

Cancer screening among Latino subgroups in the United States

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Abstract

Background. Relying upon the Health Belief Model and a behavioral model of health care utilization, the purpose of this study was to examine current adherence to cancer screening among Latino subgroups.

Methods. Using data from the 2000 National Health Interview Survey, 5377 Latinos were surveyed for their use of Pap smear, mammogram, breast self-examination and the clinical breast exam among women, prostate specific antigen test among men, and the fecal occult blood test, sigmoidoscopy, colonoscopy, and proctoscopy among both men and women. Using sampling weights, multivariate logistic regression models were used to assess screening use.

Results. Dominican women had 2.4 times greater likelihood of having had mammography than other Latinos. In addition, Latinas aged 50–69, who had more years of education, a personal history of cancer, who were not current smokers, had health insurance, had visited a primary care provider over the past 12 months, and had at least one other screening test had greater use of mammography. Younger age, marriage, greater acculturation, visits to a primary care provider, health insurance, and the use of other cancer screening tests predicted the uptake of the Pap smear. Latinas were more likely to use a CBE if they were younger, had a Bachelor's degree, a personal history of cancer, were more acculturated, had visits to a primary care provider over the past 12 months, and used other cancer screening tests. Puerto Ricans, Central or South Americans had half the likelihood of having colorectal cancer screening than other groups. Ages between 50 and 69, male sex, marriage, history of visiting a health care provider, and use of other screening tests predicted use of the FOBT. Older age, greater education, male sex, history of visiting a health care provider in the previous year, use of other screening tests, and better health status influenced the uptake of endoscopy for colorectal cancer screening. Cuban males had fivefold greater utilization of PSA testing. Additionally, PSA use among Latinos was predicted by older age, history of visiting a primary care provider in the past 12 months, and use of other screening tests.

Conclusions. Cancer screening programs must take into account differences among Latinos in age, gender, educational levels, marital status, cancer history, risk behaviors, insurance, health status and health services utilization.

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Keywords: Ethnic Groups; Hispanic Americans; Cancer Screening; Mammography; Pap smears; Colonoscopy; Sigmoidoscopy; Primary prevention; Adult

Introduction

Latinos are the fastest growing population in the United States. A diverse population, they are comprised of Mexican-Americans (66.9% of US Latinos), mainland Puerto Ricans (8.6%), Central and South Americans (14.3%), Cubans (3.7%), and “other” Latinos (6.5%,

including persons from the Dominican Republic, Spain, those of multiple Latino backgrounds, or Latinos who do not identify with any one particular group) [1]. Due to the influence of the political economies of their native countries, the various Latino subgroups differ by socio-demographics and socioeconomic status, their immigration history to the US, as well as their levels of acculturation [2].

Consequently, Latino subgroups vary in their cancer-related risk factors including rates of smoking, drinking alcohol, and patterns of dietary intake and exercise [3–9] and their rates of cancer morbidity and mortality. A cancer

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registry study indicated that the most common cancers were breast and cervical among Mexican Americans as well as Central and South Americans; breast and prostate among Puerto Ricans and Cubans; and breast and lung among other Latinos [10]. These rates may differ by nativity status, with lower incidence and mortality rates for various forms of cancer (e.g., lung, colon, breast, ovary) among Latino immigrants than among their US-born counterparts and US-born whites [11–13]. Studies of colorectal cancer among Mexican and Puerto Rican immigrants, compared to those in their home countries, suggest that these rates may increase among Latino immigrants as their time of residence in the US lengthens [11,14]. While there is evidence for differences in risk factors and access to medical care [15] across these Latino subgroups, screening adherence may account for many of the observed variations in cancer incidence and mortality [16].

Major professional groups, such as the Preventive Services Task Force (USPSTF) and the American Cancer Society (ACS) recommend a set of screening tests to reduce cancer-related mortality among asymptomatic individuals [17,18]. Overall, there has been less participation as recommended in cancer screening among Latinos than among other population groups [12,13,15,16,18–20]. Latinos are less likely than Whites to obtain recommended cancer screening services due to economic, educational, cultural, and other structural barriers [21,22].

There have been few studies of differences in the cancer screening practices among Latino subgroups. One population-based telephone survey in 1993–1994 examined the use of the Digital Rectal Examination (DRE) by men [23]. The DRE was recommended for colorectal cancer screening, but is no longer considered an effective screening approach [24]; it is, however, still recommended as a screening approach for prostate cancer, alongside the PSA. Central American and Mexican men had the lowest rates of DRE and Cuban men had the highest screening rates [23]. A prospective cohort study found that Latinas born in the Dominican Republic who were participating in the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) were more likely to return the fecal occult blood test (FOBT) than were women from other countries [25]. There is other evidence that Dominican women are less likely to engage in breast and cervical cancer screening than are other Latinas [16].

The only published national population-based study of cancer screening practices among subgroups of Latinas, using pooled National Health Interview Survey (NHIS) data from 1990 and 1992, revealed that Mexican women were the least likely to be screened with the Pap smear, mammogram, and Clinical Breast Examination (CBE) over the past 3 years [26]. Logistic regression results showed that having a usual source of care was a positive predictor of cancer screening. Marriage, aged 50 or older, and knowledge of breast self-examination predicted Pap smear adherence. Health insurance, ever having had a Pap smear

and a CBE predicted screening with mammography. Age, knowledge of breast self-examination, ever having had a Pap smear, a mammogram and being a non-smoker predicted screening via CBE over the past 3 years. Little is known about the stability of these influences over time, about differences by gender, within growing Latino subgroups such as immigrants from the Dominican Republic, or across a range of other effective screening tests such as those for colorectal cancer.

The aims of this research are twofold: first, to examine current adherence to cancer screening among both Latino men and women using the Pap smear, mammogram, breast self-examination [BSE] and the CBE among women, prostate specific antigen test [PSA] among men, and the FOBT, sigmoidoscopy, proctoscopy, and colonoscopy for both male and female Latinos. Second, relying upon a behavioral model of health care utilization [21], to examine the associations of a set of theory-grounded predictors with screening compliance.

We have identified no similar research among Latino subgroups, across a range of cancer screening tests, using nationally representative data. Individuals who adhere to one cancer screening test tend to adhere to more than one, so it is reasonable to evaluate all of the tests simultaneously. Given the increase in the population of Latinos nationwide, the study's findings are potentially highly generalizable.

Methods

The 2000 NHIS adult persons sample and the Cancer Control Supplement were based on a national probability sample survey conducted by household interview; the methodology has been described elsewhere [22]. With appropriate sampling weights, the data were representative of the entire US adult population and included a total of 32,374 civilian non-institutionalized US residents older than 18 years. For several independent variables including education, health insurance, and self-rated health, cases in the category of 'Refused/Don't know/Not Ascertained' that were less than 1% of the sample were dropped from the analysis, yielding 31,886 individuals. Including all self-reported Latinos; the final sample size for the analysis was 5377. Central and South Americans were grouped together in the questionnaire. "Other Hispanic" included any additional self-identified Latinos who chose that category.

To best approximate the conceptual variables, predictors were divided into predisposing, enabling, and need-related factors, guided by [27,28]. Predisposing factors included: age, gender, marital status, Latino subgroup, educational attainment, nativity and smoking status, personal history of cancer, perceived risk of cancer, perceived family risk of cancer, family history of cancer, and acculturation. Acculturation was measured using a modified Marin Short Acculturation Scale [29], questions 2–7, and by splitting the first question, "What language(s) do you read and

speak?” into two questions, “In general, what language do you read?” and “In general, what language do you speak?” Questions were assessed on a 5-point scale (only Spanish, mostly Spanish, Spanish and English about the same, mostly English, and only English) and an average acculturation score was computed. Enabling resources were measured as: family income, health insurance coverage, usual place for medical care, and interpersonal exchange with a primary care provider over the past 12 months including nurse practitioner, physician assistant, a general or specialist physician. Need-related factors were self-rated health status, and the use of other cancer screening tests. As stated earlier, there is a considerable body of research that suggests that those who participate in one cancer screening test (e.g., mammography) are more likely to comply with other screening regimens than are non-compliers [30–32], so use of other cancer screening tests was added to the model.

Statistical analysis

Data analysis began with descriptive statistics on all measured variables. The effects on screening behavior of each of the factors, using continuous and categorical measures of outcome were tested via one-way ANOVA or chi-square. Those variables with a statistically significant bivariate association ($P < 0.05$) were subsequently tested with a logistic regression analysis to obtain odds ratio (OR) estimates, while simultaneously adjusting for identified confounders. Variables included a priori in the logistic regression analysis were age, gender, marital status, educational level, and Latino subgroup because of consonance with existing theory [27,28], and strong previous findings on these associations; cancer diagnosis was included a priori in the multivariate analyses for the previous reasons as well as because professional guidelines suggest more frequent surveillance for those at higher cancer risk. The possibility of interactions between the major explanatory variable, Latino subgroup, and other independent factors was assessed by the significance of the likelihood ratio statistic ($P < 0.05$) after the addition of the product terms to the model. Due simultaneously to multicollinearity among personal history of cancer, family history of cancer, perceived risk of cancer, and perceived amount of cancer in the family ($r^2 = 0.66$ to 0.07 ; $P < 0.00001$ to 0.005), we retained only personal history of cancer in the multivariate model. Similarly, simultaneously since nativity and acculturation were highly intercorrelated ($r^2 = -0.69$, $P < 0.00001$), as were usual source of care and having visited a primary care provider over the past 12 months ($r^2 = 0.46$, $P < 0.0001$), we retained only the factors acculturation and having visited a health care provider over the past 12 months in the final multivariate logistic regression model. All P values are the result of two-sided tests. Analyses were conducted with SUDAAN to incorporate weights reflecting the sampling strategy, adjustment for non-respondents, and the potential effect of cluster sampling in the estimation of standard errors [33].

Results

Latino subgroups that participated in the 2000 NHIS differed by their socio-demographic characteristics, as Latinos do more generally in the US. Apart from family income, all of the predisposing, enabling, and need-related factors differed significantly among the Latino subgroups (see Table 1). Mexican and Central or South Americans tended to be younger and included more males than Cuban, Puerto Rican, Dominican, or “other Hispanic” participants. Cubans, Mexicans, and Central or South Americans in this cohort were more often married than Puerto Ricans, Dominicans, and those in the “other Hispanic” category. The educational levels of interviewees were highest among Cubans, Dominicans, Central or South Americans, and “other Hispanic.” Cubans, Dominicans, and Central or South Americans were the least likely to have been born in the United States than individuals in other subgroups. Those from the Dominican Republic were the least acculturated of all of the subgroups.

Puerto Ricans (24.4%) and “other Hispanic” (28.8%) had the highest rates of current smoking, while Dominicans (13.9%) were the least likely to be current smokers. Similarly, Puerto Ricans had the highest proportion of current smokers in an 8-city population-based telephone survey conducted in 1993–1994 among Mexican American, Central American, Puerto Rican, Cuban American, South American, and Other Latinos (including those from the Dominican Republic) [9]. Cubans (7.2%) were the most likely to have ever had cancer; this may be due in part to their older average age. Cubans (46.5%) as well as “other Hispanics” (46.5%) were most likely to have family members (biological fathers or mothers, sisters, brothers, sons, or daughters) who had been diagnosed with cancer. By contrast, Cubans had the lowest perceived risk of cancer (at 78.7%). Both Cubans (80.1%) and Central or South Americans (82.9%) reported the lowest perceived amount of cancer among family members.

The enabling factors revealed that Central or South Americans had the highest family income, and Puerto Ricans, the lowest, although the differences were not statistically significant. Mexicans (66.7%) and Central or South Americans (66.6%) were least likely to have a usual source of health care, while Puerto Ricans (85.3%) and “other Hispanic” (88.9%) were the most likely. Puerto Ricans (65.3%) and Cubans (64.7%) were most likely to have seen a primary care provider within the prior 12 months, while Mexicans were least likely (48.8%). “Other Hispanic” (71%) were the most likely to have private insurance, while Mexican-Americans (42.9%), Central or South Americans (40.7%), and Dominicans (38.6%) were most likely to be uninsured.

Puerto Ricans (20.9%) and Cubans (20.6%) were the most likely to report their health status as fair or poor. Latinos were compared by their use (or non-use) of one or more cancer screening tests (data not displayed). Among those who had

Table 1

Comparison of Latino subgroups across selected sociodemographic factors, health history and behaviors

	Puerto Rican (<i>n</i> = 552) % (SE)	Mexican/ Mexican-American (<i>n</i> = 3285) % (SE)	Cuban/ Cuban-American (<i>n</i> = 334) % (SE)	Dominican (Republic) (<i>n</i> = 176) % (SE)	Central or South American (<i>n</i> = 744) % (SE)	Other Hispanic (<i>n</i> = 286) % (SE)	Total (<i>n</i> = 5377) % (SE)
<i>Predisposing</i>							
<i>Age***</i>							
18–29	29.09 (2.29)	35.77 (1.07)	13.01 (3.23)	25.86 (3.80)	32.06 (2.35)	17.42 (2.56)	32.05 (0.87)
30–39	22.56 (2.11)	24.62 (0.95)	19.24 (1.98)	27.98 (4.03)	26.95 (2.12)	22.82 (3.23)	24.48 (0.71)
40–49	19.41 (1.85)	19.19 (0.82)	15.84 (2.63)	24.86 (3.45)	24.52 (2.22)	20.97 (2.73)	20.10 (0.72)
50–69	23.21 (2.35)	15.81 (0.84)	32.85 (2.25)	15.63 (3.21)	13.43 (1.36)	28.78 (2.87)	17.77 (0.67)
70+	5.74 (1.22)	4.61 (0.41)	19.05 (3.97)	5.66 (2.60)	3.05 (0.88)	10.01 (2.00)	5.60 (0.48)
<i>Education***</i>							
Under 12th grade	38.27 (2.78)	52.23 (1.39)	34.89 (4.84)	39.19 (5.13)	38.96 (1.96)	18.34 (3.11)	45.79 (1.04)
High school or GED	24.66 (2.32)	24.54 (1.08)	21.48 (2.63)	27.12 (3.50)	20.63 (1.99)	34.61 (3.05)	24.32 (0.76)
Some college/ AA degree	21.26 (0.78)	18.4 (1.00)	25.68 (2.85)	17.24 (4.35)	25.87 (2.08)	30.89 (3.46)	21.26 (0.78)
Bachelor/graduate or higher	8.63 (0.54)	4.83 (0.49)	17.96 (3.33)	16.45 (3.66)	14.54 (1.56)	16.16 (2.68)	8.63 (0.54)
<i>Sex**</i>							
Male	41.90 (2.57)	51.05 (1.29)	44.16 (2.80)	45.47 (4.62)	51.15 (2.25)	44.74 (3.74)	49.29 (0.93)
Female	58.10 (2.57)	48.95 (1.29)	55.84 (2.80)	54.53 (4.62)	48.85 (2.25)	55.26 (3.74)	50.71 (0.93)
<i>Marital status***</i>							
Married	55.22 (2.76)	66.43 (0.95)	66.56 (2.91)	64.00 (5.07)	68.30 (2.04)	60.70 (3.42)	65.27 (0.78)
Divorced/Separated/ Single/Widowed	44.78 (2.76)	33.57 (0.95)	33.44 (2.91)	36.00 (5.07)	31.70 (2.04)	39.30 (3.42)	34.73 (0.78)
<i>Nativity***</i>							
USA born	49.75 (2.97)	43.37 (1.44)	12.16 (2.25)	10.56 (1.97)	9.40 (1.31)	86.45 (3.45)	38.02 (1.15)
Born outside of US	50.25 (2.97)	56.63 (1.44)	87.84 (2.25)	89.44 (1.97)	90.60 (1.31)	13.55 (3.45)	61.98 (1.15)
<i>Smoking status***</i>							
Current	24.36 (2.22)	17.72 (0.89)	17.15 (2.30)	13.93 (2.91)	16.58 (1.80)	28.82 (3.55)	18.58 (0.69)
Former	15.78 (1.63)	13.39 (0.74)	14.07 (2.91)	11.80 (3.38)	13.53 (1.68)	20.30 (3.19)	13.97 (0.64)
Never	59.86 (2.59)	68.90 (1.05)	68.77 (4.30)	74.27 (3.48)	69.89 (2.20)	50.89 (3.42)	67.45 (0.84)
<i>Perceived Personal cancer risk***</i>							
Low	65.83 (2.77)	73.44 (1.13)	78.71 (2.42)	65.24 (4.41)	74.83 (2.19)	65.10 (4.05)	72.58 (0.86)
Medium	21.71 (2.30)	20.23 (1.03)	17.47 (2.03)	24.71 (4.52)	17.90 (1.74)	20.84 (3.09)	20.01 (0.76)
High	12.45 (1.94)	6.33 (0.54)	3.82 (1.20)	10.05 (2.93)	7.27 (1.65)	14.07 (2.55)	7.41 (0.49)
<i>Perceived Family cancer risk***</i>							
Low	71.19 (2.27)	79.66 (1.00)	80.14 (1.83)	74.43 (4.50)	82.92 (1.78)	71.38 (3.58)	78.81 (0.75)
Medium	19.46 (2.16)	15.03 (0.89)	16.67 (1.94)	17.90 (4.35)	12.97 (1.61)	19.11 (2.91)	15.52 (0.69)
High	9.35 (1.74)	5.30 (0.46)	3.19 (0.84)	7.67 (3.19)	4.11 (0.91)	9.52 (1.71)	5.66 (0.37)
<i>Family history of cancer***</i>							
Yes	27.72 (4.45)	23.17 (1.68)	46.48 (7.53)	26.51 (7.20)	21.49 (4.05)	46.49 (5.49)	25.32 (1.54)
No	72.28 (4.45)	76.83 (1.68)	53.52 (7.53)	73.49 (7.20)	78.51 (7.20)	53.51 (5.49)	74.68 (1.54)
<i>Personal history of cancer***</i>							
Yes	2.80 (0.78)	1.47 (0.24)	7.19 (1.73)	0.26 (0.25)	2.10 (0.69)	3.23 (1.13)	2.07 (0.23)
No	97.20 (0.78)	98.53 (0.24)	92.81 (1.73)	99.74 (0.25)	97.90 (0.69)	96.77 (1.13)	97.93 (0.23)
<i>Acculturation***</i>							
Average score ^a	3.33 (0.07)	2.65 (0.04)	2.18 (0.08)	1.95 (0.08)	2.33 (0.05)	4.10 (0.10)	2.68 (0.03)
<i>Enabling</i>							
<i>Family income</i>							
Above \$20,000	66.22 (2.37)	68.69 (1.29)	72.68 (3.11)	66.51 (5.59)	74.40 (2.07)	73.38 (3.41)	69.72 (0.98)
Below \$20,000	33.78 (2.37)	31.31 (1.29)	27.32 (3.11)	33.49 (5.59)	25.60 (2.07)	26.62 (3.41)	30.28 (0.98)
<i>Health Insurance***</i>							
Private	53.22 (2.61)	44.97 (1.23)	48.84 (2.71)	37.78 (4.93)	49.31 (2.42)	70.99 (2.78)	47.70 (0.97)
Public	30.81 (2.29)	12.10 (0.63)	28.03 (3.36)	23.58 (4.80)	10.00 (1.17)	14.98 (2.80)	15.02 (0.59)
None	15.97 (1.71)	42.93 (1.33)	23.12 (2.69)	38.64 (5.66)	40.70 (2.43)	14.03 (2.44)	37.28 (1.11)
<i>Have a usual source of health care***</i>							
Yes	85.37 (2.02)	66.66 (1.41)	82.88 (2.21)	78.98 (5.06)	66.55 (2.50)	88.94 (2.25)	70.87 (1.10)
No	14.63 (2.02)	33.34 (1.41)	17.12 (2.21)	21.02 (5.06)	33.45 (2.50)	11.06 (2.25)	29.13 (1.10)

Table 1 (continued)

	Puerto Rican (<i>n</i> = 552) % (SE)	Mexican/ Mexican-American (<i>n</i> = 3285) % (SE)	Cuban/ Cuban-American (<i>n</i> = 334) % (SE)	Dominican (Republic) (<i>n</i> = 176) % (SE)	Central or South American (<i>n</i> = 744) % (SE)	Other Hispanic (<i>n</i> = 286) % (SE)	Total (<i>n</i> = 5377) % (SE)
<i>Enabling</i>							
Seen a primary care provider over the last 12 months***							
Yes	65.33 (2.30)	48.79 (1.30)	64.70 (2.27)	50.01 (4.86)	53.35 (2.42)	58.85 (3.49)	52.57 (1.01)
No	34.67 (2.30)	51.21 (1.30)	35.30 (2.27)	49.99 (4.86)	46.65 (2.42)	41.15 (3.49)	47.43 (1.01)
<i>Need-related</i>							
Self-rated health status***							
Excellent	24.19 (2.36)	28.05 (1.06)	30.97 (3.05)	28.99 (4.62)	30.69 (2.16)	31.41 (4.22)	28.43 (0.84)
Very good	27.19 (2.36)	29.61 (1.09)	21.13 (3.28)	37.17 (5.99)	34.57 (2.16)	31.40 (3.53)	29.96 (0.85)
Good	27.74 (2.68)	29.65 (1.07)	27.30 (3.21)	19.51 (3.31)	25.79 (2.01)	20.73 (2.78)	28.00 (0.83)
Fair	16.27 (2.17)	10.03 (0.59)	17.67 (3.24)	10.03 (3.07)	7.11 (1.14)	12.54 (2.45)	10.76 (0.59)
Poor	4.60 (1.10)	2.66 (0.26)	2.93 (0.99)	4.29 (2.25)	1.84 (0.58)	3.92 (1.16)	2.85 (0.23)

Chi square *P* values: **p* < 0.05.; ***P* < 0.01; ****P* < 0.001.

^a 1 = more Spanish, 5 = more English.

endoscopy, Puerto Ricans (*P* = 0.008), Mexicans (*P* = 0.003), and “other Hispanic” (*P* < 0.0001) also had other cancer screening tests. Looking at FOBT, there were differences in the use of other cancer screening tests among Puerto Ricans (*P* = 0.004) and Mexicans (*P* < 0.0001), but not within other subgroups. Puerto Ricans (*P* = 0.0002), Mexicans (*P* = 0.0002), Central or South Americans (*P* = 0.0002), and “other Hispanic” (*P* = 0.007) men who had a PSA were significantly more likely to have other cancer screening tests than were other Latinos. Puerto Rican (*P* = 0.0001), Mexican (*P* < 0.0001), Central or South American (*P* = 0.001), Cuban, (*P* < 0.0001), and “other Hispanic” (*P* = 0.01) women who had mammography were significantly more likely to have other cancer screening tests than were other Latinos. Across all Latino subgroups, women who had Pap smears were significantly more likely to have other testing. Puerto Rican (*P* < 0.0001), Mexican (*P* < 0.0001), Central or South American (*P* = 0.002), and Cuban (*P* = 0.0003) women who had CBE were significantly more likely to have other cancer screening tests than others.

The American Cancer Society (ACS) makes recommendations for the early detection of cancer [34–36] that are the most widely recognized guidelines across diverse health care providers. Table 2 displays the uptake of cancer screening tests across Latino subgroups at average risk for cancer according to ACS recommendations. As individuals who have been diagnosed with cancer are expected to engage in more frequent surveillance, Latinos with a personal or family history of cancer were excluded from the calculation of these proportions. Subgroups differed significantly in their use of the Pap smear within the last year (ages 21–29) or over the past 3 years (ages 30–70); Cubans had significantly lower rates (69.2%) of cervical cancer screening than did other groups between the ages of 21 and 70 (*P* = 0.001). Similarly, Cuban women (42.1%) had significantly lower adherence to CBE than other Latinas (*P* = 0.002). Adherence to other screening tests did not differ significantly across groups. Overall, there was low adherence to FOBT, with rates

varying from 9.1% among Cubans to 22.3% among Puerto Ricans. Dominican women had the highest proportion adhering to mammography recommendations (52.4%), while Mexican women had the lowest adherence (37.0%). “Other Hispanic” women had the highest rates of adherence to clinical breast exam (66.2%). “Other Hispanic” persons also had the highest uptake of endoscopy over the past 5 years (29.2%), with the least use among those from the Dominican Republic (14.1%). Cuban men had the highest reported rates of PSA test utilization over the previous year (75.2%). Overall, however, the number of men in these subgroups was small, particularly among the Dominicans, so the proportions should be interpreted with caution.

The results of the multiple logistic regression analysis of screening test by predisposing, enabling, and need-related factors revealed that Latino subgroups had some differences in their cancer screening behavior (see Table 3). Cuban males had a fivefold greater utilization of PSA testing (OR = 5.10), while Dominican women had over twice the likelihood of having had mammography (OR = 2.43). Puerto Rican (OR = 0.50) and Central or South Americans (OR = 0.42) were nearly one-half less likely to have an endoscopy for the detection of colorectal cancer as other subgroups. Latinos aged 49 and younger were significantly less likely to have an FOBT, endoscopy, PSA (men only), or mammogram (women only), and more likely to have a Pap smear than were those aged 50–69 (see Table 3). In addition, women aged 70 and older were significantly less likely to have a Pap smear or CBE than women aged 50–64 or 50–69 (Pap smear), and significantly more likely to have endoscopy (OR = 1.24 for age 50–69). Females had more than one-half the likelihood of males of having had an FOBT (OR = 0.60) and one-third the likelihood of having an endoscopic screening exam (OR = 0.35). For the FOBT (OR = 0.61) and Pap smear (OR = 0.45), unmarried (including separated, divorced, widowed, and never married) women were significantly less likely than married people to have had testing. As has been uncovered in other similar studies, greater educational attainment also

Table 2

Adherence to American Cancer Society guidelines for screening use among those at average risk^a, by Latino subgroups

	Puerto Rican (%)	Mexican/Mexican American (%)	Cuban/Cuban American (%)	Dominican (Republic) (%)	Central or South American (%)	Other Hispanic (%)	Total (%)
Had FOBT in last year	(n = 129)	(n = 540)	(n = 122)	(n = 31)	(n = 96)	(n = 89)	
Ages 50+	22.29 (4.04)	14.60 (2.07)	9.05 (3.22)	10.11 (5.37)	11.04 (3.56)	18.20 (5.56)	14.75 (1.42)
Had Colorectal Screening Test in last 5 years ^b	(n = 113)	(n = 489)	(n = 111)	(n = 26)	(n = 83)	(n = 72)	
Ages 50+	20.36 (4.43)	20.09 (2.43)	25.33 (3.27)	14.12 (9.42)	13.56 (4.37)	29.16 (7.16)	20.68 (1.68)
Male Subjects	(n = 16)	(n = 44)	(n = 27)	(n = 4)	(n = 21)	(n = 13)	
Had PSA in last year							
Ages 50+	43.83 (10.61)	41.48 (6.50)	75.20 (8.75)	29.49 (24.28)	52.27 (11.02)	61.49 (10.14)	49.35 (3.68)
Female subjects							
Had mammogram in last year	(n = 125)	(n = 576)	(n = 112)	(n = 48)	(n = 149)	(n = 82)	
Ages 40+	45.70 (5.39)	37.03 (2.47)	47.10 (4.92)	52.35 (9.77)	42.08 (5.88)	38.82 (6.58)	40.55 (2.03)
Had PAP smear in last year	(n = 252)	(n = 1247)	(n = 127)	(n = 83)	(n = 298)	(n = 88)	
(ages 21–29) or last 3 years (ages 30–70)***							
Ages 21–70	82.02 (2.71)	74.23 (1.85)	69.15 (3.72)	84.30 (4.32)	76.06 (3.00)	91.42 (2.99)	76.17 (1.33)
Had clinical breast exam in last 3 years (age 30–39) or last year (age 40+)***, ^c							
Ages 30+	64.22 (4.83)	51.07 (1.87)	42.06 (2.95)	55.88 (7.30)	54.20 (4.24)	66.15 (6.27)	53.26 (1.43)

^a Excluded subjects had a personal or family history of cancer.^b Including flexible sigmoidoscopy, colonoscopy, or protoscopy.^c Although ACS recommendations suggest CBE should start in a woman's 20s, this question was asked only of subjects age 30 or older.** $P < 0.01$.*** $P < 0.001$.

predicted usage of these tests. Latinos with a Bachelor's degree or higher were significantly more likely to have an endoscopy (OR = 2.75), mammogram (OR = 1.99), or clinical breast examination (OR = 2.01) than were those with less education. Current smokers were less likely to have mammography screening than never or former smokers (OR = 0.58). Looking at acculturation, greater use of English was associated with significantly greater use of Pap smear (OR = 1.20) and CBE (OR = 1.13).

Looking at the enabling factors, having visited a primary care physician within the last year predicted increased FOBT (OR = 1.78), endoscopy (OR = 1.57), PSA (OR = 4.70) screening for males, mammography (OR = 1.64), Pap smear (OR = 1.45), and CBE (OR = 1.78) screening for female Latinos. Not surprisingly, those with health insurance at the time of the survey had a greater likelihood of mammography (OR = 2.20, private insurance, OR = 1.95, public insurance), or Pap smear (OR = 1.92, private insurance, 1.68, public insurance) testing than those without health insurance.

Those women who rated their health status as "poor" (OR = 2.33) were more likely to have endoscopy than Latino women with "excellent" health status. As predicted, Latinos who used at least one other cancer screening test

were highly and significantly more likely to use the FOBT (OR = 4.38), endoscopy (OR = 3.13), PSA (OR = 3.62), mammography (OR = 8.22), Pap smear (OR = 13.26), and the CBE (OR = 16.82) than those who had not had other cancer screening.

Looking at the predictors of each of the cancer screening tests, Latinas aged 50–69, who were from the Dominican Republic, had more years of education, a personal history of cancer, who were not current smokers, had health insurance, had visited a primary care provider over the past 12 months, and had at least one other screening test had greater use of mammography. Younger age, marriage, greater acculturation, a usual source of care (or visits to a primary care provider), health insurance, and the use of other cancer screening tests predicted the uptake of the Pap smear. The pooled 1990 and 1992 data findings are consistent with these results, except the finding on the predictive importance of health insurance. Latinas were more likely to use a CBE if they were younger, had a Bachelor's degree, a personal history of cancer, were more acculturated, had a visit to a primary care provider over the past 12 months, and used other cancer screening tests. These findings too, are consistent with the pooled data from 1990 to 1992, except

for the influence of education. Ages between 50 and 69, male sex, marriage, history of visiting a primary health care provider over the past 12 months, and use of other screening tests predicted use of the FOBT. Older age, greater education, male sex, history of visiting a health care provider in the previous year, better health status, and use of other screening tests influenced the use of endoscopy for colorectal cancer screening. Puerto Ricans and Central or South Americans had half the likelihood of having colorectal cancer screening than other groups. Finally, in addition to Cuban heritage, PSA use among Latinos was predicted by older age, history of visiting a primary care provider in the past 12 months, and use of other screening tests. There were no statistically significant interaction effects with the predisposing, enabling, or need-related factors and any of the Latino subgroups.

Conclusions

Overall, while the rates of cancer screening use differ across Latino subgroups, recommended uptake is below national *Healthy People 2010* goals for testing [37], from a low 14.8% average uptake of FOBT to a high of Pap smear use at 76.2%. Within subgroups, the “other Hispanic” maintained the highest average rate of adherence with ACS cancer screening guidelines for asymptomatic individuals, and the Mexicans were the least adherent [38]. The rates were particularly low for colorectal cancer screening using the FOBT among Cubans, Dominicans, and Central or South Americans (each 11% or under). Although the overall rates for colorectal cancer screening using endoscopies were higher, one fifth or fewer Puerto Ricans, Mexicans, Central or South Americans, and Dominicans had received a sigmoidoscopy, colonoscopy, or proctoscopy over the past 5 years. Given the relatively high rates of colorectal cancer incidence and mortality within the Latino community [39,40], particularly in urban enclaves like those of northern Manhattan, where both the colorectal cancer incidence (53.7 per 100,000) and mortality rates for Latinos (24.2 per 100,000) are higher than those reported nationally, [41] tailored programmatic approaches and targeted policy initiatives to increase screening are warranted.

Multivariate findings suggest that women from the Dominican Republic are significantly more likely to have had a mammogram over the last year than other Latino women. While the rates for Dominican women are higher than those uncovered in a population-based study among multiethnic women in New York City, perhaps due to sampling differences [16], the trends over time suggest the importance of maintaining screening-related gains in Dominicans as well as among other self-identified Hispanic subgroups.

Cuban men, with the highest unadjusted rates of prostate cancer screening using the PSA over the past year, were most likely to screen relative to other Latinos. These

findings, by contrast with those for Cuban women, highlight the importance of tailoring culturally competent programs both to subgroup and to gender.

Comparisons of descriptive data from the pooled National Health Interview Survey (NHIS) from 1990 to 1992 [26] and the current study are revealing. The study data are not entirely comparable because the pooled data only measured breast and cervical cancer screening test use among women over the past 3 years, separated Mexicans and Mexican Americans, included Latinas from the Dominican Republic in “other Hispanic,” included those at higher than average cancer risk in the calculations, and added women younger than 40 to all of the screening rates. Looking at the adjusted rates, however, some important programmatic and policy implications can be drawn. By contrast to Cuban men, Cuban women were the least likely to receive the Pap smear, mammogram and CBE across 1990, 1992; similarly, they were least likely to receive all but the mammogram in 2000. Among the primary barriers to screening cited by Cuban women to this item on the 2000 NHIS, “No reason/never thought about it” was prominent (73% of the respondents). Further, while the screening rates, particularly in the use of mammography and the Pap smear [26], have increased across Latino subgroups over time, only the Pap smear has increased in use among Cuban women. These findings highlight the importance of developing targeted media or public education campaigns to increase awareness, as well as further study of the individual barriers to screening among Cuban women. The results also suggest that programs like the CDC-funded National Breast and Cervical Cancer Early Detection Programs (NBCCEDP) that are designed to increase screening among underserved women and thus reduce breast and cervical cancer-related morbidity and mortality [42] may not be reaching Cuban women in sufficient numbers. Policy approaches to increase cancer screening among Cuban women should be targeted to the communities in which they reside.

Several of the predisposing factors were significant predictors of the uptake of screening across Latino subgroups. In the NHIS pooled 1990 and 1992 data, women aged 50 and older were significantly less likely to screen with the Pap smear and the CBE than were other Latino women. In this study, Latinas, aged 70 and older were not using the Pap smear as recommended. Non-adherence has been identified as a substantial problem even among older women in prepaid health plans who have access to screening services. Poor adherence to screening leads to later stage at diagnosis, and increased cervical cancer-related morbidity [43,44]. These findings suggest the importance of further study of the barriers to Pap smear screening among older Latinas. By contrast, over all years, older women were more likely to have a mammogram than were younger women, perhaps due to the ongoing controversy about the effectiveness of mammography for women aged 40–49 [45].

Across the pooled 1990 and 1992 data through the current 2000 NHIS findings, marriage increased the uptake

Table 3
Multiple logistic regression analysis of cancer screening test uptake ($n = 5377$)

Factors	FOBT in last year		Had sigmoidoscopy, colonoscopy, proctoscopy in last 5 years		PSA in last year ^a		Mammogram last year ^b		Pap Smear ^b		CBE ^b	
	OR	95% C.I.	OR	95% C.I.	OR	95% C.I.	OR	95% C.I.	OR	95% C. I.	OR	95% C.I.
<i>Predisposing</i>												
Latino subgroup												
Mexican/ Mexican American	1.00		1.00		1.00		1.00		1.00		1.00	
Puerto Rican	0.91	0.51–1.62	0.50*	0.28–0.89	1.29	0.47–3.52	1.20	0.76–1.89	1.15	0.72–1.85	1.12	0.71–1.78
Cuban/ Cuban American	0.59	0.32–1.06	0.62	0.36–1.07	5.10***	2.28–11.42	0.97	0.54–1.73	0.70	0.41–1.19	0.75	0.47–1.20
Dominican (Republic)	1.22	0.54–2.75	1.02	0.36–2.91	2.82	0.49–16.08	2.43**	1.31–4.49	1.75	0.81–3.77	1.30	0.69–2.45
Central or South American	0.91	0.45–1.82	0.42*	0.21–0.85	1.36	0.51–3.66	1.20	0.77–1.88	1.16	0.78–1.71	1.10	0.72–1.66
Other Hispanic	1.04	0.48–2.23	0.82	0.44–1.54	0.79	0.36–1.71	0.94	0.56–1.56	1.68	0.74–3.79	0.99	0.55–1.76
Age									Age		Age	
40–49	0.34***	0.22–0.53	0.16***	0.10–0.26	0.33***	0.17–0.62	0.21***	0.15–0.30	1.60*	1.10–2.34	1.09	0.79–1.50
50–69	1.00		1.00		1.00		1.00		1.00		1.00	
70+	0.92	0.54–1.57	1.24***	0.82–1.88	1.16	0.60–2.27	0.94	0.62–1.43	0.55*	0.33–0.94	0.56*	0.33–0.96
Educational attainment												
12th Grade or Under	1.00		1.00		1.00		1.00		1.00		1.00	
High school or GED	1.38	0.84–2.27	1.40	0.83–2.33	0.99	0.45–2.17	1.26	0.90–1.77	0.80	0.55–1.16	1.35	0.96–1.92
Some college/ AA degree	1.12	0.66–1.89	1.51	0.87–2.63	1.77	0.76–4.08	1.66**	1.18–2.34	0.78	0.54–1.14	1.22	0.83–1.81
Bachelor's degree or higher	1.78	0.86–3.67	2.75***	1.62–4.66	1.77	0.67–4.70	1.99**	1.20–3.32	0.84	0.52–1.36	2.01**	1.28–3.15
Gender												
Male	1.00		1.00		–	–	–	–	–	–	–	–
Female	0.60*	0.37–0.98	0.35***	0.24–0.52	–	–	–	–	–	–	–	–
Marital status												
Married	1.00		1.00		1.00		1.00		1.00		1.00	
Not married	0.61*	0.40–0.94	1.02	0.69–1.52	0.68	0.37–1.26	0.81	0.63–1.05	0.45***	0.34–0.60	0.94	0.71–1.24

<i>Predisposing</i>												
Smoking status												
Never	1.00		1.00		1.00		1.00		1.00		1.00	
Current	1.20	0.70–2.06	0.85	0.48–1.48	1.52	0.80–2.89	0.58**	0.41–0.83	0.83	0.56–1.23	0.96	0.67–1.37
Former	1.03	0.62–1.70	1.46	0.99–2.16	1.13	0.59–2.17	0.95	0.65–1.38	1.27	0.81–2.01	1.10	0.75–1.61
Personal history of cancer												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.99	0.93–4.26	1.91	0.90–4.06	1.08	0.28–4.18	2.47*	1.16–3.07	1.06	0.44–2.53	2.90*	1.29–6.51
Acculturation	1.11	0.93–1.32	0.96	0.83–1.12	1.17	0.87–1.58	0.90	0.80–1.01	1.20**	1.05–1.37	1.13*	1.01–1.26
<i>Enabling</i>												
Health insurance coverage												
No insurance	1.00		1.00		1.00		1.00		1.00		1.00	
Private insurance	1.14	0.60–2.17	1.56	0.84–2.88	2.18	0.73–6.52	2.20***	1.57–3.07	1.92***	1.39–3.65	1.35	0.96–1.90
Public insurance	1.94	1.00–3.77	1.40	0.75–2.61	1.98	0.60–6.53	1.95**	1.28–2.99	1.68**	1.14–2.48	1.43	0.92–2.21
Visited a primary health care provider over the past 12 months												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.78*	1.08–2.93	1.57*	1.01–2.46	4.70***	2.61–8.46	1.64**	1.19–2.27	1.45*	1.08–1.94	1.78***	1.38–2.30
<i>Need-related</i>												
Self-rated health status												
Excellent	1.00		1.00		1.00		1.00		1.00		1.00	
Very good	1.11	0.57–2.17	1.34	0.75–2.42	1.11	0.51–2.45	0.94	0.64–1.38	1.03	0.73–1.44	0.87	0.60–1.28
Good	0.92	0.51–1.66	1.45	0.87–2.43	1.11	0.49–2.55	1.02	0.71–1.48	0.92	0.64–1.32	0.92	0.66–1.30
Fair	1.11	0.58–2.10	1.39	0.76–2.55	0.88	0.39–1.98	0.94	0.57–1.57	0.79	0.50–1.22	0.70	0.42–1.16
Poor	0.84	0.58–2.10	2.33*	1.17–4.63	2.05	0.62–6.85	1.17	0.52–2.67	0.53	0.23–1.24	0.63	0.34–1.18
Used at least one other cancer screening test												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	4.38***	2.29–8.34	3.13***	2.08–4.71	3.62***	1.95–6.75	8.22***	5.17–13.07	13.26***	9.31–18.90	16.82***	10.28–27.54

Chi square *P* values: **P* < 0.05; ***P* < 0.01; ****P* < 0.001.

^a Males only.

^b Females only.

of the Pap smear. In this study, it also was a significant protective factor for FOBT screening. Although smoking rates are relatively low among Latinas overall [38,46], never smokers were more likely to screen using the mammogram than were either current or former smokers. This finding replicates those found in previous NHIS surveys [47], and suggests the continued importance of targeting smoking cessation messages to women. The findings on the association of more education and the uptake of endoscopy, mammography, and CBE seem consistent both across Latinos, when compared with whites, as well as within Latino subgroups [38,48], highlighting the role of socioeconomic and sociocultural factors in the uptake of cancer screening tests, as discussed forthwith.

There was relatively low perception of individual cancer risk or familial cancer risk across subgroups. These findings are consonant with those of other studies among Latinos [49]. Women who had a personal history of cancer were more likely to have received a recent mammogram or CBE than those without this risk factor; these findings replicate those for white women [50,51]. Yet, differences in the availability of specialized cancer susceptibility counseling and testing resources between communities [52,53] and in diagnostic and treatment resources [54,55] contribute to health disparities by socio-demographic, socioeconomic, racial, ethnic, and cultural characteristics [56].

The findings on greater acculturation, as measured by the use of English, and increased use of the Pap smear and the CBE were similar to those uncovered among Mexican-American [57,58] and Colombian, Dominican, Puerto Rican, and Ecuadorian [59] women. While these findings suggest the applicability of the current measures of acculturation across Latino subgroups, given the multidimensionality of the construct, and its importance to research on health disparities [60,61], psychometric studies of different acculturation items, across Latino subgroups, may yield more refined measures that could be adopted in subsequent versions of the NHIS.

The study results are strong and consistent across all Latino subgroups on the importance of having visited a primary care provider for cancer screening, particularly for prostate cancer. Similarly, the influence of insurance coverage on the uptake of mammography and the Pap smear is strong across Latino subgroups. Logistic regression analyses of the pooled 1990 and 1992 data for women revealed that having a usual source of care was a predictor of increased Pap smear, mammogram, and CBE uptake as well. The importance of these enabling factors on the uptake of cancer screening tests replicates results from other studies [16,26]. These findings further suggest that, to increase the uptake of screening, notably colorectal cancer screening, interventions should be directed toward primary care physicians who work in Latino communities as well as to their residents (e.g., [62]). Given the high rates of PSA screening among Cuban men, and the scientific controversy concerning the efficacy of this screening test [review in Ref. [63]], however, physicians'

abilities to effectively communicate the risks and benefits of screening, screening options, to assist the patient in values clarification, and to engage with the patient in active and collaborative communication is key.

Overall, structural factors have a strong influence on access to, knowledge of, and the uptake of cancer screening among Latinos. Social inequalities and lack of health care insurance are common among Latinos and other people of color overall [64]. Differences in education and access to health care have been posited as fundamental causes of health disparities between Latinos and whites [19]. The differences in structural factors uncovered in this study suggest that there may be important differences among Latino subgroups as well, highlighting the importance of more nuanced policy initiatives and programs to reduce health disparities.

Of the need-related factors, the importance of using more than one cancer-screening test has emerged as a strong and consistent finding across the 1990 to the 2000 NHIS data. Individuals who participate in multiple cancer screenings may be more health conscious, and/or more knowledgeable about cancer screening tests than those who do not; similarly, they may be healthier overall. While the practice of healthy behaviors (i.e., engaging in exercise, refraining from smoking, and obtaining CBE and Pap smears) has been associated with breast cancer screening using mammography in several studies (review in Ref. [65]), this study is the first to highlight its importance more generally across several cancer screening tests and within Latino subgroups. These strong findings and the recent recommendations of the Institute of Medicine (2003) [66] suggest, as discussed earlier, that, in addition to increasing cancer screening recommendations to Latinos by primary care physicians, "one stop" cancer screening sites such as the NBCCEDP, that offer breast, cervical, and, in some states, colorectal cancer screening [67,68], are promising venues for free or low cost detection among those who choose to participate in these programs.

Another need-related factor, health status, was highly predictive of endoscopy use. "Poor" perceived health status may serve as a marker for cancer-related symptoms. As suggested by a recent review [65], this factor has received less attention than others, although it has a long history in health services research; further study of the predictive importance of health status among Latino subgroups, in particular, is warranted.

The theoretical model for the study, with its explicit attention to economic as well as social and psychological factors, seemed to fit the data well and to address the relevant explanatory factors. Given the importance of recent contact with a primary care physician to cancer screening uptake among Latinos, explicit inclusion of factors measuring physician supply may increase the predictive power of future models.

A strength of the study is that it relies upon a nationally representative sample, and the household interviews were

conducted in both English and Spanish. Further, our analyses allowed for differentiation by separate Latino cultural subgroups whose cancer screening behaviors differ. The findings are subject to self-report bias, however. Even with a large database, some subgroups, such as those from the Dominican Republic, who are numerous in some northeastern urban communities, are too few in number for some subgroup analyses. Focused studies of these subgroups in select communities (e.g., [16]), or over-sampling of certain subgroups in subsequent NHIS surveys may reveal important differences that are overlooked in current surveys.

Notes

“Hispanic women” and “Latino women” are used to refer to women of Hispanic origin from Mexico, Puerto Rico, Cuba, Central or South America, the Dominican Republic, as well as to women who refer to themselves as Hispanic on the NHIS. Similarly, “Hispanic men” and Latinos are used to refer to men from these same countries and those who identify themselves as Hispanic on the NHIS. The designation “Hispanic” is used in national and state reporting systems; “Latino” is a self-designated term by members of different subgroups. “Latino” is the term that is generally used in this paper without preference or prejudice (adapted from Ref. [26]).

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