Medicaid Status and Stage at Diagnosis of Cervical Cancer

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Objectives. We examined whether Medicaid beneficiaries are more likely to be diagnosed with late-stage cervical cancer than women not enrolled in Medicaid.

Methods. Using the California Cancer Registry–Medicaid linked file, we identified 4682 women diagnosed during 1996–1999 with invasive cervical cancer. Multivariate logistic regression was used to evaluate the association between late-stage diagnosis and prediagnosis Medicaid status.

Results. Late-stage disease was diagnosed in 51% of Medicaid and 42% of non-Medicaid women. Relative to women without Medicaid coverage, adjusted odds ratios for late-stage diagnosis were 2.8 times higher among women enrolled in Medicaid at the time of their diagnosis and 1.3 times higher among those intermittently enrolled before being diagnosed. Vietnamese women were less likely than White women to have advanced disease; the adjusted odds for women in other racial/ethnic groups did not differ from those among Whites. Women of low socioeconomic status and older women were at increased risk.

Conclusions. Women intermittently enrolled in Medicaid or not enrolled until their diagnosis were at greatest risk of a late-stage diagnosis, suggesting that more outreach to at-risk women is needed to ensure access to screening services. (*Am J Public Health.* 2006;96:2179–2185. doi:10.2105/AJPH.2005.072553)

Invasive cervical cancer was once the most common cause of cancer deaths among women in the United States. However, morbidity and mortality because of cervical cancer have decreased substantially in the past 30 years, and this decline is thought to be the result of effective screening programs.[1,2] By contrast with other cancers, cervical cancer is well suited to prevention and early detection owing to its slow progression from precursor dysplasia to in situ lesions and, finally, invasive cancer.[3,4] Because it identifies precancerous and in situ cervical lesions, the Papanicolaou (Pap) test is an effective tool in preventing invasive cancer.

Today, cervical cancer incidence and later stage at diagnosis are associated with lack of screening, reduced access to care, low socioeconomic status (SES), and non-White race/ethnicity.[5,6] As such, considerable public health action has been taken to provide accessible and culturally appropriate screening.[7–10] Because cervical cancer rates are highest among low-SES women, programs such as Medicaid play a disproportionately important role in prevention and early detection.

Medicaid is a publicly funded health care program that pays for medical services for people with low incomes, including public assistance recipients, individuals younger than 21 years, and pregnant women. The Medicaid program covers hospital care, physician services, laboratory and diagnostic testing, preventive care, and pregnancy care. In California, where our study was conducted, there are different levels of coverage depending on eligibility criteria. Eligibility must be verified monthly, and coverage can be retroactively applied for up to 3 months before the month of application. Depending on family size and income, recipients may be required to pay a monthly "share of cost," similar to a copayment.

As a means of evaluating the quality of cancer screening in health care delivery systems such as Medicaid, recent studies have explored the impact of duration of Medicaid enrollment on stage at diagnosis for various cancers.[11–13] Two studies focusing on cervical cancer showed that women who enrolled in Medicaid near the time of their diagnosis were significantly more likely to be diagnosed with late-stage disease than were those who had been enrolled for months before their diagnosis.[11,12] Our goal was to expand on these studies by including SES data and Hispanic and Asian participants.

We used the California Cancer Registry–Medicaid linked file to identify all Californians diagnosed with invasive cervical cancer during 1996 through 1999 and their Medicaid enrollment status. Specifically, we examined the association between stage at diagnosis and enrollment in Medicaid after adjusting for race/ethnicity, SES, and other factors. Also, we investigated the association of timing of enrollment with late stage at diagnosis.

METHODS

Data Sources

We included in our analyses all incident cases of invasive cervical cancer diagnosed among California residents younger than 65 years between January 1, 1996, and December 31, 1999. Data were derived from the statewide California Cancer Registry, which has conducted high-quality population-based cancer surveillance throughout the state since 1988.[14] Active surveillance is used to gather information on cancer cases from hospitals, pathology laboratories, and death certificates. Additional data are derived from physicians' offices, free-standing radiation facilities, nursing homes, and other facilities.

The California Cancer Registry routinely collects medical record data on patients' demographic characteristics, tumor characteristics, and treatment during the first 4 months postdiagnosis. We included information on several demographic variables in this study. We classified participants into 5 mutually exclusive racial/ethnic groups: non-Hispanic White (White), non-Hispanic Black (Black), non-Hispanic Asian/other (Asian), Vietnamese, and Hispanic. It has been shown that incidence rates of cervical cancer are substantially higher among Vietnamese women than among women from other Asian subgroups, so these women were separated from other Asians.[15] We categorized age at diagnosis (15–29, 30–39, 40–49, 50–59, 60–64

years) to reflect differences in the frequency with which women undergo routine gynecological examinations. Marital status was defined as married or not married. Year of diagnosis was included to adjust for any changes in Medicaid enrollment policies.

Because the California Cancer Registry does not routinely collect information on SES, it has developed a procedure for deriving a composite index of neighborhood-level SES from the US census that includes estimates of poverty, income, home value, education, and blue-collar status.[16] On the basis of residence at diagnosis, each patient's address is geocoded and then assigned the specific socioeconomic characteristics for that census block group. This score is divided into 5 quintiles, with quintile 1 representing residence in the lowest SES census block group and quintile 5 representing residence in the highest SES block group. If a post office box is provided instead of a street address, neighborhood-level SES is not assigned. The practice of assigning SES at the neighborhood level when individual-level SES is not available is established in public health,[17] with some researchers suggesting that neighborhood SES itself is an independent predictor of health outcomes.[18,19]

Data on in situ cervical cancers are not collected by the California Cancer Registry. We defined stage at diagnosis, according to Surveillance, Epidemiology, and End Results (SEER) Summary Stage 1977 guidelines, as local (restricted to the cervix), regional (extending to surrounding organs), or remote (metastasized to distant parts of the body). In our analyses, we divided these stages into 2 diagnosis categories: early (local) and late (regional and remote). After determining that results did not differ when women whose diagnosis stage was not known (n=191) were included with women with a late-stage diagnosis, we combined these 2 groups to be consistent with previous work.[11] Using the *International Classification of Diseases, Oncology* (second edition), we classified tumors as adenocarcinoma (morphology codes 8140–8555), adenosquamous cell carcinomas (8560, 8570), squamous cell (8050–8082), or other types (8000–8004, 8010–8034, 8041, 8800–8932, 8990–8991, 9040–9044, 9120–9134, 9540–9581, 9990).[20]

Medicaid Enrollment Status

We determined Medicaid enrollment status using Medicaid enrollment files provided by the Medical Care Statistics Section of the California Department of Health Services. We linked monthly Medicaid enrollment files for 1995 through 1999 with California Cancer Registry data using a probabilistic matching algorithm. Patients were matched according to Social Security number, first name, last name, birth date, and zip code of residence. A total of 59.9% of the participants matched exactly on all fields, and an additional 19.3% matched exactly on name, date of birth, and Social Security number (but not zip code area). The remaining 20.8% of patients were included because they matched on combinations of these identifiers or matched according to a visual review.

We defined month of diagnosis on the basis of the cancer registry data, which typically date from the first positive microscopic confirmation. Month-by-month Medicaid enrollment histories during the 12 months before diagnosis were constructed for all women enrolled in Medicaid. From this process, we developed 2 variables designed to measure Medicaid status.

First, we used a dichotomous (enrolled vs not enrolled) measure of enrollment in Medicaid at the time of diagnosis ("Medicaid enrollment status"). Second, to investigate duration of enrollment in Medicaid at the time of diagnosis ("Medicaid duration"), we classified women into one of 4 categories: (1) first enrolled in the month of diagnosis (i.e., the first month of coverage was the month of diagnosis); (2) enrolled at the time of diagnosis and for between 1 and 11 months during the year before the diagnosis (intermittently enrolled women); (3) enrolled for 12 months before diagnosis, including at the point of the diagnosis; and (4) not enrolled at the time of diagnosis.

We elected to define duration categories as month of diagnosis or continuous enrollment for 12 months before diagnosis because these classifications represent extremes in terms of opportunities to be screened by Medicaid. The 1- to 11-month enrollment category was empirically derived, in that women in this group were intermittently enrolled for various lengths of time. Because some women might be retroactively enrolled in the first few months surrounding their diagnosis, we examined the effect of combining women enrolled in the 3 months before their diagnosis with those enrolled in the month of their diagnosis. This combining of categories led to 72 women (2% of the overall sample) being moved from the intermittent 1- to 11-month category to the enrolled at diagnosis category but did not alter the results of the multivariate model.

Because of our focus on Medicaid eligibility, we restricted participants to women who were aged 15 to 64 years at their diagnosis and whose month of diagnosis was known. In addition, eligibility was limited to women for whom cervical cancer was the first invasive cancer. After identifying 5241 women meeting these criteria, we excluded 559 (11%) women without data on race, SES, marital status, or histology.

Statistical Analyses

We used χ^2 statistics to summarize and compare the basic characteristics of the study population according to Medicaid enrollment status. We conducted logistic regression analyses to evaluate the relation between late stage at diagnosis and Medicaid status before diagnosis, adjusting for age, race/ethnicity, neighborhood SES, marital status, year of diagnosis, and histology. The first set of analyses focused on Medicaid enrollment status (enrolled vs not enrolled) and the second on Medicaid duration (not enrolled, first enrolled during month of diagnosis, enrolled 1–11 months before diagnosis, or enrolled continuously for 12 months before diagnosis).

The reference category in both models was women not enrolled in Medicaid. We calculated estimated odds ratios (ORs) and 95% confidence intervals (CIs) and set the level of statistical significance at $P<.05$. All analyses were conducted with SAS statistical software version 9.1 (SAS Institute, Cary, NC).

RESULTS

Of the 4682 women diagnosed with invasive cervical cancer in this retrospective cohort, 888 (19%) received Medicaid benefits during the month of their diagnosis (Table 1).

TABLE 1—Demographic, Socioeconomic, and Tumor Characteristics of 4682 Women Diagnosed With Cervical Cancer, by Medicaid Enrollment Status: California, 1996–1999

	Not Enrolled in Medicaid (n = 3794)	Enrolled in Medicaid (n = 888)	Total (n = 4682)
SEER summary stage, no. (%)**			
Localized	2195 (57.9)	437 (49.2)	2632 (56.2)
Regional	1128 (29.7)	326 (36.7)	1454 (31.1)
Distant/unknown	471 (12.4)	125 (14.1)	596 (12.7)
Stage at diagnosis, no. (%)**			
Early	2195 (57.9)	437 (49.2)	2632 (56.2)
Late/unknown	1599 (42.2)	451 (50.8)	2050 (43.8)
Socioeconomic status quintile,[a] no. (%)**			
1 (lowest)	950 (25.0)	424 (47.8)	1374 (29.4)
2	757 (20.0)	226 (25.5)	983 (21.0)
3	759 (20.0)	132 (14.9)	891 (19.0)
4	699 (18.4)	66 (7.4)	765 (16.3)
5 (highest)	629 (16.6)	40 (4.5)	669 (14.3)
Race/ethnicity, no. (%)**			
Non-Hispanic White	1775 (46.8)	307 (34.6)	2082 (44.5)
Non-Hispanic Black	197 (5.2)	125 (14.4)	322 (6.9)
Hispanic	1399 (36.9)	347 (39.1)	1746 (37.3)
Non-Hispanic Asian	382 (10.1)	69 (7.8)	451 (9.6)
Non-Hispanic Vietnamese	41 (1.1)	40 (4.5)	81 (1.7)
Age at diagnosis, mean ±SD	44.0 ±9.9	42.3 ±10.2	43.6 ±10.0
Age at diagnosis, y, no. (%)**			
15–29	286 (7.5)	86 (9.7)	372 (8.0)
30–39	1012 (26.7)	293 (33.0)	1305 (27.9)
40–49	1379 (36.4)	297 (33.4)	1676 (35.80)
50–59	831 (21.9)	154 (17.3)	985 (21.0)
60–64	286 (7.5)	58 (6.5)	344 (7.4)
Marital status, no. (%)**			
Married	2136 (56.3)	300 (33.8)	2436 (52.0)
Not married	1658 (43.7)	588 (66.2)	2246 (48.0)
Histology, No. (%)**			
Squamous	2633 (69.4)	708 (79.7)	3341 (71.4)
Adenocarcinoma	803 (21.2)	105 (11.8)	908 (19.4)
Adenosquamous	216 (5.7)	34 (3.8)	250 (5.3)
Other	142 (3.7)	41 (4.6)	183 (3.9)
Year of diagnosis, no. (%)*			
1996	953 (25.1)	247 (27.8)	1200 (25.6)
1997	977 (25.8)	199 (22.4)	1176 (25.1)
1998	931 (24.5)	242 (27.3)	1173 (25.1)
1999	933 (24.6)	200 (22.5)	200 (24.2)

Note. SEER = Surveillance, Epidemiology, and End Results. As a result of rounding, percentages may not sum to 100.
[a]On the basis of 2000 census block-group-level quintiles.
*P < .03; **P < .001.

Women with Medicaid benefits were more likely to be younger and to be Black than those not enrolled in Medicaid. Approximately half of the Vietnamese participants and nearly 40% of Black women diagnosed with cervical cancer received Medicaid benefits. Medicaid recipients were also more likely to be unmarried and to live in lower SES neighborhoods. Finally, they were more likely to have squamous cell tumors.

Late-stage disease was diagnosed in 2050 (44%) of the participants. Approximately half (51%) of those enrolled in Medicaid presented with advanced disease, compared with 42% of the women not covered by Medicaid. Black women were more likely to present at a late stage (52%) than were Asian (44%), Hispanic (44%), or White (43%) women. Only 28% of Vietnamese women were diagnosed with late-stage cervical cancer.

Considering only the 888 Medicaid recipients, 142 (16%) first enrolled in the month of their diagnosis, 210 (24%) received benefits for 1 to 11 months during the year before their diagnosis, and the remaining 536 (60%) were enrolled continuously for 1 year before their diagnosis (Table 2). Late stage at diagnosis was strongly associated with duration of Medicaid enrollment; 71% of women enrolling during the month of their diagnosis, 50% of those enrolled 1 to 11 months before their diagnosis, and 46% of those continuously enrolled for 12 months before their diagnosis had late-stage diagnoses.

Vietnamese and Black women were more likely to be continuously enrolled in Medicaid than women in the other groups, whereas Hispanics were more likely to enroll during the month of their diagnosis. Women enrolled in Medicaid for the first time during the month of their diagnosis were older than women in the other Medicaid duration categories. Marital status and histology did not differ according to duration of Medicaid enrollment.

Table 3 shows crude and adjusted estimates of the effects of Medicaid duration, SES, race/ethnicity, age, marital status, and histology on the odds of a late- or unknown-stage diagnosis. Adjustment for other factors weakened the effect of Medicaid enrollment on stage at diagnosis among women who enrolled in the month of their diagnosis, but it did not alter the association for other levels of Medicaid duration. Women who enrolled in Medicaid in the month of their diagnosis were 3 times more likely than those not enrolled in Medicaid to present with late-stage disease. Odds of a late- or unknown-stage diagnosis decreased as neighborhood SES increased. In a subanalysis in which SES was removed from the model, odds ratios for the Medicaid measures increased by approximately 10%,

TABLE 2—Demographic, Socioeconomic, and Tumor Characteristics of 888 Women Enrolled in Medicaid and Diagnosed With Cervical Cancer, by Duration of Enrollment Before Diagnosis: California, 1996–1999

	Enrolled in Month of Diagnosis (n = 142)	Enrolled 1–11 Months Before Diagnosis (n = 210)	Enrolled in All 12 Months Before Diagnosis (n = 536)
SEER summary stage, no. (%[a])*			
Localized	41 (28.9)	105 (50.0)	291 (54.3)
Regional	62 (43.7)	83 (39.5)	181 (33.8)
Distant/unknown	39 (27.5)	22 (10.5)	64 (11.9)
Stage at diagnosis, no. (%[a])*			
Early	41 (28.9)	105 (50.0)	291 (54.3)
Late/unknown	101 (71.1)	105 (50.0)	245 (45.7)
Socioeconomic status quintile,[b] no. (%[a])			
1 (lowest)	57 (40.1)	100 (47.6)	267 (49.8)
2	40 (28.2)	46 (21.9)	140 (26.1)
3	22 (15.5)	34 (16.2)	76 (14.2)
4	11 (7.8)	17 (8.1)	38 (7.1)
5 (highest)	12 (8.5)	13 (6.2)	15 (2.8)
Race/ethnicity, no. (%[a])*			
Non-Hispanic White	48 (33.8)	75 (35.7)	184 (34.3)
Non-Hispanic Black	7 (4.9)	23 (11.0)	95 (17.7)
Hispanic	73 (51.4)	90 (42.9)	184 (34.3)
Non-Hispanic Asian	13 (9.2)	12 (5.7)	44 (8.2)
Non-Hispanic Vietnamese	1 (0.7)	10 (4.8)	29 (5.4)
Age at diagnosis, mean ±SD	46.1 ±9.5	41.7 ±9.7	41.5 ±10.4
Age at diagnosis, y, no. (%[a])*			
15–29	3 (2.1)	20 (9.5)	63 (11.8)
30–39	37 (26.1)	70 (33.3)	186 (34.7)
40–49	51 (35.9)	78 (37.1)	168 (31.3)
50–59	35 (24.7)	33 (15.7)	86 (16.0)
60–64	16 (11.3)	9 (4.3)	33 (6.2)
Marital status, no. (%[a])			
Married	55 (38.7)	77 (36.7)	168 (31.3)
Not married	87 (61.3)	133 (63.3)	368 (68.7)
Histology, no. (%[a])			
Squamous	111 (78.2)	163 (77.6)	434 (81.0)
Adenocarcinoma	19 (13.4)	28 (13.3)	58 (10.8)
Adenosquamous	6 (4.2)	8 (3.8)	20 (3.7)
Other	6 (4.2)	11 (5.2)	24 (4.5)

Note. SEER = Surveillance, Epidemiology, and End Results. As a result of rounding, percentages may not sum to 100.
[a]Percentage within Medicaid group.
[b]On the basis of 2000 census block-group-level quintiles.
*$P < .001$.

but the confidence intervals were essentially unchanged.

In the adjusted model, Black race/ethnicity was no longer associated with late stage at diagnosis. In the case of variables other than Black race/ethnicity, there was little difference between the crude and adjusted odds ratios. Hispanic, Asian, and Black women were no more likely than White women to present with advanced disease. By contrast, Vietnamese women were approximately one third as likely as White women to be diagnosed at a late or unknown stage. There was a noticeable association with age: women younger than the reference age group of 40 to 49 years were significantly less likely to be diagnosed at a later stage, whereas women older than 49 years were significantly more likely to present with advanced disease. Women with adenocarcinoma were less likely than those with squamous cell cancer to be diagnosed with advanced disease. Year of diagnosis was not associated with stage at diagnosis.

We also examined the dichotomous Medicaid enrollment status measure in terms of late or unknown stage at diagnosis. Women with Medicaid coverage were more likely than those without coverage to be diagnosed with advanced disease (OR = 1.34; 95% CI = 1.14, 1.58) after adjustment for age, race/ethnicity, marital status, SES, and histology. Because the adjusted odds ratios for the other covariates were similar in the analyses focusing on enrollment status and the analyses focusing on Medicaid duration (data not shown), only the results for the Medicaid duration analyses are presented in the tables.

DISCUSSION

Among California women younger than 65 years diagnosed with invasive cervical cancer during 1996 through 1999, those with Medicaid coverage were more likely to have advanced disease than those without coverage. However, there was a risk gradient related to length of enrollment in Medicaid. Women enrolled continuously in Medicaid during the year before their diagnosis were at no greater risk of advanced disease than women not enrolled. The relations persisted after control for age, race/ethnicity, SES, marital status, and histology. Low SES and increasing age were independent risk factors for late-stage disease, whereas Vietnamese race/ethnicity, being married, and adenocarcinoma histology were associated with decreased odds of late-stage disease.

The substantial percentage (44%) of California cervical cancer patients diagnosed with late-stage disease, regardless of Medicaid status, is similar to what has been reported nationally in SEER as well as in Florida. SEER data show that 41% of women

TABLE 3—Odds Ratios (ORs) for Late- or Unknown-Stage Diagnoses Among 4682 Women Diagnosed With Cervical Cancer, by Medicaid Enrollment Duration and Other Factors: California, 1996–1999

	Crude OR (95% CI)	Adjusted OR (95% CI)
Medicaid enrollment duration		
Enrolled at diagnosis	3.38 (2.34, 4.89)	2.84 (1.94, 4.17)
Enrolled 1–11 months before diagnosis	1.37 (1.04, 1.81)	1.34 (1.00, 1.80)
Enrolled for 12 months before diagnosis	1.16 (0.96, 1.39)	1.08 (0.89, 1.33)
Non-Medicaid coverage	1.0	1.0
Socioeconomic status quintile		
1 (low)	1.69 (1.40, 2.04)	1.65 (1.32, 2.06)
2	1.38 (1.13, 1.69)	1.33 (1.07, 1.66)
3	1.22 (0.99, 1.50)	1.25 (1.01, 1.56)
4	1.04 (0.84, 1.28)	1.05 (0.84, 1.31)
5 (high)	1.0	1.0
Race/ethnicity		
Non-Hispanic White	1.0	1.0
Non-Hispanic Black	1.42 (1.12, 1.80)	1.04 (0.81, 1.35)
Hispanic	1.06 (0.93, 1.20)	0.88 (0.75, 1.02)
Non-Hispanic Asian	1.06 (0.86, 1.30)	0.92 (0.74, 1.15)
Non-Hispanic Vietnamese	0.53 (0.33, 0.87)	0.36 (0.21, 0.60)
Age at diagnosis, y		
15–29	0.36 (0.27, 0.46)	0.32 (0.24, 0.42)
30–39	0.66 (0.57, 0.76)	0.62 (0.53, 0.72)
40–49	1.0	1.0
50–59	1.81 (1.54, 2.12)	1.84 (1.57, 2.17)
60–64	2.11 (1.66, 2.68)	2.05 (1.61, 2.62)
Marital status		
Married	0.70 (0.62, 0.78)	0.76 (0.67, 0.87)
Not married	1.0	1.0
Histology		
Squamous	1.0	1.0
Adenocarcinoma	0.54 (0.47, 0.64)	0.57 (0.49, 0.68)
Adenosquamous	0.89 (0.68, 1.15)	0.94 (0.71, 1.23)
Other	1.19 (0.88, 1.60)	1.25 (0.91, 1.70)

Note. OR = odds ratio; CI = confidence interval.

younger than 65 years who were diagnosed in years comparable to our study population presented with late-stage disease. A registry-based study of Florida women diagnosed with cervical cancer in 1994 revealed that 45% had late-stage disease; 47% of Medicaid clients and 55% of uninsured patients had widespread disease.[6]

A study of almost 3900 women with cervical cancer diagnosed in 1996–1997 and reported to the Cancer Registry of Michigan showed a significantly increased risk of late-stage disease among Medicaid recipients that was higher among women not enrolled before their diagnosis (odds ratios of 5.5 for women enrolled after their diagnosis and 1.8 for those enrolled before their diagnosis); this estimate was higher than the odds ratio of 2.8 reported here for women enrolling in the month of their diagnosis.[11] Interestingly, the Michigan and California studies included similar percentages of women enrolling during the month of their diagnosis (approximately 15%).

The association between cervical cancer and low SES has been well studied,[5,21–23] as has the association of late-stage disease with low SES.[24] In our study, women in the lower 2 quintiles of neighborhood SES were at increased risk of late-stage disease, even after control for race and Medicaid status. This finding is consistent with results of earlier studies showing an association between late-stage disease and low SES based on either educational level or poverty level.[5,24–27] None of these studies, however, controlled for Medicaid enrollment or other insurance status. Our findings suggest that screening interventions should be targeted to women living in lower income census tracts.

The relation between race/ethnicity and stage of disease is complicated, in that it encompasses factors such as cultural beliefs, access to care, screening status, and SES. Even classifying Hispanics into a unique category separate from non-Hispanic Blacks and non-Hispanic Asians rather than a single "non-White" category may alter the impact of race/ethnicity on disease stage. Our data show that the increased odds of late-stage disease among Black women were eliminated when factors such as Medicaid status and SES were included in the analysis, confirming previous reports.[12,28,29]

Historically, rates of cervical cancer (both early and late stage) have been higher among Hispanic women than among non-Hispanic White women,[15,25,30,31] but this situation may be changing.[32] In the present study, Hispanic women were no more likely than White women to have advanced disease, confirming one national report focusing on cases diagnosed in the1990s[32] but disputing another.[30] Similar to Hispanic women, Asian women are more likely than White women to be diagnosed at a late stage[33,34] and less likely to be screened for cervical cancer.[33,35–37] Yet, in this California study, the odds of late-stage disease among Asian women (OR=0.92) were no different from those among Hispanic (OR=0.88) or White women (the reference group).

Moreover, Vietnamese women were significantly less likely than White women to be diagnosed with late-stage disease (OR=0.36). Such a result is encouraging given that, historically, rates of invasive cervical cancer have

been higher among Vietnamese American women than among other US racial/ethnic groups and Pap testing rates have been lower.[15,33,34] This reversal may reflect public health efforts to improve cervical cancer screening among Vietnamese women.[38,39] Given that race/ethnicity, SES, and Medicaid enrollment are deeply interrelated, it is critical that studies assessing stage at diagnosis of cervical cancer include all 3 variables.

Increasing age was associated with a monotonic increase in the odds of late-stage cervical cancer, a result similar to the findings reported in previous studies.[28,30,40,41] Recent research has documented that older women are significantly less likely than younger women to undergo Pap testing[42–44] and therefore are more likely to present with late-stage disease.

It has been suggested that adenocarcinomas are less amenable to screening than squamous carcinomas as a result of the difficulty of sampling cells from the endocervix and the fact that Pap tests of adenocarcinomas have higher false-negative rates than Pap tests of squamous carcinomas.[45] As such, it is surprising that we found that women with adenocarcinomas were significantly less likely than women with squamous cell cancer (adjusted OR=0.57) to present with advanced disease after control for other factors.

Our finding of an increased risk of late-stage disease among women enrolled in Medicaid either intermittently or at the time of their diagnosis is similar to the results of an investigation involving a cohort of Ohio women.[12] In that study, women were grouped into prediagnostic, peridiagnostic (2 months before diagnosis, at the time of diagnosis, and 2 months postdiagnosis), and postdiagnostic Medicaid enrollment categories. The researcher included the peridiagnostic category to minimize potential enrollment misclassification.

Although we had the statistical power to finely divide our categories, we too were concerned with potential misclassification. We defined our enrollment categories empirically as none, at the time of diagnosis, intermittent (between 1 and 11 months during the year before the diagnosis), and all 12 months before diagnosis, and the sizable numbers of women in each category allowed us to examine the peridiagnostic group in further detail. Unfortunately, there is no way to identify which of the 72 women enrolled 1 to 3 months before their diagnosis were retrospectively enrolled (thereby implying that they had an opportunity for screening when they did not). However, our analyses of this potential misclassification showed that the risk gradient among these women was slightly higher than the gradient among those enrolled 4 to 11 months before their diagnosis but considerably lower than the risk shared by those enrolled at diagnosis.

A limitation of our study was our inability to separate uninsured from insured women in the "not enrolled in Medicaid" reference group. Therefore, the reference group included women with varying access to screening and medical care. By including uninsured women in the reference group, we may have diluted the odds of late-stage disease among women with Medicaid coverage. An additional concern is that disease stage is a crude marker of screening. Otherwise, this study involved significant strengths, including a large, recent population of ethnically diverse women.

In conclusion, we found that 44% of California women younger than 65 years who were diagnosed with cervical cancer during 1996 through 1999 presented with late-stage disease, suggesting that women are not being adequately screened. Good screening programs should eliminate or reduce the occurrence of cervical cancer.[46] The risk of late-stage disease among women enrolled continuously in Medicaid did not differ from the risk among women without Medicaid coverage after control for age, race/ethnicity, SES, and histology, suggesting that Medicaid successfully screened its enrollees. Women who received Medicaid benefits intermittently in the year before their diagnosis were more likely to be diagnosed with late-stage disease, and women not enrolled before their diagnosis were at the greatest risk of late-stage disease.

The results of this study, along with those of the Florida study described earlier,[6] reinforce the evidence indicating that women at risk of cervical cancer need to be enrolled in Medicaid earlier to ensure their access to screening services and thus, reduce late-stage diagnoses. Finally, our findings suggest that it is critical to consider duration of Medicaid enrollment in evaluating the impact of Medicaid screening on cancer stage at diagnosis. ■

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Contributors

C.D. O'Malley directed the analyses, synthesized the results, and led the writing. S.J. Shema and L.S. Clarke conducted the analyses. C.A. Clarke coordinated the institutional review board approvals. C.L. Perkins originated the study, obtained the data, and coordinated the data linkage. All of the authors helped to conceptualize ideas, interpret findings, and review drafts of the article.

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Human Participant Protection

The institutional review boards of the Northern California Cancer Center and the Public Health Institute approved this study.

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