



Asian Americans' Cancer Information Seeking, Fatalistic Belief, and Perceived Risk: Current Status and Relationships with Cancer Prevention and Detection Behaviors

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## Abstract

This study pursues four research goals: (1) to examine Asian Americans and Asian ethnic groups' (i.e., Chinese, Filipinos, Japanese, Koreans, Vietnamese) information seeking, fatalistic belief, and perceived risk of cancer, in comparison to non-Hispanic Whites; (2) to identify characteristics of Asian Americans who seek cancer information, hold fatalistic cancer belief, and perceive cancer risk; (3) to assess cancer prevention and detection behavior gaps between Asian Americans and Whites, and (4) to explore whether such gaps can be explained by cancer information seeking, fatalistic belief, and perceived risk. Data from 2011-2014 Health Information National Trends Surveys (HINTS) were analyzed. Asian Americans and most Asian ethnic groups were less likely to seek cancer information and perceive their cancer risk as lower than Whites. However, Asian Americans were less likely to hold some fatalistic beliefs (i.e., everything causes cancer, there are too many cancer prevention recommendations) than Whites. Asian Americans' odds of engaging in breast cancer screening, physical activity, vegetable intake, and sun protection increased when cancer information seeking, fatalistic belief, and perceived risk of cancer were controlled.

## Keywords

Asian Americans; cancer; risk perception; fatalism; information-seeking; behavior

## Cover Page Footnote

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### **ABSTRACT**

This study pursues four research goals: (1) to examine Asian Americans and Asian ethnic groups' (i.e., Chinese, Filipinos, Japanese, Koreans, Vietnamese) information seeking, fatalistic belief, and perceived risk of cancer, in comparison to non-Hispanic Whites; (2) to identify characteristics of Asian Americans who seek cancer information, hold fatalistic cancer belief, and perceive cancer risk; (3) to assess cancer prevention and detection behavior gaps between Asian Americans and Whites, and (4) to explore whether such gaps can be explained by cancer information seeking, fatalistic belief, and perceived risk. Data from 2011-2014 Health Information National Trends Surveys (HINTS) were analyzed. Asian Americans and most Asian ethnic groups were less likely to seek cancer information and perceive their cancer risk as lower than Whites. However, Asian Americans were less likely to hold some fatalistic beliefs (i.e., everything causes cancer, there are too many cancer prevention recommendations) than Whites. Asian Americans' odds of engaging in breast cancer screening, physical activity, vegetable intake, and sun protection increased when cancer information seeking, fatalistic belief, and perceived risk of cancer were controlled.

**Keywords** Asian Americans, cancer, risk perception, fatalism, information-seeking, behavior

### **INTRODUCTION**

According to the National Cancer Institute, racial/ethnic minorities such as non-Hispanic Blacks and Hispanics, have significantly lower cancer survival rates than non-Hispanic Whites (NCI, 2016). The variance of early detection through cancer screening, quality of cancer care, and engagement in health risk behaviors connect to this disparity. With less than one fourth of adults born in the U.S. (U.S. Census, 2015), another racial/ethnic minority—Asian Americans—also experience lower cancer survival rates (Ward et al., 2004). Although Asian Americans' engagement in some health risk behaviors, such as smoking, is lower than other racial/ethnic groups, their adherence to physical activity recommendations is lower (Lim, 2010). Nonetheless,

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the most critical issue for this population is a significantly lower participation in cancer screening. Despite the highest cancer mortality rate<sup>1</sup> of the population compared to other racial groups (CDC, 2014) with the highest stomach and liver cancer incidence (Ward et al., 2004), Asian Americans' cancer screening rates are significantly lower than not only Whites, but also other racial minority groups (Liss & Baker, 2014; Oh, Zhou, Kreps, & Ryu, 2012).

In attempts to explain and reduce the cancer screening gaps between racial/ethnic minorities and Whites, numerous predictors have been suggested and tested, from individual factors (i.e., socio-economic status (SES), acculturation, healthcare access, health/cancer literacy, health/cancer beliefs, personal cancer screening history, family cancer history) to contextual factors (i.e., SES of community, rurality, density of healthcare providers, healthcare providers' training and practice) (Wee et al., 2012; Harmon et al., 2014; Jun & Oh, 2013; Lee & Vang, 2010; Lee, Chen, Jung, Baezconde-Garbanati, & Juon, 2014; Perencevich, Ojha, Steyerberg, & Syngal, 2013; Sentell, Braun, Davis, & Davis, 2015; Wong et al., 2013).

In terms of traditional SES, such as income and education, Asian Americans and Whites did not show significant differences; in fact, Asian Americans reported higher socio-economic status (Pew Research Center, 2013). Therefore, socio-economic and demographic parameters such as different levels of education and income did not sufficiently explain the cancer screening disparity as compared to Whites (Hamman & Kapinos, 2015; Liss & Baker, 2014; Oh et al., 2012; Williams, Dabney, & Holmes, 2013), while such factors have explained most of the observed disparities for other racial minority groups (Bromley, May, Federer, Spiegel, & van Oijen, 2015; Liss & Baker, 2014). Healthcare access was discovered as a more useful predictor to explain cancer screening variations of Asian Americans in some studies (Pourat, Kagawa-Singer, Breen, & Sripipatana, 2010), yet it often was not associated with decreased cancer screening gaps between Asian Americans and Whites (Hamman & Kapinos, 2015; Oh et al., 2012) as well as within Asian ethnic groups (Chawla, Breen, Liu, Lee, & Kagawa-Singer, 2015). Acculturation or immigration factors exerted greater influences in explaining Asian Americans' cancer screening and other health behaviors (Chawla et al., 2015; Gomez, Tan, Keegan, & Clarke, 2007; Lee, Ju, Vang, & Lundquist, 2010). Asian Americans appeared to have lower health literacy; but an adjustment of the low health literacy did not diminish cancer screening differences between Asian Americans and Whites (Sentell et al., 2015).

Meanwhile, there is a dearth of research investigating Asian Americans' cancer information seeking, beliefs, and perceived risk, and their association with cancer preventive health behaviors. Previous literature reported that Asian Americans present lower cancer information seeking, cancer knowledge (Nguyen & Bellamy, 2006), and risk perception (Davis et al., 2013; Nguyen & Bellamy, 2006; Orom et al., 2010). Asian Americans also presented more fatalistic cancer beliefs than Whites (Hardie & Polek, 2016; Jun & Oh, 2013). However, some of these findings are outdated, and there is no analysis disaggregating linguistically and culturally heterogeneous Asian ethnic groups, despite the increasing availability of disaggregated Asian samples in public health data. Most studies have focused on screening for one or two cancer types as an outcome of Asian Americans' cancer information seeking, belief, or/and risk perception; however, little research has included engagement in health behaviors, such as physical activity, diet, and smoking that are widely known to lower cancer risks. For example, a previous study compared Chinese, Koreans, and Vietnamese's cancer knowledge, belief, and perceived risk, but

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<sup>1</sup> Cancer mortality rate in males: Asian/Pacific Island (26.4%), White (23.6%), Black (22.2%), Hispanic (20.6%); in females: Asian/Pacific Island (27.3%), White (21.4%), Black (22.5%), Hispanic (22.6%)

their outcome variable was limited to colon cancer screening only (Le et al., 2014). Additionally, the socio-demographic profiles of Asian Americans who seek cancer information, hold fatalistic belief, and perceive cancer risk are unknown. Additionally, no research has assessed if cancer information seeking or beliefs can explain the gaps of cancer screening and cancer preventive behaviors between Asian Americans and Whites. To the best of the authors' knowledge, there is only one research study suggesting that an adjustment of cancer fatalism can significantly reduce colon cancer screening gaps between Asian Americans and Whites (Jun & Oh, 2013).

To address the limitations in prior research and offer implications for cancer interventions targeting Asian Americans, the following three research questions were posited:

**RQ1:** Are there differences in cancer information seeking, fatalistic belief, and perceived risk between Asian Americans and Whites?

**RQ2:** Are there differences in cancer information seeking, fatalistic belief, and perceived risk among Asian ethnic groups?

**RQ3:** What are the socio-demographic characteristics of Asian Americans who seek cancer information, hold fatalistic cancer belief, and perceive cancer risk?

**RQ4:** Are there differences in cancer screening and cancer preventive behaviors between Asian Americans and Whites?

**RQ5:** Can cancer information seeking, fatalistic belief, and perceived risk explain differences of cancer screening and cancer preventive behaviors between Asian Americans and Whites?

## **METHODS**

The National Cancer Institute's Health Information National Trends Survey (HINTS) datasets were employed for analyses to answer the five research questions. Administered by the National Cancer Institute since 2003, HINTS offers nationally representative data and measures regarding American adults' cancer/health information use/access, cancer screening and preventive behaviors, and cancer related belief/perception/communication (NCI, 2016). Among the seven iterations available as of September 2016, we selected and merged four iterations—HINTS 4 Cycle 1 (2011), HINTS 4 Cycle 2 (2012), HINTS 4 Cycle 3 (2013), and HINTS 4 Cycle 4 (2014)—to increase the sample size of Asian Americans as well as to compare Asian ethnic groups. HINTS began to disaggregate Asian ethnic groups since 2011. This study employed the final weight of HINTS, which controlled the respondent's base weight, an adjustment of nonresponse, and a calibration adjustment of demographic factors (i.e., race, ethnicity, age, gender, education, marital status, income, and census region) that are correlated with our outcome variables (cancer screening, cancer preventive behaviors) as well as most HINTS questionnaire items.

### Sample

Those who self-identified their race as non-Hispanic Asians and Whites were included in analyses. For Asian ethnic groups, those who self-identified their ethnicity as Chinese, Filipino, Japanese, Korean, or Vietnamese were included. An important note is that people who selected their ethnicity as one of the five Asian ethnic groups did not necessarily select non-Hispanic Asian as their race. There were non-Hispanic Whites, Hispanics, and African Americans race who selected Asian as their ethnicity.

### Background Variables

Five groups of background variables were included to describe samples: (1) SES (age, education [less than high school graduate, high school graduate, some college, college graduate,

post graduate], income [ $< \$35K$ ,  $\$35K < \$50K$ ,  $\$50K < \$75K$ ,  $\geq \$75K$ ], employment [currently employed, not employed], and marital status [currently married, not married]); (2) acculturation (birth country [born in U.S., not born in U.S.] and English fluency [very well or US born, well, not well, not at all]); (3) healthcare access (have health insurance [yes or no], have a regular doctor [yes or no], last routine check-up [within past year, within past 2 years, within 5 years, 5 or more years ago, never or not sure], and number of doctor visits in the past 12 months [none, 1-2 times, 3-4 times, 5 times or more]); (4) health status (general health status [excellent, very good, good, fair, poor] and confidence in health management [completely confident, very confident, somewhat confident, a little confident, not at all]); and (5) family cancer history (have a family member who had a cancer [yes or no]).

#### Cancer Information Seeking, Fatalistic Belief, and Perceived Risk

To gauge cancer-related information seeking, two questions were employed: (1) have you ever looked for cancer information from any sources; and (2) have you ever looked for health/medical information from any sources (yes or no). We included the health information seeking variable in addition to cancer information seeking, as health information would also contain resources and guidelines for cancer preventive health behaviors such as physical activity, diet, smoking, etc. For fatalistic belief, responses to four statements were included: (1) everything causes cancer; (2) there is not much you can do to lower chances of getting cancer; (3) there are so many different cancer prevention recommendations and it is hard to know what to do; (4) cancer is more common than heart disease (agree or disagree). To measure perceived cancer risk, answers to two questions; (1) how likely are you to get cancer in your lifetime? (unlikely, neutral, likely) and (2) how worried are you about getting cancer? (worry, neutral, don't worry) were used.

#### Cancer Screening

We measured screening for breast and cervical cancer, which are the most diagnosed cancers for the population and the only screen-detectable cancers that fall within the US Preventive Services Task Force screening guidelines (USPSTF, 2016). The population's lung, prostate, and colon cancer incidences are also high; however, the USPSTF recommends lung cancer screening only for those who are at high risk, and no longer recommend prostate screening for men who have no symptoms. Colon cancer screening measure was not available consistently in HINTS 2011-2014. Adherence to cancer screening guidelines and samples included in statistical analyses for each cancer type were determined based on the USPSTF (2016) and the American Cancer Society (ACS) recommendations (ACS, 2015).

*Breast.* Two questions were employed: (1) have you ever received a mammogram (yes or no); and (2) when did you receive a mammogram (adhered = received within two years or not adhered = never received or received more than two years ago). Females older than age 40 were included in related analyses.

*Cervical.* Similarly, two questions were employed: (1) have you ever received a Pap smear test (yes or no); and (2) when did you last receive a Pap-test (adhered = received within three years or not adhered = never received or received more than three years ago). Females older than age 18 were included in related analyses.

#### Cancer Preventive Behaviors

Four cancer preventive health behaviors that are largely known to lower breast, cervical, colon, lung, skin, and other cancer risks were assessed: physical activity, fruit/vegetable intake, smoking, and sun protection. Adherences to guidelines were determined based on the U.S. Department of Health and Human Services' Healthy People 2020 objectives (USDHHS, 2016).

*Physical activity.* Based on answers to three relevant queries— (1) engagement in any physical activity over the past month, (2) days of physical activity per week, and (3) typical durations per occasion in minutes—those who engaged in physical activity more than 150 minutes a week were considered to meet the guidelines.

*Fruit/vegetable intake.* Assessments of fruit and vegetable intake (how many cups of fruit/vegetables, such as one small apple or three broccoli spears, including 100% pure fruit/vegetable juice do you eat a day?) were employed. Those who consumed more than 3-4 cups a day were considered to meet the guidelines.

*Sun protection.* One item available in HINTS (when you are outside for more than one hour on a warm, sunny day, how often do you wear sunscreen?) was adopted, and those who used sunscreen often or always were considered as adhering to the guidelines.

*Not Smoking.* Smoking status was determined by two relevant questions: (1) have you smoked at least 100 cigarettes during lifetime and (2) do you currently smoke. Based on responses to the two items, samples were classified into two groups (current smokers vs. never smokers/quitters). This classification was adopted from a former smoking status study using HINTS (Finney Rutten, Wanke, & Augustson, 2005).

### **Analysis Plan**

First, descriptive analyses were conducted to understand the sample in terms of the background variables. Multiple logistic regression analyses were performed to compare cancer information seeking, fatalistic belief, and perceived risk among racial/ethnic groups and to identify these variables' role in explaining differences of cancer screening and preventive behaviors between Asian Americans and Whites. For all tests,  $p < .05$  was set for statistical significance. HINTS data are publicly available and contain no personal identifiers or sensitive information. Therefore, this study was exempt from the need for Institutional Review Board approval at the researcher's institution.

## **RESULTS**

An aggregate of 503 Asian Americans (weighted  $n = 11,235,668$ ) and five Asian ethnic groups were included in analyses. The breakdown of ethnic groups was as follows: Chinese (unweighted  $n = 153$ ), Filipinos ( $n = 127$ ), Japanese ( $n = 50$ ), Koreans ( $n = 45$ ), and Vietnamese ( $n = 72$ ). As previously mentioned, there were people who selected their ethnicity as Chinese, Filipino, Japanese, Korean, or Vietnamese, but did not select non-Hispanic Asian as their race. Therefore, the sum of the five ethnic Asian groups is not consistent with the total number of Asian Americans. Also, 7979 White samples were used.

### **Background Variables**

As expected, background characteristics of respondents were varied from a nationally representative sample. Table 1 offers descriptions of Asian Americans, Whites, and five Asian ethnic groups in terms of SES, acculturation, healthcare access, health status, and family cancer history. Notable differences between the two racial groups or among the five ethnic groups were Asian Americans' younger age (median age: Asians = 46 vs., Whites = 57); higher education level (college graduate or postgraduate: Asians = 56.4% vs., Whites = 35.3%); higher income ( $\geq$  \$75K for Asians = 42.9% vs., Whites = 37.4%); and higher employment rate (Asians = 64.2% vs., Whites = 60.7%).

Among Asian ethnic groups, Chinese and Vietnamese were younger (median age for Chinese = 47, Vietnamese = 49). Educational level was higher in Chinese (college graduate or

postgraduate: 61.5%). All other Asian ethnic groups were made up of college graduates (by at least about 50%), with the exception of Vietnamese (19.9%). Chinese reported the highest income ( $\geq$  \$75K= 49.6%). The only two ethnic groups that showed a lower employment rate than Whites (60.7%) were Koreans (46.7%) and Filipinos (59.4%). Japanese showed the highest employment rate (78.9%) and the lowest ratio of being currently married (36.9%).

Less than one third of Asian Americans were born in U.S. (32.7%), while the rate for Whites was 95.8%. The rate of U.S. born was varied from Japanese (75.5%) to Vietnamese (10.8%). Of those polled, 31.4% of Asian Americans answered that they speak English well, little, or not at all, while only 4.2% of Whites did so. A significantly smaller number of Vietnamese (10%) and Koreans (55.5%) answered that they speak English very well or native, while the rate for Japanese (82.6%) was much higher.

Nearly 90% of both Asian Americans (88.9%) and Whites (89.5%) reported to have a health insurance, but the rate was significantly lower for Koreans (68.2%). Only about half of Asian Americans (51.4%) responded to have a regular doctor, while 70% of Whites said so. The Chinese (64.9%) and Japanese' rate (64.6%) was closest to Whites, while Koreans' rate was lowest (44.5%). The results show that 29.9% of Asian Americans did not visit a doctor in the past year, which was nearly twice more than Whites (17.1%). The percentage of those who did not visit a doctor in the past year was highest in Vietnamese (44.3%) and lowest in Chinese (25%). More Asian Americans evaluated their general health status excellent (17.0%) than Whites (13.1%); that includes 22.1% of Chinese. Whites showed more confidence in their ability to take care of their health (very or completely confident = 69.6%) than Asian Americans (61.6%). Among Asian ethnic groups, both Korean and Vietnamese showed the lowest confidence (a little confident = 17.6%). The rates of having a family cancer history among Asian Americans (46.1 %) and all Asian ethnic groups (43.7% ~ 64.7%) were lower than Whites (72.9%).



**Table 1. Background Variables**

		Whites	Asian	Chinese	Filipinos	Japanese	Koreans	Vietnamese
<b>Sample (N)</b>		7979	503	153	127	50	45	72
<b>Weighted Sample (N)</b>		57018678	11235668	13940864	9685181	3280108	2772596	5177079
<b>SES</b>		%	%	%	%	%	%	%
Gender*	Female	51.1	44.3	48.3	38.1	65.7	70.8	57.4
Age*	18-34	27.2	41.8	48.2	45.8	44.6	40.2	20.4
	35-49	26.4	31.8	26.2	24.7	21.2	19.9	45.7
	50-64	27.4	18.1	18.3	19.6	21.7	16.8	25.7
	≥65	19.0	8.3	7.3	9.9	12.6	23.2	8.2
Education*	Less than high school	6.7	9.7	14.4	2.6	1.6	0.7	33.0
	High school graduate	21.1	12.5	3.4	15.5	4.8	8.3	23.1
	Some college	37.0	21.4	20.7	32.4	24.8	31.7	23.9
	College graduate	21.4	32.0	22.2	41.6	56.3	31.0	15.5
	Post graduate	13.9	24.4	39.3	7.8	12.5	28.1	4.4
Income*	< \$35,000	29.4	30.3	27.3	39.1	43.6	24.1	50.2
	\$35,000 to < \$50,000	14.2	13.5	14.5	17.8	3.7	5.7	25.0
	\$50,000 to < \$75,000	19.0	13.4	8.6	15.2	15.1	18.5	12.6
	≥ \$75,000	37.4	42.9	49.6	27.9	37.6	51.7	12.2
Employment <sup>1</sup> *	Employed	60.7	64.2	64.5	59.4	78.9	46.7	62.4
Marital status*	Currently married	60.3	56.8	55.8	51.9	36.9	60.3	66.1
<b>Acculturation</b>								
Born in US*	Yes	95.8	32.7	50.2	41.7	75.5	28.0	10.8
English fluency*	Very well or US born	96.3	68.6	71.8	70.2	82.6	55.5	10.0
	Well	3.0	22.5	19.0	23.1	15.4	26.0	70.4
	Not well or Some	0.7	8.9	9.2	6.7	2.0	18.5	19.6
<b>Healthcare Access</b>								
Have a health insurance*	Yes	89.5	88.9	96.5	88.4	76.3	68.2	96.9
Have a regular doctor*	Yes	70.0	51.4	64.9	51.2	64.6	44.5	48.7
Last routine check-up*	Within past year	64.8	60.8	65.0	68.3	67.3	44.0	59.5
	Within past 2 years	14.4	16.5	14.1	12.3	10.3	36.4	11.4
	Within 5 years	9.1	8.3	12.9	7.6	10.0	3.7	10.1
	5 or more years ago	7.6	7.2	6.2	7.9	6.8	14.6	13.3
	Never or not sure	4.1	7.2	1.7	3.9	5.5	1.2	5.7

Number of doctor visit in the past 12 months*	None	17.1	29.9	25.0	26.6	26.6	39.5	44.3
	1-2 times	36.2	39.2	42.2	43.8	41.2	35.3	24.7
	3-4 times	25.2	18.4	17.6	19.5	8.8	18.6	27.0
	5 or more	21.5	12.6	15.1	10.1	23.5	6.6	3.9
<b>Health Status</b>								
General health status*	Excellent	13.1	17.0	22.1	11.5	14.1	20.5	11.5
	Very good	39.8	32.2	34.3	30.0	31.1	40.6	23.1
	Good	36.1	31.8	33.5	33.0	48.1	21.6	40.1
	Fair	9.0	16.9	8.5	24.3	6.0	12.7	23.8
	Poor	2.0	2.0	1.6	1.3	0.6	4.5	1.3
Confidence in health management*	Completely confident	22.8	17.6	14.9	26.2	14.1	25.9	18.7
	Very confident	46.8	44.0	44.5	34.6	44.1	34.9	43.2
	Somewhat confident	25.8	29.5	33.3	34.4	38.2	21.6	20.8
	A little confident	3.5	7.0	3.6	4.6	3.6	17.6	14.5
	Not at all	1.1	1.9	3.7	0.2	0	0	2.9
<b>Family Cancer History</b>								
Have a family cancer history*		72.9	46.1	60.1	48.3	64.7	43.7	47.0

Notes: All estimates were weighted percentages to account for the complex survey design (using final weight from HINTS data controlled by NCI)

\*Chi-square analyses indicated significant differences between Asian Americans and Whites ( $p < .05$ )

<sup>1</sup>Unemployed includes homemaker, student, retired, and disabled

### Cancer/Health Information Seeking

Table 2 presents results of logistic regression analyses that were conducted to examine cancer information seeking, fatalistic belief, and perceived cancer risk among the whole Asian American sample and the five Asian ethnic groups as compared to Whites. It also includes results of analyses that compared the three constructs among different groups of Asian Americans in terms of background variables (SES, acculturation, healthcare access, health status, and family cancer history). Selective findings are the following.

Asian Americans' odds of seeking cancer information was lower than Whites (OR = 0.89,  $p < .05$ ). Among the ethnic groups, the odds of Japanese (OR = 0.72) and Chinese (OR = 0.80) were lower than Whites, while that of Koreans (OR = 3.72) was nearly four times bigger than Whites. Within Asian Americans, those who are younger and have higher levels of English fluency, SES (education, income, employment), and health access (health insurance, regular doctor, visiting doctors) were more likely to seek cancer information than their counterparts.

The odds of health information seeking among Asian Americans (OR = 0.55), Japanese (OR = 0.31), Vietnamese (OR = 0.45), Chinese (OR = 0.58), and Filipinos (OR = 0.64) were smaller than Whites. However, Koreans' odds (1.40) was greater. Within Asian Americans, those who are male and younger, hold a higher status in education, income, acculturation, and healthcare access, and have a family cancer history were more likely to seek health information than their counterparts.

### Fatalistic Cancer Belief

*Everything causes cancer.* Asian Americans (OR = 0.56), Chinese (OR = 0.93), and Filipinos (OR = 0.80) were less likely to agree with the statement, 'everything causes cancer' than Whites. However, Japanese (OR = 1.41) and Koreans (OR = 1.30) were more likely to agree. The odds of agreeing with the statement were higher in men, older individuals, the currently married, the foreign born, the healthier and the more confident in health management. The odds were also lower in the higher education groups and the higher English fluency groups.

*Not much to do to prevent cancer.* Asian Americans were more likely to agree with the statement 'there is not much to do to lower cancer risks' than Whites (OR = 1.32); the odds were higher in Vietnamese (OR = 2.96), Japanese (OR = 1.37), Chinese (OR = 1.20), and Filipinos (OR = 1.11). Within Asian Americans, the odds were lower in men, middle age groups, higher income groups, and the employed. Also, the U.S. born and the more fluent in English were less likely to agree with the statement than their counterparts. The greater health access and health status, as well as having a family cancer history, were negatively associated with such belief.

*Too many cancer prevention recommendations.* The odds of agreeing with the statement, 'there are too many cancer prevention recommendations to know' were lower in Asian Americans (OR = 0.83) and Filipinos (OR = 0.34), but they were higher in Vietnamese (OR = 2.81), Koreans (OR = 1.93) and Japanese (OR = 1.44) compared to Whites. The age, education, employment, and health status were associated with the belief. The odds of the oldest (OR = 4.10) and those with some college (OR = 7.08) were notably higher.

*Cancer is more common than heart disease.* Asian Americans were slightly more likely to think that 'cancer is more common than heart disease' than Whites (OR = 1.21), and all Asian ethnic groups were more likely do so as well (e.g., Vietnamese: OR = 3.22; Japanese: OR = 2.05). Within Asian Americans, the odds were bigger among those who have higher levels of education (OR = 2.05 ~ 2.83) and income (OR = 1.77 ~ 2.38).

### Perceived Cancer Risk

Asian Americans (OR = 0.24) and most Asian ethnic groups' perceived cancer risk was considerably lower than Whites (Koreans: OR = 0.21; Filipinos: OR = 0.32; Vietnamese: OR = 0.48; Japanese: OR = 0.89). Within Asian Americans, the perceived risk was lower in the older (OR = 0.15 ~ 0.62), the married (OR = 0.25), the foreign born (OR = 0.17), the healthier (OR = 0.29 ~ 0.64), and the more confident in health management (OR = 0.49 ~ 0.90). Individuals possessing a post graduate education were more than two times more likely to perceive cancer risk (OR = 2.31). Greater health access was positively associated with perceived cancer risk. In particular, the perceived cancer risk among those who have cancer history was five times greater than their counterparts (OR = 5.00).

Asian Americans (OR = 0.83), Chinese (OR = 0.33) and Koreans (OR = 0.65) were less likely to worry about cancer than Whites, but Filipinos (OR = 1.57) and Vietnamese (OR = 1.82) were more likely to do so. The likelihood was lower in men (OR = 0.26), the married (OR = 0.43), the foreign born (OR = 0.35), the lower English fluency groups (OR = 0.26 ~ 0.53), and the healthier (OR = 0.34 ~ 0.95), while it was considerably higher in the highly educated (OR = 11.05 ~ 38.76).

**Table 2. Predictors of Cancer Information Seeking, Fatalistic Belief, and Perceived Risk**

		Information Seeking			Beliefs			Perceived Risk	
		Cancer info	Health info	Everything causes cancer	Not much to do to lower cancer risks	Too many cancer preventions	Cancer is more common than heart disease	Likely to get cancer in lifetime	Worry about cancer
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Race and Ethnicity<sup>1</sup></b>									
Race	Asian	0.89 (0.89, 0.89)	0.55 (0.55, 0.55)	0.56 (0.56, 0.56)	1.32 (1.32, 1.32)	0.83 (0.83, 0.83)	1.21 (1.21, 1.22)	0.24 (0.24, 0.24)	0.83 (0.82, 0.83)
	Chinese	0.80 (0.80, 0.80)	0.58 (0.58, 0.58)	0.93 (0.93, 0.93)	1.20 (1.20, 1.20)	1.25 (1.25, 1.25)	1.14 (1.14, 1.15)	0.52 (0.52, 0.52)	0.33 (0.33, 0.33)
	Filipinos	1.13 (1.12, 1.13)	0.64 (0.64, 0.64)	0.80 (0.80, 0.80)	1.11 (1.11, 1.11)	0.34 (0.34, 0.34)	1.23 (1.23, 1.23)	0.32 (0.32, 0.32)	1.57 (1.57, 1.57)
Ethnicity	Japanese	0.72 (0.72, 0.72)	0.31 (0.30, 0.31)	1.41 (1.40, 1.41)	1.37 (1.37, 1.38)	1.44 (1.43, 1.44)	2.05 (2.04, 2.05)	0.89 (0.89, 0.89)	n/s
	Koreans	3.72 (3.71, 3.73)	1.40 (1.40, 1.41)	1.30 (1.30, 1.30)	1.07 (1.07, 1.07)	1.93 (1.93, 1.94)	1.37 (1.37, 1.37)	0.21 (0.21, 0.21)	0.65 (0.64, 0.65)
	Vietnamese	1.27 (1.26, 1.27)	0.45 (0.45, 0.46)	1.03 (1.03, 1.03)	2.96 (2.96, 2.97)	2.81 (2.80, 2.82)	3.22 (3.22, 3.23)	0.48 (0.48, 0.48)	1.82 (1.82, 1.83)
<b>Asian Americans <i>N</i> = 503, Weighted <i>N</i> = 11235668</b>									
<b>Socio-demographics<sup>2</sup></b>									
Gender	Male	1.12 (1.12, 1.12)	1.25 (1.25, 1.26)	2.16 (2.15, 2.16)	0.55 (0.55, 0.55)	1.05 (1.05, 1.06)	0.66 (0.66, 0.66)	1.45 (1.44, 1.45)	0.26 (0.26, 0.27)
	35-49	0.32 (0.32, 0.32)	1.27 (1.26, 1.27)	2.71 (2.70, 2.72)	0.35 (0.35, 0.35)	1.02 (1.02, 1.03)	1.04 (1.04, 1.05)	0.62 (0.62, 0.62)	0.89 (0.89, 0.90)
Age	50-64	0.81 (0.80, 0.81)	0.55 (0.54, 0.55)	1.94 (1.94, 1.95)	0.54 (0.54, 0.54)	1.49 (1.49, 1.50)	1.19 (1.19, 1.20)	0.31 (0.30, 0.31)	1.14 (1.13, 1.14)
	≥65	0.31 (0.31, 0.31)	0.23 (0.23, 0.23)	3.84 (3.83, 3.86)	3.18 (3.17, 3.19)	4.10 (4.08, 4.12)	1.42 (1.41, 1.42)	0.15 (0.15, 0.15)	0.54 (0.54, 0.55)
	High school graduate	3.10 (3.10, 3.13)	1.59 (1.58, 1.60)	0.50 (0.50, 0.51)	0.92 (0.92, 0.93)	3.88 (3.85, 3.90)	2.05 (2.04, 2.06)	0.12 (0.12, 0.13)	11.05 (10.81, 11.30)
Education	Some college	8.16 (8.11, 8.22)	6.69 (6.66, 6.73)	0.19 (0.19, 1.90)	2.08 (2.07, 1.09)	7.08 (7.05, 7.12)	2.34 (2.32, 2.35)	1.44 (1.43, 1.44)	14.13 (13.83, 14.44)
	College graduate	14.03 (13.94, 14.13)	41.74 (41.41, 42.08)	0.38 (0.37, 0.38)	0.29 (0.29, 0.29)	2.28 (2.27, 2.29)	2.88 (2.86, 2.89)	0.73 (0.72, 0.83)	17.57 (17.20, 17.95)
	Post graduate	26.19 (26.00, 26.39)	n/s	0.80 (0.80, 0.81)	0.69 (0.69, 0.69)	1.30 (1.29, 1.30)	2.83 (2.81, 2.84)	2.31 (2.29, 3.32)	38.76 (37.94, 39.60)
	\$35K < \$50K	3.71 (3.70, 3.73)	5.38 (5.35, 5.41)	0.71 (0.71, 0.72)	0.23 (0.23, 0.23)	0.80 (0.80, 0.80)	0.82 (0.82, 0.82)	1.93 (1.92, 1.94)	0.43 (0.42, 0.43)
Income	\$50K < \$75K	2.24 (2.24, 2.25)	8.21 (8.17, 8.26)	1.36 (1.36, 1.37)	0.86 (0.86, 0.86)	0.76 (0.76, 0.76)	1.77 (1.77, 1.78)	2.84 (2.83, 2.86)	0.16 (0.16, 0.17)
	≥ \$75K	2.34 (2.34, 2.35)	27.56 (27.36, 27.76)	0.77 (0.77, 0.77)	0.79 (0.79, 0.79)	1.06 (1.06, 1.07)	2.38 (2.38, 2.39)	1.32 (1.31, 1.32)	0.93 (0.92, 0.93)
Employed		2.82 (2.81, 2.82)	2.29 (2.28, 2.30)	1.13 (1.13, 1.13)	0.29 (0.29, 0.29)	0.52 (0.51, 0.52)	0.92 (0.92, 0.92)	1.01 (1.01, 1.02)	1.09 (1.09, 1.10)
Currently married		0.66 (0.66, 0.66)	0.60 (0.60, 0.60)	1.44 (1.44, 1.45)	1.03 (1.02, 1.03)	1.31 (1.31, 1.31)	1.58 (1.58, 1.59)	0.25 (0.25, 0.25)	0.43 (0.43, 0.43)
<b>Acculturation<sup>3</sup></b>									
Foreign born		1.02 (1.01, 1.02)	0.26 (0.26, 0.26)	1.34 (1.34, 1.35)	0.46 (0.46, 0.46)	0.80 (0.80, 0.80)	1.20 (1.20, 1.20)	0.17 (0.17, 0.17)	0.35 (0.35, 0.36)
English fluency	Very well or US born	1.94 (1.94, 1.94)	3.29 (3.28, 3.29)	0.54 (0.54, 0.54)	0.47 (0.47, 0.47)	1.43 (1.43, 1.43)	0.60 (0.60, 0.60)	2.09 (2.09, 2.09)	0.26 (0.26, 0.26)
	Well	1.89 (1.89, 1.89)	1.95 (1.95, 1.95)	0.69 (0.69, 0.69)	0.64 (0.64, 0.64)	1.38 (1.38, 1.38)	0.81 (0.81, 0.81)	1.07 (1.07, 1.07)	0.53 (0.53, 0.53)
<b>Healthcare Access<sup>4</sup></b>									
Have no health insurance		0.70 (0.70, 0.70)	0.69 (0.69, 0.69)	0.76 (0.76, 0.76)	1.38 (1.38, 1.38)	0.99 (0.99, 0.99)	1.07 (1.07, 1.07)	0.81 (0.80, 0.81)	1.24 (1.24, 1.24)
Have no regular doctor		0.66 (0.66, 0.66)	0.55 (0.55, 0.55)	0.87 (0.87, 0.87)	1.30 (1.29, 1.30)	0.91 (0.91, 0.91)	1.09 (1.09, 1.09)	0.76 (0.76, 0.76)	1.11 (1.11, 1.11)

Last routine check-up	Within past year	2.23 (2.23, 2.23)	2.45 (2.45, 2.45)	0.94 (0.94, 0.94)	0.52 (0.52, 0.52)	0.91 (0.91, 0.91)	0.82 (0.82, 0.83)	1.33 (1.32, 1.33)	1.10 (1.10, 1.10)
	Within past 2 years	2.27 (2.27, 2.27)	2.36 (2.36, 2.37)	0.72 (0.72, 0.72)	0.52 (0.52, 0.52)	0.85 (0.85, 0.95)	0.81 (0.81, 0.81)	1.61 (1.61, 1.61)	1.02 (1.01, 1.02)
	Within 5 years	2.07 (2.07, 2.07)	2.08 (2.08, 2.08)	0.82 (0.82, 0.82)	0.45 (0.45, 0.45)	0.88 (0.87, 0.88)	0.76 (0.76, 0.76)	1.87 (1.87, 1.87)	1.13 (1.13, 1.13)
	5 or more years ago	2.03 (2.02, 2.03)	3.13 (3.12, 3.13)	0.71 (0.71, 0.71)	0.41 (0.41, 0.41)	0.83 (0.93, 0.93)	0.68 (0.68, 0.68)	2.50 (2.50, 2.51)	1.32 (1.32, 1.32)
No. of doctor visit	1-2 times	1.39 (1.39, 1.39)	1.96 (1.96, 1.96)	1.01 (1.01, 1.01)	0.95 (0.95, 0.95)	0.76 (0.76, 0.76)	0.97 (0.97, 0.97)	1.22 (1.22, 1.22)	1.01 (1.01, 1.01)
	3-4 times	1.58 (1.58, 1.58)	2.13 (2.13, 2.13)	1.08 (1.08, 1.08)	1.15 (1.15, 1.15)	0.85 (0.85, 0.85)	0.87 (0.87, 0.87)	1.43 (1.43, 1.43)	0.98 (0.98, 0.98)
	5 or more	1.83 (1.83, 1.83)	2.56 (2.56, 2.56)	1.10 (1.10, 1.10)	1.12 (1.12, 1.12)	0.95 (0.95, 0.95)	1.02 (1.02, 1.02)	1.88 (1.88, 1.88)	1.24 (1.24, 1.24)
<b>Health Status<sup>5</sup></b>									
General health status	Excellent	1.68 (1.68, 1.68)	1.12 (1.12, 1.12)	1.85 (1.85, 1.86)	0.34 (0.34, 0.34)	0.53 (0.53, 0.53)	0.74 (0.74, 0.74)	0.29 (0.29, 0.29)	0.34 (0.34, 0.34)
	Very good	1.48 (1.48, 1.48)	1.38 (1.38, 1.38)	1.43 (1.43, 1.43)	0.39 (0.39, 0.39)	0.68 (0.68, 0.68)	0.76 (0.76, 0.76)	0.51 (0.51, 0.51)	0.45 (0.44, 0.45)
	Good	1.31 (1.31, 1.31)	1.14 (1.14, 1.14)	1.25 (1.25, 1.25)	0.58 (0.58, 0.58)	0.89 (0.89, 0.89)	0.85 (0.85, 0.85)	0.64 (0.64, 0.64)	0.67 (0.77, 0.67)
	Fair	1.29 (1.28, 1.29)	0.87 (0.87, 0.88)	1.28 (1.28, 1.28)	0.76 (0.76, 0.76)	0.92 (0.92, 0.92)	1.02 (1.02, 1.03)	0.58 (0.58, 0.58)	0.95 (0.95, 0.96)
Confidence in health management	Completely	1.59 (1.58, 1.59)	0.84 (0.84, 0.84)	1.97 (1.97, 1.97)	0.44 (0.44, 0.44)	0.41 (0.41, 0.41)	0.81 (0.81, 0.82)	0.41 (0.40, 0.41)	0.81 (0.81, 0.81)
	Very	1.57 (1.57, 1.57)	1.10 (1.10, 1.10)	1.64 (1.63, 1.64)	0.50 (0.50, 0.50)	0.54 (0.54, 0.54)	0.81 (0.81, 0.81)	0.59 (0.59, 0.59)	1.08 (1.07, 1.09)
	Somewhat	1.49 (1.49, 1.49)	0.98 (0.98, 0.98)	1.49 (1.48, 1.49)	0.58 (0.58, 0.58)	0.75 (0.75, 0.75)	0.79 (0.79, 0.79)	0.90 (0.90, 0.90)	1.66 (1.66, 1.67)
	A little	1.28 (1.27, 1.28)	0.60 (0.60, 0.60)	1.18 (1.18, 1.18)	0.86 (0.85, 0.86)	0.61 (0.61, 0.62)	1.00 (1.00, 1.00)	0.71 (0.71, 0.72)	2.75 (2.75, 2.76)
<b>Family Cancer History<sup>6</sup></b>									
		2.49 (2.49, 2.49)	1.73 (1.73, 1.73)	0.71 (0.71, 0.71)	0.84 (0.84, 0.84)	1.25 (1.24, 1.25)	1.02 (1.02, 1.02)	5.00 (5.00, 5.00)	1.59 (1.58, 1.59)

Notes: <sup>1</sup> Reference group = Whites

<sup>2</sup> Reference group = male (gender), ages of 18-34 (age), less than high school (education), < \$35K (income), unemployed (employment), not married (marital status)

<sup>3</sup> Reference group = born in US (birth country), some or not well (English fluency)

<sup>4</sup> Reference group = have a health insurance or a regular doctor

<sup>5</sup> Reference group = poor (general health status), not at all (confidence in health management)

<sup>6</sup> Reference group = no family cancer history

### Cancer Screening and Preventive Behaviors

Table 3 illustrates Asian Americans' odds of breast and cervical cancer screening as well as engagement in four cancer preventive behaviors (i.e., physical activity, fruit/vegetable intake, sun protection, and smoking) in comparison to Whites (RQ4). It also presents the changes of the odds when cancer information seeking, fatalistic belief, and perceived risk were adjusted respectively and jointly (RQ5).

With no adjustment, Asian Americans were less likely to ever be screened (breast: OR = 0.58; cervical: OR = 0.63) or adhere (breast: OR = 0.91; cervical: OR = 0.68) for both types of cancer screening than Whites. Asian Americans were more likely to meet the guidelines for fruit intake (OR = 1.83), vegetable intake (OR = 1.33), and smoking (OR = 2.52), but they were slightly less likely to do so for physical activity (OR = 0.91) and sun protection (OR = 0.81) than Whites.

In the Model I, the background variables, including SES (i.e., age, education, income, employment, marital status), acculturation (i.e., birth country, English fluency), healthcare access (i.e., having a regular healthcare provider, frequency of visiting health providers), and health status (i.e., general health) were adjusted. With this adjustment, some significant changes were observed. The racial gap in cervical cancer screening (ever screened: OR = 0.49; adhered: OR = 0.51) and physical activity (OR = 0.56) become greater, but the gap in breast cancer screening became smaller (ever screened: OR = 0.95). Additionally, Asian Americans' odds of vegetable intake (OR = 0.69) was reversed to be smaller than Whites, and the gaps in smoking (OR = 2.17) reduced.

When cancer and health information seeking was adjusted in addition to the background variables in Model II, some positive effects for Asian Americans were observed. Asian Americans' odds of cervical cancer screening (ever screened: OR = 0.53; adhered: OR = 0.57), physical activity (OR = 0.65), vegetable intake (OR = 0.79), and smoking (OR = 2.51) increased than Model I.

In Model III, which adjusted fatalistic beliefs, Asian Americans' odds of vegetable intake (OR = 0.80) and sun protection (OR = 0.87) increased. However, the racial gaps widened for breast cancer screening (ever screened: OR = 0.86) and cervical cancer screening (adhered: OR = 0.47).

When perceived cancer risk was adjusted in Model IV, some significantly positive effects on Asian Americans were observed. Asian Americans' odds of breast cancer screening (adhered: OR = 1.33) and vegetable intake (OR = 1.04) increased by nearly 50% and 35%, each outpacing Whites. Additionally, the racial gaps in cervical cancer screening (adhered: OR = 0.57), physical activity (OR = 0.72), and sun protection (OR = 0.84) decreased.

**Table 3. Cancer Screening and Preventive Behaviors of Asian Americans vs., Whites**

		No Adjustment	Model I Background Adjusted <sup>1</sup>	Model II Cancer/Health Info Seeking Adjusted <sup>2</sup>	Model III Cancer Belief Adjusted <sup>3</sup>	Model IV Perceived Risk Adjusted <sup>4</sup>	Model V All Adjusted <sup>5</sup>
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Cancer Screening</b>							
Breast Cancer	Ever Screened	0.58 (0.58, 0.59)	0.95 (0.95, 0.95)	0.95 (0.95, 0.95)	0.86 (0.85, 0.86)	0.93 (0.93, 0.94)	0.93 (0.92, 0.93)
	Adhered	0.91 (0.90, 0.91)	0.82 (0.82, 0.82)	0.80 (0.80, 0.80)	0.80 (0.80, 0.80)	1.33 (1.33, 1.33)	1.30 (1.30, 1.31)
Cervical Cancer	Ever Screened	0.63 (0.63, 0.63)	0.49 (0.49, 0.49)	0.53 (0.52, 0.53)	0.47 (0.47, 0.47)	0.49 (0.49, 0.49)	0.51 (0.51, 0.51)
	Adhered	0.68 (0.68, 0.68)	0.51 (0.51, 0.51)	0.57 (0.57, 0.57)	0.47 (0.47, 0.47)	0.57 (0.57, 0.57)	0.58 (0.58, 0.58)
<b>Health Risk Behaviors</b>							
Physical Activity		0.91 (0.91, 0.91)	0.56 (0.56, 0.56)	0.65 (0.65, 0.65)	0.54 (0.54, 0.54)	0.72 (0.72, 0.72)	0.85 (0.85, 0.85)
Fruit Intake		1.83 (1.82, 1.83)	2.13 (2.13, 2.14)	2.12 (2.11, 2.12)	2.07 (2.07, 2.07)	1.05 (1.04, 1.05)	1.00 (1.00, 1.01)
Vegetable Intake		1.33 (1.32, 1.33)	0.69 (0.69, 0.69)	0.79 (0.79, 0.79)	0.80 (0.80, 0.80)	1.04 (1.04, 1.04)	1.40 (1.40, 1.41)
Sun Protection		0.81 (0.81, 0.81)	0.79 (0.79, 0.79)	0.78 (0.78, 0.78)	0.87 (0.87, 0.87)	0.84 (0.84, 0.84)	0.91 (0.91, 0.92)
Not smoking		2.52 (2.51, 2.52)	2.17 (2.17, 2.18)	2.51 (2.51, 2.52)	2.05 (2.05, 2.06)	1.87 (1.86, 1.87)	1.71 (1.71, 1.72)

Notes: In the models, if adjusted OR<1, Asian Americans were less likely to adhere or be screened than Whites were. If adjusted OR>1, Asian Americans were more likely to do so than Whites.

<sup>1</sup> Adjusted for SES (i.e., age, education, income, employment, marital status), acculturation (i.e., birth country, English fluency), healthcare access (i.e., having a regular healthcare provider, frequency of visiting health providers), and health status (i.e., general health)

<sup>2</sup> Adjusted for cancer/health information seeking in addition to the background variables included in the Model 1

<sup>3</sup> Adjusted for fatalistic beliefs in addition to the background variables included in the Model 1

<sup>4</sup> Adjusted for perceived cancer risk in addition to the background variables included in the Model 1

<sup>5</sup> Adjusted for background variables, cancer/health information seeking, fatalistic belief, and perceived cancer risk



In the last model, all of the background variables, cancer information, fatalistic belief, and perceived cancer risk were adjusted. Asian Americans' odds of engaging in breast cancer screening (adhered: OR = 1.30), cervical cancer screening (adhered: OR = 0.58), physical activity (OR = 0.85), vegetable intake (OR = 1.40), and sun protection (OR = 0.91) considerably increased compared to Model I. In particular, Asian Americans' odds of meeting the guidelines for breast cancer screening and vegetable intake were inverted to be greater than Whites. Additionally, such adjustments predicted to benefit Whites by increasing odds of fruit intake (OR = 1.00) and no smoking (OR = 1.71), compared to Asian Americans.

## DISCUSSION

While concerned efforts to implement culturally-sensitive cancer intervention programs for Asian American communities have been at work for more than a decade (Chao et al., 2009; Hsu et al., 2007; Juon et al., 2008), our analyses of nationally representative data demonstrate that Asian Americans and most Asian ethnic groups still present disparities in cancer information seeking, risk perception, and detection/prevention behaviors—especially in cancer screening—compared to Whites. Our analyses suggest that some gaps in cancer screening and preventive behaviors between the two racial groups can be reduced when differences in cancer/health information seeking, fatalistic beliefs, and perceived risk are controlled. In particular, Asian Americans' odds of engaging in breast cancer screening, physical activity, vegetable intake, and sun protection were predicted to increase with such adjustment. An effective delivery of cancer/health information, reduction of cancer fatalism, and improvement of cancer risk perception should be priorities for future cancer interventions targeting Asian Americans and Asian ethnic groups.

Asian Americans' odds of seeking information for cancer and general health were lower than Whites, which is consistent with a number of previous studies reporting Whites' more active cancer/health information seeking over racial/ethnic minorities (Colón-Ramos et al., 2015; Kobayashi & Smith, 2016; Tan et al., 2014). There was an encouraging recent study that suggested the cancer information seeking gaps between White and Hispanics in 2003 HINTS data no longer exist in 2014 HINTS, due to increased Internet usage (Huerta, Walker, Johnson, & Ford, 2016). However, our finding of Asian Americans was not the case. In our data, higher levels of SES and English fluency and frequent and recent health check-ups were associated with increased odds of cancer/health information seeking among Asian Americans. The U.S born and foreign born Asian Americans did not show a substantial difference in cancer information seeking. This result implies more needs for cancer information resources and materials in Asian languages, particularly for Asian Americans who are in lower SES and have limited access to health professionals.

An interesting finding is the cancer/health information seeking variation seen within Asian ethnic groups. For instance, Korean Americans appeared as the most active cancer/health information seeker that their odds of cancer information seeking were nearly four times greater than Whites, despite their relatively older age, lower SES, lower English fluency, and limited healthcare access. A former study regarding Korean Americans' cancer information source may partially explain this result. Korean Americans rely heavily on the internet and Korean ethnic media (e.g., Korean American community newspapers/printed materials, free of charge from community centers and Korean grocery stores, and internet/satellite TV aired from South Korea) to obtain cancer information, while their use of health professionals or the U.S. mainstream media is limited because of language, cultural, and economic barriers (Oh et al., 2015). Given Koreans'

primary cancer information source, English fluency and healthcare access may not have heavily limited their cancer information seeking.

Despite more active information seeking, Korean Americans were more likely to show fatalistic beliefs (i.e., everything causes cancer and too many cancer prevention recommendations). They were also least likely to perceive cancer risk than any other racial/ethnic groups. These results are consistent with the current literature describing Korean Americans as one of the most vulnerable Asian ethnic groups in terms of cancer prevention and detection behaviors. Korean-American men had higher cigarette smoking prevalence compared to other Asian ethnic groups (Li, Kwon, Weerasingh, Rey, & Trinh-Shevrin, 2013). Korean Americans' cancer screening rates have been consistently lower than the target of U.S. national cancer guidelines, and they were the only Asian ethnic group who showed a decline in cancer screening rates in recent years (Maxwell et al., 2010).

Korean ethnic media rely on imported contents from South Korea and receive information subsidies from commercial partners, such as the South Korean medical tourism industry; they are limited in covering diverse cancer issues in the U.S. (Jun & Oh, 2015; McDonnell, Lee, Kim, Kazinets, & Moskowitz, 2008). Therefore, cancer information obtained from Korean ethnic media may not connect to comprehension or adherence of cancer prevention guidelines recommended by the U.S. government. It was found that the use of Korean ethnic media was not associated with awareness of authoritative national cancer information sources that offer cancer prevention guidelines (Oh, Kreps, Jun, & Ramsey, 2011). A similar pattern was observed among Vietnamese Americans. In our data, Vietnamese Americans reported the second highest cancer information seeking, despite the lowest SES and acculturation. However, they reported higher fatalistic beliefs (i.e., not much to do to lower cancer risks, too many cancer prevention recommendations). The current literature describe Vietnamese Americans as another Asian ethnic group with lower cancer knowledge, higher cancer fatalism, and lower cancer screening rates (Domi Le et al., 2014; McCracken et al., 2007). Vietnamese Americans are also known for heavy reliance on Vietnamese ethnic media, but the use of Vietnamese ethnic media was negatively associated with self-efficacy for cancer screening (Nguyen & Belgrave, 2012).

These results indicate that although the importance of Asian ethnic media in reaching the communities is undeniable, more access to cancer information through Asian ethnic media does not guarantee the intended effects, such as enhanced cancer knowledge and more engagement in cancer prevention and detection behaviors. Future research may consider identifying reasons of the disconnection, such as the accuracy/reliability of cancer prevention/detection information in Asian ethnic media and the cancer information sources and understanding of the U.S. cancer prevention/detection guidelines among health journalists working for Asian ethnic media.

The importance of ethnic media in reaching racial/ethnic communities and the limited quality of cancer/health information in ethnic media spurred the NCI to develop the Multicultural Media Outreach (MMO) program, which aims to utilize minority community media and spokespersons to disseminate cancer education information for minority communities (Alexander, Kwon, Strecher, & Bartholomew, 2013). However, in our review of the program in January 2017, the MMO only possessed education materials in English tailored for African Americans and Hispanics/Latinos (NCI, 2016). To address cancer disparities among more vulnerable Asian ethnic communities, such as Korean and Vietnamese Americans, the MMO and other healthcare providers will need to develop customized materials for each Asian ethnic community—rather than the whole of Asian Americans—in the native language of receptive audiences. Also, more

proactive approaches to build partnerships with Asian ethnic media and community centers are needed. Education programs for Asian ethnic media journalists and community leaders to increase cancer literacy will be merited.

On the other hand, Japanese Americans, who presented higher SES and acculturation as well as greater healthcare access, appeared as the most apathetic in seeking cancer/health information than any other racial/ethnic groups. This result contradicts previous findings, indicating positive relationships between cancer information seeking and higher SES, acculturation, and access to healthcare professionals (Huerta, Walker, Johnson, & Ford, 2016; Ma & Fleisher, 2003; Oh, Jun, Zhao, Kreps, & Lee, 2015). We do not have a sufficient explanation for this result since there is no comparable study examining Japanese Americans' cancer information seeking behaviors. Japanese Americans' cultural tendencies of avoiding negative information and fatalistic views on cancer prevention/treatment may be related to inactive cancer information seeking. They were more likely to agree with all of the fatalism statements than Whites in our data, and cancer information seeking and fatalism are known to be associated (Kobayashi & Smith, 2016). More individual and cultural factors should be discovered to better explain the cancer information seeking variation across Asian ethnic groups.

We obtained mixed results regarding the racial difference in cancer beliefs. Asian Americans were less likely to believe that everything causes cancer and that there are too many cancer prevention recommendations than Whites. They were also more likely to believe that cancer is more common than heart disease, which is true to the population. In a previous study that analyzed HINTS 2005, Asian Americans were more likely to think everything causes colon cancer, cancer is not often caused by a person's behaviors or lifestyle, and there is no way to slow down or disrupt colon cancer than Whites (Jun & Oh, 2013). This may be an encouraging new trend, indicating that Asian Americans' imprecise cancer belief is diminishing. There is no study investigating how Asian Americans or Asian ethnic groups have changed over time in terms of cancer belief, knowledge, literacy, or risk perception. Tracking this trend over time, as HINTS and other public health data grow in iterations, can be an opportunity for future research.

Asian Americans presented more pessimistic views on cancer prevention than Whites congruent with previous findings (Hardie & Polek, 2016; Jun & Oh, 2013). The cultural difference in internal and external locus of control may provide an explanation to this result. People in individualistic cultures (e.g., North Americans) tend to hold higher levels of internal locus of control as compared to people in collectivist and holistic culture (i.e., East Asians), who tend to present higher external locus of control (O'Connor & Shimizu, 2002). Individuals with higher levels of external locus of control tend to believe that health outcomes are not contingent on their own behavior to reduce health risks. They are more likely to associate an incidence of disease or illness with external forces, such as fate, chance, or luck (Büssing & Fischer, 2009; Schneider et al., 2006). Therefore, individuals with higher levels of external locus of control tend to place less emphasis on the role of health-protective behaviors (Carr, 2009).

In previous research, education and health literacy were associated with the belief that cancer is preventable (Kobayashi & Smith, 2016; Niederdeppe & Levy, 2007). Given Asian Americans' higher educational level, health literacy in English may be a more useful factor in explaining the population's fatalistic views on cancer prevention. More opportunities to increase health/cancer literacy skills may reduce cancer fatalism and increase cancer prevention efficacy among Asian Americans, which will ultimately lead to more engagement in cancer preventive behaviors. There is recent evidence that a health literacy-focused intervention successfully

promoted positive perceptions on cancer screening and cancer screening participation rates among Korean American women (Han et al., 2017).

Although Asian Americans' lower cancer risk perception was found in previous research (Davis et al., 2013; Nguyen & Bellamy, 2006; Orom et al., 2010), our analyses indicate that Asian Americans' acceptance of cancer risk is over than four times less than Whites, despite the population's higher cancer incidence rates. All Asian ethnic groups also showed a lower perceived risk than Whites. Asian Americans' odds of engaging in breast cancer screening, physical activity, and vegetable intake increased the most when perceived risk was adjusted. Orom et al. (2010) suggested that the difference in perceived cancer risk between Asian American and Whites is explained by less frequent reporting of family cancer history by Asian Americans. Also, it was found that the magnitude of the association between family cancer history and colon cancer screening was highest among Asian Americans compared to other racial groups (Perencevich, Ojha, Steyerberg, & Syngal, 2013)4/16/2018 4:53:00 PM, Collectively, these results suggest that the increased sense of vulnerability due to family cancer history may play positively in cancer protection/detection behaviors among Asian Americans. Relevant campaigns should utilize this knowledge in designing cancer prevention messages for the population. For instance, evidence and narrative-based messages highlighting unique cancer risks to Asian American families and communities would be highly effective. A family history intervention was successful in improving cancer risk perception in an African American community setting (Murthy et al., 2011).

Although our findings add some empirical support for the role of cancer/health information seeking, fatalistic belief, and perceived risk in reducing breast cancer screening gaps between Asian Americans and Whites, the cervical cancer screening disparities between the two racial groups persisted even after all variables were controlled for. Whites were still two times more likely to be screened and adhered for cervical cancer than Asian Americans. These results indicate that additional contextual, communicative, and cultural factors are needed to account for the cervical cancer disparities.

This study has several strengths. To the best of the authors' knowledge, it is the first study comparing cancer information seeking, fatalistic belief, and perceived risk among Asian ethnic groups, who are heterogeneous in terms of SES, acculturation, and healthcare access. It also provides the most current status of Asian Americans' cancer beliefs in comparison to Whites, and identified a new trend. Additionally, this is the first study that recognized the role of cancer information seeking, fatalistic belief, and perceived cancer risk in explaining differences of cancer detection and prevention behaviors between Asian Americans and Whites. This research extended study outcomes to cancer preventive health behaviors. Additionally, this is one of the few studies to identify socio-demographic characteristics of Asian Americans who seek cancer information, hold fatalistic cancer beliefs, and perceive cancer risks. Another major strength of our study is the utilization of a nationally-representative data set.

Nevertheless, some limitations of our study must be noted. First, it limits the ability to derive causal inferences among variables due to the cross-sectional nature of the HINTS data. Second, it relied on respondents' self-administration. Third, other important factors that can mediate the relationship among cancer information seeking, beliefs, and protection/detection behaviors, such as internal/external locus of control and cancer/health literacy could not be included in the analysis due to the use of secondary data. Fourth, many measures in HINTS are based on dichotomous items; thus, it was not able to compare participants on the basis of their degree of beliefs or frequency of behaviors. Fifth, the small Asian-American sample size and the

data collection methods of HINTS could affect the generalizability of our findings. Since HINTS provided instruments only in English or Spanish language, the size and the representativeness of the Asian-American sample are limited. Problems of Asian-American sample collection have been pointed out for not only HINTS but other national public health datasets (Holland & Palaniappan, 2012). Asian American participants in our data from HINTS may be younger, with higher SES, and proficient in English than average Asian Americans in the U.S.

## CONCLUSION

Overall, the results of our study demonstrate that Asian Americans and Asian ethnic groups still experience some perceptual and attitudinal cancer disparities, which connect to their lower engagement in cancer prevention and detection behaviors. However, we noticed some optimistic changes in Asian Americans' cancer beliefs. For instance, they hold more accurate beliefs about causes and status of cancer than Whites; we hope to see more evidence to support this. Also, the gaps of cancer beliefs and behaviors were often wider within Asian ethnic groups than between Asian Americans and Whites, which indicates needs for more research comparing Asian ethnic groups as well as cancer interventions optimized to each ethnic group. We propose that active cancer/health information seeking, precise cancer beliefs, and increased cancer risk perception will benefit not only Asian Americans, but also the whole U.S. populations' engagement in cancer preventions, leading to more survivals through early detection.

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