

Differences in Breast and Cervical Cancer Screening Among U.S. Women by Nativity and Family History



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Introduction: System-level factors such as poor access to health services can help explain differential uptake in breast and cervical cancer screening between U.S.- and foreign-born women. However, few studies have explored the roles of family history and perceived risk of these cancers on screening rates. To address these gaps, this study investigates whether a family history of cancer, perceived risk, and system-level factors independently and additively predict differential screening rates of breast and cervical cancer between U.S.-born and foreign-born women living in the U.S.

Methods: Data were analyzed in 2019 from the 2015 National Health Interview Survey. Descriptive and multivariable logistic regression modeling was performed to test whether there were differences in breast and cervical cancer screening within and between the 2 groups and whether family history of cancer and perceived risk of breast cancer were predictors of uptake.

Results: The sample comprised women aged 21–74 years ($n=14,047$). The mean age of the sample was 45.5 (SD=14.8 years). The majority of the women were U.S.-born (77.5%). U.S.- and foreign-born women had more mammograms and Pap tests with a usual source of care ($p<0.001$) and insurance ($p<0.001$). Healthcare access and utilization factors were also predictive for both groups of women. Data analyses were conducted in 2019.

Conclusions: These findings are consistent with previous work. Access and healthcare utilization were associated with screening uptake. However, differences in risk perception, family history of breast and cervical cancers, and screening uptake were found between U.S.- and foreign-born women.

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INTRODUCTION

Disparities in healthcare services utilization have been documented among U.S.- and foreign-born minority and low-income individuals in the U.S.^{1–3} Research has shown that foreign-born women are less likely to receive cervical and breast cancer screenings compared with U.S.-born women.^{4,5} In a recent literature review, Adunlin et al.⁶ found barriers such as lack of insurance and usual source of care, lack of knowledge, religious and cultural beliefs, lack of translation or interpreter services, mistrust of the healthcare system, and lack of community health centers to be key factors. Healthy People 2020 cancer-specific objectives proposed to increase cervical (C-15) and breast cancer (C-16) screening rates among women.⁷ However, little is

known about the relationship between perceived risk of cancer owing to family history and cancer screening (breast and cervical) rates among U.S.- and foreign-born women.

Early detection of cancer has been demonstrated to be an effective strategy for reducing morbidity and mortality rates for breast and cervical cancers.^{8–10} Some

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screening tests have been associated with lower incidence by detecting preneoplastic lesions that can be removed or treated early and less invasively,¹¹ thus preventing potential adverse outcomes. Studies have explored system-level factors that influence uptake, but few include individual/psychosocial factors such as the perceived risk of cancer. Haber et al.¹² investigated the association between family history of breast cancer, risk perception of breast cancer, and mammography screenings. They found that breast cancer risk perception was associated with the type of cancer found in first-degree female relatives (mother, sister, daughter). In addition, how they were related to the family member with cancer and family history of breast cancer affected repeat mammography behavior. This study extends this literature by investigating current determinants of cancer screenings between U.S.- and foreign-born women. It provides more insight into the literature about these determinants independently and additively to help build better solutions and continue to close the gap in cancer screenings disparities. It seeks to determine (1) whether there are any differences in uptake in breast and cervical cancer screenings within and between groups on the basis of nativity, (2) what factors are associated with breast and cervical cancer screenings among U.S.- and foreign-born women, and (3) whether perceived risk or history of cancer predicts cancer screening rates among U.S.- and foreign-born women.

METHODS

Study Population

This analysis used data from the 2015 National Health Interview Survey (NHIS; $n=14,047$ women aged 21–74 years). The sample had no missing information on the considered covariates. The NHIS data set is a nationally representative population sample administered by the National Center for Health Statistics at the Centers for Disease Control and Prevention. The NHIS serves as a source of information on the health status of the civilian non-institutionalized U.S. population.¹³ The survey comprises a complex multistage national probability design that provides a representative sample of U.S. households and civilian adults from all the 50 states and the District of Columbia.¹³ The NHIS includes a supplementary module on Adult Cancer data, which gathers information on various types of cancer among an estimated 34,000 adults. Consistent with past NHIS cancer modules, the 2015 NHIS relies on self-reported data; however, it provides comprehensive and detailed data for systematic assessment of gaps in critical preventive services utilization within priority groups that are disproportionately impacted by disease and health disparities.

Breast cancer screenings are asked of women aged ≥ 30 years in the NHIS, but recommended screening for women of average risk is at the age of 50–74 years. Similarly, cervical cancer screenings are recommended for women aged ≥ 21 years, and NHIS includes women aged 18 years who reported ever having a Pap test.

Measures

Recent breast cancer screening was defined as having received a mammogram within 2 years, and a recent cervical cancer screening was defined as having a Pap test within 3 years. Women who had a history of hysterectomy were excluded from the sample. This follows the current recommendations from the U.S. Preventive Services Task Force.

The main predictor variables were place of birth and family history of breast or family history of cervical cancer (female first-degree relative). Place of birth was a dichotomous variable where respondents reported either being U.S. born or foreign born. Other covariates were included such as SES, access and utilization of care, and perception of risk of breast cancer. Perceived risk of cervical cancer was not measured in the NHIS.

Statistical Analysis

Data were analyzed with Stata, version 15, to account for the complex sampling design and weighting procedures.¹⁴ “Stata allows for a design-based analysis for complex survey sample (applies sampling weights and adjusted for clustering and stratification of observations) such as the NHIS survey data. This controls for the skewness of the standard errors, which affects significance levels.”¹⁵ Percentages were computed for each variable (Table 1) as well as chi-square tests of independence to determine whether associations existed between cancer screenings and covariates. Tables 2–4 show multivariable logistic regression modeling. Data analyses were conducted in 2019.

RESULTS

The mean age of the sample was 44.5 (SD=14.8) years. More than half of the sample identified as white, non-Hispanics (55.6%), followed by Hispanics (21.2%), blacks/Africans (15.2%), and other, non-Hispanic ethnic groups (8.0%). The majority of the women (54.3%) had a high school education, 32.3% had college degrees, and 13.4% did not complete high school. For marital status, 54.8% of the women were married; 20.1% were divorced, widowed, or separated; and 25.1% were single/never married. Approximately 18% lived below the federal poverty level. Most of the participants had health insurance (87.7%). More than half (59.7%) of the women reported excellent/very good health status compared with 37.6% who reported good/fair health status and 2.7% who perceived poor health status. In the sample, 8.1% of the sample had a family history of breast cancer and 2.0% had a family history of cervical cancer.

Weighted bivariate proportions of breast and cervical cancer uptakes are shown in Table 1. Among U.S.-born women, there were significant differences between age groups ($p<0.001$) but not among foreign-born women for breast cancer screenings. U.S.-born black women had more breast cancer screenings than any other U.S.-born race (81.8%, $p<0.001$). There were no significant differences by race/ethnicity for foreign-born women; however, black women had the most screenings.

Table 1. Characteristics Associated With Uptake of Breast and Cervical Cancer Screenings

Independent variables	Sample characteristics (n=14,047) N (Weighted %)	Had a mammogram within 2 years (n=14,047)				Had a Pap test within 3 years (n=14,047)			
		U.S. born		Foreign born		U.S. born		Foreign born	
		Weighted, yes %	p-value	Weighted, yes %	p-value	Weighted, yes %	p-value	Weighted, yes %	p-value
Age, years (mean=44.5; SD=14.8)		<0.001		0.643		<0.001		<0.001	
21–30	3,202 (22.9)	79.6		75.6		90.8		88.8	
31–40	2,984 (21.3)	78.8		75.1		87.6		84.2	
41–50	2,676 (19.0)	78.7		77.2		84.0		82.2	
51–60	2,639 (18.8)	76.1		78.1		79.0		79.7	
61–74	2,546 (18.0)	70.5		73.5		66.5		70.9	
Race/ethnicity		<0.001		0.073		<0.001		0.177	
White, non-Hispanic	7,831 (55.6)	75.3		77.9		80.4		79.2	
Black, non-Hispanic/ African American	2,116 (15.2)	81.8		83.8		86.3		81.2	
Hispanic	2,967 (21.2)	72.9		75.4		83.7		82.9	
Asian, Non-Hispanic and others	1,133 (8.0)	76.7		73.3		82.4		79.2	
Education		<0.001		0.031		<0.001		0.590	
Incomplete high school	1,880 (13.4)	66.8		72.1		70.7		80.9	
High school graduate	7,602 (54.3)	72.8		76.2		79.2		81.1	
College graduate	4,565 (32.3)	82.9		79.3		88.6		82.8	
Marital status		0.003		0.345		<0.001		0.002	
Married	7,682 (54.8)	77.1		76.8		84.0		82.7	
Separated/widowed/ divorced	2,811 (20.1)	73.3		72.9		73.4		75.6	
Single/never married	3,554 (25.1)	77.3		76.5		84.2		82.9	
Family income, %		<0.001		<0.001		<0.001		0.044	
<100 of poverty level	3,218 (18.7)	67.6		66.1		78.6		80.4	
100–199	2,810 (21.2)	68.1		73.5		76.2		79.2	
200–399	3,752 (28.1)	76.3		81.1		80.5		83.0	
≥400	4,267 (32.0)	82.1		82.0		87.7		85.0	
Health insurance		<0.001		<0.001		<0.001		0.311	
No	1,725 (12.3)	58.3		61.8		70.0		80.1	
Yes	12,322 (87.7)	77.5		79.2		82.9		81.9	
Have a regular source of care		<0.001		<0.001		<0.001		<0.001	
No	1,683 (11.9)	52.0		53.3		70.0		70.4	

(continued on next page)

Table 1. Characteristics Associated With Uptake of Breast and Cervical Cancer Screenings (*continued*)

Independent variables	Sample characteristics (n=14,047) N (Weighted %)	Had a mammogram within 2 years (n=14,047)				Had a Pap test within 3 years (n=14,047)			
		U.S. born		Foreign born		U.S. born		Foreign born	
		Weighted, yes %	p-value	Weighted, yes %	p-value	Weighted, yes %	p-value	Weighted, yes %	p-value
Yes	12,364 (88.1)	78.0		79.2		83.0		83.5	
Has seen a doctor or general physician in the past 12 months		<0.001		<0.001		<0.001		<0.001	
No	4,241 (69.7)	64.1		62.9		76.7		75.2	
Yes	9,806 (30.3)	79.9		81.5		83.3		84.7	
General health status		<0.001		0.184		<0.001		0.194	
Excellent/very good	8,382 (59.7)	79.3		75.9		85.2		80.9	
Good/fair	5,288 (37.6)	83.2		76.9		77.1		82.6	
Poor	377 (2.7)	76.2		65.3		69.0		74.6	
Mother, sister, or daughter had breast cancer		0.021		0.264		0.046		0.879	
No	12,904 (91.9)	75.7		75.6		82.0		81.5	
Yes	278 (8.1)	79.3		80.4		79.4		81.0	
Mother, sister, or daughter had cervical cancer		0.528		0.387		0.278		0.246	
No	(98.0)	76.2		76.1		81.7		81.6	
Yes	(2.0)	74.2		68.2		84.5		79.3	
Perceived risk of breast cancer as other women		<0.001		0.038		<0.001		0.941	
Equally likely	(51.7)	77.3		74.3		83.2		81.3	
More likely	(10.4)	82.6		84.3		84.3		82.4	
Less likely	(37.8)	72.3		76.5		78.9		81.6	
Born in the U.S.									
No	(22.5)								
Yes	(77.5)								

Note: Boldface indicates statistical significance.

Table 2. Sociodemographic Factors With Breast and Cervical Screening Cancer Uptake by Nativity

Independent variables	Family history of breast cancer		Family history of cervical cancer	
	U.S. born, OR (95% CI)	Foreign born, OR (95% CI)	U.S. born, OR (95% CI)	Foreign born, OR (95% CI)
Age, years				
21–30	—	—	—	—
31–40	0.76 (0.49, 1.15)	0.30* (0.10, 0.89)	0.98 (0.65, 1.47)	1.14 (0.26, 4.98)
41–50	1.27 (0.83, 1.92)	0.72 (0.26, 1.92)	0.73 (0.45, 1.17)	1.42 (0.32, 6.27)
51–60	1.85** (1.22, 2.77)	1.03 (0.39, 2.74)	0.84 (0.53, 1.32)	2.20 (0.51, 9.39)
61–74	2.27*** (1.51, 3.40)	1.15 (0.43, 3.10)	0.75 (0.46, 1.23)	1.59 (0.29, 8.62)
Race/ethnicity				
White (ref)	—	—	—	—
Black/African American	0.86 (0.68, 1.11)	0.82 (0.34, 1.99)	0.31*** (0.19, 0.51)	0.50 (0.09, 2.68)
Hispanic	0.69 (0.47, 1.01)	0.92 (0.48, 1.77)	0.34*** (0.19, 0.61)	0.43 (0.14, 1.53)
Asians/others	1.16 (0.75, 1.81)	0.66 (0.32, 1.37)	1.03 (0.53, 2.00)	0.10* (0.01, 0.82)
Education				
Incomplete high school (ref)	—	—	—	—
High school graduate	0.76 (0.53, 1.07)	2.07* (1.12, 3.82)	0.62* (0.36, 0.83)	0.90 (0.30, 2.71)
College graduate	0.88 (0.61, 1.29)	2.39* (1.18, 4.87)	0.27*** (0.15, 0.43)	1.32 (0.35, 5.02)
Marital status				
Married (ref)	—	—	—	—
Separated/widowed/divorced	1.09 (0.89, 1.33)	1.34 (0.90, 2.55)	1.33 (0.99, 1.92)	0.64 (0.17, 2.33)
Single/never married	1.16 (0.91, 1.47)	1.10 (0.56, 2.08)	0.74 (0.50, 1.10)	1.07 (0.34, 3.42)
Family income, %				
<100 of poverty level	—	—	—	—
100–199	0.85 (0.62, 1.15)	1.33 (0.72, 2.45)	0.92 (0.63, 1.33)	1.58 (0.54, 4.62)
200–399	1.11 (0.86, 1.45)	0.86 (0.45, 1.65)	0.50*** (0.33, 0.74)	0.39 (0.08, 2.00)
≥400	1.00 (0.78, 1.31)	0.65 (0.32, 1.32)	0.35*** (0.22, 0.55)	1.03 (0.27, 4.00)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

U.S.- and foreign-born college graduates had more screenings than women who had less than a college degree, but education was not significant among foreign-born women. U.S.- and foreign-born women whose family income was $\geq 400\%$ of the federal poverty level had the highest mammogram uptake (U.S. born: 82.1%, $p < 0.001$; foreign born: 82%, $p < 0.001$).

For cervical cancer screenings, there were significant differences by age for U.S.-born ($p < 0.001$) and foreign-born ($p < 0.001$) women (Table 1). U.S.-born black women (86.3%) had more Pap tests than any other race in both groups, although this was only significant in U.S.-born women ($p < 0.001$). College-educated, U.S.-born women had more screenings than women without college degrees. There was a strong association between regular source of care and screening in U.S.-born (83%, $p < 0.001$) and foreign-born (83.5%, $p < 0.001$) women. The U.S.- and foreign-born women who saw a doctor had more uptake (U.S. born: 83.3%, $p < 0.001$; foreign born: 84.7%, $p < 0.001$).

For breast cancer screenings, among U.S.- and foreign-born women, the percentage of uptake was

higher for women who had health insurance, had a regular source of care, and saw a doctor in the 12 months preceding the interview than women who did not (Table 1).

Similar results were found for cervical cancer screenings. The percentage of uptake was higher when the respondents had health insurance, a regular source of care, and saw a doctor in the 12-months preceding the interview.

Mammogram uptake was higher for U.S.-born women who thought their health was good/fair (83.2%, $p < 0.001$) than for those who reported poorer health. U.S.- and foreign-born women had significantly more mammogram screenings when they perceived themselves at greater risk than other women for breast cancer (U.S. born: chi-squared=82.6%, $p < 0.001$; foreign born: 84.3%, $p < 0.05$). For the overall sample, more women had mammograms when their family had a history of breast cancer than women who did not have a family history of breast cancer. Stratified analyses indicated that only U.S.-born women had a significantly greater uptake in mammogram screenings (79.3%, $p < 0.05$).

Table 3. Sociodemographic and Access Factors With Breast and Cervical Screening Cancer Uptake by Nativity

Independent variables	Family history of breast cancer		Family history of cervical cancer	
	U.S. born, OR (95% CI)	Foreign born, OR (95% CI)	U.S. born, OR (95% CI)	Foreign born, OR (95% CI)
Age, years				
21–30	—	—	—	—
31–40	0.75 (0.49, 1.15)	0.30* (0.10, 0.90)	0.98 (0.66, 1.53)	1.16 (0.27, 5.07)
41–50	1.25 (0.83, 1.90)	0.85 (0.28, 2.01)	0.73 (0.45, 1.22)	1.56 (0.35, 6.88)
51–60	1.81** (1.20, 2.72)	1.06 (0.40, 2.89)	0.86 (0.60, 1.55)	2.81 (0.64, 12.35)
61–74	2.20*** (1.46, 3.31)	1.22 (0.44, 3.34)	0.76 (0.48, 1.36)	2.40 (0.42, 13.52)
Race/ethnicity				
White (ref)	—	—	—	—
Black/African American	0.86 (0.68, 1.10)	0.76 (0.31, 1.86)	0.31*** (0.19, 0.53)	0.40 (0.07, 2.23)
Hispanic	0.69 (0.47, 1.01)	0.88 (0.46, 1.70)	0.34** (0.20, 0.66)	0.43 (0.12, 1.48)
Asians/others	1.16 (0.75, 1.82)	0.65 (0.32, 1.35)	1.10 (0.62, 2.34)	0.09* (0.01, 0.80)
Education				
Incomplete high school (ref)	—	—	—	—
High school graduate	0.78 (0.55, 1.08)	2.10* (1.14, 3.91)	0.54** (0.40, 0.95)	0.95 (0.31, 2.91)
College graduate	0.96 (0.67, 1.36)	2.49** (1.22, 5.09)	0.24*** (0.16, 0.52)	1.40 (0.35, 5.59)
Marital status				
Married (ref)	—	—	—	—
Separated/widowed/divorced	1.11 (0.91, 1.37)	1.48 (0.87, 2.50)	1.36 (0.92, 1.94)	0.65 (0.17, 2.44)
Single/never married	1.14 (0.89, 1.47)	1.07 (0.56, 2.08)	0.74 (0.47, 1.08)	1.19 (0.37, 3.87)
Family income, %				
<100 of poverty level	—	—	—	—
100–199	0.85 (0.62, 1.16)	1.35 (0.73, 2.51)	0.91 (0.63, 1.32)	1.61 (0.54, 4.76)
200–399	1.10 (0.85, 1.44)	0.87 (0.45, 1.67)	0.49*** (0.33, 0.74)	0.43 (0.08, 2.24)
≥400	1.00 (0.76, 1.30)	0.66 (0.32, 1.36)	0.34*** (0.21, 0.54)	1.19 (0.90, 4.77)
Health insurance				
No (ref)	—	—	—	—
Yes	1.13 (0.75, 1.73)	0.71 (0.36, 1.40)	1.68 (0.94, 2.98)	0.87 (0.28, 2.66)
Have a regular source of care				
No (ref)	—	—	—	—
Yes	1.84* (1.09, 3.12)	2.22 (0.74, 6.71)	0.94 (0.57, 1.57)	1.13 (0.34, 3.85)
Have seen a doctor in the past 12 months				
No (ref)	—	—	—	—
Yes	0.98 (0.79, 1.22)	0.92 (0.53, 1.59)	0.76 (0.55, 1.04)	0.27** (0.10, 0.67)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

Concerning cervical cancer screening, U.S.-born women who reported excellent/very good general health significantly had more screenings (85.2%, $p < 0.001$) than those who reported poorer health. No statistically significant differences were observed across the family history of cervical cancer between U.S.- or foreign-born women.

In both U.S.- and foreign-born women, age was significantly associated with a family history of breast cancer screenings (Table 2). Foreign-born women with high school and graduate degrees were more than twice as likely to have had a mammogram with a family history of breast cancer (high school: AOR=2.07, 95% CI=1.12,

3.82, $p < 0.05$; graduate degree: AOR=2.39, 95% CI=1.18, 4.87, $p < 0.05$) as women who did not complete high school.

Race, education, and income were predictive of uptake for cervical cancer screenings for U.S.-born women. Black and Hispanic descent were strongly associated with uptake for U.S.-born women (black: AOR=0.31, 95% CI=0.19, 0.51, $p < 0.001$; Hispanic: AOR=0.34, 95% CI=0.19, 0.61, $p < 0.001$), but Asian descent was associated with uptake in foreign-born women (AOR=0.10, 95% CI=0.01, 0.82, $p < 0.05$). U.S.-born women with high school and graduate degrees were less likely to have had a Pap test when they had a family history of cervical

Table 4. Sociodemographic, Access, and Psychosocial Factors With Breast and Cervical Screening Uptake Cancer by Nativity

Independent variables	Family history of breast cancer		Family history of cervical cancer	
	U.S. born, OR (95% CI)	Foreign born, OR (95% CI)	U.S. born, OR (95% CI)	Foreign born, OR (95% CI)
Age, years				
21–30	—	—	—	—
31–40	0.73 (0.47, 1.15)	0.37 (0.12, 1.16)	0.94 (0.62, 1.43)	1.16 (0.26, 5.05)
41–50	1.26 (0.80, 1.97)	0.88 (0.31, 2.52)	0.67 (0.41, 1.09)	1.53 (0.35, 6.76)
51–60	1.98** (1.28, 3.08)	1.10 (0.38, 3.19)	0.80 (0.50, 1.28)	2.58 (0.58, 11.53)
61–74	2.80*** (1.80, 4.34)	1.67 (0.57, 4.91)	0.74 (0.45, 1.23)	2.11 (0.36, 12.54)
Race/ethnicity				
White (ref)	—	—	—	—
Black/African American	1.07 (0.83, 1.39)	1.06 (0.42, 2.70)	0.33*** (0.2, 0.54)	0.44 (0.08, 2.51)
Hispanic	0.72 (0.48, 1.07)	1.03 (0.52, 2.09)	0.36** (0.20, 0.64)	0.44 (0.11, 1.42)
Asians/others	1.42 (0.88, 2.29)	0.73 (0.34, 1.59)	1.11 (0.57, 2.16)	0.12* (0.01, 0.99)
Education				
Incomplete high school (ref)	—	—	—	—
High school graduate	0.67* (0.48, 0.99)	2.10** (1.10, 4.00)	0.58* (0.38, 0.89)	1.08 (0.35, 3.40)
College graduate	0.76 (0.55, 1.20)	2.95** (1.39, 6.32)	0.28*** (0.16, 0.48)	1.75 (0.41, 7.56)
Marital status				
Married (ref)	—	—	—	—
Separated/widowed/divorced	1.10 (0.89, 1.36)	1.31 (0.76, 2.27)	1.32 (0.92, 1.90)	0.56 (0.14, 2.18)
Single/Never married	1.19 (0.91, 1.53)	0.79 (0.39, 1.60)	0.73 (0.47, 1.10)	1.11 (0.34, 3.65)
Family income				
<100% of poverty level	—	—	—	—
100%–199%	0.91 (0.65, 1.27)	1.23 (0.65, 2.36)	0.94 (0.64, 1.37)	1.70 (0.56, 5.13)
200%–399%	1.14** (1.14, 1.52)	0.88 (0.45, 1.74)	0.54** (0.36, 0.81)	0.46 (0.09, 2.45)
≥400%	1.06 (0.80, 1.42)	0.65 (0.31, 1.39)	0.39*** (0.25, 0.63)	1.25 (0.30, 5.22)
Health insurance				
No (ref)	—	—	—	—
Yes	1.00 (0.6, 1.56)	0.71 (0.35, 1.45)	1.58 (0.89, 2.81)	0.78 (0.25, 2.48)
Have a regular source of care				
No (ref)	—	—	—	—
Yes	1.99* (1.14, 3.47)	2.21 (0.71, 6.87)	0.96 (0.58, 1.58)	1.22 (0.35, 4.20)
Have seen a doctor in the last 12 months				
No (ref)	—	—	—	—
Yes	0.99 (0.78, 1.26)	0.93 (0.53, 1.65)	0.72* (0.52, 1.00)	0.24 (0.09, 0.62)
General health status				
Excellent /Very good (ref)	—	—	—	—
Good/fair	0.84 (0.70, 1.02)	1.00 (0.60, 1.63)	1.59** (1.16, 2.16)	0.81 (0.30, 2.18)
Poor	0.70 (0.41, 1.18)	0.27 (0.03, 2.21)	1.48 (0.70, 3.10)	5.45 (0.88, 33.67)
Perceived risk of breast cancer as other women				
Equally likely (ref)	—	—	—	—
More likely	7.42*** (6.07, 9.07)	5.45*** (3.11, 9.54)	1.33 (0.94, 2.00)	1.19 (0.32, 4.41)
Less likely	0.48*** (0.38, 0.62)	0.48** (0.27, 0.87)	0.63** (0.44, 0.89)	0.35 (0.11, 1.09)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

cancer (high school: AOR=0.62, 95% CI=0.36, 0.83, $p < 0.05$; graduate degree: AOR=0.27, 95% CI=0.15, 0.43, $p < 0.001$) than women who did not complete high school. Education was not predictive in foreign-born

women. The likelihood of recent Pap tests decreased in U.S.-born women with higher income (Table 2).

The next model added study variables for healthcare access and utilization. For U.S.- and foreign-born

women, all the previous predictors remained for breast cancer screenings. However, for U.S.-born women, having a regular source of care was also predictive of mammogram uptake (AOR=1.84, 95% CI=1.09, 3.12, $p<0.05$).

Correspondingly, predictors of Pap uptake remained for U.S.-born and foreign-born women and cervical cancer screenings. Foreign-born women were less likely to have had a Pap test when they had a family history of cervical cancer (AOR=0.2, 95% CI=0.10, 0.67, $p<0.01$) and a doctor visit 12 months before screening.

In the final model, perception of general health and perceived risk of breast cancer were added. For U.S.-born women, age and having a regular source of care remained predictive, and education and income emerged as predictive factors for perceived risk of breast cancer (Table 4). Those who believed themselves to be more at risk were nearly 7.5 times as likely to have had a mammogram (AOR=7.42, 95% CI=6.07, 9.07, $p<0.001$) and those who thought they were less at risk were 52% less likely to have had a mammogram (AOR=0.48, 95% CI=0.38, 0.62, $p<0.001$). Age was no longer predictive for mammogram uptake with a family history of breast cancer for foreign-born women. Foreign-born women who perceived themselves to be more at risk were more than 5 times as likely to have had a mammogram (AOR=5.45, 95% CI=3.11, 9.54, $p<0.001$), and those who thought they were less at risk were 52% less likely to have had a mammogram (AOR=0.48, 95% CI=0.27, 0.87, $p<0.01$).

For U.S.-born women, seeing a doctor emerged as predictive (AOR=0.72, 95% CI=0.52, 1.00, $p<0.05$) of Pap tests. Those who perceived their health as good/fair were 59% more likely to have a Pap test than those who reported excellent/very good health (AOR=1.59, 95% CI=1.16, 2.16, $p<0.01$). Perceived risk of breast cancer was also predictive of uptake for Pap tests (AOR=0.63, 95% CI=0.44, 0.89, $p<0.01$). In foreign-born women, seeing a doctor was no longer predictive in the final model. Stratified analyses by race indicated that women of Asian heritage were most affected compared with those of other racial/ethnic groups, where they were 88% less likely to have a family history of cervical cancer and a Pap test (AOR=0.12, 95% CI=0.01, 0.99, $p<0.05$).

DISCUSSION

This study examined differences in associations and predictors for breast and cervical cancer screenings among U.S.- and foreign-born women. System-level factors were consistent with previous research. Specifically, compelling associations were found between women who had a regular source of care, saw a doctor, and had

health insurance in both groups and receiving mammograms and Pap tests. This finding provides more evidence that national breast and cervical cancer screenings are higher with better coverage.¹⁶

Women of African descent had high proportions of uptake in both groups for breast and cervical cancers than those of any other race/ethnicity. Although they have greater uptake than other race/ethnic groups, black women have later stages of diagnosis, higher incidence, and higher mortality rates for each cancer type.^{17,18} With increased access to screening through targeted interventions, they will have a greater chance at early detection, thus decreasing the chance of death.

Breast cancer screenings were higher among U.S.- and foreign-born women who reported good/fair health than those who reported excellent/very or poor health. The authors expected health perception and family history of breast cancer to be strong predictors that would increase uptake in both groups if the women perceived themselves in poor health and high risk, but they were not. The sample may have sought care similarly based on their perception of risk and health, yet both had lower rates of screenings with family history breast of cancer.

In U.S.- and foreign-born women, the recommended age to begin cervical cancer screening (21 years) was strongly associated with uptake. However, age was not predictive in modeling for screening and family history of cervical cancer. Similar results were found for women with a regular source of care. More research is needed to understand why women may not be receiving Pap tests when they have a family history of cervical cancer.

For U.S.-born women, age was strongly associated with the recommended age (50 years) for breast cancer screening and was predictive in each additive regression model. A known challenge in breast cancer screening is improving adherence to recommendations for regular testing, especially among those at elevated risk of disease.¹⁹ This finding may be indicative that adherence to screening at the recommended age is improving, but there are still some gaps and barriers to care.

Interestingly, seeing a doctor became a predictor of Pap uptake for U.S.-born women when psychosocial variables were added. This finding alludes to the recent changes in the U.S. healthcare system that resolved issues with obtaining health insurance for some Americans. Under the Affordable Care Act, more people have coverage, which may have caused other problems such as not being able to make a timely appointment. This finding presents another opportunity to further research on the U.S. healthcare system.

For foreign-born women, results show a weak association between breast cancer screening and education; however, education was strongly predictive of uptake.

Therefore, educational screening interventions could increase uptake in this population.

Being of Asian or other descent was the only predictor for not receiving Pap tests with a family history of cervical cancer in foreign-born women. This may be because their perceptions of risk are offset when no physical signs or symptoms are shown.²⁰

Limitations

The study has several limitations. English or Spanish fluency may also affect the ability of women to understand and accurately respond to questions.²¹ Combining foreign-born women, for example, Asians, Native Americans, and Pacific Islanders, in the multivariable analyses may also have obscured differences. There is a lack of data on factors that could potentially influence screening receipt, such as legal status, country of origin, and related cultural beliefs.²² Subgroups of immigrant women may have varied cultural beliefs that affect their use of cancer screening in different ways.²³

Notwithstanding these limitations, the comprehensive nature and dedicated focus of the NHIS cancer module allow for assessment of cancer screening practices at the population level, with a significantly large national representative sample, albeit cross-sectional in nature.²¹ Previous studies found good correspondence between objectively determined mammography rates and those from self-report.²¹ These results, aggregated with those from other similar studies, provide invaluable evidence for informing public health policy and guiding health promotion and disease prevention messages at the population level.

CONCLUSIONS

Cancer screening remains the hallmark of a comprehensive cancer prevention and control program at the population level. The study has several implications. Understanding factors contributing to and impeding access to screening will contribute to better and robust evidence-based and population-level strategies for increasing women's participation in screening. Women born in the U.S. are strongly influenced by their age, education, income, having a regular source of care, and risk when they sought breast screening. Family history of cancer positively predicts an increase in mammogram uptake, especially with the perceived risk of cancer. Predictors of Pap uptake are race, education, income, doctor visits, general health status, and risk.

In this study, foreign-born women's only predictors of mammograms are perceived risk of breast cancer and education with family history of breast cancer. Being of

Asian or other descent is the only predictor for Pap tests with family history of cervical cancer.

Further research on U.S.- and foreign-born women's perception of uptake and family history of breast and cervical cancers is warranted. Interventions that educate women on preventive care and increasing access to early screening for women, especially those at risk, would in turn decrease morbidity and mortality from these cancers. The increasing population of foreign-born women in the U.S. underscores the importance of public health systems to address the unique and often incongruent behavioral and health knowledge gaps that exist. This will ensure continued progress toward providing access to prevention education that emphasizes screening and the benefits of early detection.

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