

Risk Factors for Invasive Cervical Cancer in Latino Women

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Most invasive cervical cancer research in the United States has been conducted on non-Latino-White (NLW) and African-American women. Incidence, mortality, stage at diagnosis and survival indicators for invasive cervical cancer in Latino women in California are compared to NLW and African-American women. A model is presented which depicts structural, behavioral, genetic and biological risk factors for invasive cervical cancer. A literature review of risk factors and their association with invasive cervical cancer was conducted using MEDLINE and PsychINFO databases to determine if ethnic differences in risk factors explain observed differences in morbidity and mortality. Latino women experience a significantly higher incidence and mortality associated with invasive cervical cancer than NLW women. The review of risk factors found that rate differences of cervical cancer screening, early detection and human papilloma virus (HPV) type-specific infection explain much of the disparity in disease burden. Further research must clarify if ethnic differences exist in risk factors associated with ethnic variation in HPV-type prevalence in both cases and their sexual partners, in host immune responses, and multiparity.

KEY WORDS: Cervical cancer; race and ethnicity; outcomes.

INTRODUCTION

Despite significant advances in the prevention, early detection and clinical management of invasive cervical cancer, this cancer continues to cause significant morbidity and mortality for thousands of women each year. Latin American countries report the highest rates of cervical cancer in the world,⁽¹⁾ and it is arguably the most common cancer among women in the developing world.^(2,3) In the United States, invasive cervical cancer is the ninth most common cancer in women, affecting an estimated 15,000 women.⁽⁴⁾ Among Latino women, cervical cancer is the

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third most common cancer while it ranks sixth for NLW women.⁽⁵⁾ Cervical cancer deaths rank thirteenth among all cancer deaths with an estimated 4600 women dying in 1994. Further contributing to the morbidity burden are the estimated 55,000 cases of cervical carcinoma *in situ* and the even greater number of cytological abnormalities requiring further evaluation.⁽⁶⁾

Substantial reductions in the incidence and mortality of cervical cancer have been achieved in the past 40 years, due largely to the increasing availability and use of Papanicolaou (Pap) smear screening. The age-adjusted incidence of cervical cancer has steadily declined, dropping 35% between 1973 and 1990, from a rate of 14.2 to 8.8 per 100,000 women. Similarly, age-adjusted mortality rates for cervical cancer have declined 41% from 1973 to 1990 from 5.2 to 3.0 per 100,000 women.⁽⁷⁾ Nonetheless, cervical cancer continues to be a significant public health issue because more invasive cervical cancer cases could be prevented with timely screening and treatment. Data on cervical cancer outcomes by ethnicity and race are needed to effectively guide development of further research, prevention and early detection strategies.

According to the 1990 U.S. Census, the California population was estimated to be 57.2% NLW, 25.8% Latino, and 7.0% African-American with Latinos comprising the fastest growing group.⁽⁸⁾ Given Latinos' stated projected population growth, it is becoming increasingly important to examine ethnic differences in disease burden to identify protective practices, and factors which increase risk for cancer. Thus, this paper reviews the literature to identify differences in cervical cancer incidence and mortality rates for Latino women in California (compared to NLW women and African-American women), and to examine possible explanations for existing ethnic disparities in invasive cervical cancer indicators of morbidity and mortality. The following questions guide the literature review: (1) Does the prevalence of risk factors associated with invasive cervical cancer differ between Latino and NLW women? (2) If there are differences, do these explain the disproportionately higher incidence of invasive cervical cancer in Latinos compared to NLW women?

METHODS

Population-based data on invasive cervical cancer incidence and mortality are collected for 9.6% of the U.S. population by the Surveillance, Epidemiology, and End Results (SEER) Program.⁽⁹⁾ SEER reports of national cancer incidence and mortality are available by African-American/White race but are not published by Latino ethnicity. Since the California tumor registry publishes its reports of cancer morbidity and mortality by race and ethnicity, we used this source to make racial and ethnic comparisons of the incidence and mortality experiences of Latino women with NLW and African-American women.

1988-1992 California registry data marked the first time period for which Latino cases and deaths were identified by surname, in addition to medical record or death certificate information.⁽¹⁰⁾ A study conducted by the Northern California Cancer Center⁽¹¹⁾ found that the use of Spanish surname as a supplement to information about ethnicity obtained from the medical record resulted in improved

sensitivity and accuracy of Latino cancer rates. However, we were unable to examine trends by race and ethnicity since race-specific rates presented in earlier California Cancer Registry reports are not comparable to those reported in earlier reports where race is identified through a different methodology.

A review of the medical and psychological literature was conducted using MEDLINE and PsychINFO databases. Articles on sexual behavior risk factors, cigarette smoking, genetic and biological factors, socioeconomic status, survival, Pap smear screening utilization, and barriers to preventive health services were reviewed to explain Latinos' elevated cervical cancer incidence and mortality and to suggest areas for future research.

Conceptual Model

In order to organize the specific factors that influence the disease burden associated with cervical cancer in Latino women, we developed the conceptual model depicted in Fig. 1. Through a scientific literature review, we grouped factors associated with higher cervical cancer incidence into three categories: (1) structural factors, such as socioeconomic status, education, income and access to care; (2) behavioral factors, such as Pap smear use, cigarette smoking and sexual practices; and (3) biological and genetic factors, such as human papillomavirus (HPV) infection, host genetics, immune responses, and parity. These categories are not mutually

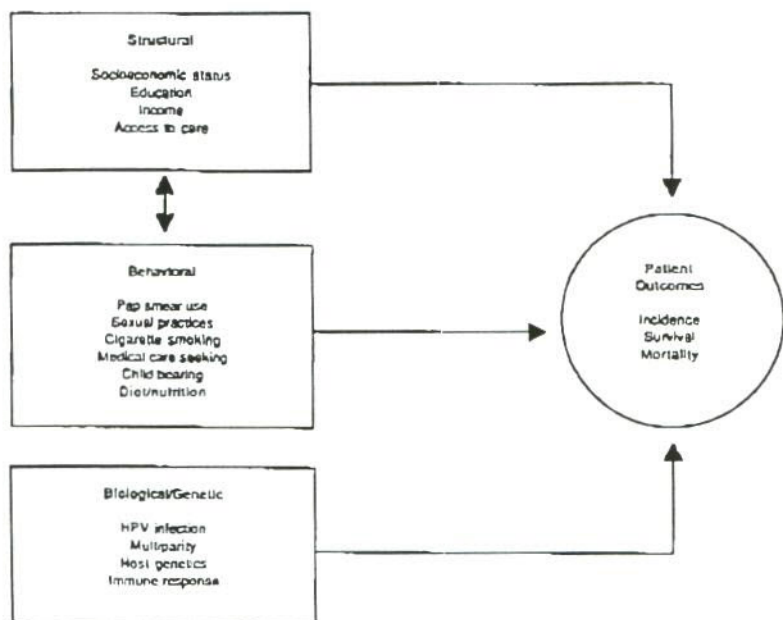


Fig. 1. Conceptual model of patient factors relating to cervical cancer mortality and morbidity.

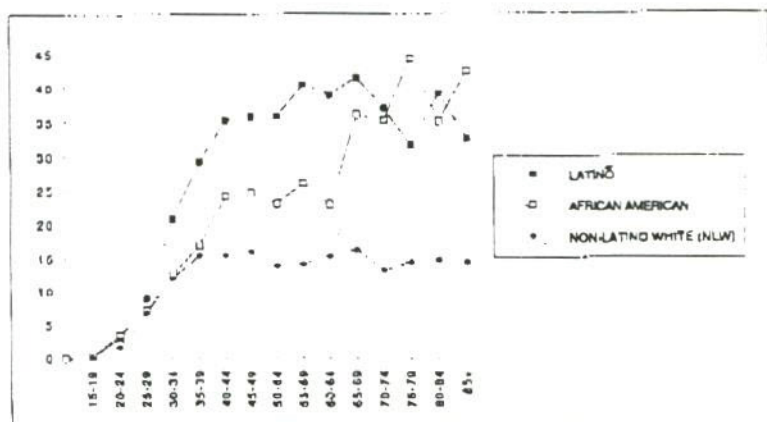


Fig. 2. Invasive cervical cancer average annual age-specific incidence by race/ethnicity California, 1988-1992. Source: California Cancer Registry.

exclusive, as a specific variable can have more than one dimension. For example, HPV infection, which is sexually transmitted, is also a biological precursor to cervical cancer. It is also heuristically useful to distinguish between factors related to etiology of cervical cancer and those related to screening practices. Etiological factors potentially affect incidence of cancer while the effects of screening factors are reflected in staging of disease and mortality indicators.

Incidence, Mortality, and Survival

In California, cervical cancer is the second most common cancer for Latino women, while it ranks sixth for African-American women, and sixteenth for NLW women. Latino and African-American women in California experience an annual age-adjusted cervical cancer incidence approximately twice as high as that of NLW women (17.1, 12.5, and 7.5 per 100,000, respectively). Age-specific incidence rates by ethnic group indicate that cervical cancer occurs at higher rates for Latino women, particularly for younger women between the ages of 30 to 45 years, and that rates increase for African-American women after the age of 65 years (Fig. 2).

Latino and African-American women also tend to die of this disease at twice the rate of NLW women (4.3, 5.0, and 2.2 per 100,000, respectively). For every 2.5 cases of cervical cancer, one African-American woman dies, compared to one death for every 4 cases in Latino women, and one in every 3.4 cases for NLW women (Table I).⁽¹⁰⁾ Age-specific mortality rates reveal increasing disparity in death rates over 30 years for all women, with dramatic increases for African-American women older than 65 years (Fig. 3).

Follow-up data to assess survival, following cervical cancer, is not available statewide, but is collected for the five counties comprising the Region 8 registry. Table II shows differences in the survival rates of NLW, Latino and African-American women in the San Francisco Bay Area with invasive cervical cancer. The 5-year

Table I. Invasive Cervical Cancer Average Annual Age-Adjusted Incidence and Mortality Rates^a by Race/Ethnicity California, 1988-1992

Race/Ethnicity	Incidence Rates		Mortality Rates	
	New Cases	Rate	Deaths	Rate
All races	8,337	9.9	2,292	2.8
Latino	2,502	17.1 ^b	552	4.3 ^b
African-American	663	12.5 ^b	253	5.0 ^b
Non-Latino-White (NLW)	4,221	7.5 ^b	1,264	2.2 ^b

^aRates are per 100,000. Source: California Cancer Registry.

^bRate is significantly different for comparable rates for all races, 1988-1992 ($p < 0.05$).

relative survival rate for women diagnosed at a localized stage was 84% for African-Americans and 84.8% for Latinos compared to 97.2% for NLWs for 1988-1992. Thus, NLW women with cervical cancer were more likely to survive when diagnosed at an early stage than the other two groups. Five year survival rates for women diagnosed with regional cervical cancer indicate that African-American women have the least likelihood of survival (20.9%), compared to Latinos (44%), or NLW women (50.7%). The greater rate disparities between African-American and NLW women may be due to more advanced disease among African-American women diagnosed at this stage. Although Latinos experience higher invasive cervical cancer rates and are screened less frequently in comparison to African-American women, they tend to die less often from the disease and experience improved survival. These observations suggest protective cultural or biological factors operating, or alternatively, better access to follow-up care.

One explanation for the poorer survival and higher mortality observed in African-Americans and Latinos with cervical cancer compared to NLW women is that minority women tend to be diagnosed at later stages of disease. California Afri-

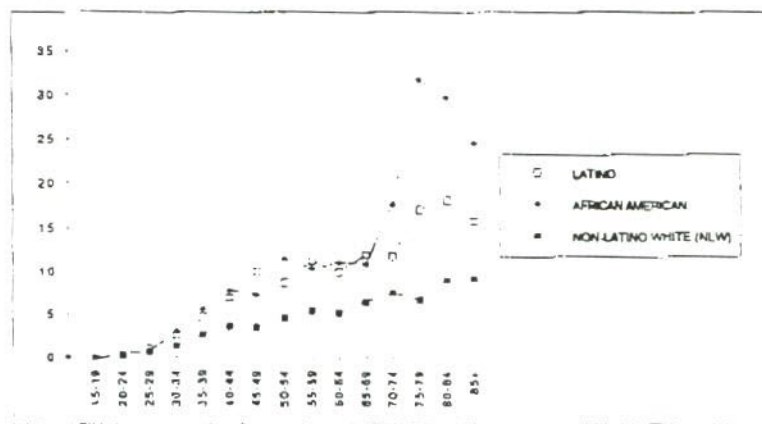


Fig. 3. Invasive cervical cancer average annual age-specific mortality by race/ethnicity California, 1988-1992. Source: California Cancer Registry.

Table II. Invasive Cervical Cancer Five Year Relative Survival Rates by Race/Ethnicity (%) San Francisco Bay Area,^a 1988-1992

Race/Ethnicity	Total N	All Stages (SE)	Localized (SE)	Regional (SE)	Distant (SE)
Latino	139	49.5 (13.9)	84.8 (21.7)	44.0 (19.6)	0.0 (27.0)
African-American	122	51.9 (0.0)	84.0 (0.0)	20.9 (0.0)	0.0 (0.0)
Non-Latino White (NLW)	233	72.3 (31)	97.2 (4.1)	50.7 (0.0)	0.0 (0.0)

^aSource: Northern California Cancer Center.

Region 8 includes Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties.

Rates are per 100,000.

can-American and Latino women are diagnosed with localized cervical cancer less frequently than are NLW women (42.9%, 48.9%, and 53.3%, respectively, Table III). For example, crudeness of the breast cancer rating system, which classifies disease extent as local, regional or distant, underestimates racial variation in survival attributable to socioeconomic factors.⁽¹²⁾ A study which evaluated the relative effects of age, race, and socioeconomic status on disease stage and survival for Connecticut women found African-American women to be 50 to 60% more likely to be diagnosed with advanced disease. Stage of disease was an independent predictor of mortality adjusting for the effects of age at diagnosis, race, and socioeconomic status (as measured by census data for the percent of high school graduates, percent below poverty level and median income).⁽¹³⁾ Unfortunately, such studies have not been published on Latino women with cervical cancer.

STRUCTURAL FACTORS

Socioeconomic Status and Ethnicity

In comparing ethnic differences across cancer sites, there are some types of cancer which are more highly correlated with socioeconomic status than others, which implies a stronger role for environmental factors than biological or genetic traits. Studies of invasive cervical cancer have found a strong association with lower socioeconomic levels. The challenge is to identify what these proxy measures represent in the real life situations of Latino women faced with the risk of cervical cancer, i.e., lifestyle practices, access to care, and delays in seeking care among others.

Table III. Invasive Cervical Cancer Stage at Diagnosis (%) by Race/Ethnicity California,^a 1988-1992

Race/Ethnicity	Local	Regional	Distant	Unstaged
Latino	48.9	34.6	8.3	8.2
African-American	42.9	35.1	12.5	9.5
Non-Latino White (NLW)	53.3	30.2	10.4	6.1

^aSource: Northern California Cancer Center.

Region 8 includes Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties.

Rates are per 100,000.

Studies that have conducted multivariate analyses to examine racial or ethnic differences in the effects of socioeconomic factors on risk of cervical cancer have obtained mixed results. This issue has largely been studied in African-American women using secondary data from national health surveys and SEER data with race-specific aggregate (census tract level) SES indicators.⁽¹⁴⁾ The various SES variables used in studies differed in the strength of their association with race depending upon whether median family income, median education level, population density or/and percent below poverty level were used. Thus, differences may be due to lack of consistency in the SES indicators used. Nonetheless, most analyses have shown that adjusting for income, poverty, and education based on census tract level indicators appears to explain approximately half of the cervical cancer incidence differential between African-Americans and NLWs.⁽¹⁵⁻¹⁷⁾ Interestingly, on one study, stratification by a group level poverty indicator revealed an interactive effect of race and social class on age-specific mortality rates, such that greater racial differences in mortality rates were observed for those groups in which poverty was less marked. Thus, available data indicate that racial and ethnic differences are confounded by poverty at lower income levels when comparing African-American and NLW women.⁽¹⁷⁾

One study of Latino and NLW women in New Mexico, which controlled for HPV infection, other sexual risk factors, and cigarette smoking status, found that education independently predicted risk for high-grade cervical dysplasia.⁽¹⁸⁾ Women having less than a high school education experienced a sixfold increase in risk compared to women with more than a high school education.⁽¹⁸⁾ Another study found the single most important factor (controlling for the effects of sexual behavior factors) accounting for differences in incidence of cervical cancer between Latino and NLW women to be years of education in spite of matching of cases and controls on neighborhood.⁽¹⁹⁾ Thus, various socioeconomic factors may operate differently for distinct racial and ethnic groups.

Barriers to Preventive Health Services

Studies have shown that utilization factors such as having a place to obtain care, having a primary care provider, obtaining regular checkups, receiving care from an obstetrician-gynecologist and use of preventive health services are significant predictors of regular screening for cervical cancer and thus affect staging of disease and mortality. One study evaluated the relative contribution of socioeconomic, utilization, attitudinal, and knowledge factors in 416 inner-city women from Baltimore at risk for cervical cancer.⁽²⁰⁾ Mamon and colleagues found that under screened women were more likely to be 45 years of age or older, to have no medical insurance, to report never having been told by a clinician how often to get a Pap test, to feel that they did not see a physician as often as they thought they should, and among older women, to lack knowledge about risk factors for cervical cancer.⁽²⁰⁾

National and regional surveys have consistently shown that Latinos are significantly more likely to be uninsured than other ethnic groups.⁽²¹⁾ According to the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BFRSS) which collects information in 48 states and the District of Columbia, 32.6% of Latino women reported lack of a health care plan versus 12.2% of

NLW women during 1991-1992.⁽²²⁾ These figures may actually underestimate the proportion of Latino women with limited access to health care since the survey is conducted via telephone and may exclude poorer segments of the population.⁽²²⁾ Unpublished analyses of California data from the 1989 National Health Interview Survey showed that 42% of Latinos younger than 65 years of age had no health insurance (Personal Communication, Roberta Wynn, Center for Health Care Policy, UCLA), which underscores the gravity of the access problem.

Misconceptions about cancer causes in general and fatalistic attitudes toward cancer diagnosis and treatment have been reported in both urban and rural Latino populations in comparison to NLWs.⁽²³⁻²⁵⁾ However, studies in both a prepaid health plan and the community in general showed no significant differences in life-time and interval Pap smear screening behavior among Latinos compared to NLWs, despite a perception that Latinos are less likely to get cancer.^(26,27) Thus, the level of misconceptions about cervical cancer causes or fatalistic attitudes regarding cancer diagnosis do not appear to have a substantial impact on screening behavior.

Lack of physician referral is a primary reason for nonadherence with regular cervical cancer screening with Pap smears, especially for older women.^(26,27) These women are under screened despite being seen by a physician in some cases up to four times a year.^(20,28) A recent cross-sectional study of Colorado primary care clinicians found that nurses with more Latino patients more often perceived the Pap smear screening barriers to be associated with transportation, child care, and release time from work than were nurses with patient loads of fewer Latinos.⁽²⁹⁾ Several studies have found that factors such as embarrassment, fear of results, and concern about becoming a burden to family members if diagnosed with cancer are more frequently reported by Latinos, especially Spanish-speakers, as reasons for not having regular screening examinations.^(1,27,30,31) Another study found that Latinos were more likely to cite forgetfulness, lack of transportation, need for child care, and the long waits for not having had cancer screening examinations.^(26,27)

A recent study of physician and patient beliefs about cervical cancer risk factors found greater discrepancies between Latino patients, particularly immigrants, and their clinicians, whereas NLW women's beliefs more likely resembled the physician biomedical model.⁽³²⁾ Interestingly enough, however, the differences manifested in underlying beliefs, rather than physician practices. For example, when Latino patients and their physicians agreed on a specific risk factor, such as multiple sex partners, the physicians viewed it as a sexually transmitted disease issue, whereas the Latinos saw it in moralistic terms.⁽³²⁾ In terms of physician practices, a study of New York City physician preventive practice patterns revealed no differences in Pap smear testing use between physicians mainly serving Latino or African-American patients and those serving over 50% NLW patients.⁽³³⁾ Further studies must address the interaction among clinicians' cultural competence, patients' beliefs and attitudes, preventive practice patterns' and system factors.

These studies underscore the importance of conducting interventions not only with women at risk, but also with clinicians and the clinics serving these populations. It is crucial to train physicians and other medical personnel on how to encourage cervical screening in a culturally-competent manner. Provider and patient language

discordance must also be further investigated as to their effects on the frequency of regular cervical screening.

Barriers to Diagnostic and Treatment Services

There is a paucity of information as to variations in practice patterns of diagnosis and treatment of cervical cancer by race and ethnicity. Differential delays in seeking treatment following an abnormal Pap smear might account for some of the excess mortality in minority women. Late stage diagnosis can result from a number of factors including infrequent screening or delays on the part of clinicians or patients in seeking diagnostic services. In a recent survey of 268 primary care physicians in Colorado whose practices included a median percentage of 15% Latino patients, only 54% of physicians recommended colposcopy as follow-up for minimally abnormal Pap smears.⁽²⁹⁾ A randomized study of over 2000 women with abnormal Pap smears in Los Angeles from 12 primary care health clinics which served low-income and ethnically diverse populations found significantly lower return rates for African-American and Latino women than for NLW women.⁽³⁴⁾

BEHAVIORAL FACTORS

Screening Rates

Another explanation for the poorer survival from cervical cancer of Latinos compared to NLW women is lack of timely Pap smear screening and early detection. National health surveys indicate that Pap smear screening rates are rising for ethnic minorities.⁽³⁵⁾ Nonetheless, Latino women consistently report lower rates of cervical cancer screening than NLW or African-American women. An analysis of 1986 Access to Health Care Survey data found health insurance status, income, education, employment status and race/ethnicity were independent predictors of having had a Pap test.⁽³⁶⁾ In this study, African-American women were more likely than NLW and Latino women to have had a Pap smear within recommended time frames (OR = 1.51, CI 1.02-2.22). Similarly, an analysis of responses from 12,252 women who participated in the 1987 National Health Interview Survey (NHIS) found that Latino ethnicity, low income, never having been married and age, especially in African-American women, independently predicted under-utilization of Pap tests. African-American women overall were found more likely than NLW and Latino women to have had a Pap smear in the past year (42.4%, versus 37.9% and 34.9%, respectively).⁽³⁷⁾ A recent analysis which compared trends for Pap smear testing based on 1987 and 1992 NHIS data found that Latinos continue to obtain Pap smears at lower rates than NLW women, but that the differences have decreased substantially.⁽³⁸⁾

In 1992-1993 among women in California with an intact uterus, 77% of Latinos reported having had a Pap test during the previous three years compared to 88% of NLWs and 92% of African-American women.⁽³⁵⁾ These proportions reflect an increase of roughly 8% in NLW and Latino women and 9% in African-American women over

the preceding year. These data are not directly comparable since in the 1991-1992 survey respondents were asked about Pap screening in the previous year while in the second survey the question concerned screening in the previous three years.

Increased intensity of Pap screening should initially result in increased rates of carcinoma in situ (CIS) followed by a decrease in invasive cervical cancer rates as diagnosis occurs at earlier stages of disease. According to estimates of the annual percent change in rates in California between 1988 and 1992, CIS incidence rates have increased for all three ethnic groups, especially for African-Americans. Incidence rates of invasive cervical cancer have decreased by 4.7% for African-Americans and by 1.6% for NLWs, but have actually increased by 1.8% for Latinos. Mortality has decreased by 6.7% in African-Americans and by 0.8% in NLWs, but it has increased by 3.9% in Latinos.⁽¹⁰⁾ Another indicator of progress in early detection of cervical cancer is the rate ratios of CIS to invasive cancer, with higher ratios implying a more successful early detection program. The rate ratios for in situ versus invasive cervical cancer by ethnicity were 2.5 for African-American, 2.2 for Latino, and 4.8 for NLW women in California for 1988-1992.⁽¹⁰⁾ These ratios indicate that programs for early detection of cervical cancer continue to lag for Latinos despite an increase in screening rates.

The need for Pap smear screening remains an important issue for the Latino community and an assessment of whether or not women are receiving regular, ongoing screening may explain some of the variation in outcomes. It is likely that national and statewide screening rates among all ethnic groups based on telephone surveys are significantly overestimated when compared to medical records.^(39,40) However, in one study that compared Latino and NLW women, there was no significant difference in over-reporting of screening tests by ethnicity.⁽³⁹⁾ Behavioral aspects of screening from the perspective of clinicians may also offer some explanation for the differences in screening rates. Differences in evaluation and treatment by race and ethnicity must also be assessed as possible explanatory factors for outcomes variations.

Sexual Behavior and HPV Infection

Epidemiological studies have demonstrated compelling evidence for an independent relationship between cervical cancers and genital human papillomavirus (HPV) infection.^(3,41) Commercial dot hybridization assays have been replaced by more advanced HPV DNA detection methods using polymerase chain reaction techniques (PCR). Using more accurate and precise methods for the detection of HPV infection, recent studies provide evidence that the majority of cervical cancer cases are associated with some type of HPV infection.⁽⁴²⁻⁴⁴⁾ Further evidence has been found for geographic and ethnic variation of HPV types which could indicate different relative risks for different geographic areas and populations.^(43,45) In a recent international survey of invasive cervical cancer in 22 countries, the presence of HPV DNA was confirmed in 93% of 1000 cancer tumor specimens.⁽⁴³⁾ Although HPV 16 was dominant in all countries, HPV 39 and HPV 59 were almost entirely restricted to Central and South America.

In a study which evaluated risk factors for HPV and cervical intra epithelial neoplasia (CIN) in 500 cases in Portland, Oregon, the associations of smoking and

early age at first intercourse with increased risk for CIN were explained by number of sexual partners. Sexual behavior did not explain the elevated risk associated with education and income. Once HPV status was adjusted for, the increased risk of CIN associated with lifetime number of sexual partners and education and income were substantially diminished. Furthermore, adjustment for HPV infection disclosed a fairly strong association between parity and CIN.⁽⁴⁴⁾ Another study conducted in four Latin American countries found a linear increased risk of cervical cancer associated with number of live births after controlling for sexual risk factors, HPV infection, interval since last Pap smear, age, and years of education.⁽⁴⁶⁾ The elevated risk associated with multiparity could be a result of physical trauma to the cervix during normal deliveries or possibly hormonal factors. Studies are beginning to emerge which show that persistence of HPV infection may play a critical role in determining whether women infected with HPV go on to develop advanced cervical cancer.^(47,48)

Two large case-control studies assessed risk factors for invasive cervical cancer in 759 women from four Latin American countries and 200 Latino women from Los Angeles and both found that younger age at first intercourse and an increasing number of sexual partners were independently associated with increased risk for invasive cervical cancer.^(19,49) After controlling for possible confounders, some researchers have found an independent contribution for both factors,^(50,51) while others report a residual effect only for age at first intercourse^(52,53) or only for number of partners.⁽⁵⁴⁾ Inconsistent results of earlier studies could be attributable to lack of advanced PCR techniques for detection and controlling for the confounding effects of HPV infection.

In the study of Latino women with cervical cancer in Los Angeles, the most important risk factors appeared to be Pap smear screening and barrier contraception, i.e., preventive factors and not etiologic ones. This study found that if all women had received regular Pap smears and regularly used barrier contraceptives, an estimated 91% of the risk would have been avoided. In contrast, the two sexual behavior risk factors, interval between first menarche and first intercourse and number of sexual partners before age 20, together accounted for only 60% of the risk.⁽¹⁹⁾ Both of these sexual behavior risk factors are thought to be surrogates for exposure to the presumed etiologic agent of HPV infection.

A study of San Francisco Bay Area married Latino women and 39 matched pairs of cervical cancer cases and controls found differences in the number of past sexual partners of husbands.⁽⁵⁵⁾ Cases were 5.3 times more likely to be married to husbands who had 20 or more lifetime sexual partners. Cases and controls did not differ in their number of lifetime sexual partners, but women with cervical cancer were younger at first intercourse. The association of higher risk for cervical cancer with husbands' sexual history persisted after adjusting for women's sexual partners and age at first intercourse. Although the results did not reach statistical significance, this study indicates that increased risk for cervical cancer among Latino women may also be associated with their male partner's history of sexually transmitted diseases and cigarette smoking.

In another study of cancer incidence in Mexicans in Los Angeles, the risk for cervical cancer was found to be much higher for those who had grown up in Mexico

than for those who emigrated to the United States as children. This observation suggests an environmental determinant which acts early in life, and is consistent with either a venereal infection with a long latent period or early exposure to a potential carrier.⁽⁵⁶⁾

Due to the disparities between Latino and NLW women in the incidence and mortality associated with cervical cancer in New Mexico, a series of studies was conducted comparing risk factors between these two populations.^(18,45,57-59) In a case-control study of 201 women with high grade cervical dysplasia (64% of whom were Latino women), the largest ethnic differences were observed for the association of HPV 16 and HPV 18 and cervical cancer for Latinos (OR = 171, 95% CI, 22.8 to 1280.5) compared to the association for NLW women (OR = 18, 95% CI, 6.4 to 50.5).⁽¹⁸⁾

The studies above have important implications for Latinos. As Latino men and women become more acculturated, they tend to report a greater number of sexual partners.^(60,61) An analysis of a national sample of 4,658 heterosexual Latinos for the 1990-1992 AIDS Behavioral Surveys, showed that 17% of men and 4% of women reported multiple sexual partners in the previous year. Latino men were almost five times as likely as Latino women to report having multiple sexual partners.⁽⁶⁰⁾ Thus, research and prevention strategies for cervical cancer need to focus on Latino men as well as women, and be sensitive to differences in levels of acculturation.

Cigarette Smoking

Although many studies have demonstrated an association between cervical cancer and cigarette smoking after controlling for sexual behavior,⁽⁶²⁾ studies which examine racial and ethnic differences in smoking and cervical cancer are rare. Even when studies do look at racial and ethnic differences, they generally have insufficient power to detect significant differences due to small numbers of cases. Peters *et al.*⁽¹⁹⁾ and Becker⁽⁵⁷⁾ in case-control studies of women with high-grade dysplasia found that current smoking was significantly associated with dysplasia after controlling for age, age at first intercourse and lifetime number of sex partners in the case of NLW women, but not for Latino women. They did not, however, control for the potentially confounding effects of HPV infection when they looked at ethnic differences.

Studies of the prevalence of cigarette smoking have consistently found lower rates in Latino compared to NLW women. According to the BRFSS for 1991-1992, the prevalence of smoking was 14.5% among Latino and 21.6% for NLW women.⁽²²⁾ Although there is evidence that as Latinos become more acculturated to the mainstream, their smoking rates tend to increase,^(63,64) overall, cigarette smoking does not appear to be a major contributor to the disproportionately higher incidence of cervical cancer in Latinos based on studies thus far and the relatively low prevalence of smoking for Latino women.

BIOLOGIC AND GENETIC FACTORS

In addition to investigations of possible geographic variation in the prevalence of different HPV types, studies have begun to evaluate genetic cofactors associated

with HPV infection which may explain ethnic differences in incidence of cervical dysplasia. Human leukocyte antigens (HLA) are molecules which regulate immune responses to foreign antigens. Certain classes of HLA types (class II haplotypes) have been found to be associated with an increased relative risk for cervical cancer in NLW⁽⁶⁵⁾ and African-American women⁽⁶⁶⁾ independent of HPV type. These findings are consistent with the hypotheses that certain HPV associated cervical cancers may be mediated by some type of host response or defective cellular immunity. Race and ethnic differences in the immune responses to HPV antigens and their relation to the development of cervical cancer are unknown at this time. Thus, the relationship between host genetics and HPV variation requires further studies to determine if these factors explain a significant portion of racial and ethnic disparities in cervical cancer morbidity and mortality.

A study of 128 Latino women in New Mexico with dysplasia using PCR techniques recently found two HLA haplotypes associated with HPV-16 related severe dysplasia, but not among other HPV types. This study also found evidence of haplotypes which appear to confer a protective effect against HPV-16 related severe cervical dysplasia. This haplotype is common among American Indians and the investigators postulated is also present in their sample of Latino women due to population admixture.⁽⁵⁹⁾ Clearly, more studies which compare biological factors and immune responses to HPV-type specific cervical cancers are needed.

If future studies show that certain ethnic groups are found to have a higher incidence of HPV types which are associated with a high risk of cervical cancer, this could have important implications for gynecological screening and public health. A new clinical trial which will attempt to identify which mild cervical lesions have a high risk of progressing to cancer along with available technology for detection of HPV types could significantly alter the standard for cervical screening.⁽⁶⁷⁾

DISCUSSION

More studies are needed to better understand the relative impact of risk factors by language and ethnic subgroup. The relative roles of education, income, screening, early detection, sexual risk factors, HPV infection, immune responses, and parity in the development of cervical cancer must be examined across groups while simultaneously controlling for the effects of potential confounders. Future research should focus on ethnic differences in sexual risk factors, specifically, possible differences in HPV prevalence by type, multiparity, type of contraception, and prevalence of HPV in male partners. More information is also needed about the importance of age and persistence of infection, as well as the risks associated with parity, host response factors and possibly nutrition.

Regarding our model of factors associated with Latino women's incidence and mortality of cervical cancer, these studies' contexts cannot be ignored. Inadequate regular Pap smear screening and barriers to access of diagnostic services continue to be widely experienced by Latino women in this country. Outreach programs which address structural and attitudinal impediments to and enablers of screening continue to be a public health priority. The results of such practices can be seen in the relatively

poorer survival and later stage at diagnosis of Latino women compared to NLW women. Notable is an alarming gap in the information related to medical treatment services' quality and outcomes received by Latinos. As published literature becomes available, environmental factors should also be added to the model.

Most literature of U.S. Latinos and cervical cancer relates to Pap smear screening, and incidence and mortality indicators. Other than one Southwestern U.S. research team, biological differences in the epidemiology of cervical cancer in Latinos have largely been ignored. There have been several major case-control studies conducted in Latin American countries and more recently, international studies which shed light on issues such as geographical variation in HPV prevalence which may explain ethnic variations in cervical cancer incidence and mortality along with differential access to screening, diagnostic and treatment services. Understanding Latinos' disproportionate burden of cervical cancer requires comprehensively assessing the full spectrum of structural, biological, behavioral and environmental factors and their relative contributions for various populations.

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