

Pap smear use in California: are we closing the racial/ethnic gap?

Israel De Alba, M.D., M.P.H.^{a,b,*}, Quyen Ngo-Metzger, M.D., M.P.H.^{a,b},
Jamie M. Sweningson, M.P.H.^b, F. Allan Hubbell, M.D., M.S.P.H.^{a,b}

^aDepartment of Medicine, Division of General Internal Medicine and Primary Care, University of California, Irvine, CA 92697, USA

^bCenter for Health Policy Research, University of California, Irvine, CA 92697, USA

Available online 5 November 2004

Abstract

Background. Minority women continue to be disproportionately affected by cervical cancer. Minority population groups at high risk for cervical cancer may be failing to fully comply with screening recommendations. The use of Pap smears among women in California was evaluated to identify ethnic groups at higher risk for noncompliance with cervical cancer screening.

Methods. Cross-sectional analysis of 2001 California Health Interview Survey data. Logistic regression was used to assess the independent contribution of race/ethnicity to the use of Pap smears.

Results. Hispanic (aPR = 1.03, 95%CI 1.02–1.05) and Black (aPR = 1.03, 95% CI 1.001–1.06) women are more likely to report a Pap smear in the past 3 years as compared to White women. Asians were the least likely to report cervical cancer screening despite a more favorable sociodemographic profile. Screening rates varied among Hispanic or Asian subgroups; Mexicans, Vietnamese, Chinese, and South Asians are particularly underserved.

Conclusions. In contrast to the country as a whole, Hispanic women in California are more likely to report a recent Pap smear as compared to White women. However, racial/ethnic disparities in Pap smear use persist; Asian women are the least likely to report cervical cancer screening as compared to any other group.

© 2004 Elsevier Inc. All rights reserved.

Keywords: Cervical cancer; Pap smear; Race/ethnicity; Screening

Introduction

The incidence and mortality rates of invasive cervical cancer in the United States have continuously decreased in the past decades [1,2] as the use of Pap smears has increased [3]. However, minority women continue to be disproportionately affected by cervical cancer [1]. Although invasive cervical cancer can be prevented by regular screening [4], the prevalence of Pap smear testing remains relatively low among minority populations such as Hispanics and Asians [5]. In a recent analysis of National Health Interview Survey data, after adjusting for sociodemographic and access factors, only 77.8% of Hispanic and 70.8% of Asian women

reported having a Pap smear in the past 3 years as compared to 84.1% of Black and 83.4% of White women [6].

California has more cervical cancer cases than any other state; nearly 14% of all new cases nationwide are diagnosed in women residing in this state [7,8]. A sizeable population and an incidence rate that is higher than the national average are the major contributors to the increased burden [7,8]. According to data from the Surveillance, Epidemiology and End Results program, the age-adjusted cervical cancer incidence rate in California from 1996 to 2000 was 10.5 per 100,000 as compared to 9.5 nationwide [8]. Although the proportion of women in California who report having a Pap smear in the past 3 years or ever is similar to the national rates [3], minority population groups at high risk for cervical cancer may be failing to fully comply with screening recommendations as suggested by prior studies at the national level [5]. However, there is limited research on Pap smear use trends among ethnic groups in California.

* Corresponding author. 111 Academy Way, Suite 220, Irvine, CA 92697-5800.

E-mail address: idealba@uci.edu (I. De Alba).

California has one of the largest proportions of minority populations in the country; one in every three state inhabitants is of Hispanic origin and one in nine of Asian descent [9]. These sizable minority populations include several subgroups that may be impacted differently by barriers to cervical cancer screening [10–17]. According to current population trends, within the next 30 years, the racial/ethnic composition of the United States will resemble that of California today [18]. Consequently, identifying subpopulations at risk for lack of cervical cancer screening is an imperative public health goal. In this study, data from the recently created California Health Interview Survey was used to assess the impact of race/ethnicity and Hispanic and Asian subgroups on Pap smear use among women in California.

Methods

Data source and study population

Data from the 2001 California Health Interview Survey (CHIS) was analyzed. The CHIS is a random-digit dial telephone survey of the state of California civilian, non-institutionalized population and was conducted for the first time in 2001. Personnel from CHIS interviewed one randomly selected adult in each of the 55,428 households sampled in the state. The interviews were conducted in six languages: English, Spanish, Chinese (Mandarin and Cantonese dialects), Vietnamese, Korean, and Khmer (Cambodian) according to participants preference or proficiency. The overall response rate for the 2001 CHIS adult survey was 37.7%. For the 2001 CHIS adult survey, the success rate of introducing the survey to a household was 59.2%; yet only 63.7% of them successfully concluded the complete interview for a final response rate of 37.7% [19].

Pap smear use among all eligible women living in California was examined; the sample included women age 18 or older without a hysterectomy. To assess predictors of Pap smear use among Hispanic and Asian subgroups, the two largest minority racial/ethnic groups in the state, two additional subanalyses that included only members of these groups were performed.

All women who self-identified as Hispanic were further categorized into the following subgroups: Mexican, Central American, South American, and other Hispanics. Puerto Ricans, Cubans, Dominicans, and European Hispanics were grouped together under other Hispanics since they constitute a very small percentage of Hispanics in California.

Women in the Asian subanalysis came from the CHIS Random Digit Dialing sample and from a CHIS oversample done to increase the numbers of several Asian ethnic subgroups [20]. Asians included Chinese, Filipino, Japanese, Vietnamese, Korean, and South Asian (Bangladeshi, Indian, Pakistani, Sri Lankan, and more than one of these nationalities) subgroups.

Variables assessed

The outcomes of interest were having a recent Pap smear and ever having one. Women who reported receiving a Pap smear in the previous 3 years were considered to have recent screening according to the United States Preventive Services Task Force guidelines [21]. Since nearly half of the cervical cancers diagnosed in the United States occur in women who have never been screened, ever having a Pap smear was considered particularly relevant [22]. Both outcomes of interest were assessed separately in each population group: all women, Hispanics and Asians.

A multivariable logistic regression model for each outcome of interest was developed. Self-reported race/ethnicity (White, Black, Hispanic, Asian, and “other” race) was the main independent variable in the models for all women. Pacific Islanders were included in the Asian category due to their small numbers. The “other” race category included women who self-identified with more than one race or with a group other than the four described above. Hispanic or Asian subgroups were the main independent variables in the models assessing Pap smear use among these minority groups. White women were the referent group in the main analysis and Mexican or Japanese women were the referents in the subanalyses.

All models adjusted for factors associated with the outcomes of interest in the current literature [10,11,15–17]. These included age (18–30, 31–40, 41–50, and ≥ 51), educational attainment (less than high school, high school, or more than high school), annual household income [coded as “low” for income less than two times the Federal Poverty Level (FPL) or “high” for two times or more], having health insurance (any coverage or no insurance) and self-reported health status (excellent, very good or good, and fair or poor).

English language proficiency was also included as a controlling variable in the Hispanic and Asian subgroup models and it contained four categories according to the ability to speak English: “very well”, “well”, “not well”, and “not all”.

This research project was approved by the Institutional Review Board at the University of California, Irvine.

Analysis

All analyses were performed with SAS Callable SUDAAN Release 8.0.2 (Research Triangle Institute, Research Triangle Park, NC) to account for the CHIS’ complex sampling design and to obtain proper variance estimations. The data analysis was done in four phases. First, descriptive statistics for each study variable were generated. Second, to characterize factors associated with the outcomes of interest, a bivariable analysis using Chi-square tests to compare categorical variables was conducted. Two-tailed *P* values less than or equal to 0.05 were

considered statistically significant. Third, to determine the impact of race/ethnicity and Hispanic or Asian subgroups in cervical cancer screening, the six multivariable logistic regression models described above were developed. Fourth, since the frequency of Pap smear use in this sample is high and the adjusted odds ratios may exaggerate the magnitude of a risk association, the odds ratios obtained in the logistic regression models were corrected by generating prevalence rate ratios (PR) using a method described by Zhang and Yu [23]. We present the results using both odds ratios and prevalence rate ratios. We used the Wald F statistic to compare levels of explanatory variables.

Results

A total of 25,228 women were included in the main analysis, 5944 in the Hispanic sub analysis and 2625 in the Asian subanalysis. Women in the main analysis had a mean age of 41.0 years and almost half (49.6%) were White, 30.1% were Hispanic, 11.3% were Asian, 5.4% were Black, and 3.6% were classified as other race (Table 1). Hispanic women were more likely to be Mexican (71.5%) and had the worst sociodemographic profile. Most Asians were Chinese (32.6%) and had higher education an income as compared to Whites (Table 1).

Table 1

Characteristics of 2001 CHIS female respondents over 18 years of age and without a hysterectomy used in the main analysis, the Hispanic subanalysis, and the Asian subanalysis

Characteristics of the three study populations	% (Standard Error)		
	Population in the main analysis ($n = 25,228$)	Population in the Hispanic subanalysis ($n = 5944$)	Population in the Asian subanalysis ^a ($n = 2625$)
<i>Race/ethnicity</i>			
White	49.6 (0.31)		
Hispanic	30.1 (0.30)		
Mexican		71.5 (0.72)	
Central American		10.6 (0.60)	
South American		2.4 (0.23)	
Other Hispanic		15.5 (0.57)	
Asian	11.3 (0.23)		
Japanese			10.2 (0.31)
Filipino			23.3 (0.99)
Korean			11.4 (0.30)
Chinese			32.6 (1.14)
Vietnamese			13.2 (0.30)
South Asians			9.4 (0.39)
African American	5.4 (0.15)		
Other	3.6 (0.17)		
<i>Age</i>			
18–30 years	30.1 (0.06)	41.9 (0.63)	29.0 (1.12)
31–40 years	25.4 (0.17)	28.6 (0.55)	25.0 (0.96)
41–50 years	20.3 (0.22)	16.9 (0.49)	21.6 (0.85)
≥51 years	24.2 (0.19)	12.7 (0.54)	24.4 (0.96)
<i>Health status</i>			
Fair to poor	17.0 (0.27)	27.4 (0.77)	17.3 (0.96)
Excellent to good	83.0 (0.27)	72.6 (0.77)	82.7 (0.96)
<i>Currently insured</i>			
No	15.8 (0.34)	31.1 (0.84)	15.9 (0.99)
Yes	84.2 (0.34)	68.9 (0.84)	84.1 (0.99)
<i>Has a usual source of care</i>			
No	11.9 (0.28)	18.0 (0.70)	13.2 (0.95)
Yes	88.1 (0.28)	82.0 (0.70)	86.8 (0.95)
<i>Federal poverty level (FPL)</i>			
<199% FPL	37.6 (0.47)	64.0 (0.94)	32.7 (1.23)
>200% FPL	62.4 (0.47)	36.0 (0.94)	67.3 (1.23)
<i>Education level</i>			
Less than high school	16.3 (0.30)	39.8 (0.76)	11.1 (0.84)
High school diploma	25.9 (0.42)	27.9 (0.77)	21.4 (1.24)
More than high school	57.8 (0.42)	32.2 (0.73)	67.5 (1.39)

^a The data set used for the Asian subanalysis is a merged file that includes Asians from the CHIS adult database and the CHIS Asian oversample database.

Pap smear in the past 3 years

In the analysis of all women, Black (91.1%) and White (89.3%) women were the most likely to report having a Pap smear in the past 3 years; only 86% of Hispanics and 71.5% of Asians report a recent Pap smear. However, after adjusting for potential confounders, Blacks and Hispanics were significantly more likely to report a Pap smear in the past 3 years as compared to White and Asian women (Table 2). Asians were by far the least likely to report recent cervical cancer screening; Blacks, Hispanics and Whites were more than 24% more likely to report a Pap smear in the past 3 years. Having a usual source of care, health insurance, higher income or education, and good health status were significantly associated with reporting a recent Pap smear.

Among Hispanics, Mexican women were the most likely to underutilize recent cervical cancer screening (Table 3). Central and South Americans were more likely to have had a

recent Pap smear as compared to Mexicans. Although the prevalence rate ratios for recent Pap smear among South Americans were greater than for Mexicans, there was no statistically significant difference due to the small number of South Americans in the sample. In contrast to the results for the analysis of all women, Hispanics with less than high school education were as likely to report a Pap smear in the past 3 years as those with more than high school. Unexpectedly, low English proficient Hispanics were more likely to report recent cervical cancer screening as compared to the more proficient. Among Hispanics, having a usual source of care, health insurance, or higher income were the factors most strongly associated with having a Pap smear in the past 3 years.

Among Asians, Vietnamese and South Asians were less likely and Filipino women were more likely to report a recent Pap smear as compared to Japanese, yet the difference was not statistically significant (Table 4). However, Filipino

Table 2
Adjusted odds ratios and prevalence rate ratios estimating Pap smear use among all women age 18 and older and without a hysterectomy

Independent variables included in the model	Had a Pap smear in the past 3 years (<i>n</i> = 25,027)		Had a Pap smear ever (<i>n</i> = 25,228)	
	Adjusted odds ratios (95% CI)	Adjusted prevalence rate ratios (95% CI)	Adjusted odds ratios (95% CI)	Adjusted prevalence rate ratios (95% CI)
<i>Race/ethnicity</i>				
White	1.0	1.0	1.0	1.0
Hispanic	1.40 (1.17–1.69)*	1.03 (1.02–1.05)*	0.94 (0.73–1.22)	0.997 (0.98–1.01)
Asian	0.32 (0.28–0.38)*	0.81 (0.78–0.85)*	0.16 (0.13–0.19)*	0.82 (0.78–0.85)*
African American	1.43 (1.01–2.01)*	1.03 (1.001–1.06)*	1.29 (0.72–2.31)	1.01 (0.98–1.02)
Other	0.74 (0.50–1.10)	0.96 (0.90–1.01)	0.70 (0.38–1.29)	0.98 (0.94–1.01)
<i>Age</i>				
18–30 years	1.0	1.0	1.0	1.0
31–40 years	2.76 (2.34–3.26)*	1.15 (1.14–1.17)*	6.38 (5.08–8.01)*	1.19 (1.18–1.20)*
41–50 years	2.11 (1.80–2.47)*	1.12 (1.10–1.14)*	7.54 (5.89–9.64)*	1.20 (1.19–1.20)*
≥51 years	1.31 (1.14–1.50)*	1.05 (1.03–1.07)*	5.22 (4.23–6.44)*	1.18 (1.17–1.19)*
<i>Health status</i>				
Fair to poor	1.0	1.0	1.0	1.0
Excellent to good	1.23 (1.04–1.44)*	1.03 (1.01–1.06)*	1.09 (0.86–1.37)	1.01 (0.97–1.02)
<i>Currently insured</i>				
No	1.0	1.0	1.0	1.0
Yes	1.71 (1.48–1.98)*	1.11 (1.09–1.14)*	1.44 (1.20–1.73)*	1.05 (1.03–1.07)*
<i>Has a usual source of care</i>				
No	1.0	1.0	1.0	1.0
Yes	2.40 (2.09–2.76)*	1.21 (1.18–1.23)*	1.87 (1.53–2.28)*	1.09 (1.07–1.12)*
<i>Federal poverty level (FPL)</i>				
<199% FPL	1.0	1.0	1.0	1.0
>200% FPL	1.44 (1.24–1.66)*	1.06 (1.04–1.08)*	1.42 (1.17–1.73)*	1.04 (1.02–1.05)*
<i>Education level</i>				
Less than high school	1.0	1.0	1.0	1.0
High school diploma	0.83 (0.70–0.98)*	0.97 (0.93–0.996)*	0.80 (0.63–1.03)	0.97 (0.94–1.003)
More than high school	1.31 (1.08–1.58)*	1.04 (1.01–1.07)*	1.42 (1.07–1.88)*	1.03 (1.01–1.05)*

Prevalence rate ratios were calculated from the logistic regression model using the methods described in Ref. [23].

CI = confidence interval.

* *P* < 0.05.

Table 3

Adjusted odds ratios and prevalence rate ratios estimating Pap smear use among Hispanic women age 18 and older and without a hysterectomy ($n = 5944$)

Independent variables included in the analysis	Had a Pap smear in the past 3 years ($n = 5909$)		Had a Pap smear ever ($n = 5944$)	
	Adjusted odds ratios (95% CI)	Adjusted prevalence rate ratios (95% CI)	Adjusted odds ratios (95% CI)	Adjusted prevalence rate ratios (95% CI)
<i>Hispanic subgroup</i>				
Mexican	1.00	1.00	1.00	1.00
Central American	1.64 (1.07–2.51)*	1.06 (1.01–1.10)*	1.63 (0.95–2.81)	1.04 (0.99–1.06)
South American	1.85 (0.84–4.06)	1.07 (0.97–1.12)	2.91 (0.88–9.62)	1.07 (0.99–1.10)
Other Hispanic	1.01 (0.69–1.47)	1.001 (0.94–1.05)	0.88 (0.56–1.40)	0.99 (0.93–1.03)
<i>Age</i>				
18–30 years	1.00	1.00	1.00	1.00
31–40 years	2.41 (1.81–3.21)*	1.12 (1.09–1.15)*	4.41 (3.07–6.33)*	1.16 (1.13–1.17)*
41–50 years	1.79 (1.37–2.34)*	1.09 (1.05–1.12)*	4.95 (3.11–7.88)*	1.16 (1.13–1.18)*
≥51 years	1.18 (0.86–1.62)	1.03 (0.97–1.08)	3.76 (2.50–5.64)*	1.15 (1.11, 1.17)*
<i>Health status</i>				
Fair to poor	1.00	1.00	1.00	1.00
Excellent to good	1.38 (1.05–1.83)*	1.04 (1.01–1.08)*	1.15 (0.81–1.64)	1.01 (0.98–1.04)
<i>Currently insured</i>				
No	1.00	1.00	1.00	1.00
Yes	1.90 (1.42–2.53)*	1.11 (1.06–1.14)*	1.90 (1.40–2.59)*	1.07 (1.04–1.10)*
<i>Has a usual source of care</i>				
No	1.00	1.00	1.00	1.00
Yes	2.17 (1.63–2.87)*	1.15 (1.11–1.20)*	1.78 (1.27–2.49)*	1.08 (1.03–1.11)*
<i>Federal poverty level (FPL)</i>				
<199% FPL	1.00	1.00	1.00	1.00
>200% FPL	1.40 (1.01–1.92)*	1.05 (1.001–1.08)*	1.63 (1.09–2.44)*	1.04 (1.01, 1.07)*
<i>Education level</i>				
Less than high school	1.00	1.00	1.00	1.00
High school diploma	0.71 (0.52–0.98)*	0.95 (0.89–0.997)*	0.54 (0.38–0.77)*	0.93 (0.87–0.97)*
More than high school	0.93 (0.64–1.35)	0.99 (0.93–1.03)	0.77 (0.50–1.19)	0.97 (0.91–1.02)
<i>How well English is spoken</i>				
Not well	1.00	1.00	1.00	1.00
Well	0.61 (0.45–0.83)*	0.92 (0.87–0.97)*	0.70 (0.50–0.99)*	0.97 (1.03–0.999)*

Prevalence rate ratios were calculated from the logistic regression model using the methods described in Ref. [23].

CI = confidence interval.

* $P < 0.05$.

women were more likely to report a recent Pap smear when compared to South Asians (PR = 1.14, 95% CI 1.002–1.24). Having a usual source of care and higher income were most strongly associated with a recent Pap smear among the group of Asians. Holding all other variables constant, English language proficiency and health status were not significant predictors of recent screening.

Pap smear ever

White and Black women were the most likely to report having a Pap smear ever (95.8% and 95.5%, respectively); 90.6% of Hispanics, 90.9% of women of “other” races, and 76.9% of Asians also reported having at least one Pap smear in the past. However, in the adjusted analysis, only Asians were significantly less likely to report having a Pap smear ever as compared to any other group (Table 2). As expected,

based on Wald F statistics, age, regular source of care, and race were the variables that contributed the most to having a Pap smear ever among women in California.

No significant difference in use of Pap smear ever among Hispanic subgroups was found. Although South Americans and Central Americans were more likely to report a Pap smear ever as compared to Mexicans, the difference was not statistically significant. Age and health insurance were more strongly associated with having a Pap smear ever than usual source of care.

Among Asian subgroups, South Asians, Vietnamese, and Chinese women were the least likely to report a Pap smear ever. There was no significant difference between any of the Asian subgroups when compared to Japanese women. Yet, Filipino and Korean women were significantly more likely to report a recent Pap smear when compared to South Asians (PR = 1.19, 95% CI 1.07–1.27 and PR = 1.13, 95% CI 1.01–

Table 4

Adjusted odds ratios and prevalence rate ratios estimating Pap smear use among Asian women age 18 and older and without a hysterectomy

Independent variables included in the analysis	Had a Pap Smear in the past 3 years (<i>n</i> = 2600)		Had a Pap smear ever (<i>n</i> = 2625)	
	Adjusted odds ratios (95% CI)	Adjusted prevalence rate ratios (95% CI)	Adjusted odds ratios (95% CI)	Adjusted prevalence rate ratios (95% CI)
<i>Asian subgroups</i>				
Japanese	1.00	1.00	1.00	1.00
Filipino	1.48 (0.83–2.64)	1.08 (0.96–1.16)	2.09 (0.98–4.46)	1.09 (0.996–1.14)
Korean	1.02 (0.64–1.63)	1.004 (0.89–1.09)	1.38 (0.76–2.49)	1.04 (0.95–1.11)
Chinese	0.97 (0.61–1.56)	0.99 (0.87–1.09)	0.83 (0.47–1.45)	0.97 (0.85–1.05)
Vietnamese	0.89 (0.48–1.64)	0.97 (0.81–1.10)	0.81 (0.41–1.59)	0.96 (0.81–1.06)
South Asians	0.85 (0.45–1.62)	0.96 (0.79–1.09)	0.76 (0.37–1.56)	0.95 (0.79–1.06)
<i>Age</i>				
18–30 years	1.00	1.00	1.00	1.00
31–40 years	4.23 (2.90–6.18)*	1.56 (1.44–1.65)*	6.71 (4.48–10.07)*	1.63 (1.55–1.70)*
41–50 years	4.00 (2.75–5.83)*	1.54 (1.42–1.63)*	8.35 (5.42–12.87)*	1.67 (1.59–1.72)*
≥51 years	2.78 (1.91–4.03)*	1.43 (1.29–1.54)*	6.24 (4.02–9.68)*	1.62 (1.52–1.69)*
<i>Health status</i>				
Fair to poor	1.00	1.00	1.00	1.00
Excellent to good	1.00 (0.69–1.46)	1.00 (0.87–1.12)	1.05 (0.68–1.62)	1.01 (0.89–1.12)
<i>Currently insured</i>				
No	1.00	1.00	1.00	1.00
Yes	1.58 (1.12–2.22)*	1.23 (1.06–1.38)*	1.59 (1.06–2.37)*	1.19 (1.02–1.33)*
<i>Has a usual source of care</i>				
No	1.00	1.00	1.00	1.00
Yes	2.47 (1.76–3.45)*	1.48 (1.31–1.63)*	2.18 (1.49–3.18)*	1.32 (1.17–1.44)*
<i>Federal poverty level (FPL)</i>				
<199% FPL	1.00	1.00	1.00	1.00
>200% FPL	1.92 (1.41–2.61)*	1.25 (1.14–1.35)*	1.92 (1.36–2.72)*	1.20 (1.10–1.28)*
<i>Education level</i>				
Less than high school	1.00	1.00	1.00	1.00
High school diploma	1.45 (0.89–2.36)	1.17 (0.95–1.36)	1.81 (1.06–3.08)*	1.21 (1.02–1.36)*
More than high school	1.49 (0.94–2.35)	1.18 (0.97–1.35)	1.87 (1.11–3.14)*	1.22 (1.04–1.36)*
<i>How well English is spoken</i>				
Not well	1.00	1.00	1.00	1.00
Well	1.54 (1.04–2.30)*	1.16 (1.02–1.28)*	1.76 (1.14–2.73)*	1.16 (1.04–1.25)*

Prevalence rate ratios were calculated from the logistic regression model using the methods described in Ref. [23].

CI = confidence interval.

* $P < 0.05$.

1.21, respectively), Vietnamese (PR = 1.27, 95% CI 1.10–1.39 and PR = 1.17, 95% CI 1.02–1.28, respectively), and Chinese (PR = 1.19, 95%CI 1.08–1.26 and PR = 1.12, 95%CI 1.03–1.19, respectively). Age and income were the most important predictors of ever having a Pap smear among Asians.

Discussion

The findings suggest that, in California, Black and Hispanic women are more likely to report a Pap smear in the past 3 years as compared to any other racial/ethnic group, including White women. There was no significant difference in use of Pap smears ever among Black, White, and Hispanic

women. Asians, on the other hand, were the least likely to report cervical cancer screening despite a more favorable sociodemographic profile. Furthermore, screening rates varied among Hispanic or Asian subgroups; Mexicans, Vietnamese, Chinese, and South Asians were particularly underserved. The results also suggest that having a usual source of care contributes the most to Pap smear use among women in California; however, having health insurance continues to be a particularly important factor among Hispanics and higher income among Asians.

The results of this study reflect a new trend in use of Pap smears among minorities; cervical cancer screening disparities have been significantly reduced or eradicated in some cases [6,24,25]. Black women have consistently reported higher cervical cancer screening rates than White women for

over a decade [26]; Hispanics may be moving in the same direction. Hispanic women in the 2001 National Health Interview Survey (NHIS) were still less likely to report a recent Pap smear as compared to Black and White women (76.9% vs. 85.2% and 81.9%, respectively) [27]. However, the gap is rapidly narrowing, Hispanics had the largest percentage increase in Pap smear use of any group between 1987 and 2000 [6]. In fact, Hispanic and Black women in the Behavioral Risk Factor Surveillance Survey (BRFSS) were more likely to receive a recent Pap smears as compared to White women (90.9%, 91.2%, and 86.7%, respectively) [28]. In California, reports on unadjusted data from the local BRFSS [28] and CHIS suggest similar trends [29,30].

The increased use of Pap smears among Hispanics in California may reflect the success of nationwide efforts to overcome disparities and the effectiveness of local interventions providing culturally sensitive approaches. Examples of national programs include the Medicare coverage of Pap smears and mammograms since 1997 and the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). The NBCCEDP program, known as “Every Woman Counts” in California, has supported a variety of organizations to develop and implement effective outreach and educational programs since 1991. Previous research has determined that the NBCCEDP has a positive impact on cancer screening rates at a state and national levels [31].

The “Every Woman Counts” programs have been particularly successful among Hispanics, who represented one third of the state inhabitants but received two thirds of services in the years 2000–2001 [32]. Many local successful outreach screening programs target key barriers to Pap smear use among Hispanics, such as lack of health insurance, low income, no English proficiency, and lack of physician referral [33,34]. In addition, public campaigns may raise physicians’ awareness of disparities and motivate them to aggressively recommend screening to patients identified as underserved by these programs [35–42]. The results of this study support the notion that barriers to cervical cancer screening such as low English proficiency and lower education have been overcome among Hispanics; however, these findings also suggest that interventions targeting Mexicans and the uninsured will further increase Pap smear use in this ethnic group.

The case of Asian women is worrisome; they had the highest education and income levels, yet they were the least likely to report a Pap smear recently or ever. The disparities persisted after adjusting for access and sociodemographics factors and Vietnamese, Chinese, and South Asians were the most affected. These findings in California mirror national figures. According to the National Center for Health Statistics, only 66.3% of Asians reported a recent Pap smear in the year 2000 in the United States [43]. The percentage increased only to 70.8% after adjusting for access and sociodemographics [6]. This is particularly relevant in view of the fact that Vietnamese women have

the highest cervical cancer incidence rate of any group [1]. The results of this study underscore the urgent need for interventions aimed at this vulnerable group and highlight subpopulations at greatest risk for noncompliance with screening recommendations. These findings also emphasize the disparities among subgroups and suggest that future interventions and research should be tailored to needs and characteristics of each individual subgroup.

The increasing use of Pap smears among Hispanics and Blacks is encouraging, but racial/ethnic disparities in cervical cancer burden persist. For instance, Black women have been the most likely to report use of Pap smears for over a decade [26,44,45]; however, they are still less likely to have cervical cancer diagnosed at a localized stage as compared to Whites [1] and have the lowest 5-year survival rates of any racial/ethnic group [46]. Hispanic women have a greater likelihood of having advanced invasive cervical cancer at the time of diagnosis as compared to non-Hispanics [47] and have the second highest mortality rate [46]. Additionally, Hispanics are the only group with no decrease in mortality rates for the past 10 years [46]. In California, cervical cancer rates have declined somewhat since 1988 for women in each race/ethnic group, but trends are statistically significant for Blacks and White women only [48].

As in previous studies, this study found that access factors, such as lack of a usual source of care or health insurance, are important barriers to cervical cancer screening [10,11]. Culturally sensitive interventions that promote access would have a positive impact on Pap smear use in our population [49]. Interventions using lay health care workers may be particularly effective among women who have not had a previous Pap smear and have low acculturation, such as recently arrived immigrants [50]. Educational campaigns aimed at Hispanic and Asian subgroups at high risk must provide culturally sensitive messages.

This study has several limitations. The California Health Interview Survey sample is drawn from the civilian, noninstitutionalized adult population residing in California households of related persons with access to residential telephone service. Individuals without residential telephone or living in group quarters of unrelated adults, common conditions among poor, recently arrived immigrants are not included. The CHIS data is based on self-report, respondents may have forgotten being counseled by their health care providers on cervical cancer screening or may have provided socially desirable answers. Women with limited English proficiency and scarce knowledge on cancer screening may be less likely to recall a discussion on Pap smear use than women that communicate perfectly with their health care provider. However, self-report instead of decreasing Pap smear use rates can substantially overestimate them, specially among low income, ethnic women [51–53]. Our sample may not be representative of the population in California because of CHIS’ relatively low response rate; however, the demographic characteristics of our population are similar to those of California in the U.S.

Census and our Pap smear use crude rates are equivalent to those in the BRFSS for the state of California [9,28].

Although inequalities in cervical cancer screening rates have decreased among Black, Hispanics, and Whites in California, disparities persist among Asians. Discontinuing or slowing down the current effective interventions may stop or even reverse the current favorable trends. Continued efforts are needed to close the racial/ethnic Pap smear use gap and to reduce cervical cancer mortality disparities.

Acknowledgment

This work was supported by a grant from the American Cancer Society (CCCA-03-197-01-CCCA).

References

- [1] Ries LAG, Eisner MP, Kosary CL, et al. SEER Cancer Statistics Review, 1975–2000. National Cancer Institute, Bethesda, MD. Available at: http://seer.cancer.gov/csr/1975_2000. Accessed May, 2003.
- [2] Surveillance Epidemiology and End Results (SEER) Program SEER*Stat Database: Mortality—All COD, Public-Use With State, Total U.S. for Expanded Races/Hispanics (1990–2000): National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch; 2003 [November 2003].
- [3] Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System Survey Data. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/brfss/index.htm>. Accessed October 30, 2003.
- [4] Kinney W, Sung HY, Kearney KA, Miller M, Sawaya G, Hiatt RA. Missed opportunities for cervical cancer screening of HMO members developing invasive cervical cancer (ICC). *Gynecol Oncol* 1998 (Dec);71(3):428–30.
- [5] American Cancer Society. Cancer prevention and early detection facts and figures. Atlanta, GA: American Cancer Society; 2002.
- [6] 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 (Mar 15);97(6):1528–40.
- [7] U.S. Cancer Statistics Working Group. United States cancer statistics: 1999 incidence. Atlanta, GA: Center for Disease Control and Prevention; 2002.
- [8] National Cancer Institute. State Cancer Profiles. National Cancer Institute and Center for Disease Control. Available at: <http://state-cancerprofiles.cancer.gov/index.html>. Accessed October 20, 2003.
- [9] U.S. Census Bureau. Statistics Report: U.S. Census Bureau; 2000 [June 2003].
- [10] Coughlin SS, Uhler RJ. Breast and cervical cancer screening practices among Hispanic women in the United States and Puerto Rico, 1998–1999. *Prev Med* 2002 (Feb);34(2):242–51.
- [11] Selvin E, Brett KM. Breast and cervical cancer screening: sociodemographic predictors among White, Black, and Hispanic women. *Am J Public Health* 2003 (Apr);93(4):618–23.
- [12] 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 (Nov 11);156(20):2353–8.
- [13] Chavez LR, Hubbell FA, Mishra SI, Valdez RB. The influence of fatalism on self-reported use of Papanicolaou smears. *Am J Prev Med* 1997 (Nov–Dec);13(6):418–24.
- [14] Suarez L, Pulley L. Comparing acculturation scales and their relationship to cancer screening among older Mexican-American women. *J Natl Cancer Inst Monogr* 1995(18):11–9 [Suppl].
- [15] Buller D, Modiano MR, Guernsey de Zapien J, Meister J, Saltzman S, Hunsaker F. Predictors of cervical cancer screening in Mexican American women of reproductive age. *J Health Care Poor Underserved* 1998 (Feb);9(1):76–95.
- [16] 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 (May 23);154(10):1073–81.
- [17] U.S. Census Bureau. National Population Projections; Summary Files. Available at <http://www.census.gov/population/www/projections/natsum.html>. Accessed November 10, 2003.
- [18] California Health Interview Survey. CHIS 2001 methodology series: report 4—response rates. Los Angeles, CA: UCLA Center for Health Policy Research; 2002.
- [19] California Health Interview Survey. CHIS 2001 methodology series: report 1—sample design. Los Angeles, CA: UCLA Center for Health Policy Research; 2002.
- [20] United States Preventive Services Task Force. Guide to clinical preventive services. Second ed. Los Angeles, CA: Agency for Healthcare Research and Quality.
- [21] Saslow D, Runowicz CD, Solomon D, et al. American Cancer Society guideline for the early detection of cervical neoplasia and cancer. *CA Cancer J Clin* 2002 (Nov–Dec);52(6):342–62.
- [22] Zhang J, Yu KF. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. *JAMA* 1998 (Nov 18);280(19):1690–1.
- [23] Breen N, Wagener DK, Brown ML, Davis WW, Ballard-Barbash R. Progress in cancer screening over a decade: results of cancer screening from the 1987, 1992, and 1998 National Health Interview Surveys. *J Natl Cancer Inst* 2001 (Nov 21);93(22):1704–13.
- [24] Hiatt RA, Klabunde C, Breen N, Swan J, Ballard-Barbash R. Cancer screening practices from National Health Interview Surveys: past, present, and future. *J Natl Cancer Inst* 2002 (Dec 18);94(24):1837–46.
- [25] Makuc DM, Freid VM, Kleinman JC. National trends in the use of preventive health care by women. *Am J Public Health* 1989 (Jan);79(1):21–6.
- [26] Freid V, Prager K, MacKay AHX. Chartbook on trends in the health of Americans. Health, United States, 2003. Hyattsville, MD: National Center for Health Statistics; 2003.
- [27] Division of Adult and Community Health, Promotion NCFCDPaH, Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Online Prevalence Data, 1995–2002 available at <http://apps.nccd.cdc.gov/brfss/index.asp>. Accessed: October 2003.
- [28] Babey S, Ponce N, Etzioni D, Spencer B, Brown E, Chawla N. Cancer screening in California: racial and ethnic disparities persist. Los Angeles, CA: UCLA Center for Health Policy Research; 2003.
- [29] Ponce N, Gatchell M, Brown E. Health policy fact sheet: cancer screening rates among Asian ethnic groups. Los Angeles, CA: UCLA Center for Health Policy Research; 2003 [November].
- [30] Adams EK, Florence CS, Thorpe KE, Becker ER, Joski PJ. Preventive care: female cancer screening, 1996–2000. *Am J Prev Med* 2003 (Nov);25(4):301–7.
- [31] California Department of Health Services, Section C.D., Cancer Detection Programs: Every Women Counts Fact Sheet and Cancer Detection Section at a Glance available at <http://www.dha.ca.gov/cancerdetection>. Sacramento, CA: California Department of Health Services. Accessed November 2003.
- [32] Reyes B, Cheng J, Currie E, et al. A portrait of race and ethnicity in California; An assessment of social and economic well-being. Public Policy Institute of California; 2003.
- [33] Brown E, Ponce N, Rice T, Lavarreda S. The state of health insurance in California: long term and intermittent laco of health insurance

- coverage. Findings from the 2001 California Health Interview Survey. UCLA Center for Health Policy Research; 2003 [November 2003].
- [35] Fox SA, Murata PJ, Stein JA. The impact of physician compliance on screening mammography for older women. *Arch Intern Med* 1991 (Jan);151(1):50–6.
- [36] Caplan LS, Wells BL, Haynes S. Breast cancer screening among older racial/ethnic minorities and whites: barriers to early detection. *J Gerontol* 1992 (Nov);47:101–10.
- [37] Mandelblatt J, Traxler M, Lakin P, Kanetsky P, Kao R. Mammography and Papanicolaou smear use by elderly poor black women. The Harlem Study Team. *J Am Geriatr Soc* 1992 (Oct);40(10):1001–7.
- [38] Nguyen TT, McPhee SJ, Nguyen T, Lam T, Mock J. Predictors of cervical Pap smear screening awareness, intention, and receipt among Vietnamese-American women. *Am J Prev Med* 2002; 23(3):207–14.
- [39] Berner JS, Frame PS, Dickinson JC. Ten years of screening for cancer in a family practice. *J Fam Pract* 1987 (Mar);24(3):249–52.
- [40] Saywell Jr RM, Champion VL, Zollinger TW, et al. The cost effectiveness of 5 interventions to increase mammography adherence in a managed care population. *Am J Manag Care* 2003 (Jan); 9(1):33–44.
- [41] Giveon S, Kahan E. Patient adherence to family practitioners' recommendations for breast cancer screening: a historical cohort study. *Fam Pract* 2000;17(1):42–5.
- [42] O'Malley MS, Earp JA, Hawley ST, Schell MJ, Mathews HF, Mitchell J. The association of race/ethnicity, socioeconomic status, and physician recommendation for mammography: who gets the message about breast cancer screening? *Am J Public Health* 2001; 91(1):49–54.
- [43] Freid V, Prager K, MacKay A, Xia H. Chartbook on trends in the health of Americans. Health, United States. Hyattsville, MD: National Center for Health Statistics; 2003.
- [44] Martin LM, Calle EE, Wingo PA, Heath Jr CW. Comparison of mammography and Pap test use from the 1987 and 1992 National Health Interview Surveys: are we closing the gaps? *Am J Prev Med* 1996 (Mar–Apr);12(2):82–90.
- [45] Martin LM, Parker SL, Wingo PA, Heath Jr CW. Cervical cancer incidence and screening: status report on women in the United States. *Cancer Pract* 1996 (May–Jun);4(3):130–4.
- [46] Surveillance Epidemiology and End Results (SEER) Program (www.seer.cancer.gov). SEER*Stat Database: Mortality—All COD, Public-Use With State, Total U.S. for Expanded Races/Hispanics (1990–2000): National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch; 2003 [November 2003].
- [47] Armstrong LR, Hall HI, Wingo PI. Invasive cervical cancer among Hispanic and non-Hispanic women—United States, 1992–1999. *Morb Mortal Wkly Rep* 2002 (November 20);51(47):1067–70.
- [48] American Cancer Society California Division, Public Health Institute, California Cancer Registry. California cancer facts and figures 2000. Oakland, CA: American Cancer Society; 1999.
- [49] Yabroff KR, Mangan P, Mandelblatt J. Effectiveness of interventions to increase Papanicolaou smear use. *J Am Board Fam Pract* 2003 (May–Jun);16(3):188–203.
- [50] Navarro AM, Senn KL, McNicholas LJ, Kaplan RM, Roppe B, Campo MC. Por La Vida model intervention enhances use of cancer screening tests among Latinas. *Am J Prev Med* 1998;15(1):32–41.
- [51] Hiatt RA, Perez-Stable EJ, Quesenberry Jr C, 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 (May);24(3):278–85.
- [52] 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 (Sep);5(9):721–6.
- [53] 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 (Nov);35(5):463–73.