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Colorectal Cancer Screening: What Do Women From Diverse Ethnic Groups Want?

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BACKGROUND: Little is known about factors associated with willingness to undergo colorectal cancer (CRC) screening for personal or public health benefit among women from diverse race/ethnic groups.

OBJECTIVE: To evaluate factors associated with willingness to undergo CRC screening for personal and public health benefit among women from diverse race/ethnic groups.

METHODS: We interviewed women aged 50 to 80 from four racial/ethnic groups from primary care clinics in 2003–2005. We asked about demographics, CRC screening knowledge and history, perceived risk of colon cancer, and about the outcomes of intention to be screened for personal benefit and for public health benefit.

RESULTS: Of the 492 women who completed the interview, 32 % were White, 16 % were African American, 21 % were Latina and 32 % were Asian. Up-to-date screening was reported by 77 % of women, with similar numbers obtaining fecal occult blood test (FOBT) within 2 years or colonoscopy within 10 years. The majority of women were “likely or very likely” to get FOBT or colonoscopy after learning the benefits and risks. Multivariate models showed that compared to Whites, fewer Asians would undergo colonoscopy (OR=0.28; 95 % CI: 0.12, 0.63), while more Latinas would undergo colonoscopy (OR=6.14; 95 % CI: 1.77, 21.34) and obtain regular CRC screening (OR=4.47; 95 % CI: 1.66, 12.04). The majority would obtain CRC screening even if they would not personally benefit; those who perceived themselves to be at higher than average cancer risk were more likely to participate in CRC screening for public health benefit (OR=2.32; 95 % CI: 1.32, 4.09).

CONCLUSIONS: The majority of women are willing to undergo screening for personal benefit. Asians were less likely, and Latinas more likely, to accept colonoscopy. Most are also willing to undergo screening for public health benefit. Self-perceived risk of CRC was the most consistent predictor of willingness and intention to be screened for either personal or public health benefit

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BACKGROUND

The United States Preventive Task Force recommends routine colorectal cancer (CRC) screening for men and women aged 50–75, and consideration of screening, based on comorbidities and other risks and benefits, in men and women aged 76–85. Although colorectal cancer screening rates are increasing nationally, Latinos, African Americans and Asians have lower rates of CRC screening compared to Whites, based on national data in 2010.[1] Among Whites, 59.8 % had a fecal occult blood test (FOBT) test in the past year or a lower endoscopy in the past 10 years, compared to 46.5 %, 55 % and 46.9 % in Latinos, African Americans and Asians, respectively. There were no gender differences, but lower educational achievement and more recent immigrants reported significantly less CRC screening.[1]

There is limited information on the role of CRC knowledge and other factors that influence willingness to be screened in age appropriate diverse women. Most persons respond that their physician’s recommendation is essential to obtain a screening test,[2,3] and facilitating access to health care and screening tests becomes a dominant factor. However, individual factors such as age, knowledge of risks and benefits of screening, belief in following screening guidelines and risk perception may also affect intent to screen.[2,4] Finally, since screening benefits in terms of mortality reduction are measured at the population level, most women who are screened do not receive individual benefit other than the knowledge of being disease free. Our goal was to understand the factors associated with willingness to undergo and continue CRC screening, and to ask whether or not women are willing to have CRC screening with the accompanying personal risk to achieve a public health benefit of decreasing population cases.

METHODS

Design Overview

CRISP (Communication of RISk Project) was a cross sectional survey designed to assess the association between risk perception and cancer screening behavior among women from diverse race/ethnic groups. Women were randomly assigned to answer one of the three scenario questionnaires focused on receiving CRC screening, breast cancer chemoprevention, or ending cervical cancer screening. This paper only concerns the questions related to willingness to be screened for CRC, and results from other analyses have been published elsewhere.[5–9] Interviews took place between October 2003 and December 2005.

Setting and Participants

Women were recruited, screened by telephone, and invited for face-to-face interviews lasting up to 90 min. The clinical sites for recruitment were four primary care practices at the University of California San Francisco (UCSF) Medical Center and community-based primary care clinics located in San Francisco, California.

Eligibility criteria included: 1) age 50–80 years; 2) ability to speak English, Spanish, Cantonese or Mandarin; 3) self-identified race/ethnicity as White, Latina, African American or Asian, and 4) at least one visit to their primary care clinician in the previous 2 years. Women who saw multiple clinicians, who had cancer at the time of the survey, or who had cognitive impairments were excluded. Women with a history of CRC were excluded.

Study Procedures

A list of potentially eligible women was generated from available patient administrative data (e.g. age, race/ethnicity) from each clinical site, and all clinicians were asked for permission to contact their patients. Personalized letters were sent to 4,523 participants; 20 % could not be reached due to incorrect contact information, and 19 % were ineligible because of illness, language or having left the physician's practice. Of the remaining 2,746 women, 1,319 (48 %) completed a 20-minute telephone questionnaire 2 weeks after mailing and 1,160 participants completed the face-to-face interview. Only those participants who were randomized to the CRC screening scenario were included in this analysis (N=492). Institutional Review Boards at UCSF and the community clinics approved the study.

Measures: Predictors

Items were derived from standard questions developed and used in previous surveys, and from formative focus groups with women in the area of cancer screening and their perceptions of risk.[10,11] The questionnaire was developed in three languages (Spanish, English, Cantonese/Mandarin) using bilingual experts, and pre-tested in each of the race/ethnic groups. The telephone survey asked about age, years of education, marital status, household income, language use, health insurance coverage, race/ethnicity, birthplace, personal and family history of cancer, and type of cancer. Health status was measured by the Medical Outcomes Study Short Form 12v2,[12] and numeracy was measured by an eight-item scale of simple mathematical operations on risk magnitudes.[13,14]

Perceived risk of colon cancer was asked with a comparative item as to whether respondent perceived herself at higher than “average risk”. Risk perception was based on a conceptual framework that included the nature and probability of benefit and harm and the factors that influence individual susceptibility.[15] We also asked participants to estimate their absolute risk of colon cancer during their lifetime. Participants were told that the average woman had about a 6 % lifetime risk of developing CRC, and about a 3 % lifetime risk of dying from CRC.[16] Women were asked to estimate their absolute risk of developing CRC with the help of a visual icon array of 100 women to illustrate the average risk of 6 %. The icon array is described in more detail in a prior publication.[9]

Use of cancer screening tests within recommended intervals was determined by asking about most recent FOBT and colonoscopy in the previous 10 years. Knowledge about CRC and screening was measured by nine true-false questions: 1) A colon polyp can be removed to prevent cancer, 2) If your FOBT is abnormal, then you definitely have cancer, 3) a woman may get CRC even if she is screened, 4) if a woman has a colon polyp, she definitely has cancer, 5) A woman could have a colonoscopy and have no puncture of the colon, 6) having a family history increases a woman's chance of colon cancer, 7) If a woman does not have a family history of colon cancer, she is not at risk for getting colon cancer, 8) the risk of a woman getting colon cancer is higher than the risk of her getting the flu and

9) some colon polyps are precancerous (could become cancer if not removed). A summary knowledge score was generated (range 0 to 9) for correct answers and divided into three categories of 0 to 6, 7–8, and 9 of similar sample size.

Measures: Outcomes

Women's intention and willingness to be screened for colorectal cancer for individual and for public health benefit were the main outcomes. The first scenario provided quantitative estimates of benefits and harms associated with CRC screening. Women were told that about 30 out of every 1,000 women who have not been screened will die from colon cancer, but this would be reduced by 33 % with regular CRC screening and removal of polyps before cancer developed, so that only 20 out of 1,000 women who have been screened would die from colon cancer. The risk of a puncture associated with colonoscopy was described as 1 in 1,000, and participants were told that out of 10,000 women who have a colonoscopy, three may die from having a complication of the test.[16,17] After hearing the risks and benefits, women were asked about their willingness to undergo screening.

In the second scenario, we asked about willingness to be screened for public health benefit independent of potential individual benefit. We asked about women's willingness to have CRC screening, despite the risk of possible serious complications including intestinal puncture, because if most women were screened there would be fewer cases of colorectal cancer in California. We also asked whether women would encourage other women to be screened for CRC because another woman's life might be saved.

Statistical Analysis

We assessed differences in study population characteristics by race/ethnic group using chi-squared tests for categorical variables and t-test for continuous variables. We also described the differences in screening behavior by race/ethnic group in bivariate analysis. We examined the association between participant characteristics and willingness and intention to receive screening using multivariate logistic regression models controlled for age, education, income, marital status, family and self-cancer history, health status, insurance coverage, employment, and numeracy, knowledge and perceived risk. Because physician recommendation is the biggest predictor of receiving CRC screening and because it is not possible to receive CRC screening without it,[3] we did not include this variable in the models. We modeled separate multivariate logistic regressions to examine the predictors of willingness and intention to receive screening for public health benefit. The same covariates were included in both models. All analyses were conducted using STATA 11.[18]

RESULTS

Of 499 women randomized to the CRC scenario, 492 completed interviews (Table 1). Most patients were from race/ethnic minority groups and more than half had attended college. The survey was completed in English by 57 %, in Spanish by 16 %, in Cantonese by 26 % and in Mandarin by 1 %. The majority were either married or living with a partner and reported being in good or excellent health. About half had private insurance, 22 % had no insurance, and less than half were employed. Almost half reported a family history of cancer, and 20 % thought that they were at a higher than "average" risk of developing CRC. Women estimated their absolute lifetime risk of developing CRC as 13 % using visual icon arrays. The mean number of knowledge questions correct (out of 9) was 7.3. There were statistically significant differences in all demographic and knowledge variables by race/ethnicity.

CRC screening behavior and perceived importance by race/ethnic group are shown in Table 2. Almost half of women reported having had an FOBT in the past 2 years. Asians were much more likely than Whites to report receipt of FOBT (54 % vs. 30 %, $p<0.001$). Less than half of all women reported a colonoscopy in the last 10 years, but Whites were much more likely than Asians to report colonoscopy (62 % vs. 20 %: $p<0.001$). Up-to-date screening was similar by race/ethnicity (72 % to 83 %, $p=0.227$). The majority reported that it was important to continue to get yearly FOBT and regularly scheduled colonoscopies. There were significant differences by race/ethnicity, as Latinas were more likely than White women to report continuing regular CRC screening (95 % vs. 84 %, $p=0.015$).

Willingness to Have CRC Screening Tests for Individual and Public Health Benefit

Most respondents (>70 %) expressed willingness to undergo or continue screening for CRC with either FOBT or colonoscopy by the demographic factors. Latinas were the most likely to respond yes (87 % to 96 %), while Asian women (31 %) and persons with less than high school education (47 %) were less enthused about obtaining colonoscopy. The multivariate predictors of willingness and intention to receive CRC screening in general are shown in Table 3. Latinas (OR=3.92; 95 % CI=1.50, 10.22) compared to Whites and individuals who had a

Table 1. Demographics and Knowledge of 492 Women Responding to Colorectal Cancer Screening Questions, San Francisco Primary Care Sites, 2003–2005*

	Total (n=492) N (%)	White (n=153) N (%)	African American (n=77) N (%)	Latino (n=105) N %	Asian (n=157) N %	P for difference between groups
Age (years)						
50–59	299 (61)	105 (69)	46 (60)	48 (46)	100 (64)	< 0.0001
60–69	141 (29)	36 (24)	22 (29)	33 (31)	50 (32)	
70–80	52 (11)	12 (8)	9 (12)	24 (23)	7 (5)	
Education						
Less than high school	169 (34)	1 (1)	8 (10)	58 (56)	102 (65)	< 0.0001
High school/Some college	158 (32)	46 (30)	46 (60)	34 (33)	32 (20)	
More than college	164 (33)	106 (69)	23 (30)	12 (12)	23 (15)	
Annual household income						
$20,000 or less	187 (45)	24 (17)	32 (46)	52 (65)	79 (64)	< 0.0001
$20,001–50,000	94 (23)	33 (24)	18 (26)	17 (21)	26 (21)	
$50,000 or more	131 (32)	81 (59)	20 (29)	11 (14)	19 (15)	
Marital status						
Never/Formerly Married	215 (44)	73 (48)	46 (60)	58 (56)	38 (24)	< 0.0001
Married/partner	275 (56)	79 (52)	31 (40)	46 (44)	119 (76)	
Health insurance						
Private	227 (47)	112 (74)	36 (47)	34 (33)	45 (30)	< 0.0001
Public	147 (31)	33 (22)	36 (47)	49 (48)	29 (19)	
No insurance	107 (22)	7 (5)	4 (5)	20 (19)	76 (51)	
Health status						
Poor/Fair	217 (44)	29 (19)	34 (44)	57 (54)	97 (62)	< 0.0001
Good	141 (29)	42 (28)	27 (35)	29 (28)	43 (27)	
Very Good/Excellent	133 (27)	81 (53)	16 (21)	19 (18)	17 (11)	
Employment						
Full/part-time	197 (42)	86 (61)	31 (43)	34 (34)	46 (30)	< 0.0001
Not working	95 (20)	11 (8)	5 (7)	15 (15)	64 (42)	
Retired	99 (21)	29 (20)	15 (21)	34 (34)	21 (14)	
Disability	77 (17)	16 (11)	22 (30)	18 (18)	21 (14)	
Numeracy Score[†]						
0–2	144 (29)	7 (5)	26 (34)	60 (57)	51 (33)	< 0.001
3–5	143 (29)	22 (14)	32 (42)	32 (31)	57 (36)	
6–8	205 (42)	124 (81)	19 (25)	13 (12)	49 (31)	
Personal history of cancer	104 (21)	38 (26)	18 (23)	27 (26)	21 (14)	0.0337
Family history of cancer	208 (44)	92 (62)	41 (56)	41 (40)	34 (23)	< 0.0001
Perceived Risk of CRC						
Higher than average risk	93 (20)	40 (26)	15 (20)	24 (24)	14 (10)	0.0003
Estimated mean absolute risk of lifetime CRC—%	13.3	12.2	14.2	21.6	7.8	< 0.0001
Summary CRC Knowledge Score						
0–6	152 (31)	6 (4)	8 (10)	29 (28)	109 (69)	< 0.0001
7–8	137 (28)	26 (17)	30 (39)	46 (44)	35 (22)	
9	203 (41)	121 (79)	39 (51)	30 (29)	13 (8)	

**Some cells do not equal 100 % due to missing data: 18 % had missing income data, 5 % had missing employment status, and < 1 % of values of other variables were missing.*

[†] Numeracy is measured by an eight-item scale[13,14]

[‡] Summary knowledge score was calculated as the mean number of correct answers of a series of nine colorectal cancer knowledge questions (see methods). A higher score= higher summary knowledge.

higher than average perceived risk for CRC (OR=5.70; 95 % CI=2.60, 12.46) compared to those with a lower than average perceived risk would be more likely to get colonoscopy after learning benefits and risks. Asians stated that they would be less likely to have a colonoscopy after learning the risks and benefits of the procedure, when compared with Whites (OR=0.28; 95 % CI=0.12, 0.64). Those who perceived their health status as very good or excellent were less likely to plan to continue to get FOBT regularly, compared with those of a poor to fair self-perceived health status (OR=0.40; 95 % CI=0.17, 0.94). Finally, those who scored intermediate on the numeracy scale would be less likely to get colonoscopy than those who scored low on the scale (OR=0.42; 95 % CI=0.21, 0.83).

Although a majority of women (>60 %) were willing to be screened for CRC to benefit the public, the proportions were somewhat lower compared to those for individual benefit. Table 4 shows the proportions and multivariate predictors for willingness and intention to receive CRC screening for public health benefit. In multivariate analyses, race/ethnicity was not a significant predictor of willingness and intention to be screened for public health benefit. Self-perceived higher than average risk for getting CRC was a significant predictor of willingness to take part in CRC screening program because there would be fewer cases in

Table 2. Colorectal Cancer Screening: Behavior and Perceived Importance of Being Tested, in 492 Women by Race/Ethnicity, San Francisco Primary Care Sites, 2003–2005

	Total (n=492) N (%)	White (n=153) N (%)	African American (n=77) N (%)	Latino (n=105) N (%)	Asian (n=157) N (%)	P for difference between groups
FOBT in the past 2 years	215 (44)	45 (30)	38 (49)	47 (45)	85 (54)	<0.001
Colonoscopy in the last 10 years	212 (44)	93 (62)	43 (58)	46 (44)	30 (20)	<0.001
Either FOBT (2 y) or colonoscopy(10 y) screening	377 (77)	121 (79)	64 (83)	79 (75)	113 (72)	0.227
Ever had any colon cancer screening	419 (85)	132 (86)	67 (87)	85 (81)	135 (86)	0.590
Ever received physician recommendation for FOBT	347 (74)	101 (69)	51 (68)	67 (70)	128 (84)	0.0084
Ever received physician recommendation for colonoscopy	326 (67)	122 (80)	59 (79)	63 (62)	82 (53)	<.0001
Ever received physician recommendation for any colorectal cancer screening	425 (86)	139 (91)	69 (90)	80 (76)	137 (87)	0.005
Perceived importance: Important to continue to get yearly FOBTs for the rest of their lives?	388 (80)	92 (62)	62 (82)	97 (92)	137 (88)	<.0001
Important to continue getting colonoscopies for the rest of their lives?	369 (76)	110 (72)	61 (80)	90 (86)	108 (70)	<.0001
Important to continue getting colonoscopies or FOBTs for the rest of their lives?	442 (90)	128 (84)	71 (92)	100 (95)	143 (91)	0.015

FOBT fecal occult blood test

California (OR=2.32; 95 % CI=1.32, 4.11). Individuals with a family history of cancer were less likely to be screened for CRC because there would be fewer cases of colorectal cancer in California (OR=0.62; 95 % CI=0.39, 0.98), but would be more likely to take part in a CRC screening program because it might prevent them from getting colorectal cancer (OR=1.93; 95 % CI=1.09, 3.42).

DISCUSSION

This study found that given similar scenarios and information, women from different race/ethnic groups reported different willingness and intention to be screened for CRC. Compared to Whites, Latina women were most likely to be willing to and intend to be screened while Asian women were the least likely. Self-perceived risk of CRC was also a significant factor associated with willingness and intent to obtain colonoscopy. These data contribute to the limited literature available about factors that predict willingness to undergo CRC screening in diverse women, and help define potential differences by race/ethnicity that can help inform clinical communication and patient education materials. Since racial/ethnic disparities in CRC screening rates persist [1], it is imperative to understand the factors that contribute to these.

Previous studies have shown that personal risk perception is an important factor in motivating individuals to obtain cancer screening, although the optimal measure of risk perception is not clear.[5,19] In a recent study of risk perception and colorectal cancer screening with 1,628 persons (51 % women, 75 % White), participants read messages about the importance of screening to reduce the risk of cancer. Perceived risk was evaluated with four measures: absolute numerical scale, absolute verbal scale, a comparative measure and a "feelings-of-risk" measure. In that analysis, absolute verbal risk perception and "feeling-of-risk" were significant predictors of intent to get a test in the next year, but the absolute numerical risk and comparative measures were not.[19] In our study, we found that the comparative measure of "higher than average" risk was a significant predictor of intent to receive screening for personal benefit, but we did not ask about "feelings-of-risk". Risk perception is different than actual risk; thus, a person who perceives herself to be at increased risk may or may not actually be at increased risk. We had previously shown that perceived risk was significantly associated with higher use of CRC screening tests,[5] but these women uniformly overestimated their numerical risk of CRC compared to population rates. Because of the importance of risk perception as a motivator of behavior, future research should address whether targeting perceived risk may result in changes in CRC screening behavior and clarify the use of different measures to assess perceived risk in diverse populations.

Self-perceived risk of colorectal cancer has previously been shown to be associated with adherence to CRC screening recommendations.[2,4] In a survey study of 492 Delaware women (84 % White), perceived risk of CRC and belief in screening guidelines were significantly associated with reporting CRC screening.[4] In a primary care clinic setting in Galveston, 562 Latina, White and African American women were studied and perceived susceptibility (OR 1.74) and greater education (OR=2.02) were associat-

Table 3. Adjusted Odds Ratios of Factors Associated With Willingness and Intention to Receive Colorectal Cancer Screening for Individual Benefit Among 492 Women, San Francisco, 2003–2005 (Odds Ratios and 95 % Confidence Intervals)

	Likely to get colonoscopy after learning benefits/risks	Intention to get FOBT regularly for the rest of their lives	Intention to get colonoscopies regularly for the rest of their lives	Intention to get FOBT or colonoscopy for the rest of their lives
Race/Ethnicity				
White	ref	ref	ref	ref
African-American	1.22 (0.53, 2.79)	1.63 (0.66, 4.00)	1.26 (0.54, 2.92)	2.08 (0.58,7.41)
Latino	**3.92 (1.50, 10.22)**	**6.14 (1.77, 21.34)**	**4.47 (1.66, 12.04)**	3.20 (0.80,12.76)
Asian	**0.28 (0.12, 0.64)**	1.78 (0.64, 4.95)	0.66 (0.28, 1.53)	0.73 (0.22,2.41)
Education				
Less than high school	0.91 (0.36, 2.30)	**3.44 (1.04, 11.38)**	0.72 (0.28, 1.82)	3.16 (0.83, 12.04)
High school/Some college	1.47 (0.73, 2.99)	1.16 (0.54, 2.49)	1.16 (0.56, 2.37)	1.25 (0.46, 3.40)
More than college	ref	ref	ref	ref
Income				
$20,000 or less	0.72 (0.30, 1.73)	**0.35 (0.12, 0.98)**	0.48 (0.20, 1.16)	0.67 (0.19,2.45)
$20,001–50,000	0.78 (0.34, 1.75)	0.72 (0.28, 1.90)	0.58 (0.26, 1.31)	0.99 (0.27,3.57)
$50,000 or more	ref	ref	ref	ref
Marital Status				
Never Married	0.47 (0.21, 1.06)	0.55 (0.23, 1.34)	0.52 (0.23, 1.18)	0.47 (0.15,1.44)
Married/partner	ref	ref	ref	ref
Formerly Married	**0.54 (0.29, 0.98)**	0.99 (0.47, 2.08)	0.84 (0.47, 1.53)	0.93 (0.38,2.25)
Health status				
Poor/Fair	ref	ref	ref	ref
Good	0.54 (0.29, 1.01)	1.18 (0.52, 2.68)	0.58 (0.32, 1.05)	1.48 (0.54,4.04)
Very good/Excellent	0.82 (0.38, 1.75)	**0.40 (0.17, 0.94)**	0.76 (0.36, 1.62)	0.50 (0.18,1.39)
Numeracy				
0–2	ref	ref	ref	ref
3–5	**0.42 (0.21, 0.83)**	0.79 (0.32, 1.97)	0.74 (0.39, 1.42)	1.11 (0.44,2.78)
6–8	0.87 (0.40, 1.90)	0.68 (0.25, 1.84)	0.71 (0.38, 1.50)	2.24 (0.67, 7.56)
Perceived higher than average risk for getting colorectal cancer?				
Yes	**5.70 (2.60, 12.46)**	0.66 (0.33, 1.34)	**3.58 (1.67, 7.71)**	1.65 (0.59,4.59)
No	ref	ref	ref	ref

FOBT fecal occult blood test

Multivariate logistic regression models also included the following variables that were not statistically significantly associated with the outcomes: age, insurance status, employment, personal history of cancer, family history of cancer, summary knowledge score

ed with CRC screening differences.[2] However, our study expands these findings by showing that they also apply to Asian women, and also shows that perceived risk is not only a predictor of past screening behavior, but is also a predictor of intention to continue CRC screening, and of intention to undergo CRC screening for public health benefit.

This study is one of the first to evaluate whether patients can be motivated to undergo a screening test for public

Table 4. Multivariate Predictors of Willingness and Intention to Receive Colorectal Cancer Screening for Public Health Benefit Among 492 Women, San Francisco, 2003–2005 (Odds Ratios and 95 % Confidence Intervals)

	Willingness to take part in colorectal cancer prevention program because there would be fewer cases of colorectal cancer in California	Intention to take part in a colorectal cancer prevention program because it might prevent them from getting colorectal cancer	Encouraging other women to get screened for colorectal cancer because a woman's life might be saved
Race/Ethnicity			
White	ref	ref	ref
African-American	0.97 (0.46, 2.04)	2.47 (0.90, 6.76)	3.54 (0.62, 20.32)
Latino	0.79 (0.37, 1.68)	2.51 (0.94, 6.70)	1.26 (0.32, 4.90)
Asian	0.64 (0.30, 1.35)	0.63 (0.26, 1.53)	0.59 (0.16, 2.18)
Insurance			
Private	ref	ref	ref
Public	0.72 (0.38,1.37)	0.83 (0.39, 1.76)	0.79 (0.29, 2.15)
No insurance	0.62 (0.31, 1.25)	0.61 (0.28, 1.35)	**0.32 (0.13, 0.83)**
Family history of cancer			
Yes	**0.62 (0.39, 0.98)**	**1.93 (1.09, 3.42)**	1.34 (0.65, 2.77)
No	ref	ref	ref
Perceived higher than average risk for getting colorectal cancer?			
Yes	**2.32 (1.32, 4.11)**	**2.25 (1.05, 4.80)**	2.36 (0.86, 6.49)
No	ref	ref	ref

Multivariate logistic regression models also included the following variables that were not statistically significantly associated with the outcomes: age, education, income, marital status, insurance, employment, personal history of cancer, summary knowledge score, health status and numeracy health benefit. Most participants responded that they would be willing to take part in a CRC screening program and take the risk of a serious complication because there would be fewer cases of cancer in California. Participants were also willing to encourage other women to get screened for colorectal cancer because a woman's life might be saved. This finding is reassuring that commitment to the public's health may be a strong motivating factor for individuals to obtain screening tests. Perceived risk was also a predictor of willingness and intent to receive screening for public health benefit. Interestingly, individuals with a family history of cancer stated that they would be less likely to be screened for public health benefit, although they would be more likely to be screened for individual benefit.

Although many interventions focus on increasing colorectal cancer screening knowledge, knowledge alone does not appear to be sufficient to motivate individuals to be willing to be screened, as shown in other studies[4,20] and confirmed by these results. Future efforts to increase rates of colorectal cancer screening should focus not only on increasing patient and clinician knowledge, particularly with Asian women, but must also target other factors such as risk perception and overcoming system barriers to screening.[1,21]

We intentionally conducted this study in a diverse population of women, both to ensure that we had a diverse, multi-ethnic sample and also to enable comparisons between ethnic groups. In this study, Latinas said that they would be more likely to get colonoscopy after hearing the risks and benefits, and were more likely to intend to get FOBT and colonoscopies regularly for the rest of their lives. Although Asians said that they would be less likely to get colonoscopy after learning the benefits and risks, Asian race/ethnicity was not a predictor of any other outcomes. There were no race/ethnic differences in any of the outcomes related to willingness to receive CRC screening for public health benefit. The importance of evaluating diverse race/ethnic samples in this area of research was highlighted by a study that compared adherence to screening according to which strategy was recommended (FOBT or colonoscopy).[22] In that study, conducted in San Francisco, Latinos and Asians were more likely to complete some form of screening compared to African Americans, and the three minority groups adhered more often to FOBT while Whites adhered more often to colonoscopy.[22]

In a recent study on Latino perceptions about CRC screening, after participants heard about the descriptions of the screening tests, they perceived stool cards as easier, safer, less painful and less embarrassing than colonoscopy.[23] However, in our study, Latinas were significantly more likely both to intend to receive colonoscopy after hearing the risks and benefits, and to plan regular screening for the rest of their lives. However, Asians stated that they would be less likely than Whites to obtain colonoscopy after hearing the risks and benefits. While we do not know the reasons for these differences, these race/ethnic differences may be partly due to the difference in risk perception between these groups,[5] and being Latino or Asian was also an independent predictor of willingness and intention to undergo CRC screening.

There are several limitations to our study. First, we asked about intentions and willingness to be screened, rather than measure future screening behavior in a longitudinal study. However, intention to be screened has previously been shown to be a predictor of CRC screening behavior.[24–26] We asked about prior screening behavior in the initial screening and 77 % had up to date CRC screening, but we were not able to measure whether or not women subsequently acted on their intentions and willingness to be screened. Second, because this survey was conducted before the guidelines that recommend stopping routine CRC screening after age 75 and stopping screening entirely after age 85,[27] we asked women whether or not they would be willing to continue CRC screening for the "rest of their lives". However, our goal was not to address the complex question of when to stop screening but to obtain a measure of commitment to the regular interval screening behavior. Third, these interviews were conducted 7–9 years ago, but the clinical issue of understanding factors affecting CRC screening has not changed. Fourth, the majority of participants had previously been screened, but we do ask about intention to continue screening, which is of particular relevance in a screened population. Fourth, since the only Asian survey languages were Cantonese and Mandarin, we cannot generalize the results to other Asian populations. Finally this study was conducted in a primary care clinic population and not in the general population; however, since CRC screening has to be initiated by the physician, this is the setting to best learn about CRC screening behavior.

In conclusion, the majority of women are willing to undergo screening for personal benefit, although there are some differences between race/ethnic groups. The majority of women were also willing to undergo screening to achieve a public health benefit of fewer CRC deaths. Since self-perceived risk appears to be the most consistent predictor of willingness to undergo screening, future research should address the extent to which targeting perceived risk can impact receipt of colorectal cancer screening for either individual or public health benefit.

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