Use of Preventive Services Among Hispanic Sub-Groups:

Does One Size Fit All?

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Use of Preventive Services Among Hispanic Sub-Groups: Does One Size Fit All?

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Executive Summary

The Hispanic population, the largest and fastest growing minority group in the nation, is generally under-served with regard to health services. We explored the use of preventive health services among Mexicans, Puerto-Ricans, Cubans, and "other" Latinos (persons from all other Spanish-speaking countries such as Spain, Central and South America) and examined how the use of preventive services was influenced by nation of origin and by rural versus urban residence. Rural is defined as living in a non-metropolitan county; urban as living in a metropolitan county.

Study Methods

Preventive Services Examined: We studied reported receipt of six preventive services among age-appropriate populations: pap test, clinical breast examination (CBE), mammogram, PSA (prostate specific antigen) test, flu vaccination and pneumonia vaccination.

Definition of Adequate Services: In setting a standard for adequate cancer screening (pap, CBE, mammogram and PSA), we used the recommendations of the American Cancer Society. These are generally more conservative, that is, require earlier or more frequent screening, than those offered by the US Preventive Services Task Force. Recommendations of the US Preventive Services Task Force were followed in defining adequate vaccination.

Data Source: We merged data from the National Health Interview Survey (NHIS) from 1998, 1999 and 2000. The NHIS is a nationally representative survey carried out by the Centers for Disease Control and Prevention. We merged three years of data in order to have enough persons in each Hispanic subgroup for statistical analysis. Our findings compare Hispanic subgroups (Mexican, Puerto Rican, Cuban, and "other Hispanics") with Whites.

Findings

- Rural residents, whether Hispanic or non-Hispanic White, were generally less likely to receive preventive services.
- Nation of origin was not consistently associated with differences in receipt of preventive services within the Hispanic population.
- Hispanics were significantly less likely than whites to report having received any of the preventive services studied. However, these differences were not present when the characteristics of respondents, such as income, education, and other factors, were held equal in multivariate analysis.
- Lack of health insurance and lack of a usual source of care were among the strongest predictors of failure to receive preventive services.

Conclusions & Implications

- Expanding programs that provide free or low-cost cancer screening and other preventive services may help reduce ethnicity-based and residence-based disparities.
- Improving the provision of culturally and linguistically appropriate services by providers, combined with targeted education at Hispanic populations, may help reduce ethnicity-based disparities. Further research is needed to develop effective interventions.

Chapter One: Introduction

Hispanic Populations in the United States

The Hispanic population is the largest and fastest growing minority group in the nation. There were 40.4 million Latinos in the United States in 2004, an increase of 14% since 2000 (US Census Bureau, 2004, Pew Hispanic Center, 2005). The Hispanic population, currently estimated to be 14.2% of the population, is projected to rise to 47.7 million by 2010, 60.4 million by 2020 and 98.2 million by 2050 (US Census Bureau, 2004; Pew Hispanic Center, 2005; Freeman and Lethbridge-Cejku, 2006).

Hispanics form a heterogeneous ethnic group with culturally diverse origins. A majority of Hispanics residing in the United States (66.9%) are of Mexican/Mexican-American descent. Other groups are from Central and South America (14.3%), Puerto Rico (8.6%), Cuba (3.7%), and other areas (6.5%) (Ramirez 2003). The majority of the Hispanics live in the South (33.3%) and the West (44.2%) (Ramirez, 2003). Hispanics of Mexican descent are more likely to live in the West. Puerto Ricans are more like to live in the Northeast and Cubans in the South (Ramirez, 2003).

Differing cultural backgrounds result in differing access to and use of health services. Puerto Rican and Cuban women are more likely to have health insurance than other Hispanic subgroups, while Mexican women were least likely to report a usual source of care in the same sample (Freeman, Lethbridge-Cejku, 2006). Cultural norms and standards within the Hispanic community, such as machismo, fatalism, passive approach to health and familiasm (a broader

Defining Hispanic: In general, the term Hispanic applies to persons who trace their ancestry to Spanish-speaking countries and regions, including Spain, Mexico, Central America, South America, and the Caribbean, including the US Territory of Puerto Rico. In the original analyses presented in this report, Hispanic individuals are persons who reported that they consider themselves to be Hispanic, regardless of their race. Sub-analyses are provided for the most common areas of origin, including Puerto Rico, Cuba, Mexico and other Spanish-speaking areas including, but not limited to Spain, Central and South America.

family structure that includes persons lacking genetic relations, as opposed to a traditional nuclear family structure) can affect use of preventive services (Puschel, Thompson, Coronado, Lopez, Kimball, 2001; Otero-Sabogal, Stewart, Sabogal, Brown, Perez-Stable, 2003). A study of 1-year postbirth visits in Mexican women found that cultural norms about family size decreased interest in family planning efforts and adherence with visits (Jones, Cason, Bond, 2002). Palmer and colleagues (2000) reported that ethno-regional differences among Hispanic women accounted for significant differences in adherence to regularly scheduled breast cancer screenings. In a low-income New York population, motivations for avoiding necessary screening differed: Mexican women were more likely to avoid regular breast cancer screenings due to shame and embarrassment while Dominican women cited fear more often (Garbers, Jessop, Foti, Uribelarrea, Chiasson, 2003).

Geographic diversity also mediates preventive service use among Hispanic subgroups. In rural areas, low acculturated Hispanic women were more likely to report personal barriers to screening exams than highly acculturated Hispanics and whites (Coronado, Thompson, Loepsell, McLerran, 2004). Other studies using 2000 NHIS data found that poor, less educated women and recent immigrants were less likely to undergo cancer screenings (Coughlin, Uhler, Bobo, Caplan, 2004; Asamoa, Rodriguez, Gines, Varela, Dominguez, Mills, et al, 2004).

Linguistic diversity also characterizes Hispanics, as individuals range from recent immigrants with limited fluency in English to persons whose families have lived in the United States for generations. Acculturation to the United States, measured by fluency in English, is beginning to receive attention as a moderator of health care use (Glover, Moore, Probst, Samuels, 2004; Weinick, Kraus 2000). In fact, some suggest acculturation is the most significant barrier to preventive services utilization by Hispanics (Bernstein, Mutschler, Bernstein, 2000).

In general, Hispanics were less likely than the white population to be screened for blood cholesterol or for breast, cervical, and colorectal cancers or to receive pneumococcal or influenza vaccination in the preceding year (CDC, 2004). Suggestions for these differences have been linked to lack of information about the preventive service, perceived low risk for cancer and provider perceptions about adherence in certain minority populations (Ramirez, Talavera, Villarreal, McAlister, Trapido, Perez-Stable, et al, 2000; Puschel, Thompson, Coronado, Lopez, Kimball, 2001). Research suggests that financial barriers and access to care impediments, such as low-income employment and lack of health insurance, have stronger effects on preventive services adherence (Davidson, Bastani, Nakazono, Carreon, 2005; Rodriguez, Ward, Perez-Stable, 2005). Various factors such as age, ethnic identity, socioeconomic and sociodemographic differences, educational attainment levels, linguistic ability and acculturation status mediate the ways in which Latino subgroups use preventive services (Sheinfeld Gorin, 2005). Little is known about the use of preventive services among Hispanics residing in rural areas and how this may differ by national origin.

Study Purpose

The present study explores the use of preventive health services among Mexicans, Puerto-Ricans, Cubans and "other" Latinos (persons from all other Spanish-speaking countries such as Spain, Central and South America). We further explore how preventive services use is affected by place of residence (rural versus urban) and acculturation. Findings from this study will help program planners and local officials tailor appropriate outreach and educational programs to promote the use of preventive health services by Hispanics.

Study methods and analysis are detailed in Appendix A. "Rural" in the present report refers to persons living in a non-metropolitan county, while "urban" refers to persons residing

within a metropolitan statistical area. For race/ethnicity, the term White refers to persons of non-Hispanic origin. The term Mexican is used to refer to persons of both Mexican and Mexican-American descent. Since there is a lack of consensus in the literature as to the most appropriate term, Hispanic and Latino are used interchangeably in this report.

Preventive Services Guidelines

Different recommendations have been issued regarding appropriate schedules for preventive services among adults. The principle source for preventive services guidelines in the U.S. is *The Guide to Clinical Preventive Services*, updated annually by the U.S. Preventive Services Task Force (USPSTF), coordinated by the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services (USPSTF, 2006). The Task Force annually reviews the strength of evidence that specific preventive services can detect and/or prevent illness, and makes graded recommendations on that basis. For example, the USPSTF recommends that all women over age 40 receive a mammogram every 1 to 2 years to screen for breast cancer, based on "fair" evidence that the benefits of this procedure outweigh its harms. However, it rules against routine genetic screening for all women, in the absence of a family history of breast cancer.

Services Studied

Women:
- Pap Test
- Clinical Breast Exam
- Mammogram

Men:
- PSA (prostate) test

All:
- Flu shots
- Pneumonia vaccination

The American Cancer Society (ACS) also has established screening guidelines for breast cancer, colon and rectal cancer, cervical cancer and prostate cancer. The ACS guidelines are generally more conservative than those published by the USPSTF. For example, the ACS suggests cervical cancer screenings for women within three years of first vaginal intercourse or no later than 21 years of age, whichever comes first, and to continue annually with a traditional Pap test or bi-annually with a liquid-based Pap test. In contrast, the USPSTF recommends

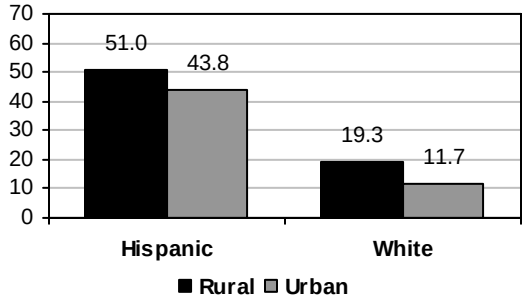
screenings every three years. Differences between the USPSTF and ACS recommendations for the specific tests used in the study are detailed in the Methods section (Appendix A). We have used the more conservative recommendations of the ACS with regard to cancer screening services while using the USPSTF recommendations for influenza and pneumococcal vaccinations.

Chapter Two: Results

Description of the Hispanic Population

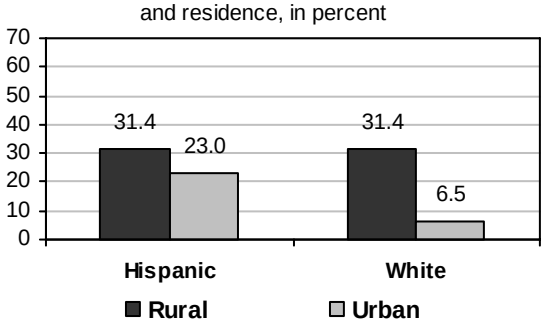
The Hispanic and White adults reached by the 1998-2000 National Health Interview Surveys were largely urban, with approximately 22% living in rural counties (Appendix B, Table 1). However, the Hispanic population was particularly concentrated in urban areas. While 24% of the Whites lived in rural areas, the Hispanic population ranges from 2% rural (Puerto Ricans) to 11% rural (Mexican).

Figure 1. Persons lacking a high school diploma, by race/ethnicity and residence, in percent



The Hispanic adult population is younger than the White population, in both rural and urban areas (Appendix B, Table 2). In rural areas, 46% of Hispanics were aged 34 or younger, versus 29% of whites. Over 30% of the Hispanic rural population lives under 100% of the federal poverty level while 23% of urban Hispanics live under this threshold. This pattern also holds for Whites (Figure 2). Rural residents and minorities were less likely than urban residents or whites to have completed high school. Rural Hispanics were the most disadvantaged population studied (Figure 3).

Figure 2.
Persons living in poverty
(<100% FPL) by race/ethnicity
and residence, in percent



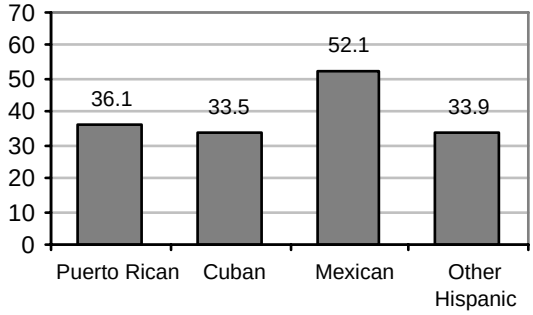
We merged data from the National Health Interview Survey (NHIS) from 1998, 1999 and 2000. The NHIS was used because it documents nation of origin for Hispanic populations. The 1998 – 2000 period was used because preventive service use was addressed in the survey and a variable for rural versus urban residence was available in the public use data set. Hispanic subgroups are compared to Whites.

Hispanic Subgroups

With the exception of Cubans, Hispanics were generally a younger population than Whites. The Mexican group had the highest proportion of adults aged less than 45 (72%), followed closely by persons of "Other" Hispanic origins (68.7%). In contrast, only 51% of whites were younger than age 45. Differences between Hispanics with Cuban and Puerto Rican origins and those from other backgrounds make measuring acculturation effects interesting. While more than half of Hispanic respondents of each national origin were born outside the U.S., this proportion is markedly higher among Cubans (80.2%) than among other Hispanics. On the other hand, three quarters of Cuban respondents to the NHIS (74.1%), along with a similar proportion of Puerto Ricans (75.6%), have lived in the U.S. for 15 years or more, while less than half of other Hispanics have done so. Despite having lived longer in the U.S., Cuban respondents were also more likely than other Hispanic groups to respond to the NHIS in Spanish (66.7%).

Among Hispanics, Cubans and "other Hispanics", have the lowest proportion of persons who have not completed high school. Over half of the Mexican respondents have less than a high school education (Figure 3). Although a large proportion of Mexicans are employed (67%), Mexicans were the poorest of all the ethnicity groups analyzed (Figure 4), possibly as a result of their relative youth and the higher prevalence of low-education persons in

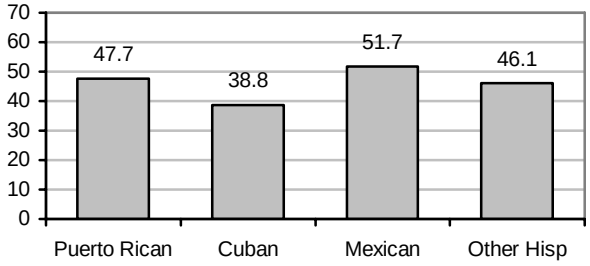
Figure 3. Hispanics with less than high school education, by national origin, in percent



the Mexican population. Other demographic characteristics of the Hispanic populations studied are provided in Appendix B, Table 1.

Acculturation

Figure 4. Hispanics below 200% FPL, by National Origin, in percent



We measured acculturation by the number of years the foreign-born respondent had lived in the U.S. and language of interview. For the study, two acculturation categories were used: low (people who used any Spanish during the interview OR people who had been in the U.S. for less than 10 years) and high (people who answered the interview in English AND those who have been in the U.S. for 10 years or longer). This definition parallels earlier research using the NHIS (Abraido-Lanza, Chao, Gammon, 2004; Abraido-Lanza, Chao, Gates, 2005).

The majority of Cubans (80%) and "other Hispanics" (66%) and about 53% of Puerto Ricans and 55% of Mexicans were born outside the U.S., potentially indicative of low acculturation. On the other hand, approximately three quarters of foreign-born Cuban and Puerto Rican respondents had lived in the U.S. for 15 years or more, versus less than half of foreign-born Mexicans or Hispanics from other countries (Appendix B, Table 1). More than 80% of Puerto Ricans, 33% of Cubans and 64% of "other Hispanics" answered the interview in English as compared to only 57% of Mexicans (Table 1).

As was expected given previous findings, the white respondents were virtually all highly acculturated (99.9%) (Table 1). Among the high-acculturation Hispanic respondents, Puerto-Ricans were the most acculturated (95.2%) followed by other Hispanics (82.4%) (Table 1).

Cubans had the highest proportion of low-acculturation respondents (37%) followed by Mexicans (20%) (Table 1). Rural and urban Hispanics reported similar levels of acculturation with 83% and 82%, respectively, highly acculturated (Table 2).

Health Status, Insurance, and Usual Place of Care

More than 80% of all persons across the ethnic subgroups studied reported having excellent to good health. Fair to poor self reported health status was most prevalent among Puerto Rican (19%) respondents and was least prevalent among whites (11%; Appendix B, Table 3). Whites had the highest prevalence of limitations in activities of daily living among the groups studied (32%) followed by Puerto Ricans (30%).

Hispanics were more likely to lack health insurance coverage than were Whites. Among Hispanics, Mexicans were most likely to lack health insurance (42%) followed by persons of other Hispanic heritage (34%; Table 3). Grouping populations by residence, rural Hispanics were most likely to lack health insurance (41%) followed by urban Hispanics (35%). Hispanics of Mexican heritage were most likely to lack a usual source of care (33%) followed by "other" Hispanics (25%). As a group, Hispanics living in both rural and urban areas were more likely to lack a usual source of care than whites (32% rural, 28% urban, respectively; Table 3).

Preventive Health Services Use

We examined the use of six preventive health services across Hispanic and White populations: Pap smear, physical breast exam, mammogram, PSA, and flu and pneumonia vaccinations. In the section below, we begin by presenting the proportion of persons within each group who received the indicated service. To examine differences in receipt of preventive services that might be attributable to cultural influences rather than demographic characteristics, we conducted two multivariate analyses. First, we grouped all Hispanics and compared them to

whites and modeled the predictors of preventive services use holding demographic characteristics equal. Next we looked within the Hispanic population to examine differences based on national origin again holding all demographic characteristics equal.

Cervical Cancer Screenings – Pap Smear Exams

More than half of the women in the total sample who were over 21 reported receiving a Pap test for cervical cancer within the past year with significant differences by ethnicity and residence (Appendix B, Table 4). The proportion of women lacking a Pap test ranged from 47% among Cuban women to 37% among other Hispanic women. Rural women of all ethnicities were less likely to report a Pap smear than urban women (Table 4).

In adjusted analysis, Hispanic women were significantly *more* likely to meet the ACS guidelines for Pap screening than were White women, [adjusted odds ratio [AOR] =1.19; 95% confidence interval [CI] 1.08, 1.32] (Appendix B, Table 5). Within the Hispanic population alone, there were no significant differences associated with country of origin. Residence did not affect receipt of a Pap test either among White/Hispanic women when examined together or among Hispanic women alone.

Age, income, education, marital status, family size, insurance status and usual source of care were all significant predictors of the likelihood of meeting ACS Pap screening guidelines. Women lacking health insurance were less likely to meet Pap guidelines [AOR =0.54; 95% CI 0.49, 0.60] both in the Hispanic/White population model and in the Hispanic only model [AOR=0.6 0; 95% CI 0.49, 0.73] (Table 5).

Breast Cancer Screenings – Clinical Breast Exams and Mammograms

The majority of both Hispanic and White women reported receiving a clinical breast exam (CBE) within an age-appropriate interval as defined by the ACS. Fewer than one third of

all groups of women across ethnicity and geographic location failed to receive a clinical breast exam (Table 4). Within the Hispanic population, persons of "other" national origin were least likely to report not receiving such an exam (23%), while Cubans were most likely to have missed it (31%). Rural Hispanics (32%) were more likely to report no clinical breast exam than were urban Hispanic women; however, this difference was not significant (27%; Table 4).

ACS guidelines for CBE:
- Age 20-39 within 3 years
- Age 40 or older within one year

In adjusted analysis, Hispanic women did not differ from White women in the probability that they would receive age-appropriate CBE. Similarly women of other national origins did not differ from Mexican women, and acculturation was also not a significant predictor. Rural versus urban residence was also not a factor predicting receipt of CBE, other factors held equal (Appendix B, Table 6).

Age, education, income, marital status, family size, geographic region, insurance status and usual source of care were all significant predictors of receipt of age-appropriate CBE (Table 6). Women over the age of 40 were significantly less likely to report age-appropriate CBE, in both models (Table 6). Lack of insurance and lack of usual source of care both significantly reduced the odds that women would receive appropriate CBE (Table 6).

More than two of every five women failed to report age-appropriate mammograms (Table 4). Examining ethnicity without considering residence, Mexican women had the highest percentage of respondents who failed to receive the preventive service (47.6%) and white women the lowest (41.1%). White rural women were less likely to receive a mammogram than white urban women (42.9% versus 40.6%). Rural-urban differences among Hispanic women, while similar in direction, did not reach statistical significance (Table 4).

Age, ethnicity, education, income, marital status, family size, acculturation, insurance status, usual source of care and low perceived health status were all significantly associated with reported receipt of a mammogram (Table 7). Within Hispanic women, Cuban women were less likely to receive appropriate mammogram services [AOR=0.45; 95% CI 0.20, 0.99], while low acculturation women were more likely to receive the service [AOR=1.97; 95% CI 1.02, 3.80]. Women under 50, low-income, uninsured with no usual source of care, and low perceived health status were less likely to receive appropriate mammograms (Table 7).

Prostate Cancer Screenings –PSA

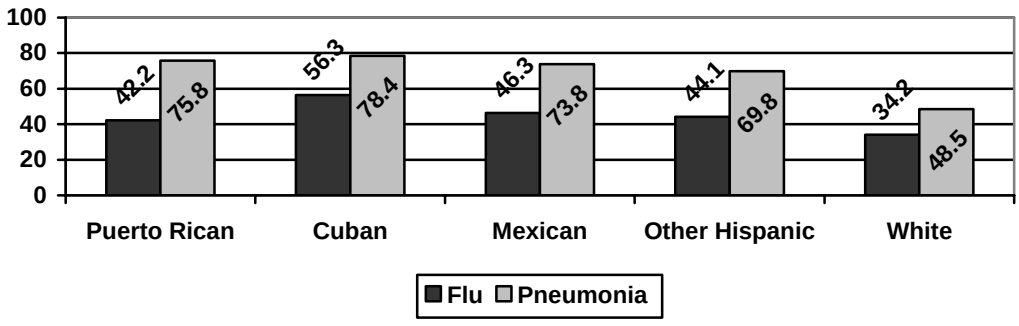
Among Hispanic men, prevalence of age-appropriate receipt of a PSA test ranged from 49.4% among Cubans to 64% among Mexicans, but differences were not statistically significant (Table 4). A slightly higher proportion of urban versus rural men failed to receive PSA screening (59.1% versus 57.7%; Table 4).

Adjusted analysis found that age, education, marital status, geographic region and usual source of care were significant predictors of adherence to the ACS guidelines for PSA testing (Table 8). Rural versus urban residence did not affect reported PSA screening. Unmarried men, in the total population and within Hispanics only, were less likely to receive PSA screenings than married men [AOR=0.79; 95% CI 0.67, 0.94], [AOR=0.44; 95% CI 0.20, 0.95]. Younger men between 50-64 years old were less likely than those aged 65 and older to meet the ACS guidelines for PSA screenings [AOR=0.75; 95% CI 0.63, 0.89]. The lack of a usual source of care was significantly associated with failing to meet PSA screening guidelines [AOR=0.32; 95% CI 0.20, 0.51].

Vaccinations - Flu and Pneumonia

Hispanic elders were markedly more likely than whites over age 65 to fail to receive pneumonia and flu vaccinations (Figure 5; Table 4). While 34.2% whites lacked a flu vaccine within the past year, rates among Hispanic subgroups ranged from 42.2% among Puerto Ricans to 56.3% among Cubans. Similarly, while 48.5% of whites over age 65 had not received a pneumonia vaccination, rates among Hispanics ranged from 69.8% ("Other Hispanics") to 78.4% (Cubans). Rates did not vary by rural versus urban residence

Figure 5. Failure to receive appropriate immunizations by race and ethnicity



In adjusted analysis, Hispanics did not differ from whites in the likelihood of receiving a flu vaccine (Table 9); similarly, rural and urban residents did not differ. Age, education, income level, marital status, family size, health insurance and usual source of care were all significantly associated with meeting the CDC guidelines for flu vaccine (Table 9). Within the Hispanic population there were no differences based on national origin or acculturation status in adjusted analysis. The two significant predictors of receipt of flu vaccine among Hispanic elders were number of persons in the family, with persons living in families of 4 or more less likely to be immunized than those in smaller families [AOR 0.54, CI 0.31, 0.88], and lack of a usual source of care [AOR 0.17, CI 0.07, 0.38].

In adjusted analysis, Hispanic older adults were less likely than whites to report having received a pneumonic vaccination [AOR 0.47, 95% CI 0.39, 0.56]; rural versus urban residence did not affect receipt. Women were more likely to have a pneumonia vaccination [AOR=1.11; 95% CI 1.02, 1.20]. Persons lacking a usual source of care were less likely to obtain the pneumococcal vaccination [AOR=0.31; 95% CI 0.25, 0.38]. Other significant predictors of pneumococcal vaccination included age, education, income and marital status (Table 10). Within responding Hispanics, residence, national origin and level of acculturation were not associated with receipt of vaccination. Only two factors were significantly associated with pneumonia vaccination: Hispanics aged 65-70 were less likely than those older than 70 to have been vaccinated, and persons lacking a usual source of care were less likely than persons with a source of care to have been vaccinated.

Chapter Three: Conclusions and Implications

We explored the use of preventive health services among Mexicans, Puerto-Ricans, Cubans, and "other" Latinos and examined how the use of preventive services was influenced by nation of origin and rural versus urban residence. Key findings are discussed below.

Nation of Origin

Using information from three years of the National Health Interview Survey (1998 – 2000), we were able to group Hispanics into four categories based on nation of origin: Puerto Rican, Cuban, Mexican and "other". Nation of origin; however, was not associated with differences in the likelihood of received preventive services either in bivariate or in adjusted analysis. While cultural differences are known to exist between and among nationalities, such differences may not directly influence receipt of the six preventive services examined in the present research.

Acculturation was examined among foreign-born respondents. Persons responding to the survey in Spanish or persons living in the U.S. for less than 10 years were defined as "low" acculturation. This characteristic had no effect on receipt of preventive services.

Residence

The Hispanic population responding to the 1998-2000 National Health Interview Survey was largely urban. Nearly a quarter of whites lived in rural areas during this time frame (24.4%). Only 11.1% of Hispanics of Mexican origin, the most rural of the Hispanic subgroups, lived in rural counties. Among Puerto Ricans, the most urban group, the percentage dropped to 2.4%. Because so few Hispanics within each nation of origin lived in rural counties, we were unable to estimate rural-urban differences within each nationality. Within Hispanics in total, rural residence was associated with increased likelihood that a respondent would fail to receive a Pap

test (48.1% rural, 40.4% urban, $p < 0.01$) in unadjusted analysis. When factors such as education, income and health insurance were held constant, rural-urban differences among Hispanic women were no longer significant. There were no significant residence-based differences in the adjusted or unadjusted likelihood that an Hispanic respondent would report receiving other types of preventive service.

Within the White population, a greater proportion of rural versus urban residents failed to receive four of the studied preventive services. Thus, rural residents were less likely than urban residents to receive Pap tests (42.4% versus 37.6%, $p < 0.001$), clinical breast examination (28.5% versus 28.1%, $p < 0.001$), mammogram (42.9% versus 40.6%, $p < 0.05$), and PSA tests (54.0 verses 52.3%, $p < 0.001$). There were no prevalence differences within Whites for receipt of flu or pneumonia vaccinations. However, in multivariable analyses that held characteristics of rural and urban respondents constant, there were no rural effects for any of the services studied. The difference between the unadjusted rates for service receipt and the multivariate analysis suggests that it is the characteristics of rural residents, rather than location alone, that contribute to residence-based disparities in the receipt of preventive services.

Differences between Hispanics and Whites

Differences between Hispanics and Whites appear to stem principally from differences in education, income, health insurance and ability to identify a usual source of care. Hispanics, in both urban and rural areas, were more likely to fail to receive mammograms, flu shots and pneumonia vaccination; in urban areas, Hispanics were also less likely to report receiving Pap tests (Table 4). When personal characteristics were held constant there were no differences between Hispanics and Whites in receipt of any of the services studied. The single exception was Hispanic women were more likely, all things held equal, to report age-appropriate Pap screening.

Findings from multivariate analysis suggest that it is the lack of enabling factors such as education and health insurance, rather than distinctive cultural factors, that contribute to lower receipt of needed services among Hispanics.

Overall Service Levels

Large proportions of respondents failed to receive age-appropriate preventive services, falling short of Healthy People 2010 objectives. For example, Healthy People 2010 calls for 90% of women to receive age-appropriate Pap tests or for a 10% "failure" rate. We found that 38.8% of white women and between 37.3% and 47.0% of Hispanic women reported not having received this service. While the Healthy People target calls for only 30% of women to fail to receive mammograms, we found that 41.1% of white women and between 42.8% and 47.6% of Hispanic women lacked these tests. As noted, there were residence-based disparities in receipt of many services. From a public health perspective, there is room for improvement in the delivery of preventive services, with ethnicity- and residence-based disparities that should be addressed.

Implications

Study findings suggest that enabling factors, such as health insurance or usual source of care, had a greater effect on preventive services use than Hispanic ethnicity or, within Hispanics, national origin. These results support the findings of previous acculturation studies among Hispanics (Zambrana, 1999). Nation of origin was only significant in one of the eight models in the analysis: Cuban women in the mammogram model. Similarly, differences in rates of preventive services use between Hispanic and White populations became insignificant when the demographic, enabling and need characteristics of the groups were held equal in multivariate analysis.

Increasing access to health care

Lack of health insurance and a usual source of care were the most consistent barriers to preventive services use across ethnic subgroups and geographic locations. Both of these barriers are more prevalent among Hispanic than White populations, and among rural than urban residents. The extension of Medicaid and SCHIP coverage may be a viable method to increase access to the health care system among Hispanics who meet program eligibility requirements. Hispanics were typically poorer than whites, and many may meet the eligibility requirements for public health insurance. However, language issues might serve as a barrier to enrolling all eligible beneficiaries. Further research is needed to explore the link between English language fluency and participation in public insurance and to ascertain the effectiveness of bilingual materials, tools and personnel to encourage enrollment.

Linguistic isolation might also serve as a barrier to preventive services use. Hispanics reported lower levels of English responses to the survey than other groups in the sample. Certain Hispanic subgroups, such as Cubans, had very high levels of non-English response to the NHIS survey. While, as noted, more research is needed, rural health care administrators should be aware of the Hispanic subgroup population in their areas and take appropriate steps to facilitate access to the health care system for these groups. This would potentially increase patient safety and customer satisfaction among low English proficiency groups. These efforts would also increase compliance with federal CLAS guidelines and JCAHO accreditation recommendations.

Provider behavior is another avenue to increase access to the health care system and to improve preventive services use especially for rural Hispanics. Providers should be aware of the diversity of the Hispanic community in their areas to be better able to address specific health issues. Culturally competent provider behavior can also improve patient satisfaction with health

care encounters and encourage future use of the health care system. Efforts to increase the cultural competency of rural providers can be accomplished through collaborations with non-profit organizations.

Healthy People 2010 ToolKit

The Healthy People 2010 Toolkit is an excellent resource for rural health stakeholders who need to increase capacity and reduce some of the disparities found in this study (Healthy People 2010). The Toolkit reduces the burden on the provider or the organization to plan, design and implement an intervention with limited resources. Small rural providers or organizations with limited resources could use the Toolkit with modifications. The modifications could tailor the interventions to specific populations in an effort to work towards the Healthy People 2010 objective to reduce the cancer death rate.

Limitations to the Study

While the aggregated NHIS datasets yielded a reasonable sample of Hispanics in total, the relatively small sample sizes of certain Hispanic subgroups are a limitation in the study. For example, there were less than 1,000 Cuban respondents. Efforts to increase the inclusion of sufficient numbers of Hispanic respondents would be helpful in future acculturation subgroup analysis. Further, the use of ACS preventive services recommendations to delineate appropriate use of cancer-related screening services may be a limitation. The ACS recommendations are more conservative, specifying younger and more frequent testing, than the USPSTF recommendations. The use of ACS preventive services recommendations would lead our research to find higher rates of non-compliance than a study using the USPSTF targets.

Future Research

Further research is needed into factors leading Hispanic populations to lack health insurance and/or a usual source of care, key predictors of lack of preventive services. When these barriers are overcome, Hispanics do not fare less well than whites. For example, the National Breast and Cervical Cancer Early Detection Program, funded by Centers for Disease Control and Prevention, is estimated to provide screening services for about 15% of eligible low income women. A higher proportion of eligible Hispanic women actually receive such screening than do non-Hispanic Whites (16% versus 11%; Tangka, Dalaker, Chattopadhyay, et al, 2006). However, such programs lack the funds to serve all women in need. Further, cancers affecting men (prostate or testicular cancer) or the population as a whole (colorectal cancer) are not included. Work with communities may enable planners to pool local resources to contribute to cancer prevention efforts, particularly among uninsured or under-insured populations, whose ultimate cancer care will affect local health care institutions.

In addition, community based research is needed to assess barriers to health insurance or identification of a usual source of care among Hispanics. Lack of insight into the nature of the U.S. healthcare system may be a barrier for low-English fluency persons. For example new immigrants may underestimate the importance of insurance, be unable to identify low cost providers such as community health centers or may be deterred from seeking care or advice due to language barriers. Targeted educational interventions directed at Hispanic populations may be effective in some communities. In a complementary fashion, efforts to inform providers of the importance of culturally and linguistically appropriate services and to provide them with language tools may reduce perceived barriers and lead individuals to select a usual source of care. Efforts directed at both potential patients and potential providers are needed.

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APPENDICES

Appendix A: Methods

Data Source and Sample

We used data from the National Health Interview Survey (NHIS), years 1998, 1999, and 2000. The NHIS is conducted annually by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). The NHIS administers face-to-face interviews in a nationally representative sample of households (CDC, 2006). Each week a probability representative sample of the civilian non-institutionalized population of the United States is interviewed by personnel of the U.S. Bureau of the Census. The NHIS is the principal source of information on the health of the civilian non-institutionalized population of the United States. Starting in 1995, the NHIS oversamples Hispanics.

Information about preventive services is contained in the sample adult files for 1999 and 2000 and in the prevention adult file in 1998. Information regarding respondent demographics, other health issues and acculturation came from the family, sample adult, and person files. In addition we used the imputed income data files for each year. Due to missing data on family income and personal earnings in the NHIS, multiple imputations of those data have been performed in surveys starting in 1997 (Schenker, Raghunathan, Chiu, Makuc, Zhang, Cohen, 2005).

The three years combined contain complete ethnicity information for 79,287 persons; 8,799 Mexicans, 1,659 Puerto Ricans, 947 Cubans, 4,151 “other” Hispanics, and 63,731 Whites.

Definitions of Measures Used

Preventive Services Recommendations and Measures

We used recommendations from the US Preventive Services Task Force (USPSTF) to define age-appropriate preventive vaccinations (flu and pneumonia), and American Cancer Society (ACS) guidelines for age-appropriate cancer screening. The ACS guidelines generally call for more frequent screening than those of the USPSTF.

Table A-1. Comparison of ACS and USPSTF preventive cancer screening recommendations

	USPSTF	**ACS**
Breast Cancer		
Mammogram	Recommends screening mammography, with or without clinical breast examination (CBE), every 1-2 years for women aged 40 or older. *Recommendation: B*	Recommends annual mammograms beginning at age 40 and every 3 years for younger women
Clinical Breast Exams	Insufficient evidence to recommend for or against routine CBE alone to screen for breast cancer. *Recommendation: I*	Recommends annually beginning at age 40 and every 3 years for younger women
Cervical Cancer		
Pap Smears	Strongly recommends screening for cervical cancer in women who have been sexually active and have a cervix. *Recommendation: A* Recommends against routine screening for women older than age 65 if they have had adequate recent screening with normal Pap smears and are not at high risk. *Recommendation: D* Recommends against routine Pap smear screening in women who have had a total hysterectomy for benign disease. *Recommendation: D*	Recommends screening beginning within three years of first vaginal intercourse or no later than 21 years of age, to be done annually (conventional Pap tests) or every two years (liquid-based Pap test). At or after age 30, screening can be reduced to every 2-3 years for women with no abnormal findings. Women age 70 or more and women who have had a hysterectomy may stop screening.
HPV DNA test	Not approved for primary cervical cancer screening by the FDA and its role in screening remains uncertain	Not included in the recommendations for the early detection of cancer ACS guidelines.
HPV Vaccine	Insufficient evidence to recommend for or against the routine use of human papillomavirus (HPV) testing as a primary screening test for cervical cancer. *Recommendation: I*	Routine vaccination recommended for girls 11-12 years old, catch up vaccination recommended for females 13-18 years old, and insufficient evidence to recommend universal vaccination for women 19-26 years old. HPV vaccination not recommended for women over the age of 26.

Prostate Cancer		
PSA blood test	Insufficient evidence to recommend for or against routine screening for prostate cancer using prostate specific antigen (PSA) testing. *Recommendation: I*	Annual screening beginning at age 50
Digital rectal exams (DRE)	Insufficient evidence to recommend for or against routine screening for prostate cancer using digital rectal examination (DRE). *Recommendation: I*	Annual screening beginning at age 50

The following measures of age-appropriate cancer screening services were created:

1. **Pap Smear**. This variable uses the question "When did you have your most recent pap smear?" We created two categories: 1) Meets the ACS guidelines: women ages 21 and older who reported having their last pap smear within one year; 2) Does not meet guidelines: women ages 21 and older who reported having their last pap smear more than one year ago.
2. **Breast Physical Exam**. Two categories were created using the answers to the question "When did you have your most recent breast physical exam?" Categories: 1) Meets the ACS guidelines: women ages 40 or older who reported having their last breast physical exam a year ago or less, or women 20-39 years whose most recent breast physical exam was 3 years ago or less; and 2) Does not meet the guidelines: women 40 or older who reported having their last breast physical exam more than a year ago, or women 20-39 years whose most recent breast physical exam was more than 3 years ago.
3. **Mammogram**. This variable uses the question "When did you have your most recent mammogram?" We created two categories: 1) Meets the ACS guidelines: women ages 40 or older who reported having their last mammogram a year ago or less; and 2) Does not meet the guidelines: women 40 or older who reported having their last mammogram more than a year ago.

4. **Prostate Specific Antigen (PSA) Test**. Two categories were created using the answers to the question "When did you have your most recent PSA test?" This question was included only in the years 1999 and 2000. Categories: 1) Meets the ACS guidelines: men ages 50 or older who reported having their last PSA test a year ago or less; and 2) Does not meet the guidelines: men 50 or older who reported having their last PSA test more than a year ago.

The final two measures of preventive services use were created using the CDC Flu Shot and Pneumococcal Immunization Recommendations (CDC, 2006). Both measures apply only to persons age 65 or above:

5. **Flu Shots**. This variable uses the question "During the PAST 12 MONTHS, have you had a flu shot?" We created two categories: 1) Meets the CDC guidelines: persons ages 65 or older who reported having their last flu shot a year ago or less; and 2) Does not meet the guidelines: persons 65 or older who reported having their last flu shot more than a year ago.
6. **Pneumonia Vaccination**. Two categories were created using the answers to the question: "Have you EVER had a pneumonia vaccination?" Categories: 1) Meets the CDC guidelines: persons ages 65 or older who reported having ever had a pneumonia vaccination; and 2) Does not meet the guidelines: persons 65 or older who reported not having a pneumonia vaccination in their lifetime.

Residence, Ethnicity and acculturation

Residence is based on the NHIS variable which distinguishes between residents of metropolitan and non-metropolitan counties. Non-metropolitan residents are classified as rural with the remainder urban. The study was limited to Hispanic and White respondents. "Hispanic" includes all persons reporting Hispanic ethnicity, regardless of race. "White" is limited to non-Hispanic White. Country of origin, for Hispanic respondents, was based on response to the question: "Give the group that represents your Hispanic origin or ancestry". Several variables were studied as measures of acculturation:

1. **Language** was dichotomized based on responses to the question: "In which language was the interview conducted?" Categories: 1) Spanish: included use of Spanish or English and Spanish during the interview; and 2) English if person answered the interview in English.
2. **Nativity**. Two categories were created using the responses to the question "Was - - born in the U.S.? (exclude U.S. territories)". Categories: 1) U.S. born: includes persons born in the 50 U.S. states and the District of Columbia; and 2) Born outside of U.S.: includes foreign-born persons and those born in Puerto Rico, Guam and other outlying territories of the U.S..
3. **Years in the U.S.**. This variable uses the answers to the question "Years that -- has been in the U.S." and applies only to foreign-born respondents. Categories: 1) Less than 1 year; 2) 1 to less than 5 years; 3) 5 to less than 10 years; 4) 10 to less than 15 years; and 5) 15 years or more.
4. **Acculturation**. We created two categories for foreign-born Hispanics: 1) Low acculturation: includes people who used any Spanish during the interview or people who

had been in the U.S. for less than 10 years; and 2) High acculturation: includes persons who answered the interview in English and those who have been in the U.S. for 10 years or longer. An acculturation measure formed using these two variables was used in an earlier analysis of preventive services using the 1991 NHIS (Abraido-Lanza, Chao, Gammon, 2004; Abraido-Lanza, Chao, Gates, 2005).

Independent Variables – Control Factors

Demographic and Socioeconomic Characteristics

1. **Age in years**. Categories: 18-24; 25-34; 35-44; 45-54; 55-64; and 65 and older.
2. **Sex**. Categories: Male and Female.
3. **Education**. Categories: Less than high school and high school or more.
4. **Employment status**. Categories: Employed and unemployed.
5. **Poverty level**. Categories: Less than 100% of the Federal Poverty Level (FPL); 100-199%; 200-399%; and 400% and more.
6. **Marital status**. Categories: Single and Married.
7. **Family size**. Categories: 1-3 and 4 or more.
8. **Geographic Region**. Categories: Northeast, South, West, Midwest.

Health Status and Insurance

9. **Perceived health status**. Two categories were created using the answer to the question: "Would you say {person's} health in general is excellent, very good, good, fair or poor?". Categories: 1) Excellent, very good, or good and 2) fair or poor.
10. **Health Insurance**. This variable uses the answers to the question: "What kind of health insurance or health care coverage does - - have? INCLUDE those that pay for only one type of service (nursing home care, accidents, or dental care), exclude private plans that

only provide extra cash while hospitalized". Categories: 1) Yes: includes persons who reported having private health insurance (from employer or work, purchased directly, through government), Medicare, Medi-Gap, Medicaid, military health care/VA, CHAMPUS, TRICARE, or CHAMP-VA, Indian Health Services, State-sponsored health plans, other government programs, or single service plans and 2) No: Persons who reported not having any kind of health insurance.

11. **Functional Limitations**. This variable was constructed using variables about functional limitations in daily life: walk, climb, stand, sit, stoop, reach, grasp, carry, push, difficulty in going out or social activities, and the ability to complete leisure activities without assistance. Respondents either reported no difficulty at all or one of the five gradients of difficulty. All of the source variables were recoded as a functional limitation variable for all conditions with two categories: (1) Limited in any way or (2) Not limited in any way.

Analysis

The analysis for this cross-sectional study assesses use of preventive services by the key independent variables of ethnicity and residence. Where appropriate, the ethnicity groups used were: Mexicans, Puerto Ricans, Cubans, other Hispanics, and Whites. All analyses were performed using SAS callable SUDAAN® (Research Triangle Park, North Carolina), to take into account the complex sampling design of the NHIS. All cross tabulations and multiple logistic regression modeling used the multiple imputation files each time. The multiple logistic regression analyses allowed us to calculate odds ratios (OR) and 95% confidence intervals.

Appendix B: Tables

Table 1. Selected demographic characteristics, by Hispanic origin subgroup: NHIS 1998-2000, in percent

	Puerto Rican	Cuban	Mexican	Other Hispanic	White
Unweighted observations	1,659	947	8,799	4,151	63,731
Place of residence* **					
Rural	2.4	*2.9*[#]	11.1	9.1	24.4
Urban	97.6	97.1	88.9	90.9	75.6
Sex* **					
Female	55.1	50.1	48.6	51.6	51.9
Acculturation					
*Interview language****					
Not in English	18.2	66.7	43.0	36.0	0.1
*Nativity****					
Born outside of US	52.7	80.2	55.5	66.1	4.5
*Years in the US****					
Less than 1	*0.8*[#]	*1.0*[#]	2.7	1.3	1.8
1 to less than 5	7.0	7.7	16.6	13.5	13.0
5 to less than 10	7.7	12.6	19.1	18.6	10.3
10 to less than 15	8.9	4.6	18.6	20.4	8.8
15 or more	75.6	74.1	43.1	46.2	66.1
Acculturation Variable[†]***					
Low	4.8	37.0	19.6	17.6	0.1
High	95.2	63.0	80.4	82.4	99.9
Age (Years)* **					
18-24	16.0	10.1	21.7	16.7	11.5
25-34	21.6	16.2	28.0	26.2	17.4
35-44	23.9	21.6	22.3	25.7	21.9
45-54	18.6	14.3	13.2	15.2	18.5
55-64	10.3	12.9	7.3	8.4	12.4
65 and older	9.7	24.9	7.5	7.8	18.3
Marital status* **					
Married	50.0	61.9	60.6	56.2	62.2
Not Married (Single, Widowed, Divorced)	50.1	38.1	39.4	43.8	37.8
Family Size **					
1-3	63.2	65.3	43.3	54.6	73.4
4 or more	36.8	34.7	56.7	45.4	26.6
Geographic region* **					
Northeast	61.4	13.9	2.1	27.6	20.3
South	22.3	78.0	34.5	32.9	33.8
West	6.6	6.7	53.9	34.2	16.5
Midwest	9.6	*1.4*[#]	9.5	5.4	29.3

[#] Unstable Estimate (<30 observations)

[†] Acculturation level determined by interview language and years in the US for foreign-born Hispanics.

* p-values <=.05
** p-values <=.01
*** p-values <=.001

Table 2. Selected demographic characteristics, by residence and ethnicity: NHIS 1998-2000, in percent

	Rural		Urban	
	Hispanic	White	Hispanic	White
Unweighted observations	1,642	15,306	13,914	48,425
Sex [b,f]				
Female	47.2	52.2	50.5	51.7
Age (years) [c,f]				
18-24	20.7	12.6	18.9	11.1
25-34	25.5	16.1	26.3	17.8
35-44	21.6	20.5	23.5	22.3
45-54	13.9	17.9	14.4	18.7
55-64	9.8	13.5	8	12
65 and older	8.5	19.4	8.9	18
Acculturation [b,f]				
Interview Language				
Not in English	32.1	*0.0*[#]	40.7	0.3
Years in US [c,f]				
Less than 5	28.3	12.1*	15.0	15.0
5 to less than 10	17.8	7.2*	17.3	10.6
10 to less than 15	12.7	2.3*	17.4	9.4
15 or more	41.2	2.3	50.2	65.1
Nativity [b (Hispanic), c (white), i]				
Born outside of US	61.0	5.5	44.8	1.4
Acculturation variable [b,f]				
Low	16.9	0	18.5	0.2
High	83.1	100.0	81.5	99.8
Education [c,f]				
Less than High School	51.0	19.3	43.8	11.7
Income c,f				
<100% FPL[1,i]	31.4	31.4	23.0	6.5
100-199%	33.3	33.3	27.8	13.3
200-399%	25.4	25.4	29.6	32.2
400% and more	9.9	9.9	19.6	48.0
Marital status [c,f]				
Married	62.0	65.0	58.0	61.2
Not Married (Single, Widowed, Divorced)	38.0	35.0	42.0	38.8
Family Size [c,f]				
1-3	52.4	73.9	49.4	73.2
4 or more	47.6	26.1	50.6	26.8
Geographic region				
Northeast [i (white only)]	*2.0*[#]	11.7	17.2	23.1
South	52.1	39.6	33.6	31.9
West	34.2	11.8	41.6	18.0
Midwest	11.7	36.9	7.6	27.0

[1] FPL – Federal Poverty Level

[#] Unstable Estimate (<30 observations)

[†] Acculturation level determined by interview language and years in the US for foreign-born Hispanics.

Significance levels for ethnicity differences:

Within rural only:
[a] p-values <=.05
[b] p-values <=.01
[c] p-values <=.001

Within urban only:
[d] p-values <=.05
[e] p-values <=.01
[f] p-values <=.001

Significance levels for rural/urban differences:

Within each ethnicity
[g] p-values <=.05
[h] p-values <=.01
[i] p-values <=.001

Table 3. Health status, insurance, and usual source of care, by residence and selected countries of origin: NHIS 1998-2000, in percent

	Characteristics by country of origin and ethnicity				
	Puerto Rican	Cuban	Mexican	Other Hispanic	White
Unweighted observations	1658	947	8797	4147	63663
Fair- poor health status [c]	19.0	17.0	11.9	12.1	10.5
Limitations in Activities of daily living [c]	30.1	21.5	18.8	21.0	32.1
Lack Health insurance [c]	18.2	21.0	41.5	34.2	10.9
Lack usual place of care [c]	14.9	17.0	33.1	24.5	12.4
Lack usual place of preventive health care [c]	4.8	5.6	6.4	8.1	4.9

Significance levels for ethnicity differences:
[c] p-values <=.001

Characteristics by residence and ethnicity				
	Rural		Urban	
	Hispanic	White	Hispanic	White
Unweighted observations	1641	15283	13908	48380
Fair- poor health status [c,f, g (Hispanics)]	17.2	14.1	12.5	9.3
Limitations in Activities of daily living [c,f]	24.9	36.6	20.3	30.7
Lack Health insurance [c,f]	40.8	13.9	35.4	10.0
Lack usual place of care [c,f]	31.9	12.4	27.5	12.4
Lack usual place of preventive health care [a,f]	7.0	4.9	6.6	4.9

Significance levels for ethnicity differences:
Within rural only:
[a] p-values <=.05
[b] p-values <=.01
[c] p-values <=.001

Within urban only:
[d] p-values <=.05
[e] p-values <=.01
[f] p-values <=.001

Significance levels for rural/urban differences:
Within each ethnicity
[g] p-values <=.05
[h] p-values <=.01
[i] p-values <=.001

Table 4. Proportion of persons who fail to receive selected preventive services, by selected countries of origin, ethnicity and residence, NHIS 1998-2000.

Failure to receive services by country of origin and ethnicity					
Failure to receive service:	Puerto Rican	Cuban	Mexican	Other Hispanic	White
Unweighted obs.	*1,658*	*947*	*8,797*	*4,147*	*63,663*
No Pap smear (women) [c]	38.4	47.0	43.0	37.3	38.8
No clinical breast examination (women) [b]	26.0	30.7	27.1	22.4	26.0
No mammogram (women) [b]	45.7	42.8	47.6	43.4	41.1
No PSA Test (men; 1999-2000)	59.1	49.4	63.7	57.4	52.7
No Flu shot [c]	42.2	56.3	46.3	44.1	34.2
No pneumonia vaccination [c]	75.8	78.4	73.8	69.8	48.5

Significance levels for national origin and ethnicity differences:
[a] p-values <=.05
[b] p-values <=.01
[c] p-values <=.001

Failure to receive services by residence and ethnicity				
	Rural		Urban	
	Hispanic	White	Hispanic	White
Unweighted obs.	*1,641*	*15,283*	*13,908*	*48,380*
No Pap smear (women) [e, h (Hisp), i (white)]	48.1	42.4	40.4	37.6
No clinical breast examination (women) [e, i (white)]	31.8	28.5	26.9	28.1
No mammogram (women) [c, e, g (white)]	52.8	42.9	45.1	40.6
No PSA Test (men; 1999-2000) [i (whites)]	57.7	54.0	59.1	52.3
No Flu shot [c,f]	52.0	34.2	46.4	34.2
No pneumonia vaccination [c,f]	76.4	49.0	73.6	48.4

Significance levels for ethnicity differences:
Within rural only:
[a] p-values <=.05
[b] p-values <=.01
[c] p-values <=.001

Within urban only:
[d] p-values <=.05
[e] p-values <=.01
[f] p-values <=.001

Significance levels for rural/urban differences:
Within each ethnicity
[g] p-values <=.05
[h] p-values <=.01
[i] p-values <=.001

Table 5. Factors associated with receipt of age-appropriate Pap screening among white and Hispanic women aged 21 to 70, NHIS 1998-2000.

	Population, Full Model		Hispanic Only	
Unweighted observations	32,887		6,557	
	AOR	95% CI	AOR	95% CI
Demographic characteristics				
Residence				
Rural (referent=urban)	0.94	0.87, 1.02	0.86	0.68, 1.10
Ethnicity				
Hispanic	1.19	1.08, 1.32	n/a	n/a
Country of Origin (referent=Mexican)				
Mexican	n/a	n/a	Ref.	Ref.
Puerto Rican	n/a	n/a	0.96	0.68, 1.36
Cuban	n/a	n/a	0.69	0.38, 1.25
Other Hispanic	n/a	n/a	1.13	0.94, 1.35
Age (referent = 31-40)				
21-30	1.77	1.62, 1.94	1.56	1.30, 1.87
31-40	Ref.	Ref.	Ref.	Ref.
41-50	0.81	0.74, 0.88	0.76	0.61, 0.95
51-60	0.75	0.68, 0.82	0.57	0.42, 0.77
61-70	0.54	0.49, 0.60	0.64	0.46, 0.89
Education				
Less than High School (referent = HS grad)	0.77	0.70, 0.84	1.01	0.85, 1.21
Income (referent = 400% +)				
<100% Federal Poverty Level	0.63	0.56, 0.70	0.77	0.57, 1.03
100-199%	0.56	0.51, 0.61	0.79	0.63, 1.00
200-399%	0.71	0.66, 0.77	0.86	0.68, 1.09
Marital status				
Not Married (referent = married)	0.89	0.84, 0.95	0.87	0.75, 1.02
Family Size				
4 or more (referent = 1-3)	0.90	0.84, 0.96	0.88	0.75, 1.04
Geographic region (referent = MW)				
Northeast	1.05	0.96, 1.16	1.02	0.69, 1.51
South	0.95	0.87, 1.03	0.94	0.68, 1.30
West	0.86	0.78, 0.94	0.92	0.68, 1.25
Acculturation				
Low (referent = high)	1.30	0.98, 1.73	1.12	0.90, 1.39
Enabling variables				
Health insurance				
Uninsured (referent = insured)	0.54	0.49, 0.60	0.60	0.49, 0.73
Usual source of care (USOC)				
No USOC (referent =yes)	0.46	0.42, 0.51	0.50	0.41, 0.62
Need variables				
Perceived health status				
Fair to poor (referent = good to excellent)	0.86	0.78, 0.96	0.85	0.65, 1.09
Limitations in ADL				
Any limitations (referent =no limits)	0.94	0.88, 1.00	1.06	0.87, 1.30

Table 6. Factors associated with receipt of age-appropriate clinical breast exams among white and Hispanic women aged 40 to 70, NHIS 1998-2000.

	Population, Full Model		Hispanic Population Only, full model	
Unweighted observations	26,987		4,595	
	AOR	95% CI	AOR	95% CI
Demographic characteristics				
Residence				
Rural (referent=urban)	0.93	0.85, 1.00	0.93	0.70, 1.22
Ethnicity				
Hispanic (referent=White)	1.12	0.97, 1.29	n/a	n/a
Country of Origin (referent=Mexican)				
Mexican	n/a	n/a	Ref.	Ref.
Puerto Rican	n/a	n/a	0.73	0.46, 1.14
Cuban	n/a	n/a	0.74	0.38, 1.46
Other Hispanic	n/a	n/a	1.21	0.94, 1.58
Age (referent =30-39)				
20-29	2.36	1.81, 3.07	2.36	1.85, 3.02
30-39	Ref.	Ref.	Ref.	Ref.
40-49	0.12	0.11, 0.14	0.12	0.11, 0.13
50-59	0.13	0.12, 0.15	0.13	0.12, 0.15
60+	0.11	0.10, 0.12	0.11	0.09, 0.12
Education (referent = HS grad)				
Less than High School	0.77	0.71, 0.85	1.02	0.80, 1.28
Income (referent = 400% +)				
<100% Federal Poverty Level	0.60	0.54, 0.68	0.75	0.49, 1.16
100-199%	0.60	0.54, 0.66	0.86	0.58, 1.26
200-399%	0.74	0.67, 0.81	0.95	0.65, 1.39
Marital status				
Not Married (referent = married)	0.82	0.77, 0.88	0.83	0.64, 1.06
Family Size				
4 or more (referent = 1-3)	0.88	0.80, 0.96	0.94	0.74, 1.18
Geographic region (referent = MW)				
Northeast	1.03	0.93, 1.14	1.11	0.66, 1.87
South	0.95	0.87, 1.03	0.75	0.52, 1.10
West	0.92	0.83, 1.02	0.63	0.43, 0.92
Acculturation				
Low (referent=High)	1.42	0.85, 2.37	1.16	0.77, 1.76
Enabling variables				
Health insurance				
Uninsured (referent = insured)	0.55	0.49, 0.62	0.68	0.50, 0.93
Usual source of care (USOC)				
No USOC (referent =yes)	0.34	0.30, 0.39	0.51	0.36, 0.72
Need variables				
Perceived health status				
Fair to poor (referent = good to excellent)	0.92	0.83, 1.01	0.98	0.72, 1.33
Limitations in ADL				
Any limitations (referent =no limits)	1.01	0.94, 1.08	1.05	0.81, 1.36

Table 7. Factors associated with receipt of age-appropriate mammograms (women only, ages 40 - 70): NHIS 1998-2000.

	Population, Full Model		Hispanic Population Only	
Unweighted observations	16,283		2,376	
	AOR	95% CI	AOR	95% CI
Demographic characteristics				
Residence				
Rural (referent=urban)	0.95	0.87, 1.04	0.77	0.56, 1.06
Ethnicity				
Hispanic (referent=White)	1.09	0.95, 1.25	n/a	n/a
Country of Origin (referent=Mexican)				
Mexican	n/a	n/a	1.00	Ref.
Puerto Rican	n/a	n/a	0.74	0.40, 1.36
Cuban	n/a	n/a	0.45	0.20, 0.99
Other Hispanic	n/a	n/a	1.01	0.73, 1.39
Age (referent = 60+)				
40-49	0.81	0.74, 0.89	0.99	0.71, 1.38
50-59	1.11	1.02, 1.21	1.00	0.71, 1.41
Education				
Less than High School (referent = HS grad)	0.76	0.69, 0.83	0.87	0.63, 1.21
Income (referent = 400% +)				
<100% Federal Poverty Level	0.69	0.59, 0.80	0.86	0.53, 1.37
100-199%	0.71	0.64, 0.79	0.88	0.56, 1.38
200-399%	0.84	0.77, 0.92	0.98	0.69, 1.39
Marital status				
Not Married (referent = married)	0.76	0.71, 0.82	0.86	0.65, 1.15
Family Size				
4 or more (referent = 1-3)	0.82	0.73, 0.92	0.77	0.58, 1.03
Geographic region (referent = MW)				
Northeast	1.07	0.97, 1.18	1.10	0.84, 1.44
South	1.02	0.93, 1.12	0.69	0.43, 1.10
West	1.01	0.92, 1.12	0.66	0.42, 1.05
Acculturation				
Low (referent=High)	1.79	0.87, 3.64	1.97	1.02, 3.80
Enabling variables				
Health insurance				
Uninsured (referent = insured)	0.59	0.51, 0.69	0.72	0.47, 1.09
Usual source of care				
No USOC (referent =yes)	0.42	0.35, 0.50	0.75	0.45, 1.26
Need variables				
Perceived health status				
Fair to poor (referent = good to excellent)	0.86	0.78, 0.95	0.79	0.56, 1.10
Limitations in ADL				
Any limitations (referent=no limits)	0.98	0.92, 1.05	1.10	0.84, 1.44

Table 8. Factors associated with receipt of age-appropriate PSA screening (PSA blood test), men only ages 50+, NHIS 1999-2000.

	Population, Full Model		Hispanic Population Only	
Unweighted observations	3,573		387	
	AOR	95% CI	AOR	95% CI
Demographic characteristics				
Residence				
Rural (referent=urban)	0.91	0.76, 1.10	1.06	0.43, 2.62
Ethnicity				
Hispanic (referent=White)	0.94	0.63, 1.14	n/a	n/a
Country of Origin (referent=Mexican)				
Mexican	n/a	n/a	1.00	Ref.
Puerto Rican	n/a	n/a	0.34	0.06, 1.83
Cuban	n/a	n/a	1.21	0.41, 3.56
Other Hispanic	n/a	n/a	0.74	0.27, 2.01
Age				
50-64 (referent = 65+)	0.75	0.63, 0.89	1.47	0.64, 3.38
Education				
Less than High School (referent = HS grad)	0.74	0.60, 0.91	1.51	0.67, 3.40
Income (referent = 400% +)				
<100% Federal Poverty Level	1.04	0.70, 1.54	0.54	0.15, 2.01
100-199%	1.05	0.82, 1.36	0.82	0.29, 2.32
200-399%	0.98	0.80, 1.21	1.34	0.41, 4.39
Marital status				
Not Married (referent= married)	0.79	0.67, 0.94	0.44	0.20, 0.95
Family Size				
4 or more (referent= 1-3)	0.94	0.74, 1.19	0.55	0.23, 1.31
Geographic region (referent= MW)				
Northeast	0.80	0.65, 0.98	2.04	0.27, 15.19
South	0.91	0.75, 1.09	1.25	0.21, 7.49
West	0.80	0.62, 1.01	0.97	0.17, 5.48
Acculturation				
Low (referent=High)	1.00	1.00, 1.00	1.00	1.00, 1.00
Enabling variables				
Health insurance				
Uninsured (referent= insured)	0.73	0.46, 1.18	0.98	0.20, 4.75
Usual source of care (USOC)				
No USOC (referent =yes)	0.32	0.20, 0.51	2.23	0.31, 16.20
Need variables				
Perceived health status				
Fair to poor (referent= good to excellent)	0.90	0.73, 1.12	1.22	0.51, 2.94
Limitations in ADL				
Any limitations (referent =no limits)	1.12	0.95, 1.32	1.72	0.68, 4.36

Table 9. Factors associated with receipt of age-appropriate flu vaccination, men and women ages 65+, NHIS 1998 – 2000

	Population, Full Model		Hispanic Population Only, full model	
Unweighted observations	16, 120		1,664	
	AOR	95% CI	AOR	95% CI
Demographic characteristics				
Residence				
Rural (referent=urban)	1.01	0.91, 1.12	0.70	0.44, 1.11
Ethnicity				
Hispanic (referent=White)	0.93	0.75, 1.16	n/a	n/a
Country of Origin (referent=Mexican)				
Mexican	n/a	n/a	1.00	Ref.
Puerto Rican	n/a	n/a	1.51	0.54, 4.22
Cuban	n/a	n/a	0.78	0.35, 1.75
Other Hispanic	n/a	n/a	1.24	0.80, 1.91
Sex				
Female (referent=Male)	0.97	0.89, 1.07	1.30	0.89, 1.89
Age				
65-70 (referent = 75+)	0.58	0.54, 0.63	0.70	0.48, 1.01
Education				
Less than High School (referent = HS grad)	0.76	0.69, 0.84	0.85	0.56, 1.26
Income (referent = 400% +)				
<100% Federal Poverty Level	0.69	0.58, 0.81	0.81	0.38, 1.70
100-199%	0.77	0.66, 0.89	0.86	0.43, 1.73
200-399%	0.92	0.82, 1.04	1.15	0.61, 2.17
Marital status				
Not Married (referent = married)	0.76	0.70, 0.83	0.52	0.36, 0.75
Family Size				
4 or more (referent = 1-3)	0.72	0.55, 0.96	0.54	0.31, 0.88
Geographic region (referent = MW)				
Northeast	0.90	0.78, 1.03	0.90	0.32, 2.54
South	0.96	0.86, 1.08	0.64	0.29, 1.40
West	1.03	0.89, 1.20	0.99	0.47, 2.09
Acculturation				
Low (referent=High)	0.90	0.38, 2.16	0.52	0.20, 1.35
Enabling variables				
Health insurance				
Uninsured (referent = insured)	0.42	0.23, 0.78	0.59	0.19, 1.78
Usual source of care				
No USOC (referent =yes)	0.28	0.23, 0.34	0.17	0.07, 0.38
Need variables				
Perceived health status				
Fair to poor (referent = good to excellent)	1.12	1.01, 1.24	1.18	0.73, 1.91
Limitations in ADL				
Any limitations (referent =no limits)	1.27	1.16, 1.39	1.39	0.96, 2.00

Table 10. Factors associated with meeting the CDC guidelines for pneumococcal vaccination, individuals age 65+, 1998-2000 NHIS

	Population, Full Model		Hispanic Population Only, full model	
Unweighted observations	16, 120		1,664	
	AOR	95% CI	AOR	95% CI
Demographic characteristics				
Residence				
Rural (referent=urban)	0.97	0.87, 1.08	0.83	0.41, 1.71
Ethnicity				
Hispanic (referent=White)	0.47	0.39, 0.56	n/a	n/a
Country of Origin (referent=Mexican)				
Mexican	n/a	n/a	1.00	Ref.
Puerto Rican	n/a	n/a	0.56	0.19, 1.65
Cuban	n/a	n/a	1.10	0.42, 2.87
Other Hispanic	n/a	n/a	1.13	0.74, 1.73
Sex				
Female (referent=Male)	1.11	1.02, 1.20	0.98	0.64, 1.49
Age				
65-70 (referent = 70+)	0.59	0.54, 0.64	0.56	0.37, 0.85
Education				
Less than High School (referent = HS grad)	0.75	0.68, 0.82	0.69	0.46, 1.03
Income (referent = 400% +)				
<100% Federal Poverty Level	0.72	0.61, 0.86	0.52	0.26, 1.05
100-199%	0.91	0.81, 1.04	0.69	0.35, 1.36
200-399%	0.99	0.85, 1.15	0.98	0.48, 1.98
Marital status				
Not Married (referent = married)	0.78	0.72, 0.85	0.72	0.50, 1.04
Family Size				
4 or more (referent = 1-3)	0.80	0.60, 1.07	0.52	0.26, 1.05
Geographic region (referent = MW)				
Northeast	0.90	0.79, 1.02	3.32	0.78, 14.07
South	1.05	0.94, 1.17	1.18	0.32, 4.32
West	1.37	1.19, 1.58	2.88	0.80, 10.30
Acculturation				
Low (referent=High)	0.48	0.14, 1.65	0.30	0.07, 1.19
Enabling variables				
Health insurance				
Uninsured (referent = insured)	0.58	0.28, 1.22	1.53	0.43, 5.43
Usual source of care (USOC)				
No USOC (referent = yes)	0.31	0.25, 0.38	0.27	0.08, 0.91
Need variables				
Perceived health status				
Fair to poor (referent = good to excellent)	1.18	1.07, 1.31	1.04	0.65, 1.67
Limitations in ADL				
Any limitations (referent =no limits)	1.34	1.22, 1.47	1.08	0.70, 1.68