

## Breast and Cervical Cancer Screening Practices among Hispanic Women in the United States and Puerto Rico, 1998-1999

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**Background.** Results from recent studies suggest that Hispanic women in the United States may underuse cancer screening tests and face important barriers to screening.

**Methods.** We examined the breast and cervical cancer screening practices of Hispanic women in 50 states, the District of Columbia, and Puerto Rico from 1998 through 1999 by using data from the Behavioral Risk Factor Surveillance System.

**Results.** About 68.2% (95% confidence interval [CI] = 66.3 to 70.1%) of 7,253 women in this sample aged 40 years or older had received a mammogram in the past 2 years. About 81.4% (95% CI = 80.3 to 82.5%) of 12,350 women aged 18 years or older who had not undergone a hysterectomy had received a Papanicolaou test in the past 3 years. Women with lower incomes and those with less education were less likely to be screened. Women who had seen a physician in the past year and those with health insurance coverage were much more likely to have been screened. For example, among those Hispanic women aged 40 years or older who had any health insurance coverage ( $n = 6,063$ ), 72.7% (95% CI 70.7-74.6%) had had a mammogram in the past 2 years compared with only 54.8% (95% CI 48.7-61.0%) of women without health insurance coverage ( $n = 1,184$ ).

**Conclusions.** These results underscore the need for continued efforts to ensure that Hispanic women who are medically underserved have access to cancer screening services. © 2002 American Health Foundation and Elsevier Science (USA)

**Key Words:** breast cancer; cervical cancer; cancer

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prevention and control; Hispanics; screening mammography; Pap tests.

### INTRODUCTION

Hispanic women in the United States are at increased risk of invasive cervical cancer compared with non-Hispanic women [1-5]. Hispanic women are also more likely to be diagnosed with breast cancer at a later stage and may have a poorer survival following a breast cancer diagnosis, although breast cancer incidence and mortality rates are lower in Hispanic women than in non-Hispanic women [3-9]. These ethnic differences in cancer stage at diagnosis may be explained by the fact that Hispanic women, particularly those who are older, are less likely to undergo routine breast and cervical screening compared with non-Hispanic women [10-17].

Blackman et al. [17] examined trends in self-reported use of mammograms (1989-1997) and Pap tests (1991-1997) among women of different racial groups who had participated in Behavioral Risk Factor Surveillance System (BRFSS) surveys conducted in 38 states. The percentage of Hispanic women aged 40 years or older who reported that their most recent mammogram occurred within the past 2 years increased from 45.2% in 1989 to 67.0% in 1997, and the percentage of Hispanic women aged 18 years or older who reported that their most recent Pap test occurred within the past 2 years was roughly unchanged from 70.8% in 1991 to 72.8% in 1997 [17]. Screening rates among Hispanic women were somewhat lower compared with those for non-Hispanic women in the 38 states for which data were available [17]. For example, the percentage of non-Hispanic women aged 40 years or older who reported that their most recent mammogram occurred within the past 2 years increased from 54.9% in 1989 to 71.7% in 1997 [17].

Prior studies have suggested that underutilization of



TABLE 1

Percentage of Hispanic Women in 50 States, the District of Columbia, and Puerto Rico Aged 40 Years or Older, Who Had Received a Mammogram in the Past 2 Years, According to Selected Demographic Characteristics, Medical History, and Cancer Screening Practices, Behavioral Risk Factor Surveillance System, 1998-1999

	n	Unadjusted <sup>a</sup>		Adjusted <sup>b</sup>	
		%	(95% CI)	%	(95% CI)
<b>Age</b>					
40 to 49 years	2,887	61.9	(58.9,65.0)		
50 to 64 years	2,546	73.5	(70.6,76.5)		
≥65 years	1,820	72.1	(68.3,75.9)		
<b>Race</b>					
White	4,694	69.8	(67.5,72.1)	69.5	(67.2,71.7)
Black	592	70.1	(64.2,76.0)	69.5	(64.6,74.5)
Asian/Pacific Islander	169	67.9	(51.4,84.4)	76.2	(67.7,84.7)
Am. Indian/Alaska Native	144	58.2	(43.3,73.1)	58.6	(47.1,70.0)
Other	1,521	62.9	(58.4,67.3)	63.4	(59.5,67.3)
<b>Marital status</b>					
Currently married	3,506	69.6	(66.9,72.2)	70.6	(68.2,73.1)
Divorced or separated	1,755	69.1	(65.3,72.9)	69.9	(66.3,73.5)
Widowed	1,369	64.5	(59.4,69.5)	59.6	(53.7,65.6)
Never married	491	63.0	(55.7,70.3)	65.3	(58.6,72.0)
Living as unmarried couple	119	58.5	(44.6,72.5)	60.9**	(54.2,67.7)
<b>Educational attainment</b>					
<High school graduate	2,784	62.1	(58.8,65.4)	60.4	(57.1,63.8)
High school graduate/GED	2,004	69.1	(65.8,72.5)	69.8	(66.5,73.1)
Some college/tech. School	1,346	75.2	(71.5,78.9)	76.6	(73.3,80.0)
College graduate	1,091	77.3	(73.3,81.4)	79.3***	(76.0,82.6)
<b>Household income</b>					
<\$15,000	2,454	61.1	(57.5,64.7)	60.2	(56.7,63.8)
\$15,000-\$34,999	2,063	69.5	(66.2,72.8)	70.7	(67.6,73.9)
\$35,000-\$49,999	622	76.4	(70.8,82.0)	77.3	(71.1,83.5)
≥\$50,000	697	82.1	(77.2,87.0)	84.7***	(79.9,89.6)
<b>Number of children in household</b>					
None	4,755	73.9	(71.8,76.0)	72.1	(69.5,74.6)
1 child	1,213	61.5	(56.2,66.8)	59.2	(52.8,65.7)
2 children	860	65.0	(59.7,70.3)	67.4	(60.3,74.4)
3+ children	419	49.1	(41.5,56.7)	48.9***	(40.2,57.6)
<b>Number of persons in household</b>					
1 person	1,944	71.7	(68.8,74.6)	69.5	(65.6,73.4)
2 persons	2,360	73.4	(70.5,76.3)	71.7	(68.6,74.7)
3 persons	1,264	69.0	(65.0,73.0)	68.3	(64.0,72.6)
4+ persons	1,679	62.8	(58.9,66.6)	64.2*	(60.0,68.5)
<b>Employment status</b>					
Currently employed	3,095	68.5	(65.5,71.5)	72.8	(69.8,75.8)
Homemaker or retired	3,366	67.1	(64.3,69.9)	64.0	(60.8,67.2)
Unemployed	275	67.8	(59.1,76.5)	71.8	(64.3,79.3)
Unable to work	508	72.5	(65.4,79.6)	68.3*	(60.6,76.0)
<b>General health status</b>					
Good to excellent	4,545	69.2	(66.9,71.6)	69.7	(67.4,72.0)
Fair or poor	2,691	66.2	(62.9,69.5)	64.3*	(61.0,67.6)
<b>Saw physician within past year</b>					
Yes	5,693	75.9	(73.9,77.9)	75.8	(73.8,77.8)
No	1,447	43.7	(38.9,48.5)	44.4***	(39.6,49.2)
<b>Any health insurance coverage</b>					
Yes	6,063	72.7	(70.7,74.7)	72.7	(70.7,74.6)
No	1,184	53.0	(48.2,57.8)	54.8***	(48.7,61.0)
<b>Clinical breast exam</b>					
Ever	5,995	75.9	(74.1,77.7)	75.8	(74.0,77.5)
Never	1,216	37.8	(33.1,42.4)	37.8***	(33.2,42.3)
<b>Clinical breast exam in past 2 years</b>					
Yes	5,016	84.6	(82.9,86.3)	84.5	(82.9,86.1)
No	2,139	30.6	(27.2,34.0)	30.4***	(27.1,33.7)

TABLE 1—Continued

	n	Unadjusted <sup>a</sup>		Adjusted <sup>b</sup>	
		%	(95% CI)	%	(95% CI)
Pap test <sup>c</sup>					
Ever	4,570	68.2	(65.8,70.6)	69.5	(67.2,71.8)
Never	374	22.7	(16.1,29.4)	21.6***	(15.1,28.2)
Pap test in past 3 years <sup>c</sup>					
Yes	3,874	75.4	(72.9,77.9)	77.4	(75.1,79.6)
No	1,031	19.1	(15.4,22.9)	17.9***	(14.4,21.3)
Current cigarette smoker					
Yes	1,009	61.7	(56.6,66.9)	62.8	(57.6,68.1)
No	6,231	69.2	(67.1,71.2)	68.9	(67.0,70.9)
Current alcohol user					
Yes	1,231	76.4	(72.2,80.7)	74.0	(69.2,78.8)
No	3,159	67.2	(64.2,70.3)	66.6***	(62.9,70.3)

<sup>a</sup> Weighted population estimates unadjusted for age; women who responded don't know or not sure or who refused are excluded.

<sup>b</sup> Weighted population estimates adjusted to the 1998–1999 age and calendar year distribution for Hispanic women in this sample.

<sup>c</sup> Excludes women who had had a hysterectomy.

\*  $P < 0.05$ ; significance testing for associations with each variable (with two or more categories) was limited to age-adjusted rates.

\*\*  $P < 0.01$ .

\*\*\*  $P < 0.001$ .

screening tests among Hispanic women may be due to their limited awareness or knowledge about cancer screening [11,12,18–20]. In a survey of 923 Mexican-American women in Texas, for example, Suarez et al. [18] found that those who were 65 years of age and older or less fluent in English were less knowledgeable about cancer screening and less likely to have had a recent mammogram or Pap test [18]. Other barriers to breast and cervical cancer screening among Hispanic women may include cost and lack of health insurance, lack of transportation or child care, cultural beliefs (for example, the belief that breast trauma may induce breast cancer or that cancer is God's punishment for improper or immoral behavior), embarrassment about mammograms and Pap tests, and fear or fatalistic attitudes about cancer [11,20–22]. Previous studies have shown that Hispanic women who have not received routine health care or a provider's recommendation to get a mammogram or Pap test are less likely to have been screened [10,11,19,23]. Results from prior studies have also suggested that Hispanic women are less likely to have health insurance, less likely to have been seen by a health care provider, and less likely to use preventive services compared with non-Hispanic women [10,11]. In a study of screening mammography and clinical breast examinations among black, Hispanic, and white women who had been surveyed as part of the 1990 Behavioral Risk Factor Surveillance System, Frazier et al. [10] found that important predictors of the use of breast screening procedures for each group included having had a routine examination or checkup in the past year. About 707 Hispanic women from 44 states and the District of Columbia were included in their analysis.

This paper describes the breast and cervical cancer screening practices of Hispanic women in 50 states, the District of Columbia, and Puerto Rico obtained by population-based probability samples from 1998 through 1999. The preventive practices examined included screening mammography, clinical breast examinations, and Pap tests.

## METHODS

The data used were from 15,180 self-identified Hispanic women who were interviewed as part of the BRFSS from 1998 through 1999. All eligible Hispanic women were included regardless of their self-identified race (white, black, Asian and Pacific Islander, American Indian and Alaska Native, or other). The ages of 47 women were unknown, which left a sample of 15,133 women available for analysis. Data from this 2-year period were pooled to increase the size of the sample available for this analysis.

The BRFSS is a state-based telephone survey of adults 18 years or older [24,25]. The BRFSS uses a random-digit-dialing technique and multistage cluster sampling in each participating state to sample noninstitutionalized adults who have telephones [26]. A computer-assisted interview is administered by trained interviewers. The interviews included questions about general health status, tobacco use, alcohol consumption, demographic and socioeconomic characteristics, screening mammography, and Pap tests. During the period of interest (1998 through 1999), each adult female respondent was asked whether she had ever had a mammogram; those who responded positively were

TABLE 2

Percentage of Hispanic Women in 50 States, the District of Columbia, and Puerto Rico Aged 18 Years or Older, Who Had Received a Pap Test in the Past 3 Years, According to Selected Demographic Characteristics, Medical History, and Cancer Screening Practices, Behavioral Risk Factor Surveillance System, 1998–1999<sup>a</sup>

	n	Unadjusted <sup>b</sup>		Adjusted <sup>c</sup>	
		%	(95% CI)	%	(95% CI)
<b>Age</b>					
18 to 29 years	3,729	77.9	(75.8,80.1)		
30 to 39 years	3,692	86.1	(84.3,87.9)		
40 to 49 years	2,298	84.8	(82.4,87.3)		
50 to 64 years	1,584	82.1	(79.1,85.2)		
≥65 years	1,047	67.2	(61.9,72.5)		
<b>Race</b>					
White	7,727	82.2	(80.8,83.6)	82.0	(80.5,83.4)
Black	945	83.7	(80.5,86.9)	83.6	(80.5,86.7)
Asian/Pacific Islander	355	84.7	(78.9,90.4)	81.6	(75.9,87.4)
Am. Indian/Alaska Native	254	80.9	(71.6,90.1)	79.5	(73.1,85.8)
Other	2,859	77.7	(75.2,80.2)	75.9**	(73.3,78.4)
<b>Marital status</b>					
Currently married	5,954	86.4	(85.1,87.8)	85.4	(83.9,86.9)
Divorced or separated	2,355	84.0	(81.4,86.6)	84.0	(81.1,86.9)
Widowed	919	70.6	(64.9,76.3)	87.9	(84.8,91.1)
Never married	2,606	69.4	(66.5,72.3)	73.2	(69.6,76.8)
Living as unmarried couple	502	81.6	(76.0,87.2)	76.9***	(72.7,81.2)
<b>Educational attainment</b>					
<High school graduate	3,499	76.8	(74.5,79.1)	77.2	(74.9,79.5)
High school graduate/GED	3,648	81.6	(79.5,83.6)	81.9	(79.9,83.9)
Some college/tech. School	3,061	84.3	(82.3,86.2)	85.9	(84.1,87.7)
College graduate	2,122	87.7	(85.5,89.9)	87.2***	(85.0,89.4)
<b>Household income</b>					
<\$15,000	3,312	76.5	(74.2,78.9)	76.7	(74.4,79.0)
\$15,000–\$34,999	4,283	83.7	(81.8,85.5)	83.8	(81.9,85.6)
\$35,000–\$49,999	1,274	89.3	(86.3,92.2)	87.6	(83.9,91.2)
≥\$50,000	1,290	91.4	(88.9,93.9)	90.9***	(88.1,93.7)
<b>Number of children in household</b>					
None	4,854	77.4	(75.6,79.3)	79.1	(77.2,81.0)
1 child	2,632	81.9	(79.4,84.4)	78.9	(75.4,82.3)
2 children	2,746	87.2	(85.2,89.2)	86.3	(83.5,89.1)
3+ children	2,105	81.0	(78.1,83.8)	79.0***	(75.4,82.6)
<b>Number of persons in household</b>					
1 person	1,761	78.4	(75.6,81.1)	82.2	(79.4,84.9)
2 persons	2,845	82.4	(80.3,84.5)	83.3	(81.4,85.3)
3 persons	2,590	83.4	(81.1,85.6)	81.8	(79.2,84.3)
4+ persons	5,141	80.8	(79.1,82.5)	79.3**	(76.9,81.7)
<b>Employment status</b>					
Currently employed	7,341	81.8	(80.3,83.3)	81.7	(79.4,83.9)
Homemaker or retired	3,830	80.5	(78.5,82.6)	81.5	(79.4,83.5)
Unemployed	710	82.8	(78.4,87.2)	85.1	(81.4,88.7)
Unable to work	450	79.9	(73.1,86.6)	82.7	(77.4,87.9)
<b>General health status</b>					
Good to excellent	9,565	82.8	(81.6,84.0)	82.3	(81.0,83.6)
Fair or poor	2,760	76.8	(74.1,79.5)	77.0***	(74.2,79.7)
<b>Saw physician within past year</b>					
Yes	9,034	87.3	(86.2,88.4)	87.2	(86.1,88.3)
No	3,103	67.3	(64.6,69.9)	64.2***	(61.2,67.2)
<b>Any health insurance coverage</b>					
Yes	9,394	84.9	(83.8,86.0)	84.7	(83.6,85.8)
No	2,940	73.7	(71.2,76.2)	71.3***	(68.3,74.3)
<b>Mammogram</b>					
Ever	5,562	90.0	(88.8,91.2)	90.2	(88.9,91.4)
Never	6,777	75.2	(73.5,76.9)	66.0***	(63.6,68.5)

TABLE 2—Continued

	<i>n</i>	Unadjusted <sup>b</sup>		Adjusted <sup>c</sup>	
		%	(95% CI)	%	(95% CI)
Mammogram in past 2 years					
Yes	4,320	94.0	(93.0,95.1)	93.6	(92.4,94.9)
No	7,994	75.1	(73.6,76.7)	67.4***	(65.4,69.3)
Current cigarette smoker					
Yes	2,060	80.1	(77.3,83.0)	77.9	(75.0,80.9)
No	10,267	81.6	(80.4,82.9)	81.3	(80.1,82.6)
Current alcohol user					
Yes	2,723	85.2	(82.7,87.7)	84.2	(81.4,86.9)
No	4,621	81.2	(79.3,83.0)	82.1*	(79.6,84.6)

<sup>a</sup> Excludes women who had had a hysterectomy.

<sup>b</sup> Weighted population estimates unadjusted for age; women who responded don't know or not sure or who refused are excluded.

<sup>c</sup> Weighted population estimates adjusted to the 1998–1999 age and calendar year distribution for Hispanic women in this sample.

\*  $P < 0.05$ ; significance testing for associations with each variable (with two or more categories) was limited to age-adjusted rates.

\*\*  $P < 0.01$ .

\*\*\*  $P < 0.001$ .

asked how long it had been since their last mammogram. Similar questions were asked for Pap test. Women were also asked whether they had undergone a hysterectomy. With respect to Hispanic ethnicity, the respondents were asked, "Are you of Spanish or Hispanic origin?"

The study population ( $n = 15,133$ ) was drawn from self-reported Hispanic women aged 18 years or older who responded to BRFSS surveys in 50 states, the District of Columbia, and Puerto Rico. Analyses of screening mammogram were limited to Hispanic women who were 40 years of age or older regardless of hysterectomy status ( $n = 7,342$ ). Analyses of Pap test use were limited to those who were 18 years of age or older who had not had a hysterectomy ( $n = 12,460$ ).

Crude and age-specific rates of screening test use were calculated for the 2-year period of interest. In examining bivariate associations, levels of statistical significance were obtained using Pearson's  $\chi^2$  tests and SUDAAN [27]. With the exception of screening rates stratified by age categories, significance testing for bivariate associations was limited to age-adjusted rates. The direct method was used to adjust estimates of the proportion of women screened for cancer for age and calendar year using the distribution for Hispanic women in the overall analytic sample as the standard. All analyses used SAS and SUDAAN to calculate the 95% confidence intervals (CIs) and  $P$  values and to allow for weighting of the estimates [27]. Telephone surveys tend to undersample certain subpopulations, such as young persons. To better represent the overall population (of all races) and to enable the different samples to be combined and compared, the samples were weighted to compensate for the unequal sampling probability resulting from the unique number of phones per household; number of unique phone numbers per primary sampling unit; and poststratification by age,

sex, and race. Women who reported that they had had a hysterectomy, and who therefore did not have an intact uterine cervix, were excluded from analyses of Pap test use.

To examine geographic variation in screening rates, estimates of the proportion of Hispanic women screened for cancer were obtained for individual states where at least 50 Hispanic women within the targeted age intervals had responded to BRFSS surveys during 1998 through 1999.

A multivariate analysis of predictors of screening test use was carried out using logistic regression techniques and SUDAAN [27]. Indicator (design) variables for survey year, age categories, and race categories were included in all models, even where the association was not significant in univariate analysis. However, most of the variables included in the multivariate models were found to be significantly associated with screening in univariate analysis. Two or more indicator variables were included for categorical variables such as age and the Wald  $F$  test was used to examine the overall statistical significance of related design variables. Covariates for categories of educational attainment were included in the models rather than those for household income to avoid problems with collinearity and missing data. Covariates for number of children in the household were included rather than those for number of persons in the household.

## RESULTS

Among the Hispanic women who were at least 40 years of age regardless of hysterectomy status, 43.1% were 40 through 49 years; 34.1% were 50 through 64 years; and 22.8% were 65 years or older, all on the basis of weighted estimates (results not shown). About 44.7% (2,844 of 7,312) reported having less than a high school

TABLE 3

Breast and Cervical Cancer Screening Practices of Hispanic Women in 50 States, the District of Columbia, and Puerto Rico by State or Place of Residence, Behavioral Risk Factor Surveillance System, 1998–1999<sup>a</sup>

	Mammogram in past 2 years among women 40 years or older			Pap test in past 3 years among women 18 years or older <sup>b</sup>		
	<i>n</i>	%	(95% CI)	<i>n</i>	%	(95% CI)
Alabama				53	83.7	(75.9,91.5)
Alaska				73	90.4	(84.0,96.7)
Arizona	177	65.2	(56.5,73.8)	328	80.2	(74.9,85.4)
Arkansas				61	79.5	(70.6,88.4)
California	430	72.1	(67.5,76.7)	999	84.1	(81.2,87.0)
Colorado	134	67.8	(58.5,77.2)	256	80.4	(75.2,85.7)
Connecticut	98	73.1	(63.0,83.2)	271	75.2	(70.0,80.4)
Delaware				76	94.2	(89.9,98.5)
Florida	420	71.5	(66.1,76.8)	664	85.6	(82.5,88.7)
Georgia				62	82.6	(75.0,90.2)
Hawaii	148	74.6	(66.5,82.7)	277	87.4	(83.3,91.5)
Idaho	92	59.5	(49.8,69.2)	214	82.0	(77.4,86.6)
Illinois	96	72.6	(63.9,81.3)	255	81.7	(76.1,87.2)
Indiana				52	72.4	(61.1,83.7)
Iowa				66	83.0	(76.5,89.4)
Kansas	79	63.7	(53.0,74.4)	184	88.4	(83.7,93.0)
Louisiana	57	62.2	(51.2,73.1)	66	74.7	(66.7,82.7)
Maryland	64	70.2	(58.1,82.3)	117	83.3	(78.3,88.3)
Massachusetts	161	82.3	(76.1,88.5)	403	81.4	(76.1,86.7)
Michigan				73	87.8	(83.1,92.6)
Minnesota	50	53.7	(41.7,65.7)	99	82.1	(76.9,87.3)
Missouri	51	59.7	(46.5,72.9)	66	92.6	(87.3,97.9)
Nebraska				56	82.8	(77.3,88.3)
Nevada	85	69.8	(59.7,79.8)	151	86.6	(81.8,91.3)
New Jersey	110	72.2	(63.5,80.9)	237	75.0	(69.6,80.3)
New Mexico	838	65.6	(62.1,69.2)	1,189	82.3	(79.9,84.7)
New York	148	74.0	(65.8,82.3)	296	85.8	(81.3,90.2)
North Carolina				53	95.1	(91.1,99.1)
Oklahoma				63	86.9	(79.3,94.4)
Oregon				91	77.0	(69.6,84.3)
Pennsylvania				77	84.2	(77.8,90.6)
Rhode Island	106	71.6	(62.6,80.5)	227	83.0	(77.1,89.0)
South Carolina				67	86.5	(78.9,94.1)
Texas	676	59.7	(55.5,63.9)	1,356	75.1	(72.2,78.0)
Utah	65	60.8	(50.0,71.5)	140	77.1	(70.1,84.0)
Virginia	60	80.6	(72.4,88.7)	110	80.3	(73.5,87.1)
Washington	59	74.8	(63.2,86.3)	141	83.3	(78.7,87.9)
Wyoming	67	74.2	(63.3,85.1)	108	82.5	(76.8,88.2)
All 50 states and DC	5,044	69.3	(67.2,71.4)	9,550	82.1	(80.8,83.4)
Puerto Rico	2,209	62.6	(60.3,65.0)	2,800	72.1	(70.2,73.9)

<sup>a</sup> Weighted population estimates adjusted to the 1998–1999 age and calendar year distribution for Hispanic women in this sample. Women who responded don't know or not sure or who refused are excluded. Results for states where there were fewer than 50 respondents are not shown.

<sup>b</sup> Excludes women who had had a hysterectomy.

education. About 37.4% (2,493 of 5,892) reported having an annual household income of \$15,000 or less. Almost 76.7% (5,758 of 7,220) reported that they had seen a physician within the past year.

Among the women who had not had a hysterectomy, about 33.7% were 18 through 29 years old; 29.7% were 30 through 39 years; 18.4% were 40 through 49 years; 11.4% were 50 through 64 years; and 6.9% were 65 years or older, all on the basis of weighted estimates (results not shown). Thirty-five percent of the women

(3,565 of 12,439) reported having less than a high school education. About 31.1% (3,360 of 10,229) reported having an annual household income of \$15,000 or less. Almost 71.7% (9,108 of 12,236) reported that they had seen a physician within the past year.

Almost 79.6% (95% CI = 77.9 to 81.4%) of 7,303 women aged 40 years or older reported that they had ever received a mammogram, and 68.2% (95% CI = 66.3 to 70.1%) of 7,253 women aged 40 years or older had received a mammogram in the past 2 years (results

not shown). Stratified analyses (Table 1) showed that the lowest screening rates were for women aged 40 to 49 years. Not having had a mammogram in the past 2 years was associated with marital status (with lower rates for those who were living as an unmarried couple or widowed), lower education, lower household income, more children in the household, employment status, general health status, not having seen a physician in the past year, lack of health insurance, not using other cancer screening tests, and current alcohol use (Table 1).

Among 12,425 women who were 18 years or older who had not had a hysterectomy, 88.4% (95% CI = 87.4 to 89.3%) had ever received a Pap test and 81.4% (95% CI = 80.3 to 82.5%) had received a Pap test in the past 3 years (results not shown). Not having had a Pap test in the past 3 years was associated with older age, race, marital status (with lower rates for those who were single or living as an unmarried couple), lower education, lower household income, more children in the household, general health status, not having seen a physician in the past year, lack of health insurance, not using other cancer screening tests, and current alcohol use (Table 2).

Regional estimates of the proportion of Hispanic women who had received a mammogram in the past 2 years or a Pap test in the past 3 years are shown in Table 3. Although the numbers of respondents from some individual states were small, and confidence intervals often overlapped, there was noticeable geographic variation in cancer screening rates (Table 3). For example, fewer women in parts of the Mountain region (Idaho), Midwest (Minnesota), and South (Missouri, Texas) had had a recent mammogram. Fewer women in parts of the Midwest (Indiana) and South (Louisiana) and Puerto Rico had had a recent Pap test.

In multivariate analysis (Table 4), factors found to be positively associated with having had a mammogram in the past 2 years included age, race, marital status, education, number of children, having health insurance, having seen a physician in the past year, and year of survey ( $P < 0.05$  in each instance). Factors found to be positively associated with having had a Pap test in the past 3 years included age, race, marital status, education, number of children, general health status, having health insurance, having seen a physician in the past year, and year of survey (Table 5,  $P < 0.05$  in each instance).

## DISCUSSION

The results of this survey provide information about the frequency of breast and cervical cancer screening practices among a diverse sample of Hispanic women in the United States including those who are of Mexican,

TABLE 4

Multivariate Predictors of Having Had a Mammogram in the Past 2 Years among Hispanic Women in the United States and Puerto Rico Aged 40 Years or Older, Behavioral Risk Factor Surveillance System, 1998–1999<sup>a</sup>

	Adjusted odds ratio	(95% CI)
Survey year**		
1998	1.00	
1999	1.29	(1.07, 1.57)
Age***		
40 to 49 years	1.00	
50 to 64 years	1.65	(1.28, 2.14)
≥65 years	1.38	(0.98, 1.93)
Race*		
White	1.00	
Black	1.13	(0.75, 1.70)
Asian/Pacific Islander	0.71	(0.33, 1.52)
Am. Indian/Alaska Native	0.48	(0.25, 0.90)
Other	0.79	(0.62, 1.00)
Marital status*		
Currently married	1.00	
Divorced or separated	1.04	(0.80, 1.34)
Widowed	0.63	(0.46, 0.87)
Never married	0.75	(0.52, 1.09)
Living as unmarried couple	0.80	(0.43, 1.51)
Educational attainment***		
<High school graduate	1.00	
High school graduate/GED	1.31	(1.01, 1.70)
Some college/tech. school	1.68	(1.26, 2.24)
College graduate	1.91	(1.39, 2.63)
Number of Children**		
3+ children	1.00	
2 children	1.82	(1.18, 2.81)
1 child	1.42	(0.93, 2.18)
None	2.04	(1.39, 3.00)
Employment status		
Currently employed	1.00	
Homemaker or retired	0.85	(0.66, 1.09)
Unemployed	1.33	(0.81, 2.18)
Unable to work	1.28	(0.77, 2.13)
General health status		
Good to excellent	1.07	(0.86, 1.33)
Fair or poor	1.00	
Saw physician within past year***		
Yes	3.43	(2.70, 4.36)
No	1.00	
Any health insurance coverage***		
Yes	1.58	(1.21, 2.06)
No	1.00	

<sup>a</sup> Women who responded don't know or not sure or who refused to answer are excluded. All of the variables shown were included in the model.

\*  $P < 0.05$  from Wald  $F$  test.

\*\*  $P < 0.01$  from Wald  $F$  test.

\*\*\*  $P < 0.001$  from Wald  $F$  test.

Puerto Rican, Cuban, or other Latin American descent. About 60% of Hispanics in the United States are of Mexican descent, and many of these women reside in California and Texas [28]. Almost 80% of U.S. Hispanics live in urban areas and have incomes below the poverty

TABLE 5

Multivariate Predictors of Having Had a Pap Test in the Past 3 Years among Hispanic Women in the United States and Puerto Rico Aged 18 Years or Older, Behavioral Risk Factor Surveillance System, 1998-1999<sup>a</sup>

	Adjusted odds ratio	(95% CI)
Survey year**		
1998	1.00	
1999	1.26	(1.07, 1.48)
Subject's age***		
18 to 29 years	1.00	
30 to 39 years	1.32	(1.06, 1.66)
40 to 49 years	1.11	(0.86, 1.44)
50 to 64 years	1.04	(0.76, 1.41)
≥65 years	0.36	(0.25, 0.53)
Race**		
White	1.00	
Black	1.27	(0.92, 1.75)
Asian/Pacific Islander	0.92	(0.57, 1.48)
Am. Indian/Alaska Native	1.01	(0.48, 2.11)
Other	0.72	(0.60, 0.88)
Marital status***		
Currently married	1.00	
Divorced or separated	0.93	(0.72, 1.19)
Widowed	0.67	(0.47, 0.94)
Never married	0.34	(0.28, 0.43)
Living as unmarried couple	0.86	(0.58, 1.27)
Educational attainment***		
<High school graduate	1.00	
High school graduate/GED	1.17	(0.95, 1.44)
Some college/tech. school	1.51	(1.20, 1.89)
College graduate	1.68	(1.24, 2.29)
Number of children**		
3+ children	1.00	
2 children	1.45	(1.09, 1.93)
1 child	1.05	(0.79, 1.39)
None	0.88	(0.66, 1.16)
General health**		
Good to excellent	1.33	(1.08, 1.62)
Fair or poor	1.00	
Saw physician within past year***		
Yes	3.62	(3.04, 4.32)
No	1.00	
Health insurance coverage***		
Yes	1.63	(1.35, 1.97)
No	1.00	

<sup>a</sup> Women who responded don't know or not sure or who refused to answer are excluded along with those who had had a hysterectomy. All of the variables shown were included in the model.

\*  $P < 0.05$  from Wald  $F$  test.

\*\*  $P < 0.01$  from Wald  $F$  test.

\*\*\*  $P < 0.001$  from Wald  $F$  test.

line [12]. Hispanics are the fastest growing minority in the United States and will soon become the largest minority group in the nation [29].

An important limitation of the present study was the lack of information about the screening practices of specific groups of Hispanic women such as Mexican American women and those of Cuban heritage. Information from prior studies (for example, results obtained

by Zambrana et al. [30] in their analysis of data from the 1990 and 1992 National Health Interview Surveys) indicates that screening rates may be lower for Mexican women compared with other Hispanic women. Although we lacked information about which Hispanic communities the respondents were from, our analysis of data from individual states did provide useful information about groups of Hispanic women in the United States who are less likely to undergo cancer screening. To the extent that Hispanics in the southwestern United States are more likely to be of Mexican descent, our findings are consistent with results obtained in previous studies which have suggested that, within the Hispanic population, barriers to health care may be greatest for Mexican Americans [31]. The observed racial differences in utilization of cancer screening tests (Tables 1 and 2), which are limited by the small number of Hispanic women in some racial categories in this sample, may be due to differences in cultural beliefs, length of residence in the United States, or other factors not measured or taken into account in the present analysis.

Although national rates must be interpreted with caution because of the heterogeneity of Hispanic communities in the United States, national data on the breast and cervical cancer screening practices of Hispanic women are useful for evaluating progress toward year 2010 objectives [32]. These objectives include increasing to at least 70% the percentage of women aged 40 years or older who have received a mammogram within the preceding 2 years. Year 2010 objectives for the nation also include increasing to at least 97% the percentage of women aged 18 years or older who have ever received a Pap test and to at least 90% the percentage who received a Pap test within the preceding 3 years. The results of the present survey suggest that Hispanic women in the United States are approaching these objectives. However, estimates of the percentage of women of all races who undergo routine breast and cervical screening obtained from telephone surveys such as BRFSS may be higher than those obtained from household surveys such as the National Health Interview Survey. Women who lack a household telephone are more likely to have a lower income or to live in rural areas.

The present study is limited by the lack of information about whether the interviews were completed in English or Spanish, which may be a marker for acculturation or a surrogate measure of the effects of education and socioeconomic status on health behavior [19,33]. Puerto Rico and states with sizeable Hispanic populations, including California, New Mexico, Colorado, and Texas, do utilize a Spanish questionnaire for BRFSS.

The present study is also limited by the lack of information about some barriers to cancer screening among Hispanic women such as cultural beliefs, fear and fatalistic attitudes about cancer, and lack of knowledge about the importance of screening and early detection of breast and cervical cancer [11,12,18-22]. Fatalistic attitudes about cancer (for example, the belief that there is nothing one can do to prevent cancer because life events are inevitable) may be more common among Hispanic immigrants than among Hispanics born in the United States [21]. Many Hispanic women, especially those with shorter residence in the United States, may also have misconceptions about cancer such as the belief that bumps or bruises cause cancer or that surgery causes cancer to spread [20]. Although we did not examine associations with formal measures of social networks [34], variables related to social support were included in the analysis including marital status and number of persons in the household.

Response bias is a possibility because the telephone survey excluded women living in households without a telephone. Overall response rates, among households of all races and ethnicities, were 59.1 and 55.2% in the 1998 and 1999 BRFSS, respectively. However, variation in response rates across states could partly account for geographic or regional variation in estimates of cancer screening rates. BRFSS response rates specifically for Hispanic women are unavailable. Finally, self-reported information about cancer screening practices may differ from information obtained from the records of health care providers. Validation studies have suggested that patients tend to overreport their use of screening and underestimate the time since their last screen [35-37].

Our results are consistent with those obtained in previous studies that have shown that Hispanic women and women of other ethnic backgrounds are more likely to undergo cancer screening if they have a regular health care provider [30,38]. Having a regular health care provider is often associated with higher income and better insurance coverage. Many Hispanic persons in the United States lack health insurance and are therefore less likely to receive medical care compared with other ethnic groups [38]. Only 70.6% of Hispanic women in the present study reported having some form of health insurance coverage, compared with 86.8% of all women 18 years of age or older, regardless of their race or ethnicity, who participated in the 1998-1999 BRFSS surveys in the United States and Puerto Rico.

These results underscore the need for continued efforts to ensure that Hispanic women who are medically underserved have access to cancer screening services. Current efforts underway in the United States include the National Breast and Cervical Cancer Early Detection Program of the Centers for Disease Control and Prevention which provides support to states for breast

and cervical screening services for medically underserved women [39].

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