

# THE INFLUENCE OF CULTURE AND CANCER WORRY ON COLON CANCER SCREENING AMONG OLDER CHINESE-AMERICAN WOMEN

**Objectives:** This study investigated the hypothesis that adherence to colon cancer screening guidelines among Chinese women was associated with Eastern cultural views and anxiety about developing colon cancer.

**Design:** Cross-sectional data from a community-based longitudinal study were used to examine the hypothesis of this study. Measures of sociodemographics, medical access factors, cultural views of health care, cancer worry, and practices of colon cancer screening were administered by a computer assisted telephone interview.

**Participants:** Four hundred and thirty-three Chinese-American women from Metropolitan Washington, DC age 50 years and older and without a history of colon cancer completed the telephone interview.

**Main Outcome Measure:** Adherence to utilization of either fecal occult blood test (FOBT) within a year, sigmoidoscopy within five years, or colonoscopy within 10 years was used to define two outcome categories: current screeners and noncurrent screeners.

**Results:** Controlling for covariates, this study found that: 1) women with more Eastern cultural views were less likely to be current screeners; 2) women who thought about the chance of getting colon cancer had approximately three-fold greater odds of being current screeners than women who never thought about colon cancer; and 3) women receiving physician recommendation for colon cancer screening had more than three-fold increased odds of being current screeners than those who had not received a recommendation.

**Conclusions:** In addition to the lack of physician recommendation, older Chinese women face cultural and psychological barriers to obtaining timely colon cancer screening. These barriers may be reduced through culturally sensitive intervention studies. (*Ethn Dis.* 2006;16:404-411)

**Key Words:** Cancer Worry, Chinese-American Women, Colon Cancer Screening, Colonoscopy, Cultural Views of Health Care, FOBT, Physician Recommendation, Sigmoidoscopy

---

From the Cancer Control Program, Lombardi Comprehensive Cancer Center, Georgetown University Medical Center (JHW, WL,

Judy Huei-yu Wang, PhD; Wenchi Liang, DDS, PhD; Mei-yuh Chen, MS; Jennifer Cullen, MPH, PhD; Shibao Feng, PhD; Bin Yi, MS; Marc D. Schwartz, PhD; Jeanne S. Mandelblatt, MD, MPH

## INTRODUCTION

Colon cancer is the second most common cancer and the third leading cause of cancer-related death among the Chinese-American population. Chinese Americans have higher colon cancer death rates than non-Hispanic Whites<sup>1</sup> and are more likely to be diagnosed with late-stage colon cancer than Japanese and White women.<sup>2</sup> Despite this disease burden, little research has been done on Chinese-Americans' colon cancer screening practices.

In 2001, overall US self-reported colon cancer screening rates (including use of fecal occult blood test [FOBT], sigmoidoscopy, or colonoscopy) were 45%–48%.<sup>3</sup> In contrast, only 22%–31% of Chinese women report ever having had FOBT and sigmoidoscopy, and among these women who ever had FOBT, just 38%–42% report an FOBT in the past year.<sup>4-5</sup> These data are consistent with previous data that indicate that Chinese women also underutilize breast and cervical cancer screening.<sup>6-9</sup>

Lower rates of cancer screening in Chinese women may be the result of several unique cultural and psychosocial barriers, beyond commonly recognized

---

MYC, SF, BY, MDS, JSM); and the Center for Prostate Disease Research, Department of Defense (JC); Washington, DC.

Address correspondence and reprint requests to Judy Wang, PhD; 3300 Whitehaven Street; N.W. Suite 4100; Milton Harris Building, Box 571445; Washington, DC 20007; 202-687-6306; 202-687-0305 (fax); jw235@georgetown.edu

---

*Many older Chinese women believe that thoughts about cancer may eventually cause cancer.*<sup>19,21</sup>

---

barriers such as lack of healthcare resources and physician recommendation.<sup>4,8-16</sup> For example, traditional Chinese medicine emphasizes natural approaches to the treatment of disease (eg, herbal medicines and balanced food).<sup>17-19</sup> Furthermore, in Chinese and other Asian cultures, cancer is viewed as an unpreventable and fatal disease.<sup>10,20</sup> Many older Chinese women believe that thoughts about cancer may eventually cause cancer.<sup>19,21</sup> Additionally, Chinese women generally perceive themselves to be at lower risk of developing cancers compared to Caucasian women.<sup>12,19</sup> Given such beliefs, we believe that Chinese-American women who hold Eastern cultural views may be disinclined to obtain colon cancer screening.

This community-based study was designed to evaluate cross-sectional associations between Chinese-American women's cultural views of care, level of worry about the risk of cancer (cancer worry), and use of colon cancer screening tests. We hypothesized that women with more Western cultural views would be more likely to report adherence to colon cancer screening than women with more Eastern views after considering other factors. In addition, based on reports that correlate cancer worry with likelihood of breast cancer

screening,<sup>22-24</sup> we hypothesized that colon cancer worry would be associated with screening adherence.

## METHODS

### Setting and Recruitment

This report is part of a larger study approved by the Georgetown University Institutional Review Board to investigate the effect of cultural beliefs on cancer screening in Chinese-American women. Chinese women were recruited from the Washington, DC metropolitan area (the District of Columbia, Fairfax County in Virginia, and Montgomery and Prince George's Counties in Maryland).

With support from local Chinese community leaders, the researchers attended health fairs, Chinese New Year Celebrations, and various community events at Chinese cultural service centers, senior centers, churches, and Chinese and Taiwanese associations to introduce this study and to distribute Chinese-language recruitment flyers. Recruitment notices were also posted in Chinese newspapers and Chinese associations' newsletters and web sites. After these public announcements, women were approached to evaluate eligibility and interest in participation. Women who were not US residents and/or were younger than 50 years of age (exclusion criterion from parent study) were excluded from the project. Eligible women were invited to participate and again were told about the purpose, procedures, benefits, and risks of participating in the study. Participants were offered incentives such as a bottle of multivitamin supplement after enrolling and periodic health-related newsletters after completing the interviews.

Overall, 573 eligible Chinese women expressed interest in participation. Of these, 509 (89%) consented to participate. Of the 509 consenting women, 438 (86%) completed the interview, 6% declined the interview,

and 8% were pending contact at the time of the present analyses. Of the 438 women who completed the interview, five reported a personal history of colon cancer and were eliminated from analyses. Thus, the final sample for this report was 433 women.

### Data Collection

A structured telephone interview was used to collect information regarding practices of FOBT, sigmoidoscopy, and colonoscopy; cultural views about health care and Western medicine; presence of physician recommendation; worry about getting colon cancer; and sociodemographics. All survey questions were translated into written languages commonly used in China, Hong Kong, and Taiwan. Bilingual speakers (English and Chinese) translated the survey questions, and back-translation was conducted to assure accuracy. Trained interviewers speaking Mandarin, Taiwanese, or Cantonese conducted computer-assisted telephone interviews with consenting women. Three participants chose to complete the interview in English. Eighteen participants who had difficulty in answering questions by telephone were interviewed in person. On average, the interviews lasted one hour.

## Measures

### Outcome Variable

Utilization of colon cancer screening was our primary outcome. According to clinical guidelines endorsed by the American Cancer Society, asymptomatic and average-risk adults aged 50 and older should receive either an annual FOBT, a sigmoidoscopy every five years, or a colonoscopy every 10 years.<sup>25</sup> We measured Chinese women's adherence to these guidelines with a series of questions. First, participants responded to separate questions about whether they had ever had FOBT, sigmoidoscopy, or colonoscopy. Women who reported having ever had a particular test

were queried about when they had their most recent test. For FOBT, choices of screening intervals ranged from within one year, one to two years, more than two years. The intervals for sigmoidoscopy were from within one year, less than or about five years, and beyond five years. The timing of the most recent colonoscopy was either within or more than 10 years. Alternatively, women could respond to the choice—don't know or unsure—if they did not remember when they went for the test.

Based on answers to these questions, colon cancer screening outcomes were divided into two levels: current and noncurrent. Current screeners were defined as having either FOBT within a year, sigmoidoscopy within five years, or colonoscopy within 10 years. Noncurrent screeners were women who either had not had any of the three tests within the recommended screening interval or had never been screened for colon cancer.

### Predictor Variables

**Cultural Views of Health Care.** Based on previous focus group data from Chinese-American women,<sup>21</sup> we developed a scale to measure Chinese women's cultural views about cancer and health care. The scale consisted of 30 items designed to measure the use of herbs, values of Western medicine, fatalistic views of cancer, lifestyles, modesty, feelings about Western medical examinations, other cultural ways of care (eg, practices of Qi-Kung or Tai-Chi), and traditional beliefs in hot-cold balance. For each item, women responded by using a five-point Likert scale from strongly agree to strongly disagree. The inter-item reliability was .80.

**Cancer Worry.** We assessed cancer worry with two items from previous research.<sup>26</sup> Explicit worry was measured with the item: "Overall, how worried are you that you might get colon cancer someday? 1=not worried, 2=some-

what, 3=worried, and 4=very worried. Thoughts about cancer were assessed by the item: "During last year, how often have you thought about your own chances of getting colon cancer? 1=not at all or rarely, 2=sometimes, 3=often, and 4=a lot."

Based on the distribution of responses, each of these variables was dichotomized: not worried vs any worry (somewhat, worried, and very worried), and not thinking about getting colon cancer vs thinking about it (sometimes, often, and a lot). "Worry" and "thoughts" were each analyzed separately to examine their unique effect on screening.

### *Covariates*

**Sociodemographics.** We assessed age (50–64 vs  $\geq 65+$ ), educational level ( $\leq$ high school vs  $>$ high school), marital (currently married vs not married) and employment status (yes vs no), and annual income. Annual income was subsequently excluded from the analysis because the variable had  $>30\%$  missing values.

**Medical Access Factors.** We also assessed medical access factors such as having health insurance (do you have any health insurance coverage? Yes/No), presence of a regular physician (do you have a doctor or nurse you usually see when you are sick or want a checkup? Yes/No), and physician recommendation (in the past two years, did any doctor recommend that you have colon cancer screening? Yes/No).

**Symptoms.** We sought to distinguish between colon cancer tests that were for the purpose of screening vs those that were diagnostic; thus, all participants were asked the following question: "Did you go for your last FOBT (or sigmoidoscopy, or colonoscopy) because of health reasons or as part of a routine checkup?" Of the 433 women, about 57% reported that they received screening as part of a routine check-up. These

women were classified as asymptomatic; the 19% ( $n=82$ ) who reported that they underwent one or more of these tests for health reasons were classified as symptomatic. Among women who had never had colon cancer screening ( $n=106$ ), we asked: "Have you ever heard about these tests?" If the answer was "yes," we asked why they had not received the tests. Those who reported not having had these tests because they were healthy and had no physical symptoms were also classified as asymptomatic ( $n=55$ ). To be conservative, the remainder of these participants ( $n=51$ ) were classified as symptomatic. Thus, overall we classified 300 women (69%) as asymptomatic and 133 (31%) as symptomatic.

### **Data Analysis**

We conducted bivariate and multivariate analyses to test the two study hypotheses. Missing data from the cultural scale were imputed with a mean substitution. Scores on each cultural item were summed to yield an overall Chinese cultural view score. We normalized the cultural sum scores from 0–100 points for the convenience of interpretation. Missing binary variables were imputed by placing missing cases in the category when its odds of predicting a criterion are closer to 1. That is, the missing variable was placed in the category that would decrease the association between the imputed variable and the outcome variable to avoid an artifact of overestimating the association.

To examine bivariate associations between screening and predictors, we used chi-square tests for dichotomous variables and  $t$  tests for continuous variables. Multivariate modeling of the effects of cultural views and cancer worry on colon cancer screening was conducted by using logistic regression with hierarchical variable entry. Variables with statistically significant associations with screening outcomes were included in the multivariate model. In the logistic models, we employed a hier-

archical variable entry approach in which we retained the significant predictors ( $P$  value  $<.05$ ) from each tested model and added the next set of predictors to the subsequent models. In model 1, we entered demographic variables including education and employment status. In model 2, we retained significant variables from model 1 and then entered medical access factors (health insurance, presence of a regular doctor, and physician recommendation for colon cancer screening). Model 3 included all significant variables from model 2 plus the symptom variable. Based on its clinical relevance, we controlled for the symptom variable in all models regardless of its significance. In the fourth model, we retained significant variables and the symptom variable from model 3 and added colon cancer worry and thoughts about colon cancer. To examine whether cultural views about health care explain variance in colon cancer screening outcomes after adjustment for covariates examined in model 4, the variable of culture was the last predictor entered in the final model. Odd ratios (OR) with 95% confidence intervals (CI) were used to estimate the significance of the odds of current screening vs noncurrent screening for each study variable. The assessment of significance of blocks of variables entered in each step was based on estimation of differences in the likelihood ratio chi-square and degree of freedom ( $df$ ) between two evaluated models. The SAS 9.0 version statistical program (SAS Institute Inc., Cary, NC, USA) was used to perform all analyses.

## RESULTS

### **Sample Characteristics**

Of the 433 participants, 432 were foreign-born. Among the foreign-born women, 60% were born in China, 3% in Hong Kong, 31% in Taiwan, and 6% in other countries including Singapore and Vietnam. The mean age of the

**Table 1. Bivariate associations between sociodemographics, medical care resources, cancer worry, and cultural variables with screening outcomes (N=433)**

Variables	Whole Group	Current Screeners (n=246)		Noncurrent Screeners (n=187)		P values
	No.	No.	%	No.	%	
Age						.9625
50 to 64 years old	246	140	57	106	57	
≥65	187	106	43	81	43	
Education						<.0001
≤High school	127	51	21	76	41	
>High school	306	195	79	111	59	
Marital status						.1026
Married	316	187	76	129	69	
Divorced/widow/single	117	59	24	58	31	
Employed						.0187
Yes	171	109	44	62	33	
No	262	137	56	125	67	
Presence of a regular doctor						<.0001
Yes	339	210	85	129	69	
No	94	36	15	58	31	
Health insurance						<.0001
Yes	349	215	87	134	72	
No	84	31	13	53	28	
Physician recommendation						<.0001
Yes	193	143	58	50	27	
No	240	103	42	137	73	
Symptoms*						.015
Yes	133	64	26	69	37	
No	300	182	74	118	63	
Worry about getting colon cancer						.0004
Somewhat/often/a lot	166	112	46	54	29	
Not at all	267	134	54	133	71	
Thoughts about getting colon cancer						<.0001
Sometimes/often/a lot	97	72	29	25	13	
Not at all	336	174	71	162	87	
Cultural views of healthcare†		M=52.08 (SD 9.46)		M=56.18 (SD 11.06)		<.0001

\* Data about symptoms were based on women's self-report rather than clinical information.

† Cultural views are continuous scores ranging from 0 to 100 points. High scores on cultural views indicate a more Eastern view of care; low scores reflect a more Western view of care.

M=mean; SD=standard deviation.

sample was 64 years, ranging from 50 to 89 (standard deviation [SD]=9 years). The majority of participants had a college degree or higher (71%), had health insurance (81%), and were married (73%). Thirty-nine percent were employed. Fifty-seven percent (n=246) of the participants were classified as current screeners, and 43% (n=187) were noncurrent screeners.

### Bivariate Analyses

Bivariate associations between sociodemographics, medical access factors, cancer worry, and cultural variables with colon cancer screening behavior are presented in Table 1. Among the sociodemographic variables, education and employment status were both associated with screening adherence. For medical access factors, current

screeners were more likely to have a regular doctor, health insurance, and physician screening recommendation than noncurrent screeners. The presence of symptoms was also associated with being a current screener. Among the psychosocial and cultural variables, current screeners reported higher levels of cancer worry and thoughts about colon cancer. In addition, noncurrent screeners had significantly higher mean scores on Chinese cultural view tests than current screeners, indicating that noncurrent screeners had a significantly more Eastern view of health care.

### Multivariate Analyses

As displayed in Table 2, we tested our hypotheses that culture and cancer worry independently predicted colon cancer screening using logistic regression analysis in which we controlled for other study covariates. Based on bivariate analyses, education and employment status were entered in model 1 as sociodemographic predictors. In this model, education significantly predicted adherence (P<.0001), but employment status did not (P=.31). In model 2, we retained education and added the medical access factors of health insurance, presence of a regular doctor, and physician recommendation. In model 2, education (P=.0017) and physician recommendation (P<.0001) were independent predictors of screening. Removing the nonsignificant medical factors of health insurance (P=.21) and presence of a regular doctor (P=.14) from model 2 resulted in a significant improvement in the model chi-square ( $\Delta\chi^2(2)=7.53, P<.05$ ).

In model three, we added our symptom variable to the variables retained from model 2 (education and physician recommendation). Although symptoms were not independently associated with screening adherence (P=.13), we felt that the clinical significance of this variable merited including it in all subsequent models. With symptoms in the model, both

**Table 2. Summary of statistics of logistic regression models predicting screening behavior between current and noncurrent screeners**

Model Construction	Estimated Coefficient	OR	95% CI	Model $\chi^2$	df	$\Delta\ddagger \chi^2$ (vs Compared Model)
Model 1				20.25	1	
Education: >high school (vs ≤high school)	.96	2.62	1.71–4.00			
Model 2				55.00	2	34.75§ (vs Model 1)
Education	.77	2.15	1.38–3.35			
Physician recommendation: yes (vs no)	1.23	3.41	2.25–5.19			
Model 3				57.32	3	2.32 (vs Model 2)
Education	.72	2.05	1.31–3.22			
Physician recommendation	1.22	3.37	2.22–5.13			
Symptoms: yes (vs no)*	.35	1.41	0.91–2.20			
Model 4				71.64	4	14.32§ (vs Model 3)
Education	.62	1.86	1.18–2.94			
Physician recommendation	1.24	3.45	2.25–5.29			
Symptoms	.45	1.57	1.00–2.48			
Thoughts about getting colorectal cancer: somewhat/often/a lot (vs no)	1.00	2.72	1.59–4.67			
Model 5 (final model)				72.34	4	15.02§ (vs Model 3)
Physician recommendation	1.24	3.44	2.25–5.28			
Symptoms	.55	1.74	1.10–2.73			
Thoughts about getting colorectal cancer	1.03	2.79	1.63–4.77			
Cultural views†	-.03	.97	0.95–0.99			

The reference group is current screeners. Nonsignificant covariates and predictors were not retained in each model except controlling for symptoms. The final model was significant at  $P < .0001$ , indicating a good fit to the data.

\* Data about symptoms were based on women's self report rather than clinical information.

† Cultural views are continuous scores ranging from 0 to 100 points. High scores on cultural views indicate a more Eastern view of care; low scores reflect a more Western view of care. For every one-point increase in the cultural scale, the odds of being current screeners were 3% less than being noncurrent screeners.

‡ The symbol ( $\Delta$ ) denotes the differences in likelihood ratio chi-square ( $\chi^2$ ) tests between the tested model and the compared model.

§  $P < .001$ .

education and physician recommendation remained statistically significant. On the next step, we entered psychological factors (worry and thoughts about colon cancer) controlling for study variables retained in model 3. Thoughts about colon cancer exhibited a significant independent effect on colon cancer screening adherence ( $P = .0081$ ), but worry was not independently associated with screening ( $P = .1593$ ). Removing worry from the model did not result in a significant change in chi-square ( $\Delta\chi^2 (1) = 1.99$ ,  $P > .05$ ). Thus, worry was excluded in the fourth model.

In the fifth model, we entered the cultural scale score. Culture was marginally predictive of screening adherence ( $P = .0597$ ) after controlling for prior variables. Notably, upon entry of cultural scale score, education was no longer

independently associated with screening outcomes ( $P = .088$ ), but symptoms became a significant independent predictor ( $P = .0371$ ). Physician recommendation and thoughts about colon cancer both remained significant predictors of screening adherence.

Given the apparent confounding of the education, symptom and culture variables in the fifth model, we conducted follow-up analyses to explore these associations. We found that culture was highly and negatively correlated with education ( $r = -0.41$ ,  $P < .0001$ ), indicating that women who had a higher educational level were less likely to hold an Eastern view of care. Given the high overlap between culture and education, we tested a final model identical to the fifth model above, retaining the variable of culture but removing that of education. In this final model, culture signif-

icantly ( $P = .006$ ) and independently predicted colon cancer screening outcomes (controlling for physician recommendation, symptoms, and thoughts about colon cancer). The model chi-square was not significantly changed when education was removed from the model ( $\Delta\chi^2 (1) = 2.9$ ,  $P > .05$ ). No interaction effect between culture and other independent variables was found.

The results of the final logistic model (Table 2) suggest that women who received a physician recommendation for colon cancer screening had more than three-fold increased odds of being a current screener compared to women who had not received a physician recommendation (OR 3.44; 95% CI 2.25–5.28). Women who sometimes or often thought about the chance of getting colon cancer had about three-fold greater odds of current screening

**Table 3. Mean differences in cultural views by women with and without college education**

Groups\Outcomes	Current Screeners			Noncurrent Screeners			t Values
	Cultural Views						
	n	M	SD	n	M	SD	
Level of education							
≤High school	51	58.1	10.3	76	62.2	11.2	2.1*
>High school	195	50.5	8.6	111	52.1	8.8	1.5

\*  $P < .05$ .

M=mean scores on the cultural scale; SD=standard deviation. Higher mean scores on cultural views indicate a more Eastern view of care. Low mean scores on cultural views indicate a more Western view of care.

compared to women never thought about colon cancer (OR 2.79; 95% CI 1.63–4.77). Finally, a 10-point increase in Eastern cultural views was associated with a 25% decreased likelihood of being a current screener (OR 0.75; 95% CI 0.74–0.76).

We further conducted a stratified analysis to examine the degree of confounding between education and cultural views. As shown in Table 3, cultural views were not associated with screening among college-educated participants. However, among participants with less education, noncurrent screeners had a more Eastern cultural view than did those who were current screeners.

## DISCUSSION

We found that the degree of belief in the Eastern way of care was strongly related to a woman's educational level. Chinese women with lower educational levels were significantly more likely to hold an Eastern view of care and were less likely to adhere to colon cancer screening guidelines than Chinese women with postsecondary education. These data suggest that cultural concepts of health care may be modified by an individual's educational experience. Higher education in modern Chinese society has been greatly influenced by Western science and technology. Chinese-American women with advanced education, especially those who completed their postsecondary education in

the United States, are more likely to be influenced by Western culture and have more opportunities to learn about Western medical care. With an understanding of Western preventive care, diagnosis, and treatment, college-educated Chinese women may be more likely to modify their existing Eastern care structure, utilize Western medical services, and follow its preventive guidelines than high school-educated Chinese women.

Although an Eastern view of care was associated with decreased screening adherence, we found that this association was only present among less-educated participants. In post hoc analysis among college-educated women, adherence to screening was significantly related to physician recommendation and colon cancer awareness (data not shown). These results suggest that efforts to target Chinese women for colon cancer screening will need to consider both their cultural perspectives and educational backgrounds.

Similar to research on other minority populations,<sup>27–30</sup> the results of this study suggest that physician recommendation is an independent predictor of colon cancer screening in Chinese women regardless of cultural views of care. Chinese culture regards physicians as authority figures.<sup>31</sup> Chinese women who hold an Eastern view of care and use less Western medical care may be least likely to be exposed to professional recommendation for colon cancer screening. However, our data suggest that when a rec-

*Chinese women with lower educational levels were significantly more likely to hold an Eastern view of care and were less likely to adhere to colon cancer screening guidelines than Chinese women with postsecondary education.*

ommendation is received, it is typically acted upon regardless of whether the individual has an Eastern or Western view of care. Physicians who are enthusiastic about encouraging patients to obtain timely colon cancer screening may explain the benefits of screening to their patients. Chinese women's misconceptions about colon cancer and screening may be clarified at this time. This encouragement may help Chinese women adapt themselves to Western ways of care by placing more value on Western preventive care, which consequently motivates them to comply with screening guidelines.

We also found that women who worried about developing colon cancer were more likely to obtain timely colon cancer screening than women who were not worried. As has been shown with other ethnic groups,<sup>32–33</sup> apprehension about having colon cancer was significantly associated with Chinese women's colon cancer screening behavior. These data are also consistent with studies examining the role of worry on other forms of cancer screening.<sup>22,24,34</sup> Moreover, thoughts about the chances of getting colon cancer appear to be a stronger predictor in the multivariate analyses than explicit worry. Thoughts about colon cancer may represent awareness of the threat. Thus, patients who are aware of the threat may be

more likely to seek screening. Our current cross-sectional data cannot specify the cause and effect between thoughts about colon cancer and screening behavior. However, prior research indicates that emotional factors, such as worry and fear, can facilitate women's behavioral responses to cancer screening and regulate screening behavior in different ethnic groups.<sup>35-36</sup>

Several limitations should be considered in interpreting our results. First, this study was based on a convenience sample of women from the community who volunteered to participate. As a result, the application of these results to the Chinese population may be limited. Individuals who volunteered to participate in this study may have been more interested in learning about colon cancer screening or were more concerned about their health in general. Our sample was not representative in terms of educational level: 71% of our sample reported post-secondary education compared to only 46% of older Chinese women who reported post-secondary education in the 2003 California Health Survey.<sup>6</sup> Second, this sample was virtually all foreign-born, which limits the study's relevance to other groups of Chinese. Third, results are based on self-report data at one time point. Fourth, our measure of whether a participant was symptomatic or not was imperfect. We attempted to distinguish women who sought true screening from those whose colorectal cancer tests were diagnostic in nature. However, since we based this distinction on a self-report measure, whether the tests reported by these participants were screening or diagnostic tests is unclear. Hence, we chose to include these women in the analyses and control for the variable of symptoms in the multivariate modeling. Finally, this study did not examine the non-screening aspect of colon cancer prevention such as weight control, diet, and exercise. These lifestyle factors are also valued in Chinese culture and are related to the cause of

colon cancer. It is crucial that future research looks into these factors to promote colon cancer prevention in this understudied minority group.

Reducing barriers in Chinese women and promoting their use of colon cancer screening may depend on culturally and linguistically appropriate intervention programs. Very few intervention studies have been designed to counteract Chinese women's psychological and cultural barriers. Our results suggest that interventions directed toward increasing colon cancer awareness and knowledge about Western preventive care through physician recommendations are important to enhance Chinese-American women's adherence to colon cancer screening.

#### ACKNOWLEDGMENTS

This work was supported by: grant No. DAMD-17-02-1-0390 from the Department of Defense to Judy Wang and Wenchi Liang; grant No. K07 CA90352 from the National Cancer Institute to Wenchi Liang; grant No. K05 CA96940 from the National Cancer Institute to Jeanne Mandelblatt; and the Cancer Clinical and Economic Outcomes Core Shared Resource at Lombardi Comprehensive Cancer Center.

#### REFERENCES

1. Luo RL, Freeman J, Freeman D, Weaver J. A population based study in colon cancer survival among non-Hispanic Whites and Asian-American subgroups [abstract]. Presented at: The 9th Biennial Symposium on Minorities, the Medically Underserved & Cancer Program; March 24-28 2004; Washington, DC.
2. Lin SS, Clarke CA, Prehn AW, Glaser SL, West DW, O'Malley CD. Survival differences among Asian subpopulations in the United States after prostate, colorectal, breast, and cervical carcinomas. *Cancer*. 2002;94:1175-1182.
3. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System. Available at: www.cdc.gov. Accessed in: 7/04.
4. Tang TS, Solomon LJ, McCracken LM. Barriers to fecal occult blood testing and sigmoidoscopy among older Chinese-American women. *Cancer Pract*. 2001;9(6):277-282.
5. Sun WY, Basch CE, Wolf RL, Li XJ. Factors associated with colon cancer screening among

- Chinese Americans. *Prev Med*. 2004;39:323-329.
6. UCLA Center for Health Policy Research. California Health Interview Survey. Available at: www.chis.ucla.edu. Accessed in: 5/05.
7. Yu ES, Kim KK, Chen EH, Brintnall RA. Breast and cervical cancer screening among Chinese-American women. *Cancer Pract*. 2001;9(2):81-91.
8. Tang TS, Solomon LJ, McCracken LM. Cultural barriers to mammography, clinical breast exam, and breast self-exam among Chinese-American women 60 and older. *Prev Med*. 2000;31:575-583.
9. Tu SP, Yasui Y, Kuniyuki AA, et al. Mammography screening among Chinese-American women. *Cancer*. 2003;97:1293-1302.
10. Yu MY, Hong OS, Seetoo AD. Uncovering factors contributing to under-utilization of breast cancer screening by Chinese and Korean women living in the United States. *Ethn Dis*. 2003;13:213-219.
11. Yu MY, Seetoo AD, Hong OS, Song L, Raizade R, Agas Weller AL. Cancer screening promotion among medically underserved Asian-American women: integration of research and practice. *Res Theory Nurs Pract*. 2002;16(4):237-248.
12. Hoeman SP, Ku YL, Ohl DR. Health beliefs and early detection among Chinese women. *West J Nurs Res*. 1996;18(5):518-533.
13. Kagawa-Singer M. Cancer and Asian-American cultures. *Asian Am Pac Island J Health*. 1998;6(2):383-399.
14. Sent L, Ballem P, Paluck E, Yelland L, Vogel AM. The Asian women's health clinic: addressing cultural barriers to preventive health care. *CMAJ*. 1998;159(4):350-354.
15. Tang TS, Solomon LJ, Yeh CJ, Worden JK. The role of cultural variables in breast self-examination and cervical cancer screening behavior in young Asian women living in the United States. *J Behav Med*. 1999;22(5):419-436.
16. Au C. Cultural factors in preventive care: Asian Americans. *Prim Care Clin Office Pract*. 2002;29:495-502.
17. Chen YLD. Conformity with nature: a theory of Chinese-American elders' health promotion and illness prevention processes. *Adv Nurs Sci*. 1996;19(2):17-26.
18. Ma GX. Between two worlds: the use of traditional and Western health services by Chinese immigrants. *J Comm Health*. 1999;24(6):421-437.
19. Facione N, Giancarlo C, Chan L. Perceived risk and help-seeking behavior for breast cancer: a Chinese-American perspective. *Cancer Nurs*. 2000;23(4):258-267.
20. Straughan PT, Seow A. Attitudes as barriers in breast screening: a prospective study among

- Singapore women. *Soc Sci Med.* 2000;51:1695-1703.
21. Liang W, Yuan E, Mandelblatt JS, Pasick RJ. How do older Chinese women view health and cancer screening? Results from focus groups and implications for interventions. *Ethn Health.* 2004;9(3):283-304.
  22. Schwartz MD, Taylor KL, Willard KS. Prospective association between distress and mammography utilization among women with a family history of breast cancer. *J Behav Med.* 2003;26(2):105-117.
  23. Andersen MR, Smith R, Meischke H, Bowen D, Urban N. Breast cancer worry and mammography use by women with and without a family history in a population-based sample. *Cancer Epidemiol Biomarkers Prev.* 2003;12(4):314-320.
  24. Diefenbach MA, Miller SM, Daly MB. Specific worry about breast cancer predicts mammography use in women at risk for breast and ovarian cancer. *Health Psychol.* 1999;18(5):532-536.
  25. American Cancer Society (ACS). *Cancer Facts and Figures 2004.* Atlanta, Ga: ACS; 2004.
  26. Schwartz M, Lerman C, Daly M, Audrain J, Masny A, Griffith K. Utilization of ovarian cancer screening by women at increased risk. *Cancer Epidemiol Biomarkers Prev.* 1995;4:269-273.
  27. O'Malley AS, Beaton E, Yabroff KR, Abramson R, Mandelblatt J. Patient and provider barriers to colon cancer screening in the primary care safety-net. *Prev Med.* 2004;39:56-63.
  28. Brenes GA, Paskett ED. Predictors of stage of adoption for colon cancer screening. *Prev Med.* 2000;31:410-416.
  29. Honda K. Factors associated with colon cancer screening among the US urban Japanese population. *Am J Public Health.* 2004;94(5):815-822.
  30. Austin LT, Ahmad F, McNally MJ, Stewart DE. Breast and cervical cancer screening in the Hispanic women: a literature review using the health belief model. *Womens Health Issues.* 2002;12(3):122-128.
  31. Ferketich A, Wewers ME, Kwong K, et al. Smoking cessation interventions among Chinese Americans: the role of families, physicians, and the media. *Nicotine Tob Res.* 2004;6(2):241-248.
  32. Friedman LC, Webb JA, Richards S, Plon SE. Psychological and behavioral factors associated with colon cancer screening among Ashkenazim. *Prev Med.* 1999;29:119-125.
  33. Myers RE, Vernon SW, Tilley BC, Lu M, Watts BG. Intention to screen for colon cancer among White male employees. *Prev Med.* 1998;27:279-287.
  34. Cohen L, Fouladi RT, Babaian RJ, et al. Cancer worry is associated with abnormal prostate-specific antigen levels in men participating in a community screening. *Cancer Epidemiol Biomarkers Prev.* 2003;12(7):610-617.
  35. Consedine NS, Magai C, Krivoshekova YS, Ryzewicz L, Neugut AI. Fear, anxiety, worry, and breast cancer screening behavior: a critical review. *Cancer Epidemiol Biomarkers Prev.* 2004;13(4):501-510.
  36. Consedine NS, Magai C, Neugut AI. The contribution of emotional characteristics to breast cancer screening among women from six ethnic groups. *Prev Med.* 2004;38(1):64-77.

**AUTHOR CONTRIBUTIONS**

*Design and concept of study:* Wang, Liang, Yi, Schwartz, Mandelblatt  
*Acquisition of data:* Wang, Liang, Chen, Yi, Schwartz, Mandelblatt  
*Data analysis and interpretation:* Wang, Liang, Chen, Cullen, Feng, Yi, Schwartz, Mandelblatt  
*Manuscript draft:* Wang, Liang, Cullen, Feng, Schwartz, Mandelblatt  
*Statistical expertise:* Wang, Cullen, Feng, Yi, Schwartz, Mandelblatt  
*Acquisition of funding:* Liang, Schwartz, Mandelblatt  
*Administrative, technical, or material assistance:* Wang, Liang, Chen, Cullen, Yi  
*Supervision:* Wang, Liang, Schwartz, Mandelblatt