptoms of infection can occur in the genital mucosa, as well as around the anus or mouth but most of them do not produce any symptoms and therefore may remain undetected (Mocarska et al., 2012). More than 118 different HPV types have been identified, and 12 are classified as carcinogens (Arron et al., 2011; de Sanjose et al., 2010). The HPV types most commonly associated with incidence of invasive cervical cancer are 16, 18, 31, 33 (de Sanjose et al., 2010; Smith et al., 2007) and 45 (Mocarska et al., 2012) with HPV 16 and HPV 18 accounting for approximately 70-100% of all cervical cancers (Bosch et al., 1995; Clifford et al., 2003; Smith et al., 2007). In some patients other types (51, 52, 58, and 59) have also been found in addition to the earlier mentioned types (Mocarska et al., 2012).

Transmission of HPV can be passed between heterosexual or same sex partners via genital contact during intercourse (vaginal or anal) but can also be transmitted during oral sex and other genital-to-genital contact (CDC, 2012a). In rare cases, HPV can also be transmitted by a pregnant mother with genital HPV to her baby during delivery, which could potentially cause child to suffer the juvenile-onset of recurrent respiratory papillomatosis (CDC, 2012a; Rombaldi et al., 2009).

Approximately 70-80% of women and men with an active sexual life at some point come into contact with the virus, and the global number of carriers is estimated at 310 million (Castellsague et al., 2009; Mocarska et al., 2012). The incidence of HPV infection is the highest among female 20-30 year olds and the highest attributable cervical cancer incidence occurs in the 5-6th decade of life (Castellsague et al., 2009; Mocarska et al., 2012). Over 99% of all cases of cervical cancer are linked to HPV but despite the HPV infection being necessary for cancer to form not every infected woman will develop it (Liu and Xu, 2012). Only limited studies were found to examine HPV distribution in the Polish female population. One of them by Bardin et al. (2008) showed that HPV prevalence in women living in Warsaw was 16.6% with the highest proportions reported in unmarried women (37.3%) and in the 25–34 age group (24.2%) (Bardin et al., 2008). High-risk HPV types accounted for 11.3%, with type 16 being reported the most frequently (3.7%). High-risk HPV was found with almost all (except one) cervical cancers examined by the researchers and HPV16 accounted for 73% of those infections. Overall 79% of cervical cancers contained HPV16/18 (Bardin et al., 2008). Similar conclusions were reported in a study in another Polish region–Gdańsk that examined HPV prevalence in cervical cancer patients. The researchers found that HPV DNA was reported in 70.1% of cervical cancers without significant differences between different cancer stages (Liss et al., 2002). Another study explored HPV prevalence in CIN1 lesions and found that almost 54% were infected with HPV 16, 21.3% with HPV 33, 16.7% with HPV 18, 10.3% with HPV 31, 8% with HPV 45, and 1.6% with HPV 52 (Kedzia et al., 2010). High prevalence of HPV 16/18 in Poland could mean that a significant proportion of Polish women could be protected with HPV vaccinations (Bardin et al., 2008) (see section 2.5.2).

2.4.2.2. *Age at sexual initiation and parity*

Risks for both cervical squamous cell carcinoma and adenocarcinoma have been linked to high numbers of sexual partners and young age at first intercourse (Cai et al., 2008; International Collaboration of Epidemiological Studies of Cervical Cancer et al., 2007). This can be linked directly to higher probability of exposure to HPV and therefore increased cancer risk during lifetime.

High parity as well as young age (< 17 years) at first childbirth have been found to increase the risk of cervical cancer (Cai et al., 2008; International Collaboration of Epidemiological Studies of Cervical Cancer et al., 2007; Munoz et al., 2002) but it has also been noted that its influence might not to be of great significance in the industrialized populations where the parity tends to be low (Hellberg, 2012).

In Poland, at the time that the data was collected for this study, 21% of 16 year old and 47% of 18 year old Polish girls had initiated their sexual lives and almost 19% had their first intercourse at age 15 or earlier (UNDP and Ministerstwo Zdrowia, 2007). 13.1% of 16-18 year old girls had had three or more sexual partners in the past but majority had one (70%) (UNDP and Ministerstwo Zdrowia, 2007). Average age of women at first childbirth was 27.1 years old (UNDP and Ministerstwo Zdrowia, 2007) and the adolescent parity accounted for approximately 16% (International Conference on Population and Development, 2012). On average Polish woman aged 15–49 had 1.25 children (UNDP and Ministerstwo Zdrowia, 2007) which is lower than an European average of 1.5 births per woman (Ezeh et al., 2012).

2.4.2.3. *Viral infections and immunosupression*

Many other environmental and endogenous risk factors, often associated with social or lifestyle factors, have been associated with cervical cancer in conjunction with presence of HPV. For example frequent viral infections with Chlamydia trachomatis or Neisseria gonorrhoeae or herpes (HSV2, herpes simplex virus) occurring in HPV infected women are more often linked to cervical cancers, as they cause cervical inflammations that involve extensive tissue remodelling, disturbing the normal cervical tissue cycles (please refer to Paavonen, 2011; Sales and Katz, 2012). Also Human Immunodeficiency Virus (HIV) and immunodeficiency caused by other reasons (i.e. pharmacotherapy) have been found to increase risk of the cervical cancer in HPV positive women due to the fact that immunosuppression weakens body's defences against cancer (Mocarska et al., 2012).

2.4.2.4. USE OF EXOGENOUS HORMONES

Multiple studies have also linked exogenous hormones such as use of OC with the increased risk of cervical cancer (Castellsague et al., 2006; McFarlane-Anderson et al., 2008; International Collaboration of Epidemiological Studies of Cervical Cancer et al., 2007). Smith et al. (2003) conducted analysis of 28 studies that included 12,531 women with cervical cancer and concluded that the risk of cervical cancer was increased with longer use of oral contraceptives (Smith et al., 2003). Later studies confirmed those conclusions by comparing women who have used OCs within the last decade to never-users, and found the users had a significantly increased risk of developing cervical cancer (Urban et al., 2012; Parkin, 2011). It is worth noting that the risk of developing cervical cancer is increased in patients taking OC for more than five years but after 10 years and discontinuation the risks are significantly reduced (Urban et al., 2012).

2.4.2.5. OTHER LIFESTYLE FACTORS

Tobacco use, especially in women positive for HPV, has been also reported as one of the factors associated with increased risk of squamous cell cervical cancers (Munoz et al., 2002, International Collaboration of Epidemiological Studies of Cervical Cancer (ICESCC) et al., 2007; DeVita Jr et al., 2011b) but not in the adenocarcinomas (ICESCC et al., 2007). The risk is especially high amongst current smokers (ICESCC et al., 2007). Gunnell et al. (2006) demonstrated that HPV infected smoking may pose a 27-fold risk increase (Gunnell et al., 2006). Also in a recent meta-analysis conducted by Zeng et al. (2012) it was found that second-hand smoke can be an important risk factor for cervical cancer and that non-smoking women who were exposed to so called ”passive smoking” when compared to unexposed women had a 73% higher risk of experiencing a cervical cancer (Zeng et al., 2012). It is thought that the substances formed during smoking impair resistance to oncogenic factors (similarly to immunosurppressed patients) and facilitate the HPV viral replication. Researchers hypothesised that the increase in numbers of young female smokers might be in part responsible for the increase of cervical cancer incidence (Kwasniewska et al., 2002; Moscicki et al., 2001; Plummer et al., 2003). This can be particularly important in Poland where approximately a third of the adult female population smokes (Zatonski et al., 2012; UNDP and Ministerstwo Zdrowia, 2007).

2.4.2.6. Socio-economic factors

Low socio-economic and educational statuses have been found to predict higher rates of cervical cancer. Women with lower socio-economic status are less likely to have access to and attend screening and therefore the precancerous changes might not get detected in time and result in a neoplasm (Mocarska et al., 2012). Similarly, those women are more likely to have nutritional deficiencies (i.e. folic acid), especially of foods rich in antioxidants having protective qualities on the immune system that might protect against cancer. This may be supported by the fact that over 80% of all cervical cancers occur in developing countries (WHO, 2005). Lower educational status has been also identified as the predictor of increased risk for cervical cancer due to the fact that women with lower finished education tend to initiate their sexual life as well as give birth at younger age than those with higher education (Parikh et al., 2002; Braaten et al., 2005;Franceschi et al., 2009).

2.4.2.7. Summary of cervical cancer risk factors

It is now confirmed that the biggest risk can be attributed to HPV infection which has been classified by the potential to cause cervical lesions as “high-risk” or “low-risk”. The majority (99%) of cervical cancer cases of all cases are HPV positive but it has been stipulated that there must exist other cervical cancer risk factors since not every HPV infected woman develops it (Liu and Xu, 2012). Those risks are linked to high numbers of sexual partners and young age at first intercourse, high parity, as well as young age (<17 years) at first childbirth.

Other factors may include immunosuppression (e.g., HIV infection, chemotherapy), frequent infections with: Chlamydia trachomatis, Neisseria gonorrhoeae or herpes (HSV2, herpes simplex virus), use of exogenous hormones such as oral contraception, use of tobacco and low socio-economic status.

Table 5 Summary of factors associated with increased risk of cervical cancer in 2006, at the time of the data collection

Level of available evidence found in the published literature has been marked from the lowest '♦ ' to the highest '♦♦♦♦' according to the following criteria: ♦ Unclear evidence or evidence coming from studies with small very specific populations ♦♦ Mixed evidence with majority of publications indicating at least some level of association ♦♦♦ Studies providing strong evidence indicating existence of association ♦♦♦♦ Studies providing very strong evidence indicating at association *Factors associated with increased risk of cervical cancer:* • Infection with HPV♦♦♦♦ • Immunosupression and repeat infections with Chlamydia trachomatis Neisseria gonorrhoeae or herpes♦♦♦ • Early age at sexual initiation, high number of sexual partners and multiparity ♦♦♦♦ • Use of exogenous hormones: oral contraception ♦♦♦ • Use of tobacco ♦♦♦♦ • Low socioeconomic status ♦♦♦

2.5. Cancer prevention and detection

Effectiveness of healthcare systems can be measured by cancer survival (Coleman et al., 2011). The regional and international differences in cancer survival show the level of avoidable mortality and help to guide or promote development of initiatives against cancer (Coleman et al., 2011). WHO (2011) promotes breast cancer control with national cancer control programmes as an integrated part of non-communicable disease prevention and control. Many types of medical screening programmes are used around the world. They include screening for disease carriers, early stage disease, or screening for predisposition to diseases. The term ‘screening’ used in this thesis refers to the use of diagnostic tests such as mammography or cytology/Pap smears among healthy populations to identify individuals with the disease who might not have developed symptoms yet (WHO, 2011). Screening types include: organised population based often nationwide or opportunistic/spontaneous screening programmes (Hakama et al., 2008). Successful screening programmes should be accurately planned, population based, sustainable and targeted at the correct population (Yip et al., 2008). An ideal screening test should be highly sensitive in reducing false negative results and highly specific to decrease false positive results (Hakama et al., 2008) although achieving these two parameters at the same time might be difficult, as increasing one might cause a decrease in the other (Yip et al., 2008). Sensitivity and specificity have an influence on positive and negative predictive values–the proportion of patients testing positive with the condition or negative without the condition (Yip et al., 2008). It should also cover the whole population of patients meeting the eligibility of the screening living in the target area (Cancer Research UK, 2011; Cancer Research UK, 2009).

Screening has many advantages and among them: better prognosis for some patients, less invasive treatment in early stages, reassurance for patients with negative results (Byrd et al., 2007; Chamberlain, 1984; Todorova et al., 2006; WHO, 2011a). However, it may result in unfavourable outcomes such as: potential overtreatment of benign changes, cost to the health care system, false reassurance in the case of false positives, include embarrassment, interpretation ambivalences, creating a sense of “embodied risk”, psychological consequences of inconclusive results, blaming of non-attendees, false alarms, false reassurance, unnecessary biopsies, over-diagnosis, and over-treatment (Byrd et al., 2007; Chamberlain, 1984; Todorova et al., 2006; WHO, 2011a). Breast and cervical cancer screening are discussed in greater detail in the further sections (2.5.1-2.5.4).

2.5.1. Breast cancer prevention and detection

Early detection of breast cancer is crucial to improve its outcomes and overall survival (Anderson et al., 2008). Even though various methods are being used for breast cancer screening including: BSE, clinical examinations by physician, ultrasound, mammography, magnetic resonance imaging (MRI), and DNA testing (Allen et al., 2010; Maria Skłodowska-Curie Memorial Cancer Centre and Institute of Oncology, 2006; Ekiert et al., 2011) opinions vary as to which combinations of screening techniques are the most effective for identifying breast cancer (Chiu, 2002; Thornton and Pillarisetti, 2008). None of the screening examinations have a sensitivity of 100% and especially BSE has been questioned as a method of breast cancer detection (Allen et al., 2010). It has been highlighted that women need to be clearly informed about the inadequacy of BSE as part of screening (Chiu, 2002; Thornton and Pillarisetti, 2008). Nonetheless, BSE is still frequently perceived and recommended as a tool raising breast cancer awareness through empowering women to take responsibility for their own health (Thornton and Pillarisetti, 2008; Allen et al., 2010; WHO, 2011b).

Mammography is the most common detection method used in organised mass breast cancer screening programmes and since the early years of screening there have been substantial improvements in screening methods (Blanks et al., 2002; Advisory Committee on Breast Cancer Screening, 2006). Mammographic screening sensitivity, in particular for small invasive cancers, was improved as a result of the increased use of two view mammography, higher film densities, and the increasing experience of radiologists (Blanks et al., 2002; Advisory Committee on Breast Cancer Screening, 2006). Mammographic screening is effective in decreasing breast cancer mortality by up to 30% in women over the 50 years old (Nystrom, 1993; Shapiro, 1998; IARC, 2002; IARC, 2008; Gotzsche and Nielsen, 2011; Tria Tirona, 2013) but its benefit versus potential harms has been extensively debated (Independent UK Panel on Breast Cancer Screening, 2012; Gotzsche and Nielsen, 2011). A Cochrane review by Gøtzsche and Nielsen (2011) reviewed randomised trials and concluded that due to differential cause of death misclassification breast cancer mortality was an unreliable outcome. Adequately randomised studies (N=3) failed to produce conclusive evidence of mortality reduction due to screening but the sub optimally randomised (N=4) produced significant results of reduced mortality. Risk ratio for all of the trials was 0.81 (95% CI 0.74-0.87) and authors stated that it is likely to achieve breast cancer mortality reduction (15%) through screening. It was also noted that screening leads to over diagnosis in 30% and therefore it may result in over treatment (Gotzsche and Nielsen, 2011). Over diagnosis has been stipulated to be one of the most significant screening harms as it happens due to small cancers being detected early resulting in higher incidence being reported (Independent UK Panel on Breast Cancer Screening, 2012). If some of the smaller cancers are not found through the screening they might never progress substantially before the woman dying for another reason never knowing of the existence of her cancer. Various prospective randomized studies demonstrated the lack of a high benefit from screening women younger than 50 and several potentially harmful screening outcomes such as radiation exposure, over diagnosis, lead time, higher number of false positive results in younger women, and costs) (Jatoi and Miller, 2003; National Institute of Health (NIH) Consensus Statement, 1997; Primic-Zakelj, 1999; Nelson et al., 2009). Other studies also confirmed that 40 to 49 year old women have also more false-positive results than other age groups (Nelson et al., 2009; Gotzsche and Nielsen, 2011). Similarly the latest literature review by Kerlikowske (2012) pointed towards the fact that even though after a period of 10 years of regular participation in screening women aged 40-49 years old benefit from a 15% decrease of breast cancer risk, the absolute benefit is small and the potential harms do not outweigh the benefits (Kerlikowske, 2012).

Following these controversies an Independent UK Panel on Breast Cancer was assembled to conduct a meta-analysis using data from good quality international clinical trials and observational studies to summarise the available evidence on the benefits and harms of breast cancer screening. They estimated, that the RR of breast cancer mortality was 0·80 (95% CI 0·73—0·89) for women invited to screening, versus controls, meaning that the RR of mortality reduction was 20% (Independent UK Panel on Breast Cancer Screening, 2012). The Panel highlighted that it is not possible to assess the over diagnosis in each individual and in reality only approximately 1% of women aged 50-52 years that get invited for screening would have experience of an over diagnosis in the next 20 years (Independent UK Panel on Breast Cancer Screening, 2012).

In addition to, or instead of mammography an MRI may be proposed to women at high risk of breast cancer (carrying BRCA 1/2 mutations or having as strong family history of breast cancer) but it was highlighted that woman’s age should be considered when offering MRI (NCCPC, 2006) (for more information on BRCA 1/2 and family history please refer back to section 2.3.2.2). It was proposed that Polish women aged 20-49 years old who have BRCA1/2 mutation or TP53 mutation should be offered MRI annually (Maria Skłodowska-Curie Memorial Cancer Centre and Institute of Oncology, 2006; Nienartowicz, 2011). Polish Union of Oncology summarised guidance on breast cancer screening stating that in addition to mammography (or ultrasound for women with higher density breast tissue) every 2 years for ages 50-69 and clinical breast examination every year for women over 40 years old, BSE is also recommended to be performed every month by women of all ages (Jassem et al., 2011).

The resources for routine screening mammography initiatives are often not available in low and middle income countries (such as Poland) and the disease is often diagnosed in its late stage (Tfayli et al., 2010; Yip et al., 2008). This was also the case for Poland prior to 2006 despite sporadic presence of breast screening activities that were conducted mostly spontaneously among various populations and by different governmental or private organisations (i.e. first opportunistic local cervical screening initiative started in 1970s in Białystok) (Łoś, 2006). It is therefore difficult to quantify the coverage of such campaigns and the only attempt can be made through conducting surveys, such as the one used in this thesis.

Currently, despite the ongoing screening programme the uptake numbers are still much below desirable levels (acceptable rate of screened women is >70% and desirable >75%) (Szewczyk, 2011) as only 31%-39.8% of Polish women are taking up mammography (Madej et al., 2010; Central Statistical Office of Poland, 2012c). Therefore many lessons can be learnt from countries where the world’s first national breast screening programmes were set up many years ago (i.e. UK). Success of the screening programme can be assessed not only by achieving high coverage but also by studying the mortality decrease which has been seen for many countries with ongoing mass screening initiatives (Shapiro et al., 1998; GLOBOCAN, 2008a; Advisory Committee on Breast Cancer Screening, 2006). Additionally the positive effect of screening can be also seen through an increase in incidence of early stage and in situ breast cancers and a decrease in the incidence of late stage malignant neoplasms and therefore reduced mortality since women present with earlier, less aggressive tumours (McCann et al., 1998; Hakama et al., 1997; Tabar et al., 1992; Kricker et al., 1999; Autier et al., 2010). Evidence shows that between 1989 and 2006 mortality was reduced by more than 20% in 15 countries. For example England and Wales, Northern Ireland, and Scotland had the largest decreases in mortality (35%, 29%, and 30% respectively) in 1989 (Autier et al., 2010) and throughout the life of the UK programme (since 1988) over 100,000 cancers were found (100 cancers per week) (NHS, 2013; NHS Breast Screening Programmes, 2008). Conversely, in Central and Eastern Europe such a decline was not present (i.e. Poland), with some countries experiencing even an increase of deaths due to this cancer (i.e. Romania) (Autier et al., 2010).

Women who are entitled to free mammography in Poland are those who are 50-69 years old, who have not had a mammography done in the past 24 months or those who have been invited in writing after 12 months from the previous mammography (Narodowy Fundusz Zdrowia (NFZ), 2011b). Women can participate in this form of screening not only by invitation but they may choose to request a test from their physician who will assess their screening needs (Narodowy Fundusz Zdrowia (NFZ), 2011b).

Table 6 Comparison of the main features of breast screening programmes in Poland and United Kingdom

	Target screening population	**Screening location**	**Screening procedures**	**Screening personnel**	**Uptake rates**	**Note**
UK	50-70– screened every 3 years; or by doctor’s indication	Patient's local clinic, hospital or mobile screening unit	Mammogram, clinical breast examination & BSE as a part of breast awareness programme	Physician/ specialist breast nurse	2010 - 77%†	Programme is currently being extended to invite women in their late 40s and up to 73 years
Poland	50-69 – screened every 2 years; younger, older or women from a higher risk group by doctor’s indication	Patient's local clinic, hospital or mobile screening unit	Mammogram, clinical breast examination & BSE	Physician	2009 -31%‡ 2009 -39.8%¥	National rollout since 2006

†NHS/HSCIC, 2010a*;* ‡Madej et al., 2010; ¥(Central Statistical Office of Poland, 2012c)

2.5.2. Cervical cancer prevention and detection

In most countries diagnosis of changes in the cervix is done with the use of traditional screening methods of molecular biology via cervical Papanicolaou test (Pap) (Everett et al., 2011). During the test some of the cervix tissue is removed with a special brush and checked under a microscope (Gheit et al., 2007; Gershenson and Ramirez, 2008). However, concerns have been raised on the low sensitivity of the conventional Pap test as its estimates vary greatly between studies (30%-87%). Specificity was found to range from 86% to 100% (Nanda et al., 2000; Sasieni et al., 1996; Agency for Healthcare Research and Quality, 2011). More sensitive HPV detection methods, such as the HPV DNA testing have been proposed to increase efficacy of cervical cancer screening programmes (Hong et al., 2009), however Poland is still using the Pap test as a screening method (Spaczyński et al., 2009).

Regular screening of all women at risk helps to detect those with an increased risk of developing an invasive cancer through an early treatment of pathological changes (NHS Cancer Screening Programmes, 2008). Cervical screening programmes including organised and opportunistic (i.e. screening of patients hospitalised for different reasons) types have been showed to decrease incidence and mortality from cervical cancer, and it has been previously observed that population based cancer screening initiatives tend to achieve higher attendance rates than those with opportunistic ones which might miss women at the highest risk of developing the disease (Anttila et al., 2009; Palencia et al., 2010; van der Aa et al., 2008). Numerous members of the European Union (e.g., Czech Republic, Estonia, others) either already have, or are in the process of introducing population-based cervical cancer screening programmes, but some of them need to improve the quality and coverage of screening (Anttila et al., 2009; van der Aa et al., 2008; OECD, 2012).

Benefits of population based nationwide cervical cancer programmes can be further supported by the example of screening in the UK, which prior to national rollout of its population based screening in 1988 was largely ineffective (Quinn et al., 1999; NHS Cancer Screening Programmes, 2008). At least two thirds of women with invasive cervical cancer had never been screened because most of the cytological tests were performed on women presenting for gynaecological, obstetric, or contraceptive reasons (Quinn et al., 1999; NHS Cancer Screening Programmes, 2008). The current success of screening has been achieved partially due to the use of a call and recall system which helped to keep track of any follow-ups and, in case the results of the smear appear normal and such approach could be also considered in other countries (Buehler and Parsons, 1997; Torres-Mejia et al., 2000) as well as high (>80%) average coverage reaching approximately 80 per cent (NHS Cancer Screening Programmes, 2008). Additionally, the NHS screening system offered incentives in a form of payments to general practitioners and the first external quality assessment schemes for laboratories, resulting in great improvement of its performance (Quinn et al., 1999; NHS Cancer Screening Programmes, 2008). Currently, approximately 4,500 lives are saved each year (approximately 64 million to date) and around 75% of cancer cases are prevented in women who attend regularly (Sasieni et al., 2003; NHS Cervical Screening Programme, 2012). Sasieni et al. (2003) estimated that single negative smear in the UK in the years 1990-2001 offered substantial protection against cervical cancer equalling to 41% for 20-39 age group, 69% for women aged 55-69 years old who attended screening every 3 years (table 7) (Sasieni et al., 2003).

Table 7 Percentage of Preventable Cancer - Protection offered by a single negative smear in UK between 1990-2001 (Sasieni et al., 2003)

Screening interval group	**20-39 years**	**40-54 years**	**55-69 years**
3-yearly screening	41%	69%	73%
5-yearly screening	30%	63%	73%

Women aged between 25 and 64 are provided with targeted cervical screening tests free of charge every three to five years depending on their age (CRUK, 2009; NHS Cancer Screening Programmes, 2008). Although the lower screening age limit is 25, following the death of the UK–Big Brother television celebrity Jade Goody, who died in 2009 from cervical cancer, a heated national debate on lowering the cervical screening age began (Metcalfe et al., 2011). However, there are frequent false positives, and low incidence rates of this cancer in women younger than 25 years old and therefore no extended screening is indicated for that age group (CRUK, 2009).

Similarly, Finland introduced an organised cervical screening programme (with a 5-year screening interval) in 1963 and extended it to the whole country by the 1970s. From the early 70s coverage exceeded 80%, later reaching 90% (i.e. at least 1 smear made per female) and 98% of women had been screened at least once in their lifetime (Van der Aa et al., 2008). The introduction of this programme resulted in a 50% reduction in cervical cancer mortality by the early 70s later reaching about 80% decrease in both mortality and age-adjusted mortality (Anttila and Nieminen, 2007).

In Poland, the national cervical cancer screening programme was introduced in 2006 in response to an unfavourable epidemiologic situation, as approximately half of women diagnosed with cervical cancer would die from it (Spaczyński et al., 2010). Prior to the national rollout, cervical cancer screening was scarce, opportunistic, and restricted to only small mostly urban districts (Bardin et al., 2008).

Following the Council of the European Union recommendations (Council of the European Union, 2003) the Polish Ministry of Health, with the National Health Fund of Poland and the Polish Gynaecological Society, developed a National Population Based Cervical Cancer Screening Programme targeting (by postal invitation) women aged 25 to 59 to be invited for screening (Bardin et al., 2008; Spaczyński et al., 2010). In the first few years of the programme (2007-2009) a slow increase in rates of screened women was observed. In 2007, the first year of the national rollout, 21.3% of eligible women were tested, in 2008 there were 24.4% and in 2009 over 26.8% of women undertook the cervical cancer screening (Spaczyński et al., 2010). This means that the programme was still far behind countries with long history of population based screening (i.e. UK or Finland, please refer to table 8 below).

Table 8 Comparison of the main features of cervical cancer screening programmes in Poland, UK and Finland

	Age of target population	Screening location	Screening procedures	Screening personnel	Uptake rates
Poland	25–59– screened every 3 years (or more frequently); <25 or > 59 on request.	Gynaecology clinic	Liquid based cytology	Gynaecologist	2007–21.25% † 2008–24.39% † 2009–26.77% † 2009–76.7% (uptake ever) €
UK	25–49 – every 3 years; 50–64 – every 5 years.	Patient's local general practice	Liquid based cytology	Nurse or physician	2008/9 –78.6%‡
Finland	30-60 - every 5-years	Patient's local health care centres	Liquid based cytology	Trained nurses (midwives)	2004–72% (90% including additional opportunistic screening) ¥

†(Spaczyński et al., 2010); ‡(NHS, 2009);¥(Van der Aa et al., 2008); €(Central Statistical Office of Poland, 2012c)

Poland and other Eastern European countries introducing screening could draw from experiences of countries with much greater screening experience (Holland et al., 2006) by learning from the positive and negative experiences. For example, as mentioned previously it has been demonstrated that call-recall system improved the screening uptake in the UK.

Currently, cervical cancer screening in Poland is always conducted in public or private gynaecology clinics and is accessible to women without a referral, cost free, from their general practitioner (Narodowy Fundusz Zdrowia (NFZ), 2011a) (see Appendix 1 for programme information leaflet). Women aged 25-59 who have not had a cytology conducted within 3 years receive a postal screening invitation with a proposed appointment date or alternatively they can go to their gynaecologist directly and request for a test. Women from high risk groups (HIV, HPV, immunosuppressed etc.) that may be more prone to developing cervical lesions might be advised by their physician to attend cytology every 12 months (NFZ, 2011a) (for description of viral and immunosupression risk factors see section 2.4.2.3). Women who are outside the screening recommended age range can also undergo cost free cervical screening through a referral from their gynaecologist (NFZ, 2011a).

In 2008, after the role of HPV in the formation of cervical cancer was demonstrated by Nobel Prize Laureate Harald zur Hausen, a prophylactic vaccine against several of the most aggressive strains was developed (Mocarska et al., 2012). Currently, two HPV vaccines exist: Cervarix (produced by GlaxoSmithKline) and Gardasil (produced by Merck) (CDC, 2012b). These vaccines are made of HPV-like particles that are non-infectious and offer a new way of the cervical cancer prevention (CDC, 2012b; Mocarska et al., 2012). Both of these vaccines protect against two HPV types: 16 and 18 most commonly associated with cancers of cervix, vulva, vagina, penis, anus and oropharynx (Khalid et al., 2011). Gardasil additionally covers types 6 and 11 (CDC, 2012b). CDC (2012) highlighted that HPV vaccine is a strong preventative measure and it is safe and in protecting both women and men the most common HPV types (CDC, 2012b). Both vaccines are currently available in Poland (Gardasil is registered under name of Silgard) (Mocarska et al., 2012) but none of them is on the list of refunded medicinal products (Dziennik Urzędowy Ministra Zdrowia, 2012).

While these vaccines give hope for reducing cervical cancer incidence there is a growing controversy around this new method because of the numerous reports of complications associated with those vaccines (Mocarska et al., 2012) such as pain, bruising, swelling at the injection site and fainting (Brankovic et al., 2013) and in some cases suspected serious disabilities or death (Tomljenovic et al., 2013). Irrespective of the creation of the vaccine, there is need for effective screening methods as the vaccine does not work for all HPV types and does not cover women prior to exposure to the virus (CDC, 2012a). Vaccine therefore will not eradicate the disease, but merely decrease its extent in the population (Garland, 2009) and the effective population based screening programmes are needed, especially in countries with high mortality from cervical cancer such as Poland and other countries in Eastern Europe (WHO, 2010).

2.5.3. Inequalities in cancer and cancer screening

Systematic morbidity and mortality inequalities exist in the population of every country, also including those with a high development index (e.g., UK, Netherlands, or Sweden) (Mackenbach, 2012; Mackenbach, 2006). The aim of cancer screening programmes is to decrease mortality rates by detecting cancers at an early stage by providing an early, less invasive treatment intervention (Mauad et al., 2009). However, unequal access to, and quality of health care including cancer prophylaxis might result in health inequalities (Marmot et al., 2012; Van der Meer and Mackenbach, 1998). The relationship between income inequality and health status has been well established (Chiu, 2003; Damiani et al., 2012). Socio-economic differences may result in unequal access to and uptake of breast and cervical cancer screening especially in countries without population-based cancer screening programmes (Palencia et al., 2010). Additionally, lower levels of education have been typically associated with lower screening uptake (Sabates and Feinstein, 2004). It has been suggested that individuals' social interactions, place of habitation, and psychosocial characteristics, all have an effect on a patient's health outcomes (Martikainen et al., 2002; Chiu, 2003). Many of these inequalities, within and between countries, are caused by inequalities in the social conditions in which people live and work (Irwin et al., 2006). These determinants have an impact on patients' wellbeing. Tackling the underlying causes of poor health and understanding the problem can contribute to improving health and health equity (Feachem, 2000).

There is a growing body of theoretical and empirical work that explores the relationships between health inequalities and place of habitual residence (Mackenbach, 2012, Popay et al., 2003). Often those health differences are discussed in the context of the populations living in different countries, regions or even as being part of different social classes. For example many researchers discussed significant mortality and morbidity health differences between Central/Eastern and Western Europe (Adeyi et al., 1997; Bobak and Marmot, 1996; Carlson, 1998; Pardell et al., 2001; Zatonski and Bhala, 2012) often explaining them by the fact that Central/Eastern Europe was subject to substantial transition from communism to democracy (Adeyi et al., 1997; Wroblewska, 2003). Others noted health variations between regions of the same country, as for example breast cancer incidence varying between women from different socio-economic groups with higher rates among women with lower socio-economic status (Bray et al., 2004). This can be partially related to the fact that those from lower socio-economic groups are more likely not to take up the screening (Bray et al., 2004). For example Doran et al. (2004) pointed towards the widely discussed term of 'North South', divide referring to health inequalities between Northern and Southern parts of Britain which they hypothesised was due to differences between social classes and the level of deprivation (Doran et al., 2004). Similarly, the Report of the Nuffield Council on Bioethics (2007) mentioned a great variation in health risks, health-related behaviours, physical and mental health, and life expectancy between different social groups. The report stated that the lower health related indices have been linked to lower socio-economic status, female gender, being from racial or ethnic minority, living in places with lower degree of urbanisation (Nuffield Council on Bioethics, 2007). Also religious views have been found to influence heath outcomes and health beliefs as for example the level of alcohol or other addictive substances use can depend on persons' religious views (Nuffield Council on Bioethics, 2007).

It has been noted that inequalities in screening uptake of both programmes can be associated with being from an ethnic minority as these women may have different access to screening, lack of availability of screening advertisements in their language as well as potentially differing frequency of screening recommended by their physicians (Rodriguez et al., 2005; Scanlon et al., 2006; Thomas et al., 2005; Glick et al., 2012; Consedine et al., 2004; Tavafian, 2012). For example a study conducted in the U.S.A. by Consedine et al. (2004) found that women from different ethnic backgrounds in migrant communities have notably different attitudes towards screening. They noted that in particular Eastern European women reported fewer mammograms than other ethnic groups (Consedine et al., 2004). However, ethnicity as a factor for health or health outcome inequalities would not play a significant role in ethnically homogenous societies such as Poland, or many of the other former Soviet bloc states (Vojtěch, 2010). It has been estimated that only 3% of inhabitants of Poland constitute ethnic minorities (EURYDICE, 2012). Only Polish nationals having personal identification number were included in the data analysed in this thesis (please see 3.3 section).

The type of screening programme (opportunistic vs. population based) has been previously found to be associated with differences in health outcomes. For example Palencia et al. (2010) found that most of the breast and cervical cancer inequalities in Europe are found in countries with opportunistic screening rather than population based initiatives (relative inequality indices (RII) for cervical cancer; and RII=3.11, 95% CI 1.78–5.42 for breast cancer) (Palencia et al., 2010). Over the past two decades, WHO created the Commission on Social Determinants of Health (2005-2008) and developed community based initiatives to provide guidance for government to improve patients' health, health related education and the quality of the services enhancing the status of women and their role in the health of families (Commission on Social Determinants of Health, 2008; Irwin et al., 2006; Marmot et al., 2012). In order for health screening to be effective and efficient a significant part (>70%) of the population has to participate in it (Mauad et al., 2009; Szewczyk, 2011). Reduction of morbidity and mortality through the uptake of screening programmes requires the constant engagement of professionals involved in the screening and reaching the populations at risk (including women that might live in remote rural locations) (Mauad et al., 2009). Fister and McKee (2005) noted that many citizens of transitional regions such as Poland still remain insufficiently involved in decisions about their health care (Fister and McKee, 2005). Abbott et al. (2006) hypothesised that health risk behaviours tend to be linked with an inclination of patients to rely on the state to care for their health instead of accepting responsibility for their own health decisions (Abbott et al., 2006). For example, European Commission (2012) found that Eastern European patients find themselves discouraged from involvement in their health care and lacking control over it if the physician does not spend (in their opinion) sufficient time on consultation (European Commission, 2012). They also look for more partnered interaction with their health provider and expressed the need to receive more comprehensive information. However, due to the superiority of physician’s experience and knowledge the Eastern European patients are more likely to give high control of their health to their physician and are less aware, than their counterparts from other member states, of the opportunities to take control of their own health (European Commission, 2012).

Patient involvement in their own health care can be as important as good centralised screening systems (Fister and McKee, 2005) and in order to encourage patients to effectively participate in their care by participation in cancer screening many cultural, behavioural and socio-economic factors have to be addressed (Bobak et al., 2000; Fister and McKee, 2005). Understanding the characteristics, needs, beliefs, and perceptions of people living in different communities and with various levels of income is one of the steps to create comprehensive health programmes and policies because perceptions often reflect the attitudes towards health and are an important element of social exclusion or inclusion (Bullock, 1999, Lott, 2002).

2.6. Determinants of breast and cervical screening

Determinants of breast and cervical cancer screening uptake have been frequently discussed side by side as similar factors tend to be influence both of them (Jepson et al., 2000; Threlfall and Fazil, 2009; Gonzalez et al., 2012). Several studies have explored issues related to screening attendance and shown that breast and cervical screening attendance can be linked to factors such as: age, previous attendance, social status, health insurance coverage, ethnicity and religion (Singh and Badaya, 2012; Threlfall and Fazil, 2009). Also numerous beliefs, perceptions and attitudinal factors have been linked with variance in the uptake of screening.

An earlier comprehensive literature review conducted by Jepson et al (2000) for the needs of the Health Technology Assessment (HTA) on the determinants of screening uptake grouped the determinants of breast and cervical screening uptake under common headers. These headers were adapted for the needs of this thesis to provide a guided overview of the most important determinants of breast and cervical cancer screening uptake. However, some of the determinants described below may have been allocated to several of these headers (for example recommendation and support of physician could be listed as both the facilitator and social influence).

The determinants have been divided into the below groups:

1) Socio-demographics (e.g., age, gender, education, income, ethnic origin, employment status, rural vs. urban setting).

2) Knowledge, behaviours and other factors related to breast and cervical cancers (e.g., knowledge of disease and screening test, past screening behaviour and attendance for tests, perceived seriousness of disease or condition).

3) Barriers and facilitating conditions (e.g. lack of transport, costs involved in attending screening, inconvenience i.e. difficulty in access, embarrassment, fear of finding test positive, fear of pain or discomfort of test procedure, recommendation by physician or other healthcare professional).

4) Social influences (knowing someone with the disease or condition, support of family, friends or significant others, support of physician or other healthcare provider, membership of a club, church or other organization, knowing someone who has been screened).
5) Health status (family history of the disease or condition, experiencing symptoms of the disease or condition, number of previous visits to doctor, self-reported health status, able to perform activities of daily living).

2.6.1. Socio-demographics

Numerous studies have examined the relationship between socio-economic and demographic factors and the uptake of breast and cervical screening tests, as the characteristics of the screened population may influence the effectiveness and uptake of the screening programme (Lorant et al., 2002; Damiani et al., 2012; Damiani et al., 2011; Wells and Roetzheim, 2007; Garrido-Cumbrera et al., 2010; Palencia et al., 2010). Factors such as: older age (>50 for breast cancer), lower education, lower economic situation (incl. higher level of deprivation) being single or divorced, belonging to ethnic minority or living in a rural location, have been widely discussed as having a positive association with lower uptake of breast and cancer screening (Chiu, 2004; Sutton and Rutherford, 2005; Thomas et al., 2005). The most important determinants of breast and cervical cancer screening uptake are discussed in greater detail in the following sections.

Age

Differences between different age-groups in the uptake of cervical screening have been noted previously (Cancer Research UK, 2011). Young women in their 20s and 30s who decide not to attend cervical screening often report that this is due to unsuitable appointment times or difficulty fitting it around their busy lifestyles, whereas older women aged 50 and over tend to be embarrassed by the procedure (Cancer Research UK - Press release, 2011). Champion (1994) noted that breast screening compliance (1 and 5 year screening) was lower for women aged 50 or over than younger women (<50 years old) (Champion, 1994). Jepson et al. (2000) reported in their review that age was a significant predictor for Pap screening uptake in the majority of the reviewed publications but the effects of the association in the reviewed studies were conflicting as the screening status and age of the study subjects varied (Jepson et al. 2000). Also a Polish study conducted amongst 109 women attending cost free prophylactic mammography showed such positive correlation (Prażnowska et al., 2010). The breast screening attendance decreased after the age of 55 years old (target screening age in Poland is 50-69) (Prażnowska et al., 2010).

Marital status

Marital status has been found to be associated with the uptake of both breast and cervical screening (Damiani et al., 2012; Sutton and Rutherford, 2005; Macedo et al., 2012; Martin-Lopez et al., 2010; Jelastopulu et al., 2013; Soni, 2007). For example Soni (2007) found that married women (75.6%) were more likely than never married (62.8%) or no longer married (64.1%) to take up mammograms. Also married women (81.3%) were more likely than never married (72.8%) or no-longer married women (67.9%) to receive a breast exam. (Soni, 2007). Later Damiani et al. (2012) confirmed these findings. They reported that married were 1.83 times more likely than single women to uptake regular breast cancer prevention 95% CI=1.56-2.15). Being married in comparison to not being married was also significantly associated with higher uptake of Pap test (OR=2.41; 95% CI=2.23-2.60) (Damiani et al., 2012). Jelastopulu et al. (2013) found a very similar relationship between marital status and Pap test uptake. Married or partnered women were 2.4 times more likely to than single women to utilise cervical screening (95% CI 1.4-4.1).

Education, employment and income

Various studies across the world show that literacy and health literacy have been found to be linked with the uptake of screening (Day et al., 2010). A positive association of education and occupation with uptake of both breast and cervical screening has been confirmed by many researchers (Damiani et al., 2012; Duport et al., 2008; Hewitt et al., 2004). One of the studies conducted amongst Italian women revealed that higher levels of education and being in employment is related to higher likelihood to undergo a mammogram than being less educated or unemployed (OR=1.77; 95% CI=1.55-2.03, OR=1.63; 95% CI=1.40-1.91 respectively). When comparing women in the highest occupational class with those in the lowest it was found that there was a significant difference between those groups (OR=1.81; 95% CI=1.63-2.01). The researchers also found that screening invitees with lower education or lower occupational levels were more likely to attend organised screening programmes than the more advantaged women who also attended those services from their own initiative (Damiani et al., 2012). Similar outcomes of lower uptake of cervical screening were observed amongst Polish women with basic education in comparison with the ones educated to a high school or higher level (20% versus 6% respectively) (Spaczyński et al., 2010). Thirty eight per cent (38%) of the women with highest education indicated that they attended screening only in private health clinics (Spaczyński et al., 2010). Over the years the literacy and education levels in Poland improved. In the mid 20th century over 50% of Polish people were literate (Unesco, 2006), by 1994 reaching 99% and in 2010, 100% (World Bank, 2013). In 2002, 10.4% of women obtained a university degree versus 18.8% in 2011. This resulted in a decrease of numbers of women in each of the remaining educational groups (high school: 35.1% in 2002 vs. 33.7% in 2011; technical: 16.9% in 2002 vs. 15.9% in 2011; complete primary: 31.4% in 2002 vs. 25.0% in 2011; and incomplete primary or lack of formal education: 4.3 % in 2002 vs. 1.7% in 2011) (Central Statistical Office of Poland, 2012b). Today education between ages 7 and 18 years old is compulsory and guaranteed by the Constitution of the Republic of Poland to every citizen. Education delivered in public schools is cost free and with equally accessible to the citizens (EURYDICE, 2012).

Researchers also showed that there is strong association between low income, level of deprivation and lower uptake of screening services (Blanks et al., 2002; Lofters et al., 2011; Champion, 1994). For example in Ontario (Canada) it has been shown that not being in the 35-49 year age group and living in the neighbourhoods with the lowest income was one of the predictors of low cervical screening uptake (Lofters et al., 2011). Blanks et al. (2002) found that women who attended breast cancer screening in the UK were more likely to live in less deprived areas than those who did not attend it (Blanks et al., 2002). Due to the political and historical background it is difficult to assess the levels of deprivation in Poland. In 2009, there were 17.4% Polish women living in poverty (poverty line: <60% of median equalized income of households) and 15.3% in deep poverty (inability to afford four or more of nine essential needs) (Szarfenberg, 2010). The European Working Conditions Observatory (2010) noted that the majority of the *working poor* (people who are below poverty line despite being employed) Poland are aged 40 years or more, and they live in multigenerational households (often two or three generations) (Towalski and Kuźmicz, 2010). It has been stated that working poor are visible in the labour market however they are not present in the social or fiscal policy institutions (Towalski and Kuźmicz, 2010). Towalski and Kuźmicz (2010) also described a study conducted in 2008 by the Centre for Public Opinion Research (CBOS) which indicated that on average, households that were classified as working poor were composed on average of 4.2 people; versus 3.2 in the working non-poor and 2.6 people in the non-working poor. The working poor were the most common amongst two generation (57.7%) and multi-generation households (16.8%), respectively (Centrum Badania Opinii Społecznej (CBOS), 2008; Towalski and Kuźmicz, 2010). The same study has also showed that the working poor have lower financial expectations when compared to all other groups including even those of the non-working poor (CBOS, 2008). Wide spread poverty amongst working Poles makes it challenging to consider employment status a proxy for economic situation. Therefore, the most important proxies for poverty or deprivation in Poland are the household characteristics and self-assessed needs and expectations (Towalski and Kuźmicz, 2010). Considering these facts the data on self-assessed economic status analysed in this thesis were treated as proxy for the level of economic status.

Rural versus urban setting

According to the most recent estimates (2011) 60.2% of Polish people live in the urban areas (61.8% in 2002) (Central Statistical Office of Poland, 2012b). Lower levels of both breast and cervical uptake can be observed especially amongst rural populations (Day et al., 2010; Spaczyński et al., 2010; Jokiel and Bielska-Lasota, 2005). Spaczyński at al. (2010) conducted a survey amongst a convenience sample of 1,625 Polish women (age: 25-59) who visited gynaecology clinics in Poland (for various reasons) and found that more women living in the rural areas (15.2%) than urban (8%) decide not to take up cervical screening (Spaczyński et al., 2010). Another study among Polish women that attended free prophylactic mammography showed that only 10% of the women in the studied sample lived in a rural region (Prażnowska et al., 2010). Even though the evidence for Poland is very limited it is likely that women from rural areas will have a limited access to the screening services.

2.6.2. Knowledge, behaviour, attitudes and beliefs

Knowledge or awareness of breast and cervical cancers and their prophylaxis have been studied by many researchers and it has been noted that their lack may negatively influence the uptake of screening (Gronwald et al., 2006; Lyttle and Stadelman, 2006; Okobia et al., 2006; Paolino and Arrossi, 2011; Steven and Fitch, 2004). Other factors such as underlying attitudes, beliefs, perceptions and motivations towards health and disease, such as cancer, have been previously found to be related to the uptake of breast and cervical cancer screening programmes (Bowling, 1989; Sutton and Rutherford, 2005; Jepson et al., 2000) and could be at least partially explained by exploration of these factors on an individual level (Sutton and Rutherford, 2005). Women with positive attitudes showing intentions to take up breast screening were more likely to use those screening services (Jepson et al., 2000; Marcinkowska et al., 2006). Fylan (1998) and Waller et al. (2009) noted that women may think of cervical screening as unnecessary or not beneficial if they believe they are not at risk of developing cervical cancer (Waller et al., 2009; Fylan, 1998). Also embarrassment when attending cervical screening, as well being afraid of receiving referral for colpsocopy and other medical procedures can be considered barriers to screening uptake (Waller et al., 2009; Fylan, 1998). Another study amongst Swedish women confirmed Fylan’s findings as Eaker et al. (2001) found that non attendees did not think that cervical screening is beneficial (Eaker et al., 2001). A recent review of studies published between 2000 and 2008 confirmed that belief in the usefulness of screening was an important predictor of breast screening uptake (Vedel et al., 2011). Also higher likelihood of breast screening attendance was found among women that undertook breast screening in the past than those who have never been screened (Lechner et al., 1997). This could be due to lack of such possibility or a conscious decision not to attend. But attending once does not mean that the woman will decide to repeat the screening (Lechner et al., 1997). Jepson et al. (2000) found a similar association in cervical screening (Jepson et al., 2000).

A number of studies explored how knowledge of breast and/or cervical cancers and their prophylaxis was related to attendance (Wong et al., 2009; Okobia et al., 2006; Jokiel and Bielska-Lasota, 2005; Spaczyński et al., 2010). The studies looked not only at knowledge amongst the general female population undergoing routine screening, or cancer patients but also amongst female healthcare professionals. For example a study conducted in Nigeria amongst community-dwelling women to assess their awareness, attitude and practice of breast cancer prophylaxis has shown that knowledge of the disease was very poor and only the minority practiced BSE or attended the clinics to have their breasts examined by a medical professional (Okobia et al., 2006). Similarly, another study among Malaysian women highlighted that many women believe that the purpose of the cervical smear test is detection of the existing cancers and that the lack of symptoms equalled to lack of need to undergo screening (Wong et al., 2009). Most of the women were not aware that the cancer could be prevented if changes were detected early (Wong et al., 2009).

Other studies examined the level of knowledge about both breast and cervical screening. Lyttle and Stadelman (2006) reported in a study in West Virginia that awareness of breast cancer issues was much higher than those relating to cervical cancer (Lyttle and Stadelman, 2006). The authors noted that many women based their knowledge on misconceptions that could have an unfavourable impact on the future uptake of cancer screening (Lyttle and Stadelman, 2006). Another study in Turkey examined knowledge of screening related topics amongst health professionals and found that health professionals may be insufficiently informed about screening and in particular about recommendations for cervical screening intervals and their dependence on the previous results. The study was conducted amongst a sample of nurses and found out that only 66.4% knew that if the repeated Pap smear tests were normal, screening could be done every 2–3 years (Yaren et al., 2008). Conversely, a study amongst health care professionals in the U.S.A. examining knowledge, perceptions and attitudes toward cervical screening found a good level of knowledge but noted that the educational resources for patients were insufficient (Tessaro et al., 1996). Paolino and Arrossi (2011) have shown that 49% of Argentinean women who had been screened and 73% of unscreened ones had inadequate levels of knowledge about Pap smears. Forty seven percent of screened and 30% of unscreened women had never heard about HPV. Having knowledge about cervical cancer screening was also positively linked to being screened in the previous three years (Paolino and Arrossi, 2011).

Limited Polish studies to date have examined the association between the levels of breast or cervical cancer screening uptake with knowledge, behaviours and attitudes towards either breast or cervical cancer or cancer screening (Jokiel and Bielska-Lasota, 2005; Spaczyński et al., 2010). One of the earlier studies conducted by Chojnacka-Szawłowska (1998) in the city of Gdańsk explored the psychological factors of knowledge of cancer symptoms in cancer patients in relation to that of the general population. The study was not specific to breast or cervical cancer but it included a number of patients (men and women) who were diagnosed with either of these cancers as well as healthy controls. Results have shown that approximately 21% of cancer patients and 53.8% of respondents from the general population were unable to name any cancer symptoms. Forty one per cent of cancer patients were able to name at least one and 27.7% two cancer symptoms versus 32.3% of general population having knowledge of one symptom and 13.7% two symptoms. Chojnacka-Szawłowska (1998) noted that the female patients who had better knowledge of cancer symptoms were younger and the level of fear of cancer was not related to knowledge of the symptoms (Chojnacka-Szawłowska, 1998).

In a later study, Jokiel and Bielska-Lasota (2005), aiming to measure women's knowledge about Pap test and their screening practices, involved nationally representative samples at 5 different time points between 1976 (N=1,035), 1986 (N=460), 1990 (N=455), 1998 (N=524), and 2002 (N=509). The results have shown at the last data collection point (2002) that 91% of women reported that they were aware of the importance of cervical screening and 88%, 75%, 65%, and 31% in 1998, 1990, 1986 and 1976, respectively. The highest knowledge levels were noted amongst women aged 25-39 or 40-49 with the highest educational level and living in cities. Also the number of women visiting their gynaecologist increased from 33% in 1976 to 46% in 2002 ($p<0.001$). The researchers also explored cancer registry data and found that the overall survival rate was 52.2% which one of the lowest amongst European countries. They also found that the relative excessive risk of death was related to progression in disease stages, delay in treatment and density of the population in the place of habitual residence (Jokiel and Bielska-Lasota, 2005).

Zych et al. (2006) on the other hand attempted to gain understanding of women's (from South-East region of Poland, N=300) knowledge of breast cancer prevention and their familiarity with its symptoms. They concluded that more than half of patients (51%) stated that they were aware of the need for BSE from the age of 20, 32% of women indicated that self-examination should be done beginning from the age of 30 and 6.9% pointed that the most appropriate period of women's life falls during the menopause. Overall the results revealed that BSE and cancer symptoms were not well understood and women did not know when BSE should be done. Risk factors for breast cancer were known to most women but every second woman had trouble in naming at least four of them (Zych et al., 2006).

Nowicki et al. (2008) examined knowledge and health screening behaviours amongst women who were employed in the healthcare sector, compared to those that were not. They found that there were no significant differences between the two groups in knowledge or screening behaviours related to cervical cancer. However, they surveyed a convenience sample of a relatively small size (N=207) women in both of the studied groups (Nowicki et al., 2008).

Later Nita et al. (2010) conducted a survey amongst 109 visitors or mothers of children being hospitalised in the Orthopaedic and Traumatology Department of The Institute of Health of Mother Pole in Lodz and found that the women had inadequate levels of knowledge of both breast and cervical cancers. Authors of this hospital based study assessed that due to lack of knowledge of cancer and cancer prophylactic practices such as BSE (currently recommended in Poland) the knowledge amongst surveyed women was insufficient (Nita et al., 2010b).

Two other Polish studies confirmed the previous findings of inadequate knowledge of breast and cervical cancer and its prophylaxis and highlighted the role of media in the increasing women's knowledge of female cancers and cancer screening initiatives (Gronwald et al., 2006; Ulman-Włodarz et al. 2011). Gronwald et al. approached Polish women from the Pomeranian region who attended genetic BRCA1/BRCA2 testing after they read an advertising article in the women's popular press. The researchers followed a sample (N=198) of BRCA1 (the most common BRCA mutation in Poland) carriers and non-carriers after one year and questioned them about their knowledge on breast cancer and its prevention. The majority (81%) of the carriers responded that they had been adequately informed during counselling about cancer prevention and 19% wanted to receive more information. At that stage (1 year after the first screening) the satisfaction of undergoing the test was very high (98%). Gronwald et al. (2006) demonstrated also that carriers of BRCA1 followed the cancer prophylaxis more often than non-carriers (Gronwald et al., 2006). The researchers pointed out that Polish women at a high risk of breast cancer do not have the possibility to get genetically screened, due to high cost or lack of recognition by their health care providers (Gronwald et al., 2006). Therefore they remain unaware of their cancer predisposition. The second of the mentioned studies (Ulman-Włodarz and Nowosielski, 2011) questioned 250 patients who attended gynaecology clinics in Krakow and found that the majority of women (68%) assessed that they had medium level of knowledge on cervical cancer. Similarly like the women from the study conducted by Gronwald et al (2006), it was found that that the primary sources of knowledge was the women's press (59%), television (47%) and internet (38%) (Ulman-Włodarz and Nowosielski, 2011). Only about a third of respondents gained their knowledge from their gynaecologist and as little as 3% attended following their personal screening invitation from the National Health Fund (Ulman-Włodarz and Nowosielski, 2011).

2.6.3. Barriers and facilitating conditions

Barriers or facilitators to screening have been extensively described in several literature reviews to date (Jepson, 2000; Consedine et al., 2004; Day et al., 2010). Perceived barriers to screening can include individual barriers or health system barriers. The most commonly explored barriers are: anticipated embarrassment, perception of pain related to screening or fear/anxiety related to the test results (Jepson et al., 2000) cultural barriers, fatalism, perceived effectiveness, lack of recommendation by a physician, male staff performing the screening, as well as lack of transport or costs involved in attending screening are significant predictors of lower screening uptake (Munn, 1993; Ahmad et al., 2001; Eisner et al., 2002; Sutton and Rutherford, 2005). The view that anxiety fear and embarrassment are correlated with lower uptake screening rates was confirmed by Ulman-Włodarz et al., (2011) in a study where Polish women indicated that the main reasons for non attendance were indeed: fear of pain (39%), lack of symptoms (18%), carelessness (15%) and embarrassment (12%) (Ulman-Włodarz and Nowosielski, 2011). Also factors such as apathy, lack of concern, low perceived need and the perception that without symptoms there is no need for screening, add to the important factors that might mean the difference between the undertaken a screening test or not (Munn, 1993; Ahmad et al., 2001; Eisner et al., 2002; Sutton and Rutherford, 2005).

Some discrepancies were also found in the literature with regards to psycho-emotional factors such as: anxiety, fear, or worry and whether they are actual barriers or facilitators of cancer screening. Consedine et al. (2004) reviewed literature on the fear of or anxiety related to having a positive test result for cancer and found that it is often linked to lower uptake but they also noted that these factors were found by other studies conducted in the past, possible motivators to take up the screening (Consedine et al., 2004). Vedel et al. (2011) found in their review that embarrassment, fear of embarrassment, discomfort or fear of the test are linked to the uptake of screening (Vedel et al., 2011). Similarly, a Polish study by Spaczynski et al. (2009) found that out of 1,625 surveyed Polish women who decided not to undertake the cervical screening the main reasons for non-attendance were: 24% lack of time, 23% aversion to have the test done by an unknown physician, and 15% dislike of the test (Spaczyński et al., 2009).

Since the early years of the first screening programmes researchers suspected that health system barriers such as insurance status or level or urbanisation would be an important predictor of cervical and breast screening uptake (Hayward et al., 1988, Smith and Haynes, 1992). Later studies confirmed those assumptions. Jepson et al. (2000) found that in 7 out of 12 reviewed studies rates of mammography were significantly higher amongst women who had health insurance coverage (Jepson et al., 2000). Other authors also found that lack of health insurance to cover the cancer screening tests (where no free screenings available) was a very strong predictor of non-attendance (Meissner et al., 2004; Rodriguez et al., 2005; Vedel et al., 2011). In Poland, insurance coverage is not of significance as since the last health care reform in 2003, the existing discrepancies in coverage have been resolved and currently every individual has the right to state funded health care (Golinowska and Kozierkiewicz, 2008).

The facilitating conditions to screening may include factors that are on the opposite end of barriers including the most commonly identified patient's characteristics, knowledge related to cancer and its screening, belief in usefulness and safety of screening, presence of risk factors, good health, health insurance covering the cost of the test, accessibility of the test and good health status (Meissner et al., 2007; Mondragon and Brandon, 2001; Sharp et al., 2005; Davey et al., 2005; Paolino and Arrossi, 2011).

2.6.4. Social influences

Social influences such as: knowing someone with the disease, having support of family, friends or significant others (e.g., physician), membership of a club, church or other organization, knowing someone who has been screened are an important factors that may influence the uptake of screening (Winkler et al., 2008; Champion, 1994; Marcinkowska et al., 2006). For example Winkler et al. (2008) showed that women that undertook cervical screening were more likely to have friends encouraging each other to take up the Pap test. Screened women also knew more other women (friends, family, or acquaintances) that had been screened in the past 3 years (Winkler et al., 2008). Champion et al. (1994) noted that a suggestion to go for cancer screening made by a health care professional can be an important factor facilitating uptake, especially among older women (Champion, 1994). Marcinkowska et al. (2006) interviewed 57 Polish women with regards to the reasons for non-uptake of mammography and noted that some of the women expressed an opinion that their physician should play an important role in convening the health related messages and advise women on which tests they should undertake (Marcinkowska et al., 2006). Polish women also seem to follow the advice of their friends or neighbours or “what is being said” and emphasize the role of their physician in their health care (Marcinkowska et al., 2006) and another type of social factor that may influence screening uptake is media. It has been previously demonstrated that women take up the cost free preventive tests following messages transmitted in mass media (Lewandowska et al., 2012; Przestrzelska et al., 2006). For example more than 58% of Polish women, included in a study (N=100) by Lewandowska et al. (2012), obtained their knowledge from the mass media such as internet, television, and radio with only 18% receiving information from their health care professional, 16% from medical press and 8% from other sources (Lewandowska et al., 2012).

2.6.5. Health status

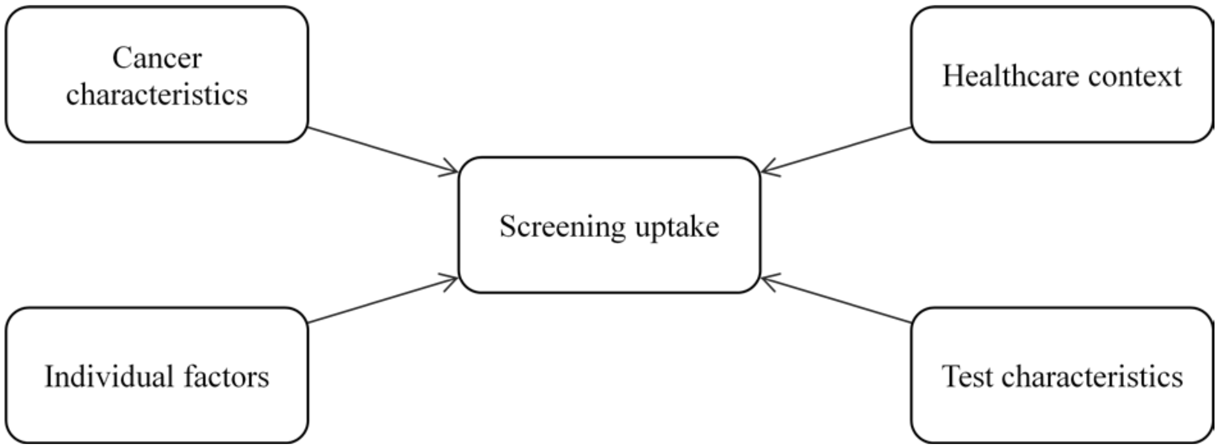
Overall health status has been found to have an association with uptake of screening (Day et al., 2010; Sadler et al., 2007; Davey et al., 2005). People with poor health have been shown to be significantly less likely to use mammography than those with good health (Sadler et al., 2007, Davey et al., 2005). Even though the body of evidence is not extensive, some studies pointed towards the examples of women with a physical or mental disability or chronic illness that may be experiencing challenges in accessing screening services and in particular mammography (Day et al., 2010). Day et al. (2010) have highlighted that despite the lack of strong evidence on the relationship of influence of screened population's health it is important not to dismiss its importance when planning for screening programmes (Day et al., 2010).

2.7. Theories used to predict health behaviours

Health behaviours are complex and may be influenced by many factors and over the years many researchers tried to explain and predict behaviour by constructing theoretical frameworks to identify its determinants and predictors (Noar and Zimmerman, 2005). Understanding what influences health related behaviours may be particularly important for government funded population-based disease screening initiatives that often are very costly, labour intense and if not utilised to a desirable level by the target population may be ineffective, burdensome to the health care system and financially wasteful (Sankaranarayanan et al., 2001).

However, people intending to perform a health-related behaviour do not always carry out this intention. Their intention usually accounts for no more than 20–30% of variance in behaviour (Armitage and Conner, 2001; Conner and Sparks, 2005; Sheeran, 2002). Various factors have been noted to play an important role in the uptake of screening with factors such as: characteristics of the cancer screened for, medical test characteristics, context of health care and individual patient characteristics (Figure 9) being among some of the most important ones (Weller et al., 2009).

Figure 9 Factors playing role in screening uptake strategies (adapted from Weller et al., 2009)



Researchers often used various theoretical models to identify, understand, explain and predict health related behaviours. Some of the most widely used behavioural theories included: Health Belief Model (HMB) (Rosenstock, 1974), Theory of Reasoned Action (Ajzen and Fishbein, 1980, Fishbein and Ajzen, 1975), the Theory of Planned Behaviour (TPB) (Ajzen and Madden, 1986, Ajzen, 1991), Social Cognitive Theory (SCT) (Bandura, 1986), Transtheoretical Model (TTM) (Prochaska and DiClemente, 1983) the Health Action Process Approach model (HAPA) (Schwarzer, 1992) and other theories and behavioural constructs that attempt to explain or predict breast or cervical cancer screening behaviours.

Noar and Zimmerman (2005) stated that many of the behavioural constructs and theories being used to explain or predict health behaviours overlap, or their components are conceptually rooted within each other (Noar and Zimmerman, 2005). It has also been previously noted that exploration of a single construct's predictive value is greatly variable but also broad theories have been criticized for not being possible or difficult to test (Ogden, 2003). The researchers also pointed out that many behavioural theories use different terminology but in fact are very similar or even the same (Conner and Norman, 1996; Noar and Zimmerman, 2005; Nigg et al., 2002; Sutton, 1998). A detailed overview of the most commonly used behavioural theories has been structured following a review by Noar and Zimmerman (2005) who made a comparison between the constructs of those theories (table 9).

Table 9 Similar or identical elements within five health behaviour theories (reproduced with permission from Noar and Zimmerman, 2005)

Concept	General tenet of the concept *'Engaging in the behaviour is likely if…'*	HBM	TRA	TPB	SCT	TTM
Attitudinal beliefs						
Appraisal of the positive and negative aspects of the behaviour and expected outcome of the behaviour	the positive aspects outweigh the negative aspects	benefits, barriers/health motive	behavioural beliefs and evaluation of those beliefs (attitudes)	behavioural beliefs and evaluation of those beliefs (attitudes)	outcome expectations / expectancies	pros, cons (decisional balance)
Self-efficacy beliefs/beliefs about control over the behaviour						
Belief in one's ability to perform the behaviour; confidence	one believes in their ability to perform the behaviour	self-efficacy	–	perceived behavioural control	self-efficacy	self-efficacy/temptation
Normative and norm-related beliefs and activities						
Belief that others want you to engage in the behaviour (and one's motivation to comply); may include actual support of others	one believes that people important to them want them to engage in the behaviour; person has others' support	cues from media, friends (cues to action)	normative beliefs and motivation to comply (subjective norms)	normative beliefs and motivation to comply (subjective norms)	social support	helping relationships (process of change)
Belief that others (e.g. peers) are engaging in the behaviour	one believes that other people are engaging in the behaviour	–	–	–	social environment/norms; modelling	social liberation (process of change)
Responses to one's behaviour that increase or decrease the likelihood one	one receives positive reinforcement from others or creates positive reinforcements for	cues from media, friends (cues to action)	–[a]	–[a]	reinforcement	reinforcement management/stimulus control (processes of change)

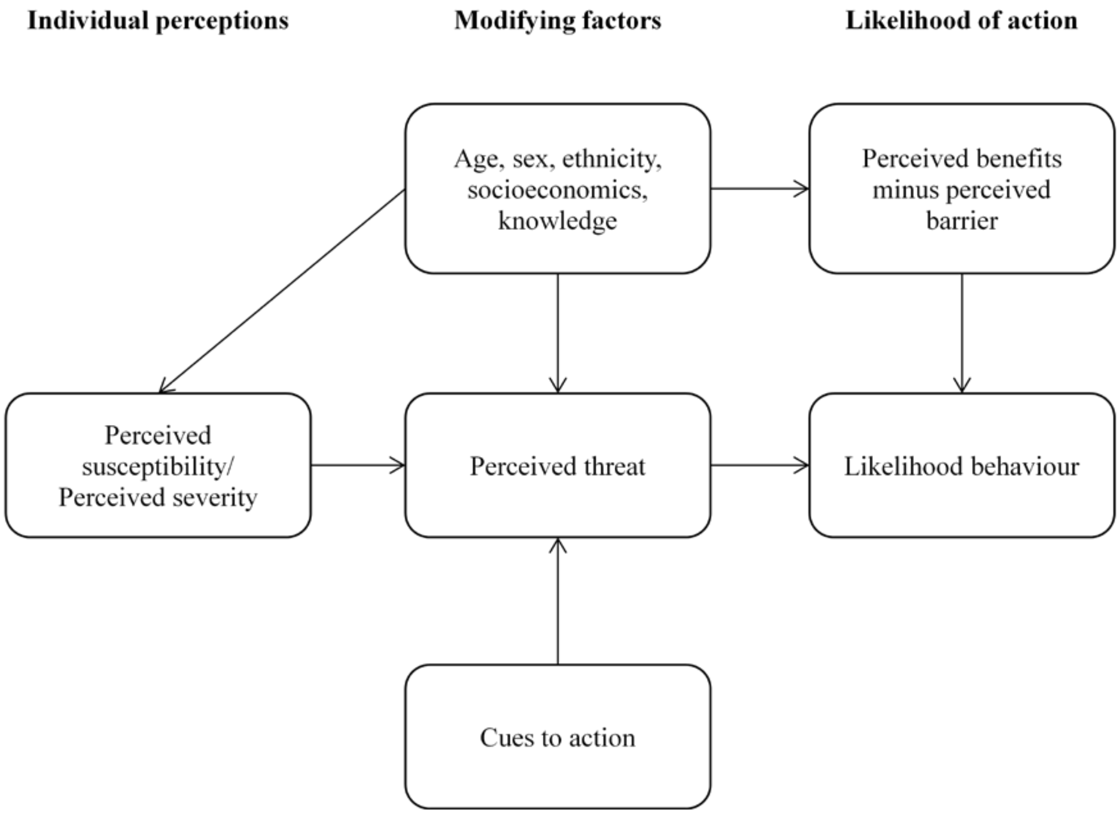
Concept	General tenet of the concept *'Engaging in the behaviour is likely if…'*	HBM	TRA	TPB	SCT	TTM
will engage in the behaviour; may include reminders	themselves					
Risk-related beliefs and emotional responses						
Belief that one is at risk if one does not engage in the behaviour, and that the consequences may be severe; may include actually experiencing negative emotions or symptoms and coping with them	one feels at risk with regard to a negative outcome or disease	perceived susceptibility/severity (perceived threat)	–	–	emotional coping responses/expectancies about environmental cues	dramatic relief (process of change)
Intention/commitment/planning						
Intending or planning to perform the behaviour; setting goals or making a commitment to perform the behaviour	one has formed strong behavioural intentions to engage in the behaviour; one has set realistic goals or made a firm commitment to engage in the behaviour	–	behavioural intentions	behavioural intentions	self-control/self-regulation	Contemplation / preparation (stages of change); self-liberation (process of change)

Variable names in parentheses indicate that the variable(s) above it are part of that larger category, according to the theory.[a] Both the TRA and TPB contain normative components that are conceptualized as beliefs in reinforcement (normative beliefs), rather than the actual reinforcement itself. It is not clear which conceptualization of these ideas is best for a theoretical framework

2.7.1. Health Belief Model (HBM)

The HBM has been developed in late 1950s (Hayden, 2009; Abraham and Sheeran, 2005; Glanz et al., 2008) and since then it has been used widely in the past to determine the relationship between health beliefs and health behaviours as well as to inform interventions (Ersin and Bahar, 2011; Hall, 2012; Webb et al., 2010; Johnson et al., 2008; Hayden, 2009). The first use of HBM is attributed to Hochbaum (1958) who hypothesised that the perception of the likelihood and severity of negative health consequences combined with perceptions of prophylaxis would predict behaviour (Hochbaum, 1958; Hayden, 2009; Rosenstock, 1974). He showed that belief of susceptibility to tuberculosis accounted for 82% of the participants that underwent the screening whereas only 21% of patients who believed in the beneficial effect of X-rays to detect and prevent TB undertook the X-ray (Hochbaum, 1958). Over time, the model has evolved and additional factors, such as self-efficacy (Rosenstock et al., 1988) and the cost of preventative behaviours (Streecher et al., 1997) were included. It was thought that the behaviour would partially reflect individual's judgements of their own capability to take the actions needed to complete the task, meaning that the more barriers one would need to overcome, the less likely the desired action would be undertaken (Streecher et al., 1997). Later also other elements were added to the model. For example Austin et al. (2002) in their study examining factors associated with breast and cervical screening in Hispanic women used: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. They described perceived susceptibility as individual's opinion of the chances of suffering from a specific condition. Perceived severity was the individual's opinion on the seriousness of getting condition and its repercussions. Perceived benefits are people's opinions of the efficacy of the health action to reduce the risk or the impact of falling ill. Perceived barriers are material and psychological costs required to take the desired health action. Cues to action have been defined as an element that may prompt individual to action i.e. advertising, health professional's advice etc (Austin et al., 2002).

Figure 10 Graphical representation of the HMB (Hayden, 2009)



Abraham and Sheeran (2005) used a model that included: 1) threat evaluation that included perceived susceptibility to the health problem and perceived severity of the consequences of the illness; 2) behavioural evaluation including perceptions of the benefits of a recommended health behaviour and perceptions about the costs/barriers to the behaviour; 3) health motivation; and 4) cues to action including individual's perceptions of symptoms, social influences and health education campaigns (Abraham and Sheeran, 2005). In brief, the HBM assumes that in order to plan a health intervention, the following are needed to be taken into consideration: perceived susceptibility and severity of the condition, perceived barriers and benefits to take an action; and cues to action (factors for activating the inclination to perform the anticipated behaviour) (Abraham and Sheeran, 2005; Hayden, 2009; Glanz et al., 2008).

Previous research has indicated that the predictive power of HBM is weak in the majority of health behaviour areas which is partially linked to absence of combinatorial principles (i.e.

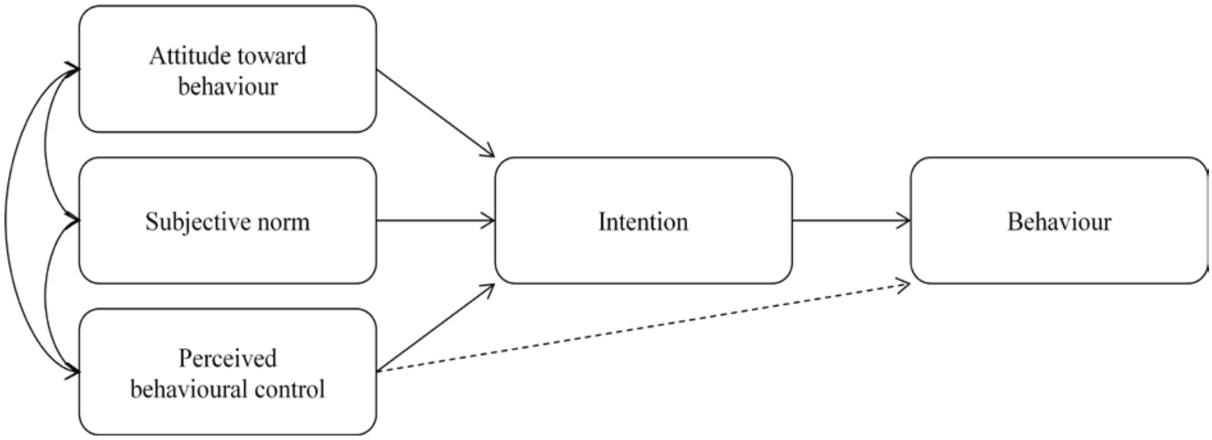
how the model components interact with each other), poor construct definition, and weaknesses in the predictive validity of the HBM’s core psychological components (Armitage and Conner, 2000) as it does not account for: socio-economic status, cultural background, and previous experiences (Soliday and Hoeksel, 2000). However, regardless of the criticisms many researchers are still using the HBM components in conjunction with other additional components forming the base for new behavioural theories some of which have been created as long ago as in 1970’s (see for example: McMillan et al., 2008; Harvey and Lawson 2009).

2.7.2. Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)

Fishbein and Ajzen in 1975 described and applied another model named the TRA to predict health behaviours. TRA takes into consideration intention as a predecessor of behaviour determined by attitudes (evaluation of taking the action) and subjective norms about the behaviour (Fishbein and Ajzen, 1975). Attitudes have been previously described as: probability, perceived severity and value of behavioural outcomes (Weinstein, 1993) and subjective norms as: the influence of others on the individual’s behaviour (social pressure) (Godin and Kok, 1996).

This theory has been later criticised as having limitations. It was suggested that predicting intentions would be difficult or impossible and the score of the association would be substantially lowered if the individual perceived very limited control over their own behaviours or attitudes while at the same time perceiving high behavioural control (Godin and Kok, 1996).

Figure 11 Graphical representation of TPB (Ajzen, 1991)



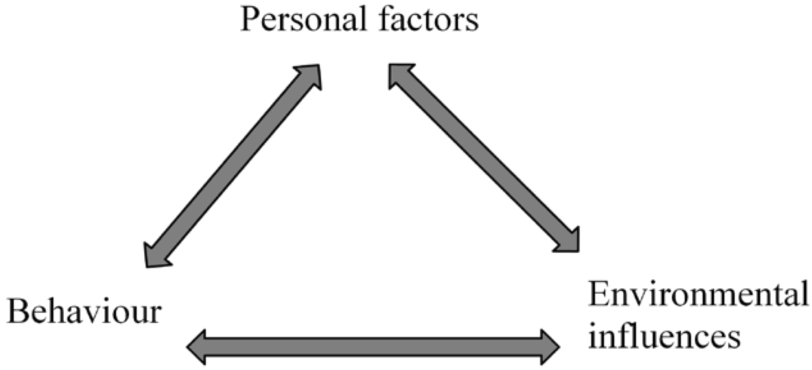
Following the criticisms of TRA, Ajzen (1991) reshaped the construct by adding perceived behavioural control (Figure 11). The model was named the Theory of Planned Behaviour (TPB) (Ajzen, 1991). It assumed that if behavioural intention is constant, highly controllable behaviours would have a higher likelihood to occur than less controllable ones (Armitage and Christian, 2003). The theory has been explored by many researchers in terms of predicting intentions and or behaviours but the results varied. It has been showed that TPB can account for moderate variance in intentions and behaviours but attitudes, subjective norms, and perceived behavioural control do not always allow the prediction of various health related behaviours (Taylor et al., 2006).

Povey et al. (2000) used the TPB in a study of consumption of fruits and vegetables and a diet low in fats. It was found that attitudes were predictive of intention to eat a low-fat product but subjective norms were not. In the case of daily fruit and vegetable consumption both attitudes and subjective norms were positively predictive of intentions. Perceived behavioural control was negatively predictive of intention to increase fruit and vegetable consumption and decreased fat intake. The same study also showed that intentions were significantly associated with self-efficacy. Povey et al.'s (2000) conclusion was that perceived behavioural control is different from self-efficacy and it could be a better predictor of intentions in certain situations (Povey et al., 2000). Other researchers pointed towards embarrassment, pain and cancer worry as factors that could prevent women from attending the screening (Blomberg et al., 2008; Hay et al., 2005). Factors influencing patients' behaviours associated with screening have been noted to be influenced by attitudes, perception of barriers and benefits of screening, fear of cancer, the illness representations, and socio-demographics (Sutton and Rutherford, 2005; Orbell et al., 1996). Day et al. (2010) stated that women's individual perceptions can lead to certain behaviours and those perceptions could be created by: adopting beliefs of people in the individual's surroundings (i.e. peers and leaders), exposure to repetitive messages such as informative campaigns, and association of beliefs with strong positive or negative emotions and traumas (Day et al., 2010).

2.7.3. Social Cognitive Theory (SCT)

The social learning or later renamed cognitive theory (SCT) is based on the assumption that behaviour is influenced by two factors: 1) incentives/reinforcements (value of specific health outcome) that are understood and possible to adopt by the individual and 2) expectancies, determined by the environment, such as consequences of own actions, competency to perform actions (self-efficacy) and their outcomes (Rosenstock et al., 1988). Situation-outcome expectancies are linked to the perception that some consequences are beyond an individual's control (Rosenstock et al., 1988). Expectancies of action outcomes link to the belief that there are specific actions necessary for a particular outcome.

Figure 12 Graphical representation of SCT (Bandura, 1986)



The SCT theory has been found to be useful for behaviour change interventions as it takes into consideration cognitive, emotional and behaviour aspects (Branscum and Sharma, 2012; Fjeldsoe et al., 2012; Dilorio et al., 2000). The theory assumes that people with higher levels of self efficacy are more likely to perform new actions, put more effort into initiating and maintaining these behaviours (Bandura, 1997). The efficacy may be influenced by successful performance of a specific behaviour, strong experiences, received convincing verbal messages (i.e. from their physician), accomplishments, and physiological signs (Bandura, 1986; Bandura, 1997). Expectancies stem from a specific outcome of performed behaviour (Bandura, 1986).

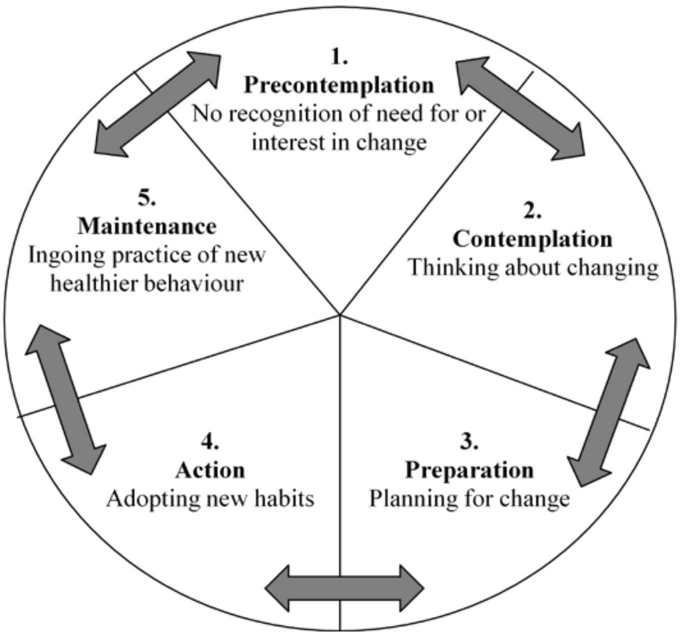
Băban and Crăciun (2007) stated that SCT overlaps with the previously described TRA and TPB on the concepts of perceived behavioural control and with HBM on the barriers (Băban and Crăciun, 2007). In agreement with this overlap assumption, a study by Allen et al. (2001) used elements of SCT and HBM to design intervention for mammography, breast clinical examination, and cytology (Allen et al., 2001). The authors noted that even though the uptake increase could be observed for all screening methods after controlling for cluster sampling and age strata only Pap test intervention was statistically significant (OR 1.28, 95% CI=1.01, 1.62) (Allen et al., 2001). Another study also combined elements of HBM and SCT to develop an intervention program to improve cervical screening behaviours and found that the intervention group had significantly higher screening rates than non intervention group (70% vs. 11.1%) (Wang et al., 2010).

In summary, SCT predicts that specific behaviours can be carried out if the individual perceives control over the action outcome, none or limited external barriers, and has confidence in own ability to perform an action (Rosenstock et al., 1988; Taylor et al., 2006).

2.7.4. Transtheoretical Model (TTM)

The Transtheoretical model (TTM) was first developed by Prochaska and DiClemente in 1982 (Prochaska and DiClemente, 1983) as an approach to psychotherapy with the main concept being that successful behaviour change will occur after application of the appropriate behavioural strategies at a correct stage and time of the desired change (Spencer et al., 2005). TTM was later adapted by Rakowski et al. (1992) to predict the readiness to participate in mammography (Rakowski et al., 1992) and by doing so he identified elements of the model used for breast cancer screening that would also apply to other cancer screening (Spencer et al., 2005). These adaptations pertain to the fact that cancer screening is a preventative measure and does not engage the individual in frequently thinking about the screening advantages and disadvantages, as is the case with behaviour change in the addictive behaviours (i.e. tobacco cessation, alcohol addictions) (Spencer et al., 2005). It has been noted that ethnic groups differ in their decisions of screening uptake and TTM has been found to have the potential to distinguish between groups of individuals with different characteristics (Pasick and Burke, 2008). Spencer et al. (2005) reviewed a large body of the literature describing use of TTM to study behaviour change leading towards uptake of breast and cervical cancer screening and they found through the TTM that barriers to screening and lack of perceived benefit of screening were the most important factors influencing lack of screening (Spencer et al., 2005).

Figure 13 Graphical representation of TTM/ stages of change (Prochaska and Di Clemente, 1982)

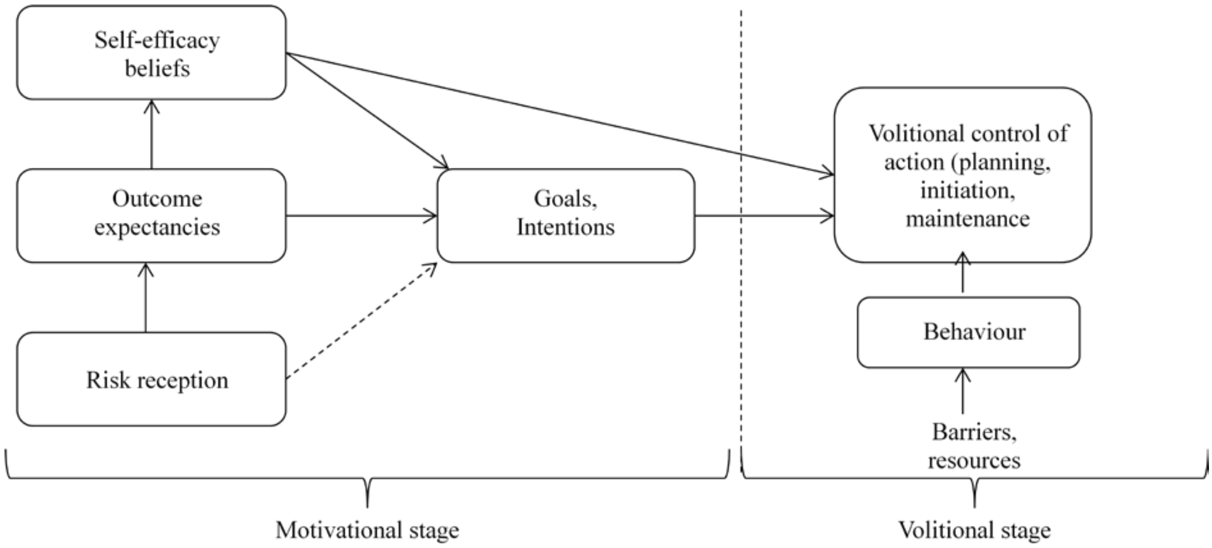


2.7.5. Health Action Process Approach (HAPA)

In addition, to the models discussed by Noar and Zimmerman there is another model that has been growing in popularity with relation to preventive behaviours (Garcia and Mann, 2003; Luszczynska et al., 2011; Luszczynska and Schwarzer, 2003). The HAPA has been first described by Schwarzer (1992) and it connects three types of models: 1) the motivational (i.e. HMB or TRA/TPB), 2) behavioural enactment models (i.e. Implementation Intentions, Goal Theory etc) and 3) multi-stage models (i.e. TTM, HAPA) (Băban and Crăciun, 2007). Behavioural enactment models have not been discussed here as they have been found to have a very low predictive value (Băban and Crăciun, 2007). Initiation and maintenance of health behaviour processes in the HAPA model are based on the assumption that motivational and volitional (formation of decision to take action) phases must occur, where the volitional phase is divided into planning and maintenance (Băban and Crăciun, 2007; Luszczynska et al., 2011; Luszczynska and Schwarzer, 2003). The motivational phase leads to intention creation and includes such constructs as: growing risk awareness, outcome expectancies, and perceived task self-efficacy. Schwartz et al. (2003) highlighted that a minimum concern or threat levels have to occur before the thoughts of benefits of the action in question occur (Schwarzer et al., 2003). Self-efficacy to perform the action is the most influential factor of this phase and it acts as a mediator between two previously mentioned elements of the model: outcome expectancies and intentions (Băban and Crăciun, 2007).

The second phase of the HAPA model is the action-volitional phase. It refers to the processes that occur after the formation of the intention (Băban and Crăciun, 2007). The processes of this stage are influenced by self-efficacy due to the fact that in order to perform an action one needs to have certain level of trust in own competence. Self–efficacy also determines the amount of effort and perseverance to perform the action (Băban and Crăciun, 2007).

Figure 14 Graphical representation of Health Action Process Approach (Schwarzer, 1992)



HAPA has been used as the basis for planning interventions to modify risk behaviours like: use of alcohol (Murgraff and McDermott, 2003) or food hygiene (Chow and Mullan, 2010). It was also used in the context of promoting health behaviour enhancing interventions such as regular breast self-examination (Garcia and Mann, 2003; Luszczynska and Schwarzer, 2003). In this respect, self-efficacy has been shown to be the best predictor of intention of performing breast self-examination and planning of the actual behaviour (Luszczynska and Schwarzer, 2003). However, it has been also noted that not all published evidence found the effect of planning on the relationship between intention and behaviour (Soureti et al., 2012). This suggested that planning of change may differ between people and it might depend on moderators such as for example: age, intention level, level of belief in self-efficacy (Soureti et al., 2012).

2.7.6. Summary of the reviewed theories used in prediction of health behaviours

HBM, TRA, TPB, SCT, TTM, and HAPA have been critically discussed by many researchers and governmental organisations to guide the most appropriate means of generic and specific interventions to support attitude and behaviour change at population and community levels (Day et al., 2010; Pasick and Burke, 2008; Taylor et al., 2006). TRA and

TBP were thought to have higher predictive power than HMB but TBP has lower ability to predict behaviours than TRA. Evidence on the effectiveness of TTM is varied, as in behavioural outcomes, as when TTM and SCT theory is applied in health promotion initiatives such as exercise or smoking cessation no difference was found with the other interventions (Taylor et al. 2006). However, many researchers noticed that the constructs of the behavioural models described above are either very similar or there is virtually no difference other than for nomenclature (Noar and Zimmerman, 2005; Ogden, 2003; Traube et al., 2011). Traube et al. (2011) noted that behavioural theories leave much of the variance in unexplained behaviour and their accuracy is often overestimated (Traube et al., 2011) According to Noar and Zimmerman (2005) there is a probability that the difference between attitudes, barriers, benefits, positive and expectances as well as pros and cons is very small and that there is no consensus in the literature on how the variables in those theories combine to predict behaviours (Noar and Zimmerman, 2005). Similarly, the HAPA model was criticised as some studies failed to show the effect of planning on the relationship of intention-behaviour suggesting that the mechanisms of factors mediating the change may be different between different people (Soureti et al., 2012).

The answers to the questions of the survey analysed and discussed in this thesis relate to constructs that can be found in the majority of the discussed models (knowledge, behaviours, perceptions, and cues to action, attitudes and others) that have been widely used by researchers attempting to predict behaviours.

2.8. Summary of the literature review

Since the introduction of the nationwide cancer screening programmes in Poland the uptake of screening remained low as breast cancer screening reached 31%-39.8% (table 6) and cervical cancer screening reached 21.25%-26.77% (76.8%-uptake ever) (table 8). However, it has been hypothesized that the low initial uptake in the post-Soviet countries can be partially explained by the fact that those countries often already had relatively high uptake of cervical cancer screening during the Soviet era, as compulsory yearly medical checks mandated by employers were a common practice (Palencia et al., 2010), although this could not be true in the case of mammographic screening since it was not available at that time.

Screening programmes are of undoubted benefit as the scientific community has demonstrated over the years (Sabatino et al., 2012; Smith et al., 2009) the best way to detect early cancerous changes through the uptake of regular screening (NHS Cervical Screening Programme, 2012; NHS Cancer Screening Programmes, 2008). However, breast and cervical cancer screening has been associated with some unfavourable outcomes including embarrassment, interpretation ambivalences, creating a sense of “embodied risk”, psychological consequences of inconclusive results, blaming of non-attendees, false alarms, false reassurance, unnecessary biopsies, over-diagnosis, and over-treatment (Byrd et al., 2007; Todorova et al., 2006; WHO, 2011a). In addition the test adequacy and sensitivity are not always accurate and in the case of inconclusive results women have to be recalled, which may cause undesirable emotional responses such as anxiety (Sasieni et al., 1996; WHO, 2011a). As screening exposes healthy individuals to potentially harmful procedures (i.e. X-rays, potential biopsies etc.) the appropriate information about the benefits of screening outweighing the risks needs to be provided along with the invitation to participate, so that the woman can make an informed decision whether to uptake the screening (Gøtzsche et al., 2009).

The review of the literature also demonstrated that when attempting to gain understanding of the factors that might contribute to women’s attendance to cancer screening it is necessary to take into consideration not only the characteristics of the cancer and cancer screening tests but also characteristics of the population, its socio-political and demographic background, women’s knowledge, attitudes, behaviours related to the screening of interest, and factors that may inhibit or facilitate the attendance. Such knowledge might contribute to successful planning or improving health initiatives including educational campaigns especially in countries like Poland which are either in early stages of the national roll-out of breast and cervical cancer screening initiatives and who have experienced similar and serious political changes (i.e. countries from the former Soviet bloc). Women invited for organised screening programmes should receive appropriate information on the benefits but also on harms related to mammography and be encouraged to make an informed decision about whether to participate in it. Appropriate actions to raise awareness of breast cancer, its early symptoms and improving the uptake of cancer screening procedures in asymptomatic populations may help in cancer detection and early treatment (WHO, 2007). It is important to understand what drives Polish women's decisions to uptake screening, in order to be able to address those factors and ascertain what can be done to improve uptake. However, a gap in the literature has been identified on the predictors of screening before the introduction of the nationwide screening programmes and the following chapter will aim to address that gap. The main constructs of the majority of behaviour change models (such as knowledge, attitudes, perceptions, behaviours, past history, cues to action, and others) as well as socio-economic and socio-demographic variables have been used by researchers to predict and explain behaviours but most of the available evidence comes from societies with organised screening. Only a few of those studies looked at Eastern European populations and those that did rely mostly on opportunistic samples that are not representative of the whole population.

The questions that arose from the literature review:

1. What were the levels of Polish women's knowledge on breast and cervical cancers and how did they differ amongst different socioeconomic groups?
2. Was there an association between the levels of knowledge on cervical and breast cancers?
3. Did levels of knowledge differ across different layers of the Polish society?
4. Did level of knowledge of breast and cervical cancers differ between women who practiced prophylactic behaviours?
5. Did cancer prophylactic behaviours differ across different layers of the Polish society?
6. Was there a relationship between practicing breast and cervical prophylactic behaviours of Polish women at the introduction of nationwide screening?
7. Which factors could be considered as predictors of breast and cervical cancer screening uptake at the time of data collection?

8. What factors were considered as barriers to breast and cervical screening by Polish women at the time of data collection?

CHAPTER 3 METHODOLOGY

3.1. Introduction

In order to inform the development of health initiatives it is necessary to understand what may influence the uptake of the screening. The aim of this study was to identify factors (knowledge, behaviours, and other factors relating to breast and cervical cancer screening) that may serve as potential predictors of the uptake of breast and cervical cancer prophylaxis in Poland on the brink of introduction of centralised and nationwide screening.

Consideration was given whether to collect new data or use an already existing data set and conduct secondary analyses[iv]. The required data needed to be able to fulfil the research objectives and to have the ability to distinguish between various socio-economic groups and demographic characteristics. Socio-economic and demographic characteristics would enable differentiation between women that performed prophylactic behaviours from those who did not.

Generating new high quality data can be very expensive, difficult to organise and time consuming (Olsen, 2008, Law, 2005). Additionally, new repeat studies may create a potential for psychological, financial, or social harms (i.e., asking questions that participants may find uncomfortable comfortable) to participants or the researchers (Polonsky and Waller, 2011; British Psychological Society, 2010). The risks may include also harms to personal social status, data privacy, harms to personal beliefs, harms to relationships, and

[iv] Secondary analysis - reanalysis of data collected for non-research reasons or for a study with objectives other than the new analysis research (Vogt and Johnson, 2011)

disclosure of illegal behaviours. Even if the research carries no risks to the participants it can still cause disruptions (British Psychological Society, 2010). It is the responsibility of the researcher to try to minimise the potential risks and take ethical matters into consideration when planning a study (for further details see section 3.4.) (Polonsky and Waller, 2011; Law, 2005). Use of secondary data gives an opportunity to reduce burden on the study subjects and improve benefit/harm ratio especially in more vulnerable groups that may be particularly sensitive to repeat data collection (Law, 2005).

Olsen (2008) in support of the use of secondary data noted that:

> *"It is never possible to design a perfect study, ensure perfect compliance with the protocol, get error-free data, and analyse those data with appropriate statistical models. Because epidemiologists conduct their research in the real world, we often have to settle for less than ideal, and weigh the pros and cons of different design options. In this decision process we sometimes have to choose between using already existing data and generating new data.* " (p.481).

The use of secondary data sources for research has increased over recent years mostly due to the increased availability of electronic healthcare records and administrative databases (Garmon Bibb, 2007; Harpe, 2009) for example Clinical Practice Research Datalink (CPRD) (formerly known as General Practice Research Database (GPRD) in the UK (e.g., Devine et al., 2010; Walker, 2011; Wood and Coulson, 2001), MarketScan® in the US (e.g., Janes et al., 2011; Mark and Chang, 2009) and others (e.g., Star et al., 2010; Wong and Murray, 2005). Such databases are mostly used for pharmacoepidemiology and outcomes research (Harpe, 2009). Researchers wishing to explore factors that are known only to the studied population, such as emotional responses, beliefs, knowledge, perceptions or past experiences, need to rely on data that is collected by methods allowing them to gain such insights e.g. surveys, interviews, focus groups etc. (for example Ellaway et al., 2005; Cleland and Ali, 2006; Nishi et al., 2012; Roalfe et al., 2012).

While secondary analysis of health survey data is a scientifically valid, practical and cost-effective method to generate new evidence to support population health, there are several limitations that have to be taken into consideration (Garmon Bibb, 2007). The main disadvantage of secondary data is that it might not be completely suitable for the research objective of the new study (Boslaugh, 2010; Garmon Bibb, 2007) and the researcher often needs to adapt the study to accommodate the data at hand (Boslaugh, 2010). Such an approach requires forming the research questions after seeing the data rather than designing a study to collect the tailored information (Boslaugh, 2010). Another challenge that the researcher may face is lack of the information around the data collection process, data cleaning and management (e.g., dealing with the missing values, data transformations etc) (Boslaugh, 2010).

Garmon Bibb (2007) summarised the limitations of the secondary data use into three main groups which have been considered when this study was being designed: 1) difficulties of finding suitable data, 2) discrepancies of primary and secondary research objectives, and 3) data quality (Garmon Bibb, 2007). These three limitation groups are discussed below in more detail:

1) Difficulties of finding suitable data

Prior to joining the University of Salford as a Ph.D. student, between February and August of 2006, I worked at the Epidemiology and Cancer Prevention Division, at the Cancer Oncology Institute in Warsaw, Poland in Professor Witold Zatoński's team as an intern-junior researcher. Professor Zatoński knowing my further career steps engaged in communication with my supervisor at that time Professor Baker. On 11-13 September 2007, Professor Baker and I held a meeting with Professor Zatoński at the University of Salford during which he informed us about a recently conducted survey of which part would be relevant to my planned research project. He kindly agreed to share with me part (relevant to breast and cervical cancers) of the raw unpublished and nationally representative data collected as part of a large (Total N=8,000, women N=4,290) nationwide interviewer assisted survey conducted in Poland titled: *Knowledge cancer and health prophylaxis in*

Poland (2006)[v]. The survey was designed by the Professor Zatoński's team and the activities of data collection had been contracted out to Social Research Laboratory (Pracownia Badań Społecznych-PBS DGA) the largest Polish contract research company having experience in the field of social research (PBS DGA, 2013). The data used was deemed suitable to address the aims and objectives of this research project. The survey was carried out in the third quarter of 2006, at a time when Poland was introducing nationwide cervical and breast screening programmes for the first time in its history. Following the agreement of Professor Zatoński, his team member Dr Jolanta Lissowska sent me the data set and other documents describing the survey methodology.

2) Discrepancies of primary and secondary research objectives

The original survey examined topics related to knowledge and behaviours related to elements of healthy life styles included in the European Code against Cancer (e.g., dietary habits, tobacco and alcohol intake, general health and cancer prophylaxis etc). The main focus was put on widely understood factors of health prophylaxis with special emphasis on various types of cancers in the Polish population. However, as the aim of this thesis was to investigate the predictors of breast and cervical cancer prophylaxis uptake (e.g., knowledge, behaviours, and other factors) only responses to questions relating to breast and cervical cancers and their prophylaxis (as well as socio-demographic and socio-economic factors) were abstracted from the main dataset containing the responses of the representative sample of Polish women aged 18 and older (N=4,290) (Appendix 2).

3) Data quality

Careful consideration of the quality of the dataset used to perform secondary analyses is necessary (Garmon Bibb, 2007, Olsen, 2008). Even though, it is not possible to influence the data quality in the secondary data analysis, detailed information on the methods and main

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[v] In order to provide clarity of the nomenclature throughout the thesis the tool of data collection that provided data for this thesis is referred to as "the survey". Nonetheless, it is necessary to highlight that the study was based on structured face to face interviews.

study considerations should be available to the researcher (Garmon Bibb, 2007) which may serve as a tool to assess whether the study findings will be valid (Olsen, 2008).

The appropriateness, sampling, collection methods and quality of the data planned for the use in this thesis were reviewed in order to ascertain suitability of the survey for the new analysis according to the objectives of this Ph.D. research project. Detailed description of the methods used and data limitations was obtained from Professor Zatoński (please see the Appendix 3 for the unpublished report from the realisation of the survey prepared by PBS-DGA, and for a report by Dyzman-Sroka et al. (2008) published for one of the regions that participated in the survey please refer to the reference section). The study methods involved the use of a survey questionnaire that was administered face to face by the trained study investigators (i.e. community nurses). A structured approach with closed questions and a free text option allowed respondents to give answers other than the pre-defined answers. If specific questions were not relevant to the respondent they could be skipped. For further details on sampling and data collection please refer to sections 3.3.2-3.3.4.

3.2. Study design

The study was a cross-sectional, non-comparative survey that collected data of a quantitative nature. A wealth of sources describing the cross-sectional survey design and quantitative data qualities exist, all of which point toward the same advantages and disadvantages of these research methods (Brace et al., 2006; Chambliss and Schutt, 2010; Kruger, 2003; Rothman et al., 2008; Levin, 2006; Rindfleisch et al., 2008; Buehler, 2008; Mann, 2003; Bowling, 2002; Coggon et al., 2003; Assessment Capacities Project (ACAPS), 2012; IARC 1999), which are discussed below.

Quantitative research methods use variables that can be recorded numerically such as: nominal, ordinal, interval data or ratios (Brace et al., 2006). These numerical data descriptors (statistics) are usually based on a sample from the studied population and are used to explore data patterns (Chambliss and Schutt, 2010). Statistics may describe single variables or be used to assess multi-item scales with the use of frequency distributions, measures of central tendency (e.g., mean, median, interquartile ranges etc) (Chambliss and Schutt, 2010; Banerjee and Chaudhury, 2010). They are also used to produce reliability tests, graphs (e.g., histograms, box plots) and other ways to describe the data (Chambliss and Schutt, 2010; Banerjee and Chaudhury, 2010). Statistics also help in describing associations between variables or to enhance the validity of the findings by serving as a control for other variables or to make inferences about the confidence of generalisation of the findings from the sample analysis to the population (Chambliss and Schutt, 2010; Banerjee and Chaudhury, 2010). Quantitative methods are most appropriate when there is a pre-existing knowledge on the topic of interest (as it was in case of this study) as the use of standardised data collection tool can allow testing a hypothesis (Bowling, 2002). Quantitative methods allow summaries of large datasets that can provide a more representative picture of the characteristic in question of the studied population (ACAPS, 2012; Kruger, 2003). They also facilitate studying the distribution of views in the population and comparisons of the variables and their categories making them an invaluable tool to evaluate of interventions (Kruger, 2003) (for examples of such evaluations see Lawson et al., 2010 and NHS National Services Scotland, 2011).

However, quantitative designs have some challenges and disadvantages. This type of research methodology should be used only if data can be measured numerically and results quantified (Nykiel, 2007). Its outcomes are limited to the hypotheses preset prior to the study initiation that come from past research (Matveev, 2002; Muijs, 2004). Quantitative research also restricts the information on the context of the study without ability to control the research environment as the respondents answer predefined questions (Matveev, 2002). No in-depth description of the experience of the studied population and the study context is available (ACAPS, 2012; Matveev, 2002). The analyses require more elaborate statistics than in qualitative design and this may result in difficulties understanding the real meaning of the data from just looking at the numbers (Kruger, 2003). Despite these disadvantages the quantitative design allows for a more objective assessment and quantification of the studied phenomena (Muijs, 2004) such as for example knowledge and behaviours related to cervical and breast cancer screening uptake.

Table 10 Summary of the main strengths and weaknesses of the quantitative data (ACAPS, 2012)

Strengths: • Quantifiable numeric estimates of studied characteristic • Potential for relatively uncomplicated data analysis • Verifiability • Comparability of data between and within different populations and at different points in time • No requirement of the analytical judgement except for consideration for the presentation of the results Weaknesses: • Potential gaps in information • Potentially laborious data collection • Potentially low participation amongst groups with studied characteristic

Various tools of quantitative data collection exist (Muijs, 2004). However, when the outcome of interest is of a social nature (e.g., knowledge, behaviours or attitudes) and it cannot be observed directly from the population researchers may choose to use a survey as a tool to collect the desired data (Bowling, 2002; International Agency for Research on Cancer (IARC), 1999). Surveys are snapshots of a characteristic of interest of the studied population at a specific time point (IARC, 1999; Rothman et al., 2008). They are usually conducted at a single time point (cross-sectional) (Rindfleisch et al., 2008; Levin, 2006) and have the capability to allow studying multiple endpoints (Rindfleisch et al., 2008; Levin, 2006). Sometimes a cross-sectional survey can try to collect information on not only the current status of the studied characteristic but also the past by inclusion of questions directed at identifying past actions i.e. smoking behaviours (past and present) (see IARC, 1999 p 214, Example 10.3) as it was in the case of the survey analysed in this thesis that collected information on past screening behaviours. Surveys can be very useful research instruments in countries where health related data recording is not well developed or difficult to obtain (Buehler, 2008). For example, in Poland prior to the introduction of centralised breast and cervical screening, due to scarceness of screening initiatives and their ad hoc nature at the time it was difficult to assess the extent of and reasons for uptake (or lack of uptake) of the screening. Nationally representative survey such as the one in this thesis can provide a better understanding of these factors. Additionally, surveys can be repeated at different times and allow for a relative longitudinality to explore changing trends of the studied factors (Rindfleisch et al., 2008) such as disease associated behaviours helping to understand the leading causes of the condition of interest (Buehler, 2008). If the survey analysed in this study is repeated it could help to assess whether the screening behaviours or level of cancer knowledge changed among Polish women.

Cross-sectional survey studies are advantageous as they are cost and time efficient (Mann, 2003) but they have been also criticised for being based on retrospective questioning, being subject to recall bias, prevalence-incidence bias (e.g., over representation of cases long-lasting conditions and under representation of those short in duration) difficulty in establishing/interpreting causality (Levin, 2006; Bowling, 2002; Coggon et al., 2003; Rothman et al., 2008). Also low participation can be a potential problem for the researchers, whether due to respondents not wanting to answer to questions on a particular topic or due to the increasing number of survey research that causes intrusion in potential respondents' lives (Galea and Tracy, 2007). It has been noted that participation tends to be higher amongst respondents who are particularly concerned with the research topic i.e. mobile phone use and cancer (Galea and Tracy, 2007). In case of the study described in this thesis participation rates were high due to sampling frame used and face to face mode of administration. For further information on the data collection tool (quantitative survey), sampling and mode of administration please refer to section 3.3.1.

Table 11 Summary of strengths and weaknesses of a cross-sectional survey design (Levin, 2006, Bowling, 2002, Coggon et al., 2003, Rothman et al., 2008, Galea and Tracy, 2007)

Strengths:
- Cross sectional studies are the best way to determine prevalence of the studied characteristic
- Relative cost effectiveness
- Time effectiveness
- Potential to study multiple outcomes

Weaknesses:
- Subject to recall bias
- Lack of possibility to ascertain causality
- Potential of low participation

3.3. Methods

3.3.1. Data collection tool - questionnaire

The aim of every survey questionnaire is to collect reliable, valid and unbiased data from a representative sample (McColl et al., 2001) with relative cost efficiency (Department of the Environment Transport and the Regions (DETR), 2000). Surveys collecting the data of interest can be designed as self-administered questionnaires as well as in a face to face or phone interviews (McColl et al., 2001). The use of questionnaires can allow the researcher to gather facts or opinions related to a selected topic and are seen as a good medium for measuring attitudes, motivation or values of respondents (Hartage and Cahill, 2008).

The principal foci that should be used while designing the questionnaires include factors such as the wording of questions, position of questions, choice of formats of responses, modes of survey administration, formatting and the presentation of the questionnaire, possibilities of increasing response rates, and expert opinion about importance of particular questions (Siniscalco and Auriat, 2005; McColl et al., 2001; Thayer-Hart et al., 2010) (please refer to sections 3.3.1.1-3.3.1.3).

Data collection success can be affected by the patients characteristics like knowledge, personality, memory (Robson, 2002), literacy level, and other factors. Taking that into consideration the questionnaires ought to be designed with the use of uncomplicated questions (Polit and Hungler, 1991; Robson, 2002). However, in case of this study, levels of literacy were mitigated by a face to face data collection.

3.3.1.1. Format of questions

All survey questionnaires should contain questions that are understandable to all respondents (Robson, 2002; Bowling, 2002). They can be based on open or closed questions or both. Closed questions ask the respondent to choose among possible answers and systematise responses and ease the preparation of the data for the analysis (Siniscalco and Auriat, 2005; Thayer-Hart et al., 2010). Incorporating closed questions for a single or multiple answer selection (Siniscalco and Auriat, 2005; McColl et al., 2001) permits the inclusion of more variables, as the format allows the respondents to answer more questions in the same time as in open ended questions (Siniscalco and Auriat, 2005). However, there is a possibility of missing the suitable options to select or incorrect answers being selected by mistake (McColl et al, 2001) which would introduce bias. Closed questions do not allow respondents to elaborate on the topic. It has been also noted previously that in some cases the respondent may be predisposed to systematically select the first/last option (Siniscalco and Auriat, 2005). Closed questions can be easier to quantify and are less time consuming for both the respondent and the researcher but because of their structured character there is no room for answers other than those preselected by the researcher what can introduce researcher led biases (Russell, 2010; Siniscalco and Auriat, 2005).

Open questions allow longer and more detailed answers with respondent's own words but they can be time consuming for both respondent and the researcher and difficult to analyse as the interpretation may pose a challenge due to the potentially large variance of answers

(Russell, 2010; Siniscalco and Auriat, 2005). As the main survey consisted of a large study sample (N=8,000) that was drawn from all of the regions (urban and rural areas) in Poland and consisted of a large number of questions (on general health prophylaxis), open ended questions could extend the time required for face to face data collection. The coding interpretation of answers could be particularly difficult if answers were long and complex (Russell, 2010; Siniscalco and Auriat, 2005). However in the case of this study in addition to closed questions with pre-defined answers an additional option was given, i.e. 'other' to allow an alternative answer to be provided (see for example question 6, Appendix 2). The answers to free text option answers were noted by the interviewers (community nurses). This decreased potential problems with understanding and coding of the answers at a later stage.

3.3.1.2. Mode of administration

There are number of modes of questionnaire administration, including: postal questionnaire; telephone interviews; face to face interviews; and in recent years via the internet (DETR, 2000, Robson, 2002). However, as the mode was used in this study was an interviewer assisted approach with a face to face data collection only this method is described below.

Such face to face data collection approach allowed the interviewer to rectify any immediate misinterpretations or inconsistencies (Bowling, 2002; Doyle, 2005; Bowling, 2005). A semi-structured approach (closed questions with open ended option) allowed the respondents to choose an answer that has not been listed in the pre-defined options (Bowling, 2002). Also, such face to face approach eliminated the requirement for minimum literacy levels of the respondents as the interviewers helped to clarify what is being asked (Bowling, 2005; Doyle, 2005).

However, face to face assisted surveys such as this one are not free of challenges. They are costly, time consuming, and they require the research staff to be able to meet with the respondents at an agreed time and location often depending on the respondent's preference (Polit and Hungler, 1991; Roberts, 2007). The collection of the data can be influenced by the interviewer's characteristics such as for example: personality, professional training and level of interviewing experience resulting in potential biases that are impossible to identify once the data has been collected. For example respondents might modify their answers to put them in a more favourable light in the interviewer's eyes (Opdenakker, 2006; Roberts, 2007). Additionally, when considering a face to face approach attention has to be paid to asking sensitive questions in the presence of third persons i.e. family members if the data is collected in respondent's home (Lee, 1993). Sensitive topics may include questions that may cause distress, strong emotions (e.g., anger, sadness, embarrassment, anxiety) or harms (e.g., disclosure of information of personal nature) (Elmir et al., 2011; Jordan et al., 2007). Interviewing in the presence of other family members may cause the respondent to withhold sensitive information which they would be willing to share in confidence with the interviewer on one-off bases under assumption of unlikely scenario of crossing-paths with the interviewer ever again (Lee, 1993). As the study questions included questions predominantly on health related issues that can be considered sensitive the interviewers were trained to advice respondents to follow the best practices of attaining privacy during the interviewing process. Whenever possible the interviewers explained to the respondent and any other household members that the data should be collected in private as it relates only to the respondent's views only. The interviewers suggested conducting the interview in another room or if not possible to sit with the respondent in a quieter part of the room (Bowling, 2002). However, in practice this is not always possible to conduct the interviews in private as there may be distractions present or other persons may want to sit close to the interviewee. In such cases it is important that the interviewer shows patience and tactfully remind that the interview is intended for a particular respondent only (Bowling, 2002). Where it was not possible to ascertain interview privacy the information was noted by the interviewers and returned to PBS DGA for assessment.

Despite the challenges the above described design allowed collecting a large quantity of complex information for a sample truly representative of all socio-economic and demographic layers of Polish society. All the respondents answered the questions in their own homes at a time convenient to them. The sections of the questionnaire utilised in this thesis can be found in the Appendix 2.

3.3.1.3. *Relevant components of the survey*

As mentioned previously only questions relevant to breast and cervical cancers, their prophylaxis and general socio-demographics were used in this study and are presented in the Appendix 2.

The main topics covered by the relevant sections of the questionnaire (breast and cervical screening) included:

- Knowledge of breast and cervical cancer related topics
- Current behaviours related to the breast and cervical cancer screening:
    - Breast self-examinations
    - Mammography attendance
    - Gynaecological/PAP examinations
- Past behaviours related to the breast and cervical cancer screening:
    - Breast self-examinations
    - Mammography attendance
    - Gynaecological/PAP examinations
- Reasons for non-participation in screening and breast and cervical cancer medical examinations
- Socio-economic and demographic details such as: age, education, social status etc.

3.3.2. Sampling

In order to source a study sample from the population of interest a sampling design needs to be decided upon (IARC, 1999). Samples selected on the bases of only the investigator's judgement or established by convenience (e.g. volunteers, patients in a specific health care establishment etc.) cannot guarantee avoidance of selection bias. Such samples may not be representative of the studied population. Therefore, a random form of sampling was used in this study as it gave the same chance of being selected to each study participant and therefore decreased the potential for selection bias (Bowling, 2002; IARC, 1999). There are many types of random sampling such as: simple random sampling (each subject has exactly the same chance of being selected), systematic sampling (each n^{th} subject being selected from a non-cyclic random list of population), stratified random sampling (subjects selected from specific strata ensuring that each of strata is represented in the overall sample), and cluster random sampling (random sampling from pre-existing groups i.e. hospitals) (Boslaugh and Watters, 2008; Pagano and Gauvreau, 2000). Simple random sampling from a whole population has the lowest potential for selection bias as it truly samples from the whole population but for the same reasons may be very costly and difficult to achieve (Boslaugh and Watters, 2008; Pagano and Gauvreau, 2000) therefore another complex random sampling form (Boslaugh and Watters, 2008) was found to be better suited for this study.

3.3.2.1. Sampling method

The sampling method used in this study was stratified cluster sampling proportional to size. In this form of sampling the population is drawn from the pre-existing subgroups (borough, street, village etc). This method is commonly used in the national surveys, especially in transition countries such as Poland, as the cost is very high (e.g., due to the costs associated with face to face design) (Boslaugh and Watters, 2008; Pagano and Gauvreau, 2000; Yansaneh, 2005) and the absence or low quality household listings results in the need for selection of geographical units first, followed by construction of household listings within the selected sampling units (Yansaneh, 2005).

Such approach produces national estimates in a more cost effective way that includes several random selection levels (e.g., from cities to local municipalities to streets etc) (Boslaugh and Watters, 2008; Pagano and Gauvreau, 2000; Chromy and Abeyasekera, 2005). As the primary sampling units (e.g., cities) may contain different numbers of individuals in each sampling group (e.g. streets) techniques of sampling proportional to that sub-group size were used to provide samples truly representative of each of the sub-groups (Boslaugh and Watters, 2008; Pagano and Gauvreau, 2000). However, in this form of sampling some sampling precision might be lost due to the fact that the subjects tend to be similar within the sampling units (e.g., inhabitants of villages sharing similar characteristics such as income level, education etc.) (Boslaugh and Watters, 2008; Yansaneh, 2005).

3.3.2.2. Sample size

Due to the need for a regional differentiation of the National Programme of Cancer Prevention, with potential regional differences in knowledge, access to healthcare the multi-stage cluster random sampling proportional to size was applied.
The study the sample consisted of 16 equinumerous regional sub-samples of 500 subjects selected from each voivodship (equivalent of a county). The total sample included equalled to 8,000 individuals of which 7,948 surveys were successfully conducted (Women accounted for 4,290 of the respondents[vi]).

3.3.2.3. Sampling frame

The following sampling scheme allowed for inclusion of a sample representative of the whole Polish population aged 18 or over.

The subjects for the participation in the study were identified in the 16 voivodships (strata) from the following levels:

1) Gmina (local municipality)
2) Villages, streets
3) Individuals (18+)

1) First draw was conducted at municipal level

The first level of sampling was simple and proportional. Territorial sampling units of the provinces were defined by the class of locations:

- Rural municipalities and rural parts of the urban-rural municipalities

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[vi] Please note that for the purpose of this thesis, the target population was constructed of women only.

- Urban municipalities (cities) and urban parts (cities/towns) in the urban-rural municipalities of up to 20,000 residents
- Urban municipalities (cities) and urban parts (cities) in the urban-rural municipalities of 20,001 to 50,000 residents
- Cities of 50,001 to 200,000 residents
- Cities of 200,001 to 500,000 residents
- Cities and urban agglomerations over 500,000 residents

The sampling frame for this stage was the list of municipalities – primary sampling units (PSU). The draw took place independently in each stratum with probability proportional to the size of the population of people aged 18 years or more.

Urban and rural municipalities were drawn basing on the ratio of the number of surveys in each stratum divided into clusters of addresses, which contained approximately 6-8 addresses in the core sample list and 10-25 in the reserve list.

2) Villages in rural areas and rural parts of the urban-rural municipalities, streets in municipalities, and urban parts of urban-rural sampling units were the sampling units in the second sampling stage.

The sampling of villages in the rural/rural-urban municipalities and streets in the urban/urban-rural areas was carried out by the Ministry of Internal Affairs and Administration from the set of randomly selected municipalities in first sampling stage. The sample selection was carried out through a simple random sampling scheme with probability of selection proportional to the size of the population aged 18 years or over residing in the streets/villages.

3) The third level of sampling was done at the individual level (18+).
Selection was done on the basis of a stratified sampling scheme with the probability of equal selection. Sampling of individuals was done by defining groups according to age and gender

(18-24, 25-39, 40-59 and 60 and over). The number of respondents was drawn from each age group.

The identification of the potential participants was done through a draw of the PESEL[vii] numbers in the register maintained by the Ministry of Internal Affairs and Administration. The resister contains lists personal identification numbers (number given to each Polish national at birth). This method excluded people that: were removed from the register, were living abroad, had strictly confidential addresses, and those who did not agree to their data being used. The number of surveys was defined for each stratum before selection.

For each of the 'gender-age' group desired survey numbers were derived from the number of surveys per locality type in each voivodship (as defined in 1st stage) and the fraction of the 'gender-age' group in the population (in the locality type group). In this sampling stage, simple random sampling with the equal probability of selection was used by the Ministry of Internal Affairs and Administration to identify the individuals (addresses) from the lists of residents of villages/streets (identified the 2nd stage).

After the core list reached its target numbers a reserve list was established. Potential participants from the reserve list would be approached to substitute individuals from the core list that were not able to participate in the study (i.e. refusal, other reasons). The selection of the potential participants from the reserve list was done following the same sampling scheme using the same strata of municipality, age and gender as the replaced individual.

[vii] PESEL – Powszechny Elektroniczny System Ewidencji Ludności [Universal Electronic System for Registration of the Population]

3.3.3. Procedure

The study was conducted by direct interview (face to face surveys assisted by trained interviewers – community nurses) in the third quarter of 2006. Further to training on the interviewing techniques the nurses made appointments (via telephone call) with the study participants. Each of the surveys was carried out in the respondents' homes.

In the first instance, the nurses attempted to reach the respondents from the core list of potential participants, and after exhausting that list they would then move to the names on the reserve list.

3.3.4. Assurance of data collection quality

In order to assure data quality an audit may be conducted that will help to uncover potential irregularities (Gliklich and Dreyer, 2010). It has been previously suggested that it can be conducted at random on 5%-20% of all data entries (Gliklich and Dreyer, 2010; Koch et al., 2009). This is followed by the PBS DGA procedures, which audited by telephone 5% of all conducted surveys. Where PBS DGA was not able to contact the respondent by telephone an auditor was sent to the respondent's address. A similar approach was taken if the interview did not take place or it was impossible to determine whether the nurse's visit took place. The purpose of the audit was to examine whether any of the surveys were falsified. The audit included thorough checks of all the study documents and revealed that 69 of the surveys were falsified. The interviewers, who delivered those surveys, were removed from the study and the national network of interviewers. All 69 questionnaires have been removed from the database and replacement nurses were sent to the selected addresses. The reasons for non-participation were recorded for all randomised subjects that were selected for participation but did not enter the final sample. They were classified as: refused to take part in the study, lived permanently abroad, were mentally ill, have died before the research took place or other reasons.

3.4. Ethical considerations

Whilst planning a research project, the researcher should make sure that the study will be conducted ethically and take appropriate actions to minimise potential risks (Polonsky and Waller, 2011). In many countries ethical aspects of the study design and conduct are governed by ethics and/or governance committees with power to either grant or refute approval based on the research proposal submitted for their opinion (Hernandez et al., 2009). They may scrutinise the research plan to assure that the best methodology has been chosen that would justify the participation of the human subjects (Goodyear-Smith et al., 2002; Steinkamp et al., 2007). Many of the Western European countries with a long history of being democratic societies (such as for example: the United Kingdom, The Netherlands, or France) have well defined research ethics committees (Steinkamp et al., 2007).

However, in Poland there is no effective system protecting rights of the research subjects in either the observational or interventional studies. Only, interventional studies being conducted by physicians need approval of bioethical committees. Also, there are no legal obligations for an approval of the independent research ethics committee for all observational and interventional studies conducted by investigators others than physicians and with the exception of clinical trials there is no need to monitor on-going studies (Czarkowski, 2012) which includes any surveys and re-analysis of previously collected data.

Even though the observational design of the study did not require the researcher to apply for ethical permission to the Polish authorities, the student gained governance and ethics approval from the Governance and Ethics Committee of the University of Salford (approval number: RGEC07/070) and several risk minimisation measures have been taken to protect data of the individuals in the analysed data set (please see the sections 3.4.1-3.4.2).

3.4.1. Data confidentiality

Despite the fact that the research using secondary data does not collect new data directly from the subjects it needs to take into consideration various ethical aspects (Polonsky and Waller, 2011). The main ethical issues that are relevant to the use of secondary data are mostly those that pertain to privacy and confidentiality of the study subjects (for example risks of identification of the participants, unauthorised access to the personal data etc) (Olsen, 2008; Polonsky and Waller, 2011; Law, 2005). The risk for loss of confidentiality in the secondary research may be decreased through the anonymisation of the participants' records (removal of any data that would allow identification of study subjects) (Law, 2005; El Emam and Dankar, 2008; National Research Council (US) Panel on Collecting Storing Accessing and Protecting Biological Specimens and Biodata in Social Surveys, 2010). This needs to be done by the researcher that originally collected the data before sharing it any further (Law, 2005). Additionally, the development of the new technologies may pose a threat for the interception on the data by unauthorised parties (e.g., unauthorised access to the researcher's computer or other location) (Law, 2005). Anonymisation and restricted access to data were used in this study. All of the identifiers (names, dates of birth, PESEL numbers, and addresses) were removed before the researcher obtained the data so that no party (including the researcher) could attempt re-identification. The data were accessible only to the researcher and her supervisors and stored on double password protected computer (BIOS and Windows passwords). The computer was also protected from viruses and other potential security breaches with up-to-date version of AVG Anti-virus and internet security tools by AVG Technologies USA, Inc., CA, US.

3.4.2. Consent

Written informed consent was obtained by the interviewers from all study participants prior to the completion of the surveys. A copy of the consent form can be found in the Appendix 4.

3.4.1. Receipt of the data

After Professor Zatoński's approval, the data relevant to breast and cervical cancers, their prophylaxis and socio-demographic characteristics was sent on the 27th May 2007 to the Ph.D. student by Dr Jolanta Lissowska, the Scientific Coordinator of the survey, working in Epidemiology and Cancer Prevention Division at the Maria Skłodowska-Curie Memorial Cancer Centre and Institute of Oncology.

3.5. Data management

The data from the whole survey[viii] was coded and entered with the use of the Statistical Package for Social Sciences (SPSS) v15 by PBS DGA. SPSS is considered to be the "industry standard" aiding the statistical analysis of data that has been widely used especially in psychology and the social sciences (Brace et al., 2006). The main strengths of SPSS include ease of labelling and output editing (Pevalin and Robson, 2009). However, it may be slow in handling large and complex data sets and demanding with regards to the punctuation in comparison to Stata (Pevalin and Robson, 2009). This slow performance of SPSS was observed by the researcher during the data handling stage and therefore the dataset was converted into StataSE v11 data file format which showed an improved response time and lower use of the computer memory. Additionally, as the data analysed in this thesis in was collected with the use of stratified cluster sampling there was need to account for sampling design in all analyses and Stata provides a range of commands that can be used for this purpose (Kreuter and Valliant, 2007). Stata can be considered a user-driven program that enables its users to download program's extensions allowing for analyses that originally were not part of the package (Pevalin and Robson, 2009). All analyses were done using this package (for details on data analysis please see section 3.6).

[viii] It is important to highlight again that only female subjects were kept for the data cleaning, quality checks and analyses.

3.5.1. Data quality and data cleaning

Prior to the start of the analyses the data needed to be checked for errors, outliers and missing values (Pallant, 2007; Bowling, 2002). In the first instance, the data was visually inspected to assess whether the recorded data looked plausible (Pallant, 2007; Bowling, 2002). Further checks for errors were done using descriptive statistics (summary data tables) and graphs (histograms, scatter plots etc) (Pallant, 2007). As the data set contained both categorical and continuous variables different approaches were used for each of them. Frequencies, minimum and maximum values, and valid and missing cases were tabulated and inspected for the categorical variables and minimum, maximum and mean values for the continuous variables (Pallant, 2007). For example if for the categorical variable (*Have you ever undergone cytology?)* the possible range of answers was 1-3 (e.g., yes, no, or I don't know), with missing values coded as 9, the value 4 would indicate an obvious error. Similarly, if a minimum value of a continuous variable such as age was recorded as 6 years old, it would suggest an error, since the age inclusion criterion was 18 years old or over. Additionally, some of other values indicative of erroneous recording were possible to identify. For example if an answer to question about mammography attendance was set to 'no' but the next question about the age of first mammography had inserted answer '58 years old', the first variable could be corrected to 'yes'. In case of other errors that were uncovered but were impossible to rectify the value was set to missing.

The format of missingness recording was also checked and brought to a unified format. In several variables, missing values were coded as: "9", "-9", "99", or "98". To avoid confusion and to enable the ease the data interpretation all missing values were recoded in Stata to: **"."**.

3.5.2. Construction of the additional variables

Based on the available data, and the literature, several additional variables were constructed through aggregation or scoring of the existing data to enable easier or more meaningful analyses (Pallant, 2007). For example transformation of the interval variables into groups may allow more powerful analyses such as Analysis of Variance or regression analyses. Collapsing categories may be useful in data analysis if the original variable records large number of groups (e.g. very granular information on the level of education) and there are very few observations in each of the groups (Pallant, 2007; Boslaugh and Watters, 2008; Kirkwood and Sterne, 2003) which was the case for several variables analysed in this study (e.g., household size, income source).

Age

In order to enable comparison of the age groups with respect to key outcome variables the interval age variable was used to develop the new ordinal variables.
The additional age variables included:

- 18-24, ≥25
- 18-49, ≥50
- 18-24, 25-29, 30-39, 40-49, 50-59, 60-69, ≥70 (the first two age groups 18-24 and 25-29 have been split unequally to allow greater detail in analyses exploring knowledge and prophylactic behaviours in screening target and non-target population (i.e. cytology in women <25 and detailed age groups for women ≥25)

Education

This survey questionnaire allowed respondents to select one of several very detailed options describing their highest level of education achieved. However, after exploration of the numbers of observations in each of the categories a new education variable was created to allow for larger numbers in each of the groups and therefore more meaningful analyses (Kirkwood and Sterne, 2003) (table 12). In the new variable, the respondents that did not give an answer to this question were treated as missing values and therefore removed.

Table 12 New education variable created through collapsing of categories

Old variable	New variable
• Lack of formal education, incomplete primary school • Completed primary school • Incomplete high school or technical school • Completed high school, technical school, vocational qualifications • Bachelor's degree or incomplete master's degree • Completed master's degree • Higher education than masters or doctoral degree • Refused to answer	• Primary or lower • Technical *[or incomplete high school]* • Medium *[i.e. high school level]* • Higher *[completed university degree or higher]*

Income source / employment

Similarly, as in case of the education, the questionnaire allowed respondents to give a very specific answer to the question about main source of income source/employment in past 12 months (table 13). Several of the categories have been collapsed to help in the meaningful analyses with larger numbers in each of the components of the variable. In the new variable, all respondents that did not give an answer to this question were treated as missing values and therefore removed. It is important to highlight again that after the review of the available literature, the income source was not considered a good proxy of deprivation in Poland due to the historical context of employment explained in the section 2.6.1.

Table 13 New Source of income variable created through collapsing of categories

Old variable	New variable
• Employed in the public sector • Employed in the private sector • Self-employed in sector other than farming • Self-employed in farming (own farm) • Self-employed in farming (not in an own farm) • Retired • Disability, social benefits • Family benefits • Unemployment benefit • Benefits from social service • Income sources other than from employment (pre-retirement benefit, alimony, studentship, property) • Support of a person from outside of the household	• Employed • Self-employed • Retired • Disability benefits • Benefits (family, social etc) • Unemployment benefits • Dependence of a person from outside the household

Number of people in the household

The number of people per household has been previously assessed as a good proxy for level of deprivation in Poland (CBOS, 2008; Towalski and Kuźmicz, 2010). The questionnaire allowed respondents to enter the number of people living in their households and the answers ranged from 1 to 12 persons living under one roof. Numbers of respondents who reported large number of residents per household was relatively small in comparison to those who reported up to 4 people therefore answers that indicated households with 5 or more people were recoded into one common category. The newly created variable included: *1 person, 2 people, 3 people, 4 people, and 5 people or more.*

Behavioural items

Two variables relating to breast and cervical cancer prophylactic behaviours were treated as outcome variables and have been dichotomised to allow for regression analyses

Table 14 Variables relating to breast and cervical cancer prophylaxis transformed into dichotomous format

Question	Possible responses	New variable
Are you examining your breasts by your-self (at home)?	• Yes • Yes, but rarely • No never	• Yes *[included 'Yes' and 'Yes, but rarely']* • No
Have you ever had a mammography?	• Yes • No • I don't know, it is difficult to say	• Yes • No
Have you ever had cytology?	• Yes • No • I don't know, it is difficult to say	• Yes • No

3.5.3. Formation of the scoring scales

Responses to single questions may be affected by many factors such as question wording, interviewer and other biases (Bowling, 2002). Creation of a scale might be a useful approach to combine a number of variables to measure a wider concept (Pevalin and Robson, 2009).

Creation of scores for a specific concept may include batteries (series of single items relating to the same concept) and/or scales (series of items about a similar concept that can be scored (Bowling, 2002).

Bowling (2002) noted:

> *"...the same form of response scale should not be used too frequently throughout the questionnaire, as this can again lead to a response set (a tendency to answer all the questions in a specific direction regardless of their content). The wording and format of response categories should be varied to avoid this..."* (p. 250).

Following this, scoring scales were created of the items in the questionnaire that measured the same concept (i.e., knowledge related to breast and cervical cancers). In addition, the scored items were also weighted to reflect the level of the measured concept (Bowling, 2002). For example, the more correct screening knowledge the higher the score (i.e. knowledge of the effect of smoking cessation on risk of cervical cancer: large protective effect=2, somewhat protective=1), and inversely the less correct knowledge the lower the score (i.e. lack of knowledge of protective effect of smoking cessation on risk of cervical cancer=0). The level of the weights was sourced from the published literature reviewed in the previous chapter (for details please refer back to sections 2.3.2 and 2.4.2).

The reliability coefficient (Cronbach's Alpha) was used to assess the reliability and internal consistency of the items in the newly created scales. The coefficient estimates the reliability of a scale based on correlation among the items of the scale. The coefficient score can range from 0.00 and 1.00 but there is no agreement over the minimum acceptable level for the scale to be considered reliable. It has been noted that some researchers consider 0.70 and above to be a good indicator of the reliability whilst others consider 0.50 and over to be sufficient to assume internal consistency (Bowling, 2002; Bland and Altman, 1997; Nunnaly, 1978). The scales used in this study demonstrated good or moderate reliability: for the overall knowledge (α=0.72), breast cancer knowledge (α=0.58), cervical cancer knowledge (α=0.58).

As the breast and cervical cancer knowledge scores included varying number of items (breast cancer-13 items and cervical cancer-6 items) the range of maximum possible scores differed greatly for both scales (breast cancer: 0-26 items and cervical cancer: 0-12). Therefore the total knowledge total score ranged from 0 to 38. The relatively wide variation in the scales' scores was later decreased by dividing each of the newly created scoring scale by the number of questions that formed the scale (Pallant, 2007) creating a new possible range of scores from 0 to 2. This was done to present results as means with their standard deviations allowing for easier comparability of the scores' during the analyses. This approach is frequently used by researchers analysing multi-item health and social science surveys to allow the use of inferential statistics (for example this is frequently used to analyse SF-12, SF-36 surveys (Gandek et al., 1998; Jenkinson et al., 1999; Butterworth and Crosier, 2004). However, the levels of the items in the surveys need to be the same meaning that respondents with the same mean score have the same weight of the tested construct (Hadžibajramovic et al., 2013). . In case of the data analysed in this thesisstudy all subjects sharing the same mean of cancer knowledge (measured construct) would have exactly the same magnitude of score (Hadžibajramovic et al., 2013).

All scores were divided into thirds and recoded to create new categorical variables with three levels: low score (from 0 to 0.6666666=from 0% to 33.3% of the total score values), medium score (between 0.6666667 and 1.333332-from 33.4 to 66.6% of the total score values) and high score (1.333333 to 2=from 66.7% to 100% of the total score values). This was done to allow more detailed interpretation and more meaningful use in multivariate logistic regression analyses. The non-scored items were analysed in a descriptive way. In order to allow easier interpretation of the results the score assigned to each of the items is presented together in the results section (section 4.2) and the scoring only in appendix 5.

3.6. Data analysis

All descriptive and inferential statistics were carried out by the researcher using Stata v11 (StataCorp LP, TX, USA).

Descriptive statistics (means, standard deviations, ranges, minimum and maximum values, percentages and frequencies) were used for analysis of the demographic data as well as knowledge, behaviours and other factors related to breast and cervical cancers and their prophylaxis. Cronbach's alpha statistic was calculated as a measure of the internal reliability for the knowledge scales. The scores were later used in the analyses either as means or as a categorical variable with values of low, medium or high (for score ranges please refer back to section 3.5.3.6).

In order to account for variability in the population and to decrease potential for bias due to complex sampling, sampling design characteristics (16 strata and 63 PSUs) and final probability weights (that included non-response and likelihood of inclusion in the survey) (Lee and Forthofer, 2006; Kreuter and Valliant, 2007; Yansaneh, 2005) were incorporated in all analyses. Analyses were done with the use of –SVY– prefix commands (for details on Stata programming techniques applied in this study please see: StataCorp LP., 2007). All results have been calculated on estimation samples allowing for a closer representation of the real population from which the sample has been drawn and (Lee and Forthofer, 2006). Corresponding design effects have been reported with the analyses (mean generalised design effects for Chi square analyses). Stratified cluster sampling usually produces design effect coefficient larger than 1 representing the level of the precision that is lost due to higher likelihood of homogeneity between subjects in this type of sampling versus simple random sampling (Boslaugh and Watters, 2008; Yansaneh, 2005; Lee and Forthofer, 2006; Hahs-Vaughn, 2005).

In cases of analyses of means of continuous variables across dichotomous variables (i.e. differences of mean knowledge scores for practice versus non-practice of cancer prophylactic behaviours), despite the fact that some outcome variables were approximately normally distributed (i.e. knowledge scores), independent t-test could not be performed as it does not account for sampling design (UCLA: Statistical Consulting Group). Instead, a design adjusted Wald test with F statistic (*test* command after sub-group mean estimation) was obtained (UCLA: Statistical Consulting Group, Bruin, 2006). The F statistic (ratio of two standardised chi-squared random variables) is given with *m* (numerator; tied to the dimensions of the table) and *n* (denominator; reflecting survey design equalling to number of PSUs minus number of strata) degrees of freedom (Archer et al., 2007; Lee and Forthofer, 2006; StataCorp LP., 2007; Burns et al., 2003). Pearson Chi-square tests (with Rao-Scott correction) with survey design correction were performed and reported with design based F-statistic to assess differences between categorical variables (Archer et al., 2007).

Linear regression was used as an equivalent to one-way ANOVA to examine continuous variables and explore differences between specific groups of categorical variables (Lee and Forthofer, 2006). Multifactorial evaluation was performed using binary logistic regression techniques to produce odds ratios (OR) and 95% confidence intervals (95% CI). Logistic regression was used for the likelihood of taking up mammography and cytology. Factors included in the logistic models were age, education, income/employment status, self-reported material conditions, marital status, previous tumour diagnosis and type of tumour, having a family member or a friend diagnosed with cancer, breast and cervical cancer knowledge (high, medium, low) and for mammography model also BSE. They were assessed for the inclusion basing on OR, 95% CI and p-values and were included in the multivariate model basing of backward elimination. All predictors where considered statistically significant if p-value was less than 0.05 ($p<0.05$). The results from the analyses are presented in the next chapter.

CHAPTER 4 RESULTS

This chapter provides a descriptive summary of the study sample and reports results of the data analysis aiming to address the following research questions:

1. What were the levels of Polish women's knowledge on breast and cervical cancers and how did they differ amongst different socioeconomic groups?
2. Was there an association between the levels of knowledge on cervical and breast cancers?
3. Did levels of knowledge differ across different layers of the Polish society?
4. Did levels of knowledge of breast and cervical cancers differ between women who practiced prophylactic behaviours?
5. Did cancer prophylactic behaviours differ across different layers of the Polish society?
6. Was there a relationship between practicing breast and cervical prophylactic behaviours of Polish women at the introduction of nationwide screening?
7. Which factors could be considered as predictors of breast and cervical cancer screening uptake at the time of data collection?
8. What factors were considered as barriers to breast and cervical screening by Polish women at the time of data collection?

Answers to the above questions will be provided in the following sections.

4.1. Socio-demographic and socio-economic variables

The study included seven socio-demographic/economic variables which were divided into two groups: socio-demographic and socio-economic characteristics. Such grouping allowed distinguishing between the descriptive demographic variables and those that could be used to in an attempt describe the economic layers (material conditions) of the studied population.

Socio-demographic variables included:

- Respondents’ age
- Marital status
- City size

Socio-economic variables included:

- Education
- Household size (number of people living in the household)
- Source of income (in last 12 months)
- Material conditions (self-assessed)

Socio-demographic variables

Table 15 Socio-demographic characteristics of the study population (age, marital status and city size)

Socio-demographic characteristic		**N (%)**
All respondents		4,290 (100)
Age	18-24	636 (12.8)
	25-29	297 (7.36)
	30-39	870 (21.8)
	40-49	650 (16.5)
	50-59	780 (19.3)
	60-69	418 (9.09)
	70+	639 (13.3)
Marital status	Married/ in relationship	2,114 (53)
	Widowed	884 (16.2)
	Separated/divorced	288 (11.6)
	Single	998 (19.2)
City size	City above 100,000	1,201 (27.9)
	City 50,000-100,000	368 (8.97)
	City <50,000	1,048 (24.8)
	Village	1,673 (38.4)

The age distribution amongst participants of the study was positively skewed with the majority of participants being in the younger age group. The mean age of the sample was 46.1 years with standard deviation (SD) of 18.3 years and age range from 18 to 93 years.

The majority, 21.8% (N=870) of women were aged between 30 and 39. The next group in terms of size 19.3% (N=780) were women 50-59 years old. Women between 40 and 49 years old accounted for 16.5% (N=650), between 18 to 24 years old for 12.8% (N=636), between 60 to 69 years old for 9.1% (N=418), 25 to 29 years old for 7.4% (N=297) and over 70 years old for 13.3% (N=639). The highest proportion of the respondents, 53% (N=2,114) were either married or in an informal relationship, 19.2% (N=998) were single, 16.2% (N=884) were widows and 11.6% (N=288) were divorced or separated. Thirty eight per cent (N=1,673) of women lived in villages; followed by a group of 27.9% (N=1,201) living in large cities with more than 100,000 residents, 24.8% (N=1,048) lived in cities below 50,000 people and 9% (N=368) in cities between 50 and 100,000 residents.

Socio-economic variables

In order to ease the interpretation of the data, education, household size and source of income were presented after being recoded into new variables (for details please refer back to section 3.5.2).

Table 16 Socio-economic characteristics of the study population (age, marital status and city size)

Socio-economic characteristic		**N%**
All respondents		4,290 (100)
Education	Primary or lower	958 (21.7)
	Technical	973 (22.7)
	Medium level i.e. high school	1,669 (39.3)
	Higher	678 (16.3)
Household size	1 person	982 (20.9)
	2 people	996 (24.4)
	3 people	867 (20.9)
	4 people	822 (19.9)
	≥5 people	611 (13.9)
Source of income	Employed	1,549 (39.9)
	Self-employed	336 (8.7)
	Retired	1,122 (25.9)
	Disability benefits	257 (6.4)
	Other benefits (family, social etc)	485 (11.5)
	Unemployment benefits	76 (1.8)
	Dependent on a person from outside household	257 (5.8)
Material conditions	We live poorly	237 (5.46)
	We live modestly	1,250 (29.1)
	We live on average level	2,135 (50.5)
	We live well	592 (13.8)
	We live very well	56 (1.14)

The majority, 39.3% (N=1,669) were educated to medium i.e. high school level, 22.7% (N=973) had technical education, 21.7% (N=958) reported primary or lower education and higher was reported by 16.3% (N=678). The proportion of various household sizes was almost evenly spread between respondents who reported living in households with 1-4 inhabitants, as 24.4% (N=996) lived in 2 person households, 20.9% (N=867) in 3, 20.9%

(N=982) in 1, and 19.9%- (N=822) in 4. There were 13.9% (N=611) of respondents who declared living in households composed of 5 people or more.

The majority of women (39.9%, N=1,549) were employed or retired (25.9%, N=1,122). The rest of women declared self-employment (8.7%, N=336), disability benefits (6.4%, N=257), other benefits (11.5%, N=485), unemployment benefits (1.8%, N=76) and dependence on a person from outside household (5.8%, N=257). When asked about material conditions half of women (50.5%, N=2,135) said that they lived on an average economical level which was followed by those who lived modestly, 29.1% (N=1,250) said that lived modestly, 13.8% (N=592) lived well, 5.4% (N=237) lived in poverty, and only 1.1% (N=56) described their economical situation as very good ("We live very well").

4.2. Scored and unscored elements of theoretical constructs: knowledge, behaviours and cues to action

The study sample relating to breast and cervical cancers and their prophylaxis has been analysed by groups of questions on either of the cancers. Cancer related knowledge, behaviours, cues to action, respondents' demographic and socio-economic characteristics are described in this section. Where appropriate a weighted scoring (sourced from the literature review - sections 2.3.2 and 2.4.2) has been applied to knowledge items to create a scale that would help to quantify the knowledge levels. Questions that were not possible to include in overall scoring were explored in a descriptive fashion (for details on the scoring methodology please refer back to section 3.5.3).

In order to allow easy interpretation of results, specific scoring applied to each element of the scale was presented immediately in the tables reporting specific proportions and frequencies of answers to each question. Scores per each item in the scale could take values of 0 (lack of knowledge), 1 (presence of some degree of the correct knowledge), or 2 (presence of the correct knowledge). The answers considered as correct knowledge have been marked with the use of <u>**bold underlined font**</u> and font of answers with a score value of 0 was left unchanged (font style as that of the main text). The results are reported as frequencies and proportions for each of the scored element and the score values are presented as notes below each table (for scoring applied to the questions without the corresponding frequencies and proportions please refer to Appendix 5).

4.2.1. Knowledge of topics related to breast and cervical cancers

The following sections 4.2.1.1 and 4.2.1.2 describe each of the knowledge items. However no final knowledge scoring is discussed until section 4.3 where it is discussed with other study variables.

4.2.1.1. KNOWLEDGE OF TOPICS RELATED TO BREAST CANCER

Table 17 Scored questions on the awareness of the need for BSE and mammography allowing early cancer detection

Question		N (%)
Have you ever heard about the need for regular breast-self-examination?		
	Yes	**3,970 (93%)**†
	No	275 (6%)
	I don't know, it’s difficult to say	45 (1%)
	Total	4,290 (100%)
Have you heard that mammography can allow early detection of cancer?		
	Yes	**3,943 (92.3%)**†
	No	166 (3.4%)
	I don't know, it’s difficult to say	181 (4.3%)
	Total	4,290 (100%)

†Score: 2; other responses were scored 0

The majority (93%, N=3,970) of women reported of having heard about the need of BSE whilst only 6 % (N=275) were not aware of such need and 1% was unsure. 92.3%, N=3,943) of the surveyed women said that they have heard that mammographic test can allow early detection of cancer, 3.4% (N=166) had not had such knowledge and 4.3% (181) were not sure.

Table 18 Do you believe that change of certain habits and behaviours can have protective effect on cancer? Please specify which of the following behaviours may influence the development of breast cancer

Breast cancer N (%)	A	B	C	D	E	F
Regular mammography below 50 y.o.	2,697 (63.5)	1,065 (24.6)	146 (3.2)	**105 (2.6)†**	**17 (0.4)‡**	260 (5.6)
Regular mammography above 50 y.o.	**2,750 (64.9)†**	**1,024 (23.5)‡**	138 (3.05)	104 (2.5)	12 (0.3)	262 (5.8)
Hormonal contraception	239 (5.5)	415 (9.6)	669 (15.4)	**507 (12.1)‡**	**677 (15.8)†**	1,783 (41.7)
HRT after menopause	285 (6.9)	525 (11.5)	583 (13.6)	**472 (11.4)‡**	**479 (11.4)†**	1,946 (45.2)
Increase of vegetable and fruit intake	1,142 (26.8)	**1,379 (31.9)†**	**670 (15.6)‡**	645 (14.8)	5 (0.2)	449 (10.7)
Limitation of fatty foods intake	**1,109 (26.5)†**	**1,386 (31.8)‡**	693 (16.2)	599 (13.5)	46 (1.1)	457 (10.9)
Limitation of alcohol use	**1,185 (28)†**	**1,393 (31.7)‡**	693 (16.2)	559 (12.8)	22 (0.7)	438 (10.6)
Smoking cessation	2,104 (49.2)	**1,364 (31.4)‡**	**286 (6.6)†**	258 (6.1)	30 (0.8)	248 (5.9)
Increase of physical exercise	**1,199 (28.5)†**	**1,449 (33.9)‡**	630 (14.4)	538 (12.3)	4 (0.1)	470 (10.8)
Regular BSE	**2,848 (67.1)†**	**1,067 (24.4)‡**	102 (2.4)	74 (1.6)	199 (4.6)	0 (0)
Frequent X-rays (various body parts)	580 (13.4)	617 (14.2)	443 (10.2)	370 (8.7)	**1,493 (35.5)†**	787 (18)

†Score: 2; ‡score: 1; other responses were scored 0

Key:

To a large extent it can protect against cancer	A
It can have protective influence against cancer	B
It can have a somewhat protective influence against cancer	C
It does not influence cancer development	D
Contrarily, it can lead to cancer development	E
I don't know, it is difficult to say	F

The scoring of the majority of the items in the following tables was based on evidence from the literature review. The evidence on smoking and fruit and vegetable consumption with regards to the risk of breast cancer had a certain degree of variation in the published studies. Nonetheless the studies published closer to the data collection time (2000-2006), reported smoking to increase breast cancer risk and vegetable and fruit consumption to decrease it.

The table above (table 18) reports on respondents views on the effect of certain habits on the risk of breast cancer. The majority (63.5%, N=2,697) of women thought that mammography below age of 50 was greatly protective of breast cancer. Almost identical answers were given to the question on the protective effect of mammography above age of 50 years old. However, at the time of data collection (2006) regular mammography was not recommended below age of 50 as a routine screening as it does not provide good imaging of breast with denser tissue and in addition it emits low doses of radiation which in itself is considered a cancer risk factor. Very few women (0.4%, N=17) were aware of its harmful effect. 2.6% (N=105) of women selected the answer that it does not influence cancer development. This was considered as somewhat correct answer (score: 1) as in the literature published up to 2006 there was mixed evidence between harmful or no effect on cancer development. 64.9% (N=2,750) women indicated large extent of protective effect of mammography above 50 years of age and 23.5% (N=1,024) responded that mammography had protective effect. Questions relating to hormonal contraception and HRT use had a large variation of answers, with 15.8% (N=677) and 11.4% (N=479) indicating harmfulness of these therapies, respectively. Most of the respondents (41.7% for contraception and 45.2% for HRT) were unsure what was also the correct answer as at the time of the data collection there was some discussion on harmfulness versus no effect of both therapies. Vegetable and fruit intake was reported by 15.6% (N=670) women indicated some positive influence on the protective effect and 31.9% (N=1,386) reported protective effect. Limitation of alcohol use was considered by 28% (N=1,185) of respondents to have a large protective effect against breast cancer and 31.7% (N=1,386) thought that it had a protective effect. Smoking cessation has been noted by 6.6% (N=286) as having only some effect on risk reduction. An increase in physical exercise was correctly assessed by the majority of respondents as greatly protective (28.5%, N=1,199) and protective (33.9%, N=1,449). Regular practice of BSE was a question that was mostly answered correctly (67.1%, N=2,848 - greatly protective effect and 24.4%, N=1,067 protective effect). X-rays have been correctly considered as harmful by 35.5% (N=1,493) women.

Not all questions could be scored and included in the scales and therefore they were analysed in a descriptive fashion.

Table 19 Where have you heard for the first time that mammography allows early detection of cancer

Source of knowledge	N (%)
Family, friends	474 (11.5)
Doctor	1,127 (28)
Radio, television	1,495 (38.9)
Women's press	481 (12.6)
Other press	49 (1.2)
School (college, courses, occupation, etc.)	141 (3.7)
Other sources	47 (1.4)
I don't remember	105 (2.7)
Total	3,919 (100)

No scoring applied

The biggest proportion (38.9%, N=1,495) of the respondents got to know about the benefits of mammographic screening from radio or television, 28% (N=1,127) from their doctor, 12.6% (N=481) from women's press, and 11.5% (N=474) heard about it from family or friends.

4.2.1.2. Knowledge of topics related to cervical cancer

Table 20 Have you heard that cytology may allow early cancer detection?

	N (%)
Yes	**3,871 (90.7)**†
No	217 (4.5)
I don't know, it's difficult to say	202 (4.7)
Total	4,290 (100)

†Score: 2; other responses were scored 0

Majority of women (90.7%, N=3,871) had indicated correctly that the regular cytology may allow early detection of cancer, 4.5% (N=217) had no such knowledge and 4.7% (N=202) were unsure.

The next table (table 21) presents respondents' views on the effect of various behaviours that may influence the development of breast cancer. In some cases more than one answer was possible to select and the evidence weights were applied to reflect what was known in the literature at the time of data collection (for detail on the published evidence please refer back to section 2.4.2)

Table 21 Do you believe that change of certain habits and behaviours can have protective effect on cancer? Please specify which of the following behaviours may influence the development of cervical cancer?

Cervical cancer N (%)	A	B	C	D	E	F
Regular cytology	**3,272 (76.9)†**	618 (14.1)	64 (1.4)	60 (1.3)	7 (0.2)	269 (6.1)
Hormonal contraception	363 (8.2)	514 (11.9)	615 (14.2)	**419 (10.9)‡**	**640 (14.5)†**	1,739 (40.6)
Early sexual initiation	115 (2.7)	113 (2.5)	703 (16.3)	999 (23)	**1,107 (25.8)†**	1,253 (29.7)
Large number of sexual partners	141 (3.1)	125 (2.8)	491 (11.2)	703 (16.1)	**1,742 (41.2)†**	1,088 (25.6)
Smoking cessation	**1,791 (41.4)†**	**1,125 (26.6)‡**	390 (8.9)	443 (10.5)	50 (1.4)	491 (11.2)

†Score: 2; ‡score: 1; other responses were scored 0

Key:

To a large extent it can protect against cancer	A
It can have protective influence against cancer	B
It can have a somewhat protective influence against cancer	C
It does not influence cancer development	D
Contrarily, it can lead to cancer development	E
I don't know, it is difficult to say	F

Regular cytology is one of the most effective methods of cancer prevention strategies and 76.9% (N=3,272) answered this correctly. The weight of published evidence in 2006 identified that hormonal contraception may increase cervical cancer risk (see section 2.4.2.7). 10.9% (N=640) pointed towards the correct answer but 40.6% (N=1,739) did not know the correct answer to this question. Strong evidence supporting the association of early sexual initiation, high number of sexual partners and smoking with increased risk of cervical cancer was identified in the literature prior to 2006. Respondents' opinions were divided on the influence of early sexual initiation on cancer risk. 25.8% (N=1,107) indicated the correct answer associating it with higher risk whilst 29.7% (N=1,253) did not know. 25.6% (N=1,088) did not know that a large number of sexual partners was associated with an increased risk of cervical cancer and 41.2% (N=1,742) answered correctly. Smoking cessation was correctly associated with decreased risk by most of the respondents (41.4%, large extent of protective effect and 26.6%, protective effect).

Table 22 Where have you heard for the first time that cytology allows early cancer detection?

	N (%)
Family, friends	467 (11.9)
Doctor	1,584 (41.1)
Radio, television	1,007 (25.9)
Women's press	474 (12.6)
Other press	49 (1.5)
School (college, courses, occupation, etc.)	134 (3.4)
Other sources	35 (1.1)
I don't remember	100 (2.6)
Total	3,850 (100)

No scoring applied

41.1% (N=1,584) of women indicated that the doctor was the first source of knowledge about the cytology allowing early cancer detection, 25.9% (N=1,007) said that they got to know about it from radio or television, 12.6% (N=474) from women’s press and 11.9% (N=467) from friends or family.

4.2.2. Behaviours related to breast and cervical cancer

4.2.2.1. Behaviours related to breast cancer

Initially, it was intended to create a scale for the behaviour items for breast cancer; however, after the closer examination of the items to be included this was decided against. As mammography was not part of the normal routine health care it would be impossible to make an assessment of whether the women made a conscious choice to take up the screening. For example, they might not have had a chance to take up cost free mammography offered as part of an ad hoc prophylactic initiative as it might not have been offered in their city.

Table 23 Questions on performance of BSE and mammography

Question		N (%)
Are you examining your breasts by yourself (at home)?		
	Yes, regularly	1,223 (32.3)
	Yes, rarely	1,662 (42.2)
	Never	1,072 (25.5)
	Total	3,957 (100)
Have you ever had a mammography?		
	Yes	1,320 (32.1)
	No	2,922 (66.8)
	I don't know, it is difficult to say	48 (1.1)
	Total	4,290 (100)
Have you ever undertaken a mammography organised as a part of cost free prophylactic action/initiative (i.e., organised by popular press, church etc.)?		
	Yes	529 (40.4)
	No	784 (59.6)
	Total	1,313 (100)
How often do you undergo mammography? (Question answered by women who declared having had mammogram in the past)?		
	Once a year	247 (18.5)
	Every 2-3 years	349 (26.8)
	Every 4-5 years	96 (7.4)
	Less frequently than once every 5 years	63 (5.2)
	Rarely-only when I have a chance	124 (9.6)
	Until now I had only one mammography	423 (31.5)
	I don't know, it's difficult to say	12 (1)
	Total	1,314 (100)

No scoring applied

The following table (table 23) presents questions relevant for breast cancer prophylaxis (BSE and mammography). Regular BSE was reported by 32.3% (N=1,223) of respondents, 42.2% (N=1,662) did it rarely, and 25.5% (N=1,072) reported never having done it. 32% (N=1,320) of the women reported having had a mammogram at least once in the past and 1.1% (N=48) were not sure. 40.4% (N=529) of the women who attended mammography previously, attended a free prophylactic test that was organised as part of a cost free prophylactic action (e.g., organised by a church or other organisation). Of the women who reported having had a mammogram in the past in the previous question (32.1%, N=1,320), 31.5% had only one, 26.8% (N=349) reporting undergoing it every 2-3 years, 18.5% (N=247) did it once a year, 7.4% (N=96) every 4-5 years, 9.6% (N=124) had it rarely-only when they had chance, and 5.2% (N=63) had it less frequently than once every 5 years.

4.2.2.2. Behaviours related to cervical cancer

Despite the fact that every woman in Poland had cost and referral free access to gynaecologist at the time of data collection (NFZ, 2011a) it was decided not to form a scoring scale and behavioural elements separately. The decision not to proceed with formation of the scale was motivated by lack of clear and widely available guidance for women on the importance and the recommended frequency of screening.

Table 24 Questions on uptake of prophylactic behaviours related to cervical cancer

Question	N (%)
In what situations do you go to a gynaecologist?	
Whenever I have to (worrying symptoms, pregnancy)	2,273 (52,2)
I am going for routine tests regularly and when there is need	1,770 (43.3)
I have never been to a gynaecologist	224 (4.5)
Total	4,267 (100)
Have you ever undergone cytology?	
Yes	3,184 (78.8)
No	835 (18.5)
I don't know. it's difficult to say	119 (2.7)
Total	4,138 (100)
How often do you undergo cytology? (Question answered by women who declared having had cytology at least once)	
Once a year	932 (30.4)
Every 2-3 years	748 (23.2)
Every 4-5 years	250 (7.7)‡
Less than once every 5 years	269 (8.2)
Rarely – only when there is occasion	544 (17.9)
Until now I had only one such test	351 (10.7)
I don't know, it's difficult to say	76 (2)
Total	3,170 (100)

No scoring applied

Answers to the above question revealed that 43.3% (N=1,770) practices the correct health behaviours with relation to their gynaecological checks, 52.2% (N=2,273) visits gynaecologist only when they have to and 4.5% (N=224) has never visited such doctor. Almost seventy nine percent (78.8%, N=3,184) of women had cytology at least once in their lives, 18.5% (N=835) never had the test, and 2.7% was unsure of answer (N=119). There were several correct answers to the question on the frequency of cytology that included attending cytology once a year (30.4%, N=932) or, every 2-3 years (23.2%, N=748), which are now a part of a recommended screening interval (i.e. every 2-3 years if the results of the previous screen were negative). Other answers included every 4-5 years (7.7%, N=250), rarely – only when there is occasion 17.9% (N=544), until now I had only one such test (10.7%, N=351), and I don't know, it's difficult to say (2%, N= 76).

4.2.3. Cues to action and barriers related to breast and cervical cancer

Two items were identified as potential cues to action to be included in a scoring scale. However, after the scale reliability was tested with Cronbach's alpha (α=0.35) showing a low reliability and the fact that family history of cancer or having a friend with cancer can be either a facilitator or a barrier to screening (Lamyian et al., 2007;; Kissal and Beser, 2011; Borugian et al., 2009) it was decided against the creation of the scoring scale.

Table 25 Questions considered as cues to action on cancer diagnosis amongst family or friends

Question		N (%)
Have any of your family members ever been diagnosed with a cancer?		
	Yes	2,089 (48.1)
	No	2,073 (49.1)
	I don't know	121 (2.8)
	Total	4,283 (100)
Have any of your friends ever been diagnosed with a cancer?		
	Yes	2,142 (50.9)
	No	1,707 (39.9)
	I do not know	407 (9.3)
	Total	4,256 (99.2)

No scoring applied

Almost half (48.1%, N=2,089) of all women have responded that at least one of their family members was diagnosed with cancer. Considering that only 7 answers were recorded as missing and the sample is nationally representative an assumption can be made that around half of the Polish women have a family member who experienced cancer. Similarly, half (50.9%, N=2,142) of the sample had a friend who was diagnosed with cancer.

The questions above were later tested for inclusion in the regression models as model covariates.

4.2.3.1. *CUES TO ACTION AND BARRIERS RELATED TO BREAST CANCER*

Table 26 Questions on the reasons for uptake and lack of uptake of breast cancer prophylaxis

Question	N (%)
What was the main reason for your last mammography?	
I noticed worrying symptoms	129 (9.8)
I belong to high risk group (cancer in the family)	83 (6.3)
I used a openly available prophylactic programme	441 (34.2)
I care about my health and I undergo prophylaxis (own initiative)	221 (16.8)
My doctor referred me to confirm or refute diagnosis	144 (10.7)
My doctor referred me for prophylactic test	260 (19.5)
Other	28 (2.2)
I don't know, it's difficult to say	7 (0.5)
Total	1,313 (100)
Due to what reason you have never undergone mammography? Please indicate one main reason	
There is nothing wrong with me-I feel healthy	1,128 (37.9)
My doctor has never referred me for it	797 (28.7)
I don't have time	72 (3)
The test is too expensive	48 (1.4)
There was no such action in my neighbourhood	100 (4)
I am too young	599 (20.2)
I have never heard about such test	29 (0.7)
Other reason	80 (3.1)
I don’t know, it's difficult to say	33 (1.1)
Total	2,886 (100)
Why you have never undertaken mammography offered as part of the cost free prophylactic action/initiative?	
I have not heard of such actions	212 (27.8)
I did not feel the need for such test	174 (22.4)
when such initiative was organised I did not have time	77 (9.8)
I go for mammography from my own initiative	147 (19.5)
There were no free spaces	33 (4)
Other reason	128 (16.5)
Total	771 (100)

No scoring applied

The first question in the table above was answered only by women who have attended mammography before (N=1,320). 34.2% (N=441) of them attended an openly available screening programme, 19.5% (N=260) were referred by their doctor for mammography as a prophylactic test, 16.8% (N=221) declared that they take care about my health and therefore they undergo prophylaxis (own initiative), 10.7% (N=144) were referred by their doctor to confirm or refute diagnosis, 9.8% (N=129) noticed worrying symptoms, 6.3% (N=83) reported that they belonged to a high risk group (cancer in the family), 2.2% (N=28) indicated other reasons, and 0.5% (N=7) were not sure.

When asked about the reasons for not taking up mammography the majority (37.9%, N=1,128) indicated that there was nothing wrong with them and felt healthy and therefore they did not attend the screening. Second and third most commonly given answers were lack of doctor's referral for such test and being too young (28.7%, N=797 and 20.2%, N=599 respectively). Other answers ranged between 0.7% and 4%.

Additionally, women were asked if they attended mammography as part of cost free prophylactic initiative and 59.6% (N=784). Women who did not attend cost free prophylactic actions indicated the main reasons for not doing so. The biggest proportion of those women 27.8% (N=212) have not heard of such actions, 22.4% (N=174) did not feel the need for such test, 19.5% (N= 147), underwent mammography elsewhere (their own initiative), 9.8% (N=77) did not have time when such actions were organised, 4% (N=33) said that there were no free spaces available, and 16.5% (N=128) indicated other reasons. Other reasons included: different age group, housebound, too expensive, mammography after surgery (including mastectomy), breast pain, due to medication, friends advice, employers requirement and others.

4.2.3.2. *CUES TO ACTION AND BARRIERS RELATED TO CERVICAL CANCER*

Table 27 Questions on the reasons for uptake and lack of uptake of cervical cancer prophylaxis

Question		N (%)
What was the main reason for your first cytology?		
	Planned pregnancy	300 (9.9)
	Worrying symptoms (own initiative)	413 (12.8)
	I am in a high risk group (cervix cancer in the family)	43 (1.5)
	Prophylactic test (own initiative)	1,181 (37.4)
	I benefited from a free prophylactic programme	102 (3.3)
	Doctor’s referral to confirm or refute the diagnosis	305 (9.2)
	Doctor’s referral for a prophylactic test	727 (22.6)
	Other	29 (0.9)
	I don't know, it’s difficult to say	81 (2.4)
	Total	3,181 (100)
Due to what reason you have never undergone cytology?		
	There is nothing wrong with me - I feel healthy	366 (44.9)
	My doctor never referred me for it	334 (39.2)
	I don’t have time	16 (2.3)
	It's too expensive	5 (0.6)
	There are no such tests in my neighbourhood	9 (1)
	I'm too young	34 (3.7)
	I've never heard of such a study	35 (3.9)
	Other	9 (1)
	I don't know, it's difficult to say	22 (3.4)
	Total	830 (100)
Due to what reason you have never been to gynaecologist?		
	There is nothing wrong with me - I feel healthy	137 (61.7)
	I'm too young	35 (15.8)
	I do not have time	4 (1.8)
	Too expensive	1 (0.5)
	I am scared/ I don't like	26 (11.7)
	Other reason	11 (5)
	I don't know, difficult to say	8 (3.6)
	Total	222 (100)

No scoring applied

Women were asked about main reason for their first cytology test. The most commonly given answers included: 37.4% (N=1,181) prophylactic test (own initiative), 22.6% (N=727) doctor’s referral for a prophylactic test, 12.8% (N=413) worrying symptoms, 9.9% (N=300) planned pregnancy, 9.2% (N=305) doctor’s referral to confirm or refute the diagnosis, and

0.9% (N=29) indicated that their last cytology was done due to other reasons than the pre-defined answers.

Women that have never undertaken cytology were asked for the reasons for not doing so. The most commonly repeated answers were: 44.9% (N=366) There is nothing wrong with me - I feel healthy and 39.2% (N=334) my doctor never referred me for it. Other answers included: I don’t have time (2.3%, N=16), It's too expensive (0.6%, N=5), There are no such tests in my neighbourhood (1%, N=9), I'm too young (3.7%, N=34), I've never heard of such a study (3.9%, N=35), Other (1%, N=9) and I don't know, it's difficult to say (3.4%, N=22).

In addition to questions about no cytology uptake, women were also asked also about the reasons for never visiting a gynaecologist (in Poland accessible without referral). Only 222 women responded to this question and majority (61.7%, N=137) indicated that they felt that there was nothing wrong with them. 15.8% (N=35) stated that they were too young for that, 11.7% (N=26) were scared/didn’t like visiting gynaecologist. Other responses ranged from 0.5% to 5%.

4.2.4. Screening and health history

Table 28 Questions relating to age at first mammography and the number of times mammographies undertaken as part of cost free prophylactic initiative

Question		N (%)
How old were you when you had your first mammography?		
	<20 y.o	19 (1.5)
	20-24 y.o	37 (2.9)
	25-29 y.o	48 (3.6)
	30-34 y.o	62 (5.6)
	35-39 y.o	112 (9.4)
	40-44 y.o	179 (14)
	45-49 y.o	200 (14.5)
	50-54 y.o	249 (18.8)
	55-59 y.o	136 (9.9)
	≥60	151 (10.5)
	I don't remember	127 (9.1)
	Total	1,320 (100)
How many times have you undertaken a mammography organised as a part of cost free prophylactic action/initiative (i.e., organised by popular press, church etc.)?		
	Once	345 (64.3)
	2 times	100 (20.6)
	3 to 5 times	70 (12.8)
	More than 5 times	10 (2.3)
	Total	525 (100)

No scoring applied

The age at the first mammography was widely spread by all age groups. This might be partially due to the fact that free mammographic events/actions organised by for example churches often do not apply age limit. The biggest group of respondents (64.3%, N=345) declared that they attended a mammography organised as a part of cost free prophylactic action/initiative once, 20.6% (N=100) attended twice, 12.8% (N=70) 3 to 5 times, and 2.3% (N=10) more than 5 times.

Table 29 Questions relating to age at first cytology and the reason for the first (ever) visit to gynaecologist

Question		N (%)
How old were you when you had your first cytology?		
	<20 y.o	430 (13.9)
	20-24 y.o	943 (30.7)
	25-29 y.o	407 (13.2)
	30-34 y.o	222 (7.5)
	35-39 y.o	100 (3.1)
	40-44 y.o	118 (3.7)
	45-49 y.o	75 (2.5)
	50-54 y.o	91 (2.7)
	55-59 y.o	30 (0.8)
	≥60	42 (1.2)
	I don't remember	649 (20.6)
	Total	3,107 (100)
What was the reason for your first (ever) visit at the gynaecologist?		
	Prescription for contraception	120 (2.9)
	Worrying symptoms, treatment	779 (19.6)
	Prophylactic tests, no symptoms	1,189 (29.3)
	Pregnancy	1,702 (42)
	Other	26 (0.7)
	I do not remember	223 (5.4)
	Total	4,039 (100)

No scoring applied

The majority of the surveyed women had their first cytology done when they were: 20-24 years old (30.7, N=943), <20 years old (13.9%, N=430), 25-29 years old (13.2%, N=407), 30-34 years old (7.5%, n=222). The proportions of age of first cytology in each of the remaining groups decreased with age (from 3.7% to 0.8%). 20.6% (N=649) did not remember what age they were at the first cytological test.

The final question relating to cervical cancer screening was on the reason for the first (ever) visit to the gynaecologist. The vast majority (42%, N=1,702) indicated that their first visit was related to their pregnancy, 29.3% (N=1,189) went for prophylactic tests without any symptoms, 19.6% (N=779) had worrying symptoms or required treatment, 22.9% (N=120) required a prescription for contraception, 5.4% (N=223) did not remember, and 0.7% (N=26) indicated other reasons.

Table 30 Have you ever been diagnosed with cancer (yes). Please specify the cancer's location (body part)?

Type of cancer	N (%)
No cancer	4,098 (95.7)
Breast cancer	62 (1.3)
Cervical cancer	25 (0.6)
Other cancer	105 (2.4)
Total	4,290 (100)

The respondents were asked whether they have ever been diagnosed with cancer before and 192 (4.3%) of them gave a positive response. Table above presents how many of those cancers were in breast (1.3%, N=62) or cervical (0.6%, N=25). Other cancers included (in the order of frequency): colon, lung, stomach, skin, endometrium, other uterus, ovary, mouth, liver, other cancer of digestive system, cancer of bone or cartilage, urinary system, brain or other cancer of central nervous system, thyroid, not specified malignant cancers, malignant cancers of blood, lymph, or other not specified carcinoma.

4.3. Answers to the research questions

4.3.1. What were the levels of Polish women's knowledge on breast and cervical cancers and how did they differ amongst different socioeconomic groups?

The knowledge score is the sum of the breast and cervical cancer scores and the following table summarises all three knowledge scores. Means have been presented with their standard deviations and standard errors as well as minimum and maximum values and 95% confidence intervals (table 31).

Table 31 Mean knowledge scores for the estimation sample (mean, S.D., S.E., 95% CI)

N=4,290	Total knowledge score	Breast cancer knowledge score	Cervical cancer knowledge score
Mean	1.00	0.98	1.03
S.D. (S.E.)	0.27 (0.008)	0.25 (0.007)	0.46 (0.015)
95% CI	0.98,1.02	0.96,0.99	0.99,1.06
Min	0.11	0.08	0
Max	1.68	1.62	2
D.eff.	2.13	1.81	2.22

The mean total cancer knowledge score was 1.00 (S.D. 0.27), mean breast cancer knowledge score 0.98 (S.D. 0.25), and mean cervical cancer knowledge score 1.03 (S.D. 0.46). As mentioned in the section 3.5.3 the knowledge scores were recoded into categorical variables that included three levels: low - from 0 to 0.6666666, medium - from 0.6666667 to 1.333332, and high - from 1.333333 to 2. The details of the knowledge scores distribution is presented in the next table (table 31).

Table 32 Comparison of knowledge scores as categorical variables with three levels: low, medium, and high

Knowledge score (N=4,290)	% (N)	S.E.	95% CI		D.eff.
Total knowledge score*					
Low	10.26 (439)	1.03	8.37	12.52	2.22
Medium	80.64 (3,462)	1	78.55	82.57	1.65
High	9.11 (389)	0.68	7.82	10.58	1.56
Breast cancer knowledge score					
Low	10.24 (449)	0.92	8.53	12.24	1.99
Medium	84.66 (3,625)	0.84	82.88	86.28	1.54
High	5.1 (216)	0.45	4.28	6.08	1.33
Cervical cancer knowledge score					
Low	28.24 (1,238)	1.36	25.59	31.04	1.97
Medium	38.23 (1,639)	1.14	35.96	40.55	1.54
High	33.53 (1,413)	1.31	30.94	36.23	1.82

*Frequencies of total knowledge score categories are result of the additive effect of score elements within each observation

Majority (80.6%) of women had medium level total cancer knowledge, 10.3% had low and 9.1% had high. The differences can be noted by splitting the knowledge on breast and cervical cancer as women had generally worse knowledge on cervical cancer as 28.2% had low knowledge in comparison to 10.2%. However, due to more even cervical knowledge score distribution more women had high level of knowledge (33.5%) than breast cancer knowledge (5.1%).

4.3.2. Was there an association between the levels of knowledge on cervical and breast cancers?

Pearson's correlation for women's knowledge on breast and cervical cancers and their prophylaxis showed that there was statistically significant medium strength positive correlation (Rho=0.506, $p<0.001$) (Weinberg and Abramowitz, 2008; Pallant, 2007). That means that if cervical cancer knowledge increased so did breast cancer knowledge.

4.3.3. Did levels of knowledge differ across different layers of the Polish society?

In this section an assessment of differences in knowledge score amongst women in different layers of the society (i.e. socio-demographics, socio-economics) is provided. As the breast and cervical cancer knowledge scores are correlated the following tests use the total knowledge score.

To assess the differences in knowledge scores across different socio-demographic and socio-economic groups, univariate simple linear regression analyses with an adjusted Wald test (with Rao-Scott correction) (Lee and Forthofer, 2006) were performed for the groups of the studied variables and marked for significance in each of the following tables in this section. The regression analysis was chosen over ANOVA due to specifics of Stata commands that account for survey design however both of these techniques are equivalent in estimating the linear relationships between the variables in question (Lee and Forthofer, 2006). The null hypothesis assumed no differences in knowledge scores (total and per each cancer type) for women in each of the categories of the socio-demographic and economic variables. Mean knowledge scores were reported instead of the regression coefficients for more meaningful interpretation of the differences in knowledge between various socio-demographic and socio-economic groups.

Table 33 Univariate linear regression analyses of knowledge scores for various socio-demographic variables adjusted for design effects (mean, S.D., S.E., 95% CI)

	Total knowledge score for both cancers					
	N	**Mean**	**S.D. (S.E.)**	**95% CI**	**D.eff**	**p-value**
Age groups (N=4,290)						
18-24	636	1.00**	0.27 (0.01)	0.97, 1.02	0.87	<0.001*** F(6,42)=11.88
25-29	297	1.01	0.23 (0.02)	0.98, 1.05	1.13	
30-39	870	1.03‡	0.22 (0.01)	1.01, 1.04	-	
40-49	650	1.04	0.24 (0.01)	1.02, 1.07	0.99	
50-59	780	1.04	0.27 (0.01)	1.01, 1.06	1.10	
60-69	418	1.03	0.29 (0.02)	1.00, 1.07	1.14	
70+	639	0.86***	0.36 (0.03)	0.80, 0.91	1.74	
Marital status (N=4,284)						
Married/in relationship	2,114	1.02‡	0.25 (0.01)	1.00, 1.04	-	0.001** F(3,45)=6.40
Widow	884	0.94***	0.35 (0.02)	0.90, 0.99	1.32	
Separated	288	1.04	0.20 (0.02)	1.00, 1.08	1.5	
Single (never married)	998	1	0.29 (0.01)	0.97, 1.02	1.08	
City size (N=4,290)						
City >100k	1,201	1.04‡	0.25 (0.01)	1.01, 1.07	-	0.031** F(3,45)=3.24
City 50-100k	368	1.01	0.23 (0.02)	0.97, 1.05	1.77	
City <50k	1,048	1.02	0.25 (0.01)	1.00, 1.05	1.78	
Village	1,673	0.97**	0.31 (0.02)	0.94, 1.00	2.04	

*p<0.05 level; **p<0.01, ***p< 0.001 level; ‡Reference category

Significant differences were noted for all three socio-demographics. For age the reference category was set for 40-49 age group due to the largest size (N=870). After inspection of the above table and additional assessment of scatter plot a somewhat curvilinear relationship was noted between age and knowledge with lower knowledge in the eldest age group and to lesser extent in the youngest. Only two age categories 18-24 and 70 and over had significantly lower mean knowledge score with p<0.01 and p<0.001, respectively.

Only widowed women and the ones that lived in villages had significantly lower level of knowledge in comparison with the reference groups (p<0.001 and p<0.01, respectively).

Table 34 Univariate linear regression analyses of knowledge scores for various socio-economic variables adjusted for design effects (mean, S.D., S.E., 95% CI)

	Total knowledge score for both cancers					
	N	**Mean**	**S.D. (S.E.)**	**95% CI**	**D.eff**	**p-value**
Education (N=4,278)						
Primary	958	0.89‡	0.35 (0.02)	0.85,0.93	-	<0.001*** F(3,45)=20.50
Technical	973	1.03***	0.24 (0.01)	1.00,1.05	1.6	
Medium	1,669	1.04***	0.25 (0.01)	1.02,1.05	1.51	
Higher	678	1.06***	0.22 (0.01)	1.03,1.08	1.57	
Material conditions (N=4,270)						
We live poorly	237	0.89***	0.35 (0.03)	0.83,0.96	1.34	<0.001*** F(4,44)=6.25
We live modestly	1,250	0.98**	0.30 (0.02)	0.94,1.01	1.32	
We live on average level	2,135	1.03‡	0.25 (0.01)	1.01,1.04	-	
We live well	592	1.03	0.23 (0.01)	1.01,1.05	1.06	
We live very well	56	1.05	0.26 (0.03)	0.98,1.12	1.02	
Source of income (N=4,261)						
Employed	1,549	1.04‡	0.23 (0.01)	1.02, 1.06	-	0.003** F(6, 42) =4.03
Self-employed	336	1.00**	0.24 (0.01)	0.97, 1.02	1.04	
Retired	1,122	0.97***	0.33 (0.02)	0.93, 1.00	1.77	
Disability benefits	257	0.99	0.31 (0.03)	0.94, 1.05	1.36	
Other benefits (family, social)	485	0.99**	0.27 (0.02)	0.95, 1.02	1.27	
Unemployment	76	1.01	0.26 (0.03)	0.94, 1.07	1.02	
Dependent on a person from outside household	257	0.99*	0.28 (0.02)	0.95, 1.04	1.28	
Household size (N=4,278)						
1 person	982	0.96‡	0.32 (0.02)	0.93,1.00	-	0.004** F(4,44) =4.46
2 people	996	1.00*	0.28 (0.02)	0.97,1.03	1.17	
3 people	867	1.03***	0.25 (0.01)	1.01,1.05	1.34	
4 people	822	1.03*	0.25 (0.01)	1.01,1.04	1.21	
5 or more	611	1.01	0.26 (0.02)	0.97,1.04	1.43	

*p<0.05 level; **p<0.01, ***p<0.001 level; ‡Reference category

Analyses of the knowledge scores by socio-economic variables (table 34) showed that there were significant differences for all three variables (p<0.001 for education and material conditions and p<0.01 for the household size). All educational levels had significantly higher cancer knowledge from the reference category-primary education (all p<0.001). Similarly, the knowledge also increased with the increasing material conditions (p<0.001 for we leave poorly category, p<0.01 for we live modestly category) but there was no statistically significant difference in knowledge between the reference and the last two categories. Significantly lower knowledge score was found amongst self-employed (p<0.01), retired (p<0.001), and on other benefits (family, social) (p<0.05) when compared to the employed women. The knowledge also differed statistically (p<0.01) for reference category (1 person) increasing with the household size with exception of the last category of

5 people or more (however it was just outside of the 0.05 level with a p value of 0.056). Category of 2 people per household was different to the reference category at 0.05 level (p<0.05) and 3 and 4 people per household categories at 0.001 level. Additionally, to supplement the information on the differences of the knowledge scores two variables on the previous cancer diagnosis were explored (table 35).

Table 35 Univariate linear regression analyses of previous cancer diagnosis and tumour type adjusted for design effects (mean, S.D., S.E., 95% CI)

		Total knowledge score for both cancers					
		N	**Mean**	**S.D. (S.E.)**	**95% CI**	**D.eff**	**p-value**
Past cancer diagnosis (N=4,243)							
	Yes	192	1.06**	0.28 (0.02)	1.02, 1.11	1.03	0.006**
	No	4,051	1.00‡	0.27 (0.01)	0.99, 1.02	-	F(1,47)=8.48
Type of cancer (N=4,290)							
	No cancer	4,098	1.00‡	0.27 (0.01)	0.98, 1.02	-	
	Breast	62	1.10**	0.24 (0.03)	1.03, 1.16	1.03	0.023*
	Cervical	25	1.05	0.26 (0.07)	0.91, 1.18	1.26	F(3,45)=3.52
	Other	105	1.05	0.29 (0.03)	1.00, 1.10	0.93	

*p<0.05 level; **p<0.01; ‡Reference category

Knowledge scores for women who reported to have been diagnosed with any type of cancer were significantly higher to those that did not report such diagnosis (p<0.01). The knowledge was also higher for women who were diagnosed with breast cancer (p<0.01) but the result showed borderline (p=0.051) for cervical cancer diagnosis.

4.3.4. Did levels of knowledge of breast and cervical cancers differ between women who practiced prophylactic behaviours?

The tests for differences in knowledge scores were performed using design adjusted Wald test and presented with corresponding F statistic. The analyses were performed depending on the age of women: BSE was assessed for all ages, mammography for women aged 50 an older, cytology for women aged 25 and older (table 36).

Table 36 Wald test adjusted for design effects of the differences of the mean total cancer knowledge scores by practice of BSE, mammography uptake and cytology uptake

Mean total cancer knowledge score		S.E.	95% CI	D.eff.	p-value
BSE (all ages)					
No	0.96	0.01	0.94, 0.99	1.62	<0.001
Yes	1.05	0.01	1.04, 1.07	1.6	F(1,47)=49.05
Mammography among women aged ≥50					
No	0.98	0.01	0.96, 1.00	1.84	<0.001
Yes	1.07	0.01	1.06, 1.09	1.23	F(1,47) =66.11
Cytology among women aged ≥25					
No	0.88	0.03	0.83, 0.93	1.81	<0.001
Yes	1.05	0.01	1.03, 1.06	1.66	F(1,47)=43.78

The total cancer knowledge scores were showed to be significantly higher (p<0.001) for women who practiced any of the above described cancer prophylactic behaviours.

Additionally, the total knowledge scores have been separated into breast and cervical cancer scores. The two types of cancer scores were examined for respective prophylactic behaviours (breast cancer knowledge for BSE and mammography and cervical cancer knowledge for cytology) (table 37).

Table 37 Wald test adjusted for design effects of the differences of the mean breast cancer knowledge score by practice of BSE or mammography uptake†, and mean cervical cancer knowledge score by cytology uptake‡ adjusted for design effects.

Mean cancer knowledge scores		S.E.	95% CI	D.eff.	p-value
BSE (all ages)†					
No	0.95	0.01	0.93, 0.98	1.55	<0.001
Yes	1.03	0.01	1.01, 1.04	1.35	F(1,47)=32.02
Mammography among women aged ≥50†					
No	0.88	0.02	0.84, 0.91	1.71	<0.001
Yes	1.04	0.01	1.02, 1.06	1.23	F(1,47)=63.48
Cytology among women aged ≥25‡					
No	0.83	0.04	0.75, 0.90	1.67	<0.001
Yes	1.1	0.01	1.07, 1.13	1.78	F(1,47)=58.98

†mean breast cancer knowledge score; ‡mean cervical cancer knowledge score

Similarly as in case of the total cancer knowledge scores both breast and cervical cancer knowledge were shown to be significantly higher (p<0.001) for women who practiced respective prophylactic behaviours. Therefore further logistic regression analyses use the total cancer knowledge scores as covariates.

4.3.5. Did cancer prophylactic behaviours differ across different layers of the Polish society?

In order to examine the differences of breast and cervical cancer behaviours across different layers of Polish society Pearson Chi-square tests were performed. The following tables present differences in BSE practice, mammography uptake (ever) and cytology uptake (ever) for women from different socio-demographic and socio-economic groups as well as those who had previous cancer diagnosis and those who did not.

4.3.5.1. BSE BY SOCIO-DEMOGRAPHIC VARIABLES

Table 38 Pearson Chi square analysis of socio-demographic variables and practice of BSE adjusted for design effects

	BSE practice					
	No		Yes			
	% (N)	95% CI	% (N)	95% CI	m.d.eff†	p-value
Age (N=3,957)						
18-24	36.97 (232)	31.75,42.51	63.03 (365)	57.49,68.25	1.58	<0.001** F(5.04, 236.68) =19.72
25-29	27.5 (81)	22.33,33.34	72.5 (205)	66.66,77.67		
30-39	19.12 (156)	16.39,22.18	80.88 (674)	77.82,83.61		
40-49	18.45 (126)	15.27,22.11	81.55 (489)	77.89,84.73		
50-59	20.21 (148)	16.75,24.17	79.79 (596)	75.83,83.25		
60-69	25.57 (105)	19.63,32.57	74.43 (281)	67.43,80.37		
70+	44.1 (224)	36.91,51.56	55.9 (275)	48.44,63.09		
Total	25.53 (1,072)	23.20,28.00	74.47 (2,885)	72.00,76.80		
Marital status (N=3,951)						
Married/ in relationship	21.7 (454)	19.33,24.28	78.3 (1,535)	75.72,80.67	1.78	<0.001** F(2.44, 114.47) =10.18
Widow	32.16 (249)	26.89,37.92	67.84 (511)	62.08,73.11		
Separated/ divorced	23.31 (63)	17.70,30.05	76.69 (216)	69.95,82.30		
Single	32.42 (305)	28.19,36.96	67.58 (618)	63.04,71.81		
Total	25.53 (1,071)	23.20,28.01	74.47 (2,880)	71.99,76.80		
City size (N=3,957)						
city >100K	22.45 (270)	18.94,26.40	77.55 (878)	73.60,81.06	2.46	0.011* F(2.74, 129.01) =3.99
city 50-100K	25.44 (95)	20.24,31.45	74.56 (262)	68.55,79.76		
city <50K	22.55 (221)	19.70,25.68	77.45 (758)	74.32,80.30		
Village	30.03 (486)	25.59,34.89	69.97 (987)	65.11,74.41		
Total	25.53 (1,072)	23.20,28.00	74.47 (2,885)	72.00,76.80		

*p<0.05, **p<0.001†mean generalised design effects

Significant differences were found for all socio-demographic variables in women who practiced BSE ($p<0.001$ for age and marital status and $p<0.05$ for the size of the city) (table 37). For example the highest proportions of women who practiced BSE were in age groups 30-39 (80.9%, N=674), 40-49 (81.6%, N=489), and 50-59 (79.8%, N=596); whilst the lowest for women over 70 years old (55.9%, N=275). More women who were married/in relationship and separated/divorced declared practice BSE than other groups (78.3%, N=1,535 and 76.69%, N=216, respectively). Also more women in the cities admitted to practicing BSE (cities >100K: 77.6%, N=878, cities <50K: 77.5%, N=758, and cities 50-100K: 74.6%, N=262) than those living in the villages (70%, N=987).

4.3.5.2. BSE BY SOCIO-ECONOMIC VARIABLES

Table 39 Pearson Chi square analysis adjusted for design effects of socio-economic variables and practice of BSE

	BSE practice					
	No		Yes			
	% (N)	95% CI	% (N)	95% CI	m.d.eff†	P-value
Education (N=3,946)						
Primary	39.73 (324)	35.04, 44.62	60.27 (445)	55.38, 64.96		<0.001**
Technical	28.27 (273)	25.06, 31.73	71.73 (631)	68.27, 74.94		
Medium level	21.76 (361)	19.29, 24.44	78.24 (1,244)	75.56, 80.71	1.27	F(2.94, 138.02) =40.02
Higher	15.24 (112)	12.29, 18.74	84.76 (556)	81.26, 87.71		
Total	25.53 (1,070)	23.20, 28.01	74.47 (2,876)	71.99, 76.80		
Household size (N=3,946)						
1 person	28.77 (260)	23.79, 34.32	71.23 (606)	65.68, 76.21		
2 people	27.71 (249)	24.01, 31.74	72.29 (663)	68.26, 75.99		0.004*
3 people	21.11 (192)	18.05, 24.53	78.89 (629)	75.47, 81.95	1.36	F(3.58, 168.48) =4.22
4 people	22.22 (200)	18.96, 25.86	77.78 (583)	74.14, 81.04		
5 or more	28.76 (168)	24.53, 33.41	71.24 (396)	66.59, 75.47		
Total	25.52 (1069)	23.20, 28.00	74.48 (2877)	72.00, 76.80		
Source of income (N=3,761)						
Employed	19.08 (295)	16.89,21.49	80.92 (1,202)	78.51,83.11		
Self-employed	26.80 (94)	20.51,34.19	73.20 (220)	65.81,79.49		
Retired	30.79 (312)	25.93,36.12	69.21 (657)	63.88,74.07		
Disability benefits	26.49 (59)	20.18,33.92	73.51 (158)	66.08,79.82		
Other benefits (family, social)	29.34 (130)	24.89,34.23	70.66 (317)	65.77,75.11	1.49	<0.001** F(4.46, 209.64) =6.5
Unemployment	29.89 (21)	19.74,42.50	70.11 (53)	57.50,80.26		
Dependent on a person from outside household	29.04 (85)	22.89,36.08	70.96 (158)	63.92,77.11		
Total	25.02 (996)	22.76,27.44	74.98 (2,756)	72.56,77.24		
Material conditions (N=3,942)						
we live poorly	43.45 (80)	32.78, 54.76	56.55 (110)	45.24, 67.22		
we live modestly	30.68 (359)	26.50, 35.21	69.32 (757)	64.79, 73.50		
we live on average level	22.67 (494)	20.40, 25.11	77.33 (1519)	74.89, 79.60	1.64	<0.001** F(3.15, 147.86) =12.82
we live well	20.39 (125)	17.30, 23.87	79.61 (443)	76.13, 82.70		
we live very well	17.92 (10)	10.14, 29.69	82.08 (45)	70.31, 89.86		
Total	25.53 (1,068)	23.20, 28.00	74.47 (2874)	72.00,76.80		

*p<0.01;** p<0.001; †mean generalised design effects

Table 39 shows that BSE practice differed for all socio-economic variables (p<0.001 for education and material conditions and p<0.01 for household size) (table 39). With respect to level of education the highest proportion of women who practiced BSE were among those with higher education (84.8%, N=556) and the lowest among those who achieved primary education (60.3%, N=445). Women from households with three and four people per household had significantly higher levels of BSE (78.9%, N=629 and 77.8%, N=583). More employed women (80.9% N=1,202) ever had mammography than any other group (57.5% to 73.5 %). Women's perception of their material conditions was shown to be linked with BSE. Proportions of BSE were larger among women with better material status (from 56.5%, N=110 for women who declared to live poorly to 82.1%, N=45 of those that stated to live very well)**.**

4.3.5.3. BSE BY PREVIOUS CANCER DIAGNOSIS

Table 40 Pearson Chi square analysis adjusted for design effects of BSE practice by previous cancer diagnosis and cancer type

	BSE practice					
	No		**Yes**			
	% (N)	**95% CI**	**% (N)**	**95% CI**	**m.d.eff†**	**p-value**
Previous cancer (N=3,915)						
No	25.5 (1,020)	23.10, 28.06	74.5 (2,716)	71.94, 76.90		
Yes	23.95 (38)	17.67, 31.60	76.05 (141)	68.40, 82.33	1.11	0.675 F(1,47)=0.18
Total	25.44 (1,058)	23.10, 27.92	74.56 (2,857)	72.08, 76.90		
Type of cancer (N=3,957)						
No cancer	25.6 (1,034)	23.21, 28.15	74.4 (2,744)	71.85, 76.79		
Breast cancer	9.39 (6)	3.43, 23.24]	90.61 (53)	76.76, 96.57		
Cervical cancer	31.79 (7)	13.67, 57.83	68.21 (17)	42.17, 86.33	1.24	0.083 F(2.88,135.46) =2.3
Other	30.35 (25)	21.21, 41.37	69.65 (71)	58.63, 78.79		
Total	25.53 (1,072)	23.20, 28.00	74.47 (2,885)	72.00,76.80		

†mean generalised design effects

The above table (table 40) presents numbers of respondents that have been diagnosed with cancer (any type) in the past. The results show that there were no statistically significant associations between the groups.

4.3.5.4. MAMMOGRAPHY UPTAKE BY SOCIO-DEMOGRAPHIC VARIABLES IN WOMEN AGED 50 AND OVER

The following table (table 41) reports on differences for mammography uptake (ever) for women aged 50 or more. This age limitation was applied to coincide with the currently recommended screening age. However, 9.5% (N=403) of all women have had mammography before the age of 50 including 43 women who were below age of 30 years old.

Table 41 Pearson Chi square analysis adjusted for design effects of mammography (ever) uptake by socio-demographic variables

	Mammography ever					
	No		Yes			
	% (N)	95% CI	% (N)	95% CI	m.d.eff†	p-value
Age (N=1,808)						
50-59	33.95 (260)	28.79, 39.52	66.05 (514)	60.48, 71.21	1.23	<0.001 F(1.99,93.42) =85.18
60-69	41.33 (177)	33.39, 49.74	58.67 (236)	50.26, 66.61		
70+	71.94 (454)	65.13, 77.87	28.06 (167)	22.13, 34.87		
Total	47.48 (891)	41.37, 53.68	52.52 (917)	46.32, 58.63		
Marital status (N=1,806)						
Married/in relationship	42.56 (291)	35.40, 50.04	57.44 (391)	49.96, 64.60	1.5	<0.001 F(2.50,117.28) =10.89
Widow	58.4 (471)	51.15, 65.30	41.6 (328)	34.70, 48.85		
Separated/ divorced	35.69 (46)	26.01, 46.69	64.31 (81)	53.31, 73.99		
Single	43.05 (81)	35.07, 51.41	56.95 (117)	48.59, 64.93		
Total	47.43 (889)	41.30, 53.63	52.57 (917)	46.37, 58.70		
Size of the city (N=1,808)						
city >100K	29.88 (168)	25.39, 34.79	70.12 (356)	65.21, 74.61	3.4	<0.001 F(2.65,124.61) =23.59
city 50-100K	40.81 (66)	31.20, 51.17	59.19 (87)	48.83, 68.80		
city <50K	44.25 (203)	35.60, 53.27	55.75 (233)	46.73, 64.40		
Village	64.77 (454)	59.31, 69.87	35.23 (241)	30.13, 40.69		
Total	47.48 (891)	41.37, 53.68	52.52 (917)	46.32, 58.63		

†mean generalised design effects

Mammography uptake differed for all socio-demographic variables (p<0.001). The highest proportions of women who ever had mammography were in 50-59 age group (66.1%, N=514) and the lowest amongst women over 70 years old (28.1%, N=167). Also, women who were separated/divorced (64.3%, N=81) or married/in relationship (57.4%, N=391) had higher mammography uptake than those who were single or widowed (57%, N=117 and 41.6%, N=328, respectively). However, as it was noted already in section 4.3.2 the widowed women also tend to be older. Also more women in the cities admitted to having ever had mammography and the uptake was the highest in the cities >100K (70.1%, N=356), and decreased linearly with decreasing city size to the lowest in villages (35.2%, N=241).

4.3.5.5. Mammography uptake by socio-economic variables in women aged 50 and over

Table 42 Pearson Chi square analysis adjusted for design effects of mammography uptake (ever) by socio-economic variables

	Mammography ever					
	No		**Yes**			
	% (N)	**95% CI**	**% (N)**	**95% CI**	**m.d.eff†**	**p-value**
Education (N=1,805)						
Primary	66.39 (486)	60.77,71.59	33.61 (232)	28.41,39.23		
Technical	46.2 (165)	40.16,52.35	53.8 (170)	47.65,59.84		<0.001**
Medium	34.94 (202)	29.56,40.74	65.06 (360)	59.26,70.44	1.45	F(2.93, 137.93)
Higher	20.52 (37)	14.87,27.62	79.48 (153)	72.38,85.13		= 57.46
Total	47.5 (890)	41.39,53.70	52.5 (915)	46.30,58.61		
Household size (N=1,806)						
1 person	50.56 (424)	43.56,57.54	49.44 (378)	42.46,56.44		
2 people	43.81 (270)	36.31,51.60	56.19 (351)	48.40,63.69		
3 people	46.49 (97)	38.20,54.98	53.51 (106)	45.02,61.80		0.017*
4 people	38.32 (38)	26.63,51.53	61.68 (44)	48.47,73.37	1.24	F(3.76, 176.74)
5 or more	59 (61)	48.54,68.70	41 (37)	31.30,51.46		= 3.18
Total	47.41 (890)	41.24,53.67	52.59 (916)	46.33,58.76		
Source of income (N=1,783)						
Employed	29.6 (65)	22.05,38.45	70.4 (151)	61.55,77.95		
Self-employed	50 (31)	36.88,63.13	50 (32)	36.87,63.12		
Retired	50.91 (583)	43.89,57.90	49.09 (510)	42.10,56.11		
Disability benefits	46.06 (86)	37.34,55.02	53.94 (103)	44.98,62.66		<0.001**
Other benefits (family, social)	54.9 (101)	43.34,65.94	45.1 (83)	34.06,56.66	1.49	F(5.03, 236.33)
Unemployment	44.94 (4)	15.41,78.53	55.06 (8)	21.47,84.59		=4.42
Dependent on a person from outside household	42.62 (10)	23.12,64.71	57.38 (16)	35.29,76.88		
Total	47.71 (880)	41.59,53.90	52.29 (903)	46.10,58.41		
Material conditions (N=1,798)						
we live poorly	57.76 (98)	47.10,67.74	42.24 (62)	32.26,52.90		
we live modestly	52.74 (395)	45.24,60.11	47.26 (333)	39.89,54.76		
we live on average level	43.43 (337)	37.32,49.76	56.57 (410)	50.24,62.68		<0.001**
we live well	32.3 (50)	22.33,44.20	67.7 (97)	55.80,77.67	1.33	F(3.48, 163.40)
we live very well	34.48 (5)	13.96,63.07	65.52 (11)	36.93,86.04		=6.38
Total	47.47 (885)	41.37,53.64	52.53 (913)	46.36,58.63		

*p<0.05 level;**p<0.001 level; †mean generalised design effects

Mammography uptake (ever) was significantly associated with all socio-economic variables ($p<0.001$ for education, income source and material conditions, and $p=0.017$ for household size) (table 42). The proportions of women who have ever had mammography were higher amongst higher educational levels. For example there were 33.6% (N=232) of women that completed primary education stated that they had at least one mammography in their lives and 79.5% (N=153) among those who achieved higher education. Mammography attendance was approximately the most prevalent amongst women who lived in homes composed of four people of whom larger proportion declared to ever had this test (61.7%, N=44). Source of income demonstrated that more employed women (70.4%, N=151) ever had mammography than any other source of income group (45.1% to 57.4%). Similarly as in case of BSE there was bigger proportion of women with higher self-assessed material conditions who had mammography (we live well: 67.7%, N=97; we live very well: 65.5%, N=11) than the ones that declared worse material situation (we live on an average level: 56.6%, N=410, we live modestly: 47.3%, N=333, and we live poorly: 42.2%, N= 62).

4.3.5.6. Mammography uptake by previous cancer diagnosis

Table 43 Pearson Chi square analysis adjusted for design effects of mammography uptake (ever) by cancer diagnosis and type

	Mammography ever					
	No		Yes			
	% (N)	95% CI	% (N)	95% CI	m.d.eff†	p-value
Previous cancer (N=1,785)						
No	49.16 (846)	43.00,55.34	50.84 (807)	44.66,57.00		<0.001
Yes	21.7 (32)	13.66,32.67	78.3 (100)	67.33,86.34	1.44	F(1, 47)
Total	47.19 (878)	41.04,53.42	52.81 (907)	46.58,58.96		=27.89
Type of cancer (N=1,808)						
No cancer	49.45 (859)	43.33,55.58	50.55 (817)	44.42,56.67		
Breast cancer	1.05 (1)	0.15,6.93	98.95 (44)	93.07,99.85		<0.001
Cervical cancer	10.7 (2)	3.90,26.14	89.3 (10)	73.86,96.10	1.28	F(2.05, 96.52)
Other	35.4 (29)	22.63,50.65	64.6 (46)	49.35,77.37		=24.11
Total	47.48 (891)	41.37,53.68	52.52 (917)	46.32,58.63		

†mean generalised design effects

Table 43 shows that uptake of mammography was significantly more common (78.3%, N=100) in women who had been diagnosed with cancer (of any body part) than those who have never had such diagnosis (50.8%, N=807). Unsurprisingly the exploration of the cancer type and mammography uptake revealed that almost 99% (N=44) of women who were diagnosed with breast cancer have had mammography. Similarly, more women who have been diagnosed with cervical cancer declared also to ever having had mammography (89.3%, N=10). Also other cancer diagnoses were reported in women that took up mammography (64.6%, N=46) but there was no difference in proportions between women who have never been diagnosed with cancer.

4.3.5.7. Cytology uptake by socio-demographic variables for women aged 25 and over

Table 44 Pearson Chi square analysis adjusted for design effects of cytology uptake (ever) by socio-demographic variables

	Cytology ever					
	No		Yes			
	% (N)	**95% CI**	**% (N)**	**95% CI**	**m.d.eff†**	**p-value**
Age (N=3,472)						
25-29	16.41 (45)	11.44,22.96	83.59 (243)	77.04,88.56		
30-39	7.6 (72)	5.65,10.14	92.4 (788)	89.86,94.35		
40-49	12.65 (84)	9.63,16.43	87.35 (550)	83.57,90.37		<0.001
50-59	11.84 (83)	9.15,15.18	88.16 (670)	84.82,90.85	2.22	F(4.57, 214.64)
60-69	19.6 (75)	13.54,27.50	80.4 (315)	72.50,86.46		=35.09
70+	39.66 (225)	32.59,47.20	60.34 (322)	52.80,67.41		
Total	15.88 (584)	13.34,18.80	84.12 (2,888)	81.20,86.66		
Marital status (N=3,467)						
Married/in relationship	12.34 (221)	9.83,15.39	87.66 (1,697)	84.61,90.17		
Widow	28.33 (229)	22.78,34.61	71.67 (568)	65.39,77.22		<0.001
Separated/ divorced	8.21 (25)	4.92,13.38	91.79 (254)	86.62,95.08	2.05	F(2.75, 129.28) =22.55
Single	23.99 (108)	18.33,30.74	76.01 (365)	69.26,81.67		
Total	15.87 (583)	13.32,18.79	84.13 (2,884)	81.21,86.68		
Size of the city (N=3,472)						
city >100K	6.53 (81)	4.52,9.37	93.47 (916)	90.63,95.48		
city 50-100K	18.01 (49)	13.42,23.75	81.99 (260)	76.25,86.58		<0.001
city <50K	16.21 (140)	12.33,21.03	83.79 (708)	78.97,87.67	3.71	F(2.75, 129.42)
Village	22.22 (314)	18.62,26.29	77.78 (1,004)	73.71,81.38		=13.88
Total	15.88 (584)	13.34,18.80	84.12 (2,888)	81.20,86.66		

†mean generalised design effects

Similarly, as for mammography attendance, the above table (table 44) presents the differences in proportions of the cytology uptake (ever) have been presented for women aged 25 or over due to the recommended screening age. However, there were 6.7% (296) women who ever undertook it that were between 18 and 24 years old at the time of the survey.

Statistically significant differences for having ever had cytology were found across all of the socio-demographic variables ($p<0.001$). The highest proportions of women who ever had cytology were in 30-39 age group (92.4% N=788) and the lowest in women over 70 years old (60.34%, N=322). Separated/divorced and married/in relationship were amongst the largest groups that had at least one cytology in their lives (91.8%, N=254 and 87.7%, N=1,697, respectively). 93.5% (N=916) of women in the cities above 100K inhabitants had attended cytology in comparison to 77.8% (N=1,004) living in the villages.

4.3.5.8. Cytology uptake by socio-economic variables for women aged 25 and over

Table 45 Pearson Chi square analysis adjusted for design effects of cytology uptake (ever) by socio-economic variables

	Cytology ever					
	No		Yes			
	% (N)	95% CI	% (N)	95% CI	m.d.eff†	p-value
Education (N=3,466)						
Primary	32.96 (278)	28.15,38.14	67.04 (526)	61.86, 71.85		
Technical	14.92 (125)	12.35,17.92	85.08 (663)	82.08, 87.65		<0.001
Medium level	11.49 (143)	9.33,14.07	88.51 (1,095)	85.93, 90.67	2.02	F(2.55, 120.05)
Higher	5.66 (38)	4.00,7.95	94.34 (598)	92.05, 96.00		=70.17
Total	15.9 (584)	13.36,18.82	84.1 (2,882)	81.18, 86.64		
Household size (N=3,465)						
1 person	23.92 (215)	18.98,29.67	76.08 (657)	70.33, 81.02		
2 people	18.63 (162)	14.13,24.16	81.37 (692)	75.84, 85.87		
3 people	12.87 (85)	9.97,16.44	87.13 (586)	83.56, 90.03		<0.001
4 people	7.84 (53)	5.60,10.88	92.16 (571)	89.12, 94.40	1.52	F(3.55, 166.91)
5 or more	13.63 (69)	9.97,18.36	86.37 (375)	81.64, 90.03		=14.30
Total	15.92 (584)	13.37,18.84	84.08 (2,881)	81.16, 86.63		
Source of income (N=3,373)						
Employed	9.37 (128)	7.55,11.57	90.63 (1,196)	88.43, 92.45		
Self-employed	12.73 (41)	9.18,17.38	87.27 (259)	82.62, 90.82		
Retired	24.83 (261	19.45,31.12	75.17 (754)	68.88, 80.55		
Disability benefits	20.51 (46)	14.76,27.78	79.49 (177)	72.22, 85.24		
Other benefits (family, social)	20.22 (70)	15.26,26.29	79.78 (270)	73.71, 84.74		<0.001
Unemployment benefits	16.68 (11)	8.61,29.86	83.32 (53)	70.14, 91.39	1.54	F(4.86, 228.56) =15.00
Dependent on a person from outside household	9.82 (12)	5.64,16.56	90.18 (95)	83.44, 94.36		
Total	15.94 (569)	13.38,18.88	84.06 (2,804)	81.12, 86.62		
Material conditions (N=3,457)						
we live poorly	25.77 (52)	17.67,35.97	74.23 (151)	64.03, 82.33		
we live modestly	21.37 (237)	17.67,25.61	78.63 (820)	74.39, 82.33		
we live on average level	13.64 (242)	11.25,16.45	86.36 (1,457)	83.55, 88.75		<0.001
we live well	8 (45)	5.23,12.06	92 (408)	87.94, 94.77	1.27	F(3.28, 154.04) =14.20
we live very well	8.6 (5)	3.84,18.13	91.4 (40)	81.87, 96.16		
Total	15.89 (581)	13.34,18.81	84.11 (2,876)	81.19, 86.66		

†mean generalised design effects

Similarly, having ever had cytology (table 45) differed across all socio-economic variables (p<0.001). As it was in case of other previously described prophylactic behaviours (BSE, mammography) proportions of cytology attendance were noted to be greater with increasing education level. Women with higher education were the largest group, (94.3%, N=598), followed by medium level (88.5%, N=1,095), technical (85.1%, N=663) and primary (67%, N=526). Cytology was the most prevalent in women living in households of 4 people (92.2%, N=571) and the least in single person households (76.1%, N=657). Employed, dependent on a person from outside the household and self-employed women were the largest groups that stated to ever having had cytology (90.6%, N=1,196, 90.2%, N=95, and 87.3%, N=259, respectively). Similarly as in case of the two previously discussed breast cancer prophylactic behaviours cytology was the more commonly reported for women with better self-assessed material conditions (we live very well: 91.4%, N=40; we live well: 92, N=408, we live on an average level: 86.4%, N=1,457; we live modestly: 78.6%, N=820, and we live poorly: 74.2%, N=151).

4.3.5.9. Cytology uptake by previous cancer diagnosis

Table 46 Pearson Chi square analysis adjusted for design effects of cytology uptake (ever) by cancer diagnosis

	Cytology ever					
	No		Yes			
	% (N)	95% CI	% (N)	95% CI	m.d.eff†	p-value
Previous cancer (N=3,434)						
No	16.31 (565)	13.74,19.25	83.69 (2,685)	80.75,86.26		
Yes	8.71 (15)	4.98,14.81	91.29 (169)	85.19,95.02	0.63	0.011* F(1, 47) =7.08
Total	15.93 (580)	13.37,18.86	84.07 (2,854)	81.14,86.63		
Type of cancer (N=3,472)						
No cancer	16.25 (569)	13.69,19.19	83.75 (2719)	80.81,86.31		
Breast cancer	5.38 (4)	1.72,15.61	94.62 (54)	84.39,98.28		
Cervical cancer	4.48 (1)	0.57,27.76	95.52 (23)	72.24,99.43	0.68	0.06 F(2.86, 134.31) =2.57
Other	11.5 (10)	5.72,21.77	88.5 (92)	78.23,94.28		
Total	15.88 (584)	13.34,18.80	84.12 (2,888)	81.20,86.66		

*p<0.05; †mean generalised design effects

Only previous cancer diagnosis was significantly associated with cytology. 91.3% (N=169) of women who have been diagnosed with any type of cancer attended cytology at least once in their lives versus 83.7% (N=2,685) women who never had such diagnosis.

4.3.6. Was there a relationship between practicing breast and cervical prophylactic behaviours of Polish women at the introduction of nationwide screening?

A Pearson chi-square (with Rao-Scott correction) was also used to address the next study question about the relationship between practicing breast and cervical cancer prophylactic behaviours. In particular it was tested whether women who practice BSE also take up mammography or cytology and whether the ones who take up mammography also take up cytology. The tests were conducted for specific age groups that are screening target groups for breast and cervical screening: cytology for ages 25 and over and mammography for ages 50 and over and presented with corresponding design based F statistic.

Results from the analysis (details in the tables 47, 48, and 49) revealed that there were significant associations ($p<0.001$) for all groups: BSE practice in women who also took up cytology; BSE in women who also took up mammography; and also women who took up mammography were also more likely to undergo cytology $p<0.001$.

Table 47 Pearson Chi square analysis adjusted for design effects of BSE practice and mammography uptake (ever) amongst women aged 50 or over

	Mammography ever							
	No			Yes				
N=1,617	**% (N)**	**S.E.**	**95% CI**	**% (N)**	**S.E.**	**95% CI**	**m.d.eff†**	**p-value**
BSE								
No	62.04 (309)	4.5	52.67,70.60	37.96 (164)	4.5	29.40,47.33		
Yes	35.82 (416)	2.22	31.48,40.40	64.18 (728)	2.22	59.60,68.52	5.22	<0.001 F(1,47)= 54.74
Total	43.17 (725)	2.88	37.49,49.03	56.83 (892)	2.88	50.97,62.51		

†mean generalised design effects

Table 48 Pearson Chi square analysis adjusted for design effects of BSE and cytology uptake (ever) amongst women aged 25 or over

	Cytology ever								
	No			Yes					
N=3,233	% (N)	S.E.	95% CI	% (N)	S.E.	95% CI	m.d.eff†	p-value
BSE								
No	24.02 (195)	2.31	19.68,28.97	75.98 (580)	2.31	71.03,80.32		<0.001
Yes	10.59 (274)	1.07	8.63,12.94	89.41 (2,184)	1.07	87.06,91.37	3.16	F(1,47)=
Total	13.68 (469)	1.13	11.57,16.11	86.32 (2,764)	1.13	83.89,88.43		47.43

†mean generalised design effects

Table 49 Pearson Chi square analysis adjusted for design effects of mammography uptake (ever) and cytology uptake (ever) amongst women aged 50 or over

	Mammography ever							
	No			Yes				
N=1,678	% (N)	S.E.	95% CI	% (N)	S.E.	95% CI	m.d.eff†	p-value
Cytology ever								
No	82.49 (316)	2.64	76.53,87.19	17.51 (63)	2.64	12.81,23.47		<0.001
Yes	34.57 (468)	2.59	29.56,39.95	65.43 (831)	2.59	60.05,70.44	4.2	F(1,47)=
Total	44.95 (784)	2.98	39.06,50.98	55.05 (894)	2.98	49.02,60.94		147.84

†mean generalised design effects

Just over sixty four percent (64.2%, N=728) of women who practiced BSE undertook mammography at least once in their life. Whilst among the women who reported never practicing BSE 62% (N=309) said that they have never taken up mammography. However, only 4% (99 out of 2,884) who responded to a question for the reason for non-attendance to mammography (table 26) gave reason of lack of availability of such test.

Results of the analyses revealed that only 10.6% (274) of women who practice BSE never undertook cytology in their life (table 47) but 75.6% (N=580) of women that do not practice BSE had at least one cytology test in the past (table 48). Sixty five percent (65.4%, N=831) of women age 50 or over, who had at least one previous cytology also had taken up mammography at least once in their life but 82.5% (N=316) who have never had cytology also reported of never having mammography (table 49).

4.3.8. Which factors could be considered as predictors of breast and cervical cancer screening uptake at the time of data collection?

Two logistic regression (LR) was used to analyse the predictors of screening behaviours. Firstly, univariate analyses were conducted to assess the candidate predictors for the multivariate models (model 1: mammography uptake (ever) for women aged 50 or over and model 2: cytology uptake (ever) for women aged 25 or over). Independent variables included: socio-demographics and socio-economics, knowing someone (family or friend who experienced cancer), and cancer knowledge level (low, medium, or high). Initially type of cancer diagnosed was explored for inclusion in the models but it was removed due to the co linearity with mammography. BSE was also tested as an independent variable to be added to the mammography model.

Each of the independent variables considered for inclusion in either of the models has been assessed for goodness for model fit basing on the p-values, 95% confidence intervals, odds ratios and post estimation regression tests. Variables that were deemed not suitable were not included in the final model.

4.3.8.1. Breast cancer prophylaxis

Univariate logistic regression was performed for all candidate predictors of mammography uptake. The results have been split into several tables presenting predictors in groups (e.g., socio-demographics, socio-economics) that have been formed in the descriptive analyses. This was done merely to allow easier information flow and no particular order or grouping of the variables has a specific meaning in presentation of the univariate logistic regression analyses. Detailed description of odds ratios related to the uptake of mammography is presented in the section reporting on multivariate logistic analyses as the univariate assessment was used in the process of finding the best multivariate model fit that controls for the final set of covariates.

Table 50 Univariate logistic regression of mammography uptake (ever) across different socio-demographic predictors adjusted for design effects (OR, S.E., 95% CI, p-value, F-statistic)

Predictor (N total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Age (N=917)								
50-59	514	Ref	-	-	-	-	-	<0.001*** F(2,46)=82.69
60-69	236	0.73	0.1	0.031*	0.55	0.97	1.12	
70+	167	0.2	0.03	<0.001***	0.16	0.26	1.06	
Marital status (N=917)								
Married/ in relationship	391	Ref	-	-	-	-	-	<0.001*** F(3,45)=12.53
Widow	328	0.53	0.07	<0.001***	0.41	0.68	1.12	
Separated/divorced	81	1.34	0.32	0.229	0.83	2.15	1.49	
Single	117	0.98	0.18	0.914	0.68	1.42	1.07	
City size (N=915)								
city >100K	356	Ref	-	-	-	-	-	<0.001*** F(3,45)=31.74
city 50-100K	87	0.62	0.15	0.059	0.37	1.02	1.3	
city <50K	233	0.54	0.12	0.009**	0.34	0.85	1.67	
Village	241	0.23	0.04	<0.001***	0.17	0.31	1.2	

*p<0.05;**p<0.01;*** p<0.001; Ref: reference category, Adj OR Adjusted Odds Ratio

Table 51 Univariate logistic regression of mammography uptake (ever) across different socio-economic predictors adjusted for design effects (OR, S.E., 95% CI, p-value, F-statistic)

Predictor (N total)	N	Adj OR	S.E.	p-value	95% CI		D.eff	p-value
Education (N=915)								
Primary	232	Ref	-	-	-	-	-	
Technical	170	2.3	0.34	<0.001***	1.72	3.09	1.06	
Medium level	360	3.68	0.47	<0.001***	2.84	4.77	1.10	<0.001*** F(3,45)=51.32
Higher	153	7.65	1.59	<0.001***	5.04	11.61	1.05	
Material conditions (N=913)								
we live poorly	62	Ref	-	-	-	-	-	
we live modestly	333	1.23	0.22	0.26	0.86	1.75	0.99	
we live on average level	410	1.78	0.33	0.003**	1.23	2.57	1.02	0.002** F(4,44)=5.13
we live well	97	2.87	0.7	<0.001***	1.75	4.69	1.01	
we live very well	11	2.6	1.54	0.114	0.79	8.56	1.01	
Source of income (N=903)								
Employed	151	Ref	-	-	-	-		
Self-employed	32	0.42	0.13	0.007**	0.23	0.78	1.10	
Retired	510	0.41	0.08	<0.001***	0.27	0.6	1.25	
Disability benefits	103	0.49	0.11	0.002**	0.32	0.76	1.06	
Other benefits (family, social etc)	83	0.35	0.09	<0.001	0.21	0.57	1.22	0.002** F(6,42)=4.40
Unemployment benefits	8	0.52	0.38	0.373	0.12	2.27	1.13	
Dependent on a person from outside household	16	0.57	0.25	0.197	0.24	1.36	1.15	
Household size (n=916)								
1 person	378	Ref	-	-	-	-		
2 people	351	1.31	0.15	0.024*	1.04	1.66	1.09	
3 people	106	1.18	0.2	0.343	0.84	1.66	1.08	0.023** F(4,44)=3.16
4 people	44	1.65	0.44	0.07*	0.96	2.83	1.19	
5 or more	37	0.71	0.16	0.129	0.46	1.11	1.00	

*p<0.05;**p<0.01; ***p<0.001; Ref: reference category, Adj OR Adjusted Odds Ratio

Table 52 Univariate logistic regression of mammography uptake (ever) by cancer and type diagnosis, having a friend/family member with cancer diagnosis and overall cancer knowledge level adjusted for design effects (OR, S.E., 95% CI, p-value, F-statistic)

Predictor (N total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Previous cancer (any type) (N=907)								
No	807	Ref	-	-	-	-	-	<0.001 F(1,47)=25.04
Yes	100	3.49	0.87	<0.001***	2.11	5.77	1.14	
Cancer type (N=917)[a]								
No cancer	817	Ref	-	-	-	-	-	<0.001*** F(3,45)=18.06
Breast cancer	44	92.52	88.8	<0.001***	13.42	637.92	0.63	
Cervical cancer	10	8.16	4.39	<0.001***	2.76	24.11	0.62	
Other	46	1.79	0.51	0.047*	1.01	3.16	1.14	
Cancer diagnosis in the family (N=917)								
No	442	Ref	-	-	-	-	-	0.001** F(1,47)=12.19
Yes	475	1.18	0.06	0.001**	1.07	1.3	1.02	
Friend with cancer diagnosis (N=917)								
No	353	Ref	-	-	-	-	-	<0.001*** F(1,47)=35.43
Yes	564	1.83	0.19	<0.001***	1.49	2.25	1.07	
Knowledge level (N=917)								
Low	47	Ref	-	-	-	-	-	<0.001*** F(2,46)=56.82
Medium	742	5.06	0.97	<0.001***	3.44	7.45	1.17	
High	128	10.73	2.41	<0.001***	6.83	16.87	1.00	
BSE (N=892)								
No	164	Ref	-	-	-	-	-	<0.001*** F(1,47)=52.74
Yes	728	2.93	0.43	<0.001***	2.17	3.94	1.29	

*p<0.05;**p<0.01; ***p<0.001; [a]variable dropped from the final model due to co linearity; Adj OR Adjusted Odds Ratio

All univariate logistic analyses showed highly significant results either at 0.05 or 0.001 levels. However, not all of the above presented results were significant after controlling for the covariates entered in the final multivariate model.

Following univariate logistic regression analyses of mammography predictors, for women aged 50 or over, all of the previously assessed independent variables were entered into the initial model for better assessment of the effect of the variables on each other. Backward elimination was used to identify only the significant predictors which, consequently, were included in the model (table 53).

Table 53 Multivariate logistic regression of mammography uptake (ever) across different socio-demographic and socio-economic predictors adjusted for design effects (OR, S.E., p-value, 95% CI)

Predictor (N total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Age (N=917)								
50-59	514	Ref	-	-	-	-		
60-69	236	0.75	0.13	0.108	0.53	1.07	1.24	<0.001*** F(2,46)=24.73
70+	167	0.3	0.06	<0.001***	0.20	0.43	1.3	
City size (N=917)								
City >100K	356	Ref	-	-	-	-		
City 50-100K	87	0.58	0.16	0.049*	0.34	1.0	1.27	<0.001*** F(3,45)=7.05
City <50K	233	0.53	0.13	0.011*	0.33	0.86	1.56	
Village	241	0.35	0.08	<0.001***	0.23	0.56	1.41	
Education (N=915)								
Primary	232	Ref	-	-	-	-		
Technical	170	0.86	0.16	0.424	0.59	1.25	1.1	<0.001*** F(3,45)=7.59
Medium	360	1.31	0.27	0.189	0.87	1.98	1.38	
Higher	153	2.32	0.5	<0.001***	1.52	3.56	0.92	
Knowledge level (N=917)								
Low	47	Ref	-	-	-	-		
Medium	742	2.34	0.4	<0.001***	1.67	3.22	0.87	<0.001*** F(2,46)=18.20
High	128	4.15	1.03	<0.001***	2.51	6.85	0.98	
BSE (N=892)								
No	164	Ref	-	-	-	-		<0.001***
Yes	728	1.98	0.29	<0.001***	1.48	2.65	1.15	F(1,47)=22.40

*p<0.05;**p<0.01; ***p<0.001; Wald goodness-of-fit test p=0.984; Ref: reference category, Adj OR Adjusted Odds Ratio

The variables that have tested insignificant in the multivariate analyses included: source of income (p=0.830), household size (p=0.159), material conditions (p=0.693), marital status (p=0.858), friend with cancer diagnosis (p=0.153) and cancer diagnosis in the family (p=0.229). Even though when previous cancer diagnosis was entered into the multivariate model it was highly statistically significant and the likelihood of mammography was 3 times as high (OR=3.03, 95% CI, 1.91-4.80, p<0.001) it was not included in the final model. The reason for non-inclusion was that the majority of breast cancer diagnoses would have been done through mammography and therefore previous cancer diagnosis was highly linearly correlated with the outcome. The final model for mammography included six explanatory covariates: age, city size, education, knowledge, previous cancer diagnosis and BSE (table 54).

Older age was a significant predictor of lower mammography uptake for the oldest age group (70 and older) as in comparison with the reference category (50-59) of those women were 70% less likely to undergo this test at least once in their lives (OR=0.30, 95% CI, 0.20-0.43, $p<0.001$). Women living in cities with less than 50,000 inhabitants or villages were significantly less likely to attend mammography in comparison with the reference category which was set for cities above 100,000 inhabitants (Cities 50-100K: OR 0.58, 95% CI, 0.34-1.0, $p<0.05$; cities less than 50K: OR=0.53, 95% CI, 0.33-0.86, $p<0.05$; villages: OR=0.35, 95% CI, 0.23-0.56, $p<0.001$). Women with higher education (completed university degree) were 2.3 times more likely to take up mammography when compared to the reference category - no formal education (OR=2.32, 95% CI, 1.52-3.56, $p<0.001$). Other education categories: technical and high school level were not significant ($p=0.424$ and 0.189, respectively). Total cancer and cancer prophylaxis knowledge had linear relationship with mammography attendance as the higher the knowledge the higher likelihood of breast screening. Women with scores in medium range were 2.34 times more likely and women with high scores were 4.2 times more likely to take up mammography than those with low cancer knowledge (OR=2.34, 95% CI, 1.67-3.22, $p<0.001$ and OR=4.15, 95% CI, 2.51-6.85, $p<0.001$, respectively). Last of the predictors in this model was the practice of BSE and unsurprisingly women who reported performing BSE (rarely or regularly) were over 2 times more likely to also undergo mammography (OR=1.98, 95% CI, 1.48-2.65, $p<0.001$).
The model was tested with the use of Wald goodness-of-fit test which was insignificant at 0.05 level ($p=0.984$) under the null hypothesis that there are no differences between fitted and expected values and therefore the fit of the model was assessed as good. Further model details are presented in the table below.

4.3.8.2. Cervical cancer prophylaxis

Identical approach was used for the assessment of the predictors related with cervical screening (cytology uptake) as for mammography (section 4.3.7.1). Both univariate and multivariate logistic regressions were done for women older than 25 years old. As it was done in case of analyses of mammography uptake the detailed description of odds ratios is presented in the section on multivariate logistic analyses.

Table 54 Univariate logistic regression of cytology uptake (ever) across different socio-demographic predictors adjusted for design effects (OR, S.E., 95% CI, p-value, F-statistic)

Predictor (N=total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Age (N=2,596)								
25-29	243	Ref	-	-	-	-	-	
30-39	788	2.39	0.61	0.001**	1.42	4.01	1.28	
40-49	550	1.36	0.32	0.2	0.85	2.17	1.2	
50-59	670	1.46	0.31	0.077	0.96	2.23	1.09	<0.001*** F(5,43)=31.35
60-69	315	0.81	0.23	0.457	0.45	1.44	1.4	
70+	322	0.3	0.07	<0.001***	0.19	0.48	1.28	
Marital status (N=2,884)								
Married/ in relationship	1,697	Ref	-	-	-	-	-	
Widow	568	0.36	0.05	<0.001***	0.27	0.47	1.19	<0.001*** F(3,45)=25.28
Separated/divorced	254	1.57	0.46	0.127	0.87	2.84	1.61	
Single	365	0.45	0.08	<0.001***	0.31	0.65	1.34	
City size (N=2,888)								
city >100K	916	Ref	-	-	-	-	-	
city 50-100K	260	0.32	0.09	<0.001***	0.18	0.55	1.40	<0.001***
city <50K	708	0.36	0.1	<0.001***	0.21	0.62	1.69	F(3,45)=12.33
Village	1,004	0.24	0.06	<0.001***	0.15	0.39	1.57	

*p<0.05;**p<0.01; ***p<0.001; Ref: reference category, Adj OR Adjusted Odds Ratio

Table 55 Univariate logistic regression of cytology uptake (ever) across different socio-economic predictors adjusted for design effects (OR, S.E., 95% CI, p-value, F-statistic)

Predictor (N=total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Education (N=2,882)								
Primary	526	Ref	-	-	-	-	-	
Technical	663	2.8	0.34	<0.001***	2.2	3.57	0.95	<0.001*** F(3,45)=39.28
Medium	1,095	3.79	0.55	<0.001***	2.83	5.06	1.23	
Higher	598	8.19	1.81	<0.001***	5.26	12.77	1.18	
Material conditions (N=2,876)								
we live poorly	151	Ref	-	-	-	-	-	
we live modestly	820	1.28	0.27	0.246	0.84	1.94	1.16	
we live on average level	1,457	2.2	0.51	0.001**	1.38	3.5	1.30	<0.001*** F(4,44)=8.98
we live well	408	3.99	1.26	<0.001***	2.12	7.53	1.32	
we live very well	40	3.69	1.72	0.007**	1.44	9.44	0.79	
Source of income (N=2,804)								
Employed	1,196	Ref	-	-	-	-	-	
Self-employed	259	0.71	0.14	0.078	0.48	1.04	1.00	
Retired	754	0.31	0.05	<0.001***	0.23	0.43	1.35	
Disability benefits	177	0.4	0.09	<0.001***	0.26	0.62	1.14	
Other benefits (family, social)	270	0.41	0.08	<0.001***	0.27	0.61	1.23	<0.001*** F(6,42)=10.40
Unemployment benefits	53	0.52	0.19	0.078	0.25	1.08	1.01	
Dependent on a person from outside household	95	0.95	0.29	0.864	0.52	1.75	0.94	
Household size (N=2,881)								
1 person	657	Ref	-	-	-	-	-	
2 people	692	1.37	0.21	0.044*	1.01	1.87	1.26	<0.001*** F(4,44)= 17.41
3 people	586	2.13	0.32	<0.001***	1.58	2.87	1.06	
4 people	571	3.7	0.65	<0.001***	2.6	5.26	1.05	
5 or more	375	1.99	0.46	0.004**	1.26	3.16	1.41	

*p<0.05;**p<0.01; ***p<0.001; Ref: reference category; Adj OR Adjusted Odds Ratio

Table 56 Univariate logistic regression of cytology uptake (ever) by cancer and type diagnosis, having a friend/family member with cancer diagnosis and overall cancer knowledge level adjusted for design effects (OR, S.E., 95% CI, p-value, F-statistic)

Predictor (N=total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Previous cancer (N=2,685)								
No	2,685	Ref	-	-	-	-	-	0.012* F(1,47)=6.80
Yes	169	2.04	0.56	0.012*	1.18	3.54	1.00	
Cancer type (N=2,888)[a]								
No cancer	2,719	Ref	-	-	-	-	-	0.036* F(3,45)=3.09
Breast cancer	54	3.41	2.06	0.047*	1.01	11.48	0.97	
Cervical cancer	23	4.14	4.19	0.168	0.54	31.79	1.02	
Other	92	1.49	0.54	0.269	0.73	3.07	1.12	
Cancer diagnosis in the family (N=1,307)								
No	645	Ref	-	-	-	-	-	<0.001*** F(1,47)= 21.72
Yes	662	1.28	0.07	<0.001***	1.15	1.42	1.11	
Friend with cancer diagnosis (N=1,307)								
No	559	Ref	-	-	-	-	-	<0.001*** F(1,47)=33.67
Yes	748	1.79	0.18	<0.001***	1.46	2.19	1.07	
Knowledge level (N=1,307)								
Low	89	Ref	-	-	-	-	-	<0.001*** F(2,46)=54.14
Medium	1,055	4.89	0.79	<0.001***	3.54	6.75	1.27	
High	163	8.66	2.3	<0.001***	5.08	14.77	1.15	

*p<0.05;**p<0.01; ***p<0.001; Ref: reference category; Adj OR Adjusted Odds Ratio; [a]variable dropped from the multivariate model due to co linearity

Following the univariate assessment, each of the variables was assessed for interaction and significance and after adjusting for other covariates there were only two variables that became insignificant in the multivariate analyses included: source of income (p=0.612) and material conditions (p=0.658). Similarly as in case of mammography women with previous cancer diagnosis (of any body part) were more likely to uptake cytology (OR=2.02, 95% CI, 1.01-4.02, p=0.046) but due to likely co linearity previous cancer diagnosis was not included in the multivariate model. The final model included eight variables: age, city size, marital status, education, household size, knowledge, cancer in the family and having a friend diagnosed with cancer (table 57).

Table 57 Multivariate logistic regression of cytology uptake (ever) across different socio-demographic and socio-economic predictors adjusted for design effects (OR, S.E., p-value, 95% CI)

Predictor (N=total)	N	Adj OR	S.E.	p-value	95% CI		D.eff.	p-value
Age (N=2,218)								
25-29	243	Ref	-	-	-	-	-	
30-39	788	2.34	0.66	0.004**	1.34	4.13	1.30	
40-49	550	1.37	0.34	0.216	0.83	2.25	1.18	<0.001***
50-59	670	1.99	0.49	0.007**	1.22	3.26	1.13	F(5,43) =812
60-69	315	1.18	0.37	0.601	0.63	2.21	1.22	
70+	322	0.65	0.19	0.148	0.36	1.17	1.17	
Marital status (N=2,884)								
Married/in relationship	1,697	Ref	-	-	-	-	-	
Widow	568	0.72	0.16	0.152	0.46	1.13	1.22	<0.001***
Separated/divorced	254	1.34	0.4	0.324	0.74	2.43	1.46	F(3,45)=9.57
Single	365	0.33	0.07	<0.001***	0.21	0.51	1.17	
City size (1,884)								
City >100K	916	Ref	-	-	-	-	-	
City 50-100K	260	0.3	0.08	<0.001***	0.17	0.52	1.32	<0.001***
City <50K	708	0.37	0.1	0.001**	0.21	0.65	1.67	F(3,45) =7.48
Village	1,004	0.31	0.08	<0.001***	0.18	0.52	1.56	
Education (N=1,787)								
Primary	526	Ref	-	-	-	-	-	
Technical	663	1.24	0.17	0.129	0.94	1.64	0.91	<0.001***
Medium	1,095	1.74	0.3	0.002**	1.23	2.46	1.16	F(3,45)=13.57
Higher	598	3.54	0.72	<0.001***	2.35	5.32	0.93	
Household size (N=2,881)								
1 person	657	Ref	-	-	-	-	-	
2 people	692	0.92	0.2	0.694	0.60	1.41	1.20	
3 people	586	1.01	0.24	0.980	0.63	1.61	1.11	0.014*
4 people	571	1.67	0.41	0.042*	1.02	2.73	1.00	F(4,44)= 3.28
5 or more	375	1.43	0.38	0.191	0.83	2.44	1.11	
Family with cancer (N=2,888)								
No	1,394	Ref	-	-	-	-	-	0.023*
Yes	1,494	1.16	0.075	0.023*	1.02	1.33	1.16	F(1,47)= 5.56
Friend with cancer (N=2,888)								
No	1,272	Ref	-	-	-	-	-	0.033*
Yes	1,616	1.30	0.15	0.03*	1.02	1.65	1.08	F(1,47)= 4.83
Knowledge level (N=2,888)								
Low	163	Ref	-	-	-	-	-	
Medium	2,423	3.16	0.55	<0.001***	2.23	4.49	1.20	<0.001***
High	302	4.91	1.40	<0.001***	2.77	8.72	1.14	F(2,46)=25.51

*p<0.05;**p<0.01; ***p<0.001; Ref: reference category; Adj OR Adjusted Odds Ratio; Wald goodness-of-fit test p=0.457

Only two of the age categories were significantly different to the reference category (25-29). Women aged between 30-39 years old were 2.3 times (OR=2.34, 95% CI, 1.34-4.13, p<0.01), and women aged 50-59 were 2 times more likely (OR=1.99, 95% CI, 1.22-3.26, p<0.05) to have had cytology at least once in their lives. Other age categories were not significant. Marital status was also a significant predictor but only for single women that were less likely to have cytology in comparison with the reference category (married/in relationship) (OR=0.33, 95% CI, 0.21-0.51). Women living in any location with less than 100,000 inhabitants were much less likely (OR ranged from 0.30-0.37, with p-values ranging from <0.001 to 0.001).

Education was linearly associated with cytology attendance. The higher the educational level the higher OR of cytology. Women with medium education were 1.7 (OR 1.74, 95 CI, 1.23-2.46, p<0.01) and with higher 3.5 (OR 3.54, 95 CI, 2.35-5.32, p<0.001) times more likely to ever having had cytology. Cervical screening among women with technical education did not differ from that of women with primary (p=0.129). Household size was insignificant for the majority of the levels of this covariate with the exception of women who lived in households of four people. They were 1.7 times more likely to undergo cervical cancer screening than women living in single households. However, the p value was close to the 0.05 cut off point as it equalled to 0.042 and the lower bound of the confidence interval was 1.02 and therefore narrowly missing the (OR=1.67, 95% CI, 1.02-2.73, p=0.042). Even though the statistical significance was relatively low for this covariate, it was decided to keep it in the model as post estimation Wald test still showed significance (p=0.014).

Similarly, the next two variables showed marginal significance and 95% CIs narrowly missing value 1. However as in case of the household size the significance was close to 0.05 cut off level of significance. Having family member with previous cancer diagnosis was associated with 1.16 times increase and knowing someone with cancer diagnosis was associated with 1.29 times increase of cytology uptake (OR=1.16, 95% CI, 1.02-1.32, p<0.05; OR=1.29, 95% CI, 1.01-1.65, p<0.05).

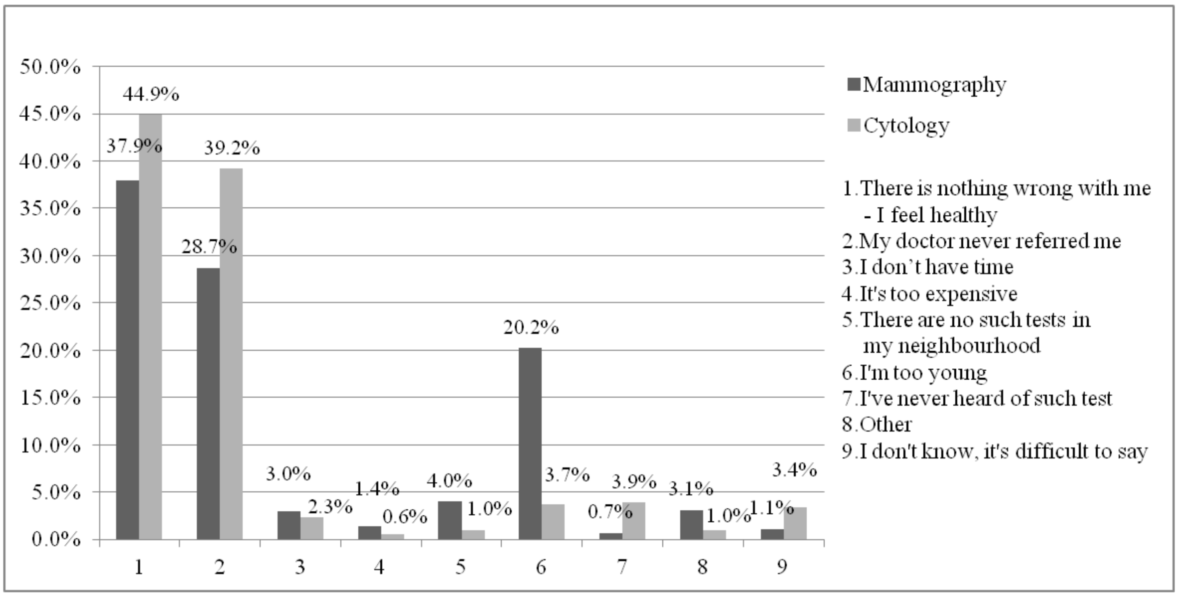
Categorical total knowledge score was the last covariate in the model. It had a highly significant linear relationship. Women who had medium knowledge score were 3.3 times more likely to attend cytology and women with high scores were 4.9 times as likely to have this test when compared to women with low cancer knowledge (OR=3.16, 95% CI, 2.23-4.49, p<0.001; OR=4.91, 95% CI, 2.77-8.72, p<0.001).

The model was tested with the use of Wald goodness-of-fit test insignificant at 0.05 level (p=0.457) under the null hypothesis that there are no differences between fitted and expected values and therefore the fit of the model was assessed as good. Further model details are presented in the table on the next page.

4.3.7. What factors were considered as barriers to breast and cervical screening by Polish women at the time of data collection?

The details on the frequencies and proportions of answers on barriers to breast and cervical screening uptake have been tabulated in section 4.2.3. This section attempts to summarise and compare that information for both screening types.

Figure 15 Comparisons of lack of uptake of mammography (N=2,922) and cytology (N=835)



Comparison of the reasons for lack of uptake of mammography and cytology was done for women who declared in previous questions that they did not attend mammography or cytology. The figure below shows that majority of women indicated that the main reason for no attendance to either breast or cervical screening was feeling that they felt healthy (37.9%, N=1,128 for cytology and 44.9%, N=366 for mammography), the next popular answer was lack of referral by doctor (28.7%, N=797 for cytology and 39.2%, N=334 for mammography). 20.2% (N=599) of women stated that they were too young to undergo mammography (594 women who selected this option were younger than 50 years old) and 3.7% (N=34) stated that they were too young to undergo cytology (31 of these women were younger than 25 years old). The remaining answers ranged between 0.6% and 4%.

Tables 26 and 27 in section 4.2.3 show that main reason for non attendance to either type of screening (mammography or cytology) is the feeling of lack of need of the test as they felt healthy and did not see anything being wrong with their health (37.9% vs. 44.9%), This was closely followed by lack of physician's referral (28.7%-29.2%). Despite lack of organised screening only a small proportion of women who declared lack of attendance to screening said that either mammography (4%) or cytology (1%) were not available in their neighbourhood. Also only a small proportion of non-attendees have never heard about these tests (mammography: 0.7%, cytology: 3.9%). Having time or thinking that these tests are expensive accounted for only 0.6%-3% of responses.

CHAPTER 5 DISCUSSION

5.1. Introduction

The study was aimed at determining factors influencing uptake of breast and cervical cancer screening. Women's knowledge on breast and cervical cancers, socio-demographic and socio-economic factors were identified, characterised and tested as predictors of breast and cervical screening uptake. Even though the data analysed in this study was collected in 2006 the study is still timely. Despite the fact that the national screening population-based initiatives have been implemented for several years the uptake of both types of screening did not increase substantially. In addition, no similar nationally representative studies identifying predictors of screening uptake in Polish society exist to date. Identification of factors influencing breast and cervical screening uptake explains not only the situation in Poland in 2006 but can also help in understanding the current low uptake rates. The study can serve to inform the policy and health promotion campaigns aiming to improve or ascertain the desirable uptake levels. It also adds to the body of evidence needed to plan initiatives in countries in similar geo-political situations that are yet to establish population based screening programmes (i.e. Romania, Bulgaria).

The majority of the elements discussed in this thesis relate to the constructs that are often included in the main theoretical frameworks aiming to predict or influence screening behaviour (please refer back to section 2.7). As the study used secondary data containing questions to which the answers were often related to several constructs at the same time, it was not possible to discuss each of the construct elements separately. Additionally, many of those constructs have been found to be equivalent across the theories (Noar and Zimmerman, 2005; Ogden, 2003) and therefore the discussion of the results of this study is presented in three main groups:

- Knowledge of breast and cervical cancers (included: knowledge and perceived benefits of screening and performing other health related behaviours, perceived susceptibility)
- Breast and cervical cancer screening behaviours and their predictors (included: past prophylactic behaviours)
- Barriers to breast and cervical cancer screening (included: barriers i.e. reasons for lack of uptake and cues to action i.e.: environmental influences)

Study strengths, limitations and challenges are discussed and recommendations provided towards the end of this chapter.

5.2. Summary of findings and discussion

5.2.1. Knowledge on breast and cervical cancer and their prophylaxis

A number of studies explored the role of knowledge in breast and/or cervical cancer screening (Gronwald et al., 2006; Lyttle and Stadelman, 2006; Okobia et al., 2006; Paolino and Arrossi, 2011; Steven and Fitch, 2004; Wong et al., 2009; Jokiel and Bielska-Lasota, 2005; Spaczyński et al., 2010; Parsa et al., 2006). However, they frequently assess single elements of knowledge or use scoring defined using study specific metrics. Also they report on different societies with varying levels of education, access to healthcare, and health care related knowledge. Therefore comparison of their results with the situation in Poland is difficult.

More meaningful interpretation of knowledge in the current study was possible through the use of weighted scores applied to the knowledge items. Comparison of the mean breast and cervical cancer knowledge scores revealed that knowledge of breast cancer was lower than of cervical cancer score (mean: 0.98, S.D. 0.25 and mean: 1.03, S.D. 0.46, respectively). Next, the knowledge scores were recoded into three levels: low, medium, and high (for scoring methodology please see section 3.5.3). The majority of women (80.6%) had medium level of total cancer knowledge, 10.3% had low and 9.1% had high. However, after splitting breast and cervical cancer knowledge notable differences were revealed. Breast cancer knowledge that was classified as medium level was the most prevalent (84.7%). Low knowledge values accounted for 10.2% and high values for 5.1%. Approximately 95% of women (10.2% with low score+84.7% with medium score) did not reach a breast cancer knowledge score above 66.6% (score values below 1.333332) of the total score possible (maximum score value of 2). The majority (93%) of women were aware of the need for breast self-examination (BSE) and 92.3% that mammography may allow early cancer detection.

Cervical cancer knowledge score was relatively evenly distributed (low: 28.2%, medium: 38.2%, and high: 33.5%). As the knowledge scores were evenly divided into thirds (please see section 3.5.3), this means that approximately 65% of women (28.2% with low score+38.2% with medium score) did not reach a breast cancer knowledge score above 66.6% (score values below 1.333332) of the total score possible (maximum score value of 2) and 33.5% had scores within the highest 33.3% of maximum possible knowledge score. This result was different from another Polish study by Ulman-Włodarz and Nowosielski (2011) who noted that the majority of women (68%) had medium level of cervical cancer knowledge (Ulman-Włodarz and Nowosielski, 2011). However their study was based on women’s self-assessed knowledge and a small convenience sample (N=250) and therefore it was not representative of Polish women in general population.

In the current study the majority (90.7%) of women knew that cytology may allow early detection of cervical cancer which is in line with a previous Polish study (2002) on cervical cancer knowledge that 91% of women reported that they were aware of the importance of cervical screening (Jokiel and Bielska-Lasota, 2005) but not with some of the other studies of communities in other countries. For example Wong et al. (2009) found that Malaysian women did not know that prevention of cervical cancer was possible if changes were detected early (Wong et al., 2009). The fact that more women had high cervical cancer knowledge than breast cancer knowledge (33.5% vs. 5.1%) seems to be consistent with the assumption that even prior to introduction of a population based screening, women would have higher cervical cancer knowledge than on breast cancer as opportunistic cervical screening was present in some areas of Poland even as early as in the 1970's (city of Białystok) (Łoś, 2006; Bardin et al., 2008).

The current study also demonstrated a moderate correlation between both types of knowledge (Rho=0.506, p<0.001). This meant that with increasing breast cancer knowledge cervical cancer knowledge increased as well. No published evidence was found to report on the strength of this correlation. This suggests that it may be beneficial to provide women with information on both types of cancers and their prophylaxis at the same time. This approach has already been implemented to some extent as screening information leaflets on both types of screening are being provided to Polish women (please see appendix 2).

Significant differences in knowledge were noted for all socio-demographic and socio-economic variables (age, marital status, city size, education, material status, household size, and source of income). The youngest (18-24 years old) and the oldest (≥70 years old) women had significantly lower knowledge in comparison to other age groups. Similarly widowed women, those living in villages, and having lower education had significantly lower levels of knowledge. This was consistent with earlier findings (Jokiel and Bielska-Lasota, 2005; Okobia et al., 2006). Women with average or better material conditions also had a better understanding of the studied cancers and their prophylaxis. Interestingly, increasing household size was also associated with higher knowledge with the exception of the households composed of 5 people or more. Women with previous cancer diagnosis had better knowledge which was especially notable amongst those that had experienced breast cancer but not for those who were diagnosed with cervical cancer. The study demonstrated that majority of women learnt about mammography from radio or television (38.9%, N=1,495), their doctor (28%, N=1,127), women's press (12.6%, N=481), or family and friends (11.5%, N=474). On the other hand physicians were the main source of first knowledge about cytology (41.1%, N=1,584), followed by, radio or television (25.9%, N=1,007), women's press 12.6% (N=474) and from friends or family (11.9%, N=467). Ulman-Włodarz and Nowosielski, (2011) found that the majority of women in their study gained their knowledge from women's press (59%), television (47%) and internet (38%), gynaecologist (30%) and midwife (38%) (Ulman-Włodarz and Nowosielski, 2011). Najdyhor et al (2013) also confirmed in their study that the majority of women gained their knowledge from press (47%) and television (46%) (Najdyhor et al., 2013).

5.2.2. Breast and cervical cancer screening behaviours and their predictors

Breast and cervical prophylactic behaviours were explored with the use of Chi square tests and univariate and multivariate logistic regression models. It was done to provide a more detailed understanding of the proportions related to each of the studied prophylactic behaviours as well as to allow for assessment of the likelihood of performing them. Breast and cervical screening predictors were tested in two separate models that were based on logistic regression analyses that included dichotomous outcome variables (mammography ever-yes/no and cytology ever yes/no).

Following the univariate analyses of each of the variables multivariate analyses were conducted using backward elimination. Only variables that have tested significant after adjusting for other covariates and sampling design were included. The final mammography model included: **age, size of the city, education, knowledge and BSE** and the cytology model included: **age, size of the city, marital status, education, household size, knowledge, cancer in the family and having a friend diagnosed with cancer**. Even though not all variables explored in the section 4.3.5 were included in the final models they are discussed below together to provide an overview of the study results.

According to the recent report by the Central Statistical Office of Poland in 2009 the overall mammography uptake (ever) and cytology uptake (ever), whether part of national screening programme or not, have not reached above 39.8% and 76.7%, respectively (Central Statistical Office of Poland, 2012c). This closely follows the results reported in this thesis as 32.1% of all women reported ever having had mammography and 78.8% ever having had cytology. Only 32.3% of women in this study admitted to regularly practice BSE and only 52.5% of women aged 50 or over (32.1% for all age groups) ever undertook mammography. This is in line with other Polish studies which showed that 31%-39.8% of Polish women ever had mammography (Central Statistical Office of Poland, 2012c, Madej et al., 2010). Also the current study found that vast majority (78.8%) of women had cytology at least once in their lives which also reflected data (76.7%) reported by Central Statistical Office of Poland (76.7%) (Central Statistical Office of Poland, 2012c). Mammography analyses were limited to women aged 50 and older in accordance with the widely recommended target screening age. However, there was a substantial proportion of women who had been screened at age younger than 50 years old (9.5%, N=403). Forty three (43) women were younger than 30 years old at their first mammography, age that is not recommended for mammography due to X-ray radiation exposure resulting in an unfavourable benefit/harm ratio in young women (<50 years old) (Preston et al., 2002) and especially for those with BRCA1/2 mutations (Gronwald et al., 2008). This mammography uptake at a young age could be a result of previously discussed prophylactic ad hoc actions that often did not have age limits. Similarly cytology uptake was analysed for women at an above screening target age group and therefore only women aged 25 or over at the time of data collection were included in these analyses. However, as it was in case of mammography there were 6.7% (N=296) younger than 25 years old at their first cytology. This can be related to the fact that in Poland every woman has access to a gynaecologist free of charge or referral and therefore a number of respondents might have been screened if their physician proposed such a test.

Age is a well known predictor of screening and it has been frequently pointed out as having a negative relationship with breast and/or cervical cancer screening attendance (Labeit et al., 2013; Jepson et al., 2000). However, the published studies describe different age screening targets and include subject with varying characteristics and therefore the results of such studies may be conflicting (Kim et al., 2008; Jepson et al., 2000).

In the current study mammography (ever) was the most prevalent in 50-59 age group (66.1%, N=514) and the least amongst in women over 70 years old (28.1%, N=167). Cytology was the most common in 30-39 year olds (92.4% N=788) and the least in women over 70 years old (60.3%, N=322). Multivariate logistic models found that older age (≥70) was a significant predictor of lower mammography uptake (OR=0.30, 95% CI, 0.20-0.43, p<0.001) in comparison to 50-59 years old age group. Women aged 30-39 years old were

2.3 times (OR=2.34, 95% CI, 1.34-4.13) and 50-59 years old 2 times more likely (OR=1.99, 95% CI, 1.22-3.26) to attend cytology in comparison to 25-29 year olds. Surprisingly, two other studies showed that breast screening attendance was lower for women over 50 years old (Champion, 1994) and 55 years old (Prażnowska et al., 2010) when compared to their younger counterparts. Champion noted that at the time of data collection the recommended screening age for women was from 35 and 40 years old at the first mammogram, then from 40 to 49 years old every 2 years and after the age of 50 it was recommended to be conducted annually. Prażnowska et al., (2010) on the other hand conducted their study on women who took part in cost free ad hoc initiative in 2007 and therefore no target screening age was defined. Cancer Research UK noted that lack of cytology uptake in younger women (in their second and third decade of life) can be mostly linked to inconvenient appointment times, whereas in older women (above age of 50 years old) to embarrassment (Cancer Research UK - Press release, 2011).

Women who were separated/divorced (64.3%, N=81) or married/in relationship (57.4%, N=391) had higher mammography uptake than those who were single or widowed (57%, N=117 and 41.6%, N=328, respectively). Marital status was found to be a significant predictor only for single women performing cytology who were less likely to do so in comparison to those in relationships (OR=0.33, 95% CI, 0.21-0.51, $p<0.001$). These findings are in line with other studies (Damiani et al., 2012; Sutton and Rutherford, 2005; Macedo et al., 2012; Martin-Lopez et al., 2010; Jelastopulu et al., 2013) which found that women in relationships are more likely (most frequently reported likelihood of 2.4 times) to attend screening than their unmarried counterparts.

Also both mammography and cytology were more commonly taken up in the cities and their uptake decreased linearly with the decreasing population density. For example mammography was reported by (70.1%, N=356) and cytology by 93.5% (N=916) in cities larger than 100,000 people and by 35.2% (N=241) and 77.8% (N=1,004) those living in the villages. Multivariate logistic models revealed that the likelihood of mammography and cytology attendance increased significantly with the size of the city the women lived in. Women living in cities smaller than 100,000 inhabitants were significantly less likely to attend mammography than those living in the largest number of inhabitants (villages OR=0.35, 95% CI 0.23-056, p<0.001; cities <50,000 OR=0.53, 95% CI, 0.33-0.86, p<0.05; cities 50,000-100,000, 95% CI 0.34-1.0 p<0.05). Women living in cities 50,000-100,000 (OR=0.30, 95% CI 0.17-0.52, p<0.001), villages (OR=0.31, 95% CI 0.18-052, p<0.001), and cities <50,000 inhabitants (OR=0.37, 95% CI 0.21-0.65, p<0.01) had significantly lower likelihood of taking up cytology than the reference category that has been set to a city larger than 100,000 inhabitants. Two other Polish studies also indicated that women living in urban areas took up both types of screening more frequently than women from rural settings (Spaczyński et al., 2010; Prażnowska et al., 2010). According to study by Prażnowska et al. (2010) 90% of free prophylactic mammography attendees lived in urban region (Prażnowska et al., 2010). Spaczyński at al. (2010) noted that higher proportion of women in rural areas did not take up cytology (15.2% vs.8%) (Spaczyński et al., 2010).

As previously discussed in section 2.6.2, education, occupation, and material conditions can play important role in uptake of breast and cervical screening (Damiani et al., 2012; Duport et al., 2008; Hewitt et al., 2004; Day et al., 2010). Having higher levels of education, being employed and being in a better material situation has been linked with higher uptake, especially that higher educated, wealthier women may attend screening through private care (Damiani et al., 2012; Spaczyński et al., 2010; Blanks et al., 2002; Lofters et al., 2011; Champion, 1994). The current study confirms that these findings are also true for Polish women. The results demonstrated additionally that more women with higher levels of achieved education practiced the studied prophylactic behaviours (BSE: higher education, 84.8%, N=556 vs. primary 60.3%, N=445; mammography: higher education, 79.5%, N=153 vs. primary education, 33.6%, N=232; and cytology: higher education, 94.3%, N=598 vs. primary, 67%, N=526). The logistic models confirmed that higher education was linearly associated with higher likelihood of taking up either of the screening tests (highest vs. lowest education: mammography OR=2.32, cytology OR=3.54, p<0.001).

Even though employed women constituted the group that the most often reported for both mammography (80.9% N=1,202) and cytology (90.6%, N=1,196) employment variable tested insignificant for both screening methods. Schumacher et al. (2008) made a similar observation and concluded that employment was not associated with uptake of either breast or cervical screening (Schumacher et al., 2008). Conversely Damiani (2012) found that women being in employment had higher likelihood to undergo a mammogram than unemployed ones (OR=1.63; 95% CI 1.40-1.91) (Damiani et al., 2012). Similarly, Jelastopulu et al. (3013) found this relationship to be true for cytology uptake as unemployed women had much lower likelihood of getting screened than the employed ones (OR=0.5, 95% CI 0.3-0.7) (Jelastopulu et al., 2013).

Higher uptake rates were found for women who declared better material conditions. Mammography uptake increased from 42.2% (N=62) amongst women living poorly to 65.5% (N=11) among those living very well. The same patterns were visible for cytology as 74.2% (N=151) of the poorest group declared ever having a smear versus women who stated to live well: 92% (N=408) or very well 91.4% (N=40). Other researchers found that better material conditions are positively associated with practicing breast and cervical cancer screening behaviours (Blanks et al., 2002; Lofters et al., 2011; Champion, 1994). For example Blanks et al. (2002) found that in the UK breast cancer screening attendance was higher in women from less deprived areas (Blanks et al., 2002). Lofters et al. (2011) demonstrated this also for cervical screening uptake in Canada (Lofters et al., 2011). The current study follows these findings with regards to larger proportions of women with better material conditions undergoing mammography and cytology. However, after testing in the respective multivariate logistic regression analyses self-assessed material status was found to be insignificant and therefore was not included in the final models. Additionally household size (number of people per household) was assessed and both mammography and cytology uptake was the most prevalent amongst women living in households composed of four people (61.7%, N=44 and 92.2%, N=571, respectively). However after adjusting for other variables in the regression models it was statistically significant only for cytology and only one household size category. Women living in the households composed of four people in comparison to single person households were 1.7 times more likely to have ever had cytology (OR=1.67, 95% CI 1.02-2.73, $p<0.05$). No other studies exploring the household size as a proxy for material conditions and breast or cervical screening were found for comparison with the current findings.

Women knowing someone with a cancer or having a family member with previous cancer diagnosis were also more likely to take up cytology (OR=1.30, 95% CI, 1.02-1.65, p<0.05, and OR=1.16, 95% CI, 1.02-0.65, p<0.001, respectively) but not mammography. On the other hand two studies in Asian communities found that women with family history of breast or cervical cancer were more likely to attend both breast and cervical cancer screening. Lee-Lin (2007) found that women were five times more likely to have had a recent mammogram if they had family member with breast cancer (OR=5.31, CI=1.09-25.84) (Lee-Lin et al., 2007). Matsubara et al. (2013) found that not only women with family history of breast cancer were more likely to have mammography but also those whose sister was diagnosed with uterine cancer had higher likelihood to take up not only cytology (OR=1.89; 95% CI 1.39-2.58), but also mammography (OR=1.54; 95% CI 1.13-2.09).

Mammography was also more commonly reported (78.3%, N=100) by women who had been diagnosed with cancer (of any body part) than those who have never had such diagnosis (50.8%, N=807). Unsurprisingly, further exploration of the cancer type revealed that almost 99% (N=44) of women who were diagnosed with breast cancer have had mammography as the diagnosis would be either done or confirmed with mammographic tests. Interestingly also, more women who have been diagnosed with cervical cancer declared mammography more often (89.3%, N=10). Other cancer diagnoses were also more often reported by women that took up mammography (64.6%, N=46) but there was no difference in proportions between women who have never been diagnosed with cancer. 91.3% (N=169) of women who reported cytology also admitted having had been diagnosed with cancer in the past in comparison to women who never had such diagnosis (83.7%, N=2,685). This result could be influenced by the fact that many of the women who were diagnosed with cervical cancer would have cytology done as a diagnostic/confirmatory test.

Day et al. (2010) reviewed studies exploring health literacy and cancer knowledge and concluded that there is a strong association with the uptake of cytology however evidence relating to mammography was mixed (Day et al., 2010). The current study shows that cancer prophylaxis knowledge is strongly related with both types of screening. Women with scores in medium range were 2.3 times more likely to have had mammography in comparison to 3.2 likelihood for cytology (mammography: OR=2.3, 95% CI, 1.67-3.22 and cytology: OR=3.16, 95% CI, 2.23-4.49, $p<0.001$). Women with high scores were 4.2 times more likely to take up mammography and 4.9 times more likely to take up cytology than those with low knowledge (mammography: OR=4.15, 95% CI, 2.51-6.85, $p<0.001$ and cytology: OR=4.91, 95% CI, 2.77-8.72, $p<0.001$, respectively).

Last of the predictors tested in mammography model was the practice of BSE. However before including it as a covariate in the logistic regression model it was explored across different socio-demographic and socio-economic variables. Due to lack of organised and population based mammographic screening programme at the time of the data collection it could serve as proxy to women's breast screening behaviours. The analyses revealed that 64.2% (N=728) of women who declared BSE also undertook mammography at least once in their life and similarly 62% (N=309) of women who have never had mammography also declared never practicing BSE. However, it is important to highlight that some of the women in the current study who were asked about ever having mammography would not have had an opportunity to undergo such a test as it was not available nationally at that time. It was found that the highest proportions of BSE were noted for the following age groups: 30-39 (80.9%, N=674), 40-49 (81.6%, N=489), and 50-59 (79.8%, N=596); whilst it was the lowest in women over 70 years old (55.9%, N=275). 78.3% (N=1,535) of married women practiced BSE in comparison with 67.6% (N=618) among single ones. Also more women living in the cities declared BSE (77.6% (N=878) of women in the cities >100,000, 77.5% (N=758) in <50,000 cities, and 74.6% (N=262) in cities with 50-100,000 inhabitants). Also employed women constituted a group that the most often practiced BSE (80.9%, N=1,202). BSE practice ranged from 56.5%, N=110 for women who declared to live poorly to 82.1%, N=45 of those that stated to live very well. The largest group of women who declared BSE lived in households composed of three (78.9%, N=629) or four people (77.8%, N=583). No statistically significant associations were found for BSE practice and previous cancer diagnosis or cancer type.

After exploration of BSE and mammography uptake in the univariate logistic regression, BSE was entered into the multivariate model and was found to be statistically significant predictor of mammography. Women who reported performing BSE were 2 times more likely to also undergo mammography (OR=1.98, 95% CI, 1.48-2.65, p<0.001). Very few other studies were found exploring this relationship but their findings are supportive of the results of the current study. For example Dunn et al. (2010) found that BSE practice (ever) was associated with mammography uptake (Malay women: adjusted OR=7.343, CI=2.686-20.079; Chinese women adjusted OR=3.466, CI=1.330-9.031) (Dunn et al., 2010). Jelinski et al. (2005) found that in age-adjusted analyses women who performed BSE were significantly more likely to have mammography (OR=1.31; 95% CI=1.05, 1.64) but when the researchers adjusted for other variables this significance was lost (OR=1.01; 95% CI=0.75, 1.35; respectively) (Jelinski et al., 2005).

Additional analyses looked at the relationship between BSE, mammography and cytology practice. Interestingly, only 10.6% (N=274) of women who practiced BSE never undertook cytology. However 75.6% (N=580) of respondents that do not practice BSE had at least one cytology test in the past. Majority of women aged 50 or over (65.4%, N=831), who reported ever having cytology also had taken up mammography but 82.5% (N=316) who have never had cytology also reported never having mammography. No other studies exploring association between BSE and cytology or mammography and cytology were found. Results of this study show that there is a clear association between practicing one of the above described prophylactic behaviours with another one, irrespectively of whether it is breast or cervical cancer related procedure.

5.2.3. Barriers to breast and cervical cancer screening

The main reasons for non attendance to either type of screening included: the feeling of lack of need of the test -feeling healthy (mammography: 37.9%, N=1,128 and cytology: 44.9%, N=366 respectively), followed by lack of referral by doctor (28.7%, N=797 for cytology and 39.2%, N=334 for mammography). A fifth of women (20.2%, N=599) stated that they were too young to undergo mammography (594 selected this answer correctly as they were younger than 50 years old) and 3.7% (N=34) stated that for cytology (31 were younger than 25 years old). Not having time or thinking that these tests are expensive accounted only 0.6%-3 % of responses. In another Polish study Iwanowicz-Palus et al. (2010) noted that in the main reasons for lack of cytology uptake was lack of time (33.3%), lack of symptoms (27.3%), cost of the test (21.2%), lack of referral (9.1%), unconvincing invitation (6.1%), and fear of diagnosis (Iwanowicz-Palus et al., 2010). However these results were based on answers given by 33 women. Ulman-Włodarz and Nowosielski (2011) on the other hand found that main reasons for lack of cytology uptake included fear of pain (39%), lack of symptoms (18%), carelessness (15%), embarrassment (12%), lack of referral (11%) and fear of the diagnosis (5%) (Ulman-Włodarz and Nowosielski, 2011). In addition to the above discussed questions above women were asked about the reasons for never visiting gynaecologist. However, only 222 women responded to this question and the majority (61.7%, N=137) indicated that they did not need it as they felt that there was nothing wrong with them. 15.8% (N=35) stated that they were too young for that, 11.7% (N=26) were scared/didn't like visiting gynaecologist.

Even though prior to 2006 there was no nationwide breast screening various institutions in different cities occasionally organised ad hoc screening and only small proportions of respondents declared the reason for non-attendance as lack of availability of mammography (4%) or cytology (1%). Women were additionally asked why they did not take part in ad hoc and cost free prophylactic actions. The most common reason was lack of knowledge of such actions (27.8%), followed by feeling of not needing such test (22.4%), women who already attend mammography elsewhere from their own initiative (19.5%), 9.8% did not have time when such actions were organised, 4% said that there were no free spaces available, and 16.5% (N=128) indicated other reasons for lack of uptake of such actions. Some of the other reasons included: different age group, housebound, too expensive, mammography after surgery (including mastectomy), breast pain, friend's advice, attending mammography elsewhere on employer's requirement. Najdyhor et al. (2013) showed that at the time of data collection for their study (2011) women were aware of some major breast screening actions organised by non-governmental organisations (e.g., Amazonki: 86%, Kampania AVON Różowa Wstążeczka: 71%) (Najdyhor et al., 2013).

5.3. Strengths, challenges, and limitations

The study has many strengths. The data was obtained from an original survey study that collected information on the knowledge and behaviours pertaining to cancer (all types) and its widely understood prophylaxis. It was conducted on a large sample (N=4,290), representative of the Polish female population. Its representativeness has been ascertained through a rigorous data collection process following stratified cluster sampling that included individuals from all regions of Poland (for description of sampling please refer back to section 3.3.2). The data was collected by trained interviewers and subsequently audited. All collected data relevant to breast and cervical cancers was extracted and analysed with the aim to identify the predictors of population based screening for these cancers. No Polish or Eastern European studies exploring breast and cervical prophylactic behaviours and their predictors in the same set of individuals, especially communities without nationwide and population based screening were found. The published evidence to date is mostly based on small, purposive or convenience samples often looking at knowledge or behaviour for only one type cancer (Jokiel and Bielska-Lasota, 2005, Spaczyński et al., 2010, Gronwald et al., 2006, Zych et al., 2006, Najdyhor et al., 2013, Nowicki et al., 2008, Nita et al., 2010a). The study also uses a novel approach to assessing knowledge on breast and cervical cancers and their prophylactic by creation and application of scoring scales based on a thorough review of published evidence that was available at the time of data collection (sections 2.3-2.6) and that the respondents could have been exposed to via various channels (please see tables 18 and 21).

Whilst using secondary data is scientifically valid, time, and cost efficient it is not free from several challenges and limitations. These challenges are inherent to using information that has been collected for a different purpose than to answer question at hand (Garmon Bibb, 2007). Even though the researcher had formed the main research question at the beginning of this project, only after the receipt of the data set it was possible to assess fully its appropriateness for this thesis. As the data was collected for another project the researcher had no control over the design of the questionnaire, or the data collection process (Boslaugh, 2010). The researcher recognises a possibility of biases that might have occurred not only at the design but also at the data collection (i.e. interviewer bias) and data input stages. Nonetheless, some data checks were still possible as even though there were some transformed variables, collapsed into more meaningful categories, the original variables were also provided to the researcher. Additionally, the questions of the survey followed a logical order and therefore in the case of questionable value in many cases the researcher could assess whether the value was correct. If the correctness of the values could not be ascertained they were set to missing (please refer back to section 3.5.1). Despite the inability to influence the original design and its processes, thanks to the wealth of information obtained through the receipt of the detailed documentation describing rigorous sampling, data collection and data quality check methods, the researcher and her supervisors were reassured of its appropriateness for this thesis.

Additionally, cross-sectional face to face administered surveys aiming to explore self-reported health related factors such as cancer and cancer prophylaxis can suffer from many limitations and challenges. They are costly and time consuming as the interviewers need to travel to the respondents' location (Polit and Hungler, 1991; Roberts, 2007). Since the survey analysed in this study is based on retrospective questioning and it collected information on respondents' knowledge and factors pertaining to cancer and its prophylaxis it can be subject to a recall bias (Levin, 2006; Bowling, 2002; Coggon et al., 2003; Rothman et al., 2008). For example respondents may not recall or remember incorrectly their screening attendance circumstances (e.g., number of previous screening tests). The validity of data could be also influenced the interviewers' characteristics (e.g., professional training or interviewing experience) (Opdenakker, 2006; Roberts, 2007). Even though all interviewers were well trained in interviewing techniques it is possible that their personality or professional health care training (community nurses) could result in respondents modifying their answers to match what they thought the interviewer considered to be the correct health behaviour (Opdenakker, 2006; Roberts, 2007) (e.g., regular screening uptake despite rare or lack of uptake). Additionally topics explored by the survey included topics that may be considered sensitive (e.g., cancer diagnosis, presence or absence of regular screening uptake, reasons for lack of screening uptake) it is possible that the respondents changed or withheld information, especially in cases where it was not possible to ascertain complete privacy of responses (i.e. third persons, family members present at the location of the data collection).

Literacy and health literacy (for definition please refer to glossary) also can play significant role in studies exploring predictors of early disease detection such as cancer screening (Day et al., 2010; Nutbeam, 2010; Smith and McCaffery, 2010). People with lower literacy are likely to be less well informed of health issues and therefore resulting in low health literacy (Miller et al., 2007). Poor health literacy can be complex in case of cancer prevention, as it may be linked with limited understanding of risks and benefits of screening, cancer symptoms, and treatment resulting in later stage at cancer diagnosis what may later cancer stage at diagnosis, (Davis et al., 2002). As the overall health literacy level could not be assessed in this study due to unavailability of such data cancer related knowledge due to its correlation to health literacy (Gazmararian et al., 2003; Kim et al., 2001) was used to partly explain women's understanding of the breast and cervical cancers. This provided a guide to explore whether their knowledge was sufficient to enable women to take informed decisions about screening uptake and whether more work needed to be done to increase their knowledge.

Several additional considerations needed to be taken into account. Health related surveys conducted on a national scale often use multiple complex sampling designs what poses several analytical challenges (such as the loss of precision due to sampling and therefore the need to select an analytical program that would allow to account for this). In this study there was need to account for the intricacies of complex sampling and many of the statistical tests that are commonly used for analysis of samples collected with the use of simple random sampling or even convenience sampling (e.g., t-tests, ANOVA) could not be used here as they would produce erroneous estimates (Lee and Forthofer, 2006, Kreuter and Valliant, 2007, Yansaneh, 2005, Hahs-Vaughn, 2005). Also only a few statistical computer programmes were found to be equipped to handle such analyses (Lee and Forthofer, 2006). Stata was found to provide relatively good accessibility of commands for various types of analyses required for this study (Kreuter and Valliant, 2007). -SVY- Stata commands with their respective suffixes and pre specified values of the sampling design were suitable to carry out the analyses (Lee and Forthofer, 2006). Majority of the commands used for analyses were included as part of the main software package offered by StataCorp (StataCorp LP., 2007). However two of them (*test* and *svylogitgof*) were written by Stata users and validated by other researchers (Lee and Forthofer, 2006, Bruin, 2006, Archer et al., 2007, UCLA: Statistical Consulting Group). Use of the -SVY- commands also required reporting of the results to be adapted. Where applicable F statistic with corresponding design based degrees of freedom adjusted for sampling design was reported (please refer back to the section 3.6. for details on the types of statistical tests used in this thesis). Due to specifics of stratified cluster sampling some precision loss was expected however the reported design effects showed that the loss of precision was relatively minimal (most of the design effects values were around the value 1).

5.4. Conclusions and recommendations

Identification of the factors that are the most influential on the uptake of breast and cervical screening is an important public health issue. The current study proposes cancer knowledge, city size, and overall education as the strongest predictors for both breast and cervical cancer screening. For mammography also age and BSE and for cytology marital status, household size, having family member with cancer, and knowing someone with cancer have been demonstrated as predictors of screening uptake.

As it is not possible to influence age, education (completed schooling level), marital status, household size or whether women have a family member or a friend with cancer, it is recommended that the organisations planning screening services pay special attention to the provision of the information campaigns highlighting the importance and acceptability of breast and cervical screening. It is also suggested that attention is paid to the distribution of this information in places with lower population density (for example in primary care centres) as the information on the benefits of screening may not be as available as in large cities.

In addition, a follow up research is suggested on the predictors identified in this study. Especially it is recommended to assess whether the uptake of screening (whether as part of the national screening programme or in private practices) has improved. The study should be conducted also on a representative sample of Polish women but focus on breast and cervical cancer related prophylaxis topics only (as opposed to the main survey from which only a subset of data was analysed in this thesis). This will help expand on other factors (than identified in this thesis) that may explain screening behaviours amongst Polish women and help to plan prophylactic campaigns aimed at increase of screening uptake. The future study should incorporate elements of theoretical constructs that have been the most commonly used in previous cancer screening research. This thesis shows that not only personal characteristics but also cancer knowledge as part of overall health literacy play important role in predicting the screening. Many of the constructs from the theories reviewed in this study (HBM, TRA, TPB, SCT, TTM, and HAPA) can be associated with the elements discussed by Weller et al. (2009) as influencing screening uptake (Figure 9). However, the data was of secondary nature and therefore it was not possible to test other constructs of the discussed theories such as: behaviours, attitudes, perceived benefit or threat, cues to action, perceived susceptibility, intentions, subjective norms and many others as significant constructs in predicting screening behaviours (please refer back to section 2.7). As the majority of theoretical frameworks are based on constructs using different nomenclature but in fact being equivalent, it is suggested to focus on the elements that have been summarised as comparable across all of the theories (please see section 2.7.6) (Ogden, 2003, Noar and Zimmerman, 2005). Even though it has been stipulated that the theoretical constructs have a limited power to explain and predict behaviours (Ogden, 2003, Noar and Zimmerman, 2005) and very limited evidence still exists on how these theoretical constructs relate to Poland and countries with complex geo-political past, it is suggested that in Poland and or other transitional countries of Central and Eastern Europe not only the building blocks of these theories are studied but also the context of the healthcare system (i.e. healthcare reforms) and the women's trust in it. It is also suggested that a wider and more qualitative study, inclusive of the majority of the constructs that were discussed in this thesis is conducted. Particularly the constructs such as knowledge, cues to action and behaviours which were to an extent covered by this study, but also perceived threats and benefits, susceptibility, personal norms and intentions should be explored. It will help to understand in more detail which constructs are the most influential in the Polish society and possibly allow more precise prediction of screening behaviours what can help in designing more effective screening policies and screening promotion campaigns. The study could include qualitative interviews with not only women themselves but also their health service providers such as doctors and nurses providing screening. Such approach could provide better understanding of the factors that in reality are driving and influencing the provision of the service and its uptake.

There are many techniques that can be used to improve uptake of screening and one of the more recent approaches has been particularly successful. The use of social marketing has been previously shown to improve the cancer related health literacy and increase uptake of cervical screening. For example researchers in New Zealand (Bethune and Lewis, 2009) described new creative strategies of social marketing used to reach women from ethnic minorities based on HBM and TTM. Part of this social marketing campaign used short humorous TV, radio and outdoor advertising. The programme also included work aiming to improve service delivery and access to services especially for hard to reach groups of women. This initiative became a platform for engagement of all stakeholders. Similar results in respect of the use social marketing techniques in screening campaigns were found in London in 2002. This campaign included mass-media messages (billboards, posters, television transmissions with a celebrity component, bus advertisements and many others) as well as various forms of personal contact with the service providers (written personal invitations with information on the importance of cervical screening, provision of toll free infoline) (Millett et al., 2005). The study showed that the coverage increased in target and non-target groups of women.

Social marketing campaigns as the ones described above may be particularly helpful in societies such as Poland where the screening uptake is still low and women’s decision to take up screening may be different and more complex than in Western societies. Such engagement of multiple stakeholders may prove to be very effective tool in reaching desired screening targets across all groups of the society and improving cancer knowledge through comprehensive educational initiatives (with the use of media and information available from healthcare providers), thus enabling women to take decision to undergo cancer screening.

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Appendix 1 Information leaflet on the availability of breast and cervical cancer screening in Poland

POPULACYJNY PROGRAM PROFILAKTYKI I WCZESNEGO WYKRYWANIA RAKA SZYJKI MACICY

Do kogo jest skierowany program?
Do wszystkich ubezpieczonych kobiet w wieku od 25 do 59 lat, które w ciągu ostatnich trzech lat nie miały wykonywanego badania cytologicznego.
Jeśli kobieta nie mieści się w grupie wiekowej od 25 do 59 lat, może skorzystać z bezpłatnej cytologii w ramach ubezpieczenia w NFZ. Lekarz specjalista wyda skierowanie na badanie. Jeśli lekarz uzna, że kobieta powinna mieć częściej wykonywaną cytologię, NFZ także sfinansuje takie badanie, płacąc za nie lekarzowi.

Czym jest cytologia?
To bezpieczne i bezbolesne badanie. Pozwala na wykrycie nie tylko wczesnych postaci raka szyjki macicy, ale także stanów, które nieleczone mogą doprowadzić do powstania nowotworu. Lekarz ginekolog lub położna pobiera za pomocą specjalnej szczoteczki komórki nabłonka z powierzchni szyjki macicy. Badanie zajmuje nie więcej niż 5 minut. Badanie to powinno się wykonywać co trzy lata, jeśli lekarz nie zaleci inaczej.

Gdzie można wykonać bezpłatne badanie cytologiczne?
Bezpłatne badania cytologiczne można wykonać **we wszystkich gabinetach ginekologicznych, które podpisały umowę z NFZ na realizację programu.** Wystarczy zgłosić się osobiście lub umówić telefonicznie z wybraną placówką i ustalić dogodny termin wizyty. Należy mieć ze sobą dokument tożsamości. **Skierowanie ani imienne zaproszenie na badanie nie jest potrzebne.**

Dlaczego warto wziąć udział w programie?
W Polsce na raka szyjki macicy zapada co roku 4 tys. kobiet (10 dziennie). Połowa z nich umiera tylko dlatego, że zbyt późno zgłosiły się do lekarza. Ryzyko zachorowania rośnie wraz z wiekiem - najczęściej chorują kobiety między 45 a 55 rokiem życia, szczególnie te, które wcześnie rozpoczęły życie seksualne, wiele razy rodziły, palą papierosy.
Wczesne wykrycie choroby gwarantuje niemal całkowite wyleczenie. Rak szyjki macicy jest bardzo podstępny i w pierwszym okresie przebiega bez niepokojących objawów. Jego rozpoznanie jest możliwe tylko dzięki badaniu cytologicznemu. Dlatego warto dać sobie szansę i wziąć udział w badaniu.

Gdzie można uzyskać dodatkowe informacje:
Dodatkowe informacje o realizacji programu w łódzkiem można uzyskać w Łódzkim Oddziale Wojewódzkim Narodowego Funduszu Zdrowia:
042 94 88
042 275 40 30
www.nfz-lodz.pl
oraz w Wojewódzkim Ośrodku Koordynującym - Instytut Centrum Zdrowia Matki Polki przy ul. Rzgowskiej 281/289.
042 271 15 16
Infolinia: 042 296 03 03
www.wybierzzycie.pl

Wszystkie informacje o programach profilaktycznych w Łódzkiem i listę gabinetów, w których można z nich skorzystać otrzymasz w ŁOW NFZ:

Łódź: 042 275 40 30, 94 88
Piotrków Trybunalski: 044 649 65 97
Sieradz: 043 822 15 86
Skierniewice: 046 834 15 90

www.nfz-lodz.pl

partnerzy

Narodowy Fundusz Zdrowia i Ministerstwo Zdrowia zapraszają kobiety do skorzystania z bezpłatnych badań cytologicznych i mammograficznych. Programy honorowym patronatem objęła Pani Prezydentowa Maria Kaczyńska.

POPULACYJNY PROGRAM WCZESNEGO WYKRYWANIA RAKA PIERSI

Do kogo jest skierowany Program?
Do wszystkich ubezpieczonych kobiet w wieku od 50 do 69 lat, które przez ostatnie dwa lata nie miały wykonywanej mammografii.
Jeśli kobieta nie mieści się w grupie wiekowej od 50 do 69 lat może skorzystać z bezpłatnej mammografii w ramach ubezpieczenia w NFZ. W tym celu powinna się zgłosić do lekarza specjalisty, który wyda skierowanie na badanie.

Czym jest mammografia?
To bezpieczne i bezbolesne badanie piersi, które jest najlepszym sposobem wczesnego wykrycia nieprawidłowych zmian. Powinno się je wykonywać co dwa lata, jeśli lekarz nie zaleci inaczej.

Dlaczego warto wziąć udział w programie?
Rak piersi jest najczęściej występującym nowotworem złośliwym u kobiet. Co roku zapada na tę chorobę 12 tys. Polek. Prawie połowa z nich umiera, bo zbyt późno zgłosiły się do lekarza. Gdyby skorzystały z badań profilaktycznych, mogłyby żyć. **Rak piersi wcześnie wykryty jest niemal w 100% uleczalny.**

Gdzie można wykonać bezpłatne badania mammograficzne?
Bezpłatne badania mammograficzne można wykonać w zakładach opieki zdrowotnej i mammobusach, które podpisały umowę z NFZ na realizację programu. Wystarczy zgłosić się osobiście lub umówić telefonicznie z wybraną placówką i ustalić dogodny termin wizyty. Należy mieć ze sobą dokument tożsamości.
Skierowanie ani zaproszenie nie jest potrzebne!

Gdzie można uzyskać dodatkowe informacje
Dodatkowe informacje o programie można uzyskać w Łódzkim Oddziale Narodowego Funduszu Zdrowia:
042 94 88
042 275 40 30
www.nfz-lodz.pl
oraz w Wojewódzkim Ośrodku Koordynującym w Łodzi – WSS im. Kopernika, ul. Pabianicka 62.
042 689-59-62
www.wok.kopernik.lodz.pl

TU ZROBISZ BEZPŁATNĄ MAMMOGRAFIĘ

SP ZOZ Centralny Szpital Kliniczny Uniwersytetu Medycznego	Łódź	Czechosłowacka 8/10	042 675 70 16
ZOZ Ministerstwa Spraw Wewnętrznych I Administracji	Łódź	Północna 42	042 63 41 183
Wojewódzki Szpital Specjalistyczny Im. M. Kopernika W Łodzi	Łódź	Paderewskiego 4	042 689 56 90
SALVE ZAKŁAD OPIEKI ZDROWOTNEJ SP. Z O.O.	Łódź	Struga 3	042 633 56 61
NZOZ Centrum Medyczne Bazarowa Sp z o.o. "Delta-Import"	Łódź	Bazarowa 9	042 613 69 11
Centrum medyczne "LUX-MED"	Łódź	Milionowa 2G	042 254 94 94
NZOZ Centrum Diagnostyki i Terapii Laserowej Politechniki Łódzkiej	Łódź	Wólczańska 215	042 681 61 39
Instytut Centrum Zdrowia Matki Polki	Łódź	Rzgowska 281/289	042 271 11 37
Niepubliczny Zakład Opieki Zdrowotnej "MegaMed" Sp. z o.o.	Bełchatów	Czapliniecka 93/95	044 635 29 38
NZOZ "Diagnostyka" Sp. z o.o.	Kutno	Kościuszki 52	024 355 84 60
Samodzielny Szpital Wojewódzki im. M. Kopernika w Piotrkowie Trybunalskim	Piotrków Trybunalski	Wolborska 76/78	044 648 03 68
Wojewódzki Szpital Zespolony w Skierniewicach	Skierniewice	Sobieskiego 5	046 834 08 54

MAMMOBUSY

Niepubliczny Zakład Opieki Zdrowotnej MEDICA	Łódź	Struga 3	501 420 706
FADO NZOZ Centrum Usług Medycznych	Gdańsk	Startowa 1	058 511 34 50
Ośrodek Profilaktyki i Epidemiologii Nowotworów	Poznań	Kazimierza Wielkiego 24/26	061 851 86 27
Zespół ZOZ Profilaktyka, Diagnostyka, Leczenie Sp. z o.o.	Warszawa	Nowolipie 31	061 879 41 80

Na **www.nfz-lodz.pl** można na bieżąco sprawdzić, gdzie można się zbadać w mammobusie.

PROGRAMY PROFILAKTYCZNE NFZ

- program profilaktyki raka szyjki macicy
- program profilaktyki raka piersi
- program badań prenatalnych
- program badań przesiewowych w kierunku wczesnego wykrywania jaskry
- program profilaktyki chorób układu krążenia
- program profilaktyki chorób odtytoniowych
- program profilaktyki gruźlicy

W ramach programów profilaktycznych osoby ubezpieczone mogą korzystać z bezpłatnych badań, wykonywanych bez skierowania (z wyjątkiem programu badań prenatalnych) w placówkach medycznych, które podpisały umowę z NFZ na realizację programu. Pacjenci chcący skorzystać z badań profilaktycznych mogą zgłaszać się osobiście lub umawiać telefonicznie z wybraną placówką, aby ustalić dogodny termin wizyty.
Programy profilaktyczne skierowane są do osób w grupach wiekowych najbardziej zagrożonych wybranymi chorobami. Osoby, które nie mieszczą się w podanych grupach wiekowych również mają prawo - w uzasadnionych medycznie przypadkach - do bezpłatnych badań w ramach ubezpieczenia zdrowotnego, na podstawie skierowania lekarza ubezpieczenia zdrowotnego.

Appendix 2 Questionnaire used to collect data in the study conducted in Poland in 2006

PBS DGA Spółka z o.o.
ul. Junaków 2
81-812 Sopot
tel. +48 58 550 60 70
fax +48 58 550 66 70
kontakt@pbsdga.pl
www.pbsdga.pl

KNOWLEDGE ABOUT CANCER AND CANCER PREVENTION			
Interviewer's name and surname	**Interviewer's number**	**Respondent's identification number**	**Questionnaire number**
....	|__|__|__|__|__|	|__|__|__|__|__|	|__|__|
Respondents gender	**City of the questionnaire completion**	**Date of the data collection (mm dd)**	**Time of the data collection**
1. female 2. male	....	|__|__| |__|__|	|__|__|:|__|__|

Dear Sir or Madam,

PBS DGA (formerly - Social Research Group) is carrying out a study on behalf of the Centre of Oncology in Warsaw with the aim to explore:

1) knowledge

2) attitudes of Polish people to elements of healthy lifestyle included in the European Code Against Cancer.

This is a scientific study carried within "the National Programme of Fight Against Cancer" of the Ministry of Health.

We kindly request for your participation in this study.

PROPHYLACTIC TESTS
1. Have you ever heard about the need for regular breast self-examination (at home)? (G8) 1. Yes 2. No ***– go to 3*** 3. *I don't know, it is difficult to say* ***– go to 3***
2. Are you examining your breasts by your-self (at home)? 1. Yes, regularly 2. Yes, but rarely 3. No, never
3. Have you ever had a mammography? 1. Yes 2. No ***– go to 9*** 3. *I don't know, it is difficult to say* ***– go to 10***
4. How old were you when you had your <u>first</u> mammography? |___|___| years *98. I don't remember*
5. How often do you undergo mammography? 1. Once per year 2. Every 2-3 years 3. Every 4-5 years 4. Less than once per 5 years 5. Rarely (occasionally) – only when I have an occasion 6. Until now I had only one mammography 7. *I don't know, it is difficult to say*
6. What was the <u>main</u> reason for your <u>last</u> mammography? *Interviewer: Read all answers to the respondent. Only one answer is possible to select* 1. I noticed worrying symptoms 2. I belong to a high risk group (breast cancer in the family) 3. I used a openly available prophylactic programme 4. I care about my health and therefore undergo prophylactic tests 5. My doctor referred me to confirm or refute diagnosis 6. My doctor referred me for a prophylactic test 7. Other, specify .... 8. *I don't know, it is difficult to say*

7. Have you ever undertaken a mammography organised as a part of cost free prophylactic action/initiative (i.e.: organized by popular press, church etc.) 1.Yes *Interviewer: ask how many times:* **|__|__|__|** times then ***go to 10*** 2.No
8. Why you have never undertaken mammography offered as part of the cost free prophylactic action/initiative? 1. I have never heard about such action 2. I did not feel the need to undertake such test 3. I did not have time when the free prophylactic action was available 4. I undergo mammography regularly 5. There were no places left 6. Other, specify ....
9. Due to what reason you have never undergone mammography? Please indicate one main reason 1. There is nothing wrong with me – I feel healthy 2. My doctor never referred me for it 3. I do not have time 4. This test is too expensive 5. There is no possibility to undertake this test in my neighbourhood 6. I am too young 7. I have never heard of such test 8. Other reason, specify .... **9.** I don't know, it is difficult to say
10. In what situations do you go to a gynaecologist? *Interviewer: Only one answer is possible* 1. Only when I have to (worrying symptoms, pregnancy) – go to 12 2. I go regularly to undertake prophylactic tests and when I need to (i.e. pregnancy, illness) – go to 12 3. I have never visited a gynaecologist – ask the question 11

CAUTION: Question asked only to the women who have never visited a gynaecologist

11. Due to what reason you have never visited a gynaecologist? Please indicate one main reason
Interviewer: Do not read the answers – Try to mark or write down the answer that is given spontaneously.

1. There is nothing wrong with me, I feel healthy
2. I am too young (I am still inactive sexually)
3. I do not have time
4. This test is too expensive
5. I am scared/I don't like it
6. Other reason, specify ....
7. [do not reveal] I don't know, it is difficult to say

12. What was the reason for your first (ever) visit at the gynaecologist?
Interviewer: Only one answer is possible

1. Prescription related to contraception
2. Worrying symptoms, treatment
3. Prophylactic test, without any symptoms
4. Pregnancy
5. Other, specify ....
6. I don't remember

13. Have you ever had your breasts examined by a gynaecologist?

1. Yes
2. No
3. I don't know, it is difficult to say

14. Have you ever undergone cytology?

1. Yes
2. No – go to 18
3. I don't know it is difficult to say-

15. How old were you at your first (ever) cytology?

|___|___| years
98. I don't remember

16. How often do you undergo cytology?

1. Once per year
2. Every 2-3 years
3. Every 4-5 years
4. Less than once per 5 years
5. Rarely (occasionally) – only when I have an occasion
6. Until now I had only one such examination

7. I don’t know, it is difficult to say

17. What was the main reason for your last cytology?

1. Planned pregnancy
2. I had worrying symptoms (by my own initiative)
3. I belong to high risk group (cervical cancer in the family)
4. I undertook it as prophylactic examination (by my own initiative)
5. I undertook it as part of prophylactic initiative
6. My doctor referred me to confirm or refute diagnosis
7. My doctor referred me for it as a prophylactic test
8. Other, specify ....

9. I don’t know, it is difficult to say

18. Due to what reason you have never undergone cytology?

1. There is nothing wrong with me – I feel healthy
2. My doctor never referred me for it
3. I do not have time
4. This test is too expensive
5. There is no possibility to undertake this test in my neighbourhood
6. I am too young
7. I have never heard of such test
8. Other reason, specify ....

9. I don’t know, it is difficult to say

KNOWLEDGE ABOUT CANCERS

Interviewer: Reveal the answer sheet

Do you believe that change of certain habits and behaviours can have protective effect on cancer? Please specify which of the following behaviours may influence the development of breast cancer

Breast cancer (I1A)	**To a large extent it can protect against cancer**	**It can have protective influence against cancer**	**It can have a somewhat protective influence against cancer**	**It does not influence cancer development**	**Contrarily, it can lead to cancer development**	***I don't know, it is difficult to say***
1. Regular mammography below the age of 50	1	2	3	4	5	*9*
2. Regular mammography above the age of 50	1	2	3	4	5	*9*
3. Use of hormonal contraception	1	2	3	4	5	*9*
4. Use of hormonal replacement therapy	1	2	3	4	5	*9*
5. Increase of intake of fruits and vegetables	1	2	3	4	5	*9*
6. Decrease of fat intake	1	2	3	4	5	*9*
7. Limitation or avoidance of alcohol	1	2	3	4	5	*9*
8. Smoking cessation	1	2	3	4	5	*9*
9. Increase of physical activity	1	2	3	4	5	*9*
10. Regular breast self-examination	1	2	3	4	5	*9*
11. Frequent X-rays (various body parts)	1	2	3	4	5	*9*

Cervical cancer (I1B)	**To a large extent it can protect against cancer**	**It can have protective influence against cancer**	**It can have a somewhat protective influence against cancer**	**It does not influence cancer developmen t**	**Contrarily, it can lead to cancer developmen t**	***I don't know, it is difficult to say***
1. Regular cytology	1	2	3	4	5	*9*
2. Use of hormonal contraception	1	2	3	4	5	*9*
3. Young age of sexual initiation	1	2	3	4	5	*9*
4. High number of sexual partners	1	2	3	4	5	*9*
5. Smoking cessation	1	2	3	4	5	*9*

<table>
<tr><th colspan="5">SOURCES OF KNOWLEDGE ABOUT CANCER PROPHYLAXIS</th></tr>
<tr><td colspan="5">19. Have you ever heard that...?

Interviewer: Reveal answer sheet</td></tr>
<tr><td></td><td>YES</td><td>NO</td><td>I don’t know, it is difficult to say</td><td>If so, where have you heard about it for the <u>first</u> time?</td></tr>
<tr><td>1.Regular mammography allows early detection of breast cancer</td><td>1</td><td>2</td><td>9</td><td>1. From family or friends
2. From a doctor
3. From the radio or TV
4. From the women’s press
5. From other press
6. From school (university, courses, work etc.)
7. From other sources, specify.....................................
8. I don’t remember</td></tr>
<tr><td>2.Regular cytology allows early detection of cervical cancer</td><td>1</td><td>2</td><td>9</td><td>1. From family or friends
2. From a doctor
3. From the radio or TV
4. From the women’s press
5. From other press
6. From school (university, courses, work etc.)
7. From other sources, specify.....................................
8. I don’t remember</td></tr>
</table>

SOCIO-DEMOGRAPHIC DATA
20. Date of birth (L1) |___|___| - |___|___| - |___|___|___|___| day month year
21. What is your education? 1. Lack of formal education, incomplete primary school 2. Completed primary school 3. Incomplete high school or technical school 4. Completed high school, technical school, vocational qualifications 5. Bachelor's degree or incomplete master's degree 6. Completed master's degree 7. Higher education than masters or doctoral degree 8. *[Do not reveal] Refused to answer*
22. What is your marital status? 1. Married , in an informal relationship 2. Widow 3. Separated, divorces 4. Single (never married)
23. Have you ever been diagnosed with cancer? 1. Yes 2. No **–** *go to 24* 3. *I don't know, it is difficult to say– go to 25*
24. Please specify the cancer's location (body part) …………………………………………………………………………………………..................................

25. Please specify the main source of your income in the last 12 months.
Interviewer: Only one answer possible

1. Employed in the public sector
2. Employed in the private sector
3. Self-employed in sector other than farming
4. Self-employed in farming (own farm)
5. Self-employed in farming (not in an own farm)
6. Retired
7. Disability, social benefits
8. Family benefits
9. Unemployment benefit
10. Benefits from social service
11. Income sources other than from employment (pre-retirement benefit, career benefit, alimony, studentship, income from a property)
12. Support of a person from outside of the household

26. How many people (including you) live in your household?

|___|___| people

27. According to you what are the material conditions of your household?

1. We live poorly – we cannot pay for our basic needs
2. We live modestly – we have to be careful about our expenses
3. We live moderately – we can afford daily expenses but we need to save for larger purchases
4. We live well – we can afford many things without major need for saving
5. We live very well – we can afford a certain level of luxury

28. Has ever anyone from your family been diagnosed with cancer?

1. Yes
2. No
3. I don't know

29. Has ever anyone from your friends been diagnosed with cancer?

1. Yes
2. No
3. I don't know

30. Voivodship, where the questionnaire is administered

1. Dolnośląskie
2. Kujawsko-pomorskie
3. Lubelskie
4. Lubuskie
5. Łódzkie
6. Małopolskie

7. Mazowieckie 8. Opolskie 9. Podkarpackie 10. Podlaskie 11. Pomorskie 12. Śląskie 13. Świętokrzyskie 14. Warmińsko-mazurskie 15. Wielkopolskie 16. Zachodniopomorskie
31. Size of the city 1. Village 2. Small town (less than 50.000 habitants) 3. Medium size town (50-100.000 habitants) 4. Large city (above 100.000 habitants)

Appendix 3 Report from the conduct of the survey (prepared by PBS-DGA)

WIEDZA O NOWOTWORACH I PROFILAKTYCE

BADANIE POPULACYJNE

ZAŁOŻENIA I REALIZACJA

WARSZAWA / SOPOT 2006-2007

Schemat doboru respondentów do badania.

W badaniu zastosowano schemat losowania warstwowego, trzystopniowego. Jednostkami losowania I stopnia były gminy. Jednostkami losowania II stopnia były wsie w gminach wiejskich i częściach wiejskich gmin miejsko-wiejskich i ulice w gminach miejskich oraz częściach miejskich gmin miejsko-wiejskich Jednostkami losowania III stopnia były osoby.

Losowanie próby I stopnia**:**

Pierwszy etap losowania był losowaniem warstwowym i proporcjonalnym. W tym celu utworzono w każdym z województw warstwy terytorialne zdefiniowane przez klasę miejscowości:

- gminy wiejskie i części wiejskie w gminach miejsko-wiejskich
- gminy miejskie (miasta) oraz części miejskie (miasta) w gminach miejsko-wiejskich do 20000 mieszkańców
- gminy miejskie (miasta) oraz części miejskie (miasta) w gminach miejsko-wiejskich od 20001 do 50000 mieszkańców
- miasta od 50001 do 200000 mieszkańców
- miasta od 200001 do 500000 mieszkańców
- miasta oraz aglomeracje miejskie ponad 500000 mieszkańców.

Dla każdej z warstw określona została liczba wywiadów do zrealizowania. Ponieważ dobór jest proporcjonalny, liczba wywiadów w warstwie jest pochodną wielkości próby oraz frakcji warstwy w populacji osób w wieku 18 lat i więcej.

Wynikająca z proporcji liczba wywiadów w warstwie dzielona była na wiązki adresowe. Wiązka składała się średnio z około 6-8 adresów podstawowych i 10-25 adresów rezerwowych. Dla tak zdefiniowanych wiązek wylosowano gminy.

Operatem losowania na tym etapie doboru próby był spis gmin w warstwie. Losowanie odbywało się niezależnie w każdej warstwie z prawdopodobieństwem proporcjonalnym do wielkości populacji osób w wieku 18 lat i więcej.

Losowanie próby II stopnia:

Losowanie wsi w gminach wiejskich/miejsko-wiejskich oraz losowanie ulic w gminach miejskich/miejsko-wiejskich było wykonane przez MSWiA ze zbioru gmin wylosowanych w etapie I. Dobór zrealizowany był wg schematu prostego z prawdopodobieństwem proporcjonalnym do liczby osób w wieku 18 i więcej na ulicy/wsi.

Losowanie próby III stopnia:

Dobór zrealizowany był wg schematu warstwowego z jednakowym prawdopodobieństwem wyboru.

W każdej z warstw typu miejscowości (w każdym z województw) zdefiniowana została warstwa ‘płciowo-wiekowa’ będąca skrzyżowaniem płci i grupy wieku: 18-24, 25-39, 40-59 oraz 60 i więcej lat.

Dla każdej z warstw ‘płciowo-wiekowej’ obliczona została liczba wywiadów do zrealizowania – jest ona pochodną liczby wywiadów w typie miejscowości w województwie (określone w etapie 1 losowania) i frakcji warstwy ‘płciowo-wiekowej’ w populacji (w warstwie typ miejscowości).

Losowanie osób (adresów) w etapie III losowania było wykonane przez MSWiA ze zbioru PESEL, mieszkających we wsiach/ulicach wylosowanych w etapie II, przy użyciu losowania prostego z jednakowym prawdopodobieństwem doboru.

Dobór respondentów ‘zastępczych’ (rezerwa)

W przypadku niezrealizowania wywiadu z osobą z ‘próby podstawowej’, wywiad został przeprowadzony z respondentem z ‘listy rezerwowej’, który dobierany był wg identycznego schematu jak lista ‘podstawowa’. Jeśli respondent z ‘próby podstawowej’ nie wyraził zgody na udział w badaniu, nie mógł być on zastąpiony innym respondentem. Założono, że brak wywiadu w warstwie określonej przez typ miejscowości, płeć oraz wiek, w ‘próbie podstawowej’, będzie uzupełniany przez wywiad z respondentem z tej samej warstwy określonej przez typ miejscowości, płeć i wiek.

Realizacja prac terenowych

Badanie przeprowadzono metodą wywiadu bezpośredniego w III kwartale 2006. Po odpowiednim przeszkoleniu pielęgniarki środowiskowe umawiały się na wizyty z potencjalnymi respondentami. Po uzyskaniu pisemnej zgody pielęgniarki przeprowadzały ankiety oraz mierzyły wzrost i ważyły respondentów.

Potencjalni respondenci, z którymi nie udało się zrealizować wywiadów (z różnych przyczyn, np odmowa, nieobecność itp.) byli umieszczani na specjalnych listach, na których opisywano szczegółowo powody niezrealizowania wywiadu.

W pierwszej kolejności pielęgniarki miały za zadanie dotrzeć do osób z tzw. próby podstawowej, a po wyczerpaniu tej listy, do nazwisk „rezerwowych”.

Zgodnie z procedurami PBS DGA 5% zrealizowanych wywiadów poddano kontroli telefonicznej. W sytuacji, gdy nie udało się skontaktować telefonicznie z respondentem, pod wskazany adres wysyłano kontrolera. Podobnie postępowano, gdy w czasie wywiadu telefonicznego nie udało się ustalić, czy wizyta pielęgniarki się odbyła. Jeśli w wyniku kontrolo okazywało się, że wywiady zostały sfałszowane, wówczas sprawdzano wszystkie ankiety zrealizowane przez daną pielęgniarkę.

W wyniku kontroli okazało się, że 69 ankiet zostało sfałszowanych. Wszczęto procedury usunięcia pielęgniarek z ogólnopolskiej sieci ankieterskiej. Sfałszowane ankiety usunięto z bazy danych, a pod wylosowane adresy wysłano nowe pielęgniarki.

Sposób realizacji próby i efektywność (przy liczeniu efektywności usunięto potencjalnych respondentów, którzy nie powinni trafić do próby, tzw. not eligible, czyli osoby, o których uzyskano informację, że mieszkają na stałe poza granicami Polski, chorych psychicznie oraz osoby, które zmarły przed rozpoczęciem badania, a które figurowały w listach adresowych z PESELa) są przedstawione w poniższych tabelach.

REALIZACJA PROBY - POPULACJA OGÓLNOPOLSKA

Tabela 1 Realizacja próby – populacja ogólnopolska w podziale na typ próby i status wywiadu

	Typ próby - podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	3775	47.67	4216	34.01	7991	39.33
Odmowa	1291	16.30	2471	19.93	3762	18.52
Dłuższa nieobecność	1874	23.66	3909	31.53	5783	28.46
Nie przebywa pod wskazanym adresem	396	5.00	661	5.33	1057	5.20
Inne	143	1.81	280	2.26	423	2.08
Nie wchodzi do badania*	440	5.56	861	6.94	1301	6.40
Total	7919	100.00	12398	100.00	20317	100.00

* zgon, choroba psychiczna, stały pobyt poza granicami Polski

Tabela 2 Realizacja próby – populacja ogólnopolska w podziale na status wywiadu i typ próby

	Typ próby - podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	3775	47.24	4216	52.76	7991	100.00
Odmowa	1291	34.32	2471	65.68	3762	100.00
Dłuższa nieobecność	1874	32.41	3909	67.59	5783	100.00
Nie przebywa pod wskazanym adresem	396	37.46	661	62.54	1057	100.00
Inne	143	33.81	280	66.19	423	100.00
Nie wchodzi do badania*	440	33.82	861	66.18	1301	100.00
Total	7919	38.98	12398	61.02	20317	100.00

* zgon, choroba psychiczna, stały pobyt poza granicami Polski

Tabela 3 Realizacja próby – populacja ogólnopolska w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	4290	41.99	3701	36.64	7991	39.33
Odmowa	1930	18.89	1832	18.14	3762	18.52
Dłuższa nieobecność	2743	26.85	3040	30.10	5783	28.46
Nie przebywa pod wskazanym adresem	489	4.79	568	5.62	1057	5.20
Inne	154	1.51	269	2.66	423	2.08
Nie wchodzi do badania*	611	5.98	690	6.83	1301	6.40
Total	10217	100.00	10100	100.00	20317	100.00

* zgon, choroba psychiczna, stały pobyt poza granicami Polski

Tabela 4 Realizacja próby – populacja ogólnopolska w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	4290	53.69	3701	46.31	7991	100.00
Odmowa	1930	51.30	1832	48.70	3762	100.00
Dłuższa nieobecność	2743	47.43	3040	52.57	5783	100.00
Nie przebywa pod wskazanym adresem	489	46.26	568	53.74	1057	100.00
Inne	154	36.41	269	63.59	423	100.00
Nie wchodzi do badania*	611	46.96	690	53.04	1301	100.00
Total	10217	50.29	10100	49.71	20317	100.00

* zgon, choroba psychiczna, stały pobyt poza granicami Polski

Tabela 5 Realizacja próby – populacja ogólnopolska w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	1289	36.85	4933	37.69	1769	47.41	7991	39.33
Odmowa	540	15.44	2457	18.77	765	20.50	3762	18.52
Dłuższa nieobecność	1128	32.25	3834	29.29	821	22.00	5783	28.46
Nie przebywa pod wskazanym adresem	221	6.32	702	5.36	134	3.59	1057	5.20
Inne	92	2.63	255	1.95	76	2.04	423	2.08
Nie wchodzi do badania*	228	6.52	907	6.93	166	4.45	1301	6.40
Total	3498	100.00	13088	100.00	3731	100.00	20317	100.00

* zgon, choroba psychiczna, stały pobyt poza granicami Polski

Tabela 6 Realizacja próby – populacja ogólnopolska w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	1289	16.13	4933	61.73	1769	22.14	7991	100.00
Odmowa	540	14.35	2457	65.31	765	20.33	3762	100.00
Dłuższa nieobecność	1128	19.51	3834	66.30	821	14.20	5783	100.00
Nie przebywa pod wskazanym adresem	221	20.91	702	66.41	134	12.68	1057	100.00
Inne	92	21.75	255	60.28	76	17.97	423	100.00
Nie wchodzi do badania*	228	17.52	907	69.72	166	12.76	1301	100.00
Total	3498	17.22	13088	64.42	3731	18.36	20317	100.00

* zgon, choroba psychiczna, stały pobyt poza granicami Polski

EFEKTYWNOSC - POPULACJA OGÓLNOPOLSKA

Tabela 7 Efektywność – populacja ogólnopolska w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	3775	50.47	4216	36.54	7991	42.02
Odmowa	1291	17.26	2471	21.42	3762	19.78
Dłuższa nieobecność	1874	25.06	3909	33.88	5783	30.41
Nie przebywa pod wskazanym adresem	396	5.29	661	5.73	1057	5.56
Inne	143	1.91	280	2.43	423	2.22
Total	7479	100.00	11537	100.00	19016	100.00

Tabela 8 Efektywność – populacja ogólnopolska w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	3775	47.24	4216	52.76	7991	100.00
Odmowa	1291	34.32	2471	65.68	3762	100.00
Dłuższa nieobecność	1874	32.41	3909	67.59	5783	100.00
Nie przebywa pod wskazanym adresem	396	37.46	661	62.54	1057	100.00
Inne	143	33.81	280	66.19	423	100.00
Total	7479	39.33	11537	60.67	19016	100.00

Tabela 9 Efektywność – populacja ogólnopolska w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	4290	44.66	3701	39.33	7991	42.02
Odmowa	1930	20.09	1832	19.47	3762	19.78
Dłuższa nieobecność	2743	28.56	3040	32.31	5783	30.41
Nie przebywa pod wskazanym adresem	489	5.09	568	6.04	1057	5.56
Inne	154	1.60	269	2.86	423	2.22
Total	9606	100.00	9410	100.00	19016	100.00

Tabela 10 Efektywność – populacja ogólnopolska w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	4290	53.69	3701	46.31	7991	100.00
Odmowa	1930	51.30	1832	48.70	3762	100.00
Dłuższa nieobecność	2743	47.43	3040	52.57	5783	100.00
Nie przebywa pod wskazanym adresem	489	46.26	568	53.74	1057	100.00
Inne	154	36.41	269	63.59	423	100.00
Total	9606	50.52	9410	49.48	19016	100.00

Tabela 11 Efektywność – populacja ogólnopolska w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	1289	39.42	4933	40.50	1769	49.62	7991	42.02
Odmowa	540	16.51	2457	20.17	765	21.46	3762	19.78
Dłuższa nieobecność	1128	34.50	3834	31.48	821	23.03	5783	30.41
Nie przebywa pod wskazanym adresem	221	6.76	702	5.76	134	3.76	1057	5.56
Inne	92	2.81	255	2.09	76	2.13	423	2.22
Total	3270	100.00	12181	100.00	3565	100.00	19016	100.00

Tabela 12 Efektywność – populacja ogólnopolska w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	1289	16.13	4933	61.73	1769	22.14	7991	100.00
Odmowa	540	14.35	2457	65.31	765	20.33	3762	100.00
Dłuższa nieobecność	1128	19.51	3834	66.30	821	14.20	5783	100.00
Nie przebywa pod wskazanym adresem	221	20.91	702	66.41	134	12.68	1057	100.00
Inne	92	21.75	255	60.28	76	17.97	423	100.00
Total	3270	17.20	12181	64.06	3565	18.75	19016	100.00

EFEKTYWNOŚĆ - POPULACJA OGÓLNOPOLSKA – PŁEĆ

Tabela 13 Efektywność – populacja ogólnopolska, kobiety, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	2124	53.94	2166	38.21	4290	44.60
Odmowa	707	17.95	1223	21.58	1930	20.09
Dłuższa nieobecność	878	22.30	1865	32.90	2743	28.56
Nie przebywa pod wskazanym adresem	184	4.67	305	5.38	489	5.09
Inne	45	1.14	109	1.92	154	1.60
Total	3938	100.00	5668	100.00	9606	100.00

Tabela 14 Efektywność – populacja ogólnopolska, mężczyźni, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	1651	46.63	2050	34.93	3701	39.33
Odmowa	584	16.49	1248	21.26	1832	19.47
Dłuższa nieobecność	996	28.13	2044	34.83	3040	32.31
Nie przebywa pod wskazanym adresem	212	5.99	356	6.07	568	6.04
Inne	98	2.77	171	2.91	269	2.86
Total	3541	100.00	5869	100.00	9410	100.00

Tabela 15 Efektywność – populacja ogólnopolska, kobiety, w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	2124	49.51	2166	50.49	4290	100.00
Odmowa	707	36.63	1223	63.37	1930	100.00
Dłuższa nieobecność	878	32.01	1865	67.99	2743	100.00
Nie przebywa pod wskazanym adresem	184	37.63	305	62.37	489	100.00
Inne	45	29.22	109	70.78	154	100.00
Total	3938	41.00	5668	59.00	9606	100.00

Tabela 16 Efektywność – populacja ogólnopolska, mężczyźni, w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	1651	44.61	2050	55.39	3701	100.00
Odmowa	584	31.88	1248	68.12	1832	100.00
Dłuższa nieobecność	996	32.76	2044	67.24	3040	100.00
Nie przebywa pod wskazanym adresem	212	37.32	356	62.68	568	100.00
Inne	98	36.43	171	63.57	269	100.00
Total	3541	37.63	5869	62.37	9410	100.00

Tabela 17 Efektywność – populacja ogólnopolska, kobiety, w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	636	40.43	2597	44.21	1057	48.96	4290	44.66
Odmowa	256	16.27	1196	20.36	478	22.14	1930	20.09
Dłuższa nieobecność	542	34.46	1708	29.08	493	22.83	2743	28.56
Nie przebywa pod wskazanym adresem	109	6.93	292	4.97	88	4.08	489	5.09
Inne	30	1.91	81	1.38	43	1.99	154	1.60
Total	1573	100.00	5874	100.00	2159	100.00	9606	100.00

Tabela 18 Efektywność – populacja ogólnopolska, mężczyźni, w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	653	38.48	2336	37.04	712	50.64	3701	39.33
Odmowa	284	16.74	1261	19.99	287	20.41	1832	19.47
Dłuższa nieobecność	586	34.53	2126	33.71	328	23.33	3040	32.31
Nie przebywa pod wskazanym adresem	112	6.60	410	6.50	46	3.27	568	6.04
Inne	62	3.65	174	2.76	33	2.35	269	2.86
Total	1697	100.00	6307	100.00	1406	100.00	9410	100.00

Tabela 19 Efektywność – populacja ogólnopolska, kobiety, w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	636	14.83	2597	60.54	1057	24.64	4290	100.00
Odmowa	256	13.26	1196	61.97	478	24.77	1930	100.00
Dłuższa nieobecność	542	19.76	1708	62.27	493	17.97	2743	100.00
Nie przebywa pod wskazanym adresem	109	22.29	292	59.71	88	18.00	489	100.00
Inne	30	19.48	81	52.60	43	27.92	154	100.00
Total	1573	16.38	5874	61.15	2159	22.48	9606	100.00

Tabela 20 Efektywność – populacja ogólnopolska, mężczyźni, w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	653	17.64	2336	63.12	712	19.24	3701	100.00
Odmowa	284	15.50	1261	68.83	287	15.67	1832	100.00
Dłuższa nieobecność	586	19.28	2126	69.93	328	10.79	3040	100.00
Nie przebywa pod wskazanym adresem	112	19.72	410	72.18	46	8.10	568	100.00
Inne	62	23.05	174	64.68	33	12.27	269	100.00
Total	1697	18.03	6307	67.02	1406	14.94	9410	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO DOLNOŚLĄSKIE

Tabela 21 Efektywność – województwo dolnośląskie w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	228	52.05	270	35.62	498	41.64
Odmowa	71	16.21	135	17.81	206	17.22
Dłuższa nieobecność	94	21.46	215	28.36	309	25.84
Nie przebywa pod wskazanym adresem	28	6.39	85	11.21	113	9.45
Inne	17	3.88	53	6.99	70	5.85
Total	438	100.00	758	100.00	1196	100.00

Tabela 22 Efektywność – województwo dolnośląskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	228	45.78	270	54.22	498	100.00
Odmowa	71	34.47	135	65.53	206	100.00
Dłuższa nieobecność	94	30.42	215	69.58	309	100.00
Nie przebywa pod wskazanym adresem	28	24.78	85	75.22	113	100.00
Inne	17	24.29	53	75.71	70	100.00
Total	438	36.62	758	63.38	1196	100.00

Tabela 23 Efektywność – województwo dolnośląskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	261	43.94	237	39.37	498	41.64
Odmowa	96	16.16	110	18.27	206	17.22
Dłuższa nieobecność	151	25.42	158	26.25	309	25.84
Nie przebywa pod wskazanym adresem	57	9.60	56	9.30	113	9.45
Inne	29	4.88	41	6.81	70	5.85
Total	594	100.00	602	100.00	1196	100.00

Tabela 24 Efektywność – województwo dolnośląskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	261	52.41	237	47.59	498	100.00
Odmowa	96	46.60	110	53.40	206	100.00
Dłuższa nieobecność	151	48.87	158	51.13	309	100.00
Nie przebywa pod wskazanym adresem	57	50.44	56	49.56	113	100.00
Inne	29	41.43	41	58.57	70	100.00
Total	594	49.67	602	50.33	1196	100.00

Tabela 25 Efektywność – województwo dolnośląskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	87	41.04	302	39.89	109	48.02	498	41.64
Odmowa	30	14.15	141	18.63	35	15.42	206	17.22
Dłuższa nieobecność	58	27.36	189	24.97	62	27.31	309	25.84
Nie przebywa pod wskazanym adresem	25	11.79	73	9.64	15	6.61	113	9.45
Inne	12	5.66	52	6.87	6	2.64	70	5.85
Total	212	100.00	757	100.00	227	100.00	1196	100.00

Tabela 26 Efektywność – województwo dolnośląskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	87	17.47	302	60.64	109	21.89	498	100.00
Odmowa	30	14.56	141	68.45	35	16.99	206	100.00
Dłuższa nieobecność	58	18.77	189	61.17	62	20.06	309	100.00
Nie przebywa pod wskazanym adresem	25	22.12	73	64.60	15	13.27	113	100.00
Inne	12	17.14	52	74.29	6	8.57	70	100.00
Total	212	17.73	757	63.29	227	18.98	1196	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO KUJAWSKO-POMORSKIE

Tabela 27 Efektywność – województwo kujawsko-pomorskie w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	245	51.15	251	33.03	496	40.03
Odmowa	91	19.00	131	17.24	222	17.92
Dłuższa nieobecność	114	23.80	351	46.18	465	37.53
Nie przebywa pod wskazanym adresem	27	5.64	25	3.29	52	4.20
Inne	2	0.42	2	0.26	4	0.32
Total	479	100.00	760	100.00	1239	100.00

Tabela 28 Efektywność – województwo kujawsko-pomorskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	245	49.40	251	50.60	496	100.00
Odmowa	91	40.99	131	59.01	222	100.00
Dłuższa nieobecność	114	24.52	351	75.48	465	100.00
Nie przebywa pod wskazanym adresem	27	51.92	25	48.08	52	100.00
Inne	2	50.00	2	50.00	4	100.00
Total	479	38.66	760	61.34	1239	100.00

Tabela 29 Efektywność – województwo kujawsko-pomorskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	264	40.74	232	39.26	496	40.03
Odmowa	124	19.14	98	16.58	222	17.92
Dłuższa nieobecność	238	36.73	227	38.41	465	37.53
Nie przebywa pod wskazanym adresem	22	3.40	30	5.08	52	4.20
Inne	0	0.00	4	0.68	4	0.32
Total	648	100.00	591	100.00	1239	100.00

Tabela 30 Efektywność – województwo kujawsko-pomorskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	264	53.23	232	46.77	496	100.00
Odmowa	124	55.86	98	44.14	222	100.00
Dłuższa nieobecność	238	51.18	227	48.82	465	100.00
Nie przebywa pod wskazanym adresem	22	42.31	30	57.69	52	100.00
Inne	0	0.00	4	100.00	4	100.00
Total	648	52.30	591	47.70	1239	100.00

Tabela 31 Efektywność – województwo kujawsko-pomorskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	87	39.73	317	39.77	92	41.26	496	40.03
Odmowa	36	16.44	138	17.31	48	21.52	222	17.92
Dłuższa nieobecność	82	37.44	306	38.39	77	34.53	465	37.53
Nie przebywa pod wskazanym adresem	14	6.39	32	4.02	6	2.69	52	4.20
Inne	0	0.00	4	0.50	0	0.00	4	0.32
Total	219	100.00	797	100.00	223	100.00	1239	100.00

Tabela 32 Efektywność – województwo kijawsko-pomorskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	87	17.54	317	63.91	92	18.55	496	100.00
Odmowa	36	16.22	138	62.16	48	21.62	222	100.00
Dłuższa nieobecność	82	17.63	306	65.81	77	16.56	465	100.00
Nie przebywa pod wskazanym adresem	14	26.92	32	61.54	6	11.54	52	100.00
Inne	0	0.00	4	100.00	0	0.00	4	100.00
Total	219	17.68	797	64.33	223	18.00	1239	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO ŁÓDZKIE

Tabela 33 Efektywność – województwo łódzkie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	243	50.10	269	40.03	512	44.25
Odmowa	107	22.06	173	25.74	280	24.20
Dłuższa nieobecność	115	23.71	178	26.49	293	25.32
Nie przebywa pod wskazanym adresem	15	3.09	42	6.25	57	4.93
Inne	5	1.03	10	1.49	15	1.30
Total	485	100.00	672	100.00	1157	100.00

Tabela 34 Efektywność – województwo łódzkie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	243	47.46	269	52.54	512	100.00
Odmowa	107	38.21	173	61.79	280	100.00
Dłuższa nieobecność	115	39.25	178	60.75	293	100.00
Nie przebywa pod wskazanym adresem	15	26.32	42	73.68	57	100.00
Inne	5	33.33	10	66.67	15	100.00
Total	485	41.92	672	58.08	1157	100.00

Tabela 35 Efektywność – województwo łódzkie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	273	44.03	239	44.51	512	44.25
Odmowa	155	25.00	125	23.28	280	24.20
Dłuższa nieobecność	160	25.81	133	24.77	293	25.32
Nie przebywa pod wskazanym adresem	28	4.52	29	5.40	57	4.93
Inne	4	0.65	11	2.05	15	1.30
Total	620	100.00	537	100.00	1157	100.00

Tabela 36 Efektywność – województwo łódzkie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	273	53.32	239	46.68	512	100.00
Odmowa	155	55.36	125	44.64	280	100.00
Dłuższa nieobecność	160	54.61	133	45.39	293	100.00
Nie przebywa pod wskazanym adresem	28	49.12	29	50.88	57	100.00
Inne	4	26.67	11	73.33	15	100.00
Total	620	53.59	537	46.41	1157	100.00

Tabela 37 Efektywność – województwo łódzkie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	73	46.79	316	42.59	123	47.49	512	44.25
Odmowa	33	21.15	166	22.37	81	31.27	280	24.20
Dłuższa nieobecność	41	26.28	210	28.30	42	16.22	293	25.32
Nie przebywa pod wskazanym adresem	6	3.85	42	5.66	9	3.47	57	4.93
Inne	3	1.92	8	1.08	4	1.54	15	1.30
Total	156	100.00	742	100.00	259	100.00	1157	100.00

Tabela 38 Efektywność – województwo łódzkie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	73	14.26	316	61.72	123	24.02	512	100.00
Odmowa	33	11.79	166	59.29	81	28.93	280	100.00
Dłuższa nieobecność	41	13.99	210	71.67	42	14.33	293	100.00
Nie przebywa pod wskazanym adresem	6	10.53	42	73.68	9	15.79	57	100.00
Inne	3	20.00	8	53.33	4	26.67	15	100.00
Total	156	13.48	742	64.13	259	22.39	1157	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO LUBELSKIE

Tabela 39 Efektywność – województwo lubelskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	257	52.56	245	35.66	502	42.69
Odmowa	60	12.27	158	23.00	218	18.54
Dłuższa nieobecność	163	33.33	274	39.88	437	37.16
Nie przebywa pod wskazanym adresem	7	1.43	10	1.46	17	1.45
Inne	2	0.41	0	0.00	2	0.17
Total	489	100.00	687	100.00	1176	100.00

Tabela 40 Efektywność – województwo lubelskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	257	51.20	245	48.80	502	100.00
Odmowa	60	27.52	158	72.48	218	100.00
Dłuższa nieobecność	163	37.30	274	62.70	437	100.00
Nie przebywa pod wskazanym adresem	7	41.18	10	58.82	17	100.00
Inne	2	100.00	0	0.00	2	100.00
Total	489	41.58	687	58.42	1176	100.00

Tabela 41 Efektywność – województwo lubelskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	273	45.88	229	39.41	502	42.69
Odmowa	104	17.48	114	19.62	218	18.54
Dłuższa nieobecność	208	34.96	229	39.41	437	37.16
Nie przebywa pod wskazanym adresem	9	1.51	8	1.38	17	1.45
Inne	1	0.17	1	0.17	2	0.17
Total	595	100.00	581	100.00	1176	100.00

Tabela 42 Efektywność – województwo lubelskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	273	54.38	229	45.62	502	100.00
Odmowa	104	47.71	114	52.29	218	100.00
Dłuższa nieobecność	208	47.60	229	52.40	437	100.00
Nie przebywa pod wskazanym adresem	9	52.94	8	47.06	17	100.00
Inne	1	50.00	1	50.00	2	100.00
Total	595	50.60	581	49.40	1176	100.00

Tabela 43 Efektywność – województwo lubelskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	85	38.81	303	41.39	114	50.67	502	42.69
Odmowa	16	7.31	141	19.26	61	27.11	218	18.54
Dłuższa nieobecność	116	52.97	273	37.30	48	21.33	437	37.16
Nie przebywa pod wskazanym adresem	1	0.46	14	1.91	2	0.89	17	1.45
Inne	1	0.46	1	0.14	0	0.00	2	0.17
Total	219	100.00	732	100.00	225	100.00	1176	100.00

Tabela 44 Efektywność – województwo lubelskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	85	16.93	303	60.36	114	22.71	502	100.00
Odmowa	16	7.34	141	64.68	61	27.98	218	100.00
Dłuższa nieobecność	116	26.54	273	62.47	48	10.98	437	100.00
Nie przebywa pod wskazanym adresem	1	5.88	14	82.35	2	11.76	17	100.00
Inne	1	50.00	1	50.00	0	0.00	2	100.00
Total	219	18.62	732	62.24	225	19.13	1176	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO LUBUSKIE

Tabela 45 Efektywność – województwo lubuskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	249	52.64	241	31.30	490	39.42
Odmowa	91	19.24	195	25.32	286	23.01
Dłuższa nieobecność	104	21.99	294	38.18	398	32.02
Nie przebywa pod wskazanym adresem	26	5.50	26	3.38	52	4.18
Inne	3	0.63	14	1.82	17	1.37
Total	473	100.00	770	100.00	1243	100.00

Tabela 46 Efektywność – województwo lubuskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	249	50.82	241	49.18	490	100.00
Odmowa	91	31.82	195	68.18	286	100.00
Dłuższa nieobecność	104	26.13	294	73.87	398	100.00
Nie przebywa pod wskazanym adresem	26	50.00	26	50.00	52	100.00
Inne	3	17.65	14	82.35	17	100.00
Total	473	38.05	770	61.95	1243	100.00

Tabela 47 Efektywność – województwo lubuskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	257	40.79	233	38.01	490	39.42
Odmowa	153	24.29	133	21.70	286	23.01
Dłuższa nieobecność	187	29.68	211	34.42	398	32.02
Nie przebywa pod wskazanym adresem	26	4.13	26	4.24	52	4.18
Inne	7	1.11	10	1.63	17	1.37
Total	630	100.00	613	100.00	1243	100.00

Tabela 48 Efektywność – województwo lubuskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	257	52.45	233	47.55	490	100.00
Odmowa	153	53.50	133	46.50	286	100.00
Dłuższa nieobecność	187	46.98	211	53.02	398	100.00
Nie przebywa pod wskazanym adresem	26	50.00	26	50.00	52	100.00
Inne	7	41.18	10	58.85	17	100.00
Total	630	50.68	613	49.32	1243	100.00

Tabela 49 Efektywność – województwo lubuskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	80	35.56	313	38.40	97	47.78	490	39.42
Odmowa	52	23.11	189	23.19	45	22.17	286	23.01
Dłuższa nieobecność	74	32.89	268	32.88	56	27.59	398	32.02
Nie przebywa pod wskazanym adresem	18	8.00	31	3.80	3	1.48	52	4.18
Inne	1	0.44	14	1.72	2	0.99	17	1.37
Total	225	100.00	815	100.00	203	100.00	1243	100.00

Tabela 50 Efektywność – województwo lubuskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	80	16.33	313	63.88	97	19.80	490	100.00
Odmowa	52	18.18	189	66.08	45	15.73	286	100.00
Dłuższa nieobecność	74	18.59	268	67.34	56	14.07	398	100.00
Nie przebywa pod wskazanym adresem	18	34.62	31	59.62	3	5.77	52	100.00
Inne	1	5.88	14	82.35	2	11.76	17	100.00
Total	225	18.10	815	65.57	203	16.33	1243	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO MAŁOPOLSKIE

Tabela 51 Efektywność – województwo małopolskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	225	48.18	274	36.93	499	41.27
Odmowa	62	13.28	140	18.87	202	16.71
Dłuższa nieobecność	122	26.12	227	30.59	349	28.87
Nie przebywa pod wskazanym adresem	36	7.71	73	9.84	109	9.02
Inne	22	4.71	28	3.77	50	4.14
Total	467	100.00	742	100.00	1209	100.00

Tabela 52 Efektywność – województwo małopolskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	225	45.09	274	54.91	499	100.00
Odmowa	62	30.69	140	69.31	202	100.00
Dłuższa nieobecność	122	34.96	227	65.04	349	100.00
Nie przebywa pod wskazanym adresem	36	33.03	73	66.97	109	100.00
Inne	22	44.00	28	56.00	50	100.00
Total	467	38.63	742	61.37	1209	100.00

Tabela 53 Efektywność – województwo małopolskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	263	43.76	236	38.82	499	41.27
Odmowa	118	19.63	84	13.82	202	16.71
Dłuższa nieobecność	152	25.29	197	32.40	349	28.87
Nie przebywa pod wskazanym adresem	48	7.99	61	10.03	109	9.02
Inne	20	3.33	30	4.93	50	4.14
Total	601	100.00	608	100.00	1209	100.00

Tabela 54 Efektywność – województwo małopolskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	263	52.71	236	47.29	499	100.00
Odmowa	118	58.42	84	41.58	202	100.00
Dłuższa nieobecność	152	43.55	197	56.45	349	100.00
Nie przebywa pod wskazanym adresem	48	44.04	61	55.96	109	100.00
Inne	20	40.00	30	60.00	50	100.00
Total	601	49.71	608	50.29	1209	100.00

Tabela 55 Efektywność – województwo małopolskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	81	40.10	300	38.86	118	50.21	499	41.27
Odmowa	25	12.38	137	17.75	40	17.02	202	16.71
Dłuższa nieobecność	69	34.16	234	30.31	46	19.57	349	28.87
Nie przebywa pod wskazanym adresem	16	7.92	79	10.23	14	5.96	109	9.02
Inne	11	5.45	22	2.85	17	7.23	50	4.14
Total	202	100.00	772	100.00	235	100.00	1209	100.00

Tabela 56 Efektywność – województwo małopolskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	81	16.23	300	60.12	118	23.65	499	100.00
Odmowa	25	12.38	137	67.82	40	19.80	202	100.00
Dłuższa nieobecność	69	19.77	234	67.05	46	13.18	349	100.00
Nie przebywa pod wskazanym adresem	16	14.68	79	72.48	14	12.84	109	100.00
Inne	11	22.00	22	44.00	17	34.00	50	100.00
Total	202	16.71	772	63.85	235	19.44	1209	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO MAZOWIECKIE

Tabela 57 Efektywność – województwo mazowieckie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	207	48.36	263	35.88	470	40.48
Odmowa	65	15.19	134	18.28	199	17.14
Dłuższa nieobecność	102	23.83	215	29.33	317	27.30
Nie przebywa pod wskazanym adresem	35	8.18	82	11.19	117	10.08
Inne	19	4.44	39	5.32	58	5.00
Total	428	100.00	733	100.00	1161	100.00

Tabela 58 Efektywność – województwo mazowieckie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	207	44.04	263	55.96	470	100.00
Odmowa	65	32.66	134	67.34	199	100.00
Dłuższa nieobecność	102	32.18	215	67.85	317	100.00
Nie przebywa pod wskazanym adresem	35	29.91	82	70.09	117	100.00
Inne	19	32.76	39	67.24	58	100.00
Total	428	36.86	733	63.14	1161	100.00

Tabela 59 Efektywność – województwo mazowieckie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	277	46.17	193	34.40	470	40.48
Odmowa	80	13.33	119	21.21	199	17.14
Dłuższa nieobecność	162	27.00	155	27.63	317	27.30
Nie przebywa pod wskazanym adresem	53	8.83	64	11.41	117	10.08
Inne	28	4.67	30	5.35	58	5.00
Total	600	100.00	561	100.00	1161	100.00

Tabela 60 Efektywność – województwo mazowieckie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	277	58.94	193	41.06	470	100.00
Odmowa	80	40.20	119	59.80	199	100.00
Dłuższa nieobecność	162	51.10	155	48.90	317	100.00
Nie przebywa pod wskazanym adresem	53	45.30	64	54.70	117	100.00
Inne	28	48.28	30	51.72	58	100.00
Total	600	51.68	561	48.32	1161	100.00

Tabela 61 Efektywność – województwo mazowieckie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	69	35.03	278	38.88	123	49.40	470	40.48
Odmowa	33	16.75	130	18.18	36	14.46	199	17.14
Dłuższa nieobecność	59	29.95	205	28.67	53	21.29	317	27.30
Nie przebywa pod wskazanym adresem	22	11.17	70	9.79	25	10.04	117	10.08
Inne	14	7.11	32	4.48	12	4.82	58	5.00
Total	197	100.00	715	100.00	249	100.00	1161	100.00

Tabela 62 Efektywność – województwo mazowieckie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	69	14.68	278	59.15	123	26.17	470	100.00
Odmowa	33	16.58	130	65.33	36	18.09	199	100.00
Dłuższa nieobecność	59	18.61	205	64.67	53	16.72	317	100.00
Nie przebywa pod wskazanym adresem	22	18.80	70	59.83	25	21.37	117	100.00
Inne	14	24.14	32	55.17	12	20.69	58	100.00
Total	197	16.97	715	61.58	249	21.45	1161	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO OPOLSKIE

Tabela 63 Efektywność – województwo opolskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	265	55.91	230	35.66	495	44.24
Odmowa	93	19.62	172	26.67	265	23.68
Dłuższa nieobecność	82	17.30	186	28.84	268	23.95
Nie przebywa pod wskazanym adresem	27	5.70	36	5.58	63	5.63
Inne	7	1.48	21	3.26	28	2.50
Total	474	100.00	645	100.00	1119	100.00

Tabela 64 Efektywność – województwo opolskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	265	53.54	230	46.46	495	100.00
Odmowa	93	35.09	172	64.91	265	100.00
Dłuższa nieobecność	82	30.60	186	69.40	268	100.00
Nie przebywa pod wskazanym adresem	27	42.86	36	57.14	63	100.00
Inne	7	25.00	21	75.00	28	100.00
Total	474	42.36	645	57.64	1119	100.00

Tabela 65 Efektywność – województwo opolskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	266	48.45	229	40.18	495	44.24
Odmowa	137	24.95	128	22.46	265	23.68
Dłuższa nieobecność	108	19.67	160	28.07	268	23.95
Nie przebywa pod wskazanym adresem	29	5.28	34	5.96	63	5.63
Inne	9	1.64	19	3.33	28	2.50
Total	549	100.00	570	100.00	1119	100.00

Tabela 66 Efektywność – województwo opolskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	266	53.74	229	46.26	495	100.00
Odmowa	137	51.70	128	48.30	265	100.00
Dłuższa nieobecność	108	40.30	160	59.70	268	100.00
Nie przebywa pod wskazanym adresem	29	46.03	34	53.97	63	100.00
Inne	9	32.14	19	67.86	28	100.00
Total	549	49.06	570	50.94	1119	100.00

Tabela 67 Efektywność – województwo opolskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	70	36.27	311	43.44	114	54.29	495	44.24
Odmowa	45	23.32	169	23.60	51	24.29	265	23.68
Dłuższa nieobecność	57	29.53	175	24.44	36	17.14	268	23.95
Nie przebywa pod wskazanym adresem	15	7.77	44	6.15	4	1.90	63	5.63
Inne	6	3.11	17	2.37	5	2.38	28	2.50
Total	193	100.00	716	100.00	210	100.00	1119	100.00

Tabela 68 Efektywność – województwo opolskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	70	14.14	311	62.83	114	23.03	495	100.00
Odmowa	45	16.98	169	63.77	51	19.25	265	100.00
Dłuższa nieobecność	57	21.27	175	65.30	36	13.43	268	100.00
Nie przebywa pod wskazanym adresem	15	23.81	44	69.84	4	6.35	63	100.00
Inne	6	21.43	17	60.71	5	17.86	28	100.00
Total	193	17.25	716	63.99	210	18.77	1119	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO PODKARPACKIE

Tabela 69 Efektywność – województwo podkarpackie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	236	52.21	266	42.83	502	46.78
Odmowa	67	14.82	80	12.88	147	13.70
Dłuższa nieobecność	117	25.88	253	40.47	370	34.48
Nie przebywa pod wskazanym adresem	22	4.87	15	2.42	37	3.45
Inne	10	2.21	7	1.13	17	1.58
Total	452	100.00	621	100.00	1073	100.00

Tabela 70 Efektywność – województwo podkarpackie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	236	47.01	266	52.99	502	100.00
Odmowa	67	45.58	80	54.42	147	100.00
Dłuższa nieobecność	117	31.62	253	68.38	370	100.00
Nie przebywa pod wskazanym adresem	22	59.46	15	40.54	37	100.00
Inne	10	58.82	7	41.18	17	100.00
Total	452	42.12	621	57.88	1073	100.00

Tabela 71 Efektywność – województwo podkarpackie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	267	50.28	235	43.36	502	46.78
Odmowa	77	14.50	70	12.92	147	13.70
Dłuższa nieobecność	165	31.07	205	37.82	370	34.48
Nie przebywa pod wskazanym adresem	16	3.01	21	3.87	37	3.45
Inne	6	1.13	11	2.03	17	1.58
Total	531	100.00	542	100.00	1073	100.00

Tabela 72 Efektywność – województwo podkarpackie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	267	53.19	235	46.81	502	100.00
Odmowa	77	52.38	70	47.62	147	100.00
Dłuższa nieobecność	165	44.59	205	55.41	370	100.00
Nie przebywa pod wskazanym adresem	16	43.24	21	56.76	37	100.00
Inne	6	35.29	11	64.71	17	100.00
Total	531	49.49	542	50.51	1073	100.00

Tabela 73 Efektywność – województwo podkarpackie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	78	40.00	319	46.64	105	54.12	502	46.78
Odmowa	20	10.26	97	14.18	30	15.46	147	13.70
Dłuższa nieobecność	88	45.13	232	33.92	50	25.77	370	34.48
Nie przebywa pod wskazanym adresem	5	2.56	28	4.09	4	2.06	37	3.45
Inne	4	2.05	8	1.17	5	2.58	17	1.58
Total	195	100.00	684	100.00	194	100.00	1073	100.00

Tabela 74 Efektywność – województwo podkarpackie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	78	15.54	319	63.55	105	20.92	502	100.00
Odmowa	20	13.61	97	65.99	30	20.41	147	100.00
Dłuższa nieobecność	88	23.78	232	62.70	50	13.51	370	100.00
Nie przebywa pod wskazanym adresem	5	13.51	28	75.68	4	10.81	37	100.00
Inne	4	23.53	8	47.06	5	29.41	17	100.00
Total	195	18.17	684	63.75	194	18.08	1073	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO PODLASKIE

Tabela 75 Efektywność – województwo podlaskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	225	47.17	289	34.45	514	39.06
Odmowa	93	19.50	234	27.89	327	24.85
Dłuższa nieobecność	123	26.21	254	30.27	379	28.80
Nie przebywa pod wskazanym adresem	28	5.87	50	5.96	78	5.93
Inne	6	1.26	12	1.43	18	1.37
Total	477	100.00	839	100.00	1316	100.00

Tabela 76 Efektywność – województwo podlaskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	225	43.77	289	56.23	514	100.00
Odmowa	93	28.44	234	71.56	327	100.00
Dłuższa nieobecność	123	32.98	254	67.02	379	100.00
Nie przebywa pod wskazanym adresem	28	35.90	50	64.10	78	100.00
Inne	6	33.33	12	66.67	18	100.00
Total	477	36.25	839	63.75	1316	100.00

Tabela 77 Efektywność – województwo podlaskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	284	43.36	230	34.80	514	39.06
Odmowa	153	23.36	174	26.32	327	24.85
Dłuższa nieobecność	174	26.56	205	31.01	379	28.80
Nie przebywa pod wskazanym adresem	41	6.26	37	5.60	78	5.93
Inne	3	0.46	15	2.27	18	1.37
Total	655	100.00	661	100.00	1316	100.00

Tabela 78 Efektywność – województwo podlaskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	284	55.25	230	44.75	514	100.00
Odmowa	153	46.79	174	53.21	327	100.00
Dłuższa nieobecność	174	45.91	205	54.09	379	100.00
Nie przebywa pod wskazanym adresem	41	52.56	37	47.44	78	100.00
Inne	3	16.67	15	83.33	18	100.00
Total	655	46.77	661	50.23	1316	100.00

Tabela 79 Efektywność – województwo podlaskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	79	33.19	303	36.68	132	52.38	514	39.06
Odmowa	61	25.63	208	25.18	58	23.02	327	24.85
Dłuższa nieobecność	75	31.51	251	30.39	53	21.03	379	28.80
Nie przebywa pod wskazanym adresem	22	9.24	48	5.81	8	3.17	78	5.93
Inne	1	0.42	16	1.94	1	0.40	18	1.37
Total	238	100.00	826	100.00	252	100.00	1316	100.00

Tabela 80 Efektywność – województwo podlaskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	79	15.37	303	58.95	132	25.68	514	100.00
Odmowa	61	18.65	208	63.61	58	17.74	327	100.00
Dłuższa nieobecność	75	19.79	251	66.23	53	13.98	379	100.00
Nie przebywa pod wskazanym adresem	22	28.21	48	61.54	8	10.26	78	100.00
Inne	1	5.56	16	88.96	1	5.56	18	100.00
Total	238	18.09	826	62.77	252	19.15	1316	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO POMORSKIE

Tabela 81 Efektywność – województwo pomorskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	242	50.95	258	32.01	500	39.03
Odmowa	90	18.95	218	27.05	308	24.04
Dłuższa nieobecność	101	21.26	242	30.02	343	26.78
Nie przebywa pod wskazanym adresem	28	5.89	64	7.94	92	7.18
Inne	16	2.95	24	2.98	38	2.97
Total	475	100.00	806	100.00	1281	100.00

Tabela 82 Efektywność – województwo pomorskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	242	48.40	258	51.60	500	100.00
Odmowa	90	29.22	218	70.78	308	100.00
Dłuższa nieobecność	101	29.45	242	70.55	343	100.00
Nie przebywa pod wskazanym adresem	28	30.43	64	69.57	92	100.00
Inne	16	36.84	24	63.16	38	100.00
Total	475	37.08	806	62.92	1281	100.00

Tabela 83 Efektywność – województwo pomorskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	275	42.05	225	35.89	500	39.03
Odmowa	153	23.39	155	24.72	308	24.04
Dłuższa nieobecność	165	25.23	178	28.39	343	26.78
Nie przebywa pod wskazanym adresem	45	6.88	47	7.50	92	7.18
Inne	16	2.45	22	3.51	38	2.97
Total	654	100.00		100.00	1281	100.00

Tabela 84 Efektywność – województwo pomorskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	275	55.00	225	45.00	500	100.00
Odmowa	153	49.68	155	50.32	308	100.00
Dłuższa nieobecność	165	48.10	178	51.90	343	100.00
Nie przebywa pod wskazanym adresem	45	48.91	47	51.09	92	100.00
Inne	16	42.11	22	57.89	38	100.00
Total	654	51.05	627	48.95	1281	100.00

Tabela 85 Efektywność – województwo pomorskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	93	43.87	305	36.70	102	42.86	500	39.03
Odmowa	39	18.40	197	23.71	72	30.25	308	24.04
Dłuższa nieobecność	51	24.06	248	29.84	44	18.49	343	26.78
Nie przebywa pod wskazanym adresem	21	9.91	59	7.10	12	5.04	92	7.18
Inne	9	3.77	22	2.65	8	3.36	38	2.97
Total	212	100.00	831	100.00	238	100.00	1281	100.00

Tabela 86 Efektywność – województwo pomorskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	93	18.60	305	61.00	102	20.40	500	100.00
Odmowa	39	12.66	197	63.96	72	23.38	308	100.00
Dłuższa nieobecność	51	14.87	248	72.30	44	12.83	343	100.00
Nie przebywa pod wskazanym adresem	21	22.83	59	64.13	12	13.04	92	100.00
Inne	9	21.05	22	57.89	8	21.05	38	100.00
Total	212	16.55	831	64.87	238	18.58	1281	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO ŚLĄSKIE

Tabela 87 Efektywność – województwo śląskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	500	44.85	291	33.14	500	37.20
Odmowa	275	18.45	189	21.53	275	20.46
Dłuższa nieobecność	521	32.83	368	41.91	521	38.76
Nie przebywa pod wskazanym adresem	48	3.86	30	3.42	48	3.57
Inne	0	0.00	0	0.00	0	0.00
Total	1344	100.00	878	100.00	1344	100.00

Tabela 88 Efektywność – województwo śląskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	500	41.80	291	58.20	500	100.00
Odmowa	275	31.27	189	68.73	275	100.00
Dłuższa nieobecność	521	29.37	368	70.63	521	100.00
Nie przebywa pod wskazanym adresem	48	37.50	30	62.50	48	100.00
Inne	0	0.00	0	0.00	0	100.00
Total	1344	34.67	878	65.33	1344	100.00

Tabela 89 Efektywność – województwo śląskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	265	39.79	235	34.66	500	37.20
Odmowa	149	22.37	126	18.58	275	20.46
Dłuższa nieobecność	229	34.38	292	43.07	521	38.76
Nie przebywa pod wskazanym adresem	23	3.45	25	3.69	48	3.57
Inne	0	0.00	0	0.00	0	0.00
Total	666	100.00	678	100.00	1344	100.00

Tabela 90 Efektywność – województwo śląskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	265	53.00	235	47.00	500	100.00
Odmowa	149	54.18	126	45.82	275	100.00
Dłuższa nieobecność	229	43.95	292	56.05	521	100.00
Nie przebywa pod wskazanym adresem	23	47.92	25	52.08	48	100.00
Inne	0	0.00	0	0.00	0	100.00
Total	666	49.55	678	50.45	1344	100.00

Tabela 91 Efektywność – województwo śląskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	78	37.14	313	35.89	109	41.60	500	37.20
Odmowa	29	13.81	184	21.10	62	23.66	275	20.46
Dłuższa nieobecność	96	45.71	342	39.22	83	31.68	521	38.76
Nie przebywa pod wskazanym adresem	7	3.33	33	3.78	8	3.05	48	3.57
Inne	0	0.00	0	0.00	0	0.00	0	0.00
Total	210	100.00	872	100.00	262	100.00	1344	100.00

Tabela 92 Efektywność – województwo śląskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	78	15.60	313	62.60	109	21.80	500	100.00
Odmowa	29	10.55	184	66.91	62	22.55	275	100.00
Dłuższa nieobecność	96	18.43	342	65.64	83	15.93	521	100.00
Nie przebywa pod wskazanym adresem	7	14.58	33	68.75	8	16.67	48	100.00
Inne	0	0.00	0	0.00	0	0.00	0	100.00
Total	210	15.63	872	64.88	262	19.49	1344	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO ŚWIĘTOKRZYSKIE

Tabela 93 Efektywność – województwo świętokrzyskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	223	47.85	277	54.21	500	51.18
Odmowa	64	13.73	45	8.81	109	11.16
Dłuższa nieobecność	140	30.04	148	28.96	288	29.48
Nie przebywa pod wskazanym adresem	28	6.01	21	4.11	49	5.02
Inne	11	2.36	20	3.91	31	3.17
Total	466	100.00	511	100.00	977	100.00

Tabela 94 Efektywność – województwo świętokrzyskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	223	44.60	277	55.40	500	100.00
Odmowa	64	58.72	45	41.28	109	100.00
Dłuższa nieobecność	140	48.61	148	51.39	288	100.00
Nie przebywa pod wskazanym adresem	28	57.14	21	42.86	49	100.00
Inne	11	35.48	20	64.52	31	100.00
Total	466	47.70	511	52.30	977	100.00

Tabela 95 Efektywność – województwo świętokrzyskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	257	53.21	243	49.19	500	51.18
Odmowa	62	12.84	47	9.51	109	11.16
Dłuższa nieobecność	136	28.16	152	30.77	288	29.48
Nie przebywa pod wskazanym adresem	15	3.11	34	6.88	49	5.02
Inne	13	2.69	18	3.64	31	3.17
Total	483	100.00	494	100.00	977	100.00

Tabela 96 Efektywność – województwo świętokrzyskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	257	51.40	243	48.60	500	100.00
Odmowa	62	56.88	47	43.12	109	100.00
Dłuższa nieobecność	136	47.22	152	52.78	288	100.00
Nie przebywa pod wskazanym adresem	15	30.61	34	69.39	49	100.00
Inne	13	41.94	18	58.06	31	100.00
Total	483	49.44	494	50.56	977	100.00

Tabela 97 Efektywność – województwo świętokrzyskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	75	45.45	304	49.43	121	61.42	500	51.18
Odmowa	10	6.06	78	12.68	21	10.66	109	11.16
Dłuższa nieobecność	59	35.76	186	30.24	43	21.83	288	29.48
Nie przebywa pod wskazanym adresem	13	7.88	28	4.55	8	4.06	49	5.02
Inne	8	4.85	19	3.09	4	2.03	31	3.17
Total	165	100.00	615	100.00	197	100.00	977	100.00

Tabela 98 Efektywność – województwo świętokrzyskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	75	15.00	304	60.80	121	24.20	500	100.00
Odmowa	10	9.17	78	71.56	21	19.27	109	100.00
Dłuższa nieobecność	59	20.49	186	64.58	43	14.93	288	100.00
Nie przebywa pod wskazanym adresem	13	26.53	28	57.14	8	16.33	49	100.00
Inne	8	25.81	19	61.29	4	12.90	31	100.00
Total	165	16.89	615	62.95	197	20.16	977	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO WARMIŃSKO- MAZURSKIE

Tabela 99 Efektywność – województwo warmińsko-mazurskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	233	50.65	270	40.91	503	44.91
Odmowa	73	15.87	75	11.36	148	13.21
Dłuższa nieobecność	112	24.35	248	37.58	360	32.14
Nie przebywa pod wskazanym adresem	24	5.22	35	5.30	59	5.27
Inne	18	3.91	32	4.85	50	4.46
Total	460	100.00	660	100.00	1120	100.00

Tabela 100 Efektywność – województwo warmińsko-mazurskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	233	46.32	270	53.68	503	100.00
Odmowa	73	49.32	75	50.68	148	100.00
Dłuższa nieobecność	112	31.11	248	68.89	360	100.00
Nie przebywa pod wskazanym adresem	24	40.68	35	59.32	59	100.00
Inne	18	36.00	32	64.00	50	100.00
Total	460	41.07	660	58.93	1120	100.00

Tabela 101 Efektywność – województwo warmińsko-mazurskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	280	48.11	223	41.45	503	44.91
Odmowa	83	14.26	65	12.08	148	13.21
Dłuższa nieobecność	177	30.41	183	34.01	360	32.14
Nie przebywa pod wskazanym adresem	30	5.15	29	5.39	59	5.27
Inne	12	2.06	38	7.06	50	4.46
Total	582	100.00	538	100.00	1120	100.00

Tabela 102 Efektywność – województwo warmińsko-mazurskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	280	55.67	223	44.33	503	100.00
Odmowa	83	56.08	65	43.92	148	100.00
Dłuższa nieobecność	177	49.17	183	50.83	360	100.00
Nie przebywa pod wskazanym adresem	30	50.85	29	49.15	59	100.00
Inne	12	24.00	38	76.00	50	100.00
Total	582	51.96	538	48.04	1120	100.00

Tabela 103 Efektywność – województwo warmińsko-mazurskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	91	43.75	308	42.19	104	57.14	503	44.91
Odmowa	21	10.10	104	14.25	23	12.64	148	13.21
Dłuższa nieobecność	66	31.73	253	34.66	41	22.53	360	32.14
Nie przebywa pod wskazanym adresem	17	8.17	37	5.07	5	2.75	59	5.27
Inne	13	6.25	28	3.84	9	4.95	50	4.46
Total	208	100.00	730	100.00	182	100.00	1120	100.00

Tabela 104 Efektywność – województwo warmińsko-mazurskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	91	18.09	308	61.23	104	20.68	503	100.00
Odmowa	21	14.19	104	70.27	23	15.54	148	100.00
Dłuższa nieobecność	66	18.33	253	70.28	41	11.39	360	100.00
Nie przebywa pod wskazanym adresem	17	28.81	37	62.71	5	8.47	59	100.00
Inne	13	26.00	28	56.00	9	18.00	50	100.00
Total	208	18.57	730	65.18	182	16.25	1120	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO WIELKOPOLSKIE

Tabela 105 Efektywność – województwo wielkopolskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	247	53.00	261	36.66	508	43.12
Odmowa	79	16.95	173	24.30	252	21.39
Dłuższa nieobecność	106	22.75	219	30.76	325	27.59
Nie przebywa pod wskazanym adresem	27	5.79	41	5.76	68	5.77
Inne	7	1.50	18	2.53	25	2.12
Total	466	100.00	712	100.00	1178	100.00

Tabela 106 Efektywność – województwo wielkopolskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	247	48.62	261	51.38	508	100.00
Odmowa	79	31.35	173	68.65	252	100.00
Dłuższa nieobecność	106	32.62	219	67.38	325	100.00
Nie przebywa pod wskazanym adresem	27	39.71	41	60.29	68	100.00
Inne	7	28.00	18	72.00	25	100.00
Total	466	39.56	712	60.44	1178	100.00

Tabela 107 Efektywność – województwo wielkopolskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	265	45.38	243	40.91	508	43.12
Odmowa	123	21.06	129	21.72	252	21.39
Dłuższa nieobecność	158	27.05	167	28.11	325	27.59
Nie przebywa pod wskazanym adresem	32	5.48	36	6.06	68	5.77
Inne	6	1.03	19	3.20	25	2.12
Total	584	100.00	594	100.00	1178	100.00

Tabela 108 Efektywność – województwo wielkopolskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	265	52.17	243	47.83	508	100.00
Odmowa	123	48.81	129	51.19	252	100.00
Dłuższa nieobecność	158	48.62	167	51.38	325	100.00
Nie przebywa pod wskazanym adresem	32	47.06	36	52.94	68	100.00
Inne	6	24.00	19	76.00	25	100.00
Total	584	49.58	594	50.42	1178	100.00

Tabela 109 Efektywność – województwo wielkopolskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	79	39.70	322	41.55	107	50.45	508	43.12
Odmowa	36	18.09	172	22.19	44	21.57	252	21.39
Dłuższa nieobecność	64	32.16	219	28.26	42	20.59	325	27.59
Nie przebywa pod wskazanym adresem	10	5.06	50	6.45	8	3.92	68	5.77
Inne	10	5.03	12	1.55	3	1.47	25	2.12
Total	199	100.00	775	100.00	204	100.00	1178	100.00

Tabela 110 Efektywność – województwo wielkopolskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	79	15.55	322	63.39	107	21.06	508	100.00
Odmowa	36	14.29	172	68.25	44	17.46	252	100.00
Dłuższa nieobecność	64	19.69	219	67.38	42	12.92	325	100.00
Nie przebywa pod wskazanym adresem	10	14.71	50	73.53	8	11.76	68	100.00
Inne	10	40.00	12	48.00	3	12.00	25	100.00
Total	199	16.89	775	64.79	204	17.32	1178	100.00

EFEKTYWNOŚĆ - WOJEWÓDZTWO ZACHODNIOPOMORSKIE

Tabela 111 Efektywność – województwo zachodniopomorskie, w podziale na typ próby i status wywiadu

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	241	49.79	261	35.13	502	40.91
Odmowa	99	20.45	219	29.48	318	25.92
Dłuższa nieobecność	124	25.62	237	31.90	361	29.42
Nie przebywa pod wskazanym adresem	20	4.13	26	3.50	46	3.75
Inne	0	0.00	0	0.00	0	0.00
Total	484	100.00	743	100.00	1227	100.00

Tabela 112 Efektywność – województwo zachodniopomorskie w podziale na status wywiadu i typ próby

	Typ próby – podstawa		Typ próby – rezerwa		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	241	48.01	261	51.99	502	100.00
Odmowa	99	31.13	219	68.87	318	100.00
Dłuższa nieobecność	124	34.35	237	65.65	361	100.00
Nie przebywa pod wskazanym adresem	20	43.48	26	56.52	46	100.00
Inne	0	0.00	0	0.00	0	100.00
Total	484	39.45	743	60.55	1227	100.00

Tabela 113 Efektywność – województwo zachodniopomorskie w podziale na płeć i status wywiadu

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	263	42.83	239	38.99	502	40.91
Odmowa	163	26.55	155	25.29	318	25.92
Dłuższa nieobecność	173	28.18	188	30.67	361	29.42
Nie przebywa pod wskazanym adresem	15	2.44	31	5.06	46	3.75
Inne	0	0.00	0	0.00	0	0.00
Total	614	100.00	613	100.00	1227	100.00

Tabela 114 Efektywność – województwo zachodniopomorskie w podziale na status wywiadu i płeć

	Kobiety		Mężczyźni		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	263	52.39	239	47.61	502	100.00
Odmowa	163	51.26	155	48.74	318	100.00
Dłuższa nieobecność	173	47.92	188	52.08	361	100.00
Nie przebywa pod wskazanym adresem	15	32.61	31	67.39	46	100.00
Inne	0	0.00	0	0.00	0	100.00
Total	614	50.04	613	49.96	1227	100.00

Tabela 115 Efektywność – województwo zachodniopomorskie w podziale na grupy wieku i status wywiadu

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	84	38.18	319	37.78	99	48.29	502	40.91
Odmowa	54	24.55	206	25.69	58	28.29	318	25.92
Dłuższa nieobecność	73	33.18	243	30.30	45	21.95	361	29.42
Nie przebywa pod wskazanym adresem	9	4.09	34	4.24	3	1.46	46	3.75
Inne	0	0.00	0	0.00	0	0.00	0	0.00
Total	220	100.00	802	100.00	205	100.00	1227	100.00

Tabela 116 Efektywność – województwo zachodniopomorskie w podziale na status wywiadu i grupy wieku

	18-24 lata		25-59 lat		60 i więcej lat		Total	
Status wywiadu	(n)	%	(n)	%	(n)	%	(n)	%
Wywiad zrealizowany	84	16.73	319	63.55	99	19.72	502	100.00
Odmowa	54	16.98.	206	64.78	58	18.24	318	100.00
Dłuższa nieobecność	73	20.22	243	67.31	45	12.47	361	100.00
Nie przebywa pod wskazanym adresem	9	19.57	34	73.91	3	6.52	46	100.00
Inne	0	0.00	0	0.00	0	0.00	0	100.00
Total	220	17.93	802	65.36	205	16.71	1227	100.00

Wyniki

Dane zostały przetworzone przy użyciu pakiety statystycznego SPSS ver 15.0.

Wyniki zostały zaprezentowane w postaci tabel i wykresów, oddzielnie dla populacji ogólnopolskiej i dla poszczególnych województw.

Dane prezentowane dla całej populacji zostały przeważone tak, aby struktura według płci, wieku i województwa odpowiadała strukturze ogólnopolskiej.

Dane dla województwo zostały zaprezentowane w postaci surowej.

Appendix 4 Consent form (version translated from Polish to English)

Declaration of Consent

for survey completion and measurement of weight and height

⇒ **Good morning, my name is.................. .... I am an interviewer employed by PBS DGA.**

⇒ **Your name has been drawn from national registry of adult Polish people for participation in a narionwide research study about health related knowlege and attitudes of Poles.**

The research relates to health of Polish people and is conducted as part of "The National Programme for Cancer Control" led by Ministry of Health.

⇒ **The aim of this study is to determine the level of knowledge and attitudes of Poles relating to elements of healthy lifestyle that are included in the European Code against Cancer.**

⇒ **My task is to concuct an interview with you and measure your weight and height.**

⇒ **Information obtained from you will be used exclusively for medical research purposes in accordance with the Act on the Personal Data Protection.**
Therefore, I am requesting you for your written consent for your participation in this research.

⇒ **I would like to request you to dedicate some time for answering the questions as they are a source of important information. We will be very thenkful if you agree to take part in this research.**

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Jolanta Lissowska PhD
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fax:022-643-9234
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PBS DGA Ltd.
Junaków 2
81-812 Sopot

Declaration

I agree to:
⇒ participate in the survey,
⇒ allow for measurement s of my weight and height,
⇒ use of my data for scientific purposes.

I declare that I was informed in detail of the purpose of this research.
All questions related to these activities have been explained to me.

City.................................... Respondent's readable signature..

Respondent's home or mobile phone.....................................

Date.................................. Interviewer's readable signature................. ....

Appendix 5 Scored items in breast and cervical cancer knowledge scales

Breast cancer knowledge scale

Questions included in the new scale	Possible responses	Weighted score
Have you ever heard about the need for regular breast self-examination (at home)?	• Yes • No • I don't know, it is difficult to say	2 0 0
Have you ever heard that regular mammography allows early detection of breast cancer	• Yes • No • I don't know, it is difficult to say	2 0 0

Question: Do you think that changing certain habits and behaviours cancer can be prevented? Please indicate, which of the below described behaviours can influence the development of the below specified cancers

	The weighted scoring applied to each of the responses					
Breast cancer	**A**	**B**	**C**	**D**	**E**	**F**
1. Regular mammography below the age of 50	0	0	0	2	1	0
2. Regular mammography above the age of 50	2	1	0	0	0	0
3. Use of hormonal contraception	0	0	0	1	2	0
4. Use of hormonal replacement therapy	0	0	0	1	2	0
5. Increase of intake of fruits and vegetables	0	2	1	0	0	0
6. Decrease of fat intake	2	1	0	0	0	0
7. Limitation or avoidance of alcohol	2	1	0	0	0	0
8. Smoking cessation	0	1	2	0	0	0
9. Increase of physical activity	2	1	0	0	0	0
10. Regular breast self-examination	2	1	0	0	0	0
11. Frequent X-rays (various body parts)	0	0	0	0	2	0

Key:

To a large extent it can protect against cancer	A
It can have protective influence against cancer	B
It can have a somewhat protective influence against cancer	C
It does not influence cancer development	D
Contrarily, it can lead to cancer development	E
I don’t know, it is difficult to say	F

Cervical cancer related knowledge scale

Scoring applied to question on the knowledge of the usefulness of cervical screening

Questions included in the new scale	**Possible responses**	**Weighted score**
Have you ever heard that regular cytology allows early detection of cervical cancer?	• Yes • No • I don’t know, it is difficult to say	2 0 0

Question: Do you think that by changing certain habits and behaviours cancer can be prevented? Please indicate, which of the below described behaviours that can influence the development of the below specified cancers

	The weighted scoring applied to each of the responses					
Cervical cancer	**A**	**B**	**C**	**D**	**E**	**F**
1. Regular cytology	2	1	0	0	0	0
2. Use of hormonal contraception	0	0	0	1	2	0
3. Young age at sexual initiation	0	0	0	0	2	0
4. High number of sexual partners	0	0	0	0	2	0
5. Smoking cessation	2	1	0	0	0	0

Key:

To a large extent it can protect against cancer	A
It can have protective influence against cancer	B
It can have a somewhat protective influence against cancer	C
It does not influence cancer development	D
Contrarily, it can lead to cancer development	E
I don’t know, it is difficult to say	F