

Colorectal Cancer Screening of Californian Adults of Mexican Origin as a Function of Acculturation

Marilyn Johnson-Kozlow

Published online: 28 February 2009
© Springer Science+Business Media, LLC 2009

Abstract *Background* Californian Latinos have lower rates of colorectal cancer (CRC) screening compared to non-Latino whites, which may account in part for disparities in colorectal incidence trends. *Methods* Participants, 603 Mexican-American men and 893 women aged 50 and older who had not been diagnosed with colon cancer, reported CRC screening behavior on the 2005 California Health Interview Survey. A 7-item acculturation index (English language use/proficiency, nativity, citizenship, and years living in the U.S.) was developed. A logistic regression model predicted CRC screening as a function of acculturation. *Results* Higher acculturated Mexican-Americans were 3–4 times more likely to have had both fecal occult blood test and endoscopic CRC screening. Lower acculturated Mexican men and women were twice as likely to not have any CRC screening. *Discussion* Colorectal screening is effective in preventing cancer; educational and outreach efforts and efforts to decrease language barriers among lower-acculturated Mexican-Americans should be intensified.

Keywords Mexican Americans · Colonoscopy · Acculturation · Colorectal cancer

Introduction

About 14% of the U.S. population is Latino [1] and most (60%) are Mexican-Americans. Nationally, colorectal cancer (CRC) is the second-most common cancer to be diagnosed among Latinos (11% of the cancers in Latino men and 9% of the cancers in Latino women), after prostate cancer in men and breast cancer in women. In general, increases in CRC screening over time have been hypothesized to be due to greater public awareness of its importance, the adoption of CRC screening as a benefit covered by medical insurance in the private and public sectors, and the implementation of screening programs in various U.S. states [2]. Although Latinos have lower rates of CRC compared to whites, they are diagnosed at a later stage and thus have a lower probability of survival following diagnosis compared to whites [3]. Further, based on the California Cancer Registry, from 1988 to 2002, there was a 26% decrease in invasive CRC incidence among non-Latino whites compared to a 8% decline among Latinos (<http://ccrcal.org/Cancer05/ColonRectum05.pdf>). Californian Latinos have lower rates of colorectal (CRC) screening compared to non-Latino whites [4] which may account in part for the disparities in colorectal incidence. Understanding why Mexican-Americans have lower rates of CRC screening is important in order to reduce healthcare disparities, a major goal of the Healthy People 2010 national cancer screening objectives [5].

The present study investigated the role that acculturation plays in affecting whether California adults of Mexican origin (Mexicans and Mexican-Americans; hereafter referred to as Mexican-Americans) have CRC screening. CRC screening is comprised of either a fecal occult blood test (FOBT), lower endoscopic procedures, or both FOBT and endoscopy. National cancer screening guidelines [6]

M. Johnson-Kozlow
Graduate School of Public Health, San Diego State University,
San Diego, CA, USA

M. Johnson-Kozlow (✉)
9245 Sky Park Ct #225, San Diego, CA 92123, USA
e-mail: mfjohnson@projects.sdsu.edu

recommend that average-risk adults aged 50 years and older have an annual, flexible sigmoidoscopy every 5 years, a combination of FOBT and flexible sigmoidoscopy every 5 years, a double-contrast barium enema every 5 years, or colonoscopy every 10 years. Any positive test results following FOBT, sigmoidoscopy, or enema should be followed by a colonoscopy. Although colonoscopy has been considered the gold standard for CRC screening [7], it is expensive; FOBT plus sigmoidoscopy may be more cost effective in saving lives, and thus more commonly recommended [8].

The purpose of this study was to examine the relationship of acculturation on CRC screening rates among Californian Mexican-Americans. Analyses were adjusted for healthcare access, health status, and socioeconomic status as determined by review of the literature regarding cancer screening behaviors. It was hypothesized that after adjusting the covariates, acculturation would be significantly related to obtaining CRC screening among Mexican-Americans. Analyses were stratified by gender to investigate whether acculturation affects CRC screening rates differentially among Mexican-American men and women. Analyses were delimited to those aged 50 and older, as this is the age targeted for CRC screening guidelines. The analyses did not include those who had been told they had colon cancer, thus focusing on routine CRC screening.

Methods

Participants

A total of 603 Mexican-American men and 893 Mexican-American women aged 50 and older who had not been told they had colon cancer were identified from the 2005 California Health Interview Survey (CHIS) and investigated. The CHIS is a random-digit dial telephone survey of households in California. CHIS interviewed one adult (aged 18 years or older) from each household. The CHIS utilized several techniques to achieve statistically robust samples of ethnic populations.

Measures

CHIS Items

In the 2005 CHIS, two sets of items concerning colorectal screening practices were asked of those aged 40 and older (although for the purpose of analyses, only data for those aged 50 or older were analyzed). The first set of two items relevant to the analyses concerned lower endoscopy (sigmoidoscopy and colonoscopy) and covered whether respondents had ever had the test (yes–no), and whether a

doctor recommended endoscopy in the past year (yes–no). The second set of two items concerned at-home FOBT (whether they ever had the test and whether the FOBT was recommended by a doctor in the past year). If needed, during the interview respondents were given a description of each exam in order to clarify each procedure. If requested by the interviewee, the CHIS survey was administered in Spanish by a bilingual interviewer. The survey specifically referred to the at-home FOBT as this test is the only FOBT test demonstrated to be effective in clinical trials [9].

Acculturation Score

An acculturation score was developed by principal components analysis, using the continuous scores automatically generated by the Statistical Package for the Social Sciences (SPSS; Version 14). The acculturation score was based on a unidimensional model [10], emphasized degree of exposure to the dominant culture, and used items available in the 2005 CHIS. The score was composed of seven status variables that measure English language use and proficiency, nativity and citizenship, and years living in the U.S. Scores were scaled to a t-score distribution with a mean of 50 and standard deviation of 10; higher scores indicated higher acculturation.

The reliability and validity of the acculturation score were examined. Cronbach's alpha for the acculturation score was 0.91; indicating a high level of within-scale inter-item consistency reliability. Evidence of construct validity was observed in the present study through correlations with variables hypothesized to be related to acculturation. Very highly significant differences ($P < 0.001$) were found between lower- and higher-acculturated Mexican-Americans in the expected direction on income, education, and healthcare access (see Table 1).

Covariates

Logistic regression to predict CRC screening included three covariates in addition to acculturation. Three key covariates were identified for inclusion in the logistic regression model based on a review by Hiatt and colleagues [11] and a broad literature review [12–16]. Based on Hiatt review of 65 journal articles concerning predictors of cancer screening behaviors, the authors identified, in addition to attitudinal factors such as acculturation, the following predictors: socioeconomic status, health status, and access to the healthcare system. In the present analysis, socio-demographic status included poverty level and educational level. Health-related factors included age and health status. Access to the health care system included having health insurance, having a usual source of health-care, seeing a doctor in the past year, and getting a

Table 1 Descriptive statistics by gender and acculturation status among Mexican-Americans from the 2005 California Health Interview Survey^a

	Mexican-American sample	Men (<i>n</i> = 603)			Women (<i>n</i> = 893)			Gender	Acculturation
		Acculturation			Acculturation			<i>P</i>	<i>P</i>
		Low	High	<i>P</i>	Low	High	<i>P</i>	<i>P</i>	<i>P</i>
<i>Mean (SE)</i>									
Participant characteristics									
Age (years)	61.66 (0.2)	60.44 (0.6)	61.08 (0.6)	0.490	61.67 (0.5)	63.27 (0.6)	0.086	0.158	0.123
Acculturation ^b	49.84 (0.3)	41.68 (0.3)	58.78 (0.3)	<0.001	41.34 (0.3)	59.17 (0.2)	<0.001	0.737	<0.001
Percent									
% living above federal poverty level	74.0	62.4	94.6	<0.001	30.6	39.4	<0.001	0.022	<0.001
High school diploma	46.7	19.7	82.9	<0.001	20.2	68.0	<0.001	0.034	<0.001
Good health status ^c	55.4	50.0	68.8	0.001	33.2	70.4	<0.001	0.025	<0.001
Health insurance ^d	79.4	68.2	91.8	<0.001	69.2	90.3	<0.001	0.847	<0.001
Usual source of healthcare	90.2	81.4	96.9	<0.001	87.7	95.1	0.002	0.263	<0.001
Saw doctor in the past year	84.7	74.2	86.3	0.003	85.9	91.8	0.010	<0.001	<0.001
Doctor recommended endoscopy ^e	14.0	6.6	25.8	<0.001	7.6	20.5	0.003	0.510	<0.001
Doctor recommended FOBT ^f	5.3	1.8	5.6	0.030	5.9	8.2	0.359	0.041	<0.001
Language barriers									
Only English spoken at home	18.6	0	39.4	<0.001	0	40.0	<0.001	0.978	<0.001
Difficulty understanding doctor	5.5	6.4	2.9	0.142	9.6	2.7	<0.001	0.286	<0.001
Doctor spoke another language ^g	82.3	91.4	58.8	0.104	93.6	40.6	<0.001	0.894	<0.001
Needed someone to understand ^g	66.5	75.6	42.6	0.266	84.4	0.0	<0.001	0.884	0.002
Screening rates									
Had both endoscopy and FOBT	20.8	7.9	30.2	<0.001	12.7	30.6	<0.001	0.686	<0.001
Had neither screening test	43.1	58.7	35.3	<0.001	48.8	30.0	<0.001	0.061	<0.001

^a The sample includes Californian Mexican-American adults aged 50 and older who have not been diagnosed with colon cancer

^b The acculturation score is scaled on a t-score distribution with a mean of 50 and a standard deviation of 10

^c Percent with good, very good, and excellent health status as compared to fair and poor health status

^d Participant had health insurance all of last year as compared to those who didn't have any health insurance last year or had health insurance part of last year

^e Among those who never had endoscopy or those who hadn't had the test within the past 10 years, percent of participants whose doctor recommended endoscopy within the past year

^f Among those who never had FOBT or those who hadn't had the test within the past year, percent of participants whose doctor recommended FOBT within the past year

^g Of those who had difficulty understanding doctor (*n* = 80; *n* = 28 men and *n* = 52 women), the reason was because the doctor spoke another language and needed someone else to understand the doctor

recommendation in the past year to get either an FOBT and/or endoscopy. As the variables were measured on different scales, these were converted to z-scores and summed to create composite scores measuring the three covariates. Higher scores indicated higher education, higher income, higher age, poorer health status, and higher acculturation level, having health insurance, a usual source of healthcare, seeing a doctor in the past year, or having a doctor who recommended CRC screening.

Analysis

Descriptive statistics were obtained for the total, gender, acculturation, and gender by acculturation groups. Differences between groups were analyzed by Chi-square and regression analyses. STATA Version 9 was used for descriptive and logistic regression analyses with an alpha level set at 0.05. Point estimates and logistic regression results took into account complex sampling design using

replicate weights to obtain variance estimates based on the jackknife method.

Two logistic regression models were analyzed: one to predict ever having both FOBT and endoscopy (vs. having one or neither test), the other to predict having neither test (vs. having both or either test). The predictor of interest was acculturation status, entered as a three-group dummy variable with the low acculturation group as the reference category. Regression analyses were stratified by gender.

In order to examine effect sizes associated with acculturation in logistic regression models, three descriptive contrast groups were created (low, intermediate, and high) based on three equally sized groups. The three acculturation groups may be described in the following ways. The majority of those in the high acculturation group spoke only English, they were U.S. citizens, were born in the U.S., were interviewed in English, spoke only English, and spoke primarily English in the home. Those at the intermediate level of acculturation indicated that they spoke English very well, were naturalized citizens, born outside the U.S., were interviewed in English, and spoke both Spanish and English in the home. The majority of those in the low acculturation group reported that they didn't speak English very well, were non-citizens, were born outside of the U.S., were interviewed in Spanish, did not speak English at all or not well, and spoke primarily Spanish in the home. Most respondents had lived in the U.S. for 15 years or more, regardless of acculturation status.

Descriptive analyses (reported in Table 1) and logistic regression analyses (reported in Table 2) were based on Mexican-Americans, and included 893 women and 603 men. For descriptive analyses, a binary acculturation score was created based on a median split of the continuous principal component score which was separately determined by gender.

Results

Descriptive Statistics

Table 1 reports descriptive statistics of Mexican-American study participants. The average age of the Mexican-American CHIS 2005 sample under examination was approximately 62 years (standard error 0.3), 74% of whom were above the federal poverty level. A total of 47% had a high school diploma, most were covered by health insurance in the previous year (79%), and had a usual source of healthcare (90%). Overall, about half (55%) were in good, very good, or excellent health. Approximately 18% said that only English was spoken at home; 5% said they had difficulty understanding their doctor at their last doctor visit. Of those ($n = 80$), 82% said they had difficulty

understanding the doctor due to language and 66% said they needed another person to help them understand the doctor.

Women were more likely to report having a poorer health status, a usual source of healthcare, and to have visited a doctor in the past year than men ($P < 0.01$). Men were more likely to live above the federal poverty level and have obtained a high school diploma ($P < 0.05$). Compared to lower acculturated participants, higher acculturated respondents were more educated, were more likely to live above the poverty level, have better health status, be covered by health insurance, have a usual source of healthcare, to have seen a doctor in the previous year, speak only English in the home, to not have difficulty understanding the doctor due to speaking another language ($P < 0.01$). Comparable acculturation-based results were obtained when analyzing men and women separately.

Screening Rates

Higher acculturated Mexican-Americans (see Table 1) as compared to lower acculturated Mexican-Americans were more likely to have received a recommendation from their doctor to have either an endoscopy or FOBT ($P < 0.001$). Higher acculturated Mexican-Americans were more likely to have both endoscopy and FOBT ($P < 0.001$) compared to the lower acculturated. The lower acculturated were more likely to have had neither endoscopy nor FOBT ($P < 0.001$) compared to higher acculturated. Among men there was no relationship between acculturation and having FOBT only or endoscopy only ($P > 0.10$). Women were more likely than men to have had a recommendation from their doctor to have an FOBT in the past year. Higher acculturated men were more likely to receive a recommendation to have an FOBT or an endoscopy compared to lower acculturated men ($P < 0.05$).

Logistic Regression

Both Endoscopy and FOBT

For Mexican-American men, socioeconomic, health status, and healthcare access factors were marginally or significantly related to having both procedures ($P < 0.10$). Compared to low acculturated men, high acculturated men were 3.37 times more likely ($P = 0.05$) to have both CRC screening tests; there was no difference between intermediate and low acculturated men.

Among women, there was a significant relationship between healthcare access and having both screening tests ($P < 0.001$). After adjustment for covariates, there was a significant effect for acculturation on having both CRC screening tests: compared to low acculturated women,

Table 2 Logistic regression model to predict colorectal cancer screening^a among Mexican-Americans by gender from the 2005 California Health Interview Survey

	Men (<i>n</i> = 603)			Women (<i>n</i> = 893)		
	Adjusted OR	95% CI	<i>P</i> -value	Adjusted OR	95% CI	<i>P</i> -value
Both endoscopy^b and FOBT						
Socioeconomic status ^c	1.34	(1.11–1.61)	0.003	0.85	(0.70–1.03)	0.115
Health status ^d	1.49	(1.10–2.01)	0.010	1.07	(0.87–1.32)	0.496
Healthcare access ^e	1.48	(0.98–2.24)	0.065	1.48	(1.24–1.78)	<0.001
Acculturation level						
Intermediate vs. low	1.89	(0.53–6.70)	0.319	1.91	(1.03–3.55)	0.040
High vs. low	3.37	(1.0–11.36)	0.050	4.08	(1.93–8.61)	<0.001
Neither endoscopy nor FOBT						
Socioeconomic status	0.65	(0.52–0.82)	<0.001	1.23	(0.91–1.39)	0.266
Health status	0.63	(0.50–0.81)	<0.001	0.83	(0.67–1.02)	0.082
Healthcare access	0.82	(0.72–0.93)	0.003	0.77	(0.69–0.87)	<0.001
Acculturation level						
Intermediate vs. low	0.46	(0.24–0.86)	0.016	0.45	(0.26–0.78)	0.005
High vs. low	0.51	(0.25–1.03)	0.060	0.35	(0.19–0.64)	0.001

^a Colorectal cancer screening includes FOBT and endoscopy, including sigmoidoscopy and colonoscopy

^b Endoscopy, or lower endoscopy, includes either sigmoidoscopy or colonoscopy. Includes those who had both tests at any time vs. those who had neither or one of the tests

^c Socioeconomic status includes poverty level and educational level; higher scores indicate higher socioeconomic status

^d Health status includes age and health status; higher scores indicate greater age and poorer health status

^e Healthcare access includes having health insurance, a usual source of healthcare, seeing a doctor in the past year, or having a doctor who recommend either FOBT or endoscopy

intermediate acculturated women were 1.91 times ($P = 0.040$) and high acculturated women were 4.08 times ($P < 0.001$) more likely to have had both CRC screening tests.

Neither Endoscopy Nor FOBT

Mexican-American men of higher socioeconomic status, better health status, and greater healthcare access were less likely to have neither endoscopy nor FOBT ($P < 0.01$). Lower-acculturated Mexican-American men were about two times as likely to have neither test. Among Mexican-American women, healthcare access was related to having neither test ($P < 0.001$) but health status and socioeconomic status were not. Low compared to high acculturated women were 2.86 times as likely to have neither CRC screening test ($P = 0.001$).

Discussion

Colorectal cancer screening among adults aged 50 and older was evaluated as one of the most cost effective preventive tests from among 25 other exams and services [17]. An estimated 50–60% of CRC deaths might be prevented if

all U.S. adults aged 50 years or older were routinely screened [18]. The efficacy of FOBT, sigmoidoscopy, and colonoscopy has been estimated as 38%, 50%, and 70%, respectively. Thus, FOBT would lead to a 38% reduction in CRC mortality when used with 100% compliance [19]. According to the American Cancer Society, survival from CRC is about 90% when the cancer is diagnosed early highlighting the importance of early screening and detection of this cancer.

To date, there has been no examination among Mexican-Americans, the largest Latino subgroup in the U.S., of the effect of acculturation on CRC screening rates. The present investigation demonstrated that in California, compared to their lower-acculturated counterparts, higher acculturated Mexican-Americans were 3–4 times more likely to have had both colorectal screening tests and about half as likely to have had neither test. These results could not be explained by socioeconomic, health, or healthcare access status. Not receiving CRC screening may be due to several factors: (1) it is less likely to be offered at the place where lower-acculturated Mexican-Americans receive medical care; (2) their medical care providers are less likely to offer them the test; (3) lower-acculturated Mexican-Americans are more likely to decline the test when it is offered; (4) it is discussed but the medical care providers and patients

have difficulty communicating due to language barriers; or (5) lower-acculturated Mexican-Americans are less likely to seek medical care and are subject to fewer outreach efforts.

Implications for Practice

According to some researchers [20], lower rates of CRC screening among lower-acculturated Mexican-Americans may be described as due to the patient or provider barriers. Patient-centered attributes include lack of knowledge about screening, not understanding the role of screening when no problem is present, being embarrassed about the procedure, having cultural attitudes such as fatalism, and not comprehending the English language [20]. Provider-organization attributes include prejudice and racism of clinical staff, lack of cultural competence when discussing colorectal screening with lower-acculturated patients, inability to speak Spanish or provide Spanish-language materials, and not providing CRC screening tests at convenient hours or locations [20].

Mandelblatt and colleagues [20] suggest that communication is the key component that links patients and providers in limiting CRC screening disparities. While lower-acculturated Mexican-American patients may lack knowledge about the importance of CRC screening and a provider may not understand the attitudes about CRC screening held by their Mexican-American patients, communication is the bridge that can help to eliminate disparities in CRC screening. At its most basic level, speaking the same language determines the depth and accuracy at which such health-related communication may occur. The key distinguishing characteristic between higher and lower acculturated Mexican-American patients is English language proficiency. Limited English proficiency patients are less likely to report empathy from their providers, be able to establish a sense of rapport, get the health-related information they need, or collaborate with their doctor to create a treatment plan [21]. Even among insured Latinos, healthcare has been found among the limited English proficient to be poorer, resulting in longer waits, difficulty getting information by phone, and a lack of continuity of care [22]. Results in the present analysis indicate that compared to the higher-acculturated, lower-acculturated Mexican-American women were more likely to have difficulty understanding their doctor due to language and that they needed someone to help understand ($P < 0.001$).

A recent meta-analysis of the effectiveness of cancer screening services [23] indicated that organizational as opposed to individual interventions were more effective in increasing use of preventive services. They identified seven intervention components that might improve preventive

services that were targeted at patients (i.e., reminders, financial incentives), providers (i.e., feedback, education), organizations (i.e., organizational change, regulatory intervention), and communities (i.e., media campaign). Organizational change was the most effective intervention method to increase CRC screening rates (adjusted odds ratio of 17.6). This included establishing a separate clinic specifically to screen patients and giving non-physician staff responsibility for preventive services. Collaboration and teamwork was identified as an important component in fostering the effectiveness of such organizational changes. In addition, provider education (adjusted odds ratio of 3.0) was important: CRC screening guidelines and other information relevant to CRC screening in the Latino community should be disseminated to providers. There are several resources available that can assist providers, including the Centers for Disease Control and Prevention site on CRC (<http://www.cdc.gov/cancer/colorectal/>) and health disparities (<http://www.cdc.gov/omhd/Topic/HealthDisparities.html>); the Cancer Research and Prevention Foundation (<http://www.preventcancer.org/>); *Redes en Acción* (Networks in Action) of the NCI-funded National Latino Cancer Research Network (<http://www.redesenaccion.org/>); the Latino-based health communication outreach organization, *Prevención*, Inc. (<http://www.prevenccion.org/>), and the American Cancer Society's Cancer Facts and Figures for Hispanics/Latinos (http://www.cancer.org/docroot/STT/stt_0.asp).

Health promotion methods [3, 23, 24] that target lower-acculturated Mexican-Americans on an individual basis should also be intensified. As some lower-acculturated Mexican-Americans may fear deportation, outreach efforts should be considered. These outreach efforts might focus on improving English language acquisition among Latinos, increasing the Latino community's knowledge about preventive services and why they are important, creating awareness of Latino rights as health consumers, and helping Latinos to navigate the healthcare system. With respect to the latter, the use of universal symbols (or word pictures) in healthcare settings has been hypothesized [25] as one way to help lower-acculturated Latinos locate and use healthcare services. Universal symbols have the advantage over multilingual signage in that they are easier to implement and maintain and are more easily noticed.

Strengths and Limitations

Differences in screening rates [26] have been demonstrated by Latino subgroup, so focusing specifically on the effect of acculturation among Mexican-Americans was a strength of this investigation. The logistic regression model was based on literature review of the most commonly cited covariates and the three predictors were based on those

identified by Hiatt and colleagues [11] who reviewed 65 journal articles concerning predictors of cancer screening behaviors. Another strength of the investigation is that the analysis adjusted for complex sampling designs.

A potential bias is that, because the CHIS is a telephone survey, the results may not be generalizable to people without telephones. However, 95% of the U.S. population has a telephone [27] and the 2005 CHIS data were weighted to minimize this source of bias. In addition, the lack of inclusion of the lower acculturated, who would be less likely to have a telephone, would likely increase the observed odds ratios if they were included in the analyses.

The measure of acculturation was based on conventional acculturation variables [28, 29] such as nativity, citizenship, time spent in the U.S., and facility with and use of the English language. Such measures have been criticized [30] because they are based on proxy rather than direct indicators of acculturation, such as cultural attachment and do not consider ethnic identity, such as an individual's identification with the Mexican culture. However, the current measure of acculturation had high internal consistency reliability ($\alpha = 0.91$) even though it included several distinct measures of acculturation-related variables. Further, strong evidence of construct validity was observed as highly significant differences were found between lower- and higher-acculturated Mexican-Americans in the expected direction on differences in income, education, and healthcare access. Lastly, status indicators are objective or observable, easily gathered and are typically the only indicators available in population-based surveys, they are often completed in a more reliable manner than attitudinal measures, and language proficiency has been demonstrated to be a reliable measure of acculturation [29]. Although this may be the first study to relate acculturation to CRC screening rates in a probability sample of Californian Mexican-Americans, similar research should be conducted in a national survey of Mexican-Americans, perhaps using direct measures of bidimensional acculturation according to the Berry model of the acculturation process [31].

Summary

In summary, differences in CRC screening were associated with acculturation in Californian Mexican-Americans. If the preferred colonoscopy screening was increased by 10% and a 70% CRC screening efficacy rate was applied [19], improvements in screening rates could potentially save over 100 lives per year among Californian Latinos aged 45 and older. This represents a 30% increase in the number of lives saved based on the current level of screening using all methods, including FOBT.

One way to decrease the disparity effects of acculturation at the individual level is to provide resources that

foster English proficiency as well as health literacy, such as free classes offered at the community level. The effects of acculturation may be diminished by providing low-cost screening clinics in Latino neighborhoods that are staffed with Spanish-speaking Latinos [23]. In other clinical settings universal signage should be used and culturally competent Spanish-speaking clinical providers who are trained in CRC screening procedures should be employed. Reminders concerning screening should be used in clinic settings as this has been found to be an effective way to increase their use [23]. As lower-acculturated Mexican-Americans are less likely to visit a medical clinic, outreach in the form of Spanish language ads on radio and TV might be effective in increasing screening rates. More research is needed on the effect of acculturation on medical outcomes, such as CRC incidence, as paradoxically, although higher acculturated Latinos are more likely to have better access to medical treatment, they are also more likely to engage in poorer health behaviors, such as increased fat intake and decreased physical activity [10].

Acknowledgements This work was supported by a New Connections grant (<http://www.rwjf-newconnections.org/>) from the Robert Wood Johnson Foundation (#58142). The author wishes to acknowledge Debra Joy Pérez, Program Officer, for her contributions and mentorship on this project.

References

1. U.S. Census Bureau. (n.d.). Retrieved January 10, 2008 from <http://www.census.gov/>.
2. Improving the Use of Cervical and Colorectal Cancer Screening. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention. The Guide to Community Preventive Services; 2005. Retrieved January 10, 2008 from <http://www.thecommunityguide.org/cancer/screening/ca-screening.pdf>.
3. American Cancer Society. Cancer Facts & Figures for Hispanics/Latinos 2006–2008. Atlanta, GA; 2008. Retrieved November 17, 2008 from http://www.cancer.org/docroot/STT/stt_0.asp.
4. Behavioral Risk Factor Surveillance System. (n.d.). Retrieved January 10, 2008 from <http://www.cdc.gov/brfss/index.htm>.
5. Healthy People 2010. U.S. Department of Health and Human Services. Retrieved January 10, 2008 from <http://www.healthypeople.gov/>.
6. Smith RA, Cokkinides V, Eyre HJ. Cancer screening in the United States, 2007: a review of current guidelines, practices, and prospects. *CA Cancer J Clin.* 2007;57:90–104.
7. Mitka M. Colorectal cancer screening rates still fall far short of recommended levels. *JAMA.* 2008;299:622.
8. Frasier LA, Colditz GA, Fuchs CS, Kuntz KM. Cost-effectiveness of screening for colorectal cancer in the general population. *JAMA.* 2000;284:1954–61.
9. Ransohoff DF, Lang CA. Screening for colorectal cancer with the fecal occult blood test: a background paper. *Ann Intern Med.* 1997; 126:811–22.
10. Lara M, Gamboa C, Kahramanian MI, Morales LS, Hayes Bautista DE. Acculturation and Latino Health in the United States: a review of the literature and its sociopolitical context. *Annu Rev Public Health.* 2005;26:367–97.

11. Hiatt RA, Klabunde C, Breen N, Swan J, Ballard-Barbash R. Cancer screening practices from National Health Interview Surveys: past, present, and future. *J. Natl Cancer Inst.* 2002;94:1837–46.
12. Etzioni DA, Ponce NA, Babey SH, Spencer BA, Brown ER, Ko CY, et al. A population-based study of colorectal cancer test use: results from the 2001 California Health Interview Survey. *Cancer.* 2004;101:2523–32.
13. Liang SY, Phillips KA, Nagamine M, Ladabaum U, Haas JS. Rates and predictors of colorectal cancer screening. *Prev Chronic Dis.* 2006, October. Retrieved January 14, 2008 from http://www.cdc.gov/pcd/issues/2006/oct/06_0010.htm.
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; April. Retrieved January 14, 2008 from http://www.cdc.gov/pcd/issues/2006/apr/05_0120.htm.
15. Seeff LC, Nadel MR, Klabunde CN, Thompson T, Shapiro JA, Vernon SW, et al. Patterns and predictors of colorectal cancer test use in the adult U.S. population. *Cancer.* 2004;100:2093–103.
16. Shah M, Kangmin Z, Potter J. Hispanic acculturation and utilization of colorectal cancer screening in the United States. *Cancer Detect Prev.* 2006;30:306–12.
17. Maciosek MV, Coffield AB, Edwards NM, Goodman MJ, Flottemesch TJ, Solberg LI. Priorities among effective clinical preventive services: results of a systematic review and analysis. *Am J Prev Med.* 2006;31:52–61.
18. 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.
19. Maciosek MV, Solberg LI, Coffield AB, Edwards NM, Goodman MJ. Colorectal cancer screening: health impact and cost effectiveness. *Am J Prev Med.* 2006;31:80–9.
20. Mandelblatt JS, Yabroff KR, Kerner JF. Equitable access to cancer services: a review of barriers to quality care. *Cancer.* 1999;86:2378–90.
21. Pérez-Stable EJ. Language access and Latino health care disparities. *Med Care.* 2007;45:1009–10.
22. Pippins JR, Alegría M, Haas JS. Association between language proficiency and the quality of primary care among a national sample of insured Latinos. *Med Care.* 2007;45:1020–5.
23. Stone EG, Morton SC, Hulscher ME, Maglione MA, Roth EA, Grimshaw JM, et al. Interventions that increase use of adult immunization and cancer screening services: a meta-analysis. *Ann Intern Med.* 2002;136:641–51.
24. Solis JM, Marks G, Garcia M, Shelton D. Acculturation, access to care, and use of preventive services by Hispanics: findings from HHANES 1982–84. *Am J Public Health.* 1990;80 Suppl:11–9.
25. Universal Symbols in Health Care Workbook: Executive Summary; Best Practices for Sign Systems. Robert Wood Johnson Foundation. Retrieved January 10, 2008 from <http://www.segd.org/resources/symbols.html>.
26. Gorin SS, Heck JE. Cancer screening among Latino subgroups in the United States. *Prev Med.* 2005;40:515–26.
27. Shapiro JA, Seeff LC, Nadel MR. Colorectal cancer-screening tests and associated health behaviors. *Am J Prev Med.* 2001;21:132–7.
28. Marín G, Sabogal F, Marín BV, Otero-Sabogal R, Pérez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hisp J Behav Sci.* 1987;9:183–205.
29. Ver Ploeg M, Perrin E, editors. Eliminating health disparities measurement and data needs. 2004 panel on DHHS Collection of Race and Ethnicity Data Committee on National Statistics Division of Behavioral and Social Sciences and Education. National Research Council of the National Academies. Washington, DC: The National Academies Press; 2004.
30. Hunt LM, Schneider S, Comer B. Should acculturation be a variable in health research? A critical review of research on US Hispanics. *Soc Sci Med.* 2004;59:973–86.
31. Berry JW. Immigration, acculturation, and adaptation. *Appl Psychol: Int Rev.* 1997;46:5–68.