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Cancer Screening, Knowledge, and Fatalism Among Chinese, Korean, and South Asian Residents of New York City

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Abstract

Background: Asian New York City (NYC) residents have the lowest cancer screening uptake across race and ethnicity. Few studies have examined screening differences across Asian ethnic subgroups in NYC.

Methods: Cross-sectional survey data were analyzed using multivariable logistic and multinomial regression analyses. Differences among Chinese, Korean, and South Asian adults in breast, cervical, and colorectal cancer (CRC) screening uptake; breast and CRC screening knowledge; and cancer fatalism were examined. Associations between breast and CRC screening knowledge and their uptake were also assessed along with associations between cancer fatalism and breast, cervical, and CRC screening uptake.

Results: Korean women reported 0.52 (95%CI: 0.31, 0.89) times lower odds of Pap test uptake compared to Chinese women; South Asian adults had 0.43 (95%CI: 0.24, 0.79) times lower odds of CRC screening uptake compared to Chinese adults. Korean adults reported 1.80 (95%CI: 1.26, 2.58) times higher odds of knowing the correct age to begin having mammograms compared to Chinese adults; and South Asian adults had 0.67 (95%CI: 0.47, 0.96) times lower odds of knowing the correct age to begin CRC screening compared to Chinese adults. Korean adults had 0.37 (95%CI: 0.27, 0.53) times lower odds of reporting cancer fatalism compared to Chinese adults.

Conclusions: Low cancer screening uptake among Asian American adults, low screening knowledge, and high cancer fatalism were found. Cancer screening uptake, knowledge, and fatalism varied by ethnic subgroup.

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Impact: Findings indicate the need for ethnic-specific cultural and linguistic tailoring for future cancer screening interventions.

Introduction

According to the New York City (NYC) Department of Health and Mental Hygiene (DOHMH), cancer is the leading cause of death among New Yorkers under the age of 65 years.(1) Between 2015-2019, the New York State Department of Health reported 42,154 (444 per 100,000) annual incident cancer cases and 12,082 (125 per 100,000) annual cancer deaths on average across NYC.(2) The National Cancer Institute (NCI) reports that low-risk screening procedures can prevent death from several high-incidence and high-mortality cancers, including breast, cervical, and colorectal cancer (CRC).(3) However, there are still gaps across NYC by race and ethnicity in receipt of timely screening, as defined by the United States (U.S.) Preventive Service Task Force (USPSTF) recommendations. In 2014, 74.9% of NYC women aged 40 or over had received a mammogram in the past two years, with differences by race and ethnicity (White: 70.3%, Black: 77.0%, Latino: 82.0%, Asian/Pacific Islander (API): 72.9%) (NYC EpiQuery). In 2017, 84.7% of women had received a Pap test in the past three years, with differences by race and ethnicity (White: 88.2%, Black: 87.7%, Latino: 85.6%, API: 66.8%) (NYC EpiQuery). In 2018, 69.1% of individuals aged 50 and over had received a colonoscopy in the past 10 years, with differences by race and ethnicity (White: 68.5%, Black: 72.4%, Latino: 68.9%, API: 65.0%) (NYC EpiQuery). Variation in breast, cervical, and CRC screening uptake has been found among Asian ethnic subgroups.(4,5)

Knowledge about cancer screening and screening guidelines has been found to be associated with breast, cervical, and CRC screening intention and uptake.(6–9) One study found that the biggest barrier to cervical cancer screening across racial and ethnic groups is lack of screening recommendation knowledge, which differed by race and ethnicity; Asian women were more likely than White women to cite lack of knowledge as the reason for not getting screened.(10)

Cancer fatalism, defined as the feeling of powerlessness or hopelessness in the face of cancer, has been found to impact cancer screening uptake among Asian individuals in quantitative(11–17) and qualitative studies.(13,17,18) However, the strength and direction of the effect varies by ethnicity and cancer type.(11–18) For example, while Guo et al. found an association between cancer fatalism and increased odds of timely Pap test and mammogram among Chinese Americans,(11) Jin et al. found fatalism to be a barrier to CRC screening among Korean Americans.(18) Levels of cancer fatalism vary by race and ethnicity with non-White groups being more likely to exhibit fatalistic beliefs than White individuals in the U.S. and United Kingdom (U.K.).(12,19,20)

Previous studies indicate the importance of investigating cancer screening uptake among disaggregated Asian American subgroups due to heterogeneity in screening uptake.(21,22) Yet, most recent studies only compare screening uptake and predictors, e.g., screening knowledge and cancer fatalism, between Asian Americans and other racial groups (e.g., Asian vs. White) or investigate only one Asian ethnic subgroup (e.g., Chinese individuals).

(11,12,14,23) Many studies examining cancer screening across Asian ethnic subgroups used data from before the COVID-19 pandemic,(21,22,24–26) during which screening uptake significantly decreased and has not yet returned to pre-pandemic levels;(27) other studies examined CRC screening only.(9,13,28)

Using data from a community needs assessment designed to understand cancer-related challenges, needs, and resources of diverse and minoritized NYC populations, we examined differences in breast, cervical, and CRC screening uptake; breast and CRC screening knowledge; and cancer fatalism among NYC's three most populous Asian ethnic subgroups: Chinese, Korean, and South Asian.(29) We also assessed whether greater breast and CRC screening knowledge were associated with increased breast and CRC screening uptake, respectively, and whether cancer fatalism was associated with decreased breast, cervical, and CRC screening uptake.

Materials and Methods

This study used data collected via the Cancer Community Health Resources and Needs Assessment (CHRNA), a cross-sectional survey developed by NYU Langone Health Perlmutter Cancer Center in collaboration with 23 community partners. The survey was administered from October 2021-December 2022. Participants included 2,636 NYC residents aged 18 and older who could speak one of the ten survey languages (Arabic, Bangla, Chinese [Simplified or Traditional], English, Haitian Creole, Korean, Russian, Spanish, or Urdu). The Cancer CHRNA was conducted in partnership with community-based organizations (CBOs) and used a multi-pronged convenience sampling approach. Asian Americans were intentionally oversampled to enable disaggregated data collection across ethnic subgroups. The institutional IRB approved this study, which was conducted in accordance with recognized ethical guidelines, and written informed consent was obtained from participants before participation. Data was acquired from NYU Langone via a data use agreement. Supplementary Table S1 shows all cancer-related exposure and outcome survey questions used in this analysis.

Outcomes

Screening Uptake—We examined self-reported uptake of breast, cervical, and CRC screening. Uptake was defined and analyzed following the timeframes and age ranges specified by the USPSTF recommendations.(30–32) Breast cancer screening uptake among women aged 40-74 years was determined as self-reported receipt of a mammogram in the past two years. Cervical cancer screening uptake among women aged 21-65 years was determined as self-reported receipt of a Pap test in the past three years. CRC screening uptake among adults aged 45-75 years was determined as self-reported receipt of one or more of the following: fecal occult blood test [FOBT] within the past year, sigmoidoscopy within the past five years, or colonoscopy within the past ten years. The screening test was first explained to the participant, followed by *"Have you ever had (this test)?"* If yes, participants were asked when they last received screening. Answer choices ranged from "within the past year" to "5 or more years ago" for mammogram, Pap test, and FOBT, and "within the past year" to "10 or more years ago" for sigmoidoscopy and colonoscopy.

Screening uptake variables were created with three categories - Yes (participant was screened within USPSTF recommended timeframe), No, and Don't know/Not sure - and analyzed as binary variables, combining No and Don't know/Not sure.

Screening Knowledge—We examined age-related screening guideline knowledge for breast and CRC screening. Participants were asked *"At what age are women supposed to start having mammograms,"* and *"At what age are most people supposed to start doing home blood stool tests, home stools tests for colon cancer markers, having a sigmoidoscopy, or having a colonoscopy?"*. Response options for both included a 1-100 year range and Don't know/Not sure. Binary variables were created for both. Mammogram screening knowledge included 40 or 50 years (correct) and Other age/Don't know/Not sure, following American College of Obstetricians and Gynecologists(33) and the National Comprehensive Cancer Network guidelines,(34) which report 40 as the mammography initiation age, and the USPSTF, which until May 2023 indicated 50 as the mammography initiation age.(30) We investigated breast cancer screening knowledge among all adults, since men could be caretakers for women who need mammograms, and it would be important for them to know this information. CRC screening knowledge included 45 or 50 years (correct) and Other age/Don't know/Not sure due to recently changed guidelines.(35,36)

Cancer Fatalism—Three cancer fatalism questions from the NCI's Health Information National Trends Survey (HINTS) were surveyed using a 4-point Likert scale (1=Strongly agree to 4=Strongly disagree): "*Do you agree with the following statements?"* (1) *"It seems like everything causes cancer,"* (2) *"There's not much you can do to lower your chances of getting cancer,"* and (3) *"There are so many different recommendations about preventing cancer; it's hard to know which ones to follow."* Responses to the three statements were summed (range: 3-12), and the variable was dichotomized at the midpoint such that total scores of 3-7 were coded as "Fatalism" and total scores of 8-12 were coded as "No Fatalism" per a previously published approach.(20) If any cancer fatalism questions were not answered, the score was set to missing.

Exposure

Race and ethnicity were collected with the question: *"What is your race or ethnic background? (check all that apply)"* with response options of White; Hispanic, Latino, or Spanish origin; Black; Middle Eastern or North African; Native Hawaiian or Pacific Islander; Asian; American Indian, Native, First Nations, Indigenous Peoples of the Americas, or Alaska Native; Some other Race or Origin (please specify); Don't Know/Not Sure; and Decline to state. For each racial category selected (besides Some other Race or Origin (please specify); Don't Know/Not Sure; Decline to state), a follow-up question was asked: *"Which group(s) best represents your origin or ancestry?"* with answer choices specific to each racial group, Other (please specify), Don't Know/Not Sure, and Decline to state. For those who selected "Asian," the ethnic group response options were Chinese, Asian Indian, Filipino, Korean, Japanese, Vietnamese, Guyanese, Bangladeshi, and Pakistani. All racial and ethnic groups were coded as binary variables (1=individual belongs to group) and were used to create a mutually exclusive Asian ethnic subgroup variable with categories of: Chinese, Korean, and South Asian (including Asian Indian, Bangladeshi,

Nepali, and Pakistani). Chinese, Korean, and South Asian participants who also identified as another Asian ethnic subgroup were excluded from the present analysis; however, Chinese, Korean, and South Asian participants who also identified as another racial/ethnic group (e.g., Black or Hispanic) were included (n=4).

Demographic variables

The survey collected self-reported data on age, sex at birth, education level (dichotomized into high school or less vs. some college or higher), nativity, insurance status (dichotomized into Private/Public vs. Other insurance type/Uninsured), and English proficiency. Other insurance type included unknown insurance type and Alaska Native, Indian Health Service, and Tribal Health Services. English proficiency was measured with the question: *"How well do you speak English?"* and was examined as a dichotomous variable (Not well/Not at all vs. Well/Very well).

Analyses

Of the 2,636 total survey participants, 1,215 (46.9%) identified as Asian. Among the Asian participants, 37 (3.0%) were excluded due to identifying as multiple Asian ethnic subgroups or not identifying as Chinese, Korean, or South Asian. An additional 134 (11.4%) Chinese, Korean, or South Asian participants were excluded due to missing data on one or more demographic variables described above. The total analytic sample size was 1,044. Frequencies and percentages of categorical variables and means and standard deviations (SDs) of continuous variables were calculated overall and stratified by Asian ethnic subgroup: Chinese, Korean, South Asian. Chi-square tests and Kruskal-Wallis tests were used to compare characteristics across ethnic subgroups.

Multivariable logistic regression analyses were used to evaluate differences in breast, cervical, and CRC screening uptake (ref: Did not receive timely screening) across Asian ethnic subgroup (ref: Chinese [due to largest n and most commonly studied]) adjusted for age, sex (for CRC), education level, insurance status, and nativity, and restricted to groups matching the age and sex for whom screening is recommended. Multivariable logistic regression analyses were used to evaluate differences in breast and CRC screening knowledge (ref: Other age/Don't know/Not sure) across Asian ethnic subgroup adjusted for age, sex, education level, insurance status, and English proficiency. Differences in cancer fatalism (ref: No Fatalism) across Asian ethnic subgroup were evaluated using multivariable logistic regression adjusted for age, sex, education level, and nativity. Separate multivariable logistic regression analyses were used to examine the association of breast and CRC screening knowledge with breast and CRC screening uptake adjusted for Asian ethnic subgroup, age, sex, education level, insurance status, and English proficiency, and restricted to groups matching the age and sex for whom screening is recommended. The associations between cancer fatalism and breast, cervical, and CRC screening uptake (separate models for each outcome) were examined using multivariable logistic regression analyses adjusted for Asian ethnic subgroup, age, sex, education level, insurance status, and nativity, and were restricted to groups matching the age and sex for whom screening is recommended. For regression, odds ratios (ORs) and 95% confidence intervals (CIs) are presented. All analyses were conducted in SAS Studio 3.81.

Data Availability Statement

Data generated in this study are not publicly available due to information that could compromise patient privacy/consent but are available upon reasonable request from the corresponding author.

Results

Among the analytic sample (*n*=1,044), those identifying as Chinese (*n*=521, 49.9%) were the largest subgroup, followed by South Asian (*n*=285, 27.3%), and Korean (*n*=238, 22.8%) (Table 1). The study population was majority female (60.0%), had completed some higher education (54.3%), were privately or publicly insured (79.3%), and were born outside the U.S. (83.1%). Half of respondents (50.4%) reported speaking English not well/not at all, and the average age of participants was 45.7 (SD=17.8) years. Overall, 67.4% of women aged 40-74 years reported receiving a timely mammogram, 48.2% of women aged 21-65 years reported receiving a timely Pap test, and 49.5% of adults aged 45-75 years reported receiving timely CRC screening. While 45.1% of participants correctly identified the age to begin receiving a mammogram, only 35.5% correctly identified the age to begin CRC screening. Most participants reported cancer fatalism (61.2%).

The distribution of age, education level, health insurance status, nativity, and English proficiency differed by Asian ethnic subgroup (Table 1). Mean age ranged from 37.6 years among South Asian individuals to 49.9 years among Chinese individuals. South Asian individuals were most likely to have some higher education (75.1%), be born in the U.S. (23.9%), and speak English well/very well (80.4%). Chinese individuals were most likely to be privately/publicly insured (89.8%) and were least likely to have some higher education (36.5%) and speak English well/very well (37.6%). Korean individuals were least likely to be privately/publicly insured (62.6%) and born in the U.S. (13.0%). Cervical and CRC screening uptake and CRC screening knowledge differed by Asian ethnic subgroup. Chinese women had the highest percentage of cervical cancer screening uptake (53.0%), while Korean women had the lowest (37.1%). For both CRC screening uptake and knowledge, Chinese individuals had the highest percentages (56.9% and 40.2%, respectively), and South Asian participants had the lowest (32.1% and 26.1%, respectively).

Results from the examination of cancer screening uptake, knowledge, and fatalism by Asian ethnic subgroups are presented in Tables 2–3. No differences were observed in breast cancer screening uptake across groups (Table 2). In adjusted models, Korean women had 0.52 (95%CI: 0.31, 0.89) times lower odds of cervical cancer screening uptake compared to Chinese women, and South Asian individuals had 0.43 (95%CI: 0.24, 0.79) times lower odds of CRC screening uptake compared to Chinese individuals (Table 2). In the adjusted examination of cancer screening knowledge by ethnic subgroup, Korean participants had 1.80 (95%CI: 1.26, 2.58) times higher odds of knowing the correct age to begin breast cancer screening compared to Chinese participants, and South Asian participants had 0.67 (95%CI: 0.47, 0.96) times lower odds of knowing the correct age to begin CRC screening compared to Chinese participants (Table 3). Regarding adjusted differences in cancer fatalism by ethnic subgroup, Korean individuals had 0.37 (95%CI: 0.27, 0.53) times lower odds of cancer fatalism than Chinese individuals (Table 3). Adjusted models showed no

evidence of an association between screening knowledge or cancer fatalism and screening uptake (Tables 4, 5).

Discussion

In this study of NYC Asian American adults, we found low cancer screening uptake and limited screening guideline knowledge (compared to U.S. adults via the Prevent Cancer Foundation's 2023 Early Detection Survey)(37) with differences across ethnic subgroups. Korean participants reported lower Pap test uptake, higher breast cancer screening knowledge, and lower cancer fatalism levels compared to Chinese participants; and South Asian participants reported lower CRC screening uptake and CRC screening knowledge compared to Chinese participants. Most participants reported cancer fatalism. Neither screening guideline knowledge nor cancer fatalism were associated with screening uptake. Our study is the first – to our knowledge – to compare cancer screening uptake, screening knowledge, and cancer fatalism across largely immigrant Asian ethnic subgroups in NYC. Our findings indicate the need for cancer screening interventions among Asian NYC residents and are important for informing efforts to improve screening knowledge and uptake.

Among the analytic sample, cancer screening uptake was lower than previously reported among NYC Asian residents, especially for cervical and CRC screening (NYC EpiQuery). Low screening uptake may be influenced by >80% of the study population being immigrants and half reporting limited English proficiency (LEP).(38) Immigration and LEP are often challenges to screening uptake, due partially to difficulty accessing language-concordant providers and lack of health information in multiple languages; this amplifies difficulties with eligibility, access, and use of public health insurance for immigrants.(38)

The differences in cervical and CRC screening uptake, breast and CRC screening knowledge, and cancer fatalism among our Asian ethnic subgroups align with the literature, which has found Asian Americans to be a diverse group with differing cancer-related needs, knowledge, and beliefs.(28,39,40) In alignment with previous findings, Korean women had lower cervical cancer screening uptake compared to Chinese women.(21,22,41) Korean participants were less likely to be privately or publicly insured compared to Chinese participants, which may have contributed to this finding. Prior studies have indicated that a lack of culturally tailored information and resources may further explain this difference. In a focus group study, Korean immigrant women reported being unfamiliar with women's health clinics and Pap tests, that these clinics are only acceptable for married women, and that gynecological exams connoted promiscuity for single women, indicating gaps in both delivering tailored messaging to Korean immigrants and familiarizing Korean immigrants with the U.S. healthcare system.(42) Further, lack of accessibility of health care services and information was identified as a barrier to receiving a Pap test, even among Korean immigrants who were fluent enough in English to attend graduate school in the U.S.(42) Prevention orientation, the belief that it is better to use screening to detect health problems early than to discover and have to treat an issue later, has been found to be associated with increased Pap test uptake among Korean American women.(43) However, lack of prevention orientation among Korean Americans is prevalent in the literature,(43) and a systematic

review of factors associated with cervical cancer screening identified lack of prevention orientation and lack of cultural tailoring as salient barriers to cervical cancer screening uptake among Korean American women.(44) This underscores the need for culturally tailored information and accessible care for this group.

We also found that Chinese participants had lower breast cancer screening knowledge than Korean participants. Previous findings of positive associations between educational attainment and cancer screening knowledge among both groups,(28,45) and the higher percentage of Korean Americans vs. Chinese Americans in this study who attained education beyond high school, could contribute to this finding. Additionally, a previous study using 2011-2014 HINTS data found that Korean Americans were more likely than Chinese Americans to seek out cancer-related information and to have been provided breast cancer screening information from providers.(5) While Asian Americans in the HINTS study were more likely than White Americans to receive breast cancer information from their providers, they were less likely to complete on-time breast cancer screening, indicating additional barriers.(5) One such barrier could be provider satisfaction, measured by concepts including the provider helping to resolve uncertainty, giving attention to the patient's feelings, and spending enough time with the patient. Both Chinese and Korean participants reported lower provider satisfaction than White participants, indicating a need for improved clinical care and information provision for these groups.(5) This need may be especially relevant among Chinese Americans, for whom recommendations and reminders from clinicians may be key facilitators for obtaining mammograms, as indicated by a focus group study in Portland, Oregon.(46) Access to language-concordant providers and culturally tailored, in-language information for all Asian subgroups is crucial given the increasing necessity for individuals to advocate for their own cancer care.(47)

Further, cancer fatalism among the study sample was higher than was measured among the U.S. adult population via the 2022 HINTS survey (RRID:SCR_023943), again indicating the need for cultural and in-language tailoring of cancer-related information for Asian NYC residents. We found fatalism to be highest among Chinese participants. A study among Chinese women in Australia reported that high cancer fatalism is linked to lack of cancer screening knowledge among Chinese individuals,(48) which could explain Chinese individuals having both higher cancer fatalism and lower breast cancer screening knowledge compared to Korean individuals in our study. However, more research on the impact of cancer fatalism among specific Asian ethnic groups is needed, as evidenced by the mixed findings in this area.(11,13,18,49,50)

Compared to Chinese participants, South Asian participants reported less CRC screening uptake and knowledge. Prior studies among Asian individuals living in the U.S., U.K., and Scotland found Chinese adults to have higher CRC screening uptake and interest than South Asian (Asian Indian, Bangladeshi, Pakistani) adults,(22,51,52) aligning with our findings. A larger percentage of Chinese participants vs. South Asian participants in our study were privately/publicly insured, potentially contributing to our finding of lower CRC screening uptake among South Asian participants. Despite being the largest Asian ethnic subgroup in the U.S. (and the second largest in NYC),(29) South Asians receive little culturally and linguistically tailored outreach and information. The NCI has not developed evidence-based

cancer screening programs which target South Asian Americans, though such programs exist for other Asian ethnic subgroups, including Chinese and Korean Americans, and non-Asian racial and ethnic groups (NCI). There is a definitive need for more research into factors which affect screening among South Asian Americans and how screening programs and information can be tailored to best reach and serve this group.

There was no association between breast or CRC screening knowledge and breast or CRC screening uptake. This could be due to differences in the relationship between knowledge and uptake among our largely immigrant sample compared to studies of mainly non-immigrants.(6,8,10,53) While studies among Asian Canadian(54) and Chinese American immigrant women(55) found no relationship between breast cancer screening knowledge and uptake, these and other studies did find that doctor recommendations, English proficiency, cultural barriers, and insurance coverage were associated with uptake, (13,54,55) indicating that these factors may be more relevant to uptake among Asian immigrants residing in North America. Additionally, the importance of female providers for breast and cervical cancer screening among Chinese, Korean, and South Asian immigrant women has been found,(56,57) indicating that gender-concordant care may be another important facilitator of screening uptake for Asian American immigrants. If language- and gender-concordant care are not feasible, translators/interpreters and cultural/linguistic/ gender-concordant patient navigators could promote patient comfort and patient-provider communication.

Lastly, there was no association between cancer fatalism and breast, cervical, or CRC screening uptake among our study population. Inconsistent findings on the impact of fatalism on screening uptake among Asian ethnic subgroups(11,13,18,49,50) may stem from the gap in disaggregated data collection among Asian Americans. This gap, together with our findings of the heterogeneity of cancer-related beliefs, information, and screening uptake among NYC's Asian residents, indicate the necessity for more studies which investigate the needs of specific Asian ethnic subgroups and qualitative studies to better understand factors which affect cancer screening among Asian Americans, such as availability and accessibility of language-, culture- and gender-concordant care.

A key strength of this study was the collection of disaggregated ethnic-level data, allowing for analyses across ethnic subgroups. Extensive collaboration with CBOs was another major strength along with the study's ability to reach immigrants and individuals with LEP, resulting in a unique dataset containing large samples of Chinese, Korean, and South Asian subgroups. The study also has important limitations, including the study population being a convenience sample, limiting generalizability, and our inability to reach LEP groups speaking languages beyond those represented in the translated surveys (e.g., Hindi, Kazakh). Additionally, subgroup analysis and guideline-recommended age restriction led to small sample sizes, limiting generalizability and potentially impacting the ability to observe between-group differences. Finally, this study did not collect information on HPV testing, meaning that cervical cancer screening uptake may have been undercounted since HPV testing with a Pap test every 5 years or alone is USPFTF guideline concordant for women 30 and older.(31)

This study adds to the current literature on the diversity of cancer needs, beliefs, and behaviors among Asian Americans. We found differences in cancer screening uptake, knowledge, and fatalism across Chinese, Korean, and South Asian NYC residents, and the findings indicate a need for ethnic-specific cultural tailoring for future cancer screening interventions. Further research into factors which influence cancer screening among these groups would be beneficial to determine community-specific needs, facilitators, and barriers and to develop effective interventions to improve cancer screening uptake among Asian Americans.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Descriptive statistics by Asian ethnic subgroup (n=1,044)

Variable	Asian Sample *n* (%)	Chinese *n* (%)	Korean *n* (%)	South Asian[d] *n* (%)	p-value
Total	1044 (100.0%)	521 (49.9%)	238 (22.8%)	285 (27.3%)	
Sex assigned at birth					0.22
Male	418 (40.0%)	195 (37.4%)	100 (42.0%)	123 (43.2%)	
Female	626 (60.0%)	326 (62.6%)	138 (58.0%)	162 (56.8%)	
Age, mean (SD)	45.7 (17.8)	49.9 (18.0)	46.2 (18.1)	37.6 (14.1)	**<0.0001** [a]
Education level					**<0.0001** [a]
High school graduate or lower	477 (45.7%)	331 (63.5%)	75 (31.5%)	71 (24.9%)	
Some college/technical/vocational school or higher	567 (54.3%)	190 (36.5%)	163 (68.5%)	214 (75.1%)	
Health insurance status					**<0.0001** [a]
Private / Public Insurance	828 (79.3%)	468 (89.8%)	149 (62.6%)	211 (74.0%)	
Other or unknown type / Uninsured	216 (20.7%)	53 (10.2%)	89 (37.4%)	74 (26.0%)	
Nativity					**<0.01** [b]
Born in the U.S.	177 (17.0%)	78 (15.0%)	31 (13.0%)	68 (23.9%)	
Not born in the U.S.	867 (83.1%)	443 (85.0%)	207 (87.0%)	217 (76.1%)	
English proficiency					**<0.0001** [a]
Speaks English well/very well	518 (49.6%)	196 (37.6%)	93 (39.1%)	229 (80.4%)	
Does not speak English well / does not speak English at all	526 (50.4%)	325 (62.4%)	145 (60.9%)	56 (19.6%)	
Breast Cancer Screening Uptake: Received a mammogram within the past year[e] (*n* missing = 6)					0.35
Yes	223 (67.4%)	138 (69.7%)	53 (67.1%)	32 (59.3%)	
No/Don’t know/Not sure	108 (32.6%)	60 (30.3%)	26 (32.9%)	22 (40.7%)	
Cervical Cancer Screening Uptake: Received a Pap smear within the past three years[f] (*n* missing = 2)					**0.03** [c]
Yes	231 (48.2%)	122 (53.0%)	39 (37.1%)	70 (48.6%)	

Variable	Asian Sample *n* (%)	Chinese *n* (%)	Korean *n* (%)	South Asian[d] *n* (%)	p-value
No/Don't know/Not sure	248 (51.8%)	108 (47.0%)	66 (62.9%)	74 (51.4%)	
Colorectal Cancer Screening Uptake: Received one or more of the recommended colorectal cancer tests with the recommended time interval[g] (*n* missing = 3)					**<0.001** [a]
Yes	228 (49.5%)	156 (56.9%)	46 (43.4%)	26 (32.1%)	
No/Don't know/Not sure	233 (50.5%)	118 (43.1%)	60 (56.6%)	55 (67.9%)	
Breast Cancer Screening Knowledge: At what age are most women supposed to start having mammograms? (*n* missing = 39)					0.15
40 or 50 years	453 (45.1%)	221 (43.2%)	109 (50.9%)	123 (43.9%)	
Other age or don't know	552 (54.9%)	290 (56.8%)	105 (49.1%)	157 (56.1%)	
Colorectal Cancer Screening Knowledge: At what age are most people supposed to start screening for colorectal cancer? (*n* missing = 33)					**<0.001** [a]
45 or 50 years	359 (35.5%)	204 (40.2%)	82 (36.8%)	73 (26.1%)	
Other age or don't know	652 (64.5%)	304 (59.8%)	141 (63.2%)	207 (73.9%)	
Cancer Fatalism (*n* missing = 44)					**<0.0001** [a]
No cancer fatalism	388 (38.8%)	150 (29.5%)	125 (56.6%)	113 (41.7%)	
Cancer fatalism	612 (61.2%)	358 (70.5%)	96 (43.4%)	158 (58.3%)	
Mean Cancer Fatalism Score, mean (SD) (*n* missing = 44)	7.1 (1.7)	6.8 (1.5)	7.8 (1.7)	7.0 (2.1)	**<0.0001** [a]

Note: bold indicates statistical significance.

[a] p<0.001

[b] p<0.01

[c] p<0.05

[d] Includes Asian Indian, Bangladeshi, Nepali, and Pakistani individuals

[e] Screening estimate for breast cancer limited to women aged 40-74 years. Breast cancer screening adherence based on mammogram within the past two years according to USPSTF guidelines.

[f] Screening estimate for cervical cancer limited to women aged 21-65 years. Cervical cancer screening adherence based on Pap test within the past three years according to USPSTF guidelines.

[g] Screening estimate for colorectal cancer (CRC) limited to individuals aged 45-75 years. CRC screening adherence based on fecal occult blood test within the past year, sigmoidoscopy in the past five years, or colonoscopy in the past ten years according to USPSTF guidelines.

Abbreviations: SD, standard deviation; U.S., United States

Table 2.

Multivariable logistic regression model evaluating the odds of breast, cervical, and colorectal cancer screening uptake by Asian ethnic subgroup

	***Breast Cancer Screening Uptake[d] (n = 331)*, OR [95% CI]**		***Cervical Cancer Screening Uptake[e] (n = 479)*, OR [95% CI]**		***Colorectal Cancer Screening Uptake[f] (n = 461)*, OR [95% CI]**	
Variable	**Unadjusted**	**Adjusted[g]**	**Unadjusted**	**Adjusted[g]**	**Unadjusted**	**Adjusted[h]**
Asian ethnic subgroup (ref = Chinese) [i]						
Korean	0.89 [0.51, 1.55]	1.05 [0.54, 2.04]	**0.52 [0.33, 0.84]** [c]	**0.52 [0.31, 0.89]** [a]	**0.58 [0.37, 0.91]** [c]	0.61 [0.35, 1.07]
South Asian[j]	0.63 [0.34, 1.18]	0.71 [0.36, 1.38]	0.84 [0.55, 1.27]	0.97 [0.62, 1.52]	**0.36 [0.21, 0.60]** [a]	**0.43 [0.24, 0.79]** [b]

Note: bold indicates statistical significance.

[a] p<0.001

[b] p<0.01

[c] p<0.05

[d] Screening estimate for breast cancer limited to women aged 40-74 years. Breast cancer screening adherence based on mammogram within the past two years according to USPSTF guidelines.

[e] Screening estimate for cervical cancer limited to women aged 21-65 years. Cervical cancer screening adherence based on Pap test within the past three years according to USPSTF guidelines.

[f] Screening estimate for colorectal cancer (CRC) limited to individuals aged 45-75 years. CRC screening adherence based on fecal occult blood test within the past year, sigmoidoscopy in the past five years, or colonoscopy in the past ten years according to USPSTF guidelines.

[g] Adjusted for age, education level, insurance status, and nativity

[h] Adjusted for age, sex at birth, education level, insurance status, and nativity

[i] Chosen as reference group due to having the largest sample size and being most commonly reported on in the literature.

[j] Includes Asian Indian, Bangladeshi, Nepali, and Pakistani individuals

Abbreviations: OR, odds ratio; CI, confidence interval

Table 3.

Multivariable logistic regression model evaluating the odds of knowing the correct age[e] to begin breast and colorectal cancer screening and the odds of cancer fatalism by Asian ethnic subgroup

	***Breast Cancer Screening Knowledge (n = 1005)*, OR [95% CI]**		***Colorectal Cancer Screening Knowledge (n = 1011)*, OR [95% CI]**		***Cancer Fatalism (n = 1000)*, OR [95% CI]**	
Variable	**Unadjusted**	**Adjusted[f]**	**Unadjusted**	**Adjusted[f]**	**Unadjusted**	**Adjusted[g]**
Asian ethnic subgroup (ref = Chinese)[h]						
Korean	1.36 [0.99, 1.88]	**1.80 [1.26, 2.58]** [c]	0.87 [0.63, 1.20]	1.07 [0.74, 1.54]	**0.32 [0.23, 0.45]** [a]	**0.37 [0.27, 0.53]** [a]
South Asian[i]	1.03 [0.77, 1.38]	1.36 [0.98, 1.90]	**0.53 [0.38, 0.74]** [a]	**0.67 [0.47, 0.96]** [d]	**0.59 [0.43, 0.80]** [b]	0.75 [0.54, 1.04]

Note: bold indicates statistical significance.

[a] p<0.0001

[b] p<0.001

[c] p<0.01

[d] p<0.05

[e] Correct age to begin breast cancer screening was defined as 40 or 50 years old. Correct age to begin colorectal cancer screening was 45 or 50 years old.

[f] Adjusted for age, sex at birth, education level, insurance status, and English proficiency

[g] Adjusted for age, sex at birth, education level, insurance status, and nativity

[h] Chosen as reference group due to having the largest sample size and being most commonly reported on in the literature.

[i] Includes Asian Indian, Bangladeshi, Nepali, and Pakistani individuals

Abbreviations: OR, odds ratio; CI, confidence interval

Table 4.

Multivariable logistic regression model evaluating the odds breast and colorectal cancer screening uptake by knowledge of what age[b] to begin breast and colorectal cancer screening

	***Breast Cancer Screening Uptake[c] (n = 323)*, OR [95% CI]**		***Colorectal Cancer Screening Uptake[d] (n = 441)*, OR [95% CI]**	
Variable	**Unadjusted**	**Adjusted[e]**	**Unadjusted**	**Adjusted[f]**
Knows correct age to begin having mammograms (ref = No)				
Yes	1.13 [0.71, 1.81]	1.11 [0.68, 1.80]	--	--
Knows age to begin having colorectal cancer screening (ref = No)				
Yes	--	--	**1.66 [1.13, 2.42]** [a]	1.41 [0.94, 2.11]

Note: bold indicates statistical significance.

[a] $p<0.01$

[b] Correct age to begin breast cancer screening was defined as 40 or 50 years old. Correct age to begin colorectal cancer screening was 45 or 50 years old.

[c] Screening estimate for breast cancer limited to women aged 40-74 years. Breast cancer screening adherence based on mammogram within the past two years according to USPSTF guidelines.

[d] Screening estimate for colorectal cancer (CRC) limited to individuals aged 45-75 years. CRC screening adherence based on fecal occult blood test within the past year, sigmoidoscopy in the past five years, or colonoscopy in the past ten years according to USPSTF guidelines.

[e] Adjusted for Asian ethnic subgroup, age, education level, insurance status, and English proficiency

[f] Adjusted for Asian ethnic subgroup, age, sex at birth, education level, insurance status, and English proficiency

Abbreviations: OR, odds ratio; CI, confidence interval

Table 5.

Multivariable logistic regression model evaluating the odds of breast, cervical, and colorectal cancer screening uptake by cancer fatalism

	***Breast Cancer Screening Uptake[a] (n = 315)*, OR[95% CI]**		***Cervical Cancer Screening Uptake[b] (n = 467)*, OR[95% CI]**		***Colorectal Cancer Screening Uptake[c] (n = 438)*, OR[95% CI]**	
Variable	**Unadjusted**	**Adjusted[d]**	**Unadjusted**	**Adjusted[d]**	**Unadjusted**	**Adjusted[e]**
Cancer fatalism (ref = No cancer fatalism)						
Cancer fatalism	1.11 [0.68, 1.84]	1.04 [0.61, 1.77]	1.01 [0.70, 1.46]	0.91 [0.62, 1.36]	1.36 [0.91, 2.03]	1.06 [0.68, 1.66]

[a]Screening estimate for breast cancer limited to women aged 40-74 years. Breast cancer screening adherence based on mammogram within the past two years according to USPSTF guidelines.

[b]Screening estimate for cervical cancer limited to women aged 21-65 years. Cervical cancer screening adherence based on Pap test within the past three years according to USPSTF guidelines.

[c]Screening estimate for colorectal cancer (CRC) limited to individuals aged 45-75 years. CRC screening adherence based on fecal occult blood test within the past year, sigmoidoscopy in the past five years, or colonoscopy in the past ten years according to USPSTF guidelines.

[d]Adjusted for Asian ethnic subgroup, age, education level, insurance status, and nativity

[e]Adjusted for Asian ethnic subgroup, age, sex at birth, education level, insurance status, and nativity

Abbreviations: OR, odds ratio; CI, confidence interval