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MEXICAN-DESCENT LATINAS' COMPLIANCE WITH CERVICAL CANCER SCREENING GUIDELINES

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ABSTRACT—High mortality from invasive cervical cancer among Mexican-descent Latinas living in the Great Plains could be substantially reduced if they would utilize screening procedures regularly. To understand possible influential factors on their screening behaviors, we investigated which variables differentiate women age 50 and older who are most compliant with cervical cancer screening guidelines from those who are less compliant. Of 184 women surveyed, 100 were compliant with a yearly Pap smear while 84 were not compliant. Discriminant function analysis revealed that, apart from the significance of sociodemographic factors and acculturation, women who were most compliant significantly received more health-care provider interventions, complied with breast cancer screening, and were more motivated to engage in general health behaviors. Findings suggest that health-care providers can help women comply successfully with cervical cancer screening guidelines by educating and referring them for Pap testing when they provide other health care services to these women.

KEY WORDS: acculturation, cervical cancer, Latinas, Mexican American, Pap smear

Introduction

In the United States, national and regional studies show that Latinas, compared to non-Latina Anglo women, have higher cervical cancer incidence and mortality rates. Latinas have a two-fold higher incidence of

aggressive cervical cancer than Anglo women (Davis et al. 1995; Harlan et al. 1991). More alarming are the higher death rates from cervical cancer among Latinas than among Anglo women (Ramírez et al. 1995; Trapido et al. 1995). Disparities in invasive cancer incidence and mortality rates are also observed at regional levels. In Texas, Latinas of Mexican descent are twice as likely to die of cervical cancer than are Anglo women (Suárez et al. 1991; Ramírez et al. 1995). The deaths from cervical cancer result largely from the late-stage detection of this cancer. Staging and mortality from cervical cancer further suggest that Latinas are underutilizing important screening procedures. The Papanicolaou's (Pap smear) test is a screening technique that when performed routinely can increase the five-year survival rates of all women by 91% if the disease is found early in-situ or localized (American Cancer Society 1998). Thus, Latinas' high mortality rates from cervical cancer could be reduced substantially if they would utilize screening procedures more regularly.

The 1987 Hispanic Health and Nutrition Examination Survey (HHANES) and more recent studies (Zambrana et al.1999) have shown that Latinas, in particular Mexican-descent Latinas, have the lowest cancer screening rates of any race and ethnic group in the nation. The HHANES survey further showed that a significantly higher percentage of Latinas never had or heard of a Pap smear (National Cancer Institute 1989). At the regional level, the Texas sample of the HHANES revealed that Mexican-descent Latinas who are 45 years or older are significantly less likely to have had a Pap smear than are other US women (Suarez et al. 1991). Similar patterns have been observed among Latinas living in other states such as Colorado, where Latinas have higher invasive cervical cancer incidence and mortality rates but lower cervical cancer screening rates compared to Anglo non-Latina women (Colorado Department of Public Health and Environment 1995, 1997).

National and regional findings suggest that information on cervical cancer and cervical cancer screening behaviors of Latinas, especially Mexican-descent Latinas, is directly relevant. It is important to the Great Plains, given that Latinos of Mexican descent constitute the largest ethnic minority group in this region (Muñoz and Ortega 1997). Our study aims at contributing more information by exploring which factors differentiate Mexican-descent Latinas who are most compliant with current cervical cancer screening guidelines from those who are less compliant. Although most of the existent research focuses on learning about the factors that are associated with poor screening compliance, it is equally important to know about those factors that are associated with more optimal compliance so that

intervention activities for Mexican-descent Latinas in the Great Plains can be targeted more effectively.

Cervical Cancer Screening Factors

The American Cancer Society (ACS 1998) and the National Cancer Institute (NCI 1992) recommend that all women begin yearly Pap smears at age 18 or when they become sexually active. They also recommend that if a woman has had three satisfactory negative annual Pap smears in a row, this test may be done less often at the judgment of a woman's health care provider. Nonetheless, American Cancer Society highlights that while the Pap test has been more successful than any other screening test for cancer detection, some abnormalities may be missed. For this reason, women may be safer by adhering to the recommended annual screening guidelines (ACS 1999).

Several factors have been found to be consistently associated with regular cancer screening among Latinas in the US, including Mexican-descent Latinas. Among the strongest sociodemographic factors positively associated with cancer screening behaviors of Latinas are family income above the poverty level, higher levels of education, having health insurance, and having a usual source of care (Farley and Flannery 1989; Harlan et al. 1991; de la Torre et al. 1995). Other less strong but consistent positive demographic factors related to screening practices of Latinas are younger age, being married, and being employed (Mandelblatt et al. 1999; Zambrana et al. 1999). To the contrary, being older than 65 years, never married, and unemployed are the usual factors associated with low participation in cervical cancer screening. Suárez (1994) found that among Mexican-descent Latinas, age was a statistically significant factor that was inversely related to screening (defined as having a Pap smear within two years). More specifically, the percentage of women who had a recent Pap smear declined with each 10-year age group, 40-49, 50-59, 60-69, 70+. Calle et al. (1993) found that in addition to older age, having never married and being unemployed were significant predictors of Latinas never having had a Pap smear.

Although sociodemographic factors are predictors of differences in cancer screening practices among Latinas, screening is most strongly associated with knowledge of screening, prior screening, and health care providers' referral for and instruction on cancer screening procedures (Richardson et al. 1987; Fox and Stein 1991; Zambrana et al. 1999). Zambrana and colleagues found that the most consistent predictors of use of cancer screening tests were the use of other preventive services. They found that related to higher Pap smear screening was knowledge on how to do a breast self-

exam. Concerning health care provider interventions, analyses of the 1992 National Health Interview Survey data revealed that women 50 years and older who received preventive interventions from their providers, such as mammography referrals, were more likely to have had a Pap smear (Gutierrez-Mohamed 1995).

A growing literature has been focusing on how cultural, social, and psychological factors are associated with Latinas' preventive health behaviors, including cancer screening. Acculturation to mainstream US society is among the factors suggested to predict Latinas' cancer screening practices. As a psychosocial construct, acculturation refers to the process of behavioral and attitudinal change undergone by individuals who come into contact with a new culture (Berry 1980). At a simplified behavioral level, two indices, (1) language proficiency, English vs. Spanish, and (2) birthplace, US vs. México, have been used as proxies for acculturation. Research has shown that these behavioral factors are associated with Latinas' use of cancer screening procedures (Marks et al. 1987; Stein and Fox 1990). Others argue that language proficiency is a proxy more of socioeconomic status than of acculturation (Suárez 1994). For this reason, acculturation measures that include multidimensional factors are preferred methods to understand the relationship between acculturation and cancer screening behaviors (Suárez and Pulley 1995).

Suárez (1994) used a multidimensional measure of acculturation ("language use and proficiency," "social interaction," "value placed on the culture," and "traditional family attitudes") to investigate the relationship between acculturation and cancer screening behaviors of Mexican-descent women. This study found that a two-year prevalence of Pap smear and mammogram screening increased with each gain in acculturation level (1 = least acculturated to 4 = most acculturated) on the English use and proficiency dimension, but this effect was reduced after statistically controlling for socioeconomic factors. Only one dimension (traditional family attitudes) remained a significant predictor of mammography use. Women who were less acculturated regarding family attitudes were more likely to have had a recent mammogram.

Harmon et al. (1996) used an abbreviated dimensional model to examine the role of acculturation, as a possible risk factor or mediating variable, in differentiating behaviors relative to cervical cancer among three acculturation subgroups of Latinas 18 years of age and older. They found in their sample that 76% of the bicultural and 78% of the highly acculturated Latinas had received an annual Pap smear. Instead, only 61% of the low-

acculturated women were found to have similar screening behavior. They used a multivariate analysis to account for acculturation along with demographic variables, family history of cancer, and fear of cancer. After accounting for all the other variables' variance, level of acculturation was a significant predictor only of knowledge about Pap tests but not of recent Pap smear screening.

Theoretical models have rarely been used to investigate the psychological factors associated with Latinas' cancer screening behavior. Few studies have used a "locus of control" (LOC) theory (Sugarek et al.1988; Bundek et al. 1993) or a "health belief model" theoretical approach (e.g., Richardson et al. 1987; Zapka et al. 1989; Hyman et al. 1994). The health belief model (HBM) is the most widely used model to explain health behavior. It focuses on four factors that can influence when people take action to protect their health (Rosenstock 1966, 1974, 1988): the cost of taking action ("barriers"), the benefits or rewards of taking action ("benefits"), susceptibility to the illness ("susceptibility"), and seriousness of the illness ("seriousness"). Other variables closely related to this theoretical approach are individuals' perceptions about their own cancer risk and their motivation to engage in various preventive health behaviors ("health motivaton").

A woman's perceived risk of developing cancer appears to be influenced by objective risk from personal and family experiences with cancer. Studies conducted to assess the relationship between objective risk and cancer screening show that women who report cancer in a first-degree relative or experience breast problems are more likely to engage in screening behaviors (Lerman et al. 1991; Aiken et al. 1995). Perceived risk of developing cancer may also be influenced by beliefs about cancer seriousness and one's cancer susceptibility. As with other psychological variables, the relationship between Latinas' cancer screening behaviors and the constructs of perceived seriousness and susceptibility has been mixed and inconsistent (Borrayo 1997). In particular, perceived susceptibility has not been found to be a strong predictor of cancer screening behaviors of Latinas (Richardson et al. 1987; Zapka et al. 1989). Studies on the relationship between perceived seriousness and cancer screening behavior are scarce. However, there is evidence to support that cancer tends to be perceived as serious by all women, including Latinas (Hyman et al. 1994). Less consistent evidence exists to date regarding the association between health motivation and Latinas' cervical cancer screening practices (Sugarek et al. 1988; Bundek et al. 1993). Health motivation (Champion 1985) refers to the concern about general health matters that results in positive health activities

and in the willingness to comply with orders that are believed to decrease disease. Borrayo (1997) found no significant relationship between health motivation and cancer screening behaviors in her sample of Latinas.

Another construct of interest to researchers studying Latinas has been health locus of control, measured mostly with "multidimensional health locus of control" (MHLC) scales (Wallston et al. 1978). MHLC is based on the principle that individuals' beliefs about their health vary in the amount of control attributed to different agents. In essence, individuals believe that control of health outcomes is determined by the person ("internal" factor), by chance or destiny ("chance" factor), or by others such as health-care providers ("powerful others" factor). Bundek et al. (1993) investigated the relationship between MHLC constructs and Pap smear frequency among Latinas over the age of 55. They found that Latinas' belief that their health is controlled by powerful others was associated with more recent Pap smear screening, accounting for 10% of the screening variance. Internal control was also related to screening, but the effect was not as strong, accounting for only 1.5% of the screening variance. Too few studies exist on MHLC constructs and cancer screening practices of Mexican-descent Latinas to arrive at any conclusions about their relationship.

In this study we explored how the variables we have discussed are associated with Mexican-descent Latinas' cervical cancer screening practices. Overall, we were interested in exploring how these variables taken together help discriminate women who were more compliant with cervical screening guidelines from those who were less compliant. Several questions were posed regarding differences in compliance related to specific variables previously found relevant. First, we were interested in differences based on demographic factors, mostly age, education, income, and health insurance variables. Second, we believed that we could discriminate screening practices that were based on personal or family cancer history differences, given an increase in women's perceived cancer risk. Third, we explored whether women who have participated in other cancer screening procedures (e.g., breast cancer screening) were different in their cervical cancer screening behaviors from women who have been less exposed to these experiences. Regarding psychosocial variables, we explored differences in acculturation levels, perceptions about cancer seriousness and personal cancer susceptibility, health motivation, and health locus of control. We used the health belief model (Rosenstock 1966), the multidimensional health locus of control (Wallston et al. 1978), and acculturation (Berry 1980) theories to enter the most relevant psychosocial constructs in our analysis.

Method

Participants

We recruited 184 Mexican-descent Latinas through community orga-
nizations in two north Texas cities, Fort Worth and Dallas. The participants
averaged 60 years of age, ranging from 50 to 86 years, and varied in
educational level from 0 to 17+ years, averaging 8 years of formal educa-
tion. Approximately 69% of the women had a $20,000 or less annual house-
hold income, and ranged from less than $5,000 to more than $40,000. Thus,
most of the women were living below the federal poverty level. Regarding
health insurance coverage, 65% of the women reported having some type of
insurance, either private insurance or Medicare, while 35% reported that
they did not have any form of insurance. Table 1 shows other relevant
demographic characteristics of the sample that were entered in the analysis,
including marital status, employment and retirement status, place of birth,
and preferred language for communication.

Procedure

We obtained a sample of Mexican-descent Latinas from various com-
munity settings, including neighborhood centers (i.e., senior centers,
community centers), churches (i.e., Catholic and Protestant), public trans-
portation services (i.e., buses, downtown light-rail), and public events (i.e.,
cultural celebrations). Participants were approached by Latina women and
asked to answer an English or Spanish version of a questionnaire. Among
the barriers encountered were that some women had low reading levels, did
not know how to read, or had other reading ability problems; thus, the
questionnaire was read to those who requested this service. All women who
volunteered to participate were given a small compensatory gift.

Measures

Data was originally collected on whether women had obtained a Pap
smear a year ago (n = 100), two-years ago (n = 32), three-years ago (n = 4),
more than three-years ago (n = 31), or never (n = 17). However, a dichoto-
mous dependent variable was constructed for cervical cancer screening: a
woman had either obtained a recent Pap smear test (a year ago, n = 100) or
a woman had not obtained a recent test (two or more years ago or had never

TABLE 1

FREQUENCY OF DEMOGRAPHIC CHARACTERISTICS
FOR THE SAMPLE

Variables	n	%
Marital status		
Never a partner	7	3.8
Has or had a partner	177	96.2
Employment		
Not employed	119	64.7
Presently employed	65	35.3
Retirement		
Not retired	131	71.2
Presently retired	53	28.8
Place of birth		
Mexico	78	42.4
United States	106	57.6
Preferred language*		
Spanish	89	48.4
English	95	51.6

Note: (N = 184).
* Preferred language for communication was assessed based on whether women
    answered the questionnaire in Spanish or English.

obtained one, n = 84). Independent variables were grouped into measures of
demographic variables, cancer history, breast cancer screening practices,
health professional interventions, perceived cancer seriousness and per-
sonal cancer susceptibility, motivation to engage in healthy behaviors, health
locus of control, and acculturation. Demographic information included
continuous measures of age and education, and dichotomous measures of
annual household income (<$20,000, >$20,001); marital status (never had
a partner vs. ever had a partner through current marriage, past marriage, or
cohabitation); employment status (currently employed vs. not employed);
retirement status (currently retired vs. other); and health insurance coverage
(private or Medicare vs. no health insurance).

Cancer history variables were determined by asking whether women had a personal cancer history (diagnosed with any type of cancer vs. never diagnosed with any type of cancer) or a family cancer history (having a relative ever diagnosed with any type of cancer vs. having no relatives ever diagnosed with any type of cancer). Breast cancer screening practices were measured by questions on mammography screening behaviors (obtained a mammogram a year ago vs. obtained one two years ago or more) and breast self-exam (BSE) performance (did BSE last month vs. did not do BSE last month). We assessed whether women's health-care providers had recommended a yearly mammogram to them (yes or no) and whether a health professional had taught women how to perform a BSE (yes or no).

The single questionnaire included psychosocial measures of perceived cancer seriousness and susceptibility, motivation to engage in health behaviors, health locus of control, and acculturation. To allow a wider diversity of women to be sampled, the entire questionnaire was translated from English to Spanish using classical back translation (Brislin 1970). A modification (Hammond and Guarnaccia n.d.) of Champion's (1992) Breast Cancer Health Belief Model Questionnaire was used to measure perceptions about cancer seriousness, personal cancer susceptibility, and personal motivation to engage in health behaviors such as exercising regularly and obtaining regular physical exams. Because of the unfamiliarity of these women with multipoint ordinal response formats, the items were changed from five-point Likert-type scales (i.e., strongly agree, strongly disagree, neither agree nor disagree, disagree, strongly disagree) to more easily completed three-point scales (i.e., yes, don't know, no). Although this simplification allowed women to complete the measures, a lowering of scale reliability was likely because of the reduction in the variability of the response scale (DeVillis 1991). The modified questionnaire, which included four items that address breast cancer susceptibility and eight items address breast cancer seriousness, had internal consistency reliabilities of .73 and .78, respectively. In addition, the questionnaire included seven items that addressed general health motivation, which had .60 internal consistency reliability.

A modified version (Marks et al. 1986) of the Wallston et al. (1978) multidimensional health locus of control (MHLC) scale was selected to measure beliefs about factors controlling one's health. Marks et al. used three MHLC-Internal items ($\underline{a}$ = .82), three MHLC-Powerful Others items ($\underline{a}$ = .82), and three MHLC-Chance items ($\underline{a}$ = .72). In this study, all three of the Internal items were used to obtain an internal consistency of .43. Only

one item of the Powerful Others scale was deleted to obtain an internal consistency of .59 and one item of the Chance items was deleted to obtain an internal consistency of .74. These two items were dropped because they decreased the alpha reliability.

Although a multidimensional acculturation scale is recommended (Hazuda et al. 1988; Suárez and Pulley 1995) as a more appropriate measure of acculturation, a shorter global measure (Elder et al. 1991) has nevertheless shown to be sensitive enough in detecting differences in cancer screening behaviors in Latino groups at different levels of acculturation (Balcazar et al. 1995). For our study's purposes and to maintain the questionnaire at a manageable length, the shorter global measure of acculturation was used to investigate the relationship between overall acculturation and cervical cancer screening behaviors. Acculturation was measured through a modification (Elder et al. 1991) of Cuellar et al.'s (1980) Acculturation Rating Scale for Mexican Americans (ARSMA). Item scores ranged from 1 to 5, with higher scores indicating greater acculturation to mainstream US society. A mean score of all items yielded a general acculturation index (GAI). Respondents can then be classified by their mean score into three categories: low acculturated (between 1.00 and 2.40), bicultural (between 2.41 and 3.60), and highly acculturated (between 3.61 and 5.00) based on previously established and theoretically meaningful cut-off scores (Balcazar et al. 1995). Elder et al.'s (1991) modified 5-item acculturation scale had an alpha internal consistency of .80. For this sample, an internal consistency of .78 was obtained for this acculturation measure.

We used discriminant function analysis to determine how socio-demographic variables, cancer history, health-care provider interventions, breast cancer screening behaviors, and psychosocial variables, taken together help discriminate women who were more compliant with cervical screening guidelines from those who were less compliant. A hierarchical approach allowed us to understand the contribution of the variables as each was entered in the analysis.

Results

Table 2 displays findings on participants' cancer history and cancer screening practices. Very few women (9%) in our sample have ever been diagnosed with any type of cancer such as cervical, breast, or ovarian cancer, and very few (19%) have had a relative who was ever diagnosed with any type of cancer. Approximately 73% of the participants reported having had a mammogram recommended to them by a physician and 85% reported

TABLE 2

FREQUENCY OF CANCER HISTORY AND
CANCER SCREENING PRACTICES

	n	%
History of any cancer		
Personal history		
Ever diagnosed	16	8.7
Never diagnosed	168	91.3
Relative history		
Ever diagnosed	34	18.5
Never diagnosed	150	81.5
Professional interventions		
Mammography referral		
Ever referred	134	72.8
Never referred	50	27.2
Breast self-exam instruction		
Ever instructed	157	85.3
Never instructed	27	14.7
Pap smear last obtained		
1 year ago	100	54.3
2 years ago or never	84	45.7
Mammography last obtained		
1 year ago	101	54.9
2 years ago or never done	83	45.1
Breast self-exam done last month		
No	87	47.3
Yes	97	52.7

Note: (N = 184).

having been taught how to perform a breast self exam (BSE) by a health-care provider. Nevertheless, only 55% of the women reported obtaining a mammogram a year ago and only 53% reported having performed a monthly breast self exam as recommended by American Cancer Society screening guidelines. Disappointingly, Pap smear rates were similar to mammography rates but slightly lower; only 54% had obtained a Pap smear a year ago.

In the first step of the discriminant Pap smear compliance equation, sociodemographic variables explained 8.4% of the variance (Λ = .916). Perceived cancer risk explained an additional 3% (Λ = .886). Health professional interventions added 12% of the explained variance (Λ = .765). Breast cancer screening behaviors substantially explained 27.4% of the variance (Λ = .492) compared to acculturation, which minimally explained 0.3% (Λ = .489). Similarly, health locus of control constructs explained 0.3% of the variance (Λ = .480) and health motivation only 0.6% (Λ = .483). The full model explained 52% of variance and 84.8% of the women were correctly classified. Women who obtained a recent Pap smear were more likely to be classified correctly (87%) than women who had obtained a test more than two years ago (82%).

As shown on Table 3, Mexican-descent Latinas who have recently obtained a Pap smear were significantly (p < .05) different from those who had not obtained a recent Pap smear with regard to the sociodemographic variables of age, education, income, and employment. Women who were younger and more educated were more likely to have obtained a recent Pap smear, while women who were older and less educated were less compliant. In addition, approximately 37% of women who had obtain a recent Pap smear reported an annual household income greater than $20,000, while only 23% of the women who had obtained a test more than two-years ago reported having the same income. Surprisingly, being covered by any type of health insurance did not discriminate toward how recently women had obtained a Pap smear. However, we did find significant differences in employment status: approximately 42% of women who had obtained a Pap smear a year ago were employed, while only 27% of those who had obtained a test more than two years ago were employed. Although some of these univariate statistics are significant, the relative contribution of these sociodemographic variables to the overall equation varies from quite small to moderate (SDFC = .009 for employment to SDFC = -.441 for age).

Contrary to our expectations for cancer history and perceived risks of developing cancer, women who had obtained a recent Pap smear were not significantly different from women who had not obtained a recent test. That is, women did not differ with regard to whether they have received a cancer diagnosis, have or had a relative who was diagnosed with any type of cancer, perceived cancer as a serious illness, or perceived themselves to be personally susceptible to develop cancer.

More encouraging was the finding that health-care professionals' intervention and women's breast cancer screening behaviors were the strongest and most significant (p < .001) factors that discriminated between

TABLE 3
PREVALENCE OF PAP SMEAR AMONG MEXICAN-DESCENT LATINAS
BY STUDY VARIABLES ENTERED AT THE LAST STEP
OF THE DISCRIMINANT FUNCTION ANALYSIS

Variables	Pap smear 1 year ago	Pap smear 2+ years ago or never	F	Significance	SDFC
Sociodemographics					
Age (mean)[1]	58.7	61.8	6.29	*	-.441
Marital Status	98.0	94.0	1.94		.229
(% ever had a partner)					
Employment	42.0	27.3	4.32	*	.009
(% currently employed)					
Retirement	32.0	25.0	1.08		.460
(% currently retired)					
Income	37.0	22.6	4.52	*	.043
(% >$20,001 household)					
Education (mean)[1]	9.0	7.6	4.85	*	-.063
Health insurance					
Private and/or Medicare	69.0	59.5	1.79		.016
(% covered)					
History of any cancer					
Personal (% ever diagnosed)	10.0	7.1	.46		.061
Relative (% ever diagnosed)	17.0	20.2	.31		-.095
Cancer perceptions[2]					
Seriousness (mean)	1.92	1.98	.41		-.027
Susceptibility (mean)	1.75	1.89	2.64		-.061
Professional interventions					
Mammography referral	86.0	57.1	21.21	***	.139
(% yes)					
Breast-self exam instruction	97.0	71.4	27.09	***	.137
(% yes)					
Breast cancer screening					
Mammography past year	84.0	20.2	125.11	***	.886
(% yes)					
Breast-self exam past month	64.0	39.3	11.78	***	-.020
(% yes)					
Acculturation					
Birthplace (ref. Mexico)					
United States	63.0	51.1	2.61		-.085
Language (ref. Spanish)					
English	58.0	44.0	3.58		.203
Acculturation Score (mean)[3]	2.61	2.26	5.58	*	-.210
Health motivation[2] **(mean)**	2.64	2.39	14.15	***	.186
Health locus of control[2]					
Internal (mean)	2.72	2.66	.29		-.013
Chance (mean)	1.78	1.85	.71		.129
Powerful Others (mean)	2.06	2.20	1.57		-.293

Note: ($\underline{N}$=184). Wilks' lambda (Λ) = .480; chi square = 125.63***; group centroids for 1 year ago = .949 and 2+ years/never = -1.13; correctly classified for 1 year ago = 87.0%, 2 years/never = 82.1, all = 84.8%; SDFC = standardized canonical discriminant function coefficients.
[1] Mean in years.
[2] Mean agreement with items (1 = no, 2 = don't know, 3 = yes).
[3] Mean score (1 = low acculturation to 5 = high acculturation).
* $\underline{p}$ < .05, ** $\underline{p}$ < .01, *** $\underline{p}$ < .001

women's cervical cancer screening behaviors. In comparing women who had obtained a recent Pap smear with women who were not compliant, women who had obtained a recent Pap smear were more likely to have had a physician recommend a mammogram to them (86% compared to 57%) and to have obtained a recent mammogram (84% compared to 20%). In addition, those who had obtained a recent Pap smear were more likely to have been taught how to perform a breast self-exam (97% compared to 71%) and to have performed a breast self-exam during the past month (64% compared to 39%). In the final step, having obtained a recent mammogram (SDFC = .886) contributed the most to the equation.

We measured acculturation through place of birth (US vs. México), preferred language (English vs. Spanish), and ARSMA scores. Only women's ARSMA scores significantly ($p < .05$) differentiated how recently women had obtained a Pap smear test. Women who were bicultural (ARSMA score = 2.61) were most likely to have obtained a test about a year ago, while women who were the least acculturated (ARSMA score = 2.26) were likely to have obtained a test more than two years ago. Although we predicted that acculturation would be a significant discriminator in this direction, women's high acculturation score made us consider the possibility that they were borderline bicultural (ARSMA scores fall between 2.41 and 2.60). The relative contribution of the ARSMA scores to the overall equation was small (SDFC = -.210).

Health locus of control (internal, chance, and powerful others) did not differentiate women's cervical cancer screening behaviors like we had expected. On the other hand, health motivation significantly ($p < .001$) discriminated how recently women had obtained a Pap smear. On a scale that assessed motivation to engage in other health behaviors (1 = no, 2 = don't know, 3 = yes), women who had obtained a Pap smear test a year ago had a mean score of 2.64 compared to a 2.39 score for women who had obtained a test more than two years ago. However, the relative contribution of health motivation (SDFC = .186) to the overall equation was small.

Discussion

In this study we explored which variables significantly discriminated Mexican-descent Latinas who are most compliant with yearly Pap smear screening guidelines from those who are less compliant. The most important finding was that although sociodemographic and acculturation variables were significant discriminators, the strongest and most significant

discriminators were health-care provider interventions, breast cancer screening behaviors, and health motivation variables. More specifically, women who were most compliant were significantly more likely to report that a health-care provider had previously recommended a mammogram to them and taught them how to perform a breast self-exam. Compliant women were also more likely to have obtained a mammogram a year ago and performed a breast self-exam the previous month. In addition, those who best complied with yearly Pap smear screening were more motivated to engage in other preventive health behaviors such as exercising regularly.

Similar predictors have emerged in more recent studies that have examined the one- to three-year criterion for screening compliance. Consistent with the socio-demographic discriminators found in this study, other studies have found that women who are younger and employed and have higher levels of income and education are more likely to adhere with cervical cancer screening guidelines (Harlan et al. 1991; Calle et al. 1993; Mandelblatt et al. 1999). The construct of acculturation was another discriminator in this study. In other studies, assessing levels of acculturation also has helped to discriminate Latinas who are most compliant from those who are less compliant with cervical cancer screening guidelines (Harmon et al. 1996). However, others have failed to find that levels of acculturation predict regular Pap smear compliance (Pérez-Stable et al. 1994). Studies more consistently support our findings that screening compliance is strongly associated with engaging in other cancer screening practices and receiving instruction and referrals from health-care providers to participate in these preventive practices (Fox and Stein 1991; Zambrana et al. 1999).

We failed to find evidence that other psychosocial variables besides health motivation could significantly discriminate which women were more likely to screen according to cancer screening guidelines. This is consistent with the inconclusive and sometimes mixed literature on psychological variables' relationship to cancer screening practices (Borrayo 1997). In this study and throughout the literature, the constructs of perceived cancer seriousness and susceptibility have not been shown to have predicting power on regular cancer screening (Richardson et al. 1987; Zapka et al. 1989). Similarly, the constructs of health locus of control did not help us discriminate between women who were more or less compliant with annual Pap smear recommendations. The multidimensional health locus of control model has previously provided mixed results regarding the association of health locus of control constructs with Mexican-descent Latinas' breast cancer screening behaviors (Borrayo et al. 2001).

Although this study constitutes a valuable contribution to the scarce literature on the cervical cancer screening practices of Mexican-descent Latinas, there are several limitations to the study that need to be discussed. First, the method of coding only women reporting annual Pap smears as in compliance with screening guidelines underestimated those actually in compliance because some women not reporting annual screenings might have had less frequent tests upon receiving three consecutive negative annual Pap smears. Second, the sample included women who were 50 years of age or older, and thus the implications of our results may not generalize to younger women over 18 years of age regarding what factors discriminate women compliant with cervical cancer screening guidelines from less compliant women. We chose to focus on an older group of Mexican-descent women because they have lower cervical cancer screening rates and consequently higher incidence of invasive cervical cancers and mortality than any other ethnic group of women. In addition, the health and screening behaviors of this age group have received very little attention (Marks et al. 1987). Another drawback to our study is that we surveyed women living in urban cities only, which limits us from making generalizations to women living in rural areas in the Great Plains. For this reason, we encourage researchers to conduct future studies with rural Latinas of Mexican descent from this same older age group.

Theoretical considerations, such as the use of the health belief model and the multidimensional health locus of control theoretical frameworks that have been developed in the US with mainly non-Latino Anglo individuals, represent a limitation to the interpretation and generalization of our findings (Borrayo et al. 2001). Participants in our study were women of Mexican descent who have been exposed to two different cultures. Such dual exposure could impact their beliefs about health, cervical cancer, and cervical cancer screening behaviors differently than if they were exposed only to US culture or to Mexico's culture. In fact, women with higher levels of acculturation endorsed theoretical constructs more in the expected direction than did less acculturated women. However, all of the theoretical constructs still did not discern between compliant women and less compliant women.

Cultural explanatory models could provide a better understanding of the psychological variables that best predict the cancer screening behaviors of Mexican-descent Latinas (Borrayo and Jenkins 2001). Borrayo and others (e.g., Saint-Germain and Longman 1993) have found that Latinas mostly embrace the belief that health outcomes are under the control of divine

forces rather than under the control of oneself, chance factors, or powerful health-care providers. Thus, women could more easily understand education about cervical cancer screening if it were framed according to culturally appropriate psychological constructs and dynamics.

Conclusions

Clearly, our findings are not different from those found in the literature regarding cervical cancer screening practices and the variables that are significantly associated with these practices among Latinas. Moreover, our findings are similar regarding the strength with which these variables discriminated between more compliant and less compliant women. In the literature, women's knowledge of screening, prior screening behaviors, and health-care provider interventions are strongly associated with women's cervical cancer screening practices above and beyond sociodemographic variables such as health insurance coverage and levels of income and education (Richardson et al. 1987; Fox and Stein 1991; Zambrana et al. 1999). Our study contributes to this literature by providing evidence that these same findings also generalize to Mexican-descent Latinas. It is important to provide this type of specific subgroup information rather than to generalize some study's findings to all people who fall under the umbrella of Latinos (e.g., Mexican, Puerto Rican, Cuban). There is increasing evidence of subgroup differences in important variables such as socioeconomic status and cultural assimilation experiences (Muñoz and Ortega 1997), which may differentially influence preventive health behaviors (Schur et al. 1987).

Overall, most studies on Latinos have concentrated primarily on Mexican-descent Latinos, though often the sampled population contains other subgroups as well (Schur et al. 1987). These studies usually concentrate on comparing Latinos with other non-Latino Americans but have ignored the heterogeneity of the Latino population. Gender differences within a population also tend to be ignored. Such methodological tendencies may explain the relative paucity of data that could elucidate the cancer screening behaviors of Mexican-descent Latinas (Borrayo 1997). The lack of data on the preventive health behaviors of this subgroup of Latinas is particularly troublesome because the high incidence of invasive cancers and resulting high mortality rates in this population suggest that they are underutilizing important screening procedures. The high cervical cancer incidence and mortality among Mexican-descent Latinas in the Great Plains may be an increasing problem as more women from this ethnic group continue to

immigrate to the region (Bean et al. 1983; Donato 1993). With a better understanding of which factors influence the screening behaviors of Mexican-descent Latinas, more efficient interventions could be created to motivate them to utilize screening procedures more regularly. An increase in cervical cancer screening could substantially reduce deaths from invasive cervical cancers among Mexican-descent Latinas in the Great Plains.

The problem of underutilization of cancer screening procedures might be greatest among Mexican-descent Latinas who live in rural communities in the Great Plains. Skaer et al. (1996) found lower rates of cancer screening in their sample of rural, Mexican-descent Latinas than we did in our sample of urban women. They found that among women age 50 and older only 24% had obtained a Pap smear in the past year (vs. 54% in our study), only 32% had obtained a mammogram in the past year (vs. 55% in our study), and only 25% had performed a breast self-exam in the past month (vs. 53% in our study). It is possible that the cervical cancer screening of Mexican-descent Latinas living in the metropolitan cities of Dallas and Fort Worth, Texas, is representative of the screening rates of Latinas who reside in urban rather rural areas in the Great Plains. According to a study that reported on the NIHS data (Calle et al. 1993), residence in a rural area was a strong predictor of the underuse of cervical cancer screening. One explanation may be that rural areas usually have limited preventive health-care resources or women may have more problems accessing such services in these areas (Treviño 1995). Our screening rates were more similar to national rates among underserved Latinas during the same time period our study was conducted (Anderson and May 1995). The increase in screening rates observed since the 1990s, compared to the lower rates before this decade, has been attributed to the implementation of more aggressive preventive programs by the public and private health-care systems. Nonetheless, the greater underutilization of screening procedures in rural areas is problematic, and greater availability of services and aggressive but culturally sensitive interventions may be needed to encourage regular cancer screening participation of Latinas on the Great Plains.

To be successful, interventions need to target sociodemographic variables and barriers to access that place Mexican-descent Latinas at higher risk of failing to comply with cervical cancer screening guidelines. Our findings suggest that women who are older and unemployed and have lower levels of income and education at are higher risk of not obtaining regular Pap smears. Hence, prevention interventions should be increased to make cervical cancer screening procedures more available to these disadvantaged

women. Our most important finding was that women who complied with a yearly Pap test were more likely to have participated in other cancer screening procedures and received direct prevention interventions from their health-care providers. These findings suggest that health professionals such as physicians and nurses can help women to comply better with cervical cancer screening guidelines by educating and referring them for Pap testing when they provide other health-care services to these women. Equally important and feasible would be for health professionals to target variables that are more amenable to change through health education. Psychological variables such as beliefs and attitudes toward prevention activities, perceived susceptibility, and perceived consequences of prevention are constructs that can be addressed through culturally sensitive educational activities for Mexican-descent Latinas (Borrayo 1998; Buller et al. 1998).

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