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## Original article

# Health-Related Factors Associated With the Participation in Cervical Cancer Screening

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## ABSTRACT

**Background:** The aim of this study was to describe the coverage for cervical cancer screening among the visitors of a food exhibition in Brussels, Belgium and to describe the factors that affect their participation in the screening programs.

**Methods:** The participants aged between 25 and 64 years were recruited during a food exhibition at the Brussels Exhibition Centre from 6 until 21 October 2012. Their participation to the cervical cancer screening was recorded as well as their medical history and health related parameters.

**Results:** After adjustment for age and region, 66% of the 408 participants have had a cervical cancer screening during the past three years. In univariate analysis, no participation in the cervical cancer screening was related to hypertension, high body mass index (BMI), low self-reported health and no adherence to breast cancer screening. Age, systolic blood pressure, abdominal circumference and BMI of the participants who did not adhere to cervical cancer screening were significantly higher as compared to the participants who did adhere. A multivariate analysis confirmed the relationship between not adhering to the screening and older age (OR=0.56; 95% CI: 0.44, 0.73) and having a high body mass index (OR=0.63; 95% CI: 0.47, 0.85). Participation to the screening was related to having a tetanus vaccination (OR=1.67; 95% CI: 1.05, 2.63) and adhering to breast cancer screening (OR=3.9; 95% CI: 2.09, 6.84).

**Conclusions:** Our study revealed an association between not having had a cervical smear in the last three years and not having had a mammography, older age, not having had a tetanus immunisation recently and having a higher BMI.

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## Introduction

Cervical cancer is an important health problem. Within Europe, the incidence and mortality rates for cervical cancer are lower in Western Europe and higher in Central and Eastern Europe<sup>1</sup>. In Belgium the age-standardised incidence rate was estimated 12/100,000 in 2004. The mortality rate was estimated 5/100,000. Belgium ranks with these incidence and mortality rates in the middle group of the European countries<sup>1</sup>. Cervical cancer is in Europe the fifth most common cancer among women with respect to mortality.

The primary aim of cervical cancer screening is to decrease the incidence of invasive cervical cancer by the early detection and treatment of precursors of the cancer<sup>2,3</sup>. The secondary aim is to reduce the mortality by the timely detection of the invasive cancers.

The early detection of cervical cancer through a pap smear is effective to reduce cervical cancer mortality<sup>4-6</sup>. The target group for screening in the European Union are women between 25 and 64 yr and the frequency proposed is between 3 and 5 years<sup>7</sup>.

In Belgium, only two out of ten provinces (Antwerp and Flemish-Brabant) had an organised screening program. Since June 2013, all women in the Flemish region have benefited from an organised screening with a central registry. The Walloon and Brussels region failed to set up a screening registry in their region and to make physicians adhere to clinical guidelines to limit screening to women aged between 25 and 64 yr and with an interval between 3 to 5 years<sup>1</sup>. The vaccination against the Human Papilloma Virus on the other hand is organised over the entire Belgian territory.

In Belgium, approximately 2,700,000 women are aged between 25 and 64 yr. On the assumption that they receive a cervical cancer screening every three years, 900,000 pap-smears per year would cover the whole population. Even though official figures confirm that yearly, 1.2 million pap-smears are made whereas 900,000 smears would be sufficient<sup>8</sup>.

The Belgian Health Interview Survey (HIS), conducted in 2008 by the Institute of Public Health (IPH) reported a coverage of 71% for cervical screening in the relevant age-group<sup>9</sup>.

These findings highlight a two-fold problem: 29% of the target group is not screened and those who are screened receive their pap smear too frequently. The overconsumption of pap smears should be tackled by stimulating the physicians to adhere to clinical guidelines.

The 29% of the Belgian population not participating in the screening for cervical cancer is probably hard to reach. They do not respond to personal letters or invitations from the authorities or their family physician.

This research aimed to describe the coverage for cervical cancer screening among the visitors of an exhibition in Brussels and to describe the factors that affect their participation in the screening program.

## Methods

### Participants

The participants were recruited during a food exhibition at the Brussels Exhibition Centre from 6 until 21 October 2012. A random selection of visitors was recruited during entry to the exhibition. Every tenth visitor was invited to participate in the study. In total 14,700 of the 147,000 visitors were invited. Eligible participants were adult Belgian visitors as far that they were not pregnant, did not take vitamin K antagonists, did not show signs of addiction to alcohol, medication or drugs, or did not suffer from a hypersensitivity to blood and / or finger pricks. In total, 974 visitors accepted to participate. The participation rate was 6.6%. Only the 408 women aged between 25 and 64 yr were retained.

### Questionnaire

We used a self-designed, tailor-made, non-standardised questionnaire. Participants were asked whether they knew their length, weight, abdominal circumference, blood pressure, cholesterol level and blood sugar level. These parameters were measured if the participants did not know them. Furthermore, participants were asked about their medical history (coronary heart disease, hypercholesterolemia, diabetes, hypertension, and other diseases) and their family history (breast cancer, coronary heart disease, diabetes, colon cancer). They were also asked about their latest tetanus vaccination, cervix cancer screening and mammography.

Participants used a visual analogue scale (VAS) to score their perceived health status. The scale ranged between 0 and 100 with 0 corresponding with the worst health participants can imagine and 100 with the best health participants can imagine. Such a VAS scale is used in the EQ-5D questionnaire<sup>10</sup>. The VAS scale was completed after the participants recorded their age, gender and zip code, but before other health-related questions were asked.

### Measurements

Weight was measured with a digital personal scale Seca Sensa 804. The measurement of the height was done with a Seca 206 wall-mounted measuring tape. The abdominal circumference was measured with a Seca 201 ergonomic circumference measuring tape. Blood pressure was measured with a calibrated DS-54 WelchAllyn sphygmomanometer blood pressure device. Blood sugar was measured with a OneTouch device using capillary blood. Total cholesterol was measured with an Accutrend Plus monitor using capillary blood. Capillary blood was obtained with a prick in the

index finger. The food and beverage intake during the two hours before the measurement were carefully noted.

### Approval of the ethical committee

The study protocol was approved by the Ethical Committee of the University Hospital Brussels. Visitors of the exhibition were allowed to participate after they read the patient-information leaflet and signed the informed consent document. After the questionnaire was completed, the patients received a health advice adapted to their answers to the questionnaire.

### Statistical processing

The data were introduced through an online custom-made user interface based on a PHP and recorded in a MySQL database centrally managed at the Faculty of Medicine and Pharmacy of the Vrije Universiteit Brussel. The data were stored anonymously. It was not possible to identify patients from the recorded personal information (gender, year of birth and zip code). Body mass index (BMI) was generated by the system. Cardiovascular risk was estimated from the SCORE risk tables<sup>11</sup>. Two groups were created: one with a low self-reported health (SRH) and another group with a high SRH. As a cut-off, the median (71,4) for the SRH was used permitting to compare two groups of a similar size.

Incomplete data sets (n=43) were eliminated from the database. Analyses were done with SPSS 20. For the detection of statistically significant differences between discrete variables, the cross-tables and the Chi-Square test were used. For continuous variables, the *t*-test was used.

Coverage figures were adjusted for age and region according to the demographics of the Flemish, Walloon and Brussels region in 2012.

A logistic regression was done to determine variables linked with the adherence to cervix cancer screening. The following variables were entered: gender, age-groups, language, region, hypertension, hypercholesterolemia, diabetes, coronary heart disease, no disease, family history of coronary heart disease, family history of colon cancer, family history of diabetes, family history of breast cancer, no family history, tetanus vaccination history, weight, length, abdominal circumference, does know blood pressure, does know blood sugar level, does know cholesterol level, no treatment nor diet for cholesterol, diet for cholesterol, statin for cholesterol, plant stanol for cholesterol, adherence to breast cancer screening, self-reported health, smoker, alcohol abuse, physical activity, BMI (4 groups), cardiovascular risk groups (SCORE low, intermediate and high).

## Results

### Adherence to cervical cancer screening

Overall, 408 female visitors, aged between 25 and 64 yr participated (Table 1). Most of the participants (76%) lived in the Flemish region, 19% in the Brussels Region and 5% in the Walloon Region. No significant differences in adherence rates for cervical cancer were detected between regions. After adjustment for age and region, 66% of the participants had a cervical cancer screening during the past three years.

### Association with risk factors

In a univariate analysis, no participation in the cervical cancer screening was significantly related to hypertension,

high BMI, low self-reported health and no adherence to breast cancer screening (Table 1).

**Table 1:** Characteristics of the study population and mean adherence rates to cervical cancer screening per group

Variables	Number	Participants %	P value
Region			0.309
Brussels	77	68.8	
Flemish	310	71.1	
Walloon	21	55.0	
Language			0.234
Dutch	356	68.8	
French	52	76.9	
Having hypertension			0.002
No	326	73.3	
Yes	82	56.1	
Having hypercholesterolemia			0.606
No	288	69.1	
Yes	120	71.7	
Having diabetes			0.073
No	387	70.8	
Yes	21	52.4	
Coronary heart disease			0.292
No	394	70.3	
Yes	14	57.1	
Some disease			0.687
No	235	70.6	
Yes	173	68.8	
Family history of coronary heart disease			0.731
No	326	70.2	
Yes	82	68.3	
Family history of colon cancer			0.838
No	357	70.0	
Yes	61	68.6	
Family history of diabetes			0.641
No	295	70.5	
Yes	113	68.1	
Family history of breast cancer			0.835
No	346	69.7	
Yes	62	71.0	
Family history of some disease			0.349
No	188	67.6	
Yes	220	71.8	
Tetanus vaccination up-to-date			0.067
No or unknown	181	65.2	
Yes	227	73.6	
Adherence to breast cancer screening			0.033
No	154	63.6	
Yes	254	73.6	
Patient does know his/her weight			0.345
No	9	55.6	
Yes	399	70.2	

Variables	Number	Participants %	P value
Patient does know his/her length			0.506
No	28	64.3	
Yes	380	70.3	
Patient does know his/her abdominal circumference			0.519
No	369	69.4	
Yes	39	74.4	
Patient does know his/her blood pressure			0.929
No	54	70.4	
Yes	354	69.8	
Patient does know his/her blood sugar level			0.802
No	143	70.6	
Yes	265	69.4	
Patient does know his/her cholesterol level			0.243
No	150	73.3	
Yes	258	67.8	
Diet or treatment for cholesterol			0.471
No	279	71.0	
Yes	129	67.4	
Diet for cholesterol			0.154
No	51	78.4	
Yes	357	68.6	
Statin treatment for cholesterol			0.087
No	55	60.0	
Yes	353	71.4	
Plant stanol treatment for cholesterol			0.375
No	60	65.0	
Yes	348	70.7	
Self-reported health			0.027
Low	225	65.3	
High	183	75.4	
Smoker			0.103
No	361	71.2	
Yes	47	59.6	
Alcohol abuse			1.000
No	400	69.8	
Yes	8	75.0	
Physical activity			0.373
Low	286	68.5	
High	122	73.0	
Body Mass Index class			0.006
Underweight (BMI <18.5)	12	83.3	
Normal weight (18.5 ≤ BMI <25)	193	76.2	
Overweight (25 ≤ BMI <30)	142	66.9	
Obesity (BMI >30)	61	54.1	
SCORE cardiovascular risk			0.151
Low	357	71.4	
Intermediate	17	52.9	
High	34	61.8	

Age, systolic blood pressure, abdominal circumference and BMI of the participants who did not adhere to cervical cancer screening were significantly higher as compared to the participants who did adhere (Table 2).

**Table 2:** Mean values of parameters according to the adherence to cervical cancer screening

Variables	Screening		No screening		P value
	Numbers	Mean (SD)	Numbers	Mean (SD)	
Age (yr)	285	49.0 (11.7)	123	52.9 (10.6)	0.002
Last measured systolic blood pressure (mmHg)	198	122.3 (13.5)	81	124.5 (16.7)	0.285
Last measured diastolic blood pressure (mmHg)	198	77.6 (8.6)	81	77.4 (8.8)	0.850
Last measured weight (kg)	279	68.0 (13.3)	118	70.4 (12.3)	0.090
Last measured length (cm)	267	164.2 (6.7)	111	162.5 (5.7)	0.015
Last measured abdominal circumference (cm)	19	89.2 (13.4)	7	91.3 (10.8)	0.690
Last measured blood sugar (mg/dl)	149	85.8 (11.1)	60	90.1 (21.8)	0.060
Last measured cholesterol (mg/dl)	146	188.5 (33.9)	62	188.2 (40.2)	0.953
Mean number of cigarettes per day	285	1.3 (4.7)	123	2.0 (5.4)	0.181
Mean number of alcoholic beverages per day	285	2.7 (4.1)	123	2.9 (4.4)	0.631
Actual systolic blood pressure (mmHg)	285	120.7 (13.4)	123	124.0 (17.5)	0.044
Actual diastolic blood pressure (mmHg)	285	76.8 (8.9)	123	77.7 (8.6)	0.309
Actual blood sugar (mg/dl)	285	103.5 (48.4)	123	107.0 (34.7)	0.403
Actual body weight (cm)	285	67.0 (13.3)	123	70.4 (12.4)	0.078
Actual length (cm)	285	164.0 (6.8)	123	162.3 (5.8)	0.016
Actual total cholesterol (mg/dl)	285	178.7 (31.4)	123	180.2 (37.1)	0.710
Actual abdominal circumference (cm)	285	86.1 (12.3)	123	90.2 (12.5)	0.002
Actual body mass index (kg/m <sup>2</sup> )	285	24.8 (4.7)	123	26.3 (4.8)	0.005

### Logistic regression

All parameters were dichotomized where possible and included in a logistic regression (Table 3). Age was divided into 10-yr age groups, BMI into 4 groups and cardiovascular risk into 3 groups. This multivariate analysis confirms the relationship between not adhering to the screening and older age and having a high body mass index. Participation to the screening was related to having a tetanus vaccination and adhering to breast cancer screening.

**Table 3:** Logistic regression on the adherence to cervical cancer screening<sup>a</sup>

Variables	B	P value	OR (95% CI)
Age-groups (per 10 yr)	-0.572	0.001	0.564 (0.440, 0.725)
Tetanus up-to-date	0.510	0.029	1.665 (1.053, 2.633)
Breast cancer screening up-to-date	1.331	0.001	3.784 (2.093, 6.839)
Body mass index (4 groups)	-0.459	0.002	0.632 (0.470, 0.851)

<sup>a</sup> Variable (s) entered on step 1: gender, age-groups, language, region, hypertension, hypercholesterolemia, diabetes, coronary heart disease, no disease, family history of coronary heart disease, family history of colon cancer, family history of diabetes, family history of breast cancer, no family history, tetanus vaccination up-to-date, weight, length, abdominal circumference, does know blood pressure, does know blood sugar level, does know cholesterol level, no treatment nor diet for cholesterol, diet for cholesterol, statin for cholesterol, plant stanol for cholesterol, breast cancer screening, self-reported health, smoker, alcohol abuse, physical activity, body mass index (4 groups: underweight >normal weigh >overweigh >obesity), cardiovascular risk groups (SCORE low, intermediate and high)

## Discussion

### Coverage

We selected visitors of a food exhibition for estimating cervical cancer screening coverage and not subjects who pre-

sented in primary care centers or hospitals. The authors choose this population because they aimed to include patients who were not focussed on their health and who were maybe not attending prevention programs.

There was an overrepresentation of participants from the Flemish region in our study. As we never aimed to include a representative sample of the Belgian population, we cannot generalise the results to the Belgian population or to other populations. However, this will not hamper the interpretation of our results because the general results on adherence we adjusted according to the demographics of the different regions.

The studied sample was also biased by the fact that all participants were visitors of an exhibition and for that reason, disabled or seriously ill people were less likely to participate in the study.

Our age and region adjusted coverage for cervix cancer screening was 66%. According to the Belgian HIS, 71% of the women from the target population were screened<sup>9</sup>. The figures from our study, as well as from the HIS, are self-reported figures and for that reason well comparable.

### Factors associated with cervix cancer screening

Our multivariate analysis confirms the relationship between not adhering to the screening and older age. This association is found in many other studies and is probably related to the lower socio-economic status of elderly<sup>12-15</sup>.

The association between low adherence to cervical cancer screening and high BMI was also found. This association was also detected in some studies, however other studies proved the contrary<sup>16,17</sup>.

Participation to cervical cancer screening was also related to tetanus vaccination. This association was not yet discussed in any study up until today. There might be a correlation between several preventive actions among a specific group of people highly interested in preventive measures. At least two meta-analysis indicated that physician reminders were an effective intervention to improve compliance for both cervical cancer screening and tetanus immunizations<sup>18,19</sup>.

In our study, there was a strong association between having a cervical smear within the last three years and the adherence to breast cancer screening within the last two years. As well in the United States as in Canada, having had a pap-smear within the last 3 years was the strongest and the most consistent predictor of adherence to breast cancer screening<sup>20,21</sup>. This is one of the most important findings of our study. There is a higher chance that patients not attending for a pap smear did also not attend for a mammography and vice versa. Although the age groups and timings for pap-smears and mammographies are different, physicians should check the medical records for both screening examinations in the overlapping age group.

The empowerment of women is another important instrument to increase the adherence to screening programs. Health education based on the Health Beliefs Model proved to enhance women's knowledge of cervical cancer, change their health beliefs and improve their behaviors regarding screening programs like pap-smears<sup>22</sup>.

#### Weaknesses of the study

In this study, we emphasised on chronic conditions, self-reported health and lifestyle of the participants. The registration of socio-demographic parameters such as marital status, educational level, monthly income and nationality might have contributed to a better understanding of our findings. We choose not to record these parameters because many publications already report them<sup>23,24</sup>. However, these parameters could have influenced our logistic regression; for example, there might be an association between BMI and social class.

#### Conclusions

Our study among women belonging to the target population for cervical cancer screening could detect an association between not having had a cervical smear in the last three years and not having had a mammography, older age, not having had a tetanus immunisation recently and having a higher BMI.

Most of these associations are probably related to the socio-economic status. However, the joint lack on adherence to cervical cancer screening and breast cancer screening is an important finding. Possibilities to offer both preventive acts on a same occasion should be studied, taking into account that both screening methods have nowadays a different time schedule.

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#### Conflict of interest statement

The authors received logistical support from Unilever Belgium for this study. They provided this by paying two student workers for the reception on the booth, the tests-strips for cholesterol and blood sugar and for the samples of margarine that were dispersed to the test persons free of charge.

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