

Frequency and Determinants of Triennial Pap Smear Screening Rates

Purpose: Before 1993, no data on either 3 year rates of Papanicolaou (Pap) screening or factors determining screening rates were available for large populations except for results of self-reported patient surveys containing known inaccuracies. The purpose of this study was to investigate the factors determining 3 year rates of Pap screening among health plan members throughout Kaiser Permanente in Southern California.

Methods: We analyzed computer files of enrollment, clinical encounters, and Pap reports.

Results: Overall, 74.5% of the study cohort received ≥ 1 Pap smear during the 3 year study interval. Screening rates varied by patient's age, median income, copayment status, and number of visits to primary care departments. Women who had either their own assigned personal physician, a female personal physician, or both were more likely to have received Pap screening. Screening rates were inversely related to age of personal physician. Women who had personal physicians practicing in family practice (FP) departments were more likely to have received Pap screening than women who had personal physicians practicing in internal medicine (IM) departments. Multivariate analysis of women who had a personal physician assigned to them showed that women were more likely to receive Pap screening if they had a

female FP personal physician (odds ratio (OR) = 1.13) or a female IM personal physician (OR = 1.23) than if they had a male IM or FP personal physician. We detected no statistically significant effect of provider age or Hispanic ethnicity when controlling for other variables.

Conclusions: High rates of triennial Pap screening rates were documented. Major factors determining receipt of Pap screening were patient age and number of visits to primary care departments. Differences in screening rates associated with median income and personal physician's gender were smaller than those reported in other settings. Unlike patients in other settings, patients in this population who had older providers, greater out-of-pocket medical expenses, or Hispanic ethnicity did not have lower 3 year screening rates after controlling for other factors.

Introduction

If screening of vaginal and cervical cytology (Papanicolaou smears) were performed appropriately, 90% of invasive squamous cervical cancers could be prevented.¹ For vaginal and cervical cytologic screening to be effective, a large proportion of the at-risk population must be screened. Screening programs which depend upon "opportunistic" screening—programs which test for an unsuspected disorder when a person sees a doctor for another reason—are much less effective than those in which an organized effort is made to screen an entire population.^{2,3} The most graphic example of the failure of "opportunistic" screening comes from the Nordic countries.³ Despite similar national policies concerning the frequency and age range of women to be screened, the efficacy of cytologic screening in the Nordic countries has varied greatly. After cytologic screening was introduced as an organized program reaching 80% of Iceland's population, mortality from cervical cancer fell 84% in that country, whereas it fell only 11% in Norway, where organized screening was limited to only one county.

Reaching the entire at-risk population is so important in determining the efficacy of a cytologic screening program. Therefore, methods must be designed to measure the proportion of women screened (identifying women who are unscreened) and to determine the factors which affect screening rates. As patients report more frequent, more recent, and more normal Pap smears than can be documented,^{4,8} methods other than patient recall are needed to define who has or has not been screened. Vaginal and cervical cytologic screening rates have been reported to

Table 1. Characteristics of health plan members in study

Member Characteristic	N	Mean	SD	Median	Interquartile Range
Age	503,226	45.6 yr	15.8 yr	44 yr	24 yr
Median income*	465,720	\$43,504	\$18,004	\$40,750	\$21,661
Out-of-pocket expenditure for Pap smear	502,181	\$4.30	\$4.40	\$5.00	\$5.00
No. visits to primary care departments †	503,140	10.5	9.9	8	11

SD = standard deviation.

* Based on median income reported by 1990 U.S. Census for residents of member's residential block.

† Outpatient visits to family practice, internal medicine, and obstetrics/gynecology departments during the study period.



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be lower in Hispanic populations.⁹⁻¹¹ in black populations,^{10,12} in native white populations,¹³ in the elderly,^{9,10,14-16} in poor women,^{9,10,14,16,17} and in women who have male physicians.¹⁸ As many of these factors are interrelated, it remains unclear which factors are independently related to screening frequency. The dual purpose of this study was to determine the proportion of women aged ≥ 18 years continuously enrolled in Kaiser Permanente Southern California from October 1, 1990 through September 30, 1993 who had vaginal or cervical cytologic screening during that 3 year period and to investigate the effect of median income, ethnicity, copayment, patients age, number of primary care visits during the 3 year period, age and gender of personal physician, and personal physician's specialty on the rates of cervical or vaginal cytologic screening.

Methods

Health plan data files concerning membership, laboratory management, appointments, and personnel were merged to identify and determine screening rates for all 503,226 female members who were aged ≥ 18 years and continuously enrolled from October 1, 1990 through September 30, 1993. Periods of nonenrollment lasting < 3 months were ignored because these members generally continue to receive care at Kaiser Permanente facilities.

Laboratory Management System files were used to determine Pap smear utilization during the same 3 year period for each member. The address of each member and the name of the member's personal provider was obtained from Appointment System files. Gender, age, and specialty of each personal provider was obtained from employee and physician personnel files. Members with Hispanic surnames (as determined by the 1990 U.S. Census) were counted as Hispanic. Members were considered to have the same median income as that reported by the U.S. Census for the member's residential block. Dates of each member's outpatient primary care visits during the 3 year study period were obtained from a computer database of appointments. Out-of-pocket costs paid by members for Pap smears were estimated using the appointment and laboratory copayment fee schedules which were in effect on September 30, 1993. (These figures are estimates because members whose coverage benefits changed over the study period might have paid various fees for their Pap smears.) Three year rates of Pap smear screening were determined using univariate and multivariate analysis.

We determined the unadjusted relation between member demographics, out-of-pocket expense, primary care utilization, and provider characteristics on Pap smear screening by comparing the characteris-

tics of members who received a Pap smear during the 3 year study period. Differences in proportions were tested using the Pearson's Chi-Square statistic. Confidence intervals for unadjusted proportions were calculated using the normal approximation method.¹⁹ Differences in adjusted proportions were tested using the Cochran-Mantel-Haenszel statistic. In unadjusted analyses, logistic regression was used to test for the joint effects of factors found to be significant predictors ($p < 0.05$) of Pap smear screening. Odds ratios and confidence intervals for adjusted effects were estimated from the logistic model. Point estimates and confidence intervals were rounded to the nearest 0.01. All statistical analyses were done using version 6.07 of SAS software (SAS Institute Inc. SAS users guide: statistics, version 6.07 edition, Cary, North Carolina: SAS Institute Inc.) for the MVS operating system. All statistical tests were conducted at the $p < 0.05$ level of significance.

Results

Table 1 presents selected characteristics of the study cohort. The membership is younger and more affluent than the general population, indicating that more members of health maintenance organizations (HMOs)

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Table 2. Department and gender of providers studied

Department/gender of provider	No of members served	% study population
Family practice:	177,274	43.6
male	114,300	64.5
female	54,163	30.6
unspecified	8,811	5.0
Internal Medicine:	145,759	35.9
male	100,566	69.0
female	42,109	28.9
unspecified	3,084	2.1
Obstetrics/gynecology:	834	0.2
male	460	55.2
female	374	44.8
unspecified	0	0.0
Nonprimary care department	7,579	1.9
Unspecified department	75,027	18.5

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are actively employed. Approximately 19% of members were classified by surname as Hispanic. According to a 1990 survey of 3,930 health plan members, 51% were non-Hispanic white, 24% were Hispanic, 14% were black, 11% were Asian, and 1% were of other race. The differences in these membership rates is probably due to a combination of misclassification error and changes in membership demographics associated with secular changes in economic conditions and enrollment.

Personal providers were assigned to 406,473 members (80.8%) of the study cohort. Provider's department was identified for 331,446 (81.5%) of those members. Of the 323,867 members (97.7%) identified as having a primary care personal provider, the provider's gender and age were ascertained for 311,972 (96.3%) members. Table 2 shows department and gender distribution of personal providers assigned to members of the study cohort. Incomplete provider identification and categories with missing information are included in the table.

Of women aged ≥18 years and continuously enrolled during the 3 year period studied, 74.5% had cervical or vaginal cytologic screening performed by our health plan in Southern California.

During the 3 year interval, 74.5% of the cohort received at least one Pap smear. The rate was 76.5% for those with Hispanic surnames versus 74.0% for

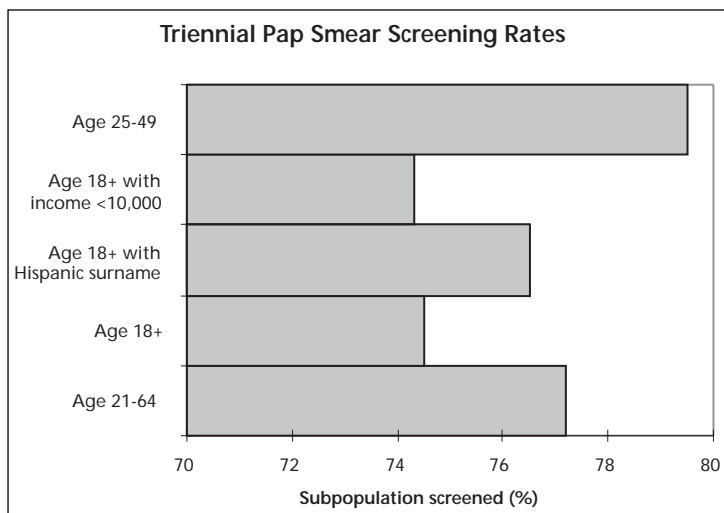


Fig. 1. Triennial Pap smear screening rate by certain sociodemographic characteristics shows having Hispanic vs. other surname significant at $p < 0.001$ for screening.

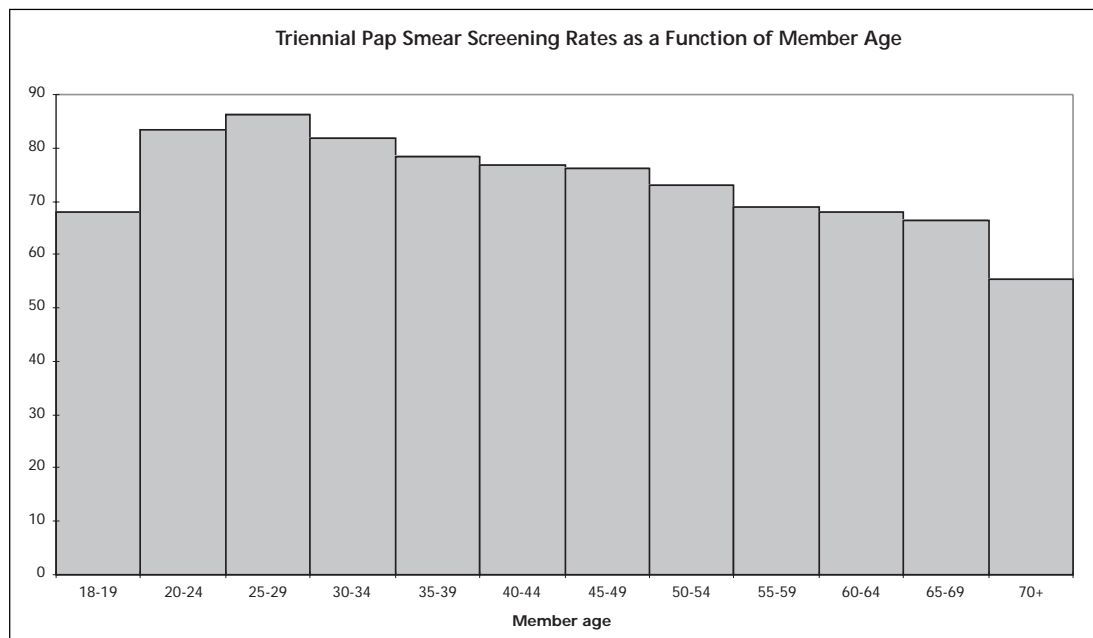


Fig. 2. Triennial Pap smear screening rate by member age shows inverse relation significant at $p < 0.001$ for all but age 18-19 years.



all others combined ($p < 0.001$). Corresponding rates for key subpopulations are shown (Fig. 1). For patients aged 20 to 24 years, screening rates varied inversely by patient age (Fig. 2).

Table 3. Characteristics of health plan members receiving Pap smear within past 3 years			
Member characteristic	% receiving Pap smear in past 3 yr	95% CI	p value
Ethnicity:			<0.001
Hispanic surname	76.5	(76.0, 77.0)	
other surname	74.0	(73.7, 74.3)	
Age (yr):			<0.001
18-19	68.6	(67.0, 70.2)	
20-29	85.7	(85.2, 86.2)	
30-39	80.0	(79.5, 80.4)	
40-49	76.5	(76.0, 77.0)	
50-59	71.1	(70.5, 71.7)	
60-69	67.3	(66.6, 68.0)	
70+	55.4	(54.5, 56.3)	
Median income (\$):*			<0.001
<20,000	69.2	(68.0, 70.4)	
20,000-39,999	73.0	(72.6, 73.4)	
40,000-59,999	75.7	(75.3, 76.1)	
60,000+	77.5	(76.9, 78.1)	
Out-of-pocket expenditure for Pap smear (\$):			<0.001
0	74.7	(74.3, 75.1)	
2-5	73.3	(72.9, 73.7)	
6-10	76.2	(75.4, 77.0)	
11-19	77.6	(76.9, 78.3)	
No. visits to primary care departments:†			<0.001
0	15.4	(14.6, 16.2)	
1	50.8	(49.6, 52.0)	
2-6	74.5	(74.1, 74.9)	
7+	83.3	(83.0, 83.6)	
Member has personal provider?			<0.001
yes	77.1	(76.8, 77.4)	
no	63.6	(63.0, 64.2)	

CI = confidence interval.

* Based on median income reported by 1990 U.S. Census for residents of member's residential block.

† Outpatient visits to family practice, internal medicine, and obstetrics/gynecology departments during the study period.

The relation between Pap smear utilization and member's age and income, out-of-pocket expense, primary care utilization, and whether the member had an assigned primary care provider is presented (Table 3). Family income ($p < 0.001$), number of primary care visits during the 3 year study period ($p < 0.001$), having an assigned personal provider ($p < 0.001$), and having Hispanic surname ($p < 0.001$) were all positively associated with likelihood of having received a Pap smear. Except for members aged 18 to 19 years, age was inversely related to likelihood of having a Pap smear ($p < 0.001$).

The unexpectedly higher screening rates among members with Hispanic surnames was largely attributable to the relative youth of Hispanics as compared with other members. Only 44.2% of Hispanic-surnamed members were aged ≥ 40 years old compared with 64.0% of other members. After controlling for age, the relationship between ethnicity and screening essentially disappeared. The 95% confidence interval for the relative risk of being screened (1.010, 1.018) favored members who did not have Hispanic surnames.

To our surprise, among members who incurred any copayment expense for Pap smears, those who paid most were most likely to have been screened. Even after controlling for family income, the percentage of members who had been screened was greatest among those who paid most for the procedure ($p < 0.001$).

After controlling for the existence of a personal provider, we also investigated the relation between Pap smear utilization and number of primary care visits. In either case, members who had more visits were more likely to have been screened. However, existence of a personal provider did seem to influence screening behavior at the extremes of the utilization spectrum. Members who had no primary care visits were much more likely to have been screened if they had a personal provider (24.6%) than if they did not (9.7%). Conversely, among members who had >6 primary care visits, members who had no personal provider were more likely to have been screened (91.2%) than those who had a personal provider (82.3%).

Women to whom a personal physician had been assigned were more likely to be screened (76.7%) than women who had no assigned personal physician (70.1%) ($p < 0.001$). Women who had female personal physicians were more likely to be screened (79.4%) than women who had male personal physicians (75.5%) ($p < 0.001$). Women who had family practice personal physicians were more likely to be screened (78.4%) than women with internal medicine personal physicians (74.9%) ($p < .001$). Rates of screening were also higher in women who had younger personal physi-

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cians: the screening rate was 79.3% for women whose personal physicians were aged <35 years, 77.4% for women whose personal physicians were aged 35 to 44 years, 75.0% for women whose personal physicians were aged 45 to 54 years, and 73.7% for women whose personal physicians were aged ≥ 55 years ($p < 0.001$).

Results of logistic regression used to evaluate the unique influences of each factor are presented (Table 4). For women aged >20 years who had an assigned personal physician, multivariate analysis was done using screening rate as the dependent variable; independent variables consisted of patient's age, median income, copayment, Hispanic ethnicity, number of primary care visits during 3 year study period, and personal physician's age, gender, and specialty. In this analysis, women who had a female personal physician specializing in family practice or internal medicine were slightly more likely to be screened (odds ratios of 1.13 and 1.23). No statistically significant effect was seen for provider age or patient's Hispanic ethnicity.

Discussion

Merging existing health plan data files to determine Pap smear screening rates was less time-consuming and more accurate than performing a patient survey or chart review of a randomly selected cohort of our health plan population. Our methodology cannot be used to determine screening rates in most other health care systems, however, because obtaining a comprehensive list of women at risk within the population (i.e., women aged ≥ 18 years) is difficult, cytologic smears are reported by multiple laboratories, and data concerning provider's gender, age, and specialty are unavailable.

Our study somewhat underestimates cytologic screening because $\geq 10\%$ of nominally "unscreened" women have had recent Pap smears outside the health plan: a 1993 survey showed that 15,260 members who had no Pap smear done within Kaiser Permanente during the preceding 3 years had received one at non-Kaiser Permanente facilities during that period. The clinically indicated screening rate is underestimated in this study also because some women in the study population had a hysterectomy for reasons other than cervical neoplasia and were advised by their providers not to have vaginal cytologic screening.²⁰

The 3 year screening rate (74.5%) found in this study is higher than the annual rate of vaginal or cervical cytologic screening (67%) for women aged 15 to 44 years as reported in the National Survey of Family Growth⁹ and is higher than the biannual screening rate (64.8%) for women aged 20 to 79 years as reported in the National Health Interview Survey.¹⁰

Table 4. Independent relation between health plan member characteristics and receipt of Pap screening

Member characteristic	Odds ratio	95% CI	p value
Ethnicity:			
Hispanic surname	1.03	(1.01, 1.05)	<0.001
other surname	1.00		
Age (yr):			
18-19	1.00	(67.0, 70.2)	<0.001
20-29	2.17	(2.06, 2.28)	
30-39	1.59	(1.51, 1.66)	
40-49	1.21	(1.15, 1.26)	
50-59	0.76	(0.73, 0.80)	
60-69	0.56	(0.53, 0.58)	
70+	0.30	(0.29, 0.32)	
Median income (\$):*			
<20,000	1.00		<0.001
20,000-39,999	1.05	(1.03, 1.08)	
40,000-59,999	1.18	(1.15, 1.20)	
60,000+	1.41	(1.37, 1.45)	
Out-of-pocket expenditure for Pap smear (\$):			
0	1.00	(74.3, 75.1)	<0.001
2-5	0.98	(0.97, 1.00)	
6-10	1.03	(1.00, 1.06)	
11-19	1.15	(1.16, 1.18)	
Members who have personal provider†*			
PC visits interaction			
No. visits by members who have personal provider::			
0	1.31	(1.29, 1.33)	<0.001
1	5.12		
2-6	18.13		
7+	38.17		
No. visits by members who have no personal provider::			
0	1.00	(76.8, 77.4)	<0.001
1	5.67	(5.42, 5.94)	
2-6	16.10	(15.49, 16.73)	
7+	30.78	(29.70, 31.89)	

PC = primary care.

* Based on median income reported by 1990 U.S. Census for residents of member's residential block.

† Outpatient visits to family practice, internal medicine, and obstetrics/gynecology departments during the study period.



However, the 3 year screening rate is lower than the goal of 85% established by Healthy People 2000: National Health Promotion and Disease Prevention Objectives.²¹ Strict comparison of screening rates found in our and prior studies is difficult because of differences in age of the population surveyed, rate defined (annual, biannual, or 3 years), and the methods used (patient survey versus merging existing data files). Notably, the screening rate seen in this trial occurred during a period in which the guideline for cervical and vaginal cytologic screening within Kaiser Permanente Southern California recommended annual Pap smears for all women aged ≥ 18 years. In 1993, after extensive literature review and discussion, the guidelines for cervical and vaginal cytologic screening were changed such that women who had ≥ 2 negative cervical or vaginal smears and no history of cervical neoplasia were screened every 3 years until age 65 years and every 5 years thereafter. Women who had hysterectomy for reasons other than cervical neoplasia were advised not to undergo screening. After this study, which defined not only the screened population but also defined the unscreened population, we instituted measures to encourage unscreened members to be screened (Binstock MA, unpublished material).*

This study confirmed the finding of others^{9,10,14-16} that elderly women were less likely to be screened for cervical or vaginal neoplasia. This tendency may be appropriate, given that cervical neoplasia is very unlikely to develop in women between ages 50 and 60 years who have participated in vaginal or cervical cytologic screening programs but who have never had evidence of cervical neoplasia.^{22,23} Elderly women who have not participated in cytologic screening programs are at risk not only for cervical neoplasia: if cervical neoplasia develops in these women, they are more likely to be diagnosed with invasive cancer than are younger women.^{23,24}

Our study confirms that women who have lower median incomes also have lower rates of cervical and vaginal cytologic screening. These results should be interpreted with caution because the median income attributed to any given patient was neither self reported nor necessarily the patient's actual income. Thus "ecological following" of individuals could be introduced. The differences in screening rates based on median income are smaller than seen in other series.^{9,10,14,16} The decreased importance of median income as seen in our study may be speculated to reflect a homogenous population which has minimal monetary barriers to receiving health care. Nota-

bly, copayment status was not seen to influence screening rates; this suggests that the current size of copayment does not deter screening.

Our conclusions on the impact of Hispanic ethnicity on rates of Pap smear screening may be limited by the study methods used: Hispanic ethnicity was not assigned on the basis of self reporting (which was not available) but rather on surname. This technique is used in other settings and has a very high rate of inclusion for Hispanics—usually $\geq 70\%$ ²⁵—but errors of commission and omission are common.

Our study did find lower screening rates among women who had male physicians and older physicians, but the differences were not as striking as those found by Lurie et al.¹⁸ In that series, even after controlling for differences in patient age and physician age, women were about twice as likely to have Pap smears if they had female physicians specializing in internal medicine or family practice. In that same study, women treated by obstetrician/gynecologists had different cytologic screening rates only when their personal physicians were aged 38 to 42 years. The reason for physician gender having less effect in our study than in the study by Lurie et al¹⁸ is not clear, inasmuch as both studies evaluated populations within health maintenance groups and corrected for physician age and patient age. ♦

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"Elderly women who have not participated in cytologic screening programs are at risk not only for cervical neoplasia: if cervical neoplasia develops in these women, they are more likely to be diagnosed with invasive cancer than are younger women."^{23,24}

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"Bandon Beach, Oregon" by Stu Levy, MD, a Family Practice physician for NWP, PC.

STU LEVY, MD, a Family Practice physician for Northwest Permanente, PC, studied photography with Ansel Adams. Stu has taught many photography workshops and has had over 20 one-person shows of his work. His photographs are in several major collections, including the Portland Art Museum, the Portland Visual Chronicle, and the Center for Creative Photography in Tucson, Arizona.