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Acculturation and Familiarity With, Attitudes Towards and Beliefs about Genetic Testing for Cancer Risk Within Latinas in East Harlem, New York City

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Abstract

Recent research underscores the need for increasing use of genetic testing for cancer risk in Latinos. This study examined the influence of acculturation on attitudes, beliefs about and familiarity with genetic testing for cancer risk in a community-based sample of Latinas in East Harlem, New York City (*N*=103). Multivariate linear regression models analyzed the relationship of acculturation to: (1) familiarity (2) perceived benefits (3) perceived barriers and (4) concerns about abuses of genetic testing for cancer risk. Controlling for sociodemographic factors, results revealed that with increasing acculturation Latinas were more familiar with genetic testing (β=1.62, SE=0.72, *p*=0.03), more likely to cite perceived benefits (β=1.67, SE=0.79, *p*=0.04), and less likely to report perceived barriers related to genetic testing (β=−2.76, SE=1.64, *p*= 0.10). Study results may help inform the development of culturally-appropriate health education outreach materials and programs targeted to increase awareness, knowledge and understanding about genetic testing for cancer risk within Latinas.

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Keywords

Genetic testing; Acculturation; Latinas

Introduction

Growing Disparities in Use of Genetic Services for Cancer Prevention

Despite the now relatively wide availability of genetic services for cancer prevention, including genetic counseling and testing for cancer risk, there is increasing evidence of a widening gap across racial/ethnic groups between those who have access to and knowledge of such services and those who do not (Hall and Olopade 2006, 2005; Olopade 2004). Recent literature highlights the urgency of increasing genetic testing access and participation in racial/ethnic minority and underserved populations in an attempt to eliminate such disparities (Hall and Olopade 2006, 2005; Olopade 2004).

Genetic Services and Latinos

The study of the determinants and barriers to genetic testing and counseling for cancer risk may become of increasing importance within Latinos, the fastest growing minority group in the U.S. (U.S. Census Bureau 2004). Recent reports from Myriad Genetic Laboratories show that of the 46,276 (not including Ashkenazi) individuals undergoing *BRCA* testing for breast cancer risk in the years 1996–2007 only 4% were Latinas (Noll et al. 2007), a strikingly low number given that Latinos represent 14% of the U.S. population as of 2004 (U.S. Census Bureau 2004). Meanwhile, despite lack of official population estimates, studies suggest that the prevalence levels of *BRCA* gene mutations in Latinas are at least comparable to what is seen in other ethnic groups (Frank et al. 2002; Weitzel et al. 2005).

Genetic testing for cancer risk may be paramount for Latinos as recent estimates from the American Cancer Society for 2006–2008 rate cancer as the second leading cause of death in Latinos, with breast cancer the most commonly diagnosed cancer and leading cause of death in Latinas (ACS 2006). Incidence rates of breast cancer may be lower in Latinas, however Latinas are 22% more likely to die of breast cancer during the 5 years after diagnosis compared to white women (ACS 2006). This differential in survival may be attributable to later stage at time of diagnosis in Latinas and/or other factors including genetics (ACS 2006). Recent analysis of the Surveillance, Epidemiology and End Results (SEER) tumor registries in Detroit and Los Angeles found that Latinas were significantly less likely to be diagnosed at early stages of breast cancer compared to white women, even when controlling for income, education and method of detection (Lantz et al. 2006).

Latinos face unique health care needs that may impact barriers to genetics services for cancer prevention. Latinos account for 30% of the uninsured population in the U.S. (Shah and Carrasquillo 2006), with an undocumented population of 11 million as of 2005 (Passel 2005). Within East Harlem, a predominantly Latino community in New York City (55% of the population), 26% of the population was uninsured as of 2006, with 37.2% of foreign-born Latinos uninsured compared to 15.9% of U.S. born Latinos (NYC Department of Health and Mental Hygiene 2006). Lack of health care access may also be confounded by language barriers among those Latinos who speak primarily Spanish (APHA 2002).

Barriers to Underuse of Genetic Testing for Cancer Risk in Latinos

Recent literature has identified barriers to the underuse of genetic testing for cancer risk in Latinos, including lack of knowledge and awareness. In an analysis of the 2000 National Health Information Survey (NHIS), only 20.6% of Latinos reported having heard of genetic testing

for cancer risk, compared to 32.9% of African Americans and 49.9% of whites (Wideroff et al. 2003). Attitudes may also influence use of genetic testing, as a community-based study previously conducted by members of our research team in East Harlem found that Latinas were more likely to agree with questions about perceived disadvantages of genetic testing compared to African American and white women. Spanish language preference was one of the only significant predictors of perceived disadvantages of genetic testing, after controlling for other sociodemographic factors (Thompson et al. 2003). Further, Latinas reported facing many barriers to genetic testing including: lack of time, low priority placed on genetic testing because most women currently felt healthy and anticipation about feeling ashamed if genetic testing results were positive (Thompson et al. 2003). Similarly, in a telephone-based survey conducted across a generalized population, Latinos and African Americans were found to have more negative beliefs about the consequences of genetic testing compared to whites, as well as report less resources available for genetic testing including information and finances/insurance (Singer et al. 2004). However, this same study found that 76.5% of Latinos said they would want to be tested for a “treatable genetic disease” (Singer et al. 2004).

Acculturation and Genetic Testing

These findings highlight the critical need for designing culturally-appropriate health education outreach materials and programs for genetic testing for cancer risk targeted to the needs and values of Latinos. However, in order to design such interventions future studies must address genetic testing attitudes, beliefs and barriers found within Latinos. Although often treated in the health literature as a relatively homogenous group, Latinos in the U.S. represent complex, diverse groups of individuals, differing in nativity, countries of origin, population distribution and acculturation (U.S. Census Bureau 2004). Acculturation is traditionally defined as the degree to which the majority culture is adopted by a minority culture (Suarez 1994), representing the process of ethnic groups exchanging cultural elements and complexes (Abraido-Lanza et al. 2006). There are a range of approaches that currently exist for the assessment of acculturation, including measuring nativity, language use, years residence in the U.S. and cultural immersion assessed via scales incorporating language, media use and social relations (Caetano 1987; Marin et al. 1987; Marin and Gamba 1996; Snowden and Hines 1999). However, there is currently no clear consensus on the most useful measures. Recent literature highlights the multi-dimensional and extraordinarily complex nature of acculturation, involving the simultaneous maintenance and adaptation of some cultural characteristics (Abraido-Lanza et al. 2006), suggesting measures including an individual’s level of cultural immersion may be most appropriate.

For Latino immigrants, acculturation may represent one of the strongest forces impacting health beliefs and behaviors, with review of the acculturation and health literature highlighting this complexity (Lara et al. 2005; Vega and Amaro 1994). On the one hand, there may be a negative effect of acculturation on specific health behaviors and outcomes, including substance abuse, diet, birth outcomes, cancer rates and high blood pressure (Lara et al. 2005; Vega and Amaro 1994). Conversely, a range of positive effects of acculturation on other health outcomes may be found, including health care use, self-perceptions of health, as well as better preventive behaviors including cancer detection and screening (Brown et al. 2006; Lara et al. 2005; Vega and Amaro 1994).

Yet, although previous literature has documented a negative association of acculturation in Latinos to cancer risk and incidence (Eschbach et al. 2005; John et al. 2005) and positive association of acculturation to screening behaviors for cancer (Abraido-Lanza et al. 2005; Carrasquillo and Pati 2004; Echeverria and Carrasquillo 2006; O’Malley et al. 1999; Rodriguez et al. 2005), there is a surprising lack of information about the relationship of acculturation to genetic testing awareness, attitudes and beliefs. Recent analysis of the 2000 NHIS data revealed

that immigration status was one of the strongest predictors of awareness of genetic testing in the U.S. general population (Honda 2003), yet to our knowledge, only two studies to date have addressed this question within Latinos. Examining a sample of Latino respondents in the 2000 NHIS study, awareness of genetic testing was analyzed through responses to a single question regarding genetic testing familiarity. Vadaparampil et al. (2006) found that completing the interview in Spanish and English or only Spanish was inversely associated with genetic testing awareness, as was having an intermediate or low level of English language preference. Similarly, more recent analysis of Latinos in the 2000 and 2005 NHIS studies found that greater use of English was associated with increased awareness of genetic testing, while residence in the U.S. for less than 5 years was associated with less awareness of genetic testing (Heck et al. 2008). Limitations of these studies included the following: acculturation was measured through language use or years in the U.S., alone and genetic testing awareness was assessed with a single question.

Study Hypotheses

In this study, we hypothesize that acculturation should influence attitudes, beliefs about and familiarity with genetic testing for cancer risk. We hypothesize that with increasing acculturation, Latinas will be more familiar with genetic testing and have more positive attitudes and beliefs about genetic testing for cancer risk, based on previous research demonstrating a positive relationship between acculturation and other cancer prevention-related behaviors, including early screening and detection (Abraido-Lanza et al. 2005; Carrasquillo and Pati 2004; Echeverria and Carrasquillo 2006; O'Malley et al. 1999; Rodriguez et al. 2005).

The current study is distinguished from previous research conducted on this topic. Namely, this study addresses previous research limitations by assessing acculturation via a more expanded understanding of an individuals' level of cultural immersion through the use of an acculturation scale, compared to proxy indicators of acculturation such as language or years residence in the U.S.. Such proxies, while convenient to measure for the purpose of national studies, are limited in their ability to capture cultural immersion. In a smaller study which can use acculturation scales we gain a level of specificity and precision to measuring this cultural immersion, which ultimately may be more directly related to the shaping of health behaviors than either years in the U.S. or language, alone.

Conceptual Model: Health Belief Model

Furthermore, the conceptual model of this study incorporates a theoretical framework adapted from the Health Belief Model (HBM) of behavior change to examine the relationship of acculturation to a wide range of outcomes which may influence genetic testing uptake including: (1) familiarity with genetic testing, (2) perceived benefits related to genetic testing, (3) perceived barriers related to genetic testing and (4) concerns about abuses of genetic testing for cancer risk. The HBM is widely recognized in the public health field as an important component to health education programming as it has been empirically linked to a range of preventive health behaviors and interventions, including screening and is therefore applicable to genetic testing for cancer risk (Becker et al. 1974; Janz and Becker 1984; Strecher and Rosenstock, 1997). In the context of cancer prevention, the HBM examines the likelihood an individual will take a preventive action to a cancer threat (in this case, genetic testing for cancer risk) based on perception of their vulnerability to cancer and benefits and barriers related to the action or behavior (Glanz et al. 1997; Janz and Becker 1984; Rosenstock 1974; Strecher and Rosenstock 1997).

We have chosen to adapt the HBM for this study to focus on the four identified outcomes outlined above based on previous research of the HBM which examine mediating factors to

uptake of genetic testing for cancer risk, specifically. Such studies demonstrate that one's likelihood of undergoing genetic testing is dependent not only on awareness of genetic testing, as has been analyzed in prior studies, but influenced by additional factors, including perceived benefits and perceived barriers related to genetic testing (Bosompra et al. 2000; Bunn et al. 2002). In fact, review across HBM studies demonstrates that perceived barriers may be one of the most powerful and predictive factors of the HBM dimensions (Janz and Becker 1984). Meanwhile, background factors including sociodemographics, personal and family history of cancer and medical mistrust may also inform our study outcomes and are therefore incorporated into the conceptual model (Bosompra et al. 2000; Bunn et al. 2002; Thompson et al. 2003, Thompson et al. 2004).

Methods

Study Setting and Population

A secondary analysis was conducted on survey data previously collected from a sub-sample of Latina participants (*N*=103) originally recruited from the East Harlem Partnership for Cancer Awareness (EHPCA), a collective of hospitals and community health centers formed in 1999 in northern Manhattan, New York City to reduce disparities in cancer screening and prevention among medically underserved minorities (Jandorf et al. 2005). The purpose of the original EHPCA study was a needsassessment to develop community based interventions to increase awareness of cancer risk, prevention, and treatment, and foster participation in cancer screening and early detection (Jandorf et al. 2005). In the secondary analysis presented in this paper, we used a convenience sample taken from the original EHPCA community-based study, rather than focus on high-risk families only, as previous research demonstrates interest in genetic testing for cancer risk in the general population (Andrykowski et al. 1996; Tambor et al. 1997). We also chose to focus exclusively on a subset of Latina women, as there is increasing need to understand beliefs about genetic testing as it relates to breast cancer risk. Eligibility criteria for participation in the original EHPCA study included: at least 18 years of age, living, working or receiving health care in East Harlem, speaking English or Spanish and providing informed consent. Participants were recruited by trained health educators and research interviewers at EHPCA clinic sites, street fairs, senior centers and other community venues. In total, 248 people agreed to participate in the original EHPCA study, among 103 who self-identified as being of primarily Hispanic/Latina ethnicity and were therefore included in the secondary analysis conducted here. All EHPCA participants had previously completed the 1 h interviewer-administered survey at the recruitment site (*N*=173; 70%) or via telephone (*N*=75; 30%) to determine demographic characteristics of the community, knowledge of and participation in cancer screening, and barriers related to screening. Participants completed the interview in English or Spanish (45.6% English and 54.4% Spanish among Latinas), with both versions of surveys developed by bilingual health educators and then translated using a standard back-translation procedure. Participants received $10 for completing the EHPCA survey. Study design and informed consent was approved by Mount Sinai's Institutional Review Board.

Measures

Covariates

Sociodemographic Information—Sociodemographic information included participants' age, education, income, marital status, employment, primary care doctor, and insurance status.

Family and Personal History of Cancer—Information about participants' family history of cancer and personal history of cancer was included.

Medical Mistrust—Medical mistrust was included as a covariate, based on previous research indicating that medical mistrust is associated with attitudes about genetic testing in Latinas (Thompson et al. 2003, 2004). Medical mistrust was measured using the Group-Based Medical Mistrust Scale (GBMMS), a 12-item scale including questions related to suspicion of mainstream health care systems and health care professionals and the kind of treatment provided to individuals of the respondent's ethnic/racial group (Thompson et al. 2004). Participants responded using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree), with total medical mistrust score computed by adding all responses (score range=12–60). The internal validity of the scale in this sample was considered strongly reliable (α=0.84).

Predictors

Acculturation Level—Acculturation level was measured using the mean score of responses computed from a 10-item-questionnaire adapted and previously used in Latino and African American populations (Caetano 1987; Snowden and Hines 1999). This questionnaire represented several dimensions of participants' race/ethnicity-related cultural immersion including: media preferences and language use (music, television and radio), balance in the context of social interaction (friends, church, parties, neighborhoods), attitudes (relying on relatives for help, desirability of interracial marriage) and degree of comfort in interaction with whites versus Latinos (Caetano 1987; Snowden and Hines 1999). Participants responded using a Likert-type scale with different ranges depending on topic. Responses were summed and then averaged across the number of questions answered rather than a total score computed, as some questions had the potential for non-applicable responses (for example, some may report they never go to church or parties). The mean acculturation level ranged from a possible 1–4, with higher score indicating more acculturation. Internal reliability of the items in the acculturation scale for this sample was considered good (α=0.79).

Other acculturation-related measures are reported in the descriptive statistics (Table 1), including: proportion of one's life spent in the U.S., interview language, nativity, and country of origin. However, unlike previous research, this study was interested in examining a more in-depth assessment of an individual's level of cultural immersion using an acculturation scale. Other acculturation-related measures were therefore not included in final models due to concerns of collinearity between measures and strong multicollinearity with the acculturation scale being incorporated in this study (p<0.0001).

Outcomes

The EHPCA survey provided a one-paragraph description in layman's terms of genes, how genes carry information and influence disease, and that genetic tests use a small sample of blood to look at a person's genes. This description was created by board-certified genetic counselors and was not cancer-site specific.[1] Participants then answered the following questions about genetic testing for cancer risk:

Familiarity with Genetic Testing—Familiarity with genetic testing for cancer risk was measured using a four-item questionnaire (high = more familiarity) which asked participants to assess how much they already know about cancer and genetics. Example questions included: "How much have you heard or read about genetic testing for inherited disease (diseases that run in families)?" and "How much have you heard or read about genetic testing for breast cancer?" Participants responded using a Likert-type scale ranging from 1 (almost nothing) to 4 (a lot), with total familiarity with genetic testing score computed by summing all responses (score range=4–16). Reliability of the items in this scale was strong (α=0.88).

[1]A copy of the one-paragraph description may be obtained by contacting study authors.

Perceived Benefits Related to Genetic Testing—A six-item questionnaire was used to assess perceived benefits related to genetic testing for cancer cited by respondents. Example statements included: "My genetic test results could give my family members useful information about their risk of getting cancer" and "I would obtain genetic testing for cancer now so I can avoid future problems". Participants responded using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree), with total perceived benefits related to genetic testing score computed by adding responses to all six questions (score range=6–30). There was adequate reliability for the items in this scale (α=0.72).

Perceived Barriers Related to Genetic Testing—Participants responded to an 11-item questionnaire asking about perceived barriers related to genetic testing for cancer risk. Such perceived barriers may include those which may impede having the genetic test completed, as well as those that occur as a result of genetic testing. Example topics included: implications of testing positive such as financial problems, trouble getting health insurance, harm caused to family members, confidentiality of test results, potential stigma of *BRCA* mutation carrier status, and barriers including lack of time for genetic testing. Participants responded using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) and responses were then summed to create a total perceived barriers related to genetic testing score (score range=11–55). Reliability of the items in this scale was considered good (α=0.78).

Concerns About Abuses of Genetic Testing—Concerns about abuses of genetic testing for cancer risk were assessed through a five-item questionnaire previously examined across racial/ethnic groups focusing on concerns or beliefs that genetic testing could be used to manipulate others, discriminate against others, or appropriate control that is supposed to lie with God (Thompson et al. 2003). Example statements included: "The results of genetic tests are used to treat certain people unfairly", "Genetic tests allow doctors and scientists to 'play God'" and "Genetic tests are used to show that my ethnic group is not as good as others". A Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used for all responses, with total concerns about abuses of genetic testing score created by summing all five responses (score range=5–25). There was good reliability for the items in this scale (α=0.76).

Analytic Plan—Basic descriptive statistics were computed on all available data. Crude univariate linear regression analyses were performed testing each predictor and covariate individually and its potential association with the four primary study outcomes: (1) familiarity with genetic testing, (2) perceived benefits related to genetic testing, (3) perceived barriers related to genetic testing and (4) concerns about abuses of genetic testing. Multivariable linear regression models were developed separately for each study outcome with the following steps: All significant covariates (at $p \leq 0.10$) in univariate analyses were chosen as covariates for inclusion in the candidate short list for multivariable models. A forward selection test was conducted as the automatic statistical procedure of choice to control for potential problems of collinearity. Missing values were not included in analyses. Due to a relatively small sample size, a level of significance of $p \leq 0.10$ was chosen as most appropriate for determining entry into final models.

Variables significant from the forward selection test were then included in final multivariable linear regression models. After the forward selection test, all other covariates were added one by one to test for potential confounding, as long as they did not introduce potential collinearity into the model. Any such covariates producing a change of at least 20% in the odds ratios of predictors already in the model (as a result of forward selection) were considered confounders and included in final models. Any theoretically relevant sociodemographic variables were also added. The percentage of the variability explained by the final multivariable linear regression model was computed using an R^2 test. SAS software package v.9.1.3 was used to perform all

statistical procedures. A level of $p \leq 0.05$ was chosen to determine overall statistical significance of variables in the final model.

Results

Sample Characteristics

Sample characteristics are presented in Table 1. One hundred and three Latina women were included in the sample. The mean acculturation level was 1.95 (S.D.=0.52; range=1.0–3.5), indicating participants were of medium level acculturation status. About half chose to complete the interview in Spanish (54.5%) and the majority of participants were foreign-born (71.8%) (predominantly from Puerto Rico, Mexico, and the Dominican Republic), with the mean proportion of lifetime spent in the U.S. over 60% of their life. The mean age of participants was 45.19 (S.D.= 16.95; min=21, max=83). The majority of participants reported a household income of less than $20,000/year, had attained less than or the equivalent of a high school diploma/GED, and were not currently married or working. Most participants were insured (including public and private) and had access to a primary care doctor. Nearly all participants had no personal history of cancer, while half reported a family history of cancer.

Sample means for the four study outcome variables, (1) familiarity with genetic testing, (2) perceived benefits related to genetic testing (3) perceived barriers related to genetic testing and (4) concerns about abuses of genetic testing were: 7.42 (S.D.=3.44; min=4, max=16), 24.85 (S.D.=3.94; min=13, max=30), 29.71 (S.D.=8.51; min= 11, max=49) and 11.30 (S.D.=4.65; min=5, max=25), respectively.

Univariate Results

Table 2 reports the unadjusted predictors of the four study outcomes. Acculturation was a significant predictor of all study outcomes. Other significant predictors of genetic testing outcomes in univariate analyses were the following: age was associated with concerns about abuses of genetic testing, medical mistrust was associated with perceived benefits, perceived barriers and concerns about abuses of genetic testing and insurance status was associated with familiarity with genetic testing.

Multivariate Results

Final multivariate models are reported in Table 3, Table 4, Table 5 and Table 6, adjusted for covariates considered theoretically relevant and/or necessary (including age, education, insurance status and family history of cancer) based on previous literature conducted in this topic area (Honda 2003;O'Malley et al. 1999;Thompson et al. 2003;Thompson et al. 2004). Results showed that with increasing acculturation Latinas were more familiar with genetic testing, more likely to cite perceived benefits related to genetic testing, and less likely to report perceived barriers related to genetic testing, even after controlling for sociodemographic factors. Meanwhile, acculturation was not associated with concerns about abuses of genetic testing for cancer risk in multivariate analysis.

Other significant variables in multivariate analyses included: insured Latinas were more likely to be familiar with genetic testing than uninsured Latinas; with increasing levels of medical mistrust, Latinas were less likely to cite perceived benefits related to genetic testing, more likely to report perceived barriers related to genetic testing and more likely to cite concerns about abuses of genetic testing for cancer risk; and age was positively associated with concerns about abuses of genetic testing for cancer risk. The proportion of variance accounted for by each final regression model was the following: R^2=0.20 (familiarity with genetic testing); 0.18 (perceived benefits of genetic testing); 0.24 (perceived barriers related to genetic testing); 0.33 (concerns about abuses of genetic testing).

Discussion

This study sought to examine the influence of acculturation on attitudes, beliefs about and familiarity with genetic testing for cancer risk within Latinas in East Harlem, New York. Overall, we found that Latinas with higher acculturation levels were more likely to be familiar with genetic testing, more likely to cite perceived benefits related to genetic testing and less likely to report perceived barriers related to genetic testing for cancer risk. These findings were consistent with two previous studies based on national samples which found an association between language preference, years lived in the U.S. and genetic testing awareness (Heck et al. 2008; Vadaparampil et al. 2006). In contrast to previous studies which used proxy measures of acculturation such as language or years in the U.S. (Heck et al. 2008; Vadaparampil et al. 2006), this study included a more in-depth understanding of an individual's level of cultural immersion and acculturation via race/ethnicity-related cultural and media preferences, attitudes and social interactions (Caetano 1987; Snowden and Hines 1999).

Furthermore, informed by elements of the HBM of behavior change, the results of this study expand upon previous research to document the association of acculturation not only with familiarity with genetic testing, but also perceived benefits and barriers related to genetic testing. Using this conceptual approach, we gain a more complete understanding of how acculturation may influence the range of attitudes and beliefs which eventually impact genetic testing behavior. Although this study did not assess uptake of genetic testing, study findings relate to previous research on the HBM which suggest that perceived barriers may be the strongest predictor of taking a behavior change action (Janz and Becker 1984; Strecher and Rosenstock 1997). Similarly, studies on intention to obtain genetic tests for cancer risk demonstrate the influence of perceived benefits and barriers (Bosompra et al. 2000; Bunn et al. 2002); specifically, perceived barriers most highly correlate with intention to undergo testing (Bunn et al. 2002). Our findings fall in line with this research by identifying acculturation as a critical within-group factor which may influence such perceived attitudes and beliefs about genetic testing.

Implications for Genetic Counseling Practice

In agreement with previous literature which found a positive association between acculturation and cancer preventive practices, including early screening and detection (Abraido-Lanza et al. 2005; Carrasquillo and Pati 2004; Echeverria and Carrasquillo 2006; O'Malley et al. 1999; Rodriguez et al. 2005), our results demonstrated that with higher acculturation, Latinas were more likely to have more positive attitudes and beliefs about genetic testing for cancer risk. Study implications for genetic counseling practice thus underscore the importance of examining such within-group differences within Latinas by acculturation level to better determine possible barriers to genetic testing, as well as to more accurately represent the diversity of Latino experiences related to genetic testing for cancer risk. Gaining this understanding of Latino diversity, in turn, may help inform the design of more culturally-appropriate and sensitive education materials which serve multiple functions, including potentially creating more positive attitudes and beliefs about genetic testing and thereby helping to increase the number of Latinas who use genetic services for breast cancer. Ultimately, the use and application of these culturally-appropriate and sensitive materials by health educators and genetic counselors may lead to more effective cancer prevention and control management and reduce the growing genetic testing-related health disparities witnessed in this population.

Although acculturation was the focus of our paper, we argue that acculturation should be treated as only one component impacting Latino cultural influences on health. It is imperative that researchers acknowledge the role of other factors which may confound familiarity with, attitudes towards and beliefs about genetic testing, including health care and information access

related to insurance status within Latino communities. As the number of uninsured Latinos in the U.S. grows amidst large decreases in Medicaid coverage (Shah and Carrasquillo 2006), the relevance of our findings which demonstrated an association between insurance status and familiarity with genetic testing are particularly timely. Further, recent research underscores the importance of providing access to cancer genetics services in underserved Latina communities, as access, alone, may increase uptake of these services (Ricker et al. 2007). Finally, study findings related to medical mistrust confirmed previous research documenting how an overall suspicion of the medical establishment within Latinas may influence beliefs about the purpose and value of genetic testing (Thompson et al. 2003).

Following in line with the HBM of behavior change, future research should explore the extent to which familiarity with, attitudes towards and beliefs about genetic testing impact perceived interest, actual uptake and use of genetic testing services based on acculturation. Recent literature suggests that Latinos may express a largely positive interest in genetic testing services despite significant gateway barriers. Among underserved Latinos in Los Angeles, 96% said they would take a blood test to determine their cancer risk, while 95% indicated they would go to a cancer risk clinic if recommended by their doctor (Ricker et al. 2007). In a study of women with a family member with breast cancer, Latinas reported a high level of interest in genetic testing for breast cancer susceptibility despite low awareness. This finding suggests that lack of knowledge may, in effect, drive interest level (Ramirez et al. 2006). Understanding the mechanisms by which an apparently high level of interest of genetic testing translates into actual use or non-use of such services remains an area to be further explored in Latino populations and yet to be addressed in terms of acculturation.

Study Limitations and Research Recommendations

Some study limitations should be noted. First, this study was based on a convenience sample taken from an urban, community-based study rather than a high-risk cancer population, as previous studies documented communitywide interest in genetic testing (Andrykowski et al. 1996; Tambor et al. 1997). Potential selection bias of this convenience sample may thus limit the generalizability of study results. Future research should replicate these findings among those most in need of genetic testing, including Latinas at high risk for carrying a *BRCA* genetic mutation. Second, while conducted in East Harlem, a community with many medically uninsured (NYC Department of Health and Mental Hygiene 2006), our sample was marked by unusually high levels of medical insurance coverage among participants which could potentially bias results. Access to healthcare and insurance coverage may be factors which vary widely within Latino groups and by acculturation level. Third, as we were particularly interested in recent research highlighting the underuse of *BRCA* genetic testing (Hall and Olopade 2006, 2005; Olopade 2004), our sample only included Latinas and may not be applicable to men.

Furthermore, the generalizability of study results to Latino subgroups or countries of origin may be limited. While participants in this study self-identified as Latino/ Hispanic, it is not known whether these women represented multiple races beyond this primary ethnic identity and therefore whether differences exist in genetic testing attitudes based on this possible racial diversity. In addition, although these Latinas represent diverse countries of origin including Puerto Rico, Mexico, Dominican Republic, Central/South America and the U.S., small sample sizes limited the ability of this study to examine country of origin as a predictor of attitudes and beliefs about genetic testing. Studying Latinos by country of origin may be necessary as analyses of the 1997–2001 National Health Interview surveys found distinct health patterns among Latino ethnic groups, documenting perceived health benefits for Mexicans, health disparities for Puerto Ricans and a mix of health disparities and perceived benefits for Cubans and Dominicans depending on the health outcome in question (Zsembik and Fennell 2005).

Similarly, language usage may vary in Latino immigrants by country of origin with years of U.S. residence (Arcia et al. 2001), ultimately affecting acculturation and associated health beliefs and outcomes.

Conclusion

Study results underscore the extent to which acculturation is a critical factor influencing familiarity with, attitudes towards and beliefs related to genetic testing for cancer risk within Latinas. Research findings have important implications for addressing cancer disparities across race/ethnicity and highlight the need for the creation of culturally-appropriate health education interventions and programs targeted to increase awareness, knowledge and understanding about genetic testing for cancer risk within Latinos.

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Table 1

Sample Characteristics

	Sample mean (SD)	Possible range	Actual range	*n*[b]	%
Outcome variables					
Familiarity with GT[a]	7.42 (3.44)	4–16	4–16	91	n/a
Perceived benefits related to GT[a]	24.85 (3.94)	6–30	13–30	85	n/a
Perceived barriers related to GT[a]	29.71 (8.51)	11–55	11–49	84	n/a
Concerns about abuses of GT[a]	11.30 (4.65)	5–25	5–25	86	n/a
Predictor variables					
Acculturation level[a]	1.95 (0.52)	1–4	1–3.5	91	n/a
Proportion years lived in U.S.	0.64 (0.33)	0–1.00	0.02–1.00	102	n/a
Interview language					
English	n/a	n/a	n/a	47	45.6
Spanish	n/a	n/a	n/a	56	54.4
Nativity					
Foreign born	n/a	n/a	n/a	74	71.8
U.S. born	n/a	n/a	n/a	29	28.2
Country of origin (among foreign born)					
Puerto Rico	n/a	n/a	n/a	43	58.1
Mexico	n/a	n/a	n/a	12	16.2
Dominican Republic	n/a	n/a	n/a	9	12.2
Central America	n/a	n/a	n/a	8	10.8
South America	n/a	n/a	n/a	2	2.70
Age	45.19 (16.95)	18–none	21–83	103	n/a
Education					
≤High school diploma/GED	n/a	n/a	n/a	75	72.8
>High school diploma/GED	n/a	n/a	n/a	28	27.2
Income					
≤$19,999/year	n/a	n/a	n/a	81	87.1
≥$20,000/year	n/a	n/a	n/a	12	12.9
Marital status					
Currently married/living together	n/a	n/a	n/a	40	38.8

	Sample mean (SD)	Possible range	Actual range	*n*[b]	%
Not currently married/living together	n/a	n/a	n/a	63	61.2
Employment					
Currently working	n/a	n/a	n/a	25	24.3
Not currently working	n/a	n/a	n/a	78	75.7
Medical mistrust[a]	28.18 (9.34)	12–60	12–49	95	n/a
Family history of cancer					
Yes	n/a	n/a	n/a	56	55.5
No	n/a	n/a	n/a	45	45.5
Personal history of cancer					
Yes	n/a	n/a	n/a	5	4.9
No	n/a	n/a	n/a	97	95.1
Primary care doctor					
Yes	n/a	n/a	n/a	81	79.4
No	n/a	n/a	n/a	21	20.6
Insurance status					
Insured (including public and private)	n/a	n/a	n/a	79	79.8
(Private)	n/a	n/a	n/a	13	16.5
(Public)	n/a	n/a	n/a	66	83.5
Non-insured	n/a	n/a	n/a	24	20.2

[a]Where variable is linear and a higher score indicates more of the given variable

[b]*n* values vary as not all questions were completed by all participants in the original EHPCA study

Table 2

Unadjusted Predictor Estimates of Genetic Testing (GT) for Cancer Risk Outcomes

Outcomes	Familiarity with GT	Perceived benefits related to GT	Perceived barriers related to GT	Concerns about abuses of GT
β Coefficient/parameter estimate (SE)				
Acculturation level[a]	2.01 (0.68)*	1.46 (0.81)*	−4.29 (1.79)*	−2.18 (0.97)*
Age	0.02 (0.02)	−0.03 (0.03)	−0.03 (0.05)	0.09 (0.03)*
Education				
≤High school vs. >HS	−0.88 (0.79)	−0.50 (0.95)	2.63 (2.05)	1.44 (1.10)
Income				
≤$19,999/year vs. ≥$20K/yr	−0.24 (1.06)	0.21 (0.86)	1.48 (2.53)	0.17 (1.54)
Marital status				
Married/living together vs. not married/ living together	−1.16 (0.73)	−0.32 (0.71)	0.59 (0.73)	−1.48 (0.15)
Employment not working vs. currently working	−0.79 (0.34)	−1.49 (0.13)	3.73 (1.89)*	2.79 (1.11)*
Medical mistrust[a]	−0.02 (0.04)	−0.11 (0.04)*	0.39 (0.09)*	0.22 (0.05)*
Family history of cancer				
No vs. yes	0.46 (0.73)	−0.46 (0.87)	−1.37 (1.89)	−1.19 (1.01)
Personal history of cancer				
No vs. yes	−1.14 (1.77)	0.43 (1.99)	−0.24 (3.92)	0.33 (2.76)
Primary physician				
No vs. yes	−1.16 (0.85)	0.33 (1.01)	1.29 (2.19)	−0.26 (1.19)
Insurance status				
Insured vs. non-insured	2.60 (0.84)*	−0.76 (0.98)	−1.91 (2.22)	0.52 (1.22)

*Significance level $p \leq 0.10$

[a]Where variable is linear and a higher score indicates more of the given variable

Table 3

Final Multivariable Model-Adjusted Predictors Familiarity with Genetic Testing for Cancer Risk

Characteristic	β Coefficient/parameter estimate (SE)	*p* value
Acculturation level[a]	1.62 (0.72)	0.03*
Insurance status (insured vs. non-insured)	2.21 (0.89)	0.01*
Age	0.02 (0.02)	0.47
Education (≤high school vs. >high school)	−0.93 (0.78)	0.23
Family history of cancer (no vs. yes)	0.89 (0.72)	0.22

* Significance level $p \leq 0.10$. $n=84$; $R^2=0.20$. Final model includes variables significant from forward selection procedure (acculturation level and insurance status) plus confounders (none) and any theoretically relevant covariates (age, education, and family history of cancer)

[a] Where variable is linear and a higher score indicates more of the given variable

Table 4

Final Multivariable Model-Adjusted Predictors Perceived Benefits Related to Genetic Testing for Cancer Risk

Characteristic	β Coefficient/parameter estimate (SE)	*p* value
Acculturation level[a]	1.67 (0.79)	0.04*
Medical mistrust[a]	−0.12 (0.04)	0.003*
Age	0.04 (0.03)	0.13
Education (≤high school vs. >high school)	0.08 (0.86)	0.93
Insurance status (insured vs. non-insured)	−1.37 (0.95)	0.16
Family history of cancer (no vs. yes)	−0.49 (0.80)	0.54

*Significance level $p \leq 0.10$. $n=81$; $R^2 = 0.18$. Final model includes variables significant from forward selection procedure (medical mistrust and acculturation level) plus confounders (none) and any theoretically relevant covariates (age, education, insurance status, and family history of cancer)

[a]Where variable is linear and a higher score indicates more of the given variable

Table 5

Final Multivariable Model-Adjusted Predictors Perceived Barriers Related to Genetic Testing for Cancer Risk

Characteristic	β Coefficient/parameter estimate (SE)	*p* value
Acculturation level[a]	−2.76 (1.64)	0.10*
Medical mistrust[a]	0.32 (0.08)	0.003*
Age	−0.05 (0.05)	0.34
Education (≤high school vs. >high school)	2.18 (1.77)	0.22
Insurance status (insured vs. non-insured)	−0.23 (1.96)	0.91
Family history of cancer (no vs. yes)	−0.49 (1.64)	0.76

*Significance level $p \leq 0.10$. $n=81$; $R^2 = 0.24$. Final model includes variables significant from forward selection procedure (acculturation level and medical mistrust; employment status fell out of significance) plus confounders (none) and any theoretically relevant covariates (age, education, insurance status, and family history of cancer)

[a]Where variable is linear and a higher score indicates more of the given variable

Table 6

Final Multivariable Model-Adjusted Predictors Concerns about Abuses of Genetic Testing for Cancer Risk

Characteristic	β Coefficient/parameter estimate (SE)	*p* value
Acculturation level[a]	−1.01 (0.94)	0.29
Medical mistrust[a]	0.19 (0.05)	0.0002*
Age	0.06 (0.03)	0.06*
Employment (not working vs. currently working)	1.73 (1.06)	0.11
Education (≤high school vs. >high school)	0.80 (1.00)	0.42
Insurance status (insured vs. non-insured)	0.21 (1.12)	0.86
Family history of cancer (no vs. yes)	−0.40 (0.94)	0.67

*Significance level $p \leq 0.10$. $n=81$; $R^2 = 0.33$. Final model variables significant from forward selection procedure (acculturation level, medical mistrust, age and employment) plus confounders (none) and any theoretically relevant covariates (education, insurance status, and family history of cancer)

[a]Where variable is linear and a higher score indicates more of the given variable