

# Predictors of mammography use among Canadian women aged 50–69: findings from the 1996/97 National Population Health Survey

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## Abstract

**Background:** Screening mammography, although recommended every 2 years for women aged 50–69, is thought to be underused among select groups of Canadian women.

**Methods:** We used data from the 1996/97 National Population Health Survey to describe current patterns in mammography use (including reasons for not having a mammogram within the 2 years before the survey and future screening intentions) in Canada and to determine factors associated with nonparticipation and time-inappropriate use (mammogram 2 or more years before the survey) among women aged 50–69.

**Results:** Among respondents aged 50–69, 79.1% (95% confidence interval [CI] 76.9%–81.2%) reported ever having had a mammogram, and 53.6% (95% CI 51.4%–55.9%) had had a recent (time-appropriate) mammogram (within the 2 years before the survey). Only 0.6% (95% CI 0.3%–0.9%) of recently screened women reported problems of access, and few reported personal or health system barriers as reasons for not obtaining a recent mammogram. Over 50% of the women who had not had a recent mammogram reported that they did not think it was necessary, and only 28.2% (95% CI 23.8%–32.7%) of those who had never had a mammogram planned to have one within the 2 years following the survey. The rate of time-appropriate mammography varied significantly by province, from 41.1% (95% CI 29.3%–52.9%) in Newfoundland to 69.4% (95% CI 61.3%–77.6%) in British Columbia. Significant predictors of never having had a mammogram included higher age, residence in a rural area, Asia as place of birth, no involvement in volunteer groups, no regular physician or recent medical consultations (including recent blood pressure check), current smoking, infrequent physical activity and no hormone replacement therapy.

**Interpretation:** Despite increases in mammography screening rates since the 1994/95 National Population Health Survey, current estimates indicate that almost 50% of women aged 50–69 have not had a time-appropriate mammogram. Our findings confirm continued low mammography participation rates among older women and those in rural areas, select ethnic groups and women with negative health care and lifestyle characteristics.

Among Canadian women, breast cancer remains the leading type of cancer in terms of incidence and the second leading cause of cancer-related death, with about 19 200 new cases and 5500 deaths from breast cancer estimated to have occurred in 2000.<sup>1</sup> The benefits of regular mammography screening in reducing breast cancer mortality have been demonstrated among women aged 50–69 years<sup>2–8</sup> and are supported by recent Canadian trends illustrating a decline in mortality rates (also attributed to improved treatment) over the last decade.<sup>1</sup> For women aged 50–69 years, the National Workshop on the Early Detection of Breast Cancer recommends a mammogram every 2 years along with a clinical examination and the teaching and monitoring of breast self-examination.<sup>9</sup>

Although routine screening can be effective in the early detection of breast cancer, mammography remains underused by some women. Previous analyses of data

*Research*

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from the 1994/95 National Population Health Survey illustrated the relative importance of sociodemographic, health and lifestyle factors to appropriate breast cancer screening among Canadian women.<sup>10</sup> Significant predictors of under-use included age greater than 69, low education level and income, few social supports, poor preventive health behaviours, ethnic background (e.g., born in Asia) and residence in a rural area. These findings are consistent with previous observations, which were largely from US studies and smaller-scale Canadian investigations.<sup>11-17</sup>

We examined the consistency of findings regarding factors associated with appropriate mammography screening by using data from the second cycle (1996/97) of the National Population Health Survey. Questions regarding reasons for not obtaining a mammogram within the 2 years before the survey and future screening intentions were added to this survey cycle; thus, secondary aims were to examine the relative importance of personal and system barriers to mammography participation and the relation of previous mammography practices to future intentions.

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### Methods

The National Population Health Survey is an ongoing survey conducted by Statistics Canada through which cross-sectional and longitudinal data are collected on the health of Canadians. We used data from the second cycle (1996/97) of the household component, obtained primarily through telephone interviews, to examine women's mammography experiences and the relation of socio-demographic, health and lifestyle factors to mammography use in a representative sample of Canadian women not living in institutions.

Of the 21 302 respondents aged 40-99 years 20 124 consented to share their data with provincial and federal governments; 583 did not respond to the question on ever having had a mammogram, which left 19 541 women (8602 aged 50-69) available for evaluation. We focused our study on the target group of women aged 50-69. Further details of the design and methodology of the 1996/97 survey appear elsewhere.<sup>18-20</sup>

**Table 1: Mammography history and intentions reported by women participating in the 1996/97 National Population Health Survey, by age group**

Characteristic	Age group, yr; % of women (and 95% CI)		
	50-69 <i>n</i> = 8602	40-49 <i>n</i> = 5848	≥ 70 <i>n</i> = 5091
<b>Mammography history</b>			
Never	20.9 (18.8-23.1)	43.6 (41.0-46.3)	35.6 (32.7-38.5)
Recent (< 2 years before the survey)	63.4 (61.2-65.7)	36.0 (33.4-38.6)	38.2 (35.3-41.2)
Time inappropriate (≥ 2 years before the survey)*	15.6 (14.1-17.2)	20.3 (18.2-22.5)	26.1 (23.4-28.9)
<b>Reason for having recent mammogram</b>			
Screening§	84.6 (82.7-86.5)	80.3 (76.7-83.9)	83.0 (78.1-87.8)
Other¶	15.4 (13.5-17.4)	19.7 (16.1-23.3)	17.0 (12.2-21.9)
<b>Reason for not having mammogram†</b>			
Did not think it was necessary	55.6 (52.0-59.2)	-	-
Did not get around to it	26.3 (23.2-29.4)	-	-
Doctor did not think it was necessary	12.3 (9.9-14.7)	-	-
Fear	3.9 (2.6-5.2)	-	-
Other‡	7.3 (6.1-8.4)	-	-
<b>Had problems obtaining recent mammogram**</b>	0.6 (0.3-0.9)	2.0 (0.5-3.4)	0.8 (0.0-1.7)
<b>Intentions (stage of mammography adoption)</b>			
Intending to have a mammogram within 2 years following the survey			
Women who never had a mammogram or did not have a recent one	15.1 (13.7-16.6)	29.5 (27.2-31.9)	10.7 (8.7-12.8)
Women who had a recent mammogram	57.0 (54.7-59.3)	31.0 (28.5-33.5)	29.3 (26.6-32.0)
Not intending to have a mammogram within 2 years following the survey			
Women who never had a mammogram or did not have a recent one	21.5 (19.3-23.6)	34.4 (31.9-37.0)	51.0 (47.9-54.2)
Women who had a recent mammogram	6.4 (5.3-7.6)	5.0 (4.1-6.0)	8.9 (7.0-10.8)

Note: CI = confidence interval.

\*This includes women who reported ever having had a mammogram but who did not give the date.

†Responses were obtained from women aged 50-69 who never had a mammogram or did not have one within 2 years before the survey; responses are not mutually exclusive. Women who did not give a reason (*n* = 49) were classified as responding No for the various reasons.

‡Included personal problem, unavailable at time of appointment, mammography unavailable in the area, length of wait, transportation problem, language difficulty, cost, uninformed and "other" (not specified).

§Screening performed because of family history, check-up, age or receipt of hormone replacement therapy. Women who did not give a reason for having a recent mammogram (*n* = 6) were classified as having one for screening purposes.

¶Included prior lump, follow-up of breast cancer treatment and "other" (not specified).

\*\*Women who did not report any problems (*n* = 1) were classified as not having any problems.

We used responses from 2 of the survey questions (“Have you ever had a mammogram, that is, a breast x-ray?” and “If yes, when was the last time you had a mammogram...?”) to derive 2 binary outcome variables: ever or never having had a mammogram; and time-appropriate (mammogram within the 2 years before the survey) or time-inappropriate (mammogram 2 or more years before the survey) use.

All women were asked whether they intended to have a mammogram within the next 2 years. Only those reporting a recent (time-appropriate) mammogram were asked the reason for their most recent mammogram and whether they had encountered problems obtaining it. Consequently, potential diagnostic mammograms were retained in our analyses. Women aged 50–69 reporting that they had never had a mammogram or that their most recent mammogram was 2 or more years before the survey (time inappropriate) were asked why they had not obtained a recent mammogram.

We examined the following covariates as potential predictors of mammography use: sociodemographic characteristics (age, residence, household income, education, language, birth place, marital status, social network indices); health factors (mobility problems, presence of regular physician, number of medical consultations in the year before the survey, recent blood pressure check, hormone drug use); and lifestyle factors (smoking, physical activity).

Bivariate associations were examined using cross-tabulations and  $\chi^2$  tests of significance. Because age confounds the interpretation of these bivariate estimates, age-adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using logistic regression analysis. Factors found to be significant ( $p \leq 0.05$ ) were entered into multivariate logistic regression models.<sup>21</sup> Variables no longer independently associated with mammogram use after controlling for other eligible factors were removed using backward elimination. To ensure valid population estimates, survey records were down-weighted. To further account for stratification and clustering in estimating variance, bootstrap re-sampling methods were incorporated, with weights reflecting the sampling used in the survey by Statistics Canada (allowing 95% CIs to be calculated for the parameters).

## Results

An estimated 79.1% (95% CI 76.9%–81.2%) of the women aged 50–69 years reported ever having had a mammogram (Table 1). This proportion was significantly higher than that among women aged 40–49 (56.4% [95% CI 53.7%–59.0%]) and among those 70 years or more (64.4% [95% CI 61.5%–67.3%]). A time-appropriate screening mammogram was reported by 53.6% (95% CI 51.4%–55.9%) of the women aged 50–69 (data not shown); such use was lowest in Newfoundland and highest in British Columbia (Fig. 1).

Of the women aged 50–69 who had had a time-appropriate mammogram 0.6% (95% CI 0.3%–0.9%) reported

problems of access: primarily lengthy waiting times or unavailability of mammography in their area (Table 1). Over 50% of those who had not had a recent mammogram reported that they did not think mammography screening was necessary. The next most common reasons were not getting around to it and their doctor thinking that it was not necessary. Only 3.9% (95% CI 2.6%–5.2%) reported fear as a deterrent.

The majority of women aged 50–69 (72.1%) reported that they intended to have a mammogram within the 2 years following the survey; however, the proportion was lower among those who had never had a mammogram (28.2%) and those who had not had a recent mammogram (58.8%) (Table 2). Among women who had had a recent mammogram, those in the target age group were more likely than those 40–49 and those 70 and older to report an intention to have a mammogram within the 2 years following the survey.

After adjusting for potential confounders, we found that significant predictors of never having had a mammogram were higher age, residence in a rural area, Asia as place of birth, no involvement in volunteer groups, no regular physician or recent medical consultations (including recent blood pressure check), current smoking, infrequent physical activity and no hormone replacement therapy (Table 3). We found that these negative health and lifestyle characteristics (excluding physical activity) and no hormone replacement therapy were also significant predictors of time-inappropriate mammogram use. Other predictors of time-inappropriate use were French or bilingual language and 4 or more medical consultations in the year before the survey. Women born in Asia were significantly

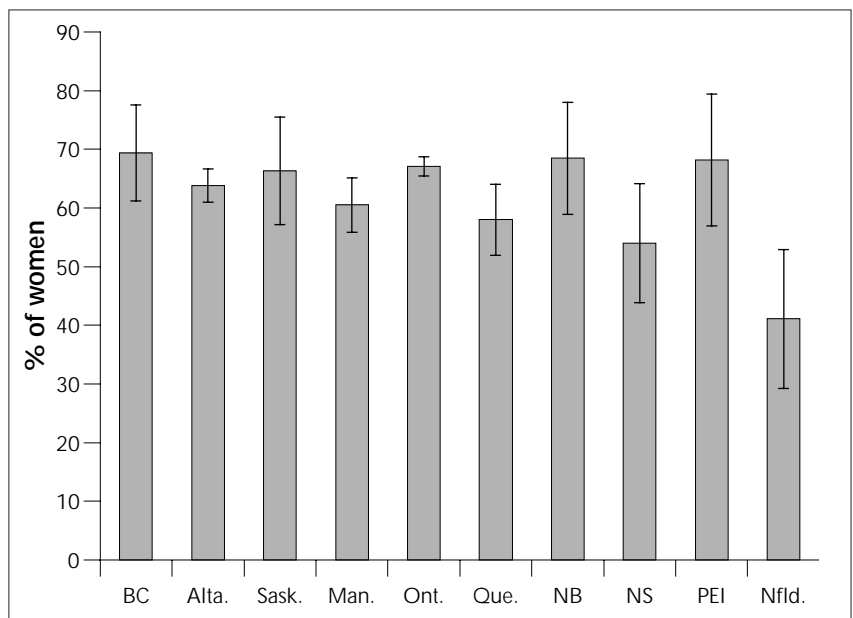


Fig. 1: Proportion of women aged 50–69 participating in the 1996/97 National Population Health Survey who had had a time-appropriate mammogram (< 2 years before the survey), by province. Error bars represent 95% confidence intervals.

less likely than those born elsewhere to have had a time-inappropriate mammogram.

## Interpretation

Our results show a slight increase in lifetime mammography use among women aged 50–69 compared with the estimate of 75.3% in the 1994/95 National Population Health Survey.<sup>10</sup> Our findings of lower rates among women aged 40–49 and those 70 or older are consistent with results from other reports<sup>10</sup> and were expected given the lack of consensus regarding screening guidelines for women in these age groups.<sup>22</sup> The proportion of women aged 50–69 who reported a time-appropriate screen was higher than that found in the 1994/95 survey (53.6% v. 48.5%) but was still less than optimal. Our results concerning future screening intentions (stage of mammography adoption<sup>23</sup>) indicate that participation in regular, time-appropriate mammography by up to 80% of women aged 50–69 is attainable by attracting women who are contemplating mammography and by maintaining participation rates among those at risk of not returning for mammograms and those currently in compliance of screening guidelines.

Provincial variation in time-appropriate mammography use in the 1996/97 survey was generally comparable to the variation observed in the 1994/95 survey. Such use appears to have increased in New Brunswick, from 49.7% (95% CI 41.1%–58.4%) to 68.5% (95% CI 59.0%–78.1%). However, this difference may reflect, in part, the high degree of sampling variability in the 1996/97 survey.

Few of the women who had had a recent mammogram reported having problems obtaining it. Women who had not had a recent mammogram were most likely to report that they or their doctor did not think it was necessary. These findings are consistent with others<sup>24–26</sup> and emphasize the need for continued educational interventions directed at women and their physicians.

Reported intention to have a mammogram is an important predictor of subsequent participation in screening.<sup>27,28</sup> As expected, in our study, women who had ever had a mammogram were significantly more likely than those who

had never had one to plan to have a mammogram within the 2 years following the survey. Their actual participation will be documented in the 1998/99 survey. Although 90% of the women aged 50–69 who reported having had a recent mammogram expressed their intention to continue with routine screening, preliminary data from the 1998/99 survey indicate that fewer than 50% reported having had a recent mammogram in both 1996/97 and 1998/99.

As reported previously<sup>10–13,17,29,30</sup> our analyses show the relevance of sociodemographic factors as important determinants of mammography use. Women living in rural areas remained at greater risk of not having a mammogram than did women in urban areas. This may reflect reduced accessibility or availability of services, differences in screening practices by rural physicians or differences in women's attitudes and beliefs toward preventive health care. An increased risk of having a time-inappropriate mammogram was not associated with rural residence but was associated with French and bilingual language. These factors may be related, in part, to the province of residence (Fig. 1) and may reflect regional screening practices rather than language barriers per se.<sup>31</sup> Although marital status was not found to be a significant predictor, another indicator of social support (being a member of a volunteer group) was positively associated with ever having had a mammogram.

Our estimates continue to indicate that women born in Asia are at significant risk of never having had a mammogram. Several other investigations<sup>32,33</sup> have demonstrated the importance of cultural beliefs and attitudes about cancer risk and prevention as barriers to screening. The survey data we report are limited because country of birth was collapsed into large regions and was strongly correlated with length of time in Canada.

Women reporting health care barriers (e.g., not having a regular physician or any medical consultations during the year before the survey) were more likely than those not reporting such barriers to have never had a mammogram and, especially, to have had a time-inappropriate mammogram. Although data support improved preventive health measures by physicians in recent years,<sup>10,34</sup> the increased risk of time-inappropriate mammography use among women with fre-

**Table 2: Reported intention to have a mammogram within 2 years following the survey, by mammography history/reason and by age group**

Characteristic	Age group, yr: % (and 95% CI) of women intending to have a mammogram within 2 years		
	50–69	40–49	≥ 70
Never had a mammogram	28.2 (23.8–32.7)	40.1 (36.4–43.8)	6.2 (3.7–8.6)
Had a recent mammogram for screening purposes	89.6 (87.7–91.5)	87.7 (84.9–90.5)	75.0 (69.9–80.0)
Had a recent mammogram for reasons other than screening	91.5 (87.3–95.8)	79.4 (72.1–86.6)	84.8 (78.5–91.2)
Had a time-inappropriate mammogram	58.8 (52.9–64.6)	59.2 (54.1–64.4)	32.6 (26.2–39.0)
All	72.1 (69.9–74.3)	60.5 (57.9–63.2)	40.0 (36.9–43.2)

**Table 3: Estimated odds ratios (ORs) of women aged 50–69 reporting never having had a mammogram or having had a time-inappropriate mammogram, by sociodemographic, health and lifestyle characteristics**

Characteristic	Never had a mammogram*		Had a time-inappropriate mammogram†	
	Age-adjusted OR (and 95% CI)	Adjusted OR‡ (and 95% CI)	Age-adjusted OR (and 95% CI)	Adjusted OR‡ (and 95% CI)
<b>Age group, yr</b>				
50–54	1.00	1.00	1.00	1.00
55–59	1.22 (0.91–1.61)	1.38 (1.02–1.86)	0.76 (0.53–1.88)	0.90 (0.62–1.32)
60–64	1.47 (1.05–2.04)	1.41 (0.99–2.02)	0.91 (0.64–1.28)	0.92 (0.63–1.33)
65–69	1.72 (1.28–2.38)	1.79 (1.30–2.48)	1.22 (0.85–1.72)	1.27 (0.85–1.85)
<b>Residence</b>				
Urban	1.00	1.00	–	–
Rural	1.30 (1.01–1.68)	1.32 (1.00–1.76)		
<b>Household income§</b>				
Not stated	1.03 (0.78–1.37)	–	–	–
Low	1.35 (0.98–1.89)			
Moderate	1.00			
High	0.65 (0.43–0.98)			
<b>Education</b>				
Elementary, some secondary	1.00	–	–	–
Secondary, some postsecondary	0.72 (0.55–0.95)			
Postsecondary	0.68 (0.51–0.91)			
<b>Languages spoken</b>				
English only	–	–	1.00	1.00
French only			1.92 (1.31–2.78)	2.22 (1.43–3.33)
Bilingual			1.33 (1.00–1.79)	1.59 (1.16–2.17)
<b>Birth place¶</b>				
Canada	1.00	1.00	1.00	1.00
United States, Europe or Australia	0.63 (0.47–0.83)	0.59 (0.43–0.80)	0.83 (0.62–1.11)	0.79 (0.58–1.09)
Asia	2.33 (1.12–5.00)	2.61 (1.17–5.79)	0.31 (0.14–0.68)	0.35 (0.15–0.80)
Other	0.76 (0.38–1.52)	0.68 (0.31–1.50)	0.71 (0.37–1.37)	0.92 (0.49–1.72)
<b>Marital status</b>				
Married, common law or partner	–	–	1.00	–
Widowed, separated or divorced			1.42 (1.10–1.89)	
Single			0.68 (0.37–1.22)	
<b>Member of volunteer group</b>				
No	1.00	1.00	1.00	–
Yes	0.63 (0.49–0.81)	0.72 (0.55–0.93)	0.70 (0.55–0.89)	
<b>Have a regular medical doctor</b>				
Yes	1.00	1.00	1.00	1.00
No	3.13 (1.96–5.00)	1.93 (1.10–3.39)	5.00 (2.78–9.09)	3.45 (1.96–6.25)
<b>No. of consultations with a physician in the year before the survey</b>				
0	2.08 (1.56–2.86)	1.63 (1.20–2.22)	2.63 (1.89–3.57)	2.44 (1.69–3.45)
1–3	1.00	1.00	1.00	1.00
≥ 4	0.70 (0.39–1.27)	0.70 (0.38–1.28)	2.04 (1.06–3.85)	2.32 (1.15–4.55)
<b>Last blood pressure check</b>				
< 2 years	1.00	1.00	1.00	1.00
Never or ≥ 2 years	4.17 (2.78–6.25)	2.76 (1.74–4.37)	8.33 (4.76–14.29)	5.26 (2.94–9.09)
<b>Frequency of physical activity</b>				
Regular or occasional	1.00	1.00	–	–
Infrequent	1.75 (1.37–2.27)	1.54 (1.19–1.98)		
<b>Current smoking status</b>				
Never or former smoker	1.00	1.00	1.00	1.00
Daily or occasional smoker	2.13 (1.64–2.70)	1.78 (1.35–2.34)	2.17 (1.64–2.86)	2.22 (1.67–2.94)
<b>Hormone replacement therapy</b>				
No	1.00	1.00	1.00	1.00
Yes	0.27 (0.20–0.39)	0.34 (0.24–0.48)	0.36 (0.25–0.51)	0.41 (0.28–0.58)

\*Perceived social support, mobility problems, language, marital status and emotional well-being were nonsignificant factors in the age-adjusted model and therefore ineligible for the final model; income and education did not remain significant in the final model.

†Perceived social support, rural residence, income, education, frequency of physical activity, mobility problems and emotional well-being were nonsignificant factors in the age-adjusted model and therefore ineligible for the final model; marital status and being a member of a voluntary group did not remain significant in the final model.

‡Obtained from multivariate logistic regression model and adjusted for all other variables listed in table.

§Responses for household income were collapsed to provide low-, moderate- and high-income groups, which represented about 20%, 60% and 20% of the sample respectively; income was significantly correlated with education.

¶Birth place was significantly correlated with number of years in Canada and with race.

quent (4 or more) medical consultations in the year before the survey supports the need for further improvements in physician referral.

Consistent with previous reports,<sup>10,35</sup> the women who engaged in positive preventive health behaviours (e.g., recent blood pressure check, regular physical activity and no smoking) and those receiving hormone replacement therapy were more likely than those not engaged in preventive health behaviours and not receiving hormone replacement therapy to report ever having had a mammogram and (except for regular physical activity) a time-appropriate mammogram. These associations may reflect increased physician contact (and thus referral), more positive attitudes and referral practices of physicians toward such women, more favourable attitudes and beliefs among such women, or a combination of these factors.

Given the limitations of the cross-sectional design of the survey, our estimates failed to indicate the dynamic nature of mammography participation (i.e., regular, opportunistic and first-time users) and the temporal relation between factors important in promoting mammography and participation. It is important to differentiate between these groups of users, since factors that may precipitate the initiation of screening are likely to differ from those that foster ongoing participation. Our analyses, especially regarding ethnic background, were also limited by a lack of data on the role of women's attitudes, beliefs and knowledge regarding cancer and preventive health practices.

In summary, the findings from the 1996/97 National Population Health Survey reveal that rates of participation in routine, time-appropriate mammography screening are less than desirable, particularly in certain subgroups of Canadian women. Organized screening programs have a role in reaching underserved women to ensure a 70%–80% participation rate every 2 years among women aged 50–69.

*Competing interests:* None declared.

*Contributors:* Dr. Maxwell was responsible for the initial analyses of the data from the National Population Health Survey (NPHS), the interpretation of the results and the drafting and revising of the manuscript. Ms. Bancej was responsible for the data linkage with Statistics Canada (for the NPHS Share File) and for the revised bootstrap analyses; she also provided input regarding methodological and substantive issues relevant to the interpretation of the results. Ms. Snider contributed to the writing of the article, provided input regarding clinical and public health issues relevant to the interpretation of the results and assisted with the revising of the manuscript.

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