



## Correlates of Mammography Utilization in Alberta Using the 2013/2014 Canadian Community Health Survey (CCHS) Data

Rabeb Khelifi<sup>1\*</sup>, Janusz Kaczorowski<sup>2</sup>, Magali Girard<sup>3</sup> and Djamal Berbiche<sup>4</sup>

<sup>1</sup>Department of Health Care Systems and Services, University of Montreal Hospital Research Centre, Canada.

<sup>2</sup>Department of Family and Emergency Medicine, University of Montreal Hospital Research Centre, Canada.

<sup>3</sup>Research Coordinator, University of Montreal Hospital Research Centre, Canada.

<sup>4</sup>Department of Medicine and health sciences, Charles-Le Moyne Hospital Research Center, Canada.

### Abstract

**Background:** The mortality rate from breast cancer among women in Canada decreased in the early 2000s following the introduction of breast cancer screening programs in the 1990s. Using data from the Canadian Community Health Survey (CCHS, 2013/2014), we examined factors associated to the non-us of mammography such as age, marital status, income, education, immigration status, body mass index, and tobacco use and their association with mammography use among women in Alberta, aged between 50 and 69 years.

**Methods:** A cross-sectional study to examine the factors associated with the use of mammography screening for breast cancer in Alberta, Canada.

**Results:** The 2013/2014 CCHS data shows that the non-use of mammography in the past two years was 33.1% for women aged 50 to 69 in Alberta. The reasons for the non-use of mammography were examined in univariable and multi-variable analysis using logistic regression models. The following factors were associated with the non-use of mammography: immigrant status, no access to a regular doctor, low household income, smoking, high body mass index (BMI), low level of leisure-time, inactivity, high level of stress, low self-perception of general health, and a low sense of community belonging. Women aged 55 to 64 who were divorced, separated, single or never married were more than twice likely of not having used a mammography than those who were married or living in common-law union. Furthermore, women who did not have a regular doctor were three times more likely of not having a mammography than those who had a regular doctor.

**Conclusion:** A Mammography is recommended for women aged 50 to 69, given its effectiveness in reducing breast cancer mortality. However, in 2013/2014, one-third of women in Alberta are reported not having had a Mammography in the past two years. Although biennial Mammography is an effective screening exam to detect breast cancer, some women in Alberta continue to be less likely to use mammography.

**Keywords:** Breast cancer; Mammography; Canadian Community Health Survey (CCHS)

### Introduction

In Canada, breast cancer is the leading cancer diagnosed in women and the second most common cause of cancer death among women. According to Canadian statistics, an estimated 26,300 new cases of breast cancer were detected in 2017, accounting for 26% of all new cases of cancer in women. In 2017, among Canadian women, the number of deaths caused by breast cancer was 5,000, accounting for 13% of all cancer deaths [1]. It was estimated in 2010 that 1 in 8 women will have breast cancer before age 90, and that 1 in 31 will die from it [1].

In Canada, breast cancer affects 51% of women aged 50 to 69, 32% of women aged 70 and older, and 17% of women under 50 years of age [1]. Furthermore, breast cancer deaths are more frequent in females less than 70 years old. Breast cancer mortality is proportiona-

tely higher among women aged 30 to 59 years (21% of all female cancer deaths) whereas it is lowest among women aged 60 years and older (12% of all female cancer deaths) [1]. The relative survival rate after 5 years of having breast cancer is 87%. This means that women who have a positive diagnosis of breast cancer have an 87% chance of surviving 5 years or more compared to women in the general population who do not have cancer, but who share similar characteristics [1, 2].

After Ontario, Quebec, and British Columbia, Alberta had the fourth highest breast cancer incidence and mortality rate in 2017. Alberta had a 9.9% incidence rate with 2,600 new cases and a 8.2% mortality rate, with 410 deaths from breast cancer [1]. However, when compared to the rest of Canada, Alberta had the lowest age-standardized mortality rate for the breast cancer: 157.4 deaths per 100,000 women with breast cancer [1]. In Canada, the age-standardized mortality rate for breast cancer has decreased by 44%, from 41.7 deaths per 100,000 in 1987 to 23.2 deaths per 100,000 in 2017. The rate of decrease was first shown in the mid-1980s and accelerated up to 2.6% annually between 2003 and 2012 [1]. These statistics are largely explained by the improvements in early detection of breast

\*Address for Correspondence: Dr. Rabeb Khelifi, Research Centre (CRCHUM) Head, Department of Health Care Systems and Services, University of Montreal Hospital Research Centre, Canada, Tel: 1 (514) 358-2186, E-Mail: rabeb.khelifi@umontreal.ca

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cancer, the increase in screening mammography rate [3] and the effectiveness of subsequent breast cancer treatments [4, 5].

Breast cancer screening is offered throughout Canada, delivered and funded by the provinces and territories. The provinces started providing the program at different times: starting with British Columbia (1988), Alberta (1990), Saskatchewan and Ontario (1990), Nova Scotia (1991), New Brunswick (1995), New found land and Labrador (1996), and followed by Quebec and Prince Edward Island (1998). These programs are generally offered in the form of a personal invitation for a free mammogram screening every two years for women aged 50 to 69 who have an average risk of having breast cancer. The screening criteria include: (1) those women who do not have a first-degree relative with breast cancer;(2) women without a risk of a genetic mutation of BRCA1 and BRCA2; and (3) women with no exposure of the chest wall to radiation [6-11].

There was a 32% increase in the use of mammography in Canada between 1990 and 2008 (40.5% to 72.5%) and a 30.6% increase in Alberta (from 43.4% in 1990 to 74% in 2008) [3]. However, in 2008 the biennial non-use of mammography in Canada (27.5%) was highest among immigrant women and/or women with low household income and low levels of education [3].

Referring to these results of 2008 CCHS and using the same methods [3], the objective of the current study is to provide an update on the use of mammography by women aged 50 to 69 in Alberta. Using the 2013/2014 Canadian Community Health Survey (CCHS, 2013/2014), several characteristics and factors potentially associated with the non-use of mammography were examined. The estimates were based on the use of mammography without making a distinction between screening and diagnosis as the CCHS data does not provide such details.

## Methods

### Data Source

Data from the 2013/2014 CCHS were used to estimate the non-use of mammography and to examine its correlates. This cross-sectional survey targets the representative sample of population of non-institutionalized households aged 12 and older in all provinces and territories except for regular Canadian Forces members and bases (military and civilian), Indian Reserve members, and some remote areas. In 2013/2014, the overall response rate was 65.6% (63,964 completed surveys), and in Alberta 64.4% (6,061 completed surveys). The Alberta sample of the 2013/2014 CCHS included 1,142 women aged between 50 to 69, and it was weighted to represent 466 648 women in that age range [Table 1].

The current study was approved by Statistics Canada to use the micro data and findings of the last CCHS (June 2015).

### Measures

In all our analysis, variables were measured and recoded following the guide and the questionnaire of CCHS 2013/2014 [Table A].

### Mammography

According to guidelines by the Canadian provincial and regional programs, the recommended period for a Mammogram is two years. As a result, throughout this article, "non-user of Mammography" refers to a woman who indicated that she had not received a Mammogram in the past two years.

"Mammography" is one of the optional modules of the CCHS 2013/2014. This means that the questions are not asked in every wave of CCHS across Canada, but only in certain provinces and territories. In 2013/2014 the questions in the "Mammography" module were only asked in the following four provinces/territories: Alberta, the Northwest Territories, Nova Scotia, and New Brunswick. The questions in this module asked female respondents, aged 35 or older: "Have you ever had a mammogram, that is, a breast x-ray?" (Yes/No); "Why did you have it?" (Open-ended; multiple responses accepted); and "When was the last time?" (less than 6 months ago/ 6 months to less than 1 year ago / 1 year to less than 2 years ago / 2 years to less than 5 years ago/ 5 or more years ago). Due to lack of specificity in the question concerning the reasons for having done a mammogram in the past two years, it is not possible to distinguish between a screening or a diagnostic mammogram. Therefore, our analysis is based on the use/non-use of mammography for screening or diagnosis in the past two years, including women with current or past breast cancer problems.

### Household Income

The Household income was adjusted by household size using the equivalence score method to generate quintile (Household income groups) [3]. For each respondent in the 2013/2014 CCHS, this score was based on the calculation of a household weight factor based on household size. The weight of the first household member was 1, the second member weight was 0.4, and for the third member and over, the weight was 0.3. As a result, the household weight factor is the sum of the weights of these members. The household size adjusted incomes were grouped into quintiles.

### Leisure-Time and Physical Activity

This variable was calculated by determining the level of leisure-time physical activity in the three months prior to the interview. There are three levels of physical activity during free time that have been defined according to activity-specific kilocalories per kilogram per day (KKD): active (3 or more KKD), moderate (1.5 to 2.9 KKD), and inactive (less than 1.5 KKD).

### Level of Day-to-Day Stress

The question was asked in the CCHS as follows: Thinking about the amount of stress in your life, would you say that most days are, "Not at all stressful? Not very stressful? A bit stressful? Quite a bit stressful? Extremely stressful?" This variable was dichotomized as follows: low (those who selected the first two responses) and medium/high (those who chose the last three responses).

### Sense of Community Belonging

The responses provided along with the question concerning community belonging were as follows: "How would you describe your sense of belonging to your local community? Would you say it is: Very strong? Somewhat strong? Somewhat weak? Very weak? The original coding was preserved in our analysis: very weak, somewhat weak, very strong, and somewhat strong.

To examine association between age group and the non-use of mammography [3], women aged 50 to 69 years were divided into four 5-year age categories.

### Statistical analysis

In order for our results to be representative of the female popula-

**Table 1:** Characteristics of the study sample, female household population aged 50 to 69, Alberta, 2013/2014

Variable	Sample size (n)	Estimated number (n)	Estimated percentage <sup>≠</sup> (weighted) (%)		Sample size (n)	Estimated number (n)	Estimated Percentage <sup>≠</sup> (weighted) (%)
<b>Total</b>	<b>1142</b>	<b>466648</b>	<b>100.0</b>	<b>Sense of community belonging</b>	<b>1122</b>	<b>457316</b>	<b>100.00</b>
				Very/Somewhat strong	794	306926	67.1
<b>Age group (years)</b>	<b>1142</b>	<b>466648</b>	<b>100.0</b>	Very/Somewhat weak	328	150390	32.9
50 to 54	236	150300	32.2	Missing	20	....	....
55 to 59	322	135038	28.9	<b>Smoker</b>	<b>1141</b>	<b>466168</b>	<b>100.0</b>
60 to 64	297	104682	22.4	Yes	238	96631	20.7
65 to 69	287	76628	16.4	No	903	369537	79.3
<b>Marital status</b>	<b>1141</b>	<b>466571</b>	<b>100.0</b>	Missing	1	....	....
Married/Common-law	718	333577	71.5	<b>Leisure-time physical activity</b>	<b>1136</b>	<b>464007</b>	<b>100.0</b>
Widowed	121	29006	6.2	Active/Moderately active (1.5 or more KKD)	612	242626	52.3
Divorced/Separated	203	70807	15.2	Inactive Less than 1.5 KKD)	524	221381	47.7
Single/Never married	99	33181	7.1	Missing	6	....	....
Missing	1	....	....	<b>BMI category</b>	<b>1074</b>	<b>447486</b>	<b>100.0</b>
<b>Resides in Census Metropolitan Area</b>	<b>1142</b>	<b>466648</b>	<b>100.0</b>	Underweight/ Normal weight (less than 25.0)	431	193309	43.2
Yes	425	305083	65.4	Overweight (25.0 to 29.99)	367	148064	33.1
No	717	161865	34.6	Obese class I (30.0 to 34.99)	174	68347	15.3
<b>Place of birth</b>	<b>1133</b>	<b>462036</b>	<b>100.0</b>	Obese class II (35.0 to 39.99)	62	25759	5.8
Canada and other North American countries	1003	380547	82.4	Obese class III (40.0 or more)	40	12007	2.7
Europe	76	44354	9.6	Missing	68	....	....
Other	54	37135	8.0				
Missing	9	....	....				
Immigrant	<b>1133</b>	<b>462036</b>	<b>100.0</b>				
Yes	139	85394	18.5				
No	994	376642	81.5				
Missing	9	....	....				
<b>Household income quintile</b>	<b>1142</b>	<b>466648</b>	<b>100.0</b>				
1 (lowest)	135	61822	13.2				
2	196	62883	13.5				
3	187	86267	18.5				
4	248	96946	20.8				
5 (highest)	376	158730	34.0				
<b>Education</b>	<b>1112</b>	<b>436528</b>	<b>100.0</b>				
less than secondary graduation	80	26927	6.2				
Secondary graduation	220	70521	16.2				
Postsecondary graduation	812	339080	77.7				
Missing	30	....	....				
<b>Has a regular doctor/ Care received in last year</b>	<b>1105</b>	<b>450119</b>	<b>100.0</b>				
Yes-Yes	680	273248	60.7				
Yes-No	351	148999	33.1				
No -Yes and No - No	74	17872	6.1				
Missing	37	....	....				
<b>Self-perceived general health</b>	<b>1141</b>	<b>466584</b>	<b>100.0</b>				
Excellent /Very good	652	255543	54.8				
Good	324	136767	29.3				
Fair/Poor	165	74274	15.9				
Missing	1	....	....				
<b>Level of day-to-day stress&amp; low</b>	<b>1133</b>	<b>464419</b>	<b>100.0</b>				
Medium/High	404	146473	31.5				
Missing	729	317946	68.5				
	9	....	....				

<sup>≠</sup> Missing values are excluded from denominators

--- not applicable

Source: 2013/2014 condition community Health Survey.

tion, aged 50 to 69, the data was weighted using CCHS specifications. Based on the update of the relevant literature [3] and available CCHS data, the selected variables were examined in the cross tabulations and in the univariate and multiple logistic regression models.

Following the analytical approach of recent literature [3], we included some psychosocial factors, such as social support and stress that have been shown to be associated with the non-use of mammography [3]. As a result, stress, community belonging, and all variables selected were included in the univariable and multivariable analysis because of their statistically significant association with the non-use of mammography. In the multivariable analysis, the associations between the independent variables were examined using the multicollinearity test to eliminate strongly correlated predictors.

Using the same analytical approaches as used in recent literature [3], we used the bootstrap technique to estimate standard errors, coefficients of variation, and 95% confidence intervals. This was to account for the design effects of the CCHS survey to provide representative results of the female population aged 50 to 69 in Alberta. The statistical significance in all analysis was determined at the level of  $p < 0.05$  (two-tailed).

## Results

### Characteristics of the Study Population

Most of women (71.5%) were married. More than half (65.4%) lived in a Census Metropolitan Area. The majority (82.4%) were born in North America, mostly in Canada. Less than 1 in 5 (18.5%) were immigrants who were born in Europe and other countries. Around three-quarters (77.7%) had postsecondary education, and two-thirds (60.7%) reported that they had a regular medical doctor from whom they had received care in the last year. Slightly over half (54.8%) self-reported that they had excellent or very good health. Two-thirds of women (68.5%) reported that they had a medium or high level of day-to-day stress and a similar proportion (67.1%) had a very or somewhat strong sense of community belonging. The majority of women (79.3%) were nonsmokers and slightly less than half (43.2%) reported that they were underweight or of normal weight.

### Non-Use of Mammography – univariable analysis

One-third of women aged 50 to 69 (33.1%) in Alberta reported that they had not used the mammography in the past two years [Table 2]. Women who were widowed, divorced, separated, single, or never married were more likely to be non-users of mammography than were those married or living in common-law unions. The proportion of non-users of mammography was similar for women living in Census Metropolitan areas (32.2%) as those living outside (35%).

Immigrant women were more likely to be non-users. The non-use of mammography was inversely associated with the level of household income, with the highest rate among women with the lowest household income (46.9%). Having less than a secondary education was associated with non-use (54.2%). Irrespective of whether or not they had received a care in last year, the women who did not have a regular doctor were more likely to be non-users of mammography (59.2%). Women who perceived that their health was fair or poor were more likely to have not had a mammography in the past two years (40.2%). Respondents who reported that they had a medium or high level of stress and a somewhat weak or very weak sense of community belonging were also more likely to be non-users.

Women who were smokers (50%), inactive (34.1%), and those with high BMI scores (56.5%) were more likely to have not had a

mammography in the past two years. All factors that were associated with the non-use of mammography among the women aged 50 to 69 in Alberta are shown in Table 2.

### Non-Use of Mammography – multivariable analysis

All significant variables from univariable analysis were subsequently examined using a multivariable logistic model [Table 3]. In the multivariable analysis, all factors were statistically associated with the non-use of Mammography except for women who were born in Europe and North America. Women aged 55 to 64, divorced, separated, single or never married were more than twice as likely of not having used a Mammography as those who were married or in common law relationships. Women who did not have a regular doctor were three times more likely not having a Mammography than those who had a regular doctor (Odds ratio 3.03, 95% CI: 2.95-3.12).

Women who were living in a Census Metropolitan Area had a 28% lower chance of not using a Mammography than those living outside of a Census Metropolitan Area (Odds ratio 0.72, 95% CI: 0.712-0.735). Women who didn't have a regular doctor had a 21% lower probability of not having a Mammography (Odds ratio 0.79, 95% CI: 0.77-0.80) than those that did irrespective of whether they received care from their doctor in the past 12 months or not.

The women who reported that they had a medium or high level of stress had a 32% lower chance of noticing mammography than women who had a low level. In addition, women with a very or somewhat weak sense of community belonging had a 15% lower chance of not having a Mammography than the women who had a very or somewhat strong sense of community (Odds ratio 0.85, 95% CI: 0.83-0.86).

Women who were inactive had a 23% lower chance of not using a Mammography than active women. Within the BMI classification, women who were overweight had a 27% lower chance of not using a Mammography than the women who were under or normal weight (Odds ratio 0.73, 95% CI: 0.71-0.74).

### Reasons for not having a Mammography?

Woman who had not had a Mammography in the past two years answered the question, "What are the reasons you have not had one in the past 2 years?" The most common reasons for non-use of Mammography in Alberta were compared to the 2009-2010 data and are shown in [Figure 1]. The most common reason was that the respondent did not think it was necessary, and this was similarly reported by 32.1% in 2013/2014 and 30.6% in 2009-2010. The response, "Doctor did not think it was necessary," increased from 17.3% in 2009-2010 to 26.7% in 2013/2014. The "other" reasons that were not further defined in the CCHS, but saw an increase from 2.3% in 2009-2010 to 4.5% in 2013/2014.

There were fewer women who reported that they had not had a mammogram because they had not gotten around to it in 2013/2014 (29.5%) than in 2009-2010 (37.1%).

## Discussion

The 2013/2014 CCHS data showed that the non-use of Mammography was associated with several factors, including: marital status (separated, divorced, or never married), living outside of a Census Metropolitan Area, being immigrant, having the low household income, not having a regular doctor, being a smoker, and having a low self-perception of general health. The non-use of mammography was also associated with women who had a medium or high level of

**Table 2:** Non-use of mammography in past two years, relative to selected characteristics, female household population aged 50 to 69, Alberta, 2013/2014

Variable	95% confidence interval		95% confidence interval	
	Number (n/N)	Percentage (%)	from	to
<b>Total</b>	<b>153784 / 464238</b>	<b>33.1</b>	<b>32.99</b>	<b>33.26</b>
<b>Sense of community belonging</b>				
Very/Somewhat strong <sup>†</sup>	151588 / 457316	33.1**	33.01	33.28
Very/Somewhat weak	100721 / 306926	32.8	32.65	32.98
<b>Age group (years)</b>	<b>153784 / 464238</b>	<b>33.1</b>	<b>32.99</b>	<b>33.26</b>
<b>50 to 54</b>	40533 / 149725	27.1*	26.85	27.30
<b>55 to 59</b>	54381 / 134631	40.4*	40.13	40.66
<b>60 to 64</b>	39791 / 104600	38.0*	37.75	38.34
<b>65 to 69<sup>†</sup></b>	19079 / 75282	25.3	25.03	25.66
<b>Marital status</b>	<b>153707 / 464161</b>	<b>33.1**</b>	<b>32.98</b>	<b>33.25</b>
Married/Common-law <sup>†</sup>	94149 / 331514	28.4	28.25	28.55
Widowed	12510 / 29006	43.1*	42.56	43.70
Divorced/Separated	33859 / 70807	47.8*	47.45	48.19
Single/Never married	13189 / 32834	40.2*	39.64	40.70
<b>Resides in Census Metropolitan Area</b>	<b>153784 / 464238</b>	<b>33.1</b>	<b>32.99</b>	<b>33.26</b>
Yes	97916 / 304508	32.2*	31.99	32.32
No <sup>†</sup>	55868 / 159730	35.0	34.74	35.21
<b>Place of birth</b>	<b>152498 / 459626</b>	<b>33.2*</b>	<b>33.04</b>	<b>33.31</b>
Canada and other North American countries <sup>†</sup>	120783 / 378712	31.9	31.74	32.04
Europe	19218 / 44354	43.3*	42.87	43.79
Other	12497 / 36560	34.2*	33.70	34.67
<b>Immigrant</b>	<b>152498 / 459626</b>	<b>33.2**</b>	<b>33.04</b>	<b>33.31</b>
Yes	34146 / 84819	40.3**	39.93	40.59
No <sup>†</sup>	118352 / 374807	31.6	31.43	31.73
<b>Household income quintile</b>	<b>153784 / 464238</b>	<b>33.1</b>	<b>32.99</b>	<b>33.26</b>
1 (lowest)	28935 / 61740	46.9*	46.47	47.26
2	16320 / 61272	26.6*	26.29	26.99
3	25514 / 86267	29.6*	29.27	29.88
4	31700 / 96229	32.9*	32.65	33.24
5 (highest) <sup>†</sup>	51315 / 158730	32.3	32.10	32.56
<b>Education</b>	<b>1.46819 / 434383</b>	<b>33.8**</b>	<b>33.66</b>	<b>33.94</b>
Less than secondary graduation	13864 / 25581	54.2*	53.59	54.81
Secondary graduation	26364 / 70439	37.4*	37.07	37.79
Postsecondary graduation <sup>†</sup>	106591 / 338363	31.5	31.35	31.66
<b>Has a regular doctor/ Care received in last year</b>	<b>142328 / 450119</b>	<b>31.6*</b>	<b>31.48</b>	<b>31.76</b>
Yes - Yes <sup>†</sup>	88169 / 273248	32.3	32.09	32.44
Yes - No	37647 / 148999	25.3*	25.05	25.49
No- Yes and No-No	16512 / 27872	59.2*	58.66	59.82
<b>Self-perceived general health</b>	<b>153720 / 464174</b>	<b>33.1**</b>	<b>32.98</b>	<b>33.25</b>
Excellent/Very good <sup>†</sup>	71802 / 255461	28.1	27.93	28.28
Good	52337 / 135156	38.7*	38.46	38.98
Fair/Poor	29581 / 73557	40.2*	39.86	40.57
<b>level of day-to-day stress</b>	<b>152660 / 462151</b>	<b>33.0**</b>	<b>32.90</b>	<b>33.17</b>
Low <sup>†</sup>	50549 / 144780	34.9	34.67	35.16
Medium/High	102111 / 317371	32.2*	32.01	32.34

<sup>†</sup>reference category

\*Significant different from estimate for reference category (p=0.001)

\*\* Sample size (N=1137) reduced by missing values

KKD: Kilocalories per kilogram per day

Source: 2013/2014 Canadian community Health Survey

**Table 3 :** Odds Ratios relating selected characteristics to not using of mammography in past two years, female household aged 50 to 69, Alberta, 2013/2014

Variable	95% confidence interval			95% confidence interval				95% confidence interval			95% confidence interval		
	Unadjusted odds ratio	from	to	Adjusted odds ratio	from	to		Unadjusted odds ratio	from	to	Adjusted odds ratio	from	to
<b>Age group (years)</b>							<b>Sense of community belonging</b>						
50 to 54	1.094*	1.072	1.116	1.128*	1.100	1.156	Very/Somewhat strong†	1.0	....	....	1.0	....	....
55 to 59	1.996 *	1.957	2.036	2.265*	2.211	2.321	Very/Somewhat weak	1.046*	1.033	1.060	0.849*	0.835	0.863
60 to 64	1.809*	1.772	1.846	2.103*	2.052	2.155	<b>Smoker</b>						
65 to 69 †	1.0	....	....	1.0	....	....	Yes	2.473*	2.437	2.509	1.611*	1.582	1.640
<b>Marital status</b>							No†	1.0	....	....	1.0	....	....
Married/Common-law †	1.0	....	....	1.0	....	....	<b>leisure-time physical activity</b>						
Widowed	1.912*	1.866	1.959	1.605*	1.557	1.654	Active/Moderately active (1.5 or more KKD) †	1.0	....	....	1.0	....	....
Divorced/Separated	2.310*	2.272	2.349	2.068*	2.026	2.111	Inactive (Less than 1.5 KKD)	1.083*	1.070	1.097	0.770*	0.758	0.782
Single/Never married	1.693*	1.654	1.733	2.066*	2.007	2.127	<b>BMIcategory</b>						
<b>Resides in Census Metropolitan Area</b>							Underweight/Normal weight (less than 25.0)†	1.0	....	....	1.0	....	....
Yes	0.881*	0.870	0.892	0.724*	0.712	0.735	Over weight (25.0 to 29.99)	0.909*	0.896	0.922	0.725*	0.712	0.738
No †	1.0	....	....	1.0	....	....	Obese class I (30.0 to 34.99)	1.346*	1.322	1.370	1.104*	1.079	1.129
<b>Place of birth</b>							Obese class II (35.0 to 39.99)	0.619*	0.600	0.638	0.540*	0.521	0.560
Canada and other North American countries †	1.0	....	....	1.0	....	....	Obese class III (40.0 or more)	2.739*	2.638	2.843	1.658*	1.587	1.732
Europe	1.633*	1.600	1.666	1.352*	1.270	1.438							
Other	1.109*	1.084	1.134	0.940	0.880	1.004							
<b>Immigrant</b>													
Yes	1.460*	1.438	1.483	1.245*	1.173	1.321							
No †	1.0	....	....	1.0	....	....							
<b>Household income quintile</b>													
1 (lowest)	1.846*	1.812	1.882	1.158*	1.128	1.189							
2	0.760*	0.744	0.776	0.686*	0.669	0.704							
3	0.879*	0.863	0.895	1.149*	1.123	1.176							
4	1.028*	1.011	1.046	0.930*	0.911	0.949							
5 (highest)†	1.0	....	....	1.0	....	....							
<b>Education</b>													
Less than secondary graduation	2.573*	2.508	2.640	1.866*	1.804	1.930							
Secondary graduation	1.301*	1.279	1.323	1.042*	1.020	1.064							
Postsecondary graduation †	1.0	....	....	1.0	....	....							
<b>Has a regular doctor / Care received in Last year</b>													
Yes - Yes†	1.0	....	....	1.0	....	....							
Yes- No	0.710*	0.700	0.720	0.789*	0.776	0.803							
No - Yes and No-No	3.051*	2.975	3.129	3.033*	2.949	3.119							
<b>Self-perceived general health</b>													
Excellent/Very good †	1.0	....	....	1.0	....	....							
Good	1.616*	1.594	1.639	1.700*	1.670	1.730							
Fair/Poor	1.721*	1.691	1.750	1.602*	1.564	1.641							
<b>level of day-to-day stress</b>													
low †	1.0	....	....	1.0	....	....							
Medium/High	0.884*	0.873	0.896	0.682*	0.671	0.693							

† references category

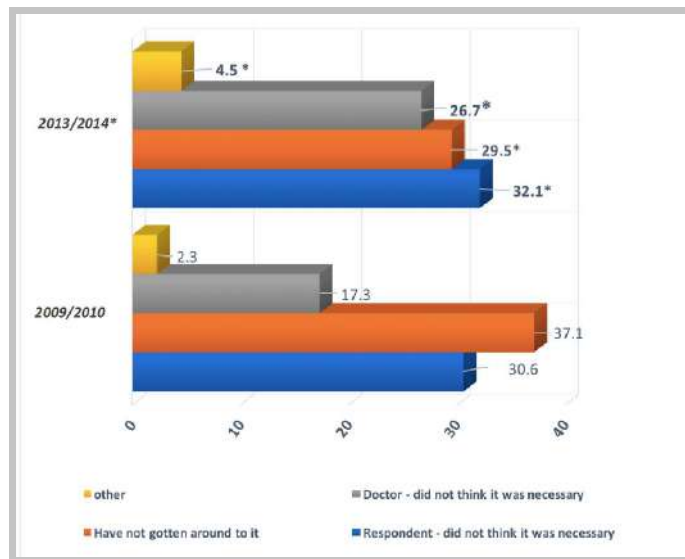
\* Significant different from estimate for reference category ( $p < 0.001$ )

.... not applicable

KKD: Kilocalories per kilogram per day

Source: 2013/2014 Canadian community Health Survey

**Figure 1:** Distribution for the most frequently stated reasons for non-use of mammography in last two years, female household population aged 50 to 69, † Alberta, 2009/2010 and 2013/2014



†based on respondents who did not have a mammography in past two years  
\* significantly different from estimate for 2009/2010 ( $p < 0.0001$ )

Sources: 2009/2010 and 2013/2014 Canadian Community Health Survey.

stress, a very or somewhat weak sense of community belonging, less physical activity during leisure-time, and those who were overweight.

The non-use of mammography has significantly decreased since the implementation of breast screening programs in Canada (from the 1990s to 2008). [3] However, according to the 2013/2014 CCHS data, the rate of the non-use of mammography in Alberta was slightly higher than in 2008 (33.1% versus 26%, respectively). These are similar results between the current study and those reported for Canada in 2008 [3]. The non-use of Mammography was higher in women aged 50 to 54. Immigrant women who were recently immigrant in Canada (0 to 9 years of immigration) were more likely not having a Mammography than those were not immigrant. Women with low household income were more likely not using a Mammography than those with higher household income. Respondents who reported that they had not a regular doctor were more likely not having a mammography than those had a regular doctor. And women who were daily smokers were less likely to be non-users of mammography than non-smokers as were women living outside of a Census Metropolitan Area [3].

In contrast, some characteristics such as sense of community belonging and Self-perceived general health were associated differently with the non-use of mammography than in the 2008 CCHS study [3, 12-27].

The results showed that immigrant women in Alberta were more likely to be non-users of Mammography, which was also shown in other studies particularly among recent immigrants from different ethnic origins [3, 13, 16-19, 22]. This could be explained by the different cultures, attitudes, and beliefs held by immigrant women about the utility of Mammography. In the current study and in the 2008 Canadian study, having a regular doctor was an important factor in the use of Mammography [3]. Several studies indicated a strong association between screening use, access to medical care, and the importance of the doctor's function in encouraging breast cancer screening [18, 23, 24, 26].

## Limitations

The present study provides an update of the use of Mammography using a larger representative sample of women from Alberta (aged 50 to 69). However, since the 2009 CCHS, the questions about the use of Mammography in the past two years was only asked in four provinces/territories (Alberta, the Northwest Territories, Nova Scotia, and New Brunswick) [8]. Therefore, it was not possible to have an update for Canada as a whole. Moreover, the CCHS data reported the use of Mammography without making a distinction between screening and diagnosis. The question about Mammography use concerning the past two years may indicate the recommended period for Mammography screening according to the guidelines set by the Canadian Cancer Society. However, it was not possible to distinguish if a respondent had a Mammography for screening or diagnosis. In addition, the CCHS data was based on self-reporting that was not validated with clinical or administrative records. This may introduce recall bias [3]. The number of respondents was insufficient to compare the non-use of Mammography with the duration of immigration in Alberta.

Participants increasingly used the "other" category in order to describe the reasons for their non-use of Mammography in 2013/2014 compared to 2009/2010.

## Conclusion

Despite the importance of the use of Mammography for reducing the mortality due to breast cancer, one-third of women aged 50 to 69 in Alberta have not had a Mammography in the past two years. The most frequently reported reason for the non-use of Mammography was that it was not necessary. This shows that perhaps there is a lack of understanding regarding the importance of Mammography as a screening test for breast cancer, especially among women with low socioeconomic status.

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## Appendix

**Table A**

	Question(s) / definition	Answer / codes	Recode
Age	What is [respondent name]'s age?	Age in years: ((MIN: 0) (MAX: 121))	50 to 69 years were divided into four 5-year age groupings: 1- 50 to 54 years 2- 55 to 59 years 3- 60 to 64 years 4- 65 to 69 years
Marital status	What is [respondent name]'s marital status?	1- Married 2- Living common-law 3- Widowed 4- Separated 5- Divorced 6- Single, never married	1- Married/Common-law (1 to 2) 2- Widowed 3- Divorced/Separated (4 to 5) 4- Single/Never married
Resides in Census Metropolitan area (CMA)	Derived variable	1- Census metropolitan area 2- Tracted census agglomeration 3- Non-tracted census agglomeration 4- Strongly influenced (zone) 5- Moderately influenced (zone) 6- Weakly influenced (zone) 7- Not influenced (zone) 8- Territories	1- Yes 2- No (2 to 8)

Place of birth	In what country were you born?	"...The respondent specifies country of birth according to current boundaries. Start typing the name of the country of birth to activate function. Enter (CAN) to select Canada. Enter "Other - Specify" to capture a name of the country that is not part of the list."	Answers were regrouped by continent and it was only in 3 categories: 1- Canada and other North American countries 2- Europe 3- Other
Immigrant	Were you born a Canadian citizen?	1- Yes 2- No	1- Yes 2- No
Household income	What is your best estimate of the total income received by all household members, from all sources, before taxes and deductions, in the past 12 months?	MIN: 9,000,000\$ MAX: 90,000,000\$	It was adjusted by household size from a version of the equivalence score method to have "quintile" (household income groups): 1 (lowest) 2 3 4 5 (highest)
Education	Derived variable, indicates the highest level of education acquired by the respondent.	1- Less than secondary school graduation 2- Secondary school graduation, no post-secondary education 3- Some post-secondary education 4- Post-secondary certificate/diploma or university degree	1- Less than secondary graduation 2- Secondary graduation 3- Postsecondary graduation (3 to 4)
Has a regular doctor/ care received in last year	Two were variables added in one variable: 1- Do you have a regular medical doctor? 2- In the past 12 months, not counting hospital visits, have you received any health care services from a family doctor or other physician?	1- Yes/ No 2- Yes/No	1- Yes - Yes 2- Yes - No 3- No -Yes and No - No
Self-perceived general health	In general, would you say your health is...?	1- Excellent 2- Very good 3- Good 4- Fair 5- Poor	1- Excellent/ Very good (1 to 2) 2- Good 3- Fair / Poor (4 to 5)

Level of day-to-day stress	Thinking about the amount of stress in your life, would you say that most days are...?	Not at all stressful Not very stressful A bit stressful Quite a bit stressful Extremely stressful	1- Low 2- Medium/High (2 to 5)
Sense of community belonging	How would you describe your sense of belonging to your local community? Would you say it is...?	1- Very strong 2- Somewhat strong 3- Somewhat weak 4- Very weak	1- Very/Somewhat strong (1 to 2) 2- Very/Somewhat weak (3 to 4)
Smoker	At the present time, do you smoke cigarettes daily, occasionally or not at all?	1- Daily 2- Occasionally 3- Not at all	1- Yes (1 to 2) 2- No
Leisure-time physical activity	Derived variable, indicates the activation level of the respondents in their transportation and leisure time based on the total daily Energy Expenditure values (kcal/kg/day)	1- Active (more than 3.0 kcal/kg/day) 2- Moderately active (1.5 to 3.0 kcal/kg/day) 3- Inactive (less than 1.5 kcal/kg/day)	1- Active/Moderately active (1.5 or more KKD) 2- Inactive (less than 1.5 KKD)
BMI category	Derived variable, was to identify the Body Mass Index (BMI) among respondents aged 18 and older and not to pregnant women.	1- Underweight (less than 18.50) 2- Normal weight (18.50 to 24.99) 3- Overweight (25.00 to 29.99) 4- Obese - Class I (30.00 to 34.99) 5- Obese - Class II (35.00 to 39.99) 6- Obese - Class III (40.00 or more)	1- Underweight/ Normal weight (less than 25.0) 2- Overweight (25.0 to 29.99) 3- Obese class I (30.0 to 34.99) 4- Obese class II (35.0 to 39.99) 5- Obese class III (40.0 or more)