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Trends in Colorectal Cancer Among Hispanics by Stage and Subsite Location: 1989–2006

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OBJECTIVES: Hispanic colorectal cancer (CRC) rates historically have been lower than for non-Hispanic Whites in the United States and in Florida. The aim of this study is to understand CRC trends in Florida Hispanics and non-Hispanic Whites.
METHODS: Using a cross-sectional study design, all invasive CRCs diagnosed among Florida residents between 1989 and 2006 were accessed from the Florida Cancer Data System (FCDS). These cases were analyzed by Hispanic and non-Hispanic White ethnic identification. The Hispanic Origin Identification Algorithm was applied to the FCDS data to identify Hispanic subjects. Primary cancer site and histology data were organized according to SEER (Surveillance Epidemiology and End Results) categories. Joinpoint regression was used to generate incidence trends by stage and subsite location.
RESULTS: Rates of CRC incidence were higher for Florida Hispanics compared with non-Hispanic Whites since the mid 1990s. There was a consistent significant increase in the incidence of distant stage CRC in Hispanics (annual percent change (APC) of 1.26 and 0.90 in males and females), whereas rates in non-Hispanics decreased significantly during the same time period (APC −1.36 and −1.28, respectively). Similar trends were found in distant-stage right-sided CRC. Among right-sided CRCs, local stage incidence rate increased for both non-Hispanic Whites and Hispanics, whereas the incidence rate for regional stage decreased for both racial/ethnic groups.
CONCLUSIONS: Trends for distant-stage CRC are increasing among Florida Hispanics. This is a particular public health concern given that CRC is a cancer for which screening modalities exist and could imply a concomitant increase in CRC-related mortality among Florida Hispanics. Lower rates of CRC screening in Hispanics are documented at the state level, relative to non-Hispanic Whites. Screening programs targeting the Florida Hispanic population are warranted.
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INTRODUCTION

In the United States, Hispanics are the largest, youngest, and fastest-growing minority, accounting for 15% of the US population (45.5 million people in 2007).[1] In 2009, there were four million Hispanics (21%) among Florida's rapidly growing population.[2] Following California and Texas, Florida ranks third among states with the highest number of Hispanics, totaling over 3.7 million in 2007.[3] Hispanics in the United States have traditionally demonstrated lower cancer incidence and mortality rates than non-Hispanic populations.[4–6] Prior reports detailing colorectal cancer (CRC) incidence trends in US Hispanics exist,[7,8] but changes in this incidence rate over time have not been well documented among Hispanic subgroups. Detailing these potential changes is important given the shift in lifestyle behaviors associated with an increase in obesity and less nutritious diets among the Hispanic population, particularly with increasing time spent in the United States.[9] Cancer occurrence and risk factors can also vary among Hispanics because of acculturation, geographic, behavioral, and genetic differences.[6,10–13] Ongoing monitoring of CRC rates and trends in Hispanics is vital given these demographic and behavioral shifts.

Despite their overall lower risk of cancer, US Hispanics are more likely to be diagnosed at a later stage for certain common cancers, and are less likely to report utilizing cancer screening.[14–16] In part, this may be because of a lack of health insurance among Hispanics compared with non-Hispanic Whites and Blacks; beyond access to care, other issues have been identified as barriers to Hispanic cancer screening, including less education, lower socioeconomic status, and cultural barriers.[14,16] Among Floridians $\geq$50 years old, based on the 2008 Behavioral Risk Factor Surveillance Survey (BRFSS), only 27.0% Hispanics compared with 49.8% non-Hispanic Whites reported ever having home fecal blood testing; only 49.5% vs. 67.7% reported ever having had sigmoidoscopy or colonoscopy, respectively.[17]

Among Hispanics, lifestyle changes, relatively poor CRC screening uptake, and the need for allocation of health dollars underlie the need for identification of trends in CRC incidence. The aim of this study is to examine the 1986–2006 trends in CRC incidence among Hispanics residing within Florida by using data from the Florida Cancer Data System (FCDS) registry, the second largest central cancer registry in the United States. This investigation differs from prior studies by

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representation of a diversity of Hispanic nationalities and by the factors contributing to increased CRC burden among this population. The Hispanic population of Florida differs from prior studies in that it includes not only Hispanics of Central American origin, but also from the Caribbean islands (including Cuba, Puerto Rico, and the Dominican Republic) and Central/South American countries.[3] A special emphasis on trends in advanced-stage cancer stratified by region of colonic involvement has been performed given recent attention to this topic in the gastrointestinal and oncologic literature.

METHODS

Data were derived from all cancer cases among Hispanic and non-Hispanic White Florida residents, diagnosed between 1989 and 2006, and reported to the FCDS ($n = 178{,}927$). The FCDS is a statewide, population-based cancer incidence registry created by the State of Florida Department of Health in 1978, and operated by the Sylvester Comprehensive Cancer Center at the University of Miami Leonard M. Miller School of Medicine with support from the Florida Department of Health and from the Centers for Disease Control and Prevention (CDC) and National Program for Cancer Registries (NPCR).

For the assignment of ethnicity and subpopulation, the recently developed Hispanic Origin Identification Algorithm (HOIA) was used, using data from the FCDS.[12] HOIA is largely based on the existing North American Association of Central Cancer Registries (NAACCR) Hispanic Identification Algorithm (NHIA).[18] HOIA takes into account all information routinely available to cancer registries, and in addition, all non-Hispanic cases are matched to a Hispanic surname list.[19] HOIA is available online at http://fcds.med.miami.edu and has been described in detail in previous publications.[10–12,20] A comparison between results from HOIA and NHIA has been performed.[10,11,20] In short, HOIA corrects for data miscodes common in the FCDS database in the NAACCR data item 190 "Hispanic Origin," for example, misclassification of unknown Hispanics as "Mexican," or the inclusion of Brazilians and Portuguese as Hispanics. In addition, HOIA uses a stepwise approach to incorporate the information present in death certificates (birthplace and recorded Hispanic subgroup) with the same information from cancer registry records. Not only does HOIA provide increased ascertainment of Hispanic ethnicity, it also allows for estimates of cancer rates in the following Hispanic subpopulations: Mexicans, Puerto Ricans, Cubans, and New Latinos (all other Hispanics).[13] Of note, HOIA was not able to reclassify all Hispanics into these subpopulations; in this case, these Hispanics were categorized as a subgroup denoted as "Hispanic NOS" or "not otherwise classified."

The rates presented were focused on Hispanics and the comparison group of non-Hispanic Whites, that is, a mixed ethnic and racial classification. "Hispanics" include both Blacks and Whites in part because this follows the patterns of Hispanic race/ethnic self-identification (i.e., Black Hispanics often identify as "Hispanics" rather than "Black"), and because the numbers of identified Black Hispanics in the FCDS database are quite small. These analyses do not include non-Hispanic Blacks who are a mixture of African Americans and Blacks from other countries (particularly the Caribbean). As with all data in the FCDS, these racial/ethnic data are extracted from the medical and pathology records by trained Certified Cancer Registrars using nationally recognized standards.[21] Reported cases of malignant CRC diagnosed among Florida residents of all races and ethnicities during the 18-year period from 1989 to 2006 were used in the analysis. Primary cancer site and histology data were coded according to the International Classification of Diseases for Oncology in use at the time of diagnosis, converted to the third edition.[22] Colorectal classification included all sites coded C18.0 through C20.9. Approximately 90% of all colorectal carcinomas were classified as adenocarcinomas, historically the most common histologic type. Subsite locations were categorized into the right colon (cecum, ascending colon, hepatic flexure, and transverse colon), the left colon (splenic flexure, descending colon, and sigmoid colon), and the rectum (rectosigmoid junction, rectum). Staging was derived from the 1977 and 2000 Surveillance Epidemiology and End Results (SEER) coding systems,[23] of which our analysis included the following staging categories: local, regional, and distant. This research specifically analyzed distant-stage CRC, which refers to a case where cells have spread beyond the colon and rectum, the primary tumor, to other parts of the body. These extensions can occur in the lymph nodes beyond those closest to the colon and rectum, or in organs beyond the adjacent tissue of the colon and rectum. Local- and regional-stage CRCs were also considered.

Age- and gender-specific population data for the state of Florida for each racial and ethnic group for the study years were obtained from the Florida Consensus Estimating Conference for the underlying denominator of all individuals at risk.[24] Cancer incidence rates for years 1989–2006 per 100,000 persons were age adjusted by 18 age groups (0–4, 5–9, …, 80–84, and ≥ 85) to the 2000 US standard population. The direct method of age adjustment was used to calculate age-adjusted incidence and mortality rates.[25] Standard errors and 95% confidence intervals were generated using equations published by SEER*Stat.[26] These values were produced to enable long-term cancer incidence trends through Joinpoint analysis for all Hispanics and non-Hispanic Whites.[27] To protect confidentiality, data were suppressed when cell counts were <10 cancer cases (following FCDS rules).

The analyses of cancer incidence trends between the years 1989–2006 were conducted using the Joinpoint regression model, where statistically significant rate changes (increase or decrease) determine the best fitting points, or "joinpoints." The analysis begins with a minimum number of joinpoints (e.g., zero or a straight line), and tests whether one or more points are significant and whether they should be added to the model by means of the Monte Carlo Permutation method. The final model represents a statistically significant change in a trend at each joinpoint. The annual percent change (APC), or the average rate of change in a cancer rate, was generated for each joinpoint segment and was tested at the $P<0.05$ to determine if the rate of change was significantly different from zero. A maximum of three joinpoints and four line segments were allowed for each model. The joinpoint analyses were performed using the Joinpoint software, version 3.3, from the Surveillance Research Program of the US National Cancer Institute (available at http://srab.cancer.gov/joinpoint).

Table 1 Proportions of CRC incidence rates by Hispanic subgroup in relation to proportion of Hispanic population

Country of origin	Proportion by US 2000 census (%)	Proportion of CRC, 1989–2006 (%)
Cuba	31	44
Puerto Rico	17	8
Mexico	14	2
South and Central America	19	7
Other Hispanic	19	10
Hispanic NOS	—	29

CRC, colorectal cancer; NOS, not otherwise classified.

The following are the results of the joinpoint analyses of CRC among Hispanics over the 1989–2006 time period, comparing Hispanic males and females with non-Hispanic White males and females by stage and subsite location.

RESULTS

Demographics. The Hispanic population described herein comprised individuals of a variety of Caribbean, Mexican, and Central and South American origins, as delineated by US 2000 Census data (Table 1). The majority of Florida Hispanics are of Cuban ancestry (31%). The proportion of CRCs during years 1989–2006 among Hispanics in Florida is reflective of this finding, with 44% of CRCs identified in patients of Cuban origin.

CRC trends by gender and ethnicity. The age-adjusted rates of CRC changed substantially over the time period; ultimately, Hispanic males had the highest rates (2006: 56 cases/100,000) compared with non-Hispanic White males (2006: 50 cases/100,000), and Hispanic females had higher rates (2006: 41 cases/100,000) than non-Hispanic White females (2006: 37 cases/100,000). Initially, both male and female Hispanics had significant increases in CRC trends, males in particular, with an APC of 4.01 (between 1989 and 1996), and women with an APC of 1.05 (between 1989 and 2000). The increase in rates for Hispanic males was particularly large from 1989 to 1996, eliminating the lower relative difference in rates with non-Hispanic males. There were overall decreasing trends in CRC incidence for both Hispanic and non-Hispanic Whites (Figure 1). Rates among non-Hispanic Whites began decreasing at a rate of 1.09 for males (1989–2000) and 0.65 for females (1989–2000) from the start of the study period. This decline among non-Hispanic Whites continued to decline at a greater rate until 2006 (−4.47 non-Hispanic males and −4.01 non-Hispanic females). A similar decline occurred in Hispanics, although not until the late 1990s and early 2000s, with a more pronounced downward trend among females (−4.19) than in males (−2.69). All trends were statistically significant.

CRC trends by local, regional, and distant stage. Incidence rate trends for CRC by stage vary by time period, race/ethnicity, and sex. For local-stage disease, there were no significant rate changes among Hispanic males or females, whereas non-Hispanic White males and females experienced

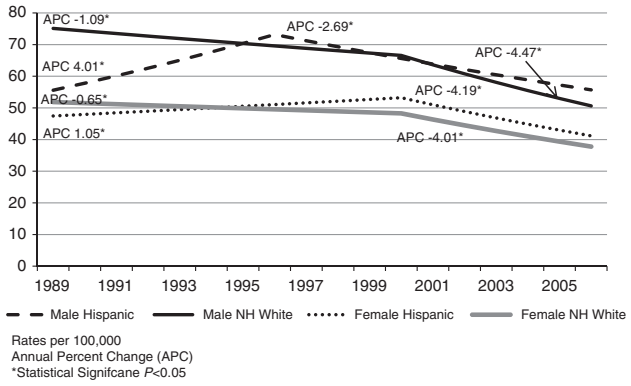

Figure 1 Joinpoint regression trends for colorectal cancer, Florida, 1989–2006. APC, annual percent change; NH, non-Hispanic. *Statistical significance $P < 0.05$.

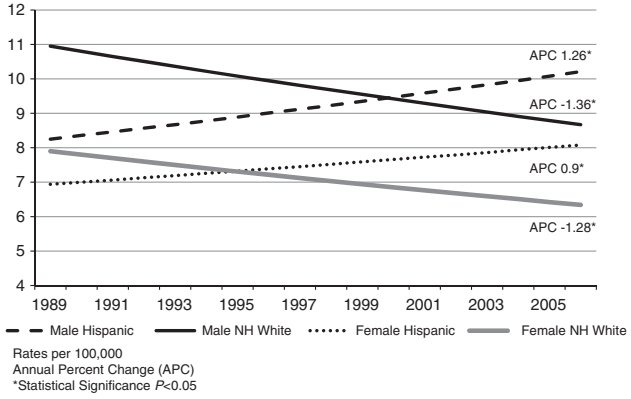

Figure 2 Joinpoint regression trends for colorectal cancer, distant stage, Florida, 1989–2006. APC, annual percent change; NH, non-Hispanic. *Statistical significance $P < 0.05$.

initial declines (−3.76 and −3.20, respectively) up to the mid 1990s, at which point changes became insignificant. By 2006, incidence rates were comparable between males, and between females of both groups. With the exception of a significant increase in regional-stage CRC among Hispanic men (2.67) in the early period, there were significant declining trends for all groups beginning from the early 2000s, with APCs ranging from −5.93 for Hispanic males and −7.36 for non-Hispanic White females. By the end of the period, Hispanics had slightly higher rates than non-Hispanic Whites. For distant-stage (Figure 2) CRC, only non-Hispanic White males and females experienced significant declines throughout the study period (−1.36 and −1.28, respectively), whereas significantly increasing rates occurred among Hispanic males and females (1.26 and 0.90, respectively), resulting in higher overall rates in 2006 compared with their non-Hispanic White counterparts.

Distant-stage CRC trends by subsite colonic location. The alarming finding of increased incidence rate of distant-stage CRC prompted an investigation for specific colonic locations of disparate disease burden. An analysis of CRC trends by distant stage and subsite colonic location produced similar variations by race/ethnicity and sex (Table 2). Distant-stage trends in the right colon (Figure 3) produced overall increasing

Table 2 Joinpoint regression results for distant-stage colorectal cancer: subsite by sex and race/ethnicity, Florida, 1989–2006

	Sex	Joinpoint segment		APC
Distant colon and rectum				
Hispanic	Male	1989	2006	1.26[a]
	Female	1989	2006	0.90[a]
NH White	Male	1989	2006	−1.36[a]
	Female	1989	2006	−1.28[a]
Distant-stage left colon				
Hispanic	Male	1989	2006	0.14
	Female	1989	2006	−0.79
NH White	Male	1989	2006	−2.14[a]
	Female	1989	2006	−1.97[a]
Distant-stage right colon				
Hispanic	Male	1989	2006	2.04[a]
	Female	1989	2006	2.19[a]
NH White	Male	1989	1994	3.15
		1994	2006	−2.39[a]
	Female	1989	2006	−1.34[a]
Distant-stage rectum				
Hispanic	Male	1989	2006	0.62
	Female	1989	2006	0.56
NH White	Male	1989	2006	−1.31[a]
	Female	1989	2006	−1.52[a]

APC, annual percent change; NH, non-Hispanic. [a]APC is statistically significant at $P<0.05$.

rates among Hispanic males and females (2.04 and 2.19, respectively), whereas after an initial increase among non-Hispanic White males until 1994 (3.15), overall decreasing trends occurred among non-Hispanic White males and females (−2.39 and −1.34, respectively).

Distant-stage trends in the left colon resulted in overall declines throughout the time period, although trends were significant only among non-Hispanic White males and females (−2.1 and −2.0, respectively). Results for distant-stage cancer of the rectum show significant declines among non-Hispanic White males and females (−1.31 and −1.52, respectively), but there were no significant changes among Hispanic males or females during this time period.

Trends for local and regional stages of CRC by subsite colonic location. Left-sided CRC trends among non-Hispanic White males and females have significantly declined overall since 1986 for all stages (local −5.8 and −5.3; regional −8.3 and −7.7; distant −2.1 and −2.0 male and female, respectively; Table 3). Male and female Hispanics experienced a significant decline in left-sided colon cancer for regional stage only (−8.9 and −2.4).

Local-stage right-sided CRC increased significantly for both Hispanic and non-Hispanic Whites (Hispanic 2.3 and 5.6; non-Hispanic White 0.9 and 1.4; Table 4). Regional-stage CRC decreased significantly among Hispanic and non-Hispanic White males and females (Hispanic −8.6 and −6.9; non-Hispanic White −7.9 and −7.9).

DISCUSSION

This investigation identified a concerning trend for the increased incidence rate of distant-stage CRC among Florida Hispanics. This finding is of particular importance given the precipitous drop in survival noted for distant-stage disease when compared with local or regional CRC.[28] According to the most recent US Census data, Hispanics comprise the largest proportion of growth among the US population, giving the present findings immediate importance with regard to health policy.[29]

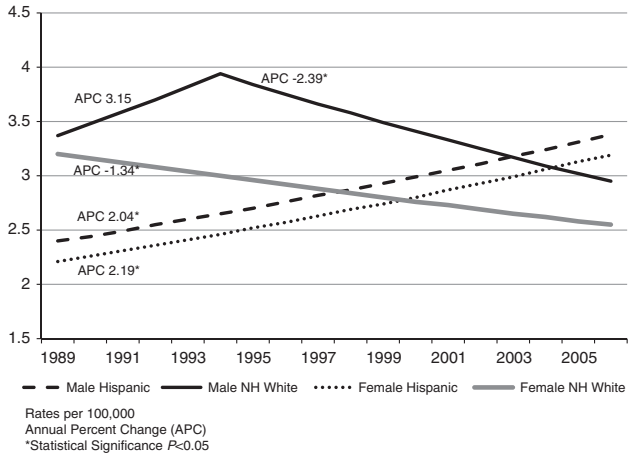

Figure 3 Joinpoint regression trends for right colon cancer, distant stage, Florida, 1989–2006. APC, annual percent change; NH, non-Hispanic. *Statistical significance $P<0.05$.

Florida has the third largest Hispanic population in the United States, with a diverse distribution of Hispanic subgroups compared with other states.[3] This diversity is based not only on self-reported country of origin or distinct sociocultural behaviors, but also on genomic observations. Study of genome patterns among US Hispanics from the Caribbean and South America reveal significant variation in admixture proportions, reflective of a history of human migration.[30] These genomic markers delineate a wide range of ancestral contribution among US Hispanics, with mixture of Native American, European, and African origins. Genomic differences in the proportions of continental ancestry are noticed among Hispanic countries of origin, particularly when comparing Mexicans with Caribbean Hispanic populations (i.e., Cuban and Puerto Rican).[31] Furthermore, differences in gene frequency among US Hispanics categorized by country of origin have been associated with noncancer-related disease risk.[32] Clinical data demonstrate that Hispanic subpopulations do have discrete cancer risks, with Caribbean (Puerto Rican) Hispanics having higher cancer risk than Mexicans.[13] Perhaps this cancer difference by country of origins for US Hispanics is mediated by genomic differences representing distinct proportions of admixed heritage.

These observations make the current analysis of Hispanic cancer incidence unique to the region, but raise intriguing questions regarding advanced stage of CRC presentation and CRC disease location that may be applicable to the more generalizable population of Hispanics as a whole, in particular for regions where Caribbean or South American Hispanics predominate. Since the 1990s, cancer incidence rates among both female and male Hispanics in Florida have dropped steadily, and have historically been lower than rates among

Table 3 Left-sided colon trends by stage, sex, and race/ethnicity, Florida, 1989–2006

Stage	Sex	Cohort	Segment	Year from	Year to	APC	Lower CI	Upper CI
Local	Male	Hispanic	1	1989	2006	−1	−2.4	0.4
Local	Male	Non-Hispanic White	1	1989	1995	−5.8*	−8.9	−2.6
Local	Male	Non-Hispanic White	2	1995	1999	5.1	−4.9	16.2
Local	Male	Non-Hispanic White	3	1999	2006	−3.5*	−5.9	−1
Local	Female	Hispanic	1	1989	2006	−0.8	−2.6	1
Local	Female	Non-Hispanic White	1	1989	1996	−5.3*	−6.6	−4
Local	Female	Non-Hispanic White	2	1996	2000	5.4*	0	11
Local	Female	Non-Hispanic White	3	2000	2006	−4.0*	−5.8	−2.3
Regional	Male	Hispanic	1	1989	1999	3.1	−0.6	6.9
Regional	Male	Hispanic	2	1999	2006	−8.9*	−13.8	−3.7
Regional	Male	Non-Hispanic White	1	1989	2000	−1.9*	−2.8	−1.1
Regional	Male	Non-Hispanic White	2	2000	2006	−8.3*	−10.6	−6
Regional	Female	Hispanic	1	1989	2006	−2.4*	−3.8	−1
Regional	Female	Non-Hispanic White	1	1989	2000	−1.7*	−2.8	−0.6
Regional	Female	Non-Hispanic White	2	2000	2006	−7.7*	−10.6	−4.7
Distant	Male	Hispanic	1	1989	2006	0.1	−1.6	1.9
Distant	Male	Non-Hispanic White	1	1989	2006	−2.1*	−2.9	−1.4
Distant	Female	Hispanic	1	1989	2006	−0.8	−2.6	1
Distant	Female	Non-Hispanic White	1	1989	2006	−2.0*	−2.6	−1.3

APC, annual percent change; CI, confidence interval. Left-sided colon trends among non-Hispanic White males and females have significantly declined overall since 1986 for all stages. Male and female Hispanics experienced a significant decline in left colon cancer for regional stage only. *Statistical significance $P<0.05$.

Table 4 Right-sided colon trends by stage, sex, and race/ethnicity, Florida, 1989–2006

Stage	Sex	Cohort	Segment	Year from	Year to	APC	Lower CI	Upper CI
Local	Male	Hispanic	1	1989	2006	2.3*	1.1	3.5
Local	Male	Non-Hispanic White	1	1989	1992	−7.6	−15.4	1
Local	Male	Non-Hispanic White	2	1992	2006	0.9*	0.1	1.6
Local	Female	Hispanic	1	1989	1999	5.6*	2.9	8.4
Local	Female	Hispanic	2	1999	2006	−1.8	−4.8	1.4
Local	Female	Non-Hispanic White	1	1989	2006	1.4*	0.9	2
Regional	Male	Hispanic	1	1989	2001	1	−1.4	3.3
Regional	Male	Hispanic	2	2001	2006	−8.6*	−15	−1.7
Regional	Male	Non-Hispanic White	1	1989	2000	−0.5	−1.5	0.6
Regional	Male	Non-Hispanic White	2	2000	2006	−7.9*	−10.5	−5.2
Regional	Female	Hispanic	1	1989	2001	1.2	−0.6	3
Regional	Female	Hispanic	2	2001	2006	−6.9*	−12.1	−1.4
Regional	Female	Non-Hispanic White	1	1989	2000	0.3	−0.5	1.2
Regional	Female	Non-Hispanic White	2	2000	2006	−7.9*	−10	−5.8

APC, annual percent change; CI, confidence interval. Local-stage right colon cancer increased significantly for both Hispanic and non-Hispanic (NH) Whites, whereas regional stage decreased significantly among Hispanic and NH White males and females. *Statistical Significance $P<0.05$.

the non-Hispanic White population.[33] Similar trends were observed in incidence rates of CRC, where declines among Hispanics have occurred since the late 1990s; however, CRC incidence rates were higher in Hispanics than non-Hispanic Whites in Florida by the year 2006.

The rationale underlying this observed difference in incidence rates is unclear, but may be multifactorial. The rapidity with which the trends have developed suggests a population-level influence like domestic and international migration patterns rather than an underlying biologic or cultural distinction that would take decades to manifest. The US Census 2000 showed that the southern states, including Florida, experienced the largest net domestic immigration gain of Hispanics during the period 1995–2000, with 92,480 Hispanics moving primarily from New York, New Jersey, and California.[34] Hispanics also make up the majority of movers to the United States from abroad, with 348,477 immigrating to Florida.[34] These population fluxes may underlie the observed incidence rate changes.

CRC screening behaviors may explain another portion of these findings. It is unclear from the data available within the FCDS whether the subjects had previously undergone any CRC screening before diagnosis. One explanation for the increase in distant-stage and distant-stage right-sided colon carcinoma among Hispanics may be the persistently low rate of CRC screenings in Florida. In 2002, only 35% of Hispanics over the age of 50 reported having received either a sigmoidoscopy or colonoscopy exam in the previous 5 years compared with 47% of non-Hispanic Whites.[35] In 2008, those figures increased slightly to 42% for Hispanics and 59% for non-Hispanic Whites.[36] Factors previously documented to be associated with poor utilization of CRC screening include lack of health insurance coverage, foreign-born status, duration of residency in the United States, language preference, and attitudinal fears; these characteristics are common among the Hispanic population of Florida.[37–39]

Although the overall downward trends in CRC incidence noted in this study are encouraging, the relationship between

cancer prognosis and degree of cancer progression at diagnosis warrant analysis of CRC characteristics by stage of disease. The 5-year survival rate for CRC is 90% when diagnosed at local stage and 11.6% when diagnosed at distant stage.[40] Analyzing trends by stage is an important indicator of both the burden of advanced disease and the likelihood of mortality secondary to CRC. Although Hispanics traditionally have lower rates of cancer incidence and mortality, they have higher rates of advanced-stage cancers than their Non-Hispanic White counterpart for many types of cancers, as was noted in this study.[15]

In Florida, local-stage CRC among Hispanics increased since 1989, although these trends were not statistically significant, whereas rates for regional CRC declined significantly since the late 1990s for both males and females. In contrast, distant-stage CRC rates among Hispanic males and females increased at a steady and statistically significant rate over the study period, surpassing the incidence rates of non-Hispanic Whites in the mid to late 1990s. Distant-stage trends in the left colon resulted in overall declines throughout the period for Hispanics and non-Hispanics. However, declines were only significant among the non-Hispanic White population. Similar trends were found for distant-stage rectal cancer. Distant-stage trends in the right colon increased among Hispanic males and females at a steady and significant rate, whereas trends declined significantly for Non-Hispanic Whites since 1989 for females and since the early 1990s for males. Right-colon cancer trends in the US Hispanic population have not shown the same increase in rates as those in the Florida Hispanic population.[41,42] However, Mexican Hispanics are the overwhelming majority in the national studies, unlike Florida Hispanics where Cubans are the predominant subgroup.

For those individuals fortunate enough to have access to the formal health care system, screening modalities confer a CRC-specific survival benefit, particularly when fecal occult blood testing is performed and followed by endoscopic investigation for positive test results.[43,44] But given the increase in screening rates among Florida Hispanics over time, we would have expected to see an attenuation of increasing trends in advanced-stage right-sided colon cancer; this was not observed. Sigmoidoscopy and colonoscopy are suboptimal in detecting and preventing proximal colon cancers. A recent, large-scale study of British patients promotes the utility of once-only flexible sigmoidoscopy as screening to prevent CRC.[45] Screening colonoscopy is associated with a decreased mortality from CRC in observational studies, but this survival benefit is more pronounced for distal colonic neoplasias than proximal lesions.[46,47] The reason for the disparate rate of endoscopic CRC detection/benefit by colonic region may be multifactorial, including its significant miss rate.[48–51] Many clinicians suspect that the exaggerated miss rate in the proximal colon may be related to the different endoscopic and histologic appearance of right-sided colonic neoplasias.[51–53] The utility of colonoscopy should continue to increase with the recognition of quality indicators for the procedure and advances in intraprocedural technologies to improve polyp detection.

Addressing sociocultural barriers, improving access to CRC screening modalities, and improvement in existing screening procedures are important, but may not entirely explain underlying differences in CRC epidemiology between Hispanics and non-Hispanic Whites. The disparity in cancer exists not only at the population level, but may also exist at the molecular/genetic level. Confronting these differences in tumor biology is vital in alleviating their influence on health-care disparities and screening test outcomes. Increasing attention has been paid to the different biology between right- and left-side lesions as well as variance by ethnicity.[54–56] Poorly understood is the role of ethnic variability in molecular markers and their potential role in CRC disease outcome and late stage at diagnosis; this gap in knowledge exists because few studies address the molecular mechanism of CRC in minority populations. Minority populations in particular are disproportionately diagnosed with right-sided colon cancers.[57,58] Microsatellite instability is also more likely to occur in cancers of the right colon than the left colon and rectum.[59] These findings support the future investigation of microsatellite instability in Florida Hispanics.[60]

Prior investigations do not support the notion of an increased prevalence of proximal colonic neoplasia in Hispanics. A review of SEER data that segregated groups by race and ethnicity notes that Hispanics develop fewer CRCs in the proximal colon than non-Hispanic Whites or Blacks.[61] In fact, Hispanic Americans develop distal CRCs more frequently and at an earlier age than the population at large.[62] Although Blacks in the United States are commonly diagnosed with proximal colon malignancies, this is not true for US Hispanics.[63] American Blacks commonly, but not universally, demonstrate a preponderance of proximal colonic lesions.[64,65]

Although the FCDS has received Gold Certification from the NAACCR since 2003, all cancer registry data can be limited by the accuracy and completeness of the data. Staging data are not always complete, and cancer records from the Florida Veteran's Administration medical facilities are not included. In the present study, this could exclude a number of Puerto Rican patients who utilize the Veteran's Administration system. In addition, the denominator data used to calculate incidence rates were based on US Census estimates, which can also be subject to inaccuracies. Application of the HOIA algorithm to the FCDS data has reduced misclassification of Hispanic subgroups, but it must be acknowledged that misclassification of Hispanic subgroups still occurs. Also, the lack of annual census estimates for Hispanic subgroups within Florida prevented us from calculating cancer incidence estimates for our pooled data.

In summary, trends in colorectal rates have declined significantly for both Hispanics and non-Hispanic Whites in Florida since the 1990s. However, rate trends for distant-stage CRC increased significantly among male and female Florida Hispanics, whereas rates decreased among non-Hispanic Whites. Similar patterns were observed when analyzing distant-stage rates in the right-sided colon; overall decreasing trends occurred among non-Hispanic White males and females whereas increasing trends were observed among male and female Hispanics. Variations in effective screening modalities, screening compliance, and access to insurance for screening coverage could play a significant role

in producing these trends. Moreover, scientific investigations of molecular markers are warranted to fully understand the biological mechanisms behind varying trends in distant-stage and right-sided CRC.

CONFLICT OF INTEREST

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Study Highlights

WHAT IS CURRENT KNOWLEDGE

- Hispanic CRC incidence is traditionally believed to be lower than non-Hispanic White counterparts.
- In the US Hispanics are less likely to participate in CRC screening.

WHAT IS NEW HERE

- Distant-stage CRC is increasing among Florida Hispanics.
- The ethnic disparity for incidence of distant-stage CRC originating in the right colon continued to widen during the study period.

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