ORIGINAL ARTICLE

Impact of U.S. Citizenship Status on Cancer Screening Among Immigrant Women

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OBJECTIVES: We evaluated the relationship between U.S. citizenship status and the receipt of Pap smears and mammograms among immigrant women in California.

DESIGN: Cross-sectional study using data from the 2001 California Health Interview Survey.

PATIENTS/PARTICIPANTS: Noninstitutionalized, civilian women, aged 18 years and older living in California.

MEASUREMENTS AND MAIN RESULTS: We analyzed data from the 2001 California Health Interview Survey and used logistic regression models to adjust for sociodemographic factors and for access and utilization of health services. After adjusting we found that U.S. citizen immigrants were significantly more likely to report receiving a Pap smear ever (adjusted prevalence ratio [aPR], 1.05; 95% confidence interval [CI], 1.01 to 1.08), a recent Pap smear (aPR, 1.07; 95% CI, 1.03 to 1.11), a mammogram ever (aPR, 1.17; 95% CI, 1.12 to 1.21), and a recent mammogram (aPR, 1.38; 95% CI, 1.26 to 1.49) as compared to immigrants who are not U.S. citizens. Also associated with receiving cancer screening were income, having a usual source of care, and having health insurance. Hispanic women were more likely to receive Pap smears as compared to whites and Asians.

CONCLUSIONS: Not being a U.S. citizen is a barrier to receiving cervical and breast cancer screening. Additional research is needed to explore causal factors for differences in cancer screening rates between citizens and noncitizens.

KEYWORDS: citizenship; immigrant; Pap smear; mammogram; women.
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Despite a remarkable increase in cervical Papanicolaou (Pap) smear and mammogram use rates in the past decade in the United States,[1] the benefits of cancer screening are not reaching all women. Cervical cancer continues to disproportionately strike low-income, immigrant, and minority women.[2–4] According to data from the National Health Interview Survey (NHIS), only 61% of recent immigrants reported having a Pap smear in the past 3 years as compared to 83% of women born in the United States.[1] From 1985 to 1996, cervical cancer mortality rates increased among foreign-born women in the United States to such a great extent that it contributed substantially to and influenced overall U.S. cervical cancer mortality trends.[5] Similarly, although breast cancer is more common among white women,[6] immigrants are less likely than nonimmigrants to report a mammogram in the past 2 years[1] and to be diagnosed with early stage disease.[7,8]

Numerous barriers to cancer screening have been identified; sociodemographic and health access factors such as older age, low income or educational level, and lack of health insurance or regular source of health care have been extensively documented.[3,9–19] Barriers related to culture, knowledge, and attitudes such as acculturation, fatalism, and low English proficiency also play an important role.[17,20–26] Immigrants who are not U.S. citizens may be disproportionately affected by these barriers and may face additional challenges to access and receive appropriate health care as compared to immigrants who have become U.S. citizens.[3,27–29] In previous studies, citizenship status has been shown to independently affect access to health insurance[27,30] and receipt of medications for diabetes mellitus and hypertension[31] and referrals to mental health services.[31] Previous reports suggest a potential effect of citizenship status on receipt of cancer screening[32,33]; however, one presents only unadjusted data on citizenship status and Pap smear use,[33] and the other is a preliminary report.[32] Furthermore, both of these studies are limited to a single urban location and to one racial/ethnic group.

Immigrants who are not U.S. citizens constitute an important and rapidly growing segment of U.S. and California populations. Currently, close to 18 million non-U.S. citizens live in the United States[29] and only in the last decade their numbers have increased by over 50%.[29] While the number of immigrants who became U.S. citizens has increased by 71% in the last three decades, the number of immigrants who remained non-U.S. citizens has increased by 400% during the same period.[29] California has a higher percentage and number of noncitizens than any other state in the country; approximately 5.5 million noncitizens live in the state.[29] Therefore, identifying factors than prevent immigrant women from receiving appropriate cancer screening continues to be an important public health goal. In this report, we analyze data from the California Health Interview Survey (CHIS) to assess the impact of citizenship status on the receipt of Pap smears and mammograms among immigrant women in California.

METHODS

Data Source and Study Population

We analyzed data from the 2001 CHIS. The CHIS is a telephone survey of the state of California civilian, noninstitutionalized

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population. The CHIS is a two-stage, geographically stratified random-digit-dial sample conducted for the first time in 2001. Personnel from CHIS interviewed one randomly selected adult in each of the 55,000 households sampled in the state. Major content areas for the survey included health-related behaviors, health status and conditions, health insurance coverage, and access to health care services. The interviews were conducted in 6 languages: English, Spanish, Chinese (Mandarin and Cantonese dialects), Vietnamese, Korean, and Khmer (Cambodian). The overall response rate for the 2001 CHIS adult survey was 37.7%.[34]

We examined the impact of citizenship status on the receipt of Pap smears and mammograms among immigrant women living in California. Immigrants were defined as individuals born outside the United States or its territories who currently live in this country. For our analyses on Pap smear use, we included women age 18 or older without a hysterectomy. Women with history of cervical cancer were not excluded because they would need continued screening.[35] For our analyses on mammogram use, we included women age 40 or older. Although there were inconsistencies in the guidelines regarding screening mammograms for women age 40 to 49 at the time the data were collected, citizens and noncitizens in this age group should receive mammograms in the same proportion.

There are considerable cultural differences between immigrant women and those born in the United States. To decrease the confounding effect of cultural factors, we limited our analysis of the impact of citizenship status on Pap smear and mammogram use to immigrants. Therefore, we compared use of Pap smears and mammograms between those immigrants who became U.S. citizens, know as naturalized citizens, and those who remained as noncitizens. Noncitizens are a heterogeneous group and include legal permanent residents, refugees, asylees, undocumented immigrants, and others.

Variables Assessed

The outcomes of interest were receiving a Pap smear in the past 3 years, a Pap smear ever, a mammogram in the past 2 years, and a mammogram ever according to generally accepted preventive guidelines.[35,36] We developed a multivariable logistic regression model for each outcome of interest. Self-reported citizenship status (U.S. citizen or non-U.S. citizen) was the main independent variable.

We considered the following to be potential confounders in all models: age (continuous variable), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, and other race), education attainment (<high school, high school, or >high school), annual household income (<200% or ≥200% the federal poverty level), having health insurance (any coverage or no insurance), having a usual source of health care (yes or no), years in the United States (<10 or ≥10 years), and self-reported health status (excellent, very good, or good vs fair or poor). We also included English language proficiency as a controlling variable and it included 2 categories: high (speak English "very well" or "well") and low (speak English "not well" or "not at all"). The Institutional Review Board at the University of California, Irvine approved this research project as exempt of review, because it involves use of publicly available data without personal identifiers.

Statistical Analysis

All analyses were performed with SAS Callable SUDAAN (Version 7.5.6 for Windows; Research Triangle Park, NC) to account for the CHIS's complex sampling design and to obtain proper variance estimations. For the data analysis, we first generated descriptive statistics for each study variable. To characterize factors associated with the outcomes of interest, we then conducted a bivariable analysis using χ^2 tests to compare categorical variables and t tests for continuous variables. Two-tailed P values less than or equal to .05 were considered statistically significant. To assess collinearity, we estimated Pearson correlation coefficients between all pairs of variables; a coefficient score ≥ 0.7 defined collinearity. We also assessed multicollinearity, which we defined as tolerance test scores <0.1 and variance inflation factors of >2. We found no collinearity among independent variables included in the models.

To determine the impact of citizenship status on use of Pap smears and mammograms, we developed the 4 multivariable logistic regression models described, one for each outcome of interest, adjusting for all confounders described previously. Because the outcome of interest is prevalent in our population, the odds ratios may magnify or overstate the risk association. Therefore, in order to produce accurate approximations of the risk ratios, we transformed odds ratios into prevalence ratios following standard procedures;[37] we present the results in both odds ratios and prevalence ratios. The adjusted prevalence of receiving a screening test was compared between naturalized citizens and noncitizen immigrants. We used the Wald F statistic to compare the levels of explanatory variables.

RESULTS

A total of 6,320 women were included in our analysis of cervical cancer screening and 3,828 in the analysis of breast cancer screening; 47% and 65% were naturalized citizens, respectively. Naturalized citizens in both samples were older and more likely to report having health insurance, a usual source of care, more than high school education, and an annual income of 200% of the federal poverty level or higher as compared to noncitizen immigrants (Table 1). As expected, naturalized citizens were also more likely to report speaking English well and 93% in the cervical cancer sample and 97% in the breast cancer sample had been in the United States for 10 years or more as compared to 55% and 75%, respectively, of noncitizens.

Most naturalized citizens were Hispanic or Asian, reflecting the large number of participants from these groups. However, the majority of Hispanics in our sample were noncitizens (Table 1). White women represented only 20% of the naturalized citizens and 9% of the noncitizens in the Pap smear use sample and 26% and 14%, respectively, in the mammogram use sample.

Overall, 82.7% of immigrants reported a Pap smear in the past 3 years and 88.1% a Pap smear ever; 55% reported a mammogram in the past 2 years and 84% a mammogram ever. Naturalized citizens were more likely to report having Pap smears and mammograms recently or ever.

In the multivariable logistic regression models, after adjusting for potential confounders, naturalized citizens were more likely to report receiving a Pap smear in the past 3 years

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Table 1. Characteristics of Female Immigrant Respondents of the 2001 CHIS Eligible for Pap Smear and Mammogram Testing

	Analysis of Pap Smear Use of Women Without Hysterectomy (*N*=6,320)			Analysis of Mammogram Use of Women Age 40 or Older (*N*=3,828)		
Characteristics, %	Naturalized Citizens (*n*=2,976) 43.1%	Noncitizens (*n*=3,344) 56.9%	*P* Value	Naturalized Citizens (*n*=2,472) 62.7%	Noncitizens (*n*=1,356) 37.3%	*P* Value
Had a Pap smear in past 3 years	85.5	80.6	<.001	–	–	–
Ever had a Pap smear	91.3	85.7	<.001	–	–	–
Had a mammogram in past 2 years	–	–	–	58.8	48.4	<.001
Ever had a mammogram	–	–	–	90.2	73.5	<.001
Race/ethnicity			<.001			<.001
White	20.1	9.1		26.3	13.9	
Hispanic	38.8	69.6		36.5	60.7	
Asian	37.9	19.5		34.6	23.4	
African American	0.8	0.8		0.8	0.6	
Other	2.6	1.1		1.7	1.4	
Years in the U.S.			<.001			<.001
<10	6.1	44.8		2.9	25.0	
>10	93.9	55.2		97.1	75.0	
Age, y			<.001			<.001
18–29	16.9	35.1		–	–	
30–39	26.0	36.0		–	–	
40–49	25.8	17.2		39.7	56.0	
50–64	21.0	8.7		37.0	31.8	
65+	10.3	3.1		23.3	12.3	
How well English is spoken			<.001			<.001
Not well	25.2	63.2		31.2	67.8	
Well	74.8	36.8		68.8	32.2	
Health status			<.001			<.001
Fair to poor	20.8	30.2		28.5	42.9	
Excellent to good	79.3	69.8		71.5	57.2	
Currently insured	84.9	60.2	<.001	87.9	66.5	<.001
Has a usual source of care	90.6	76.1	<.001	93.3	81.5	<.001
Federal poverty level			<.001			<.001
<199%	39.7	70.1		42.7	66.5	
>200%	60.3	29.9		57.3	33.5	
Education level			<.001			<.001
Less than high school	19.0	48.1		24.6	52.1	
High school diploma	22.5	21.2		21.2	18.3	
More than high school	58.5	30.8		54.2	29.6	

Percentages are weighted to yield California population estimates.

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(adjusted prevalence ratio [aPR], 1.07; 95% confidence interval [CI], 1.03 to 1.11) and ever (aPR, 1.05; 95% CI, 1.01 to 1.08) as compared to noncitizens (Table 2). Other factors associated with having a Pap smear ever or Pap smear in the past 3 years were Hispanic ethnicity, having a usual source of care, higher income, and having health insurance. Those in the United States for 10 years or more were more likely to report ever having a Pap smear, as were individuals over the age of 30. Compared to the youngest age group (18–29 years), women between 30 and 64 years old were most likely to get a recent Pap smear and women age 65 and older were the least likely (Table 2). As compared to white women, Hispanics were significantly more likely to report having a Pap smear ever or in the past 3 years and Asians were less likely to report any of these outcomes as compared to any other racial/ethnic group.

Naturalized citizens were more likely to report a mammogram ever (aPR, 1.17; 95% CI, 1.12 to 1.21) or in the past 2 years (aPR, 1.38; 95% CI, 1.26 to 1.49) as compared to noncitizens (Table 3). Other factors significantly associated with both of these outcomes were having a usual source of care, having health insurance, being in the United States over 10 years, and women in the 50–64 years of age group. As compared to white women, Asians were less likely to report a mammogram in the past 2 years or ever. There was no difference between white women and Hispanics. Being in the United States for 10 years or more was significantly associated with having a mammogram ever but not with having one in the past 2 years.

DISCUSSION

We found that not being a U.S. citizen is a barrier to receiving cervical and breast cancer screening among immigrants in California. Even after adjusting for sociodemographics, access to health care, English proficiency, and years in the United States, noncitizens were less likely to receive cervical or breast cancer screening as compared to immigrants who were U.S. citizens.

Consideration must be given to explanations for our findings. Noncitizen immigrants in our study were disproportionately affected by factors that have a negative impact on health care access and utilization. They had lower income, education, and English proficiency levels as compared to immigrants who had become U.S. citizens. However, as in previous reports, the impact of citizenship status persisted after taking these and health access factors into account,[30–32] suggesting a possible role for additional cultural, attitudinal, or social factors. Although we adjusted for acculturation by including language

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Table 2. Adjusted Odds Ratios and Prevalence Ratios from Logistic Regression Models Predicting Pap Smear Usage Among Immigrant Women Aged 18 and Older Without a Hysterectomy

Independent Variables	Had a Pap Smear Ever		Had a Pap Smear in the Past 3 Years	
	AOR (95% CI)	APR (95% CI)	AOR (95% CI)	APR (95% CI)
Race/ethnicity				
White	1.00	1.00	1.00	1.00
Hispanic	2.23 (1.27 to 3.92)	1.04 (1.02 to 1.06)	2.40 (1.57 to 3.66)	1.09 (1.06 to 1.12)
Asian	0.31 (0.20 to 0.48)	0.86 (0.77 to 0.93)	0.45 (0.33 to 0.63)	0.85 (0.77 to 0.92)
African American	2.55 (0.23 to28.55)	1.05 (0.80 to 1.08)	3.16 (0.52 to 19.22)	1.11 (0.88 to 1.16)
Other	0.57 (0.20 to 1.59)	0.95 (0.77 to 1.03)	0.59 (0.25 to 1.36)	0.91 (0.69 to 1.04)
Citizenship status				
Noncitizen	1.00	1.00	1.00	1.00
Naturalized citizen	1.54 (1.10 to 2.15)	1.05 (1.01 to 1.08)	1.51 (1.15 to 1.99)	1.07 (1.03 to 1.11)
Years in the U.S.				
<10	1.00	1.00	1.00	1.00
>10	1.40 (1.03 to 1.90)	1.06 (1.01 to 1.11)	1.15 (0.90 to 1.47)	1.03 (0.97 to 1.09)
Age, y				
18–29	1.00	1.00	1.00	1.00
30–39	3.94 (2.89 to 5.36)	1.21 (1.18 to 1.24)	2.51 (1.88 to 3.35)	1.18 (1.14 to 1.22)
40–49	3.91 (2.69 to 5.70)	1.21 (1.17 to 1.24)	1.97 (1.44 to 2.71)	1.15 (1.09 to 1.19)
50–64	4.52 (2.88 to 7.08)	1.23 (1.18 to 1.25)	1.91 (1.35 to 2.71)	1.14 (1.07 to 1.19)
65+	1.69 (1.09 to 2.62)	1.11 (1.02 to 1.17)	0.63 (0.43 to 0.93)	0.87 (0.75 to 0.98)
How well English is spoken				
Not well	1.00	1.00	1.00	1.00
Well	0.97 (0.70 to 1.35)	0.996 (0.95 to 1.03)	0.87 (0.66 to 1.14)	0.98 (0.92 to 1.02)
Health status				
Fair to poor	1.00	1.00	1.00	1.00
Excellent to good	1.14 (0.85 to 1.52)	1.01 (0.98 to 1.04)	1.21 (0.95 to 1.55)	1.03 (0.99 to 1.07)
Currently insured				
No	1.00	1.00	1.00	1.00
Yes	1.63 (1.23 to 2.17)	1.07 (1.03 to 1.10)	1.64 (1.29 to 2.08)	1.10 (1.05 to 1.13)
Has a usual source of care				
No	1.00	1.00	1.00	1.00
Yes	1.97 (1.46 to 2.67)	1.12 (1.08 to 1.16)	2.45 (1.90 to 3.17)	1.23 (1.18 to 1.27)
Federal poverty level				
<199%	1.00	1.00	1.00	1.00
>200%	1.74 (1.32 to 2.28)	1.05 (1.03 to 1.07)	1.59 (1.25 to 2.03)	1.07 (1.04 to 1.10)
Education level				
Less than high school	1.00	1.00	1.00	1.00
High school diploma	0.74 (0.53 to 1.03)	0.97 (0.95 to 1.03)	0.84 (0.63 to 1.12)	0.97 (0.92 to 1.02)
More than high school	0.81 (0.56 to 1.18)	0.98 (0.93 to 1.02)	0.94 (0.69 to 1.28)	0.99 (0.94 to 1.03)

CI, confidence interval; aOR, adjusted odds ratio; aPR, adjusted prevalence ratio; CI, confidence interval.

proficiency and years in the United States in the regression models, differences in cultural integration between naturalized citizens and noncitizens may have persisted, explaining some of the observed differences.[38] In addition, preventive cancer care is uncommon in many countries and immigrants may perceive it as an element of the local culture. When they formally become U.S. citizens, they may embrace cancer screening as an expected behavior of citizens of this country. Acquiring U.S. citizenship may change attitudes and behaviors among many immigrants, including those related to health such as cancer screening.

Noncitizens are a heterogeneous group with diverse sociodemographic characteristics and health services use rates.[39–44] In the case of California, groups such as refugees and undocumented immigrants constitute an important proportion of noncitizen immigrants and their cancer screening rates may influence those of noncitizens in general.[43] Refugees and undocumented immigrants may be disproportionately affected by cultural, knowledge, and attitudinal barriers to cancer screening, such as fatalism, fear, and lack of knowledge of preventive health interventions or their benefits.[17,20–24] The legal status of some noncitizens may be an additional barrier, perceived by the patient or imposed by care sites intentionally or unintentionally, to access and use health services, including preventive care.[45,46] Legal and citizenship status have become progressively more important after California's ballot Proposition 187 and the Welfare reform of 1996. Proposition 187 intended to discontinue undocumented immigrants' eligibility for most health services while mandating that health care professionals report suspected undocumented patients to authorities.[47–55] The Personal Responsibility and Work Opportunity Reconciliation Act of 1996, the Welfare reform, greatly restricted the provision of public services to undocumented immigrants and based eligibility on citizenship status.[56–58] This adverse social climate for immigrants has been progressively exacerbating.[59] More inclusive law initiatives may assist in the implementation of outreach interventions and may contribute to reduce self-imposed barriers limiting access to cancer screening programs among immigrants.

We also found that having a usual source of care and health insurance were strong predictors of recent or ever screening for cervical and breast cancer among immigrants in California, supporting findings in previous studies.[1,3] Unexpectedly, education and language proficiency were not associated with the outcomes assessed in our sample of immigrants, with the exception of those with a high school

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Table 3. Adjusted Odds Ratios and Prevalence Ratios from Logistic Regression Models Predicting Recent Mammograms Among Immigrant Women Aged 40 and Older

Independent Variables	Had a Mammogram Ever		Had a Mammogram in the Past 2 Years	
	AOR (95% CI)	APR (95% CI)	AOR (95% CI)	APR (95% CI)
Race/ethnicity				
White	1.00	1.00	1.00	1.00
Hispanic	0.69 (0.45 to 1.06)	0.97 (0.92 to 1.004)	0.79 (0.52 to 1.20)	0.90 (0.73 to 1.07)
Asian	0.46 (0.32 to 0.66)	0.92 (0.86 to 0.96)	0.50 (0.35 to 0.72)	0.71 (0.57 to 0.87)
African American	4.49 (0.89 to 22.70)	1.06 (0.99 to 1.08)	4.58 (0.91 to 23.14)	1.45 (0.96 to 1.62)
Other	0.51 (0.21 to 1.26)	0.93 (0.78 to 1.02)	0.57 (0.23 to 1.41)	0.77 (0.43 to 1.13)
Citizenship status				
Noncitizen	1.00	1.00	1.00	1.00
Naturalized citizen	2.15 (1.65 to 2.81)	1.17 (1.12 to 1.21)	2.15 (1.65 to 2.78)	1.38 (1.26 to 1.49)
Years in the U.S.				
<10 years	1.00	1.00	1.00	1.00
>10 years	1.60 (1.16 to 2.19)	1.15 (1.05 to 1.23)	1.58 (1.16 to 2.15)	1.27 (1.09 to 1.45)
Age, y				
40–49	1.00	1.00	1.00	1.00
50–64	2.80 (2.16 to 3.63)	1.17 (1.14 to 1.20)	2.09 (1.77 to 2.47)	1.38 (1.30 to 1.46)
65+	1.30 (0.89 to 1.91)	1.06 (0.97 to 1.12)	1.15 (0.89 to 1.48)	1.07 (0.94 to 1.21)
How well English is spoken				
Not well	1.00	1.00	1.00	1.00
Well	0.87 (0.60 to 1.25)	0.97 (0.87 to 1.04)	0.85 (0.63 to 1.14)	0.92 (0.78 to 1.06)
Health status				
Fair to poor	1.00	1.00	1.00	1.00
Excellent to good	0.92 (0.70 to 1.21)	0.98 (0.93 to 1.03)	0.93 (0.77 to 1.14)	0.97 (0.88 to 1.05)
Currently insured				
No	1.00	1.00	1.00	1.00
Yes	1.66 (1.21 to 2.26)	1.13 (1.05 to 1.20)	1.87 (1.47 to 2.39)	1.39 (1.24 to 1.55)
Has a usual source of care				
No	1.00	1.00	1.00	1.00
Yes	2.36 (1.68 to 3.32)	1.27 (1.18 to 1.35)	2.16 (1.61 to 2.90)	1.58 (1.35 to 1.80)
Federal poverty level				
<199%	1.00	1.00	1.00	1.00
>200%	1.18 (0.89 to 1.55)	1.03 (0.98 to 1.08)	1.13 (0.94 to 1.35)	1.06 (0.97 to 1.14)
Education level				
Less than high school	1.00	1.00	1.00	1.00
High school diploma	1.44 (1.03 to 2.00)	1.07 (1.01 to 1.12)	1.04 (0.80 to 1.35)	1.02 (0.89 to 1.14)
More than high school	1.39 (0.98 to 1.96)	1.07 (0.996 to 1.12)	1.10 (0.83 to 1.44)	1.05 (0.91 to 1.17)

CI, confidence interval; aOR, adjusted odds ratio; aPR, adjusted prevalence ratio; CI, confidence interval.

diploma being more likely to report ever having a mammogram. In addition, in our study, Hispanic immigrants were more likely to receive cervical cancer screening as compared to whites and Asians. These findings may reflect the success of statewide campaigns targeting low-acculturated Hispanics. In contrast, Asian immigrants were the least likely to report recent or ever screening for cervical or breast cancer. This result supports findings of previous studies[30,33,39,60–62] and highlights the need for culturally sensitive interventions targeting this relevant and numerous group.

Our study has several limitations. The CHIS data are based on self-report, which involves recall and social desirability biases. Previous research shows that self-report overestimates screening rates, in particular among low-income ethnic women such as noncitizens.[63–65] In this case, self-report would bias our results toward a null finding; it would decrease the cancer screening gap between naturalized citizens and noncitizens. Because of the relatively low response rate in the CHIS, the possibility of nonresponse bias exists. In an attempt to adjust for this, the racial/ethnic and sociodemographic profiles in our sample are weighted to match those of the 2000 U.S. Census for the state. Furthermore, the unweighted racial/ethnic profiles are very similar to those in the census data, suggesting that the sample is representative of the population of California. Due to the sensitive nature of legal status in the United States, some undocumented immigrants may have refused to participate in the survey. The exclusion of a group of noncitizens with presumably lower screening rates, such as undocumented immigrants, would increase the observed noncitizens' overall screening rates and decrease the disparities with citizens, again biasing the findings to the null hypothesis. Additionally, some noncitizens may have provided inaccurate representation of their citizenship or legal status. However, cross-contamination would also bias our results toward the null. Because legal status of CHIS participants is not provided in the publicly available database, we could not estimate the contribution of undocumented immigrants or refugees to the screening rates of noncitizens. Finally, the magnitude of effects was relatively small; however, a small increase in the prevalence ratio remains important because it represents large numbers of screening tests done.

Understanding the impact of citizenship status on Pap smear use may have public health policy implications at a national level but in particular to states such as California, Texas, New York, New Jersey, and Florida, where almost 70% of non-U.S. citizens live.[29] The findings of our study may help policy makers design more effective interventions aimed at eliminating barriers to cancer screening and help guide implementation of community-based educational programs and outreach initiatives among immigrants. Community-based

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educational interventions should highlight the need for screening among all women regardless of citizenship or legal residency status in a culturally sensitive manner. They should also address potential psychological and attitudinal barriers among noncitizens such as the perception that cancer screening is a privilege or duty limited to citizens of this country. Future research should explore the nature of psychological and attitudinal barriers that prevent cancer screening among noncitizen immigrant women and look at additional cultural and social factors. Future studies should also explore the impact of legal status on use of Pap smears, mammograms, and other health services among subgroups of noncitizens.

Not being a U.S. citizen is a barrier to receiving cervical and breast cancer screening. Additional research is needed to explore causal factors for differences in cancer screening rates between citizens and noncitizens. For the time being, immigrants, especially those who are not U.S. citizens, should be targeted for improved health care access and appropriate cancer screening.

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REFERENCES

1. **Swan J, Breen N, Coates RJ, Rimer BK, Lee NC.** Progress in cancer screening practices in the United States: results from the 2000 National Health Interview Survey. Cancer. 2003;97:1528–40.
2. **Skaer TL, Robison LM, Sclar DA, Harding GH.** Cancer-screening determinants among Hispanic women using migrant health clinics. J Health Care Poor Underserved. 1996;7:338–54.
3. **Calle EE, Flanders WD, Thun MJ, Martin LM.** Demographic predictors of mammography and Pap smear screening in US women. Am J Public Health. 1993;83:53–60.
4. **Trapido EJ, Burciaga Valdez R, Obeso JL, Strickman-Stein N, Rotger A, Perez-Stable EJ.** Epidemiology of cancer among Hispanics in the United States. J Natl Cancer Inst Monogr. 1995;18:17–28.
5. **Seeff LC, McKenna MT.** Cervical cancer mortality among foreign-born women living in the United States, 1985 to 1996. Cancer Detect Prev. 2003;27:203–8.
6. **Ries LAG, Eisner MP, Kosary CL, et al**. SEER Cancer Statistics Review, 1975–2000. Bethesda, MD: National Cancer Institute. Available at: http://seer.cancer.gov/csr/1975_2000. Accessed May 2003.
7. **Hedeen AN, White E.** Breast cancer size and stage in Hispanic American women, by birthplace: 1992–1995. Am J Public Health. 2001;91:122–5.
8. **Hedeen AN, White E, Taylor V.** Ethnicity and birthplace in relation to tumor size and stage in Asian American women with breast cancer. Am J Public Health. 1999;89:1248–52.
9. **Wu ZH, Black SA, Markides KS.** Prevalence and associated factors of cancer screening: why are so many older Mexican American women never screened? Prev Med. 2001;33:268–73.
10. **Howe HL, Wingo PA, Thun MJ, et al**. Annual report to the nation on the status of cancer (1973 through 1998), featuring cancers with recent increasing trends. J Natl Cancer Inst. 2001;93:824–42.
11. **Roetzheim RG, Pal N, Tennant C, et al**. Effects of health insurance and race on early detection of cancer. J Natl Cancer Inst. 1999;91:1409–15.
12. **Powell-Griner E, Bolen J, Bland S.** Health care coverage and use of preventive services among the near elderly in the United States. Am J Public Health. 1999;89:882–6.
13. **O'Malley AS, Mandelblatt J.** Delivery of preventive services for low-income persons over age 50: A comparison of community health clinics to private doctors' offices. J Community Health. 2003;28:185–97.
14. **O'Malley AS, Forrest CB, Mandelblatt J.** Adherence of low-income women to cancer screening recommendations. J Gen Intern Med. 2002;17:144–54.
15. **Mandelblatt JS, Gold K, O'Malley AS, et al**. Breast and cervix cancer screening among multiethnic women: role of age, health, and source of care. Prev Med. 1999;28:418–25.
16. **O'Malley AS, Mandelblatt J, Gold K, Cagney KA, Kerner J.** Continuity of care and the use of breast and cervical cancer screening services in a multiethnic community. Arch Intern Med. 1997;157:1462–70.
17. **O'Malley AS, Kerner J, Johnson AE, Mandelblatt J.** Acculturation and breast cancer screening among Hispanic women in New York City. Am J Public Health. 1999;89:219–27.
18. **Schur CL, Albers LA, Berk ML.** Health care use by Hispanic adults: financial vs. non-financial determinants. Health Care Financ Rev. 1995;17:71–88.
19. **Janes GR, Blackman DK, Bolen JC, et al**. Surveillance for use of preventive health-care services by older adults, 1995–1997. MMWR CDC Surveill Summ. 1999;48:51–88.
20. **Hubbell FA, Chavez LR, Mishra SI, Valdez RB.** Beliefs about sexual behavior and other predictors of Papanicolaou smear screening among Latinas and Anglo women. Arch Intern Med. 1996;156:2353–8.
21. **Chavez L, McMullin J, Mishra S, Hubbell F.** Beliefs matter: cultural beliefs and the use of cervical cancer screening tests. Am Anthropol. 2001;103:1–16.
22. **Ramirez AG, Suarez L, Laufman L, Barroso C, Chalela P.** Hispanic women's breast and cervical cancer knowledge, attitudes, and screening behaviors. Am J Health Promot. 2000;14:292–300.
23. **Tortolero-Luna G, Glober GA, Villarreal R, Palos G, Linares A.** Screening practices and knowledge, attitudes, and beliefs about cancer among Hispanic and non-Hispanic white women 35 years old or older in Nueces County, Texas. J Natl Cancer Inst Monogr. 1995;18:49–56.
24. **Perez-Stable EJ, Otero-Sabogal R, Sabogal F, McPhee SJ, Hiatt RA.** Self-reported use of cancer screening tests among Latinos and Anglos in a prepaid health plan. Arch Intern Med. 1994;154:1073–81.
25. **De Alba I, Sweningson JM, Chandy C, Hubbell FA.** Impact of English language proficiency on receipt of Pap smears among Hispanics. J Gen Intern Med. 2004;19:967–70.
26. **Goel M, Wee C, McCarthy E, Davis R, Ngo-Metzger Q, Phillips R.** Racial and ethnic disparities in cancer screening: the importance of foreign-birth as a barrier of care. J Gen Intern Med. 2003;18:1028–35.
27. **Carrasquillo O, Carrasquillo AI, Shea S.** Health insurance coverage of immigrants living in the United States: differences by citizenship status and country of origin. Am J Public Health. 2000;90:917–23.
28. **Jang M, Lee E, Woo K.** Income, language, and citizenship status: factors affecting the health care access and utilization of Chinese Americans. Health Soc Work. 1998;23:136–45.
29. **Schmidley A.** U.S. Census Bureau, Current Population Reports, Series P23-206, Profile of the Foreign-born Population in the United States: 2000. Washington, DC: U.S. Census Bureau, U.S. Government Printing Offic; 2001.
30. **Jang M, Lee E, Woo K.** Income, language, and citizenship status: factors affecting the health care access and utilization of Chinese Americans. Health Soc Work. 1998;23:136–45.
31. **Li A, Covinski K.** Citizenship status is an important determinant of health care disparity. J Gen Intern Med. 2003;18(suppl. 1):179.
32. **Katzburg J.** Impact of citizenship on access to preventive services among Latina women. Paper presented at the 128th annual meeting of the American Public Health Association, November 4, 2000, Boston, MA.
33. **Chaudhry S, Fink A, Gelberg L, Brook R.** Utilization of Papanicolaou smears by South Asian women living in the United States. J Gen Intern Med. 2003;18:377–84.
34. **California Health Interview Survey.** CHIS 2001 Methodology Series: Report 4—Response Rates. Los Angeles, CA: UCLA Center for Health Policy Research; 2002.
35. **United States Preventive Services Task Force.** Guide to Clinical Preventive Services. 2nd ed. Agency for Healthcare Research and Quality; 1996.
36. **Smith RA, Saslow D, Sawyer KA, et al**. American Cancer Society guidelines for breast cancer screening: update 2003. CA Cancer J Clin. 2003;53:141–69.
37. **Zhang J, Yu KF.** What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. JAMA. 1998;280:1690–1.
38. **Yang PQ.** Explaining immigrant naturalization. Int Migr Rev. 1994;28:449–77.
39. **Taylor VM, Jackson JC, Yasui Y, et al**. Pap testing stages of adoption among Cambodian immigrants. Asian Am Pac Isl J Health. 2000;8:58–68.
40. **Hubbell FA, Waitzkin H, Mishra SI, Dombrink J, Chavez LR.** Access to medical care for documented and undocumented Latinos in a southern California county. West J Med. 1991;154:414–7.

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41. **Chavez LR, Hubbell FA, Mishra SI, Valdez RB.** Undocumented Latina immigrants in Orange County, CA: A comparative analysis. Int Migr Rev. 1997;31:88–107.
42. **Chavez LR, Cornelius WA, Jones OW.** Utilization of health services by Mexican immigrant women in San Diego. Women Health. 1986;11:3–20.
43. **U.S. Department of Homeland Security.** Yearbook of Immigration Statistics 2002. Washington, DC: U.S. Department of Homeland Security; 2003.
44. **Fix M, Passel JS, Sucher K.** Trends in naturalization. The Urban Institute. September. Available at: http://www.urban.org.
45. **Asch S, Leake B, Gelberg L.** Does fear of immigration authorities deter tuberculosis patients from seeking care? West J Med. 1994;161:373–6.
46. **Crane LA, Kaplan CP, Bastani R, Scrimshaw SC.** Determinants of adherence among health department patients referred for a mammogram. Women Health. 1996;24:43–64.
47. **Clark WA.** Large-scale immigration and political response: popular reaction in California. Int J Popul Geogr. 1998;4:1–10.
48. **Fenton JJ, Catalano R, Hargreaves WA.** Effect of Proposition 187 on mental health service use in California: A case study. Health Aff (Millwood). 1996;15:182–90.
49. **Fenton JJ, Moss N, Khalil HG, Asch S.** Effect of California's Proposition 187 on the use of primary care clinics. West J Med. 1997;166:16–20.
50. **Freeman GP.** Reform and retreat in United States immigration policy. People Place. 1998;6:1–11.
51. **Marx JL, Thach AB, Grayson G, Lowry LP, Lopez PF, Lee PP.** The effects of California Proposition 187 on ophthalmology clinic utilization at an inner-city urban hospital. Ophthalmology. 1996;103:847–51.
52. **McBride MJ.** Migrants and asylum seekers: policy responses in the United States to immigrants and refugees from Central America and the Caribbean. Int Migr. 1999;37:289–317.
53. **Ziv TA, Lo B.** Denial of care to illegal immigrants. Proposition 187 in California. N Engl J Med. 1995;332:1095–8.
54. **Lee YT, Ottati V.** Attitudes toward U.S. immigration policy: the roles of in-group-out-group bias, economic concern, and obedience to law. J Soc Psychol. 2002;142:617–34.
55. **Halfon N, Wood DL, Valdez RB, Pereyra M, Duan N.** Medicaid enrollment and health services access by Latino children in inner-city Los Angeles. JAMA. 1997;277:636–41.
56. **Kullgren JT.** Restrictions on undocumented immigrants' access to health services: the public health implications of welfare reform. Am J Public Health. 2003;93:1630–3.
57. **Fix M, Passel JS.** Trends in noncitizens' and citizen' use of public benefits following Welfare reform: 1994–97. The Urban Institute, Available at: http://urban.org. Accessed October 12, 2003.
58. **Ellwood MR, Ku L.** Welfare and immigration reforms: unintended side effects for Medicaid. Health Aff (Millwood). 1998;17:137–51.
59. **The Gallup Organization.** Americans worried about immigration, oppose Bush plan; majority says immigrants hurt economy. The Gallup Organization. Available at: http://www.gallup.com. Accessed March 1, 2004.
60. **McPhee SJ, Stewart S, Brock KC, Bird JA, Jenkins CN, Pham GQ.** Factors associated with breast and cervical cancer screening practices among Vietnamese American women. Cancer Detect Prev. 1997;21:510–21.
61. **Tu SP, Yasui Y, Kuniyuki A, et al**. Breast cancer screening among Cambodian American women. Cancer Detect Prev. 2000;24:549–63.
62. **Yu SM, Huang ZJ, Singh GK.** Health status and health services utilization among US Chinese, Asian Indian, Filipino, and other Asian/Pacific Islander children. Pediatrics. 2004;113(pt 1):101–7.
63. **Hiatt RA, Perez-Stable EJ, Quesenberry C Jr, Sabogal F, Otero-Sabogal R, McPhee SJ.** Agreement between self-reported early cancer detection practices and medical audits among Hispanic and non-Hispanic white health plan members in northern California. Prev Med. 1995;24:278–85.
64. **Paskett ED, Tatum CM, Mack DW, Hoen H, Case LD, Velez R.** Validation of self-reported breast and cervical cancer screening tests among low-income minority women. Cancer Epidemiol Biomarkers Prev. 1996;5:721–6.
65. **McPhee SJ, Nguyen TT, Shema SJ, et al**. Validation of recall of breast and cervical cancer screening by women in an ethnically diverse population. Prev Med. 2002;35:463–73.

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