Older Women and Mammography Screening Behavior: Do Possible Selves Contribute?

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Older Women and Mammography Screening Behavior: Do Possible Selves Contribute?

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This study sought to explore the contribution of the self-concept to older women's adherence to regular mammography screening behavior. The PRECEDE and health belief model concepts were incorporated with a measure of the women's future selves to determine whether the self-concept adds to our ability to predict screening. A self-administered questionnaire was completed by 210 community-dwelling women ages 50 to 75 years, recruited from urban and rural women's groups. Logistic regression analyses revealed that predictors of adherence were clinical breast examination, physician recommendation, age, barriers, benefits, feared health-related possible self, and self-efficacy in the feared domain. The addition of the self measures significantly improved the overall fit of the model. Implications for theory development, practice, and future research are discussed.

While many health behaviors are widely practiced by older people, some are not, and new health practices do not seem to be accepted readily among older adults.[1] Most models of health behavior have failed to adequately explain behavior, especially among older persons. Some researchers have suggested that the self system plays a role in motivation. However, we know little about the interactive and independent effects of various components of the self system on behavioral mechanisms.[2] A better understanding of the self system may increase our ability to understand and influence older persons' health behaviors.

Breast cancer is one of the leading causes of cancer-related deaths among Canadian women, with incidences increasing about 1.5% per year since 1981, rising most rapidly among women age 60 and older.[3] Mammography is the method of choice for screening (with clinical breast examination) to detect early breast cancer.[4] However, regular adherence to mammography screening guidelines is one behavior that is poorly practiced,

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especially among older women.[5,6] Older women have lower levels of knowledge about breast cancer and screening, feel less susceptible, and have more barriers than younger women.[7] But research efforts to predict older women's likelihood to be screened have been modest. With increasing age, cancer is perceived as more serious, less controllable, less curable, and less preventable.[8] Thus, identifying factors that might influence these perceptions of older women is important.

A number of health behavior models were considered from which to examine this behavior. The PRECEDE model[9] was chosen for its flexibility to incorporate key constructs from the health belief model (HBM)[10,11] and self theory[12] that have been supported by research. Only one other similar study[13] was found, but it did not appear to test all important variables of the model in a consistent manner, nor did it include the self-concept. The PRECEDE model identifies three categories of factors influencing behavior, including predisposing (provides the motivation), enabling (enables the motivation to be realized), and reinforcing (subsequently provides incentive for persistence). The HBM suggests that a woman is likely to take a recommended action (obtain a mammogram) if she perceives herself susceptible to getting the disease, if she perceives that the disease is serious, if the benefits of the health behavior outweigh the barriers, and if there is a cue to action. Since cancer is perceived as universally serious, this variable is not included in this research.

Predisposing factors. According to the PRECEDE model (see Figure 1), predisposing factors include a person's knowledge, attitudes, beliefs, values, and perceptions that facilitate or hinder motivation for change.[9] Predisposing factors found in the literature to predict mammography screening include the HBM's beliefs regarding susceptibility, benefits, and barriers[14]; perceived needs that include a history of breast problems and family or friend history of breast cancer[15]; and the demographic characteristics of income, education, marital status, race, occupation, and age.[16]

Health system enabling factors. Health system enabling factors are those skills, resources, or barriers that can help or hinder the desired behavioral or environmental changes.[9] Enablers identified in mammography screening research include having access to a specialist, attending a source of health care regularly, and showing evidence of personal health skills (recent clinical breast exam/Pap test, knowledge of breast self-examination).[15]

Reinforcing factors. Reinforcing factors are the rewards received and the feedback the learner receives from others following adoption of the behavior, which may encourage or discourage continuation of the behavior.[9] A major reinforcing factor for mammography screening is considered to be physician recommendation to have a mammogram, as well as the knowledge that peers have had mammograms.[5] Although physician and peer influence could be viewed as predisposing women toward mammograms, research on women's perceptions of their physician's influence following a prior mammogram led to framing these two variables as a reinforcing factors.

The Cognitive Model of the Self

The PRECEDE model is a useful organizing framework, but it lacks personalized beliefs and goals about the self. Self-cognitions, particularly future-oriented self-cognitions, play an important role in motivating and shaping behavior. Green and

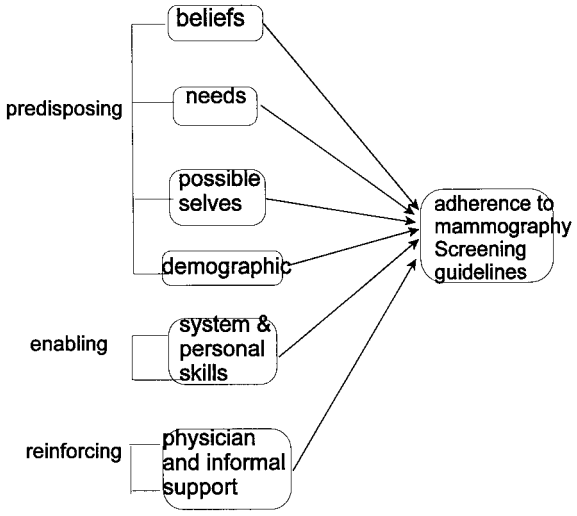

Figure 1. Model of predictors for mammography screening adherence.

Kreuter[9] concede that personality factors could predispose a given behavior but that these are immutable. This position ignores the variability found in the nature and functioning of the individual self-concept. Further research, which more fully examines the self-concept's role with mammography behavior, would augment our knowledge on health behaviors.

Possible selves,[17,18] which are future self-conceptions as identified in self theory, are seen as dynamic and responsive to the environment and offer promise for influencing motivation. Possible selves are thought to manifest goals, aspirations, motives, fears, and threats that guide choices.[12,19] *Hoped-for possible selves* are cognitive representations that express feelings of mastery, function as incentives, and include the actions or strategies planned to strive for the self. They might include the successful self and the rich or the independent self, whereas the dreaded or *feared possible self* is to be avoided and could be the alone self or the incompetent or alcoholic self.[20] Older adults in one study[19] listed both hoped-for and feared possible selves as important to health, while in another study, feared possible selves in the health domain appeared more salient for younger than for older persons.[21]

Possible selves are thus included in this model as a predisposing variable. Three dimensions of possible selves have been identified from the theoretically based empirical literature as being associated with behaviors and behavior choices: the presence of a health-related possible self,[21] the extent of balance in hoped-for and feared possible selves,[22] and the overall number of possible selves.[2] Regarding the first dimension, older persons with a most important health-related possible self were found more likely to participate in a variety of health-protective behaviors than those without a health-related possible self. Oyserman and Markus[22] identified the second dimension and suggested that a balance between hoped-for and feared possible selves in the same domain was important motivationally. That is, balance strengthened one's perseverance toward a goal and protected the domain from competing action alternatives. The last dimension is the overall number of possible selves. The total number of domains is thought to provide more diver-

sity for motivation[2] as the person increases the number available. Thus, one could develop self-aspects *outside* the health domain that would support goals elaborated *for* health.

Finally, Emmons[23] has hypothesized that the positive affect arising from successful goal attainment may be influenced by self-efficacy perceptions[24] that may, in turn, increase future expectancies of success. In fact, evidence supports that the more closely self-efficacy expectations are linked to specific possible selves, the greater their influence on behavior.[12] Thus, specific self-efficacy expectancies would be implicated in strengthening the influence of possible selves. No studies were found that investigated the relationship of the self-concept or its related self-efficacy to mammography screening behavior.

Based on the theoretical framework and scientific evidence, the following questions were formulated:

1. What combination of predisposing, enabling, and reinforcing variables best predicts older women's adherence to mammography screening guidelines?
2. Does the self-concept, as measured by possible selves, significantly add to the ability of the predisposing, enabling, and reinforcing variables to predict adherence to mammography screening guidelines by older women?
3. What possible self domains, other than in the health domain, are associated with adherence to mammography screening guidelines?

Hypotheses derived from the literature are the following:

1. Older women with a most important health-related possible self will be more likely to adhere to mammography screening guidelines compared with women who do not have a most important health-related possible self.
2. Among those with a most important health-related possible self, the strength of their self-efficacy will be positively related to adherence.

METHOD

Design and Setting

A cross-sectional survey design was employed to obtain information via a self-completed questionnaire from a convenience sample of community-dwelling women.

Participants. A total of 210 women were recruited from community and women's groups identified through a community information book, the phone book, and through networking with the public health department. Out of a total of 42 groups contacted, appointments were completed with 23 groups (54.8%). Of those groups that did not participate, 2 refused, 6 did not call back, 6 had no available meeting time, and 5 had members either too young or too old in the majority. Of those groups that did participate, most women completed the survey with only one or two women per group declining due to lack of interest or wrong age. The five types of groups accessed included social/recreational, service, business, professional, and religious. Criteria for participant selection included (1) women with no history of breast cancer, (2) ages 50 to 75 years, and (3) able to read and write English. Women older than 69 years were treated as a subgroup to determine

whether their perceptions of the need for mammography were influenced by Canadian policy recommendations (screening every 2 years for those 50-69 years), which could confound assessment of the outcome variable.

Instrument

Predisposing factors. A two-part questionnaire contained the following components. *Susceptibility beliefs* were measured by a five-item scale capturing the individual's self-perceived risk of contracting breast cancer.[25,26] For example, one item states, "It is extremely likely I will get breast cancer in the future." The 5-point summated scale (*strongly agree* to *strongly disagree*) has a reported alpha coefficient of .93 and a test-retest reliability of .70.[27] In the current study, 192 participants completed this scale, and the internal reliability was .93. The *perceived benefits* scale comprised a 5-point summated scale consisting of six items measuring the benefits of obtaining mammography. Cronbach's alpha of .79 has been reported.[26] For example, "Having a mammogram will help me find lumps early." To minimize the effect of missing data due to interpretation of several item stems, the group mean was imputed for 11 respondents, resulting in an internal reliability score of .79. The *perceived barriers* scale consisted also of a 5-point summated scale originally comprising five items that addressed perceived negative aspects regarding mammography—specifically, pain, cost, time, worry, and embarrassment. The barrier scale has been shown to be internally consistent (Cronbach's alpha ranging from .73 to .79) and to have a test-retest reliability of .65.[26,27] Based on literature[4] suggesting that for older women, caregiving, physical limitations, or limited support may increase access barriers, two items focusing on "too many problems" and "too many responsibilities" were added to the barrier scale and piloted, achieving an internal reliability of .81.

The three belief scales have established construct and criterion validity using factor analyses and multiple regression.[26] Higher scores on the three scales indicate greater susceptibility, greater benefits, and greater perception of obstacles to getting mammograms.

Needs. *History of breast problems* (noncancer) was obtained by asking whether the woman has ever experienced pain, swelling, or a lump or an abnormal mammogram that resulted in further screening or testing. *Family/friend history of breast cancer* was assessed by asking the woman if she had a mother, sister, daughter, aunt/grandmother, or friend with breast cancer.

Self-concept. *Possible selves* were assessed following the procedure used by Cross and Markus.[17] In an open-ended format, each participant was asked to generate freely a complete listing of her self-descriptions of hoped-for possible selves and feared possible selves.[17,21] These questions preceded those related to mammography/breast cancer to avoid overstimulating self-aspects related to breast cancer. Once the free responses were listed, the women were asked to view a list of commonly identified possible selves and endorse any that they may have failed earlier to identify freely but that were self-descriptive. Then, they were asked to select the two most important hoped-for and feared possible selves from among those they listed or endorsed. They were asked also for a measure of their perceived self-efficacy related to these most important possible selves. *Self-efficacy* was measured by asking how capable the woman feels of accomplishing (hoped for) or preventing/avoiding (feared) her most important possible selves rated on a 7-point scale.[21] Three dimensions of possible selves were assessed: total number of balanced

pairs of possible selves, total number of possible selves, and the presence or absence of a health-related possible self.

Demographic characteristics. These characteristics included the continuous variables of income and age and the categorical variables of education, marital status, occupation, and race. Income was further classified as income adequacy.[28] This indicator of socioeconomic status takes into account both household income and household size (e.g., the category "poor" is roughly equivalent to Statistics Canada's lowest income cutoff point).

Health System Enabling Factors. Single items measured the extent to which the individual had a *regular source of health care* and *type of MD* (general, specialist). Questions also assessed whether the woman had a *clinical breast exam* (CBE) and a *cervical screening* (Pap test), both rated as recent (≤ 2 years) and not recent (≥ 2 years/never) or not applicable (had hysterectomy). Another item tapped whether the woman knew how to perform *breast self-examination* (BSE).

Reinforcing Factors. A single item assessed the last time the woman had a *physician recommend mammography screening*, and women were asked about their *knowledge of the mammography behavior of similar-aged friends/family.*

Dependent Measures. A mammogram was defined as "an x-ray of the breasts taken by a machine that presses against the breast while the picture is taken."[29] Mammography screening behavior was defined as *adherent to recommended screening guidelines* if the woman had at least one prior mammogram during the past 2 years and was planning one in the next year, if recommended by her schedule.[26] For a woman age 50, a special case of adherence was made for her to need a mammogram in the next year. Adherence guidelines were consistent with the Canadian National Workshop group recommendation,[30] except the upper age examined was increased from 69 to 75 years of age; thus, a woman 70 years of age was coded as adherent if she followed the guidelines.

Procedures

The questionnaires were pilot tested with nine volunteers who met the eligibility criteria, and revisions were made. Following institutional review board approval, consent was sought. Once the group/center administrator agreed to participate, they requested generally that the investigator administer the survey following the group meeting or during active programming. The study purpose was reviewed, signed informed consent was obtained, and the questionnaire was distributed to those willing to participate.

The investigator used a prepared script to explain the meaning of the possible self questions and to instruct the individual or group in completing these items, section by section. Women were able to move on at their own pace to the booklet containing the remaining questions regarding general health, mammography, and demographic items. A $5.00 incentive was given to eligible participants.

Those who responded positively to the item on breast cancer history were encouraged to complete the survey as much as possible but were excluded from the main analyses. To ensure no woman participated more than once, names were checked for duplicates.

DATA ANALYSIS

SPSS, version 6.1,[31] supported the quantitative analyses (descriptive and logistic regression analysis), and ATLAS/ti[32] was used for the textual interpretation. Variables whose univariate logistic regression analysis obtained a p value of $< .25$ were selected along with variables of known theoretical importance. Variables that did not contribute to the multivariate model were eliminated and a new model fitted. Possible interactions suggested by the literature that had theoretic importance were identified a priori and assessed by conducting multivariate logistic regression models, fitting suspected covariates and their interaction terms to the logistic regression function with adherence. Preparation of the self variables involved the following data reduction procedures.

Balanced pairs of possible selves. Prior to categorization, the possible selves (open-ended and closed-ended) of each participant were read, and all possible pairs of responses (negative and positive aspects of the same content area) were identified by the investigator. Each participant received a score ranging from zero (no balance) to a score equal to the maximum number of possible balanced pairs, counting a pair only once.[33] A random sample of self-descriptions was independently coded by a blinded rater with acceptable agreement obtained.

Total number of possible selves. The possible selves identified in open-ended and closed-ended sections were entered in text files and ATLAS/ti software. Each line was scrutinized in a process called "open coding."[34] The self-descriptions were categorized through constant comparison leading to progressive category clarification and definition. Further analyses led to clustering of the data segments to identify emerging themes or patterns. Counts of the total number of possible selves (both hoped for and feared) identified by each participant were done in both the open-ended and closed-ended lists and a grand total computed.

Health-related possible self. Among the total possible selves counted, the presence of a health-related possible self (hoped for and/or feared) and whether it was identified as a most important possible self were noted for each participant as a separate variable.

RESULTS

Of the 210 participants, 10 reported a history of breast cancer and 2 did not respond to this question, leaving 198 on whom the analyses were conducted.

The women were on average 66.7 years of age ($SD = 6.5$). Three-fifths of the sample were 69 years and younger (59.5%), and the remainder 70 years and older. Most were married (59.6%), while 40.4% ($n = 80$) were widowed, divorced, separated, or never married. Women 50 to 69 years of age were more likely to be married and employed than women 70 years and older. The modal education level was college, and the modal income level was $40,000 to $59,999. The sample was slightly poorer compared with the Canadian population as a whole (using income adequacy categories). Most of the women were retired (70%) and Caucasian (98.5%) (see Table 1). Most women were recruited from social/recreational or religious groups. Table 1 displays descriptive data for these and other study variables for the entire sample and by age group. The HBM scales are displayed in Table 2.

Table 1. Descriptive Statistics for Variables in Model by Total Sample and by Age Groups

	% of Total Sample	% of 50-69 Years	% of 70-75 Years
Predisposing			
Demographics			
Age (n = 195; M = 66.7 years; SD = 6.45)		59.5	40.5
Marital status (n = 198)***			
Married	59.6	74.1	38.0
Widowed/divorced/separated	36.4		
Never married	4.0		
Education (n = 198)			
Elementary	9.6	6.0	15.0
Secondary	43.4	44.8	43.0
College	47.0	49.1	41.8
Work status (n = 197)*			
Employed	7.1	10.3	2.6
Retired	70.1	63.8	79.5
Homemaker	20.8	22.4	17.9
Unemployed/other	2.0	3.4	—
Race (n = 196)			
Caucasian	98.5		
Other	1.5		
Income adequacy (n = 169)[a]			
Poor	13.0	9.0	18.8
Lower middle class	31.4	26.0	37.5
Upper middle class	42.0	48.5	32.8
Rich	13.6	15.5	10.9
Type of group recruited (n = 198)			
Religious	23.2	19.8	26.6
Business/professional	14.6	16.4	11.4
Education	3.5	5.2	1.3
Service	14.1	12.9	16.5
Social/recreation	44.4	45.7	44.3
Needs			
Prior abnormal problem (n = 193)*			
Pain/swelling/lump	18.5	31.9	16.7
Abnormal mammogram	6.9		
None/no answer	74.6		
Relative or friend history (n = 188)			
Known	55.3	57.3	53.3
None known	44.7		
Possible selves (PS)			
Total number coded in sample = 65 (M = 16.3 selves per woman; SD = 5.63; range: 4-36 selves per woman)			
Health-related PS endorsed as important (n = 198)	76.6	75.2	83.3
Hoped-for health-related PS endorsed as important (n = 198)	64.3	61.7	69.2
Feared health-related PS endorsed as important (n = 198)	53.0	53.0	51.4
Cancer possible self	16.7	20.4	11.0

(continued)

Table 1. continued

	% of Total Sample	% of 50-69 Years	% of 70-75 Years
Enabling			
Systems/personal skills			
Type of doctor (n = 197)			
General/family	84.3	82.8	85.9
Specialist	13.7	15.5	11.5
None	7.0	1.7	2.6
Recency of clinical breast exam (n = 195)			
Less than 1 year ago	44.6	81.0	75.0
1-2 years ago	33.3		
More than 2 years ago	16.4		
Never	5.6		
Recency of Pap smear (n = 192)***			
Less than 1 year ago	21.9	64.8	35.0
1-2 years ago	28.1		
More than 2 years ago	40.1		
Never	4.7		
Not applicable	5.2		
Knowledge of breast self-examination (BSE) (n = 193)			
Knows BSE	90.2	90.4	89.5
Doesn't know BSE	9.8		
Reinforcing			
Physician recommendation (n = 186)**			
Ever	74.7	82.1	64.8
Never	25.3		
Knowing peers as screeners (n = 191)			
Most women	28	87.7	85.3
Some women	42		
Few women/none	16.8		
Don't know	12.6		
Mammography practices (n = 197)			
Ever had mammogram*	79.2	85.0	72.0
Never had mammogram	20.8		
Government recommendation for screening			
Every year	25.4	22.3	30.1
Every 2 years	56.2	59.8	50.7
Never/don't know	18.4	17.9	19.2
Lifetime number of mammograms (M = 2.18)			
One	28	24.7	33.9
Two	26	24.7	26.8
Three or more	46	50.5	39.3
Adherence to guidelines*			
Adhere	51.7	57.9	42.6
Not adhere	48.3		

a. Income adequacy based on Canadian Health Promotion Survey definition.[28]
*$p < .05$. **$p < .01$. ***$p < .001$ (using χ^2 analysis). Age group comparisons of some variables used collapsed categories.

Table 2. Health Belief Model Scales

	Total Sample		Age Groups (scale mean)	
	Scale Mean (*SD*)	Cronbach's Alpha	50-69 Years	70-75 Years
Susceptibility (possible range: 5-25)	11.6 (4.06)	.93	11.0	11.2
Benefits (possible range: 6-30)	21.99 (3.67)	.78	21.75	22.5
Barriers (possible range: 7-35)	13.8 (3.95)	.81	13.9	13.5

Mammography practices. Seventy-nine percent ($n = 156$) of the sample reported they had *ever* had a mammogram. Those in the younger age group had a higher rate of *ever* being screened than the older age group. Reasons for never having a mammogram varied from the "doctor not suggesting" screening to "no need or interest." Women older than 70 years were most likely to report "no need." Of those who "ever had" a mammogram, approximately one-third had lapsed from the guidelines. Thus, 51.7% of the sample were adherent to the guidelines. Younger women (50-69 years) had a higher rate of adherence (57.9%) than those who were ages 70 to 75 years (42.6% adherent). Both groups were as likely to say the government recommended screening every 2 years for women of their age. Thus, most older women perceived regular screening applied to them, regardless of existing provincial guidelines.

Predisposing variables. Sixty-five possible self domains were categorized for the entire sample, and among them the 10 most commonly reported were, in declining order of frequency, the following: good health, dependence, mentally alert, independence, active, poor health, senile, sociable, inactive, and respected. Three-quarters of the sample identified health in the future (either hoped for or feared) as an important self domain. The hoped-for health domain encompassed broad statements such as "to keep my good health," while the feared health domain tended to be defined more specifically, such as feared becoming a "stroke victim," "incontinent," or having "a bad heart." These diverse feared health descriptors excluded cancer, which was coded as a separate domain for 31 participants (most of them younger women). In later analysis, cancer self was incorporated into the feared health domain, but its inclusion did not affect the overall results. No statistically significant differences were found in the percentages of feared and hoped-for possible selves by age group, although more younger women tended to have feared health selves, while more older women tended to have hoped-for health selves.

Bivariate analysis (see Table 3) revealed significant positive associations between regular adherence and group type (odds ratio [OR] = 3.21; confidence interval [CI] = 1.51, 6.82; $p < .01$) and benefits (OR = 1.89; CI = 1.08, 1.32; $p < .0001$) and negative associations with age (OR = .95; CI = .91, .99; $p < .05$) and barriers (OR = 0.83; CI = 0.76, 0.91; $p < .0001$). Women in the social/recreational group were more likely to adhere to screening than those in the religious/education group. None of the self-concept variables were associated with adherence to mammography screening behavior. However, when controlling for the presence of a feared health-related possible self, self-efficacy ratings were positively associated with adherence.

Enabling variables. Significant associations (Table 3) were identified between mammography adherence and recent CBE (OR = 26.3; CI = 7.69, 89.84; $p < .0001$) and recent

Table 3. Means, Standard Deviations, and Endorsement Rates for Main Study Variables: Unadjusted Odds Ratios and 95% Confidence Intervals (CI)—Adherence to Mammography Guidelines ($N = 198$)

Variable	*M*	*SD*	Endorsement Rate	Odds Ratio	95% CI
Group type					
(1)				1.76	0.69, 4.67
(2)				1.29	0.49, 3.45
(3)				3.21**	1.51, 6.82
Age in years				0.95*	0.91, 0.99
Age squared				0.99	0.99, 1.003
Age group				0.54*	0.29, 0.99
Income adequacy					
(1)				1.36	0.78, 4.08
(2)				1.74	0.61, 4.97
(3)				1.38	0.39, 4.87
Education					
(1)				2.09	0.72, 6.12
(2)				1.27	0.44, 3.65
Marital status				1.80	0.98, 3.32
Beliefs					
Susceptibility	11.58	4.06		1.07	0.99, 1.16
Barriers	21.90	3.67		0.83****	0.76, 0.91
Benefits	13.76	3.95		1.19***	1.08, 1.32
Relative/friend history			.55	0.92	0.49, 1.69
Personal history			.25	1.93	0.95, 3.89
Self-concept					
Total selves	16.3	5.63		1.04	0.98, 1.09
Balanced pairs	5.86	2.90		1.03	0.93, 1.04
Health related			.77	0.86	0.42, 1.91
Regular MD/specialist			.98	1.42	0.59, 3.37
Recent clinical breast exam			.78	26.29****	7.7, 89.8
Recent Pap			.53	5.71****	2.9, 11.22
Know breast self-examination			.90	1.31	0.48, 3.58
Physician recommended			.75	6.88****	3.05, 15.5
Know peers			.87	2.69*	1.04, 6.96

NOTE: Group type had four levels: 1 (business/professional), 2 (service), and 3 (social/recreational) compared with the reference category religious/education. Age and age squared were expressed as deviations around the mean. Age group was either 0 = ≤ 69 years or 1 = ≥ 70 years. Income adequacy[28] was categorized from level 1 (lower middle class) to level 3 (rich) compared with the reference category poor. Education was categorized from level 1 (secondary) to level 2 (college) compared with the reference category elementary. Marital status had two categories: 0 (widowed/divorced/separated/single) and 1 (married). Endorsement rate was the proportion of the sample responding affirmatively to the item.
*$p < .05$. **$p < .01$. ***$p < .001$. ****$p < .0001$.

Pap test (OR = 5.7; CI = 2.9, 11.2; $p < .0001$). Women in the younger age group were more likely to have had a recent Pap test (Table 1).

Reinforcing factors. Significant bivariate associations were found between adherence and physician recommendation (OR = 6.88; CI = 3.05, 15.55; $p < .0001$) and knowing

peers as screeners (OR = 2.7; CI = 1.04, 6.97; $p < .04$). Women in the 50- to 69-year age group were more likely to have received a physician recommendation than those 70 years and older (Table 1).

Question 1 asked what overall combination of variables best predicts older women's mammography screening behavior. Logistic regression analysis was used to test multivariate relationships among variables with bivariate significance of $p \leq .25$[35] or those with theoretic significance. Demographic variables (i.e., age, education, and marital status) were entered to control for their effect. Education and marital status were weakly associated with adherence in bivariate association. Race and occupation had little variation, and income was not a significant covariate and thus not used further. Given the number of missing cases for some variables, a subset of cases ($n = 155$) met the stipulation of having nonmissing cases on which to compare different multivariate models. The subset of cases was similar to the total sample, except this subset was slightly younger on average (65.9 years vs. 66.7 years for total) and had a slightly higher rate of adherence (56% vs. 51.7%), and a higher percentage received a physician recommendation to be screened (80.6% vs. 74.7%).

In addition, due to the large number of variables, one of a pair of highly correlated variables was considered for deletion if not important for biological or theoretical reasons. Because Pap test and CBE were highly correlated, only CBE was left in the model. Among the self variables, balanced pairs were highly correlated with the total number of selves and thus excluded from analysis. Health-related possible self and total possible selves were left in the model due to their theoretical importance. However, they failed to contribute in earlier model fitting. The components of health-related self (hoped for and feared) were substituted for the health-related possible self in later model fitting.

A number of interactions specified a priori were explored through a series of logistic regression models. Profile plots were constructed to determine if an interaction was present. Among the self variables, only the feared health-related possible self and the interaction term between self-efficacy and feared health-related possible self were significant predictors of adherence. Among the belief variables, only the main effects and the interaction between benefits and susceptibility were significantly associated with adherence. Thus, those variables and their interaction term were fitted to the logistic regression function. Group type and knowledge of peers were not significant predictors in initial model fitting and thus were eliminated in the final model (Table 4). Significant predictors were age, CBE, physician recommendation, benefits, barriers, feared health-related possible self, self-efficacy in the feared domain, and their interaction term.

Question 2 asked whether the self-concept measures added to the model's ability to predict adherence to mammography screening. This question was tested by comparing the full model containing the self variables with a reduced model without the self measures (see Table 4). This comparison assessed the gain in prediction made by the self measures to the model. Using the likelihood ratio test statistic,[35] the results showed that the self parameters added significantly to the final model ($\chi^2 = 11.84 > 9.49$, $p = .05$), and the overall fit of the model was judged adequate. Regression diagnostics supported this conclusion.

Question 3 asked whether possible self domains, other than health-related ones, were associated with screening adherence. No other domains studied were statistically significant predictors of the outcome.

Table 4. Adjusted Odds Ratios (OR) and Confidence Intervals (CI) for Refitted Full and Reduced Models With Main and Interaction Effects

	Full Model				Reduced Model			
Predictor	Estimated Coefficient	Adjusted OR	CI	*p*	Estimated Coefficient	Adjusted OR	CI	*p*
Age	–0.10	0.90	0.81, 1.13	.07	–0.10	0.91	0.82, 1.01	.07
Age squared[a]	–0.02	0.83**	0.73, 0.94	.004	–0.02	0.98**	0.97, 0.99	.003
Marital status	0.78	2.18	0.58, 8.21	.25	0.25	1.28	0.39, 4.16	.67
Education	–0.33	0.72	0.29, 1.78	.48	–0.66	0.52	0.22, 1.22	.13
Clinical breast exam	4.19	66.31***	9.49, 462.87	.0001	3.46	31.82***	5.94, 170.58	.0001
Physician recommended	2.41	11.17***	2.33, 53.57	.003	1.71	5.55**	1.55, 19.91	.009
Benefits	0.48	1.62*	1.02, 2.57	.04	0.51	1.65*	1.05, 2.63	.03
Barriers[b]	–0.32	0.199***	0.08, 0.51	.0008	–0.23	0.79**	0.67, 0.93	.004
Susceptibility	0.65	1.91	0.92, 3.97	.08	0.69	1.99	0.96, 4.16	.06
Ben-Suscep[c]	–0.03	0.97	0.94, 1.00	.09	–0.03	0.97	0.94, 1.00	.06
Feared, health-related possible self	–7.01	0.001**	0.00, 0.07	.002				
Self-efficacy	–0.78	0.46*	0.24, 0.89	.02				
Feared self-efficacy[d]	1.28	3.60**	1.53, 8.47	.003				
Total possible selves	–0.04	0.96	0.87, 1.06	.42				
Intercept	–5.59				–9.82			

NOTE: For the full model, $\chi^2 = 89.79$ ($df = 14$, $n = 137$); –2 log likelihood = 97.49. For the reduced model, $\chi^2 = 77.95$ ($df = 10$, $n = 137$); –2 log likelihood = 109.33.

a. OR (CI) based on increments of 10.

b. OR (CI) based on increments of 5.

c. Benefit and susceptibility interaction term.

d. Feared health-related possible self and self-efficacy interaction term.

*$p < .05$. **$p < .002$. ***$p < .0001$.

DISCUSSION

The PRECEDE model was a useful framework to explore these relationships. With regard to question 1, a number of predictors represented by predisposing (age, benefits, barriers, feared health-related possible self, self-efficacy in the feared domain, the interaction term), enabling (CBE), and reinforcing (MD recommendation) were significantly associated with mammography adherence. The adherence rate (57.9% for women 50-69 years) was relatively high but still below the Canadian goal of 70%.[36] Similar to the findings of other studies,[37,38] increasing age and increasing barriers decreased the odds of screening adherence. Pain, harm, and fear were among the top three reasons for not planning to have a mammography in the future. A recent study that illustrates the impact of barriers found that women who perceived themselves at high risk of having a heart attack and perceived other health problems as more important were less likely to be regular screeners.[39]

Having a recent CBE and a physician recommendation[40,41] strongly predicted screening adherence. Having a personal or family history failed to predict adherence. Although other studies[42] have found that breast problem history has strongly predicted adherence, researchers have suggested physician reinforcement may have moderated this effect and needs further study. Nevertheless, the present finding supports the notion that objective

risk is insufficient to promote behavior adoption and suggests that this risk needs to be personally relevant.

Increasing benefits of screening weakly predicted screening, which has been found in other research,[43] although the imputation of the mean for 11 respondents (7% of sample) and minimal variability may be partly responsible for the weak effect. Susceptibility was not a significant predictor in the regression model, although in bivariate analysis, those intending to be screened had significantly higher susceptibility ratings than nonintenders, a finding supported by Champion.[26] Also, when controlling for age group, among those ages 50 to 69 years, adherers had significantly higher susceptibility ratings than nonadherers, whereas susceptibility ratings for those ages 70 to 75 years made no difference to their adherence.

The lack of importance of older women's susceptibility perceptions in relation to adherence is a common finding. This tendency may be a response to their belief that protective efforts against cancer are not worthwhile, or they may be responding to the media attention that has focused on younger women and breast cancer.

To answer question 2, certain self-concept variables did improve the predictive ability of the model. However, hypothesis 1 was not supported. That is, health-related possible self, which measures both negative and positive self-aspects regarding health, did not add to the model. Combining two opposing self-aspects in the same domain may have canceled each effect.

One possible explanation as to why the feared domain was more potent than hoped-for health may be related to evidence that it seems to be more salient with younger groups.[44] Given that the sample contained proportionally larger numbers of younger women, they may have exerted a stronger influence through the feared domain. Feared future selves may fit with the stereotypes of aging by the younger women and thus have more motivating influence in seeking ways such as breast screening to improve health or detect disease in the future. This explanation requires further testing, as the differences between younger and older groups in their rates of feared health-related selves did not reach statistical significance.

The finding that feared health-related possible self, self-efficacy in the feared domain, and their interaction were predictors supports hypothesis 2. This relationship is advanced by self theory, which suggests that a close link between self-efficacy and the self domain strengthens the influence of the self-concept on the outcome behavior.[12] However, the self-efficacy finding is a departure from previous health behavior research in relation to the outcome studied.[24] In the present study, self-efficacy, which was linked to a variety of feared health states (most unrelated to cancer), predicted one specific behavioral outcome (mammography screening). In other words, if a woman had one or more of a collection of feared selves about health and thought she was capable of avoiding the self domains in the future, she was more likely to obtain mammography screening than if she thought she was not capable. Previous research[20] found associations between feared health-related possible self, self-efficacy, and an inventory of several health behaviors (e.g., diet, exercise, smoking, managing stress) rather than a single outcome.

Research implications. The current research may be suggesting that *many* different future health fears, which the person feels capable of controlling, can lead to a multitude of health-protective behaviors, one of which is cancer screening. Building self-efficacy related to possible selves in the feared health domains may build a generalized health-protective approach, but this hypothesis requires further research. Another area of study would be to identify whether aspects of self are open to change over time as threats to

health become a reality (e.g., screening, diagnosis, treatment, posttreatment) and to explore the meaning of these changes. As well as measuring self-efficacy associated with the self, a measure of mammogram self-efficacy (the ability to successfully complete the outcome) might have further explicated the relative contribution of these components to the outcome. For example, Maddux and Rogers[45] found that even those with low expectations of susceptibility, who had high expectations of response efficacy[46] and high mammography self-efficacy, followed a precaution strategy or "why take a chance" approach and adopted the behavior. Self and Rogers[47] concluded in their work that raising perceptions of health threats may be appropriate if people can be persuaded that they can avoid the danger.

Practice implications. The research suggests the need to focus on strategies to overcome barriers at an individual or a system level (e.g., women-friendly clinics/offices, van transportation, translators); to make information personally relevant; to explore women's future selves and build on their capacity to overcome health fears; to encourage women's positive self thoughts about health in the future; to support physician-led recommendations for screening (both breast and cervical), particularly with older women; and to promote more than one preventive or early detection behavior (e.g., CBE, Pap, mammography). Recent research[48] indicates that Canadian women who obtain blood pressure checks, exercise regularly, and do not smoke are more likely to obtain screening mammography.

Study limitations. Limitations of the study include the lack of random sampling so that generalizations beyond women in certain women's groups cannot be made without caution. Nevertheless, the study provides useful information, particularly for active, socially engaged women. Repeating this study with women from a broader representation of racial/ethnic groups would add to its external validity. The study relied on self-report, which raises concerns regarding respondent bias. However, studies have found this method to reflect accurately actual mammography status in the past year.[49] Model fitting done with a smaller subset may have reduced power to detect relevant relationships. Given that the subset had a slightly higher adherence rate, results may not fully represent the total sample.

This study laid the foundation for describing and relating aspects of the self to specific health behaviors in the context of other important factors. Opportunities are open for extending this research to other groups such as new immigrants or underserved populations and testing interventions arising from these findings so that early breast cancer detection will be promoted.

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