Factors Associated with Hispanic/non-Hispanic White Colorectal Cancer Screening Disparities

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BACKGROUND: In the United States, Hispanics are less likely to undergo colorectal cancer (CRC) screening than non-Hispanic whites (whites).

OBJECTIVE: To examine factors associated with disparities in CRC screening between whites and Hispanic national origin subgroups.

DESIGN: Cross-sectional analysis of 1999–2005 Medical Expenditure Panel Survey data.

PARTICIPANTS: Respondents aged >50 years self-identifying as non-Hispanic white (18,733) or Hispanic (3686)—the latter of Mexican (2779), Cuban (336), Puerto Rican (376), or Dominican (195) origin.

MEASUREMENTS: Dependent variable: self-report of up to date CRC screening, defined as fecal occult blood testing within 2 years and/or lower endoscopy at any time. Independent variables: ethnicity/race, country of origin, interview language, socio-demographics, and access to care.

RESULTS: Unadjusted CRC screening rates were highest in whites [mean (standard error), 55.9 (0.6) %], and lowest in Dominicans [28.5 (4.2) %]. After demographic adjustment, CRC screening was significantly lower for Mexicans [adjusted odds ratio (95% confidence interval), 0.46 (0.40, 0.53), p<0.001)], Puerto Ricans [0.65 (0.47, 0.91), p=0.01], and Dominicans [0.30 (0.19, 0.45), p<0.001] versus whites. With further adjustment for language, socioeconomic factors, and access, Hispanic/white disparities were not significant, while among Hispanics, Cubans were more likely to be screened [1.57 (1.15, 2.14), p=0.01].

CONCLUSIONS: Factors associated with CRC screening disparities between Hispanics and non-Hispanic whites appear similar among Hispanic sub-groups. However, the relative contribution of these factors to disparities varies by Hispanic national origin group, suggesting a need for differing approaches to increasing screening for each group.

KEY WORDS: colorectal neoplasms; Hispanic Americans; mass screening; quality of health care; socioeconomic factors.
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INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer mortality in the United States (U.S.).[1] CRC screening reduces mortality[2–6] and is cost-effective.[7,8] However, CRC screening is underutilized: in 2004, only 57% of adults aged 50 years or older reported up to date screening status in the Behavioral Risk Factor Surveillance Survey (BRFSS), much lower than for other effective cancer screening methods.[1]

There is also a marked disparity in CRC screening between Hispanics and non-Hispanic whites. For example, in the 2004 BRFSS, only 42% of Hispanics reported up to date CRC screening.[1] Likewise, pooled National Health Interview Survey (NHIS) data from 1987 through 2003 found 30.4% of Hispanic men and 31.4% of Hispanic women, compared with 47.5% and 44.1% for non-Hispanic white men and women, respectively, and 42.8% and 37.5% for black men and women, respectively.[9] These figures may help to explain the increased risk of CRC mortality in Hispanics relative to non-Hispanic whites observed in some studies.[10]

Prior studies have suggested several potential determinants of CRC screening disparities experienced by Hispanics, including relatively low CRC screening knowledge,[11,12] less favorable socioeconomic status,[13–18] worse access to care,[12–18] and language barriers.[19] However, all these studies had significant limitations, including use of small, single geographic region samples,[12,16] failure to adjust for known correlates of screening behavior,[12,14,15,17–19] and/or considering Hispanics as a monolithic group.[13–15,18,19]

The latter may be particularly problematic, since substantial variation has been shown to exist among Hispanics for a number of health behaviors and outcomes.[20–26] One prior national study explored the relationships between national origin and CRC screening among Hispanic subgroups.[27] However, it involved 2000 NHIS data, which may now be less salient given the considerable secular increases in CRC screening in the U.S. since 2000.[1] Furthermore, non-Hispanic whites were not included in the analyses. Thus, no recent national studies have examined the disparity in CRC screening between Hispanics non-Hispanic whites with sufficient sample size to explore whether the factors associated with the disparity may differ, in type and/or magnitude, among Hispanic national origin subgroups.

To address this research gap, we employed data from the 1999–2005 Medical Expenditure Panel Survey (MEPS) to examine CRC screening in four Hispanic national origin subgroups: people of Mexican, Puerto Rican, Cuban, and Dominican origin. We constructed four models, adjusting progressively for: age, sex, region of country and survey year (basic demographics—Model I); additionally for income and

education level (shared socioeconomic factors—Model II); additionally for health insurance status and availability of a usual source of care (shared access barrier factors—Model III); and, finally, additionally for interview language (as a proxy for language-based barriers to care faced by Spanish-speaking Hispanics—Model IV). These factors have been shown to influence a number of health outcomes in various ethnic/racial groups.[28,29] We sought to identify their independent contributions to disparities in CRC screening between several large Hispanic national origin subgroups and non-Hispanic whites in the U.S.

METHODS

Sources of Data

MEPS is a nationally representative survey of health care use and costs in the U.S. civilian and non-institutionalized population conducted by the Agency for Healthcare Research and Quality (AHRQ).[30] It employs an overlapping panel design and over-samples Hispanics and Blacks. Data are collected for individuals over a 2-year period through a baseline and five follow-up interviews. The MEPS Household Component collects information on interview language, country of origin, socio-demographic information, usual source of care, and health insurance coverage. The response rate was approximately 65% for the seven panels of data used in this study.

Measures

Race, ethnicity, and country of origin. MEPS respondents self-select the racial category (white, black, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, or multiple races) and ethnicity (Hispanic or non-Hispanic) they feel best describes themselves. Responses to race and ethnicity questions are crossed to derive combined race/ethnicity categories (e.g., non-Hispanic white). Additionally, Hispanic respondents are asked if their main national origin or ancestry is Puerto Rican, Cuban, Mexican, Dominican (coded separately after the year 2000), other Central/South American, or other. The analyses in this study focused on adults aged 50 years or older classified in MEPS as either non-Hispanic white or Hispanic, the latter subcategorized by national origin: Mexican, Cuban, Puerto Rican, or Dominican. Given the importance of evaluating CRC screening status among people of specific national origins or ancestries, individuals in the other Hispanic and central/south American subcategories were excluded from analyses.

CRC screening. MEPS respondents are asked whether they have ever undergone fecal occult blood testing (FOBT) and/or "flexible sigmoidoscopy or colonoscopy" (single item) and, if so, the time interval (within past year, 2 years, 3 years, 5 years, or more than 5 years ago). In the study analyses, respondents were considered up to date for screening if they reported FOBT within 2 years (based on data from randomized controlled trials[3,6]) or flexible sigmoidoscopy or colonoscopy at any time. We employed the latter definition for 2 reasons. First, it is not possible to distinguish receipt of flexible sigmoidoscopy from receipt of colonoscopy in the MEPS database, making use of specific time intervals such as every 5 or 10 years problematic. Second, there are no firmly evidenced-based intervals for endoscopic CRC screening tests.[31] Furthermore, separate analyses conducted after excluding the 1048 persons considered up-to-date for CRC screening based on report of endoscopy more than 5 years ago produced results nearly identical to analyses employing our chosen up to date definition (data not shown); thus, only the latter are reported here. CRC screening data were missing for 610 (2.8%) non-Hispanic whites and 170 (3.1%) Hispanics.

Socio-demographic factors. Socio-demographic variables examined in analyses were: age (categorized as 50–54, 55–59, 60–64, 65–74, and <100%,100-<125%, 125- <200%, 200 - <400%, or >400% of the Federal poverty level); educational attainment (less than high school, some high school, high school graduate, some college, college graduate); and geographic region (Northeast, Midwest, South, West).

Access to Care. Access to care variables examined were insurance status (private, public, uninsured) and having a usual source of health care (yes/no).

Language. Language (English or Spanish) in which the MEPS interview was conducted was also included as a covariate.

Statistical Analyses

Data were analyzed in February 2008 using STATA version 10.0 (Stata Corporation, College Station, TX), adjusting for the complex survey design of MEPS. Analyses incorporated the longitudinal strata and primary sampling units and were weighted to yield appropriate standard errors and estimates representative of the U.S. civilian, non-institutionalized adult population.

Four main models were constructed to determine the relationship between CRC screening and Hispanic national origin subgroup using a series of logistic regression analyses with CRC screening as the dependent variable in the models. The modeling sequence was designed to adjust first for relatively fixed demographic characteristics, then basic socioeconomic factors common to all persons, then access factors common to all persons, and, finally, language, a factor of specific relevance to Hispanics in this analysis. Model I examined the relationship between CRC screening and national origin adjusting only for age, sex, region of country and survey year. Model II incorporated additional adjustment for socioeconomic status (income and education); Model III additional adjustment for access to care (insurance status and availability of a usual source of care); and, Model IV included additional adjustment for interview language. Interactions between national origin group and the other covariates were also examined, but none of these were significant and so are not reported.

RESULTS

Table 1 illustrates key socio-demographic characteristics among non-Hispanic whites and the four Hispanic national origin subgroups. Survey respondents of Mexican origin

Table 1. Relationships of Racial and National Origin Groups to Study Characteristics

Characteristic	White[1]	Mexican	Cuban	Puerto Rican	Dominican
N	18,733	2,779	336	376	195
Colorectal cancer screening up to date					
Total	55.9 (0.6)	35.2 (1.4)	51.0 (3.2)	45.7 (4.0)	28.5 (4.2)
Endoscopy	46.3 (0.6)	26.1 (1.1)	40.0 (3.1)	35.1 (3.7)	23.6 (4.2)
FOBT[2]	26.9 (0.6)	17.7 (1.2)	26.8 (3.2)	22.6 (2.6)	16.9 (3.6)
Age Group					
50–54	23.1 (0.5)	29.1 (1.4)	22.3 (5.1)	23.9 (2.6)	30.7 (4.0)
55–59	19.4 (0.4)	21.7 (1.3)	13.7 (1.6)	25.3 (3.3)	23.4 (3.8)
60–64	14.9 (0.4)	13.5 (1.0)	10.4 (2.7)	22.6 (2.9)	16.1 (3.5)
65–74	22.6 (0.4)	22.1 (1.1)	28.5 (3.1)	18.9 (2.4)	19.4 (3.7)
≥75	20.0 (0.5)	13.6 (1.4)	25.2 (4.3)	9.2 (1.7)	10.4 (3.1)
Female	53.8 (0.3)	53.8 (1.0)	52.0 (3.1)	60.4 (3.3)	60.5 (3.7)
Spanish interview	0.0 (0.0)	42.4 (1.9)	70.1 (4.8)	37.2 (3.8)	60.1 (6.6)
Years of schooling					
<9	7.0 (0.3)	47.3 (1.5)	31.7 (3.6)	26.7 (2.4)	44.4 (5.0)
9–11	10.8 (0.3)	14.2 (0.9)	9.2 (2.1)	18.3 (2.2)	11.3 (3.3)
12	35.0 (0.6)	20.4 (1.4)	24.6 (2.9)	29.8 (3.1)	22.5 (4.5)
13–15	20.8 (0.4)	11.0 (1.0)	12.8 (2.6)	13.1 (2.1)	10.6 (2.6)
≥16	26.4 (0.7)	7.2 (0.7)	21.7 (4.0)	12.2 (2.3)	11.2 (3.0)
Family income (% of poverty level)					
<100	8.0 (0.3)	16.8 (1.0)	15.4 (2.4)	20.4 (2.5)	28.3 (4.7)
100–124	3.7 (0.2)	7.7 (0.7)	6.1 (1.3)	7.3 (2.0)	6.7 (2.6)
125–199	12.7 (0.4)	22.0 (1.2)	22.1 (4.1)	16.8 (2.3)	17.1 (3.5)
≥400	48.0 (0.7)	22.9 (1.5)	26.2 (3.7)	26.9 (2.6)	23.9 (6.6)
Insurance status					
Private	75.5 (0.6)	45.4 (1.9)	41.9 (4.0)	50.6 (2.9)	37.7 (6.1)
Public	19.3 (0.5)	33.2 (1.5)	41.0 (3.8)	40.5 (2.9)	42.5 (5.9)
Uninsured	5.1 (0.2)	21.3 (1.1)	17.1 (2.2)	8.9 (1.7)	19.8 (4.3)
Usual source of care	91.0 (0.3)	78.3 (1.6)	78.8 (2.5)	91.7 (1.7)	66.7 (4.6)
Region					
Northeast	20.0 (1.3)	3.6 (0.9)	12.4 (3.2)	59.7 (5.2)	51.6 (6.8)
Midwest	25.5 (1.3)	5.4 (1.0)	2.4 (1.3)	10.2 (3.7)	4.9 (3.0)
South	35.4 (1.6)	37.2 (5.2)	82.0 (3.5)	21.8 (3.6)	28.0 (6.8)
West	19.2 (1.6)	53.8 (5.0)	3.2 (1.0)	8.3 (2.1)	15.4 (3.9)

Numbers reflect population percent (standard error) with characteristic [1]
White = non-Hispanic white [2]
FOBT = fecal occult blood testing

disproportionately lived in the South and West, those of Cuban origin in the South, and those of Puerto Rican and Dominican origin in the Northeast. Hispanics, particularly those of Mexican, Puerto Rican, and Dominican origin, were less likely to be older than 75 years. People of Puerto Rican and Dominican origin were more likely to be female, and to have conducted their interview in Spanish. Education and income levels were lower in Hispanics, especially for those of Mexican, Puerto Rican, and Dominican origin.

The unadjusted rate of up to date CRC screening was 54.5% overall, highest in non-Hispanic whites, lowest in people of Dominican origin (Table 1). Of note, there was a greater disparity between Hispanics and non-Hispanic whites for endoscopic screening than for FOBT.

The adjusted odds ratios for the logistic regression models are shown in Table 2. Compared with non-Hispanic whites, all Hispanic national origin subgroups except people of Cuban origin were significantly less likely to report up to date CRC screening, after adjustment for age, sex, region, and year (Table 2—Model I). With additional adjustment for socioeconomics (Table 2—Model II), the effect for people of Puerto Rican origin became non-significant. With further adjustment for access (insurance status, and availability of a usual source of care, Table 2—Model III), there was a further non-significant attenuation of disparities. The final model (Table 2—Model IV), including language revealed further attenuation of the disparity between non-Hispanic whites and Hispanics (with no remaining statistically significant disparity), while people of Cuban origin had higher adjusted screening rates.

Table 2. Adjusted Relationship between National Origin Group and Colorectal Cancer Screening with Progressive Adjustment for Demographics, Socio-Economic Factors, Access to Care, and Interview Language

National Origin	Adjusted Odds Ratio	95% Confidence Interval	P value
Mexican			
Model I	0.46	0.40, 0.53	0.00
Model II	0.70	0.60, 0.81	0.00
Model III	0.79	0.69, 0.91	0.00
Model IV	0.90	0.77, 1.04	0.15
Cuban			
Model I	0.83	0.64, 1.07	0.15
Model II	1.01	0.77, 1.32	0.96
Model III	1.21	0.91, 1.61	0.18
Model IV	1.57	1.15, 2.14	0.01
Puerto Rican			
Model I	0.65	0.47, 0.91	0.01
Model II	0.88	0.64, 1.21	0.44
Model III	0.90	0.64, 1.26	0.53
Model IV	1.02	0.72, 1.44	0.91
Dominican			
Model I	0.30	0.19, 0.45	0.00
Model II	0.44	0.28, 0.69	0.00
Model III	0.54	0.32, 0.91	0.02
Model IV	0.67	**0.39, 1.16**	0.15

Notes: Reference group is non-Hispanic white. Model I: adjusted for age, gender, region, and year; Model II: also adjusted for income and education; Model III: also adjusted for health insurance and availability of a usual source of care; Model IV: also adjusted for language

DISCUSSION

The study findings suggest that language, socio-demographics, and to some extent, access to care may explain the disparity in CRC screening between Hispanics and non-Hispanic whites in the U.S. Furthermore, it appears that the contribution of each of these factors to CRC screening disparities varies by national origin among Hispanics. The analyses were conducted using a large, nationally-representative data set that included sufficient numbers of people reporting Cuban, Puerto Rican, Mexican, or Dominican origin to examine the sources of CRC screening disparities in Hispanic subgroups. Thus, these findings begin to reconcile the conflicting results of prior studies exploring the correlates of CRC screening disparities.[11–19]

A main goal of disparity research is to yield findings that might inform interventions aimed at eliminating the disparities. Our findings should be helpful in guiding public health policy and health care delivery intervention efforts to mitigate the disparity in CRC screening between Hispanics and non-Hispanic whites. They underscore that variations in health behaviors may be as great among individuals *within* major racial/ethnic groups as between racial/ethnic groups.[32] Thus, developing disparity reduction strategies based *solely* on broad racial/ethnic group characteristics may be misguided. Personally tailored interventions to address barriers to CRC screening, provided within a culturally salient framework in the user's preferred language, have the potential to address both inter- and intra-racial/ethnic group variability. Though as yet unproven, such interventions, therefore, hold promise as a way of mitigating disparities in screening among groups.[33]

Our findings differ from those of Gorin and Heck,[27] who found people of Puerto Rican and Central/South American origin were half as likely as those of Cuban, Dominican, and Mexican origin to be up to date for endoscopic screening. They also found no significant differences by national/regional origin in being up to date for FOBT. However, their study used 2000 NHIS data. Substantial secular increases in CRC screening overall in the U.S. since 2000,[1] along with the rapid growth and change in the U. S. Hispanic population since 2000,[34] are likely to explain why their findings differed from ours. Further, their analyses did not include data for non-Hispanic whites, limiting their usefulness to those seeking to address the disparity in CRC screening between Hispanics and non-Hispanic whites.

The reasons for the association between interview language (Spanish versus English) and CRC screening are unclear. The respondent's choice of language may reflect cultural preferences. On the other hand, language might simply represent a barrier to obtaining optimal care. These potential explanations imply different approaches to remedying disparities, and each might be operative to varying degrees among different Hispanic subgroups. Further studies designed to explore this issue are needed.

We also note that differences in endoscopy between Hispanics and non-Hispanics were greater than differences in FOBT, echoing the results of other studies.[9,19] These findings provide evidence of a technology diffusion gap between Hispanics and non-Hispanics. It remains unclear whether the gap exists due to limited access to screening endoscopy for Hispanics relative to others, or less access to follow-up endoscopy (e.g., after abnormal FOBT or to evaluate worrisome symptoms), or a combination of these factors. Regardless, such a technology diffusion gap may contribute, along with the overall CRC screening disparities presented here, to the increased risk of advanced stage CRC cancer and CRC mortality in Hispanics relative to non-Hispanic whites observed in some studies.[10]

Study Limitations and Strengths

In addition to its previously mentioned strengths, our study had several limitations. MEPS data are cross-sectional, precluding causal conclusions regarding the associations among language, socio-demographics, access to care, and CRC screening. The sample size for persons of Dominican national origin was small, so conclusions for this group are tentative. Also, the response rate for the MEPS is about 65%, and it is therefore possible that participants, particularly Hispanics, differ from their non-participant counterparts. While the direction and size of this effect is unknown, and could well vary among Hispanic national origin groups, it may lead to under-estimation of the disparity in CRC screening between Hispanics and non-Hispanic whites.

MEPS data also include only limited geographic detail. We could only adjust for geographic region (Northeast, Midwest, South, or West) because more finely grained information (e.g., state of residence) is not made available in the MEPS database due to confidentiality concerns. This may be problematic given marked differences in the geographic distribution of various Hispanic ethnic groups in the U.S., and in light of the considerable variation in medical practices across the U.S. Nonetheless, the data regarding geographic region by ethnicity presented in Table 1 suggest the potential for confounding even by broad geographic region, and our models adjusted for such confounding.

Finally, we note limitations in our key outcome variables, receipt of FOBT and endoscopy, which rely on self-report, which correlates only modestly with claims data.[35, 36] It is plausible that response bias (e.g., due to social desirability) may affect the various national origin groups differently, contributing to a biased estimate of the disparities.[35] Moreover, it is not possible to determine in MEPS data whether respondents who indicate receiving endoscopy underwent colonoscopy (currently recommended every 10 years in most but not all guidelines) or flexible sigmoidoscopy (currently recommended every 5 years in most guidelines).[31] Due to these limitations in MEPS endoscopy data, and because the currently recommended intervals for endoscopic CRC screening tests are not firmly evidence-based,[31] we conservatively defined up to date status for endoscopic screening as receipt of endoscopy at any time. We also used a generous definition for up to date FOBT status. However, these definitions resulted in relatively few additional persons being categorized as up to date beyond the number so classified using a 1-year interval for FOBT and a 5-year interval for endoscopy. Moreover, repeated analyses using these definitions gave qualitatively similar results (data not shown). Finally, MEPS questions regarding endoscopy do not distinguish between screening and testing to evaluate symptoms. Thus, the rates of CRC screening reported here, as in other national self-report surveys, are likely to be inflated. The extent to which inflation varies among study subgroups is unknown.

CONCLUSIONS

In conclusion, several factors—language, socio-demographics, and access to care—largely explain the disparity in CRC screening between Hispanics and non-Hispanic whites in the

U.S. Furthermore, the contribution of these factors varies by national origin among Hispanics. Particularly given the ongoing rapid growth of the Hispanic population in the U.S.,[34] studies to develop and evaluate interventions aimed at mitigating these barriers and the associated CRC screening disparities are clearly needed.

Conflicts of interest: *None disclosed.*

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REFERENCES

1. Increased use of colorectal cancer tests-United States, 2002 and 2004. MMWR Morb Mortal Wkly Rep. 2006;55:308–11.
2. **Lieberman DA, Weiss DG, Bond JH, Ahnen DJ, Garewal H, Chejfec G.** Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans affairs cooperative study group 380. N Engl J Med. 2000;343:162–8.
3. **Mandel JS, Bond JH, Church TR, et al.**. Reducing mortality from colorectal cancer by screening for fecal occult blood. N Engl J Med. 1993;328:1365–71.
4. **Muller AD, Sonnenberg A.** Protection by endoscopy against death from colorectal cancer. A case-control study among veterans. Arch Intern Med. 1995;155:1741–8.
5. **Selby JV, Friedman GD, Quesenberry CP Jr., Weiss NS.** A case-control study of screening sigmoidoscopy and mortality from colorectal cancer. N Engl J Med. 1992;326:653–7.
6. **Hewitson P, Glasziou P, Irwig L, Towler B, Watson E.** Screening for colorectal cancer using the faecal occult blood test, Hemoccult. Cochrane Database Syst. Rev. 1, CD001216.
7. **Pignone M, Rich M, Teutsch SM, Berg AO, Lohr KN.** Screening for colorectal cancer in adults at average risk: a summary of the evidence for the U.S. Preventive Services Task Force. Ann Intern Med. 2002;137:132–41.
8. **Tengs TO, Adams ME, Pliskin JS, et al.**. Five-hundred life-saving interventions and their cost-effectiveness. Risk Anal. 1995;15:369–90.
9. **Meissner HI, Breen N, Klabunde CN, Vernon SW.** Patterns of colorectal cancer screening uptake among men and women in the United States. Cancer Epidemiol Biomarkers Prev. 2006;15:389–94.
10. **Chien C, Morimoto LM, Tom J, Li CI.** Differences in colorectal carcinoma stage and survival by race and ethnicity. Cancer. 2005;104:629–39.
11. **Cameron KA, Francis L, Wolf MS, Baker DW, Makoul G.** Investigating Hispanic/Latino perceptions about colorectal cancer screening: A community-based approach to effective message design. Patient Educ Couns. 2007;68:145–52.
12. **Yepes-Rios M, Reimann JO, Talavera AC, Ruiz de Esparza A, Talavera GA.** Colorectal cancer screening among Mexican Americans at a community clinic. Am J Prev Med. 2006;30:204–10.
13. **Coughlin SS, Berkowitz Z, Hawkins NA, Tangka F.** Breast and colorectal cancer screening and sources of cancer information among older women in the United States: results from the 2003 Health Information National Trends Survey. Prev Chronic Dis. 2007;4:A57.
14. **Pollack LA, Blackman DK, Wilson KM, Seeff LC, Nadel MR.** Colorectal cancer test use among Hispanic and non-Hispanic U.S. populations. Prev Chronic Dis. 2006;3:A50.
15. **Rao RS, Graubard BI, Breen N, Gastwirth JL.** Understanding the factors underlying disparities in cancer screening rates using the Peters-Belson approach: results from the 1998 National Health Interview Survey. Med Care. 2004;42:789–800.
16. **Thompson B, Coronado G, Neuhouser M, Chen L.** Colorectal carcinoma screening among Hispanics and non-Hispanic whites in a rural setting. Cancer. 2005;103:2491–8.
17. **Shih YC, Zhao L, Elting LS.** Does Medicare coverage of colonoscopy reduce racial/ethnic disparities in cancer screening among the elderly. Health Aff (Millwood). 2006;25:1153–62.
18. **Wee CC, McCarthy EP, Phillips RS.** Factors associated with colon cancer screening: the role of patient factors and physician counseling. Prev Med. 2005;41:23–9.
19. **Shah M, Zhu K, Potter J.** Hispanic acculturation and utilization of colorectal cancer screening in the United States. Cancer Detect Prev. 2006;30:306–12.
20. **Hummer RA, Rogers RG, Amir SH, Forbes D, Frisbie WP.** Adult mortality differentials between Hispanic subgroups and non-Hispanic whites. Soc Sci Q. 2000;81:459–76.
21. **Liao Y, Cooper RS, Cao G, et al.**. Mortality patterns among adult Hispanics: findings from the NHIS, 1986 to 1990. Am J Public Health. 1998;88:227–32.
22. **Morales LS, Lara M, Kington RS, Valdez RO, Escarce JJ.** Socioeconomic, cultural, and behavioral factors affecting Hispanic health outcomes. J Health Care Poor Underserved. 2002;13:477–503.
23. **Scribner R, Dwyer JH.** Acculturation and low birthweight among Latinos in the Hispanic HANES. Am J Public Health. 1989;79:1263–7.
24. **Singh GK, Siahpush M.** All-cause and cause-specific mortality of immigrants and native born in the United States. Am J Public Health. 2001;91:392–9.
25. **Turra CM, Goldman N.** Socioeconomic differences in mortality among U. S. adults: insights into the Hispanic paradox. J Gerontol B Psychol Sci Soc Sci. 2007;62:S184–92.
26. **Vega WA, Kolody B, Aguilar-Gaxiola S, Alderete E, Catalano R, Caraveo-Anduaga J.** Lifetime prevalence of DSM-III-R psychiatric disorders among urban and rural Mexican Americans in California. Arch Gen Psychiatry. 1998;55:771–8.
27. **Gorin SS, Heck JE.** Cancer screening among Latino subgroups in the United States. Prev Med. 2005;40:515–26.
28. **Franks P, Clancy CM, Gold MR.** Health insurance and mortality. Evidence from a national cohort. JAMA. 1993;270:737–41.
29. **Rodriguez MA, Ward LM, Perez-Stable EJ.** Breast and cervical cancer screening: impact of health insurance status, ethnicity, and nativity of Latinas. Ann Fam Med. 2005;3:235–41.
30. Medical Expenditure Panel Survey. Available at: http://www.meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp. Accessed August 18, 2007.
31. U.S. Preventive Services Task Force. Screening for colorectal cancer: recommendations and rationale. Ann Intern Med. 2002;137:129–31.
32. **Kleinman A, Benson P.** Anthropology in the clinic: The problem of cultural competency and how to fix it. PLoS Med. 2006;3:e294.
33. **Cooper LA, Hill MN, Powe NR.** Designing and evaluating interventions to eliminate racial and ethnic disparities in health care. J Gen Intern Med. 2002;17:477–86.
34. Facts for Features CB07-FF.14. Hispanic Heritage Month 2007: Sept 15-Oct 15. Available at: http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/010327.html. Accessed August 16, 2007.
35. **Fiscella K, Franks P, Doescher MP, Saver BG.** Disparities in health care by race, ethnicity, and language among the insured: findings from a national sample. Med Care. 2002;40:52–9.
36. **Schenck AP, Klabunde CN, Warren JL, et al.**. Data sources for measuring colorectal endoscopy use among Medicare enrollees. Cancer Epidemiol Biomarkers Prev. 2007;16:2118–27.