

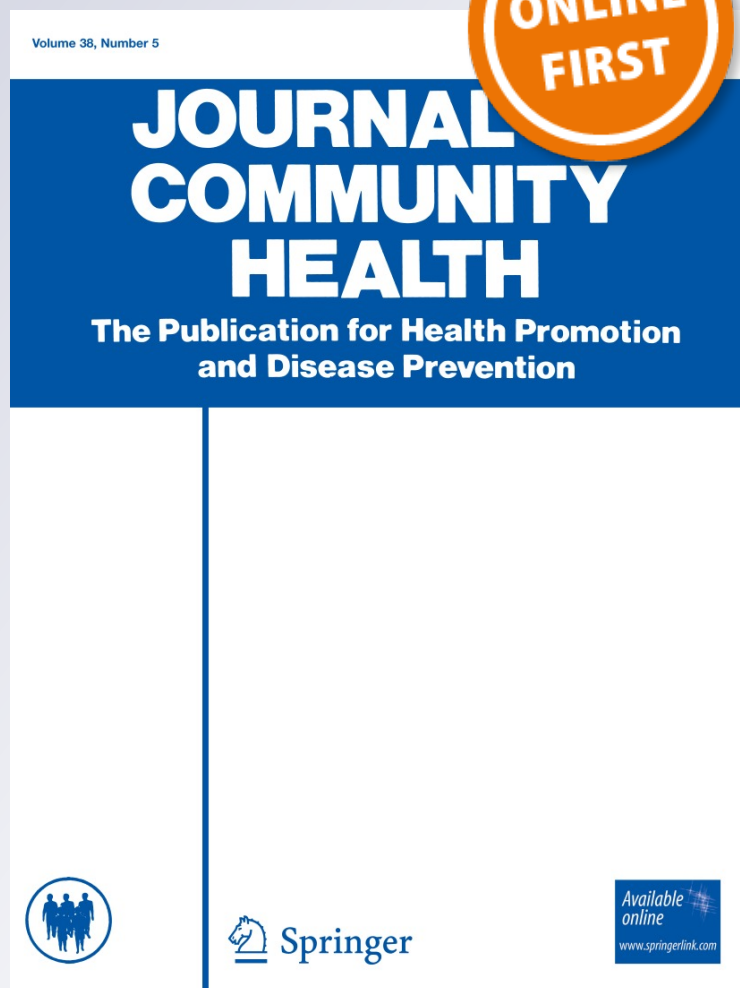
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Differences in Knowledge, Attitudes, Beliefs, and Perceived Risks Regarding Colorectal Cancer Screening Among Chinese, Korean, and Vietnamese Sub-Groups

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Abstract Asian ethnic subgroups are often treated as a single demographic group in studies looking at cancer screening and health disparities. To evaluate knowledge and health beliefs associated with colorectal cancer (CRC) and CRC screening among Chinese, Korean, and Vietnamese subgroups, a survey assessed participants' demographic characteristics, healthcare utilization, knowledge, beliefs, attitudes associated with CRC and CRC screening. Exploratory factor analysis identified six factors accounting >60 % of the total variance in beliefs and attitudes. Cronbach's alpha coefficients assessed internal consistency. Differences among Asian subgroups were assessed using a Chi square, Fisher's exact, or

Kruskal–Wallis test. Pearson's correlation coefficient assessed an association among factors. 654 participants enrolled: 238 Chinese, 217 Korean, and 199 Vietnamese. Statistically significant differences existed in demographic and health care provider characteristics, knowledge, and attitude/belief variables regarding CRC. These included knowledge of CRC screening modalities, reluctance to discuss cancer, belief that cancer is preventable by diet and lifestyle, and intention to undergo CRC screening. Chinese subjects were more likely to use Eastern medicine (52 % Chinese, 25 % Korean, 27 % Vietnamese; $p < 0.001$); Korean subjects were less likely to see herbs as a form of cancer prevention (34 % Chinese, 20 % Korean, 35 % Vietnamese; $p < 0.001$). Vietnamese subjects were less likely to consider CRC screening (95 % Chinese, 95 % Korean, 80 % Vietnamese; $p < 0.0001$). Important differences exist in knowledge, attitudes, and health beliefs among Asian subgroups. Understanding these differences will enable clinicians to deliver tailored, effective health messages to improve CRC screening and other health behaviors.

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Introduction

Colorectal cancer (CRC) is the third most common cause of cancer death in the United States [1]. CRC screening in average-risk asymptomatic populations has been shown to reduce both incidence and mortality [2–5]. Evidence-based guidelines, like those from the United States Preventive

Services Task Force [6], recommend CRC screening for all average-risk individuals beginning at age 50. Recommended CRC screening modalities include an annual fecal occult blood test (FOBT) [6], flexible sigmoidoscopy every five years [6], or colonoscopy every 10 years [6]. Despite these guidelines, multiple studies find that CRC screening rates in the United States remain low [7–11]. A 2005 National Health Interview survey revealed that only half of eligible Americans received appropriate CRC screening [7].

Asian-Americans comprise a large, diverse racial minority in the United States. Many studies place Asian-Americans into a single demographic group; however, each Asian subgroup is unique and differ not only in language, culture, and health beliefs, but also in patterns of cancer incidence and mortality. In 2008, an estimated 15.5 million Asian-Americans represented 5 % of the total population, and this is projected to increase by 162 % to 40.6 million in 2050 compared to a 44 % increase in the entire U.S. population over the same period [12]. Although prevalence of CRC among Asian-Americans is similar to that of non-Asians [13], Asians have a 10–30 % higher risk of being found with late stage CRC at time of diagnosis [14]. CRC screening and survival rates remain lower among Asian Americans compared to Caucasians [7, 15–17]. Reasons for this disparity are unclear and may include lack of knowledge, language barriers, limited access to healthcare, and cultural beliefs that do not promote screening [18–21].

Though differences in CRC screening rates exist among Asian ethnic subgroups, varying levels of English proficiency and access to medical care are not the only explanations [22]. Diverse cultural backgrounds may influence beliefs about CRC screening. However, few studies have examined more nuanced differences related to health behaviors and cancer screening among various Asian ethnicities that extend beyond language barriers and access to care. A broad approach to Asian-Americans without consideration of subgroups may lead to interventions insensitive to cultural differences which may thus be ineffective [23]. This study aimed to assess differences in knowledge, attitudes, and beliefs about CRC screening among Chinese, Korean, and Vietnamese subgroups in the Portland, Oregon metropolitan area.

Methods

Investigators at Oregon Health & Science University (OHSU) partnered with a community-based organization, the Asian Health and Service Center (AHSC), to conduct this study. The AHSC, a nonprofit organization that provides services and information to more than 13,000 Asian clients each year in the Portland metropolitan area, aims

to reduce health disparities and increase access to care for all Asians. This is part of a larger study designed to develop and test culturally tailored educational interventions designed to improve CRC screening. OHSU's Institutional Review Board (IRB # 3819) approved all study activities.

Study Population

Eligible subjects included men and women, aged 50–75 years and of Chinese, Vietnamese, or Korean ethnicity. All enrolled subjects provided informed consent, had no history of colon cancer, no history of receiving CRC screening, and no significant medical illnesses that would preclude CRC screening. Subjects who had a first degree relative with colon cancer were excluded and counseled to speak with a health care provider about appropriate screening. Participants were not required to speak or read English.

Survey Design, Implementation

Co-authors PAC and FL designed and developed the survey instrument which queried demographic characteristics, healthcare utilization, beliefs and attitudes about cancer and cancer screening, and past experience with cancer (see “Appendix”). Demographic characteristics included: age, gender, marital and educational statuses, race/ethnicity, employment, English language proficiency, language spoken at home, and number of years in the U.S. Healthcare utilization questions included: access to a healthcare provider, duration of time with that provider, level of trust in the provider, need for translation during healthcare visits, use of herbal or Eastern therapies, beliefs about Western medicine being effective in treating disease, and the extent to which a provider discussed colorectal cancer screening with them.

Survey questions on beliefs and attitudes were guided by the Theory of Planned Behavior, which posits that human action is guided by three considerations: (1) behavioral beliefs about likely consequences of behavior; (2) normative beliefs about normative expectations of others; and (3) control beliefs about the presence of factors that may facilitate or impede occurrence of behavior [24]. Individually, behavioral beliefs produce a favorable or unfavorable attitude toward the behavior, normative beliefs result in perceived social pressure or subjective norms, and control beliefs give rise to perceived behavioral controls. Together, attitudes toward a behavior, subjective norms, and perceptions of behavioral control lead to the formulation of a behavioral intention. The more favorable the attitude and subjective norm, the greater the perceived control, the stronger the person's intention will be to

perform the behavior under study, and the best predictor of human behavior is intention [24]. Eleven variables were developed to assess behavioral beliefs, fourteen to assess attitudes toward a behavior, seven to assess control beliefs, six to assess perceived behavioral controls, and four to assess behavioral intentions. Responses were recorded on a 5-point Likert scale: strongly agree, agree, neutral, disagree, strongly disagree. The survey was pilot-tested using cognitive interviewing techniques [25] and revised until it was completed with ease by members of each subgroup.

Baseline surveys, upon which these analyses were based, were administered during the initial phase of the study. All participants were consented and enrolled at AHSC by AHSC staff after which the survey was administered orally in each participant's preferred language.

Data Analysis

Descriptive statistics were used to summarize the data for each Asian subgroup. Using combined data from all three Asian subgroups, exploratory factor analysis with varimax rotation was performed on 42 questions that measure beliefs and attitudes about cancer and cancer screening. Six factors accounted for over 60 % of the total variance; a set of questions that contributed to each factor was retained for further statistical analyses. Cronbach's alpha coefficients were calculated separately for each question set associated with defined factors to assess internal consistency. Chi square, Fisher's exact, and Kruskal–Wallis tests were used to evaluate differences among Asian subgroups. All tests were two-tailed with alpha levels set at 0.05. All analyses were performed using Statistical Analysis System (SAS version 9.2).

Results

654 participants enrolled in the study and completed the survey (Table 1). 238 were Chinese (75 men, 163 women), 217 were Korean (74 men, 143 women), and 199 were Vietnamese (75 men, 124 women). The mean age was 62.3 years; more than 60 % were women. This study's demographic profile closely reflects the AHSC's client database that consists of 67 % women and a median age range from 55 to 65 years. Chinese participants were significantly older than Korean and Vietnamese participants. Approximately 70 % were married and more than half had at minimum a high school education. Although the need for translation at health care visits varied, two-thirds of all participants self-assessed their English proficiency as fair to average.

Over half of study participants (64 % Chinese, 58 % Korean, and 45 % Vietnamese) had a regular health care

provider (Table 2). Chinese and Vietnamese subjects more commonly required translators at their visits compared to Korean subjects (81 % Chinese, 81 % Vietnamese, 66 % Korean; $p < 0.01$). Chinese subjects were more likely to consider Eastern medicine to treat health problems compared to other subgroups (52 % Chinese, 25 % Korean, 27 % Vietnamese; $p < 0.01$), but were also more likely to believe that Western medicine was effective in treating disease (93 % Chinese, 76 % Korean, 79 % Vietnamese; $p < 0.01$).

Between 34 and 58 % of participants reported no memory of discussion about CRC screening with providers (46.6 % Chinese, 58 % Korean, 34 % Vietnamese; $p < 0.0001$) (Table 3). Vietnamese participants were significantly less aware of available CRC screening modalities compared to the other two subgroups (61 % Chinese, 63 % Korean, 47 % Vietnamese; $p = 0.0017$) and fewer Vietnamese subjects believed that screening could prevent CRC (72 % Chinese, 79 % Korean, 57 % Vietnamese; $p < 0.0001$). Korean participants were more likely to believe that polyp removal can be associated with prevention of CRC relative to Chinese and Vietnamese participants (44 % Chinese, 52 % Korean, 46 % Vietnamese; $p = 0.02$). The majority of each ethnic subgroup denied fear of CRC screening tests. A higher proportion of Korean subjects expressed anxiety over cancer (41 % Chinese, 46 % Korean, 33 % Vietnamese; $p = 0.0004$), had a family member with cancer (27 % Chinese, 49 % Korean, 20 % Vietnamese; $p < 0.0001$), or knew an unrelated person with CRC (38 % Chinese, 49 % Korean, 21 % Vietnamese; $p < 0.0001$).

Among the 26 statements on health beliefs, statistically significant differences were found for reluctance to discuss cancer with a health care provider, belief that cancer can be prevented by diet and lifestyle, and intention to undergo CRC screening (Table 4). Korean subjects were less likely to view herbs as a form of cancer prevention compared to other subgroups (34 % Chinese, 21 % Korean, 34 % Vietnamese; $p < 0.001$). Vietnamese subjects were more likely to believe that certain foods could prevent cancer (49 % Chinese, 43 % Korean, 63 % Vietnamese; $p < 0.0001$) and more likely to express fatalistic views on cancer and the belief that death is inevitable with a cancer diagnosis (25 % Chinese, 22 % Korean, 61 % Vietnamese; $p < 0.01$). Vietnamese subjects appeared less receptive to screening in the absence of a family history of CRC (95 % Chinese, 95 % Korean, 80 % Vietnamese; $p < 0.0001$). Chinese subjects were less likely to report anxiety about discussing the topic of cancer with a health care provider (66 % Chinese, 49 % Korean, 48 % Vietnamese; $p = 0.0001$).

Compared to Korean men, Korean women were more likely to report concern about discomfort with a health care provider touching them for CRC screening (36 % Korean women, 14 % Korean men; $p < 0.001$). No

Table 1 Demographic characteristics

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	<i>p</i> value [†]
Demographics				
Mean age	65.2 (7.6)	60.6 (7.8)	60.7 (7.1)	<0.0001*
Male	31.5	34.3	37.7	0.40 [†]
Mean years in US	17.3 (13.0)	23.4 (10.1)	17.2 (9.8)	<0.0001*
Marital status				
Married	71.7	74.2	62.8	0.0014 [†]
Unmarried; domestic partner	0	0.9	2.0	
Single	4.2	2.3	8.0	
Separated	1.7	1.4	6.0	
Divorced	5.9	9.2	9.6	
Widowed	16.5	12.0	11.6	
Highest educational level				
No formal schooling	5.5	0	7.5	<0.0001 [†]
Elementary school	36.3	6.1	28.6	
High school	28.7	40.2	42.2	
Some college or technical school	12.24	15.9	8.0	
College	13.9	31.3	8.5	
Graduate, professional school	3.4	6.5	5.0	
Employment				
Full time	14.78	39.4	31.5	<0.0001 [†]
Part time	8.7	13.9	11.7	
Unemployed	63.0	43.8	46.2	
Other	13.5	2.9	10.6	
Language spoken at home				
Chinese: Mandarin	43.7	0.46	0.5	<0.0001 [†]
Chinese: Cantonese	68.9	0	4.5	
Korean	0.42	95.3	0	
Vietnamese	4.2	0	97.5	
English	12.6	14.7	8.54	
Other	5.46	0	1.01	
English language proficiency				
Fluent	32.2	1.9	18.8	<0.0001
Well	13.1	14.0	26.9	
Average	31.4	40.2	20.3	
Fair	16.5	35.5	27.9	
Poor	4.2	6.1	3.0	
None	2.5	2.3	3.1	

* ANOVA

[†] Chi square

other significant differences existed between genders. About two-thirds of each Asian ethnic subgroup reported seeing a health care provider only when faced with a health problem. Half of all participants relied upon a family member or friend for transportation to a healthcare provider.

Cronbach's alpha coefficients were calculated for each question set representing individual factors to assess internal consistency among each subgroup (Table 5).

These ranged from 0.17 to 0.90. Because the factors were identified using all three Asian subgroups combined, some factors may be subgroup-specific (e.g., perceived behavioral control) and may not have consistent Cronbach's alpha coefficients across subgroups. Significant differences among all six factors were seen among the three subgroups with regard to attitudes about cancer screening (Table 6) and behavioral intention (Table 7). Taken together, these results highlight differences in beliefs and attitudes among

Table 2 Healthcare and healthcare provider characteristics

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	p value
<i>Healthcare relationships</i>				
Presence of a healthcare provider				0.002*
Yes	64.0	57.5	45.2	
No	34.3	41.2	51.8	
Unsure	1.7	1.4	3.1	
Duration of relationship with provider				0.357 [†]
<1 year	20.8	26.9	27.6	
1–2 years	22.0	21.2	13.3	
3–4 years	17.3	19.9	18.1	
>5 years	39.9	32.1	40.1	
Mean level of trust in provider (1 = no trust; 10 = complete trust)	8.3	7.8	7.9	0.037**
Need for translator at health care visits				<0.0001 [†]
Yes	80.9	65.6	80.8	
No	19.1	34.4	19.2	
Discussion with provider about colorectal cancer (CRC) screening?				<0.0001 [†]
Yes	47.7	36.5	39.8	
No	41.9	58.3	32.4	
Unsure	10.5	5.2	27.8	
Use of herbal, Eastern therapies				<0.0001 [†]
Yes	51.5	24.6	27.1	
No	43.8	75.4	62.8	
Unsure	4.7	0	10.1	
Belief that western medicine effectively treat disease				<0.0001 [†]
Yes	92.8	75.6	79.3	
No	1.3	6.6	13.6	
Unsure	6.0	17.8	7.1	

* Fisher's Exact Test

** Kruskal–Wallis Test

[†] Chi square

Table 3 Prior experience with cancer and cancer knowledge characteristics

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	p value [†]
Family member with cancer				<0.0001 [†]
Yes	26.9	48.8	20.1	
No	66.8	46.5	70.4	
Unsure	6.3	4.7	9.6	
Family member who died from cancer				<0.0001 [†]
Yes	21.2	38.6	16.2	
No	73.3	55.8	72.1	
Unsure	5.5	5.6	11.7	
Anxiety over cancer				0.0004 [†]
Yes	41.4	45.8	33.3	
No	47.3	42.5	41.9	
Unsure	11.4	11.7	24.8	
Knowledge of anyone with CRC				<0.0001 [†]
Yes	38.1	48.6	20.6	
No	46.6	40.9	61.3	
Unsure	15.3	10.6	18.1	

Table 3 continued

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	<i>p</i> value [†]
Assessment of risk of developing CRC				<0.0001 [†]
20 % or higher	6.6	18.6	8.6	
10–19 %	15.5	20.6	8.6	
5–9 %	23.5	19.6	19.9	
1–4 %	28.8	27.5	31.7	
0 %	25.7	13.7	31.2	
Can screening prevent CRC?				<0.0001 [†]
Yes	72.2	78.8	57.4	
No	5.9	7.6	13.2	
Unsure	21.9	13.7	29.4	
Knowledge of colon polyps, growths				<0.0001 [†]
Yes	61.3	50.2	40.2	
No	27.3	37.6	37.7	
Unsure	11.3	12.2	22.1	
Are most colon polyps cancerous?				<0.0001 [†]
Yes	11.8	17.8	25.8	
No	41.2	44.9	25.3	
Unsure	47.1	37.4	49.0	
If polyps are removed, can CRC be prevented?				0.0137 [†]
Yes	43.7	52.1	45.9	
No	8.0	13.6	7.7	
Unsure	48.3	34.3	46.4	
Can CRC be prevented by herbs?				<0.0001 [†]
Yes	34.9	15.0	24.6	
No	11.3	49.5	25.6	
Unsure	53.8	35.5	49.8	
Knowledge of CRC screening tests				0.0017
Yes	61.3	62.6	46.7	
No	20.4	25.6	34.0	
Unsure	18.3	11.9	19.3	
Friends/family with CRC screening tests				0.0055 [†]
Yes	43.7	52.3	38.2	
No	34.9	36.5	38.7	
Unsure	21.4	11.2	23.1	
Fear of CRC screening tests				0.1108 [†]
Yes	22.0	18.7	18.0	
No	62.3	69.6	61.3	
Unsure	15.7	11.7	20.6	
Friends fearful of CRC screening tests				0.0003 [†]
Yes	11.4	22.9	13.2	
No	26.6	34.6	30.0	
Unsure	62.0	42.5	56.9	
Family fearful of CRC screening tests				0.0051 [†]
Yes	13.0	14.0	11.6	
No	42.4	56.1	42.2	
Unsure	44.5	29.9	46.2	

† Chi square

Table 4 Attitudes and beliefs about cancer and cancer screening—analysis of individual questions

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	p value
<i>Perceived behavioral controls (doctors) and behavioral intentions</i>				
If a doctor advised cancer screening, I would obtain it				<0.0001*
Strongly agree/agree	92	95	86	
Neutral	5	4	14	
Disagree/strongly disagree	3	1	1	
If I could get cancer screening tests for free, I would get them				0.0526*
Strongly agree/agree	85.7	92.5	85.9	
Neutral	12.2	5.6	13.1	
Disagree/strongly disagree	2.1	1.9	1.0	
If I had questions about cancer or screening, I would talk to my doctor				<0.0001*
Strongly agree/agree (%)	96.2	97.7	84.3	
Neutral (%)	3.4	1.4	14.7	
Disagree/strongly disagree (%)	0.4	0.9	1.0	
Even if busy, I would make time to get cancer screening				<0.0001†
Strongly agree/agree	79.0	89.4	68.2	
Neutral	15.6	9.7	30.3	
Disagree/strongly disagree	5.5	0.9	1.5	
I intend to stay up-to-date with cancer screening				<0.0001†
Strongly agree/agree	67.9	75.2	63.1	
Neutral	18.1	21.4	35.4	
Disagree/strongly disagree	13.9	3.4	1.5	
I feel comfortable scheduling cancer screening tests				<0.0001†
Strongly agree/agree	79.8	61.2	58.4	
Neutral	11.3	24.3	34.0	
Disagree/strongly disagree	8.8	14.5	7.6	
Even if nervous about getting cancer screening, I would still get it				<0.0001†
Strongly agree/agree	84.0	88.4	61.9	
Neutral	12.2	10.2	35.0	
Disagree/strongly disagree	3.8	1.4	3.1	
<i>Behavioral Beliefs (Cancer Screening)</i>				
Cancer can be prevented by a healthy lifestyle				0.0334†
Strongly agree/agree	84.0	80.4	72.6	
Neutral	13.0	16.4	20.3	
Disagree/strongly disagree	2.9	3.3	7.1	
Cancer screening is a good method to find cancer early				<0.0001†
Strongly agree/agree	93.7	95.8	83.8	
Neutral	4.6	1.9	13.7	
Disagree/strongly disagree	1.7	2.4	2.5	
Cancer can be cured if found early				0.0617
Strongly agree/agree	92.4	88.5	85.4	
Neutral				
Disagree/strongly disagree				
Even without a family history of cancer, I should still get screening				<0.0001*
Strongly agree/agree	94.9	95.3	80.3	
Neutral	3.4	3.8	17.7	
Disagree/strongly disagree	1.7	1.0	2.0	

Table 4 continued

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	p value
Better to detect cancer early through screening than discover it later				0.0116*
Strongly agree/agree	94.1	96.2	90.4	
Neutral	2.5	1.9	8.1	
Disagree/strongly disagree	3.4	1.9	1.5	
<i>Attitudes toward behavior</i>				
Most people talk about cancer screening				0.0034 [†]
Strongly agree/agree	42.9	48.6	32.3	
Neutral	30.3	32.6	43.4	
Disagree/strongly disagree	26.9	18.9	24.2	
People feel the way I do about cancer screening				<0.0001 [†]
Strongly agree/agree	36.3	54.7	28.9	
Neutral	37.1	32.2	41.6	
Disagree/strongly disagree	26.6	13.1	29.4	
I talk to people about the cancer screening I received				<0.0001 [†]
Strongly agree/agree	52.7	65.0	36.7	
Neutral	21.5	26.6	37.8	
Disagree/strongly disagree	25.7	8.4	25.5	
I talk to people about the cancer screening I need				<0.0001 [†]
Strongly agree/agree	52.5	70.1	34.7	
Neutral	21.4	22.8	40.8	
Disagree/strongly disagree	26.1	7.1	24.5	
<i>Behavioral beliefs (Cancer)</i>				
Cancer can be prevented by qi gong				<0.0001 [†]
Strongly agree/agree	13.0	42.9	14.7	
Neutral	56.3	38.1	32.5	
Disagree/strongly disagree	30.7	19.0	52.8	
Cancer can be prevented by certain foods				<0.0001 [†]
Strongly agree/agree	12.6	22.3	7.1	
Neutral	38.7	34.6	30.3	
Disagree/strongly disagree	48.7	43.1	62.6	
Cancer can be prevented by herbs				<0.0001 [†]
Strongly agree/agree	16.0	41.6	19.7	
Neutral	50.4	37.8	46.0	
Disagree/strongly disagree	33.6	20.6	34.3	
Cancer can be caused by yin-yang imbalance				0.0001 [†]
Strongly agree/agree	17.3	31.1	26.9	
Neutral	51.9	34.5	51.3	
Disagree/strongly disagree	30.8	34.5	21.8	
Cancer can be caused by poor qi and blood circulation				<0.0001 [†]
Strongly agree/agree	16.5	21.7	23.9	
Neutral	46.0	29.3	48.2	
Disagree/strongly disagree	37.6	49.1	27.9	
<i>Control beliefs (Eastern/Asian medicine)</i>				
Eastern/Asian Medicine is effective in treating health problems				<0.0001 [†]
Strongly agree/agree	5.0	19.8	11.1	
Neutral	28.6	37.3	35.4	
Disagree/strongly disagree	66.4	42.9	53.5	

Table 4 continued

	Chinese (n = 238)	Korean (n = 217)	Vietnamese (n = 199)	p value
I would use Eastern/Asian medicine before Western medicine				0.0278 [†]
Strongly agree/agree	36.6	50.0	45.2	
Neutral	37.4	34.0	35.5	
Disagree/Strongly disagree	26.1	16.0	19.3	
I use Eastern/Asian medicine to treat health problems				<0.0001 [†]
Strongly agree/agree	13.0	23.4	25.4	
Neutral	16.0	27.1	36.6	
Disagree/strongly disagree	71.0	49.5	38.1	
<i>Perceived behavioral control (reliance on family)</i>				
I rely on family for advice about health				<0.0001 [†]
Strongly agree/agree	44.1	21.9	8.1	
Neutral	16.1	33.8	32.0	
Disagree/strongly disagree	39.8	44.3	59.9	
I rely on family or friends to take me to a health care provider				<0.0001 [†]
Strongly agree/agree	30.4	37.5	6.6	
Neutral	11.4	21.6	31.8	
Disagree/strongly disagree	58.2	40.9	61.6	

* Fishers exact test

[†] Chi Square

Table 5 Cronbach's alpha of six coefficient factors representing attitudes and beliefs about cancer and cancer screening

Factor Description	Chinese Cronbach's alpha (standardized)	Korean Cronbach's alpha (standardized)	Vietnamese Cronbach's alpha (standardized)	Overall Cronbach's alpha (standardized)
Perceived behavioral control (doctors) and behavioral intentions	0.86	0.85	0.90	0.87
Behavioral beliefs (cancer screening)	0.73	0.77	0.77	0.76
Attitudes toward behavior	0.79	0.78	0.83	0.81
Behavioral beliefs (cancer)	0.74	0.71	0.70	0.71
Control beliefs (Eastern/Asian medicine)	0.61	0.80	0.54	0.69
Perceived behavioral control (reliance on family)	0.59	0.17	0.87	0.56

Table 6 Attitudes and beliefs about cancer and cancer screening

Factor Description	Number of questions	Chinese mean (SD)	Korean mean (SD)	Vietnamese mean (SD)	Kruskal–Wallis test p value
Perceived behavioral control (doctors) and behavioral intentions	7	3.95 (0.51)	4.20 (0.53)	3.91 ± 0.57	<0.0001
Behavioral beliefs (cancer screening)	5	4.13 (0.43)	4.34 (0.57)	4.07 (0.52)	<0.0001
Attitudes toward behavior	4	3.22 (0.72)	3.54 (0.65)	3.07 (0.76)	<0.0001
Behavioral beliefs (cancer)	5	2.77 (0.53)	3.00 (0.69)	2.77 (0.58)	<0.0001
Control beliefs (Eastern/Asian medicine)	3	2.60 (0.61)	2.99 (0.89)	2.90 (0.70)	<0.0001
Perceived behavioral control (reliance on family)	2	2.85 (0.88)	2.87 (0.84)	2.34 (0.80)	<0.0001

Table 7 Correlation between perceived behavioral control, behavioral intentions, and other factors

Factor description	Chinese Pearson r (p value)	Korean Pearson r (p value)	Vietnamese Pearson r (p value)
Perceived behavioral control (doctors) and behavioral intentions	1	1	1
Behavioral beliefs (cancer screening)	0.49 (<0.0001)	0.36 (<0.0001)	0.52 (<0.0001)
Attitudes toward behavior	0.32 (<.0001)	0.07 (.3267)	0.25 (0.0005)
Behavioral beliefs (cancer)	−0.10 (0.1425)	0.01 (0.9332)	0.02 (0.7743)
Control beliefs (Eastern/Asian medicine)	0.03 (0.6887)	0.11 (0.0934)	−0.20 (0.0049)
Perceived behavioral control (reliance on family)	0.02 (0.7280)	−0.11 (.0962)	−0.50 (<0.0001)

Asian ethnic subgroups toward CRC and underscore how varied approaches to CRC screening intervention may be required.

Discussion

This study found important differences in knowledge, attitudes, and beliefs regarding CRC and its associated screening tests among Chinese, Korean, and Vietnamese subgroups. As with other studies, language barriers did not solely explain CRC screening behavior among our participants. Having same-language providers has not correlated with increased likelihood of receiving cancer screening recommendations [26–29]. In our analysis, Chinese and Vietnamese subjects were more likely to identify the need for a translator at health visits, but a higher proportion of Chinese subjects recalled having a discussion about CRC screening with their provider when compared to Vietnamese and Korean subjects. The lower proportion of Korean subjects reporting utilization of translation services may reflect that a majority sought care from a same-language provider. The proportion of Koreans and Vietnamese not perceiving a CRC screening recommendation from their provider, despite differences in the need for a translator, may reflect varying levels of awareness of screening guidelines among providers, assumptions of cultural views that may not prioritize screening or disease prevention, or under-insurance in the setting of a limited referral network [28].

Consistent with current literature, this study's Vietnamese subgroup was significantly less aware of CRC screening modalities, less likely to report that screening was a good method for early cancer detection, and less likely to express intention to undergo CRC screening. McCracken et al. [18] reported that Vietnamese immigrants encounter cultural and economic barriers to preventive health care; cancer screening rates for Vietnamese are lowest among all major Asian subgroups. Factors behind a decreased inclination to undergo screening may include

lack of health insurance and lack of a regular health care provider.

This study also demonstrates a complex interplay between conventional Eastern and Western concepts of medicine and illness. While Chinese participants were more likely to report use of herbs or Eastern therapies, this Asian subgroup was also more likely to find Western medicine effective. Though Korean subjects were less likely to report herbal use for cancer prevention, a higher proportion expressed the belief that cancer can be caused by poor *qi*. Despite disparate beliefs regarding Eastern medicinal practices, many Korean and Chinese participants similarly expressed an intention to undergo cancer screening. Perhaps neither exclusive Eastern nor Western beliefs drive intention to receive screening. Increased willingness to undergo screening may be correlated with overall knowledge of screening tests, knowing friends who received CRC, and discussing screening tests with community members. Unlike other studies where acculturation may have a differential impact, acculturation itself was not likely to be an influential factor here since the mean number of years in the US was more than 17 for all three subgroups [30]. Korean and Chinese subgroups stated that they only sought medical care when symptomatic. However, these same subgroups were also more likely to declare that they would undergo screening if recommended. This finding is important since it contradicts past observations that Asians who sought care only when ill were *less* likely to obtain CRC screening, underscoring a lack of familiarity with the concept of routine screening and health maintenance. Multiple opportunistic approaches during illness visits may be necessary to initiate the CRC screening process successfully.

A unique aspect of this study is that an instrument applying a well-tested theoretical framework was used [24]. Prior research using the Theory of Planned Behavior has illustrated success in promoting a healthy diet [31–33], mammography screening [34], and exercise [35]. The model has been used to study ethnicity in health behavior [36] and revealed how ethnicity and gender must be

considered when developing instruments for attitude assessment. Godin et al. [37] found this model efficient for explaining intention and in determining importance of perceived behavioral control and attitudes.

Variations in education, income, English proficiency, and health care access have been proposed as explanations behind differences in receipt of cancer screening among Asian American subgroups [22, 27, 28]. Many studies have only examined disparities associated with demographic characteristics. Not only does our study expand on the emerging literature that highlights heterogeneity among Asian subgroups with regard to CRC screening, but it also reveals more nuanced differences in each subgroup's socio-cultural values, health beliefs, knowledge, and intentions. Strengths of this study include the focus on non-English speaking Asian-Americans, the assessment of knowledge, cultural beliefs, and attitudes toward colorectal cancer and screening tests, partnering with a community-based organization and a linguistically and culturally appropriate staff, and the design and development of surveys administered in participants' native languages. However, the results on differences among these Asian subgroups are based in Oregon and may not represent those of the same ethnic Asian

subgroups in other geographic areas. All participants were foreign-born, thus it remains unclear if such differences persist among second- and third-generation Asian-Americans. Finally, data was based on self-reporting and may be subject to recall or social response bias.

In conclusion, our study found important differences among Asian ethnic subgroups which may provide insight into health utilization among Asian Americans, highlight the need for language and culturally specific health interventions, and have implementations for assessment methods.

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Conflict of interest None.

Appendix: Colorectal Cancer Early Detection Project

Instructions: Please complete the questions below by indicating your response in the space provided. You can skip any question you choose not to answer.

Section 1: Questions about You

- 1.01 What is your gender? 1. Male 2. Female
- 1.02 What is your age? _____years old
- 1.03 What is your ethnic group?
1. Chinese
 2. Korean
 3. Vietnamese
- 1.04 How old were you when you moved to the United States? _____ years old
- 1.05 How many years have you lived in the United States? _____ years
- 1.06 What is your marital status?
1. Currently married
 2. Not married, living with partner
 3. Single, never married
 4. Separated
 5. Divorced
 6. Widowed
- 1.07 What is the highest educational level you have achieved?
1. Did not undertake any formal schooling
 2. Completed elementary school
 3. Completed high school
 4. Some college or technical school
 5. Completed college
 6. Graduate school; professional degree
- 1.08 What is your current employment status?
1. Employed full-time
 2. Employed part time
 3. Not currently employed
 4. Other (please specify: _____)
- 1.09 What language do you typically speak at home? (Circle all apply)
1. Chinese: Mandarin
 2. Chinese: Cantonese
 3. Korean
 4. Vietnamese
 5. English
 6. Other (please specify: _____)

Section 3: Questions about How You Feel About Cancer and Cancer Screening:

Behavioral Beliefs	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.01 Cancer can be prevented by living a healthy lifestyle	1	2	3	4	5
3.02 Cancer can be prevented by doing qi gong	1	2	3	4	5
3.03 Cancer can be prevented by eating certain foods	1	2	3	4	5
3.04 Cancer can be prevented by taking herbs	1	2	3	4	5
3.05 Cancer can be caused by an imbalance of yin (cold) and yang (heat)	1	2	3	4	5
3.06 Cancer can be caused by poor qui and blood circulation	1	2	3	4	5
3.07 Cancer Screening test is a good method of finding cancer early	1	2	3	4	5
3.08 Cancer can be cured if it is found early	1	2	3	4	5
3.09 Even if I do not have a family history of cancer, it is important to be checked regularly	1	2	3	4	5
3.10 I am afraid to talk to my doctor about cancer	1	2	3	4	5
3.11 Being reluctant to talk with a healthcare provider about cancer can reduce the chance that cancer can be found early	1	2	3	4	5
Attitudes Toward Behavior	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.12 It is better to detect cancer early through screening than discover it later	1	2	3	4	5
3.13 When I think about getting screened for cancer, I feel good about myself	1	2	3	4	5
3.14 Most people are afraid of getting screened for cancer	1	2	3	4	5
3.15 There are some kinds of cancer that are not that bad to get	1	2	3	4	5
3.16 Getting cancer pretty much means the person is going to die.	1	2	3	4	5
3.17 My risk of getting cancer is about the same as everyone else	1	2	3	4	5
3.18 Most people are afraid of getting cancer	1	2	3	4	5
3.19 People are happy to get cancer screening tests	1	2	3	4	5
3.20 Most usually people talk to each other about cancer screening tests they get	1	2	3	4	5
3.21 People feel the same way I do about getting cancer screening	1	2	3	4	5
3.22 I talk to other people about the cancer screening tests I have gotten	1	2	3	4	5
3.23 I talk with other people about the cancer screening tests I need to get	1	2	3	4	5
3.24 I feel uncomfortable talking about my body with a health care provider	1	2	3	4	5
3.25 I am uncomfortable about letting health care provider touches my body even if it is a health screening exam	1	2	3	4	5

4.03 Do you ever worry that you might have cancer?

1. Yes 2. No 3. Not Sure

4.04 Do you know anyone who had **colon** cancer?

1. Yes 2. No 3. Not Sure

4.05 What do you think is your personal risk of developing colon cancer in your lifetime?

1. 0% 2. 1%-4% 3. 5%-9% 4. 10%-19% 5. 20% or higher

4.06 Screening involves having tests before you develop any signs or symptoms of colon cancer. Do you think that screening could prevent colon cancer?

1. Yes 2. No 3. Not Sure

4.07 Have you heard about colon polyps (growths)?

1. Yes 2. No 3. Not Sure

4.08 Do you think that most colon polyps are cancerous?

1. Yes 2. No 3. Not Sure

4.09 If colon polyps are detected and removed, can colorectal cancer be prevented?

1. Yes 2. No 3. Not Sure

4.10 Do you think colon cancer can be prevented with herbs or alternative medicines?

1. Yes 2. No 3. Not Sure

4.11 Have you heard about colon screening tests (like home stool cards, sigmoidoscopy or colonoscopy)?

1. Yes 2. No 3. Not Sure

4.12 Have any of your friends or family had colon screening tests?

1. Yes 2. No 3. Not Sure

4.13 Are you afraid of getting colon screening tests?

1. Yes 2. No 3. Not Sure

4.13a – If yes, why: _____

4.14 Are your friends afraid of colon screening tests?

1. Yes 2. No 3. Not Sure

4.15 Are your family members afraid of colon screening tests?

1. Yes 2. No 3. Not Sure

We will be giving you a test to find blood in a stool sample. We would like to find out why people may not want to have this test and how you feel about this test. We want to know how likely are the following reasons to keep you from having a stool blood test.

		Very Unlikely						Very Likely
5.01	Fear of finding something wrong	1	2	3	4	5	6	7
5.02	Handling stool is unpleasant	1	2	3	4	5	6	7
5.03	I am not having any symptoms	1	2	3	4	5	6	7
5.04	Not knowing how to do test	1	2	3	4	5	6	7
5.05	Lack of time	1	2	3	4	5	6	7
5.06	I would be embarrassed	1	2	3	4	5	6	7

Thanks for your participation. We will be giving you a test to find if there is blood in a stool sample; We will need to send your result to you and your health care provider (HCP). May we have your and your HCP's contact information?

Your Name: _____

Your HCP's Name: _____

Your Address: _____

Your HCP's Address: _____

Your Phone #: _____

Your HCP's Phone #: _____

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