

# UC Irvine

## UC Irvine Previously Published Works

### Title

Factors Associated with Women's Unwillingness to Decrease Alcohol Intake to Decrease Breast Cancer Risk.

### Permalink

<https://escholarship.org/uc/item/2pt6j5t8>

### Authors

Matin, Jenna  
Lucia, Rachel McFarland  
Lal, Krustina  
et al.

### Publication Date


2021

### DOI

10.1177/21501327211000211

Peer reviewed

# Factors Associated with Women's Unwillingness to Decrease Alcohol Intake to Decrease Breast Cancer Risk

Journal of Primary Care & Community Health  
Volume 12: 1–8  
© The Author(s) 2021  
Article reuse guidelines:  
sagepub.com/journals-permissions  
DOI: 10.1177/21501327211000211  
journals.sagepub.com/home/jpc  


Jenna Matin<sup>1</sup>, Rachel McFarland Lucia<sup>2</sup>, Krustina Lal<sup>2</sup>,  
Alyssa Columbus<sup>2</sup>, Deborah Goodman<sup>2</sup>, Kathryn Larsen<sup>2</sup>,  
Argyrios Ziogas<sup>2</sup>, and Hannah Lui Park<sup>2</sup> 

## Abstract

**Objective:** Alcohol intake is a known risk factor for breast cancer. National organizations recommend that women consume no more than one serving of alcohol per day, if at all; however, many women exceed this recommendation, and some are unwilling to decrease consumption. Our study sought to identify factors associated with women's unwillingness to decrease their alcohol intake to decrease their breast cancer risk.

**Methods:** 942 women in a screening mammography cohort were asked questions about their demographics, personal and family health history, lifestyle factors, and willingness/unwillingness to decrease alcohol intake to decrease their breast cancer risk. Univariate and multivariate analyses of their responses were performed.

**Results:** 13.2% of women in our cohort indicated they were unwilling to decrease their alcohol intake to reduce their breast cancer risk. After adjusting for potential confounders, women who were 60 years and older were more than twice as unwilling to decrease their alcohol intake compared to their younger counterparts ( $P = .0002$ ). Women who had an annual household income of more than \$200,000 were 1.75 times more unwilling to decrease their alcohol intake compared to their less affluent counterparts ( $P = .033$ ). Unwillingness was not significantly associated with race/ethnicity, education, having a first-degree family member with cancer, health perception, breast cancer risk perception, or BMI.

**Conclusions:** Levels of unwillingness to decrease alcohol intake differed by age and household income. An opportunity is present to potentially decrease breast cancer risk in the community by educating women, especially older and more affluent women, about alcohol as a risk factor for breast cancer and the importance of limiting one's alcohol intake.

## Keywords

alcohol, lifestyle, breast cancer prevention, breast cancer risk

Dates received 3 February 2021; revised 3 February 2021; accepted 4 February 2021.

## Introduction

Lifestyle factors such as body mass index, physical activity, and alcohol consumption are associated with breast cancer risk.<sup>1-3</sup> A multinational study found that the risk of postmenopausal breast cancer decreased by 3% for each one-point increase in a healthy lifestyle index score, which included these factors and behaviors.<sup>4</sup> Gaining a better understanding of women's willingness and unwillingness to undergo lifestyle modifications to decrease their breast cancer risk could inform the design of more effective, targeted health education, communication, and intervention. While there have been numerous studies focusing on willingness to eat a healthier diet and increase physical activity,<sup>5-8</sup>

factors associated with women's unwillingness to decrease alcohol intake to decrease their breast cancer risk have not been well characterized.

A meta-analysis on 53 studies worldwide, mostly in developed countries, showed that the relative risk of breast

<sup>1</sup>Tulane University School of Medicine, New Orleans, LA, USA

<sup>2</sup>University of California, Irvine School of Medicine, Irvine, CA, USA

### Corresponding Author:

Hannah Lui Park, Department of Pathology, University of California, Irvine School of Medicine, 839 Health Sciences Road, Sprague Hall Rm. 218, Irvine, CA 92697, USA.

Email: hlpark@uci.edu



cancer increases by 7.1% for each additional 10 g of alcohol consumed a day (5 oz wine, 12 oz beer, or 1.5 oz spirits = 14 g alcohol).<sup>9</sup> More recently, a meta-analysis on 20 studies showed that even <0.5 drinks per day (<52.5 g alcohol per week) was associated with increased breast cancer risk compared to no alcohol consumption (RR = 1.04, 95% CI 1.01-1.07).<sup>10</sup> Studies have estimated that 60% to 69% of women aged 18 and older in the United States consumed alcohol in the previous year.<sup>11,12</sup> The American Cancer Society's guidelines for cancer prevention and the Dietary Guidelines for Americans recommend women to drink no more than 1 drink of alcohol per day, if at all;<sup>13,14</sup> however, 60% of women who drink alcohol drink more than 1 glass per day on the days they drink.<sup>15</sup> Given that alcohol consumption is an established risk factor for breast cancer and many women drink more than the recommended amount, gaining a better understanding of women's unwillingness to decrease alcohol intake to decrease breast cancer risk is important.

Some studies have found that measures of alcohol intake differ with age, race/ethnicity, socioeconomic factors, and family history of cancer.<sup>16-19</sup> However, other studies have found that there is no association between alcohol intake and family history of breast cancer specifically.<sup>20-22</sup> In terms of willingness to decrease alcohol intake for health reasons, a recent study found that intent to decrease alcohol intake was negatively associated with age;<sup>23</sup> however, this study only included women at elevated risk for breast cancer, and these findings may not be applicable to women in the broader patient community, which include women with different levels of risk. In the current study, we sought to assess the willingness of women in a screening mammography cohort to decrease their alcohol intake (to less than 1 glass a day) to reduce their breast cancer risk, and to identify factors associated with unwillingness.

## Methods

### Study Recruitment

This study was approved by the University of California, Irvine (UCI) Institutional Review Board, HS #2010-7489. Study participants were recruited from the UCI Athena Breast Health Network (Athena).<sup>24</sup> The UCI Athena cohort is an ongoing cohort started in 2011 comprised of women 18 years and older who completed an electronic clinical intake form when they received a screening mammogram at a UCI breast imaging facility and provided informed consent to share their intake data for research purposes. Some participants also indicated they were willing to be contacted for future studies. Athena participants who indicated willingness to be contacted for future studies were invited between 2015 and 2017 by email to complete a follow-up

web-based study questionnaire. 1114 women completed the study questionnaire.

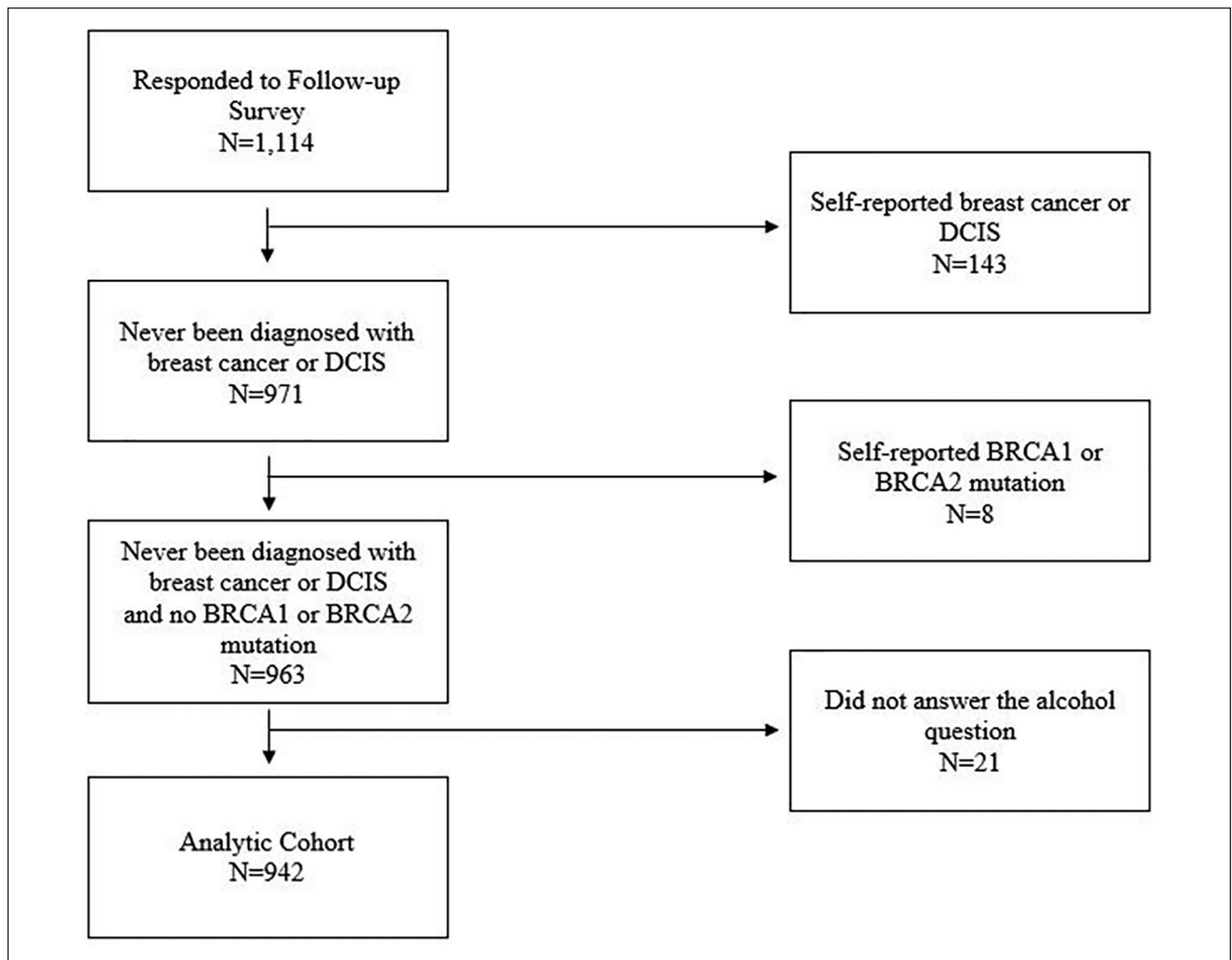
### Data Collection

The electronic intake form included questions about race/ethnicity, education, first-degree family history of breast cancer, having a *BRCA1* or *BRCA2* mutation, and self-reported height and weight. Data related to household income, health perception, breast cancer risk perception, and willingness/unwillingness to change lifestyle behaviors were collected from the study questionnaire. Willingness/unwillingness to change lifestyle behaviors was assessed by a set of questions starting with, "How willing would you be to do the following to lower your risk of breast cancer?" This study focused on participants' responses to the behavior "decrease alcohol intake to less than 1 glass per day." The possible responses were "Very Willing," "Somewhat Willing," "Neutral," "Somewhat Unwilling," "Very Unwilling," and "Not applicable (already doing this)." Study questionnaire data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at UCI.<sup>25</sup>

### Data Analysis

Because this study focused on unwillingness to decrease alcohol intake among women without a history of breast cancer, women who had a history of invasive breast cancer or ductal carcinoma in situ (DCIS) (n = 143) and women who did not answer the willing to decrease alcohol intake question (n = 21) were excluded from the analysis (Figure 1). Women who reported having a *BRCA1* or *BRCA2* mutation were also excluded because women who are aware they have such mutations are known to be more willing to undergo preventive measures<sup>26</sup> (and all 8 *BRCA1*- or *BRCA2*-positive participants answered "Very Willing"). Participants who answered "Not applicable (already doing this)," "Very Willing," or "Somewhat Willing" were categorized as "Willing/Already doing," whereas those who answered "Neutral," "Somewhat Unwilling," or "Very Unwilling" were categorized as "Unwilling."

For race/ethnicity categorization, since the numbers of participants who indicated they were Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander ancestry were low (15 or fewer in each), these participants were categorized with participants in the "Other/Unknown" category, which also included those who indicated they were "Some other race" and those who answered "Don't know" or "Prefer not to answer," resulting in 4 race/ethnicity categories (non-Hispanic white, non-Hispanic Asian, Hispanic, and Other/Unknown). Body mass index (BMI) was calculated from



**Figure 1.** Study workflow and exclusion criteria.

self-reported height and weight by dividing the weight in kilograms by the height in meters squared.

Health perception was assessed using answers to the question: “Considering your health over the last month, how would you characterize your health?” The answer choices were “Excellent,” “Very Good,” “Good,” “Fair,” and “Poor.” Because there were only 8 participants who answered “Fair” and only 1 participant who answered “Poor” to this question in the “Unwilling” to decrease alcohol group, participants in the “Fair” and “Poor” categories were grouped together in a “Fair or Poor” category. Breast cancer risk perception was assessed by participants’ answers to the question, “Are you at low, average, or high risk for breast cancer?” The answer choices were “Low risk,” “Average risk,” “High risk,” and “Don’t know.”

Univariate analysis was done to determine whether unwillingness to decrease alcohol intake was associated with demographic, family health history, and personal factors. We used Fisher’s exact test to detect differences in the

distribution of categorical variables among the “Already Doing/Willing” group compared to the “Unwilling” group. Multivariate analysis was done using logistic regression. Variables below an alpha level of 0.20 in the univariate analysis were included in the multivariate model. An alpha of 0.05 was used for all hypothesis tests. Missing data were omitted from the analyzes. All data analysis was done using SAS software (SAS version 9.4, SAS Institute Inc., Cary, NC, USA).

## Results

Participants had an average age of  $58.7 \pm 10.8$  years, were predominantly non-Hispanic white (68.1%), and most had at least a college degree (74.7%). Overall, 13.2% of women indicated that they were unwilling to decrease alcohol intake to less than 1 glass per day. There were statistically significant differences in willingness/ unwillingness to decrease alcohol intake to reduce breast cancer risk by age

**Table 1.** Demographic and Health Characteristics of the Overall Study Population.

	Total (n = 942)	Willing/Already doing (n = 818) (%)	Unwilling (n = 124) (%)	<i>P</i>
Age, years (mean ± SD)				<b>.0007</b>
30-59 (50.2 ± 6.2)	494	447 (90.5)	47 (9.5)	
60+ (68.0 ± 6.1)	448	371 (82.8)	77 (17.2)	
Race/ethnicity				.378
Non-Hispanic White	641	548 (85.5)	93 (14.5)	
Hispanic	151	136 (90.1)	15 (9.9)	
Non-Hispanic Asian	100	90 (90.0)	10 (10.0)	
Other/unknown	50	44 (88.0)	6 (12.0)	
Education				.658
College graduate or more	701	606 (86.4)	95 (13.6)	
Some college or less	237	208 (87.8)	29 (12.2)	
Annual household income				<b>.027</b>
<\$99,999	330	289 (87.6)	41 (12.4)	
\$100,000-\$199,999	313	279 (89.1)	34 (10.9)	
>\$200,000	193	156 (80.8)	37 (19.2)	
First-degree family history of breast cancer				.642
No	729	635 (87.1)	94 (12.9)	
Yes	206	177 (85.9)	29 (14.1)	
<25 BMI, kg/m <sup>2</sup>	426	362 (85.0)	64 (15.0)	.200
25-30	266	234 (88.0)	32 (12.0)	
>30	217	195 (89.9)	22 (10.1)	
Health perception				.174
Excellent	182	156 (85.7)	26 (14.3)	
Very good	385	327 (84.9)	58 (15.1)	
Good	268	240 (89.6)	28 (10.4)	
Fair or poor	104	95 (91.3)	9 (8.7)	
Perceived breast cancer risk				.588
Low	261	232 (88.9)	29 (11.1)	
Average	422	363 (86.0)	59 (14.0)	
High	147	126 (85.7)	21 (14.3)	
Don't know	97	87 (89.7)	10 (10.3)	

Statistically significant *P* values are bolded. Missing data: N=4 for education, 106 for household income, 7 for first degree history of breast cancer, 33 for BMI, 3 for health perception, and 15 for perceived breast cancer risk.

and household income (Table 1). A higher proportion of older women (ages 60 years and older) were unwilling to decrease their alcohol intake compared to women who were 30 to 59 years old (17.2% and 9.5%, respectively,  $P=.0007$ ). Unwillingness to decrease alcohol intake was also associated with annual household income, with 12.4% and 10.9% of women whose annual household incomes were less than \$99,999 and \$100,000 to \$199,999, respectively, being unwilling compared to 19.2% of women whose incomes were more than \$200,000, respectively ( $P=.027$ ). Unwillingness was not significantly associated with race/ethnicity, education, having a first-degree family member with breast cancer, BMI, health perception, or breast cancer risk perception (Table 1).

Logistic regression analysis was used to construct the multivariate model to adjust for potential confounders. We included all variables with  $P<.20$  in the univariate analysis, namely, age, annual household income, and health perception (Table 2). Women 60 years and older were 2.26 times more likely to be unwilling to decrease their alcohol intake compared to women between the ages of 30 and 59 years ( $P=.0002$ ). Women who had a household income of more than \$200,000 were 1.75 times as likely to be unwilling to decrease their alcohol intake compared to women whose household income was less than \$99,999 ( $P=.033$ ). Unwillingness was not significantly associated with health perception in the multivariate analysis (Table 2).

**Table 2.** Odds Ratios of Unwillingness to Decrease Alcohol Intake by Age, Annual Household Income, and Health Perception.

	Unadjusted		Adjusted	
	OR (95% CI)	P	OR (95% CI)	P
Age, years				
30-59	Ref		Ref	
60+	1.97 (1.34, 2.19)	.0006	2.26 (1.48, 3.46)	.0002
Annual household income				
<\$99,999	Ref		Ref	
\$100,000-\$199,999	0.86 (0.53, 1.39)	–	0.83 (0.51, 1.37)	–
>\$200,000	1.67 (1.03, 2.72)	.04	1.75 (1.05, 2.92)	.033
Health perception				
Fair or poor	Ref		Ref	
Good	1.23 (0.56, 2.71)	–	1.14 (0.49, 2.67)	–
Very good	1.87 (0.90, 3.92)	–	1.53 (0.69, 3.42)	–
Excellent	1.76 (0.79, 3.91)	–	1.37 (0.57, 3.28)	–

Only P values <.05 are shown.

## Discussion

Since even moderate alcohol intake is associated with breast cancer risk, decreasing alcohol intake is one way to decrease breast cancer risk in the community. However, the unwillingness to decrease alcohol intake exhibited by some women presents a challenge. Development of effective public health interventions requires defining and understanding the problem and its causes.<sup>27,28</sup> This is the first study to examine willingness or intent to decrease alcohol intake to decrease breast cancer risk in a cohort of women with different levels of breast cancer risk. It is also the first study to show that annual household income was significantly associated with unwillingness to decrease alcohol consumption. Our findings that unwillingness was also associated with age, but not breast cancer risk perception, are consistent with a recent study on women who were all at elevated breast cancer risk, which showed that intent to decrease alcohol intake was negatively associated with age but not associated with perceived breast cancer susceptibility.<sup>23</sup> Our results are especially concerning because age and household income are factors associated with increased breast cancer risk.<sup>17,29-31</sup> Thus, our study suggests that increased health education about the relationship between alcohol consumption and breast cancer risk are especially needed in older and more affluent women.

Studies in the U.S. and United Kingdom have shown that 75% to 80% of women do not know that alcohol is a risk factor for breast cancer.<sup>32,33</sup> In addition, women tend to self-identify as “normal drinkers” even if their level of alcohol consumption is above average and at a level that increases their risk of breast cancer.<sup>32,34,35</sup> A 2015 Gallup poll indicated that 66% of women surveyed thought that moderate alcohol consumption (1-2 drinks/day) was either good for health or

makes no difference to health.<sup>36</sup> Although income has been shown to be associated with health knowledge of other aspects of breast cancer risk including breast density and breast self exam,<sup>37,38</sup> and thus suggests that women with higher incomes should “know” to limit alcohol consumption, women in our study with higher household incomes were actually more unwilling to decrease their alcohol intake.

Studies on the health effects associated with moderate alcohol consumption have been conflicting.<sup>39-42</sup> However, a recent study on global alcohol consumption and disease risk revealed that even a low amount of alcohol consumption is linked with loss of health.<sup>43</sup> Consistent with the American Cancer Society recommendations<sup>13</sup> and the Dietary Guidelines for Americans,<sup>14</sup> the American Heart Association (AHA) also recommends that people do not start drinking if they do not already drink alcohol, and if they do drink, to drink in moderation, which is an average of one drink a day for women.<sup>44</sup> The AHA further states that the health benefits of low alcohol consumption can be obtained by other means, including eating a healthy diet, exercising, and lowering your cholesterol and high blood pressure.<sup>44</sup>

The primary care setting presents “teachable moments” in which providers can counsel patients on prevention for common health concerns including breast cancer, such as both before and after breast screening; upon the diagnosis of a premalignant lesion; or after the diagnosis of cancer in the patient’s family member.<sup>33,45,46</sup> Studies have shown that cancer prevention education is acceptable to women attending breast screening or clinic appointments.<sup>33,47</sup> However, counseling patients to limit alcohol intake would be dependent on providers’ own knowledge about alcohol intake as a breast cancer risk factor as well as their willingness to discuss the subject with their patients. A recent study indicated that 81.4% of adults reported being asked about alcohol use



by a health professional in person or on a form during a checkup in the past 2 years. However, of the individuals who reported current binge drinking in the past 30 days at time of survey, only 13.7% were advised to reduce drinking. Interestingly, this rate varied by demographic and other factors, including age and income, with lower rates of advice to reduce drinking among older individuals ( $\geq 65$  years old) and those with higher incomes compared to their younger, less affluent, counterparts.<sup>48</sup> Thus, older and more affluent women, who are at higher risk for breast cancer, are getting less advice from their health care providers to decrease their alcohol intake and, as our study shows, are more unwilling to decrease their alcohol intake.

Several tools and interventions have been developed to facilitate provider-patient discussions regarding breast cancer risk factors with limited levels of effectiveness.<sup>47,49,50</sup> For example, a tablet computer-based intervention was tested in the waiting room before a scheduled primary care visit. However, there was no increase in discussion about alcohol intake, while there was an increase in discussion about regular exercise and weight.<sup>50</sup> The limited effectiveness of such interventions can be attributed to providers' lack of knowledge about alcohol as a breast cancer risk factor, fear of alienating patients, time constraints, and other possible reasons.<sup>51,52</sup> Overcoming these barriers will be important in enabling health care providers to more effectively and efficiently counsel their patients.

Strengths of this study include the relatively large sample size and detailed characterization of the study cohort, which allowed for assessment of a variety of factors and adjustments for potential confounders. Limitations of our study include that participants were recruited by email from the Athena Breast Health Network, a screening mammography research cohort, and asked to complete an online survey, and thus may be more health conscious and tech-savvy than the general female population. Compared to the screening mammography patient population from which they were recruited, a larger proportion of the study participants were older (47.6% vs 34.4% were 60 years or older), non-Hispanic white (68.0% vs 42.5%), and had at least a college degree (74.7% vs. 52.5%). Lastly, our study did not examine reasons for women's unwillingness. This will also be important to understand for the development of effective interventions.

In conclusion, our results identify household income as a novel factor and confirm age as an independent factor associated with women's unwillingness to decrease alcohol intake to decrease breast cancer risk. Since income and age are also associated with breast cancer risk, a significant opportunity is present for health care providers, health educators, health policy makers, and others to work together to decrease breast cancer risk in the community. A better understanding of the health beliefs, reasons for drinking, and barriers to decreasing alcohol intake may enable better

public health education on the risks of even moderate alcohol intake in our communities and promotion of more healthful behaviors to replace the perceived benefits of alcohol intake.

## Implications for Research and Practice

Age and household income were found to be associated with unwillingness to decrease alcohol intake to decrease breast cancer risk. In the primary care setting, there is an opportunity to counsel female patients who report drinking alcohol about the misconceptions surrounding moderate alcohol intake as being "good for health." Decreasing alcohol intake in women presents a significant opportunity to decrease breast cancer risk in the community. Further studies on women's reasons for drinking, barriers to decreasing alcohol intake, and effective communications strategies are needed.

## Acknowledgments

The authors thank our study participants and the Athena Breast Health Network for support of this study. Support of the Athena Breast Health Network was provided by the Safeway Foundation, University of California Office of the President (UCOP), and Salesforce.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## ORCID iD

Hannah Lui Park  <https://orcid.org/0000-0001-9973-1396>

## References

1. Hankinson SE, Colditz GA, Willett WC. Towards an integrated model for breast cancer etiology: the lifelong interplay of genes, lifestyle, and hormones. *Breast Cancer Res.* 2004;6:213-218. doi:10.1186/bcr921
2. Sun YS, Zhao Z, Yang ZN, et al. Risk factors and preventions of breast cancer. *Int J Biol Sci.* 2017;13:1387-1397. doi:10.7150/ijbs.21635
3. Howell A, Anderson AS, Clarke RB, et al. Risk determination and prevention of breast cancer. *Breast Cancer Res.* 2014;16:446.
4. McKenzie F, Ferrari P, Freisling H, et al. Healthy lifestyle and risk of breast cancer among postmenopausal women in the European Prospective Investigation into Cancer and Nutrition cohort study. *Int J Cancer.* 2015;136:2640-2648. doi:10.1002/ijc.29315

5. Mazanec SR, Professor A, Payne Bolton F, et al. Health behaviors in family members of patients completing cancer treatment HHS public access. *Oncol Nurs Forum*. 2015;42:54-62. doi:10.1188/15.ONF.54-62
6. Fasching PA, Von Minckwitz G, Fischer T, et al. The impact of breast cancer awareness and socioeconomic status on willingness to receive breast cancer prevention drugs. *Breast Cancer Res Treat*. 2007;101:95-104. doi:10.1007/s10549-006-9272-2
7. Kaplan CP, Kim SE, Wong ST, Sawaya GF, Walsh JME, Pérez-Stable EJ. Willingness to use tamoxifen to prevent breast cancer among diverse women. *Breast Cancer Res Treat*. 2012;133:357. doi:10.1007/S10549-012-1960-5
8. Thomson MD, Peter ME. An opportunity to address modifiable breast cancer risks: mammography screening and physical activity readiness to change. *Prev Med Rep*. 2017;5:41-44. doi:10.1016/j.pmedr.2016.11.005
9. Hamajima N, Hirose K, Tajima K, et al. Alcohol, tobacco and breast cancer—collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. *Br J Cancer*. 2002;87:1234-1245. doi:10.1038/sj.bjc.6600596
10. Choi YJ, Myung SK, Lee JH. Light alcohol drinking and risk of cancer: a meta-analysis of cohort studies. *Cancer Res Treat*. 2018;50:474-487. doi:10.4143/crt.2017.094
11. Grant BF, Chou SP, Saha TD, et al. Prevalence of 12-month alcohol use, high-risk drinking, and *DSM-IV* alcohol use disorder in the United States, 2001–2002 to 2012–2013. *JAMA Psychiatry*. 2017;74:911. doi:10.1001/jamapsychiatry.2017.2161
12. Kerr WC, Mulia N, Zemore SE. U.S. trends in light, moderate, and heavy drinking episodes from 2000 to 2010. *Alcohol Clin Exp Res*. 2014;38:2496-2501. doi:10.1111/acer.12521
13. Rock CL, Thomson C, Gansler T, et al. American Cancer Society guideline for diet and physical activity for cancer prevention. *CA Cancer J Clin*. 2020;70:245-271. doi:10.3322/caac.21591
14. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015–2020 Dietary Guidelines for Americans. 8th Edition. December 2015. Accessed March 8, 2020. <https://health.gov/our-work/food-nutrition/previous-dietary-guidelines/2015>
15. Agrawal P, Mercer A, Hassanali J, Carmack C, Doss D, Murillo R. Gender differences in the association between alcohol use and sedentary behavior among adults. *Am J Heal Promot*. 2018;32:1576-1581. doi:10.1177/0890117118761338
16. Beard E, Brown J, West R, Kaner E, Meier P, Michie S. Associations between socio-economic factors and alcohol consumption: a population survey of adults in England. *PLoS One*. 2019;14:e0209442. doi:10.1371/journal.pone.0209442
17. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Results from the 2007 National Survey on Drug Use and Health: National Findings. Accessed March 8, 2020. <https://www.dpft.org/resources/NSDUHresults2007.pdf>
18. Liu M, Zhang C, Cai H, et al. The willingness to change risky health behaviors among Chinese rural residents: what we learned from a population-based esophageal cancer cohort study. Chang JS, ed. *PLoS One*. 2016;11:e0161999. doi:10.1371/journal.pone.0161999
19. Bostean G, Crespi CM, McCarthy WJ. Associations among family history of cancer, cancer screening and lifestyle behaviors: a population-based study. *Cancer Causes Control*. 2013;24:1491-1503. doi:10.1007/s10552-013-0226-9
20. Townsend JS, Steele CB, Richardson LC, Stewart SL. Health behaviors and cancer screening among Californians with a family history of cancer. *Genet Med*. 2013;15:212-221. doi:10.1038/gim.2012.118
21. Ochoa EM, Gómez-Acebo I, Rodríguez-Cundín P, Navarro-Córdoba M, Llorca J, Dierssen-Sotos T. Relationship between family history of breast cancer and health-related behavior. *Behav Med*. 2010;36:123-129. doi:10.1080/08964289.2010.516783
22. Madlensky L. Preventive health behaviors and familial breast cancer. *Cancer Epidemiol Biomarkers Prev*. 2005;14:2340-2345. doi:10.1158/1055-9965.EPI-05-0254
23. Conley CC, Agnese DM, Vadaparampil ST, Andersen BL. Factors associated with intentions for breast cancer risk management: does risk group matter? *Psychooncology*. 2019;28:1119-1126. doi:10.1002/pon.5066
24. Park HL, Tran SM, Lee J, et al. Clinical implementation of a breast cancer risk assessment program in a multiethnic patient population: which risk model to use? *Breast J*. 2015;21:562-564. doi:10.1111/tbj.12461
25. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42:377-381. doi:10.1016/j.jbi.2008.08.010
26. Grann VR, Patel P, Bharthuar A, et al. Breast cancer-related preferences among women with and without BRCA mutations. *Breast Cancer Res Treat*. 2010;119:177-184. doi:10.1007/s10549-009-0373-6
27. Wight D, Wimbush E, Jepson R, Doi L. Six steps in quality intervention development (6SQuID). *J Epidemiol Community Health*. 2015;70:520-525. doi:10.1136/jech-2015-205952
28. Campbell NC, Murray E, Darbyshire J, et al. Designing and evaluating complex interventions to improve health care. *BMJ*. 2007;334:455-459. doi:10.1136/bmj.39108.379965.BE
29. Lundqvist A, Andersson E, Ahlberg I, Nilbert M, Gerdtham U. Socioeconomic inequalities in breast cancer incidence and mortality in Europe—a systematic review and meta-analysis. *Eur J Public Health*. 2016;26:804-813. doi:10.1093/eurpub/ckw070
30. Galea S, Ahern J, Tracy M, Vlahov D. Neighborhood income and income distribution and the use of cigarettes, alcohol, and marijuana. *Am J Prev Med*. 2007;32:S195-S202. doi:10.1016/j.amepre.2007.04.003
31. Howlander N, Noone AM, Krapcho M, et al. SEER Cancer Statistics Review, 1975–2016. Table 1.11. Median age of cancer patients at diagnosis, 2012–2016. National Cancer Institute.
32. Khushalani JS, Qin J, Ekwueme DU, White A. Awareness of breast cancer risk related to a positive family history and alcohol consumption among women aged 15–44 years in United States. *Prev Med Rep*. 2020;17:101029. doi:10.1016/j.pmedr.2019.101029



33. Sinclair J, McCann M, Sheldon E, Gordon I, Brierley-Jones L, Copson E. The acceptability of addressing alcohol consumption as a modifiable risk factor for breast cancer: a mixed method study within breast screening services and symptomatic breast clinics. *BMJ Open*. 2019;9:e027371. doi:10.1136/bmjopen-2018-027371
34. Chambers SE, Copson ER, Dutey-Magni PF, Priest C, Anderson AS, Sinclair JMA. Alcohol use and breast cancer risk: a qualitative study of women's perspectives to inform the development of a preventative intervention in breast clinics. *Eur J Cancer Care (Engl)*. 2019;28:e13075. doi:10.1111/ecc.13075
35. Meyer SB, Foley K, Olver I, et al. Alcohol and breast cancer risk: middle-aged women's logic and recommendations for reducing consumption in Australia. Haighton C, ed. *PLoS One*. 2019;14:e0211293. doi:10.1371/journal.pone.0211293
36. Riffkin R. One in five Americans say moderate drinking is health. Gallup. Accessed March 8, 2020. <https://news.gallup.com/poll/184382/one-five-americans-say-moderate-drinking-healthy.aspx>
37. Rhodes DJ, Breitkopf CR, Ziegenfuss JY, Jenkins SM, Vachon CM. Awareness of breast density and its impact on breast cancer detection and risk. *J Clin Oncol*. 2015;33:1143-1150. doi:10.1200/JCO.2014.57.0325
38. Yavari P, Pourhoseingholi MA. Socioeconomic factors association with knowledge and practice of breast self-examination among Iranian women. *Asian Pac J Cancer Prev*. 2007;8:618-622.
39. Ronksley PE, Brien SE, Turner BJ, Mukamal KJ, Ghali WA. Association of alcohol consumption with selected cardiovascular disease outcomes: a systematic review and meta-analysis. *BMJ*. 2011;342:d671. doi:10.1136/bmj.d671
40. Stockwell T, Zhao J, Panwar S, Roemer A, Naimi T, Chikritzhs T. Do "Moderate" drinkers have reduced mortality risk? A systematic review and meta-analysis of alcohol consumption and all-cause mortality. *J Stud Alcohol Drugs*. 2016;77:185-198. doi:10.15288/jsad.2016.77.185
41. Goel S, Sharma A, Garg A. Effect of alcohol consumption on cardiovascular health. *Curr Cardiol Rep*. 2018;20:19. doi:10.1007/s11886-018-0962-2
42. Naimi TS, Stockwell T, Zhao J, et al. Selection biases in observational studies affect associations between 'moderate' alcohol consumption and mortality. *Addiction*. 2017;112:207-214. doi:10.1111/add.13451
43. Griswold MG, Fullman N, Hawley C, et al. Alcohol use and burden for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2018;392A:1015-1035. doi:10.1016/S0140-6736(18)31310-2
44. American Heart Association. Is drinking alcohol part of a healthy lifestyle? Accessed March 8, 2020. <https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/nutrition-basics/alcohol-and-heart-health>.
45. Demark-Wahnefried W, Rock CL, Patrick K, Byers T. Lifestyle interventions to reduce cancer risk and improve outcomes. *Am Fam Physician*. 2008;77:1573-1578.
46. McKnight-Eily LR, Henley SJ, Green PP, Odom EC, Hungerford DW. Alcohol screening and brief intervention: a potential role in cancer prevention for young adults. *Am J Prev Med*. 2017;53:S55-S62. doi:10.1016/j.amepre.2017.04.021
47. Anderson AS, Dunlop J, Gallant S, et al. Feasibility study to assess the impact of a lifestyle intervention ('LivingWELL') in people having an assessment of their family history of colorectal or breast cancer. *BMJ Open*. 2018;8. doi:10.1136/bmjopen-2017-019410
48. McKnight-Eily LR, Okoro CA, Turay K, Acero C, Hungerford D. Screening for alcohol use and brief counseling of adults — 13 States and the district of Columbia, 2017. *MMWR Morb Mortal Wkly Rep*. 2020;69:265-270. doi:10.15585/mmwr.mm6910a3
49. Anderson AS, Macleod M, Mutrie N, et al. Breast cancer risk reduction – is it feasible to initiate a randomised controlled trial of a lifestyle intervention programme (ActWell) within a national breast screening programme? *Int J Behav Nutr Phys Act*. 2014;11:156. doi:10.1186/s12966-014-0156-2
50. Ozanne E, Karliner LS, Tice JA, et al. An intervention tool to increase patient–physician discussion of lifestyle risk factors for breast cancer. *J Women's Heal*. 2019;28:1468-1475. doi:10.1089/jwh.2018.7026
51. McNeely J, Kumar PC, Rieckmann T, et al. Barriers and facilitators affecting the implementation of substance use screening in primary care clinics: a qualitative study of patients, providers, and staff. *Addict Sci Clin Pract*. 2018;13:8. doi:10.1186/s13722-018-0110-8
52. Moyer VA. Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med*. 2013;159:210-218. doi:10.7326/0003-4819-159-3-201308060-00652