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Colorectal Cancer Screening Among Foreign-born South Asians in the Metropolitan New York/New Jersey Region

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Abstract

The goal of this study was to examine colorectal cancer (CRC) screening practices and factors associated with CRC screening among foreign-born South Asians living in the metropolitan New York–New Jersey area. Two hundred and eight men and women recruited from community settings in the New York and New Jersey metropolitan area completed a questionnaire that included demographics, CRC screening practices, health care access and practices, attitudes about the health care system, primary care physician support for CRC screening, cultural factors, and attitudes about CRC screening and CRC worry. Almost a third of the sample had not heard of any of CRC screening tests. Approximately 62 % of the sample had never had a CRC screening test and approximately 69 % of the sample was not currently on schedule with regard to CRC screening. When the relative contribution of significant correlates were evaluated, participants who had lived in the US for a longer time, who endorsed more CRC screening benefits, and who endorsed fewer CRC screening barriers were significantly more likely to have had CRC screening in the past. Participants who were more likely to use English in their daily life, who endorsed more CRC screening benefits, and endorsed fewer CRC screening barriers were more likely to be on schedule with regard to CRC screening. In conclusion, awareness of CRC screening and uptake of screening was low in this population of foreign-born South Asians. Interventions to promote CRC screening may benefit from targeting this subgroup of Asian Americans.

Keywords

Colorectal cancer screening; South Asians; Acculturation; Attitudes about cancer screening

Introduction

South Asians (i.e., individuals who identify their ancestry as Indian, Pakistani, Sri Lankan, Bangladeshi, Nepali, Bhutani, and Maldivian) are the third largest Asian group in the US, comprising 3.4 million persons [1]. South Asians are also the fastest growing of all Asian American immigrants, with a growth rate of 106 % from 1990 to 2000 [1]. As the South Asian population in the US grows, the cancer burden in this population increases

concomitantly. Although new cases of cancer have decreased overall in the US over the past 20 years [2], Asian Americans are the only US demographic subgroup with cancer as their leading cause of death [3]. Moreover, cancer incidence, including colorectal cancer (CRC), is increasing in the South Asian population. Indeed, the rates of CRC are higher among South Asians living in the US than those living in South Asia [4]. Early detection of CRC reduces mortality from this disease. Current recommendations for CRC screening are, beginning at age 50, an annual fecal occult blood test (FOBT), a sigmoidoscopy every 5 years, or a colonoscopy every 10 years [5]. Given the historically low CRC screening rates, only 40 % of new colorectal cancers are diagnosed at an early stage [6].

Basic information about CRC screening practices among South Asians is limited. One key reason for this lack of information is that most studies aggregate South Asians with other Asian groups in their analyses [7]. The limited data suggests that CRC screening compliance is significantly lower among South Asians than in the US population as well as compared with other Asian American subgroups. Rates of ever having CRC screening vary widely, with figures ranging from 17 % [8], 33 % [4], to a high of 53 % [9]. Rates of being up-to-date with CRC screening have also shown a great deal of variability, with three published studies reporting 25 % [4], 48 % [9], and high percentage of 58.5 % [10]. Across the available literature, the rates are consistently lower than the US population estimates of 65 % [11]. Studies comparing CRC screening rates among subgroups of Asian Americans suggest that South Asians report lower rates of CRC screening compared with Chinese, Japanese, and Vietnamese subgroups [3].

Correlates of CRC screening uptake examined in prior work have included cultural factors have indicated that South Asians of Bangladeshi ethnicity [4], those who have less fluency in English [8], and those who have lived fewer years in the US [4, 8] are less likely to have CRC screening. Attitudes about the health care system that may be indicative of cultural beliefs such as the degree of trust in the health care system and comfort communicating with health care providers have also been reported as barriers to CRC screening among South Asians [12]. The only study that disaggregated the South Asian population from other Asian Americans found that higher levels of medical mistrust were associated with lower CRC screening uptake [8]. In terms of demographic and health care access factors, studies have found that women, older age individuals, individuals with less education, lower income, those not having insurance, and those not having a primary care physician predicted lower levels of CRC screening [4, 8]. The only study evaluating attitudinal factors and CRC screening among South Asians was Menon and colleagues [8], who did not find an association between perceived barriers to screening and perceived benefits of CRC screening and CRC screening practices. Although other factors such as perceived risk for CRC, perceptions of family influence, and physician recommendation and support for CRC screening are well-known correlates of screening uptake in non-South Asians in the US [13–15], these variables have not been studied in this population.

In summary, there is a paucity of research on CRC screening practices among South Asians in the US and even less is known about factors associated with CRC screening uptake. This study sought to assess rates of CRC screening uptake among foreign-born South Asians living in the New Jersey and New York metropolitan areas. The New York metropolitan

area, including northern and central New Jersey, has a particularly high concentration of South Asians [16]. The second goal was to characterize perceived CRC screening attitudes (e.g., perceived benefits, perceived barriers, normative influences, and worry about CRC). Lastly, this study sought to examine demographic, health access, health care attitudes, perceived physician support for screening, cultural, and attitudinal correlates of CRC screening.

Methods

Participants and Procedures

Eligibility criteria included: (1) between 50 and 70 years of age; (2) descent from Bangladesh, India, Pakistan, Nepal or Sri Lanka; (3) resided for at least 1 year in the New York Metropolitan area, Philadelphia and suburbs, North, Central or Southern New Jersey; (4) does not have a first degree relative with CRC or a personal history of colorectal cancer, and; (5) able to speak and read English. The Institutional Review Board of the Rutgers Robert Wood Johnson Medical School approved this study and written informed consent was received from participants.

Participants were recruited using several community recruitment methods: (1) engaging with local community, ethnic social groups, religious organizations, and professional organizations to distribute study information to their members; (2) posting flyers at community ethnic grocery stores, restaurants, beauty salons, and places of worship; (3) volunteering at local ethnic celebrations (e.g., Diwali) and health fairs geared towards this ethnic group; (4) collaborating with outreach staff at three community organization sites. Potential participants were approached by study staff at recruitment sites or were contacted by telephone and eligibility was confirmed. Participants who saw study flyers at community sites contacted the study staff by telephone and eligibility was determined. Wherever potential participants' telephone numbers were obtained, research staff confirmed eligibility criteria using a Rutgers University-IRB approved telephone script. Participants were also requested to refer other eligible South Asians to the study.

The survey instrument (see below) was either mailed to study participants or completed in person. The average time to complete the survey was 45 min and subjects were paid $30. Data collection was carried out between April 2014 and March 2015.

Of the 351 individuals approached, 50 were not eligible (<50 years). Of the 301 eligible persons, 94 refused and 220 consented and completed the survey. Of the 220 subjects who consented and completed the survey, 12 subjects were excluded due to missing data. Thus, the final sample used in the data analysis was 208 (69 % acceptance).

Outcome Measure: CRC Screening

Participants were asked if they ever heard of a colonoscopy, fecal occult blood test, and a flexible sigmoidoscopy. Participants who had heard of any of the screening tests were asked whether they had a colonoscopy, fecal occult blood test, or a flexible sigmoidoscopy, and the date of the last screening test. Two outcome variables were calculated: (1) whether or not the participant has ever had CRC screening and; (2) whether the participant was currently on

schedule for CRC screening (e.g., yearly for FOBT, every 5 years for sigmoidoscopy, or every 10 years for colonoscopy). Participants who had never heard of any of the screening tests were categorized as not ever having screening and not on schedule for screening.

Correlates

Demographics—Participants reported their age, sex, country of birth, education, marital status, income, occupational status (employed or not) and family history of cancer (yes/no)

Health Care Access and Practices—Participants indicated whether they had visited a dentist regularly (which is a common indicator of good health care routines) (*yes/no*), whether they saw a healthcare provide regularly (at least once a year) (*yes/no*), and whether they had a health care provider to go to if they were sick (*yes/no*).

Attitudes about Health Care

Patient-Provider Communication: A five-item scale on patient provider communication from Katz and colleagues [17] was used. Statements were rated on a five-point Likert-type scale (5 = *Never*, 1 = *Always*). Higher scores indicate better perceived communication. Cronbach's alpha was 0.65.

Medical Mistrust: Medical mistrust scale [18] measures the level of trust in mainstream health care systems. The scale's 12 items were rated on a five-point Likert-type scale (5 = *strongly agree*, 1 = *strongly disagree*). Cronbach's alpha was 0.90.

Health Care Provider Support for CRC Screening—A ten-item measure of health care provider support for CRC was used [19]. Two items assessed health care provider support for each screening test—FOBT, sigmoidoscopy, and colonoscopy (e.g., item stem: “I think my doctor's encouragement for colonoscopy is none to a lot of support). Items were rated on a four-point Likert-type scale (1 = *None* to 4 = *A lot of support*). Internal consistency was 0.91.

Cultural Factors

Ethnicity: Participants reported the country of birth (India, Pakistan, Bangladesh, Sri Lanka). For purposes of analyses, ethnicity was categorized as Indian versus non-Indian.

Number of years residing in the US: Participants reported the number of years residing in the US using five response choices (e.g., <1 year, between 1 and 3 years, 4–5 years, 6–10 years, and more than 10 years).

Acculturation: Language, Media, Clothing, and Acceptance: Palmer and colleagues' [20] scales assessing acculturation were used. The language scale contained eight items assessing whether or not the participant understands English, speaks English, reads English, writes English, uses English at home, with friends, with neighbors, and at work (*yes/no*). Higher scores indicated greater use of English (range 1–8). The media scale contained three items assessing the language used to read newspapers and magazines, to watch television programs, films, or video, and to listen to radio. Higher scores indicated that the person

viewed media more frequently in English (range 1–12). The third scale assessed the clothing typically worn inside home (*traditional South Asian clothing, both traditional and South Asian clothing worn, or primarily Western*) and outside the home (same item choices). Higher scores indicated that western clothing was worn more often (range 0–4). The acceptance scale contained seven items assessing feeling at home and comfortable in the society. Items assessed whether the participant viewed the US as their home, felt part of American society, feared racist attacks, feared discrimination when apply for job due to ethnic status, and feared a loss of cultural identity for oneself or one's children (*yes/no*). Higher scores indicated more perceived acceptance in the US (range 0–7).

Attitudes about CRC Screening and Cancer Worry

CRC Screening Pros and Cons: Items for this scale were used from another study on the correlates of CRC by Manne and colleagues [21]. The original scale was adapted from Rakowski and colleagues [22]. The scale consisted of ten benefits and 18 barriers. Statements were rated on a five-point Likert-type scale (5 = *strongly agree*, 1 = *strongly disagree*). Internal consistency for the pros scale was 0.81 and internal consistency for the cons scale was 0.85.

Subjective Norms: Subjective norms were defined as perceived beliefs about family and friend attitudes about the participant completing CRC screening and the desire to comply with family and friends' attitudes toward CRC screening. Four items were included from Vernon and colleagues [23]. Sample items are: “My family thinks I should complete regular colorectal tests,” and “I would like to do what my family wants me to do about regular colorectal tests”. Higher scores indicate higher levels of perceived social influence to have CRC screening. Internal consistency for the scale was 0.83.

Cancer Worry: Two items assessed worry: “I am worried about having CRC screening tests” and “I worry about having colorectal cancer.” Higher scores indicate greater worry. Internal consistency was 0.61.

Data Analysis

Predictor variables were partitioned into groups to examine correlates within categories. The categories were: (1) Demographic factors: age, gender, education, income, employment status, marital status, and family history of cancer; (2) Health care access and practices: engagement in regular dental care, regular physician visits, and access to a usual source of care; (3) Health care provider support for CRC screening; (4) Attitudes about Health Care: Medical mistrust and provider-patient communication; (5) Cultural factors: ethnicity, years in the US, language, media, clothing, and acceptance; (6) Psychological factors: CRC screening benefits, screening barriers, subjective norms, and cancer worry. The relationship between each independent variable and screening outcome (ever had screening and currently on- schedule for CRC screening) was examined with separate regressions. Next, a stepwise logistic regression was conducted entering only those variables within each category in six (or fewer) steps.

Results

Descriptive Information

The characteristics of the sample are summarized in Table 1. The sample consisted of 107 men and 101 women. Ages ranged from 50 to 75 years. A little more than half of participants had completed a college degree or higher education and approximately half were currently employed. The majority were married (76 %). Most participants reported seeing a primary care physician regularly (85 %) and a little more than two-thirds of the sample reported having regular dental check-ups.

CRC Screening Uptake

Level of awareness of the tests was relatively low. Approximately 31 % had never heard of a colonoscopy, 54.6 % had never heard of a FOBT, and 73.9 % had never heard of a flexible sigmoidoscopy. Almost a third of the sample (29.5 %) had not heard of any of the three screening tests.

Approximately 62 % of the sample had never had a CRC screening test (83 participants had a test, 125 had never had a test). Approximately 69 % of the sample was not currently on schedule with regard to CRC screening. Among the 83 participants reporting having a screening test, 65 % had undergone a colonoscopy (n = 54), 20.5 % reported having an FOBT as well as a colonoscopy (n = 17), and 14.5 % reported having an FOBT only (n = 12).

Cultural and Psychological Characteristics of the Sample

Information regarding cultural and psychological characteristics is shown in Table 2. More than two-thirds of the sample (67.3 %) had resided in the US for more than 10 years. The majority of participants spoke English (80 %), read English (85 %), wrote English (80 %), used English when speaking with friends (60 %), used English when speaking to neighbors (69.2 %), and used English when speaking to others at work (68.3 %). However, only 40 % reported using English as their primary language at home. About a third of participants who read newspapers and magazines reported reading them only or primarily in their native language (31 %), 39.5 % who reported watching television or viewing films reported that they only or primarily watched television shows or films in South Asian languages, and 33.5 % of those who reported listening to the radio reported they only or primarily listening to South Asian radio. About a third of participants reported that they primarily wore traditional South Asian clothing when in the home (34.3 %) or a mixture of traditional and western clothing (42.7 %), but very few wore primarily traditional South Asian clothing outside of the home (6 %). Levels of perceived acceptance in the American culture were relatively high. Most participants reported that they felt America was their home (84 %), felt a part of American society (78 %), did not fear job discrimination (71 %), and did not perceive that they would be denied work opportunities due to ethnicity (70 %).

Average ratings of CRC screening benefits were high when the scale mean was evaluated (M = 4.0 on a five point scale, 4 = “agree”). Item ratings for screening benefits are presented in order of their ranking in Table 3. The highest-ranked screening benefits were “I would have

a CRC test if my doctor said it was important" and "CRC tests are a part of good health care." Average ratings of CRC screening barriers were lower, with the scale mean in the "undecided" range (M = 2.9, 3 = "undecided"). The highest-ranked CRC screening barriers were "I would probably not have a CRC screening test unless my doctor was sure I really needed one" and "A healthy diet lowers my risk of CRC and means I don't need CRC tests very often." Worry about potentially being diagnosed with CRC (M = 2.6) and worry about screening tests (M = 2.8) were slightly below undecided (3 = "undecided", 2 = "disagree"). Subjective norms item ratings ranged between "undecided" (rating = 3) and "agree" (rating = 4), with mean item ratings ranging from a low of 3.2 ("I want to do what my friends think I should do about getting regular colon cancer tests") to a high of 3.7 ("I want to do what my family thinks I should do about regular colon cancer tests").

Correlates of CRC Screening

Two analyses were conducted. First, to reduce the number of variables included, each variable within each of the six categories were evaluated in separate logistic regressions to determine their relation with the outcome within each category. Second, once a set of significant factors was selected within each category, a logistic regression analysis was conducted with the significant variables entered into the equation.

For the outcome variable of ever had CRC screening, results of the six separate logistic regression equations are shown in the left panel of Table 4. The following variables were selected for inclusion within each category (1) Demographics: education and income; (2) Health care practices: regular physician visits; (3) Health care attitudes: none; (4) Physician support for screening: none; (5) Cultural: years in the US and English language use; (6) Attitudes: CRC screening benefits and barriers. Participants who were more educated, reported a higher annual income, were more likely to have seen a primary care doctor within once a year or more, lived in the US for a longer period of time, spoke English in more settings, reported higher perceived benefits of having CRC screening, and reported lower barriers to having screening were more likely to have ever had CRC screening.

The results of the final logistic regression that evaluated the relative contribution of education, income, primary care doctor visits, years lived in the US, use of English, perceived benefits, and perceived barriers of screening in one equation predicting ever had CRC screening are shown in the top panel of Table 5. Participants who had lived in the US for a longer time, who endorsed more CRC screening benefits, and who endorsed fewer CRC screening barriers were significantly more likely to have had CRC screening.

For the outcome variable of currently on-schedule with CRC screening, the results of the six separate logistic regression equations are shown in the right panel of Table 4. The following variables were selected for inclusion within each category (1) Demographic: income; (2) Health care practices: regular physician visits, (3) Health care attitudes: none; (4) Physician support for screening: none; (5) Cultural: years in the US and English language use; (6) Attitudes: CRC screening benefits and barriers. Participants with a higher annual income, were more likely to have seen a primary care doctor within once a year or more, lived in the US for a longer period of time, spoke English in more settings, reported higher perceived

benefits of having screening, and reported lower barriers to having screening were more likely to have ever had CRC screening.

The results of the final logistic regression predicting currently on-schedule with CRC screening are shown in the bottom panel of Table 5. Participants who were more likely to use English in their daily life, who endorsed more CRC screening benefits, and endorsed fewer CRC screening barriers were more likely to be on schedule with regard to CRC screening.

Discussion

In this population of foreign born South Asians living in the New Jersey and New York metropolitan areas, 38 % had CRC screening in the past and 31 % were on-schedule with regard to CRC screening. These rates of uptake are lower than the recent figures of 63–72 % of persons in the states of New York and New Jersey [24]. These screening rates are also 26.5–33.5 % lower than the national rate of 35.5 % not on-schedule in the US [24]. Our rate of CRC screening uptake among South Asians in the New York metropolitan area is slightly higher than those reported by other [4, 8]. Across all studies, data on South Asians consistently yields lower CRC screening uptake than the US population which points to a notable disparity in screening.

When demographic, health care attitudes and practices, cultural, and psychological correlates of CRC screening practices were examined separately, our findings indicate a number of factors may contribute to the lower CRC screening uptake: lower levels of education, lower levels of income, fewer number of years in the US, less fluency in English, and perceived benefits and barriers to screening. Some of these findings are consistent with studies among the general population of non-South Asians. Less education, less income, and perceived benefits and barriers are known correlates of CRC screening uptake among the general population [13, 25–28] and among other ethnic minorities [29]. Indicators of acculturation including less use of the English language [30] and fewer years residing in the US [9] have been associated with less CRC screening uptake in studies of other foreign-born Asian Americans.

When we evaluated correlates in one model, two indicators of acculturation were associated with ever having had CRC screening (years in the US) and being up to date with screening (English language), even after accounting for demographic correlates. In addition, perceived benefits and barriers were associated with both ever having had screening and being up-to-date with screening after accounting for the effects of demographic and cultural factors. These results suggest that it may be important for behavioral interventions for improving CRC screening uptake to offer interventions in the individual's native language for those who do not use English and to target South Asians who have lived in the US less than a decade. Moreover, it may be important to tailor interventions to address perceptions about CRC screening test risks and benefits.

Before concluding, several study limitations should be mentioned. First, we did not assess CRC knowledge (e.g., risk factors for CRC, the fact that CRC is common among both men

and women) and screening knowledge (e.g., the purpose and procedures for each test), which is a common correlate of uptake of screening tests. Second, the sample included a small percentage of individuals who were born in Bangladesh, Pakistan, and Sri Lanka, and thus conclusions about these subgroups cannot be made. Finally, the population was relatively highly educated, but more than half were not currently employed (possibly due to being homemakers). Future studies should include less educated and a larger proportion of employed persons.

In terms of clinical implications, this study supports a disparity in CRC screening uptake among foreign born South Asians in the New York metropolitan area. Screening uptake is lower than in the US population, and awareness of these tests is also low. Because physician recommendation was a highly-rated barrier and a highly-rated reason to have CRC screening, interventions should link participants with health care systems. Health care providers who serve the South Asian community should be aware of the important role they could play in increasing CRC screening rates. In addition, targeting South Asians who do not use English in their daily life and those who have lived in the US for 5 years or less, along with perceptions about CRC screening may improve uptake.

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Table 1

Demographic characteristics of the sample (n = 208)

Variable	N	(%)	M	SD	Range
Age			60.3	6.2	50–76
Gender					
Men	107	51.4			
Women	101	48.6			
Education level					
Some high school or less	43	20.7			
High school degree	12	5.8			
Some college	30	14.4			
College degree or higher	123	59.1			
Income					
Less than $15,000	66	31.7			
$15,000-$35,000	29	13.9			
$35,000-$50,000	18	8.7			
$50,000-$75,000	15	7.2			
More than $75,000	61	29.3			
Employment status					
Employed	109	46.2			
Not employed	99	58.7			
Marital status					
Married	158	75.9			
Not married	50	24.1			

Table 2

Descriptive information for health care access and practices, health care system attitudes, physician support for screening, cultural, and psychological factors

Variable	N	(%)	M	SD
Health care access and practices				
Has regular check-ups	177	85		
Has regular dental care	140	67.3		
Has source of health care	193	92.3		
Health system attitudes				
Medical mistrust			23.1	7.8
Communication with provider			20.4	3.6
Physician support for screening			3.15	0.79
Cultural factors				
Country of birth				
India	185	88.9		
Bangladesh	7	3.4		
Pakistan	37	17.8		
Other country	1	0.04		
Missing data	1	0.01		
Acculturation factors				
English fluency			0.72	0.29
Western media			1.48	1.06
Western clothing			1.15	0.55
Acceptance in US			0.79	0.24
Years in US				
Less than 1 year	6	2.9		
1–3 years	15	7.2		
4–5 years	20	9.6		
6–10 years	18	8.7		
Greater than 10 years	140	67.3		
Missing data	9	4.3		
Psychological factors				
Screening benefits			4.00	0.52
Screening barriers			2.91	0.54
Subjective norms for CRC screening			13.94	3.3
CRC worry			2.66	0.89

Table 3
Perceived CRC screening benefits and barriers

Attitude	M (SD)
Benefits	
Would be more likely to have if a doctor said it was useful	4.36 (0.81)
Part of good health care	4.22 (0.91)
Can find growths that are not yet cancer but could become cancer	4.06 (0.90)
Useful for people my age	4.11 (0.79)
Peace of mind about my health	4.04 (0.82)
Give peace of mind about health	4.03 (0.91)
Make me feel in control of my health	3.90 (0.95)
Will help me live a long life	3.86 (0.95)
Those close to me will benefit if I have test	3.80 (0.92)
Are safe	3.71 (0.87)
Barriers	
Would not have unless doctor told me to	3.53 (1.18)
Healthy diet helps lower CRC risk so don't need test often	3.14 (1.23)
Too many things can lead to a wrong result	3.12 (0.94)
If comes out normal won't have to do more	3.12 (1.17)
If chance not safe, don't want to have test	3.11 (1.10)
Too many twists and turns in the intestine for test to find a cancer	3.00 (0.88)
Current tests not very effective	2.88 (1.03)
It would be inconvenient	2.87 (1.10)
Takes too much time	2.87 (0.90)
Too many things can go wrong with test	2.83 (0.91)
Will get in way with things I want to do	2.79 (1.18)
Do not need to have unless have stomach problems	2.71 (1.20)
Test is embarrassing	2.60 (1.23)
Cannot afford test	2.56 (1.17)
If test finds something, it will be too late	2.57 (1.10)
Would not have if involved laxatives	2.57 (1.16)
Would not have if family or friends said it was painful	2.54 (1.10)
Test is too risky	2.53 (0.91)

Table 4

Logistic regression models: ever had a CRC screening test and up to date screening

Variable	Ever had screening				Up-to-date screening			
	B	SE	χ^2	95 % CI	B	SE	χ^2	95 % CI
Demographics								
Age	0.055	0.029	3.514	0.997, 1.119	0.053	0.031	3.046	0.993, 1.120
Gender	0.031	0.348	0.008	0.521, 2.041	−0.044	0.367	0.015	0.466, 1.965
Education	0.153	0.074	4.235*	1.007, 1.348	0.143	0.081	3.096	0.984, 1.352
Income	0.251	0.075	11.276**	1.110, 1.489	0.249	0.081	9.599**	1.094, 1.502
Employed[a]	0.245	0.377	0.424	0.611, 2.674	0.218	0.394	0.306	0.574, 2.694
Marital status[b]	0.793	0.432	3.369	0.948, 5.159	0.716	0.479	2.233	0.800, 5.230
Family history	0.460	0.371	1.541	0.766, 3.277	0.341	0.383	0.791	0.663, 2.981
Health care access								
Regular doctor visits	−1.124	0.529	4.516*	0.115, 0.916	−1.281	0.643	3.969*	0.079, 0.979
Usual source of health care	−1.178	0.797	2.184	0.065, 1.468	−1.518	1.066	2.030	0.027, 1.769
Dental care	−0.419	0.331	1.605	0.344, 1.257	−0.345	0.356	0.937	0.352, 1.424
Health care attitudes								
Medical mistrust	0.001	0.020	0.003	0.962, 1.042	0.005	0.022	0.056	0.963, 1.049
Patient-provider communicatio	n 0.044	0.045	0.961	0.957, 1.142	0.057	0.049	1.388	0.963, 1.165
Physician support	0.319	0.212	2.267	0.908, 2.082	0.121	0.214	0.317	0.741, 1.717
Cultural factors								
Place of birth[c]	−0.315	0.582	0.293	0.233, 2.284	0.160	0.635	−0.064	.245, 2.956
Years in US	0.557	0.215	6.699*	1.145, 2.663	0.612	0.258	5.607*	1.111, 3.061
English fluency	1.828	0.816	5.021*	1.257, 30.756	2.721	0.978	7.745**	2.236, 103.242
Western clothing	0.501	0.313	2.566	0.894, 3.049	0.334	0.336	0.984	0.722, 2.699
Western media	0.060	0.208	0.082	0.706, 1.597	−0.043	0.219	0.038	0.624, 1.472
Acceptance in US	0.045	0.672	0.005	0.279, 3.924	−0.404	0.705	0.329	0.168, 2.658
Psychological attitudes								
Screening benefits	1.364	0.379	12.963***	1.862, 8.217	1.158	0.386	8.993**	1.493, 6.781

Variable	Ever had screening				Up-to-date screening			
	B	SE	χ^2	95 % CI	B	SE	χ^2	95 % CI
Screening barriers	−1.330	0.349	−14.551***	0.134, 0.524	−0.285	0.364	12.44***	0.135, 0.565
Cancer worry	−0.26	0.191	0.018	0.706, 1.492	0.030	0.199	0.023	0.698, 1.521
Subjective norms	−0.031	0.056	0.302	0.869, 1.082	−0.054	0.058	0.861	0.846, 1.062

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$

[a] 1 = employed, 2 = not employed;

[b] 1 = married, 2 = not married;

[c] 1 = India, 2 = not India

Table 5

Multivariable logistic regression: ever had CRC screening and up to-date screening

Variable	B	SE	χ^2	95 % CI
Dependent variable: ever had				
Education	−0.076	0.084	0.817	0.786, 1.093
Income	−0.039	0.094	0.176	0.800, 1.155
Years in the US	−0.475	0.228	4.353 *	0.398, 0.972
English fluency	−1.197	0.877	1.863	0.054, 1.686
Screening benefits	−1.097	0.346	10.060 **	0.170, 0.658
Screening barriers	0.809	0.383	4.466 *	1.060, 4.756
Dependent variable: up-to-date				
Income	0.005	0.096	0.003	0.832, 1.214
Regular doctor	0.935	0.802	1.359	0.529, 12.254
Years in the US	−0.518	0.274	3.560	0.348, 1.020
English fluency	−2.346	1.035	5.141 *	0.013, 0.728
Screening benefits	−0.817	0.355	5.301 *	0.221, 0.886
Screening barriers	0.811	0.396	4.205 *	1.037, 4.886

* $p < 0.05$;

** $p < 0.01$