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### Title

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### Permalink

<https://escholarship.org/uc/item/504724gs>

### Journal

The American Journal of Cardiology, 116(4)

### ISSN

0002-9149

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### Publication Date

2015-08-01

### DOI

10.1016/j.amjcard.2015.05.029

Peer reviewed



Published in final edited form as:

*Am J Cardiol.* 2015 August 15; 116(4): 642–646. doi:10.1016/j.amjcard.2015.05.029.

## Perceptions, Information Sources, and Behavior Regarding Alcohol and Heart Health

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### Abstract

Despite the equipoise regarding alcohol's cardiovascular effects and absence of relevant rigorous controlled trials, the lay press frequently portrays alcohol as "heart healthy." The public perception of alcohol's heart effects, the sources of those perceptions, and how they may affect behavior are unknown. We performed a cross-sectional analysis of data obtained between March, 2013 and September, 2014 from consecutive participants enrolled in the Health eHeart Study. Of 5,582 participants, 1,707 (30%) viewed alcohol as heart healthy, 2,157 (39%) viewed it as unhealthy, and 1,718 (31%) were unsure. Of those reporting alcohol as heart healthy, 80% cited lay press as a source of their knowledge. After adjustment, older age (odds ratio 1.11), higher education (odds ratio, 1.37), higher income (odds ratio 1.07), US residence (odds ratio 1.63) and coronary artery disease (CAD) (odds ratio 1.51) were associated with perception of alcohol as heart healthy (all  $p < 0.003$ ). Ever smokers (odds ratio 0.76,  $p = 0.004$ ) and those with heart failure (HF) (odds ratio 0.5,  $p = 0.01$ ) were less likely to cite alcohol as heart healthy. Those perceiving alcohol as heart healthy consumed on average 47% more alcohol on a regular basis (95% confidence interval 27–66%,  $p < 0.001$ ). In conclusion, among more than 5,000 consecutive Health eHeart participants, approximately one third believed alcohol to be heart healthy, and the majority cited the lay press as the origin of that perception. Those with a perception of alcohol as heart healthy drink substantially more alcohol.

### Keywords

Alcohol; Cardiovascular Diseases; Epidemiology

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Alcohol is the most commonly consumed drug in the United States.<sup>1</sup> While the harms of alcohol abuse related to physical and mental health are well established,<sup>2</sup> there remains

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equipoise regarding the cardiovascular health effects of moderate consumption.<sup>3</sup> Alcohol may have protective lipid effects<sup>4</sup> and reduce incidence of myocardial infarction,<sup>5,6</sup> but may also increase the risk of hypertension<sup>7</sup> and atrial fibrillation.<sup>8–10</sup> Yet, despite the absence of rigorous controlled trials on the actual cardiovascular benefits of alcohol, and the conflicting data on the health effects of moderate consumption, the lay press frequently portrays alcohol as “heart healthy.”<sup>11,12</sup> In considering how to best counsel patients regarding alcohol intake and provide optimal care regarding this commonly consumed substance, it is important to understand the public’s source of knowledge on the cardiovascular effects of alcohol, their perceptions of alcohol’s effects on heart health, and the associations between those perceptions and actual behavior.

## Methods

We performed a cross-sectional analysis of data obtained between March 8, 2013 (enrollment initiation) and September 29, 2014 from consecutive participants enrolled in the Health eHeart Study. The Health eHeart Study is an internet-based, longitudinal, cardiovascular cohort study. Participants are recruited through lay press, promotional events, word of mouth, social media, email, and clinic visits. After the baseline internet-deployed “eVisit”, participants follow-up online every 6 months. Participants are required to complete surveys addressing demographics, family and personal history, medical history, activity level, and quality of life. At baseline, all participants provide information regarding their health perceptions of alcohol (Supplementary Material, Table 1) and complete a validated survey instrument to assess the frequency and quantity of alcohol intake.<sup>13–16</sup>

We analyzed the results of the question, “Do you believe alcohol is good for your heart?” with responses being “Yes,” “No,” or “I don’t know.” Those who reported that they believed alcohol to be heart healthy received a follow-up question, “You believe alcohol is good for your heart because?” with the non-mutually exclusive answers “Your doctor told you,” “You learned this in school,” “You learned from reading lay press,” “You learned this from friends, colleagues, or word of mouth,” or “Other [free text].” All free text comments were analyzed and included in one of the pre-specified categories, as appropriate, and a new category based on free text review, “I read this in scientific publications,” was added.

In analyses examining the relationship between the perception of alcohol and alcohol consumption, the number of drinks consumed per week was used as the primary outcome. “Current binge drinker” was defined as 5 consecutive drinks for men and 4 for women within the last 30 days.<sup>17</sup> Due to implausibility, patients who reported drinking more per week than seven times their reported maximum daily amount were interpreted as erroneous entries and were therefore excluded (n = 112). Smokers were categorized as “never” versus “past” or “current” (i.e. “ever smoker”).

The Health eHeart Study was approved by the University of California, San Francisco Committee on Human Research and all participants provided informed consent obtained electronically via the internet.

Normally distributed and non-normally distributed continuous variables were compared using the Student's t-test and the Kruskal-Wallis Test, respectively. In order to identify predictors of the perception of alcohol as heart healthy after multivariable adjustment, a logistic regression model was constructed using a dichotomous outcome (i.e. "yes" versus not "yes"). Relationships between continuous variables were assessed using linear regression, with log transformation of skewed outcomes as needed (such as alcohol consumption) and investigation of residuals to assure adequate model fit. Covariates were selected for inclusion in multivariate models based on "face value" (age, sex, and race) and for covariates associated with the outcome with P-values < 0.1 in unadjusted analyses.

Two tailed P-values were considered statistically significant. Stata version 13 (College Station, Texas) was used for statistical analyses.

## Results

Of the 5,582 participants that answered questions regarding their perception of alcohol, 1,707 (30%) viewed alcohol as heart healthy, 2,157 (39%) viewed it as unhealthy for the heart, and 1,718 (31%) were unsure. The characteristics of participants stratified by beliefs regarding the heart healthiness of alcohol are shown in Table 1. Of the 6,476 Health eHeart enrollees during the study period, 894 (14%) had not yet completed the "Alcohol Use" survey included in this study, and were therefore not included in analysis (Supplemental Material, Table 2). Those that completed the survey were significantly older than those that did not.

Of those reporting alcohol as heart healthy, 80% cited the lay press as a source of their knowledge (Figure 1).

Two-thirds (n=3,729) of participants reported that the type of alcohol mattered in affecting heart health. Of those, 3,322 (92%) reported that red wine exclusively was heart healthy. When those who believe alcohol to be heart healthy were asked about the optimal amount and frequency of alcohol consumption for heart health, the vast majority of participants (80%, n = 853) reported 7 drinks per week as optimal and 98% reported that 14 or fewer drinks per week was optimal.

Results after adjustment for patient characteristics associated with the belief that alcohol was heart healthy are depicted in Figure 2. Those reporting a perception of alcohol as heart healthy regularly drank more wine and overall more alcohol per week (Table 2). After adjusting for demographics and cardiovascular risk factors, wine consumption and overall alcohol consumption each remained higher among those perceiving alcohol as heart healthy (Figure 3). In addition, among those who believed alcohol to be heart healthy, there was a significantly positive relationship between the perceived optimal amount of alcohol consumption for heart health and alcohol consumption: every additional drink per week increase for perceived optimal heart health was associated with an average of 10% more actual alcohol consumed (95% confidence interval, 6–14% more; P<0.001).

## Discussion

In this first assessment of perceptions of alcohol as it relates to cardiovascular health, approximately one third of individuals reported believing that alcohol was heart healthy. The vast majority of those who believed alcohol was heart healthy cited the lay press as their source of knowledge. They were of higher socioeconomic status, more likely to reside in the United States, have coronary artery disease, and less likely to have smoked or have heart failure. Finally, individuals who believed alcohol was heart healthy also consumed significantly more alcohol on a regular basis.

Knowledge of the health benefits and detriments of alcohol is based primarily on observational studies, and while the data seem convincing that moderate alcohol consumption is beneficial regarding specific types of cardiovascular disease (for example, evidence appears to be consistent that moderate alcohol consumption improves lipid profiles<sup>4</sup> and reduces incidence of myocardial infarction<sup>5,6</sup>), the literature also demonstrates increased cardiovascular morbidity, such as atrial fibrillation<sup>8–10</sup> and hypertension,<sup>7</sup> at similar levels of alcohol intake. Therefore, the conundrum remains that, while moderate consumption may provide protection against some diseases or risk factors, it may similarly elevate the risk for others, and the balance of these effects remain poorly defined.<sup>3,18</sup> While the lay press frequently warns of the detriments of alcohol abuse, their reporting of the cardiovascular effects of moderate alcohol consumption is frequently positive.<sup>11,12</sup> We believe that it is important to understand the prevalence of certain perceptions of alcohol on cardiovascular health, as certain perceptions may be premature or even erroneous, and how these perceptions may impact behavior.

Both the Department of Health and Human Services and the American Heart Association recommend that heavy alcohol consumption should be avoided, moderate consumption be condoned or even supported, and that those who abstain not be counseled to start drinking alcohol.<sup>19,20</sup> Based on the level of uncertainty regarding the health effects of alcohol,<sup>3,18</sup> including the absence of any randomized trials,<sup>20</sup> these guidelines may or may not be appropriate. However, based on the data from our current study, a substantial fraction of participants believe that alcohol is heart healthy, and importantly, those believing so drink significantly more alcohol.

Consistent with the widely publicized “French Paradox” of low incidence of coronary artery disease attributed to high red wine consumption despite high dietary cholesterol,<sup>21</sup> it is provocative that apparent public perception, including the preponderant attribution of alcohol’s health benefits exclusively to red wine, more closely mirrors the lay press, which misreport medical data in as many as half of press releases,<sup>22</sup> rather than the scientific literature. While a cause and effect relationship could not be fully elucidated in this study, our findings are consistent with the concept that the lay press may inappropriately influence public perception regarding the heart-related effects of alcohol.

Certain cardiovascular diseases had associations with perceptions of alcohol as heart healthy. In those patients with coronary artery disease and history of myocardial infarction, diseases purported to benefit from alcohol consumption both in the lay press and in the

scientific literature,<sup>4-6,11,12</sup> there was a positive association with the belief that alcohol is heart healthy. Heart failure patients were significantly *less* likely to report alcohol as heart healthy – explanations for which include avoidance of excess fluid intake, and that excessive alcohol can be a cause of cardiomyopathy.<sup>23</sup> Highlighting the degree of scientific equipoise, however, is that alcohol has been shown to be of benefit in patients with systolic dysfunction,<sup>24-26</sup> a contraindication for alcohol according to American Heart Association guidelines. That smoking was negatively associated with a perception of alcohol as heart healthy may be related to smoking's direct relationship with alcohol consumption<sup>27</sup> and a subsequent grouping of the two as a “vices.”

Of those perceiving alcohol as heart healthy, 98% reported a range of 1–2 drinks/day as optimizing cardiovascular benefits. This near-unanimous quantification is consistent with the American Heart Association guidelines,<sup>20</sup> but stands in contrast to the literature. Even low to moderate levels of alcohol consumption have been shown to impose harm, including higher risk of mortality (< 2 drinks per day),<sup>28</sup> atrial fibrillation (1–2 drinks per day),<sup>10</sup> and hypertension (3 drinks per day).<sup>29</sup> In the context of this scientific conflict, that those who believed alcohol to be heart healthy consume nearly 50% more alcohol than those who do not has important implications regarding dissemination of science and counseling of patients. Of interest, although this was statistically significantly more, those who believe alcohol to be heart healthy still reported drinking a median of 5 drinks per week (which is in fact consistent with American Heart Association guidelines) (Table 2). Although we cannot tease out cause and effect in this observational study, perceptions regarding alcohol as heart healthy may be contributing to substantially more alcohol consumption, the consequences of which remain unknown.

By the nature of the study's cross-sectional design, only prevalence of perceptions and behaviors could be observed, and no causation can be demonstrated. Additionally, Health eHeart Study participants are less racially and ethnically diverse and of a higher socioeconomic status than the general population. It is possible that those who completed the alcohol survey may have had different characteristics that could have influenced our results (such as the fact that they were older than those who did not complete that survey). These potential limitations should only limit generalizability rather than internal validity. Finally, as with the majority of studies regarding alcohol consumption, we relied on survey results to determine “actual” alcohol consumption. As any inaccuracies in that reporting would generally be due to under-reporting,<sup>30</sup> this limitation may suggest that our associations with actual alcohol consumption may be underestimates of true effects.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

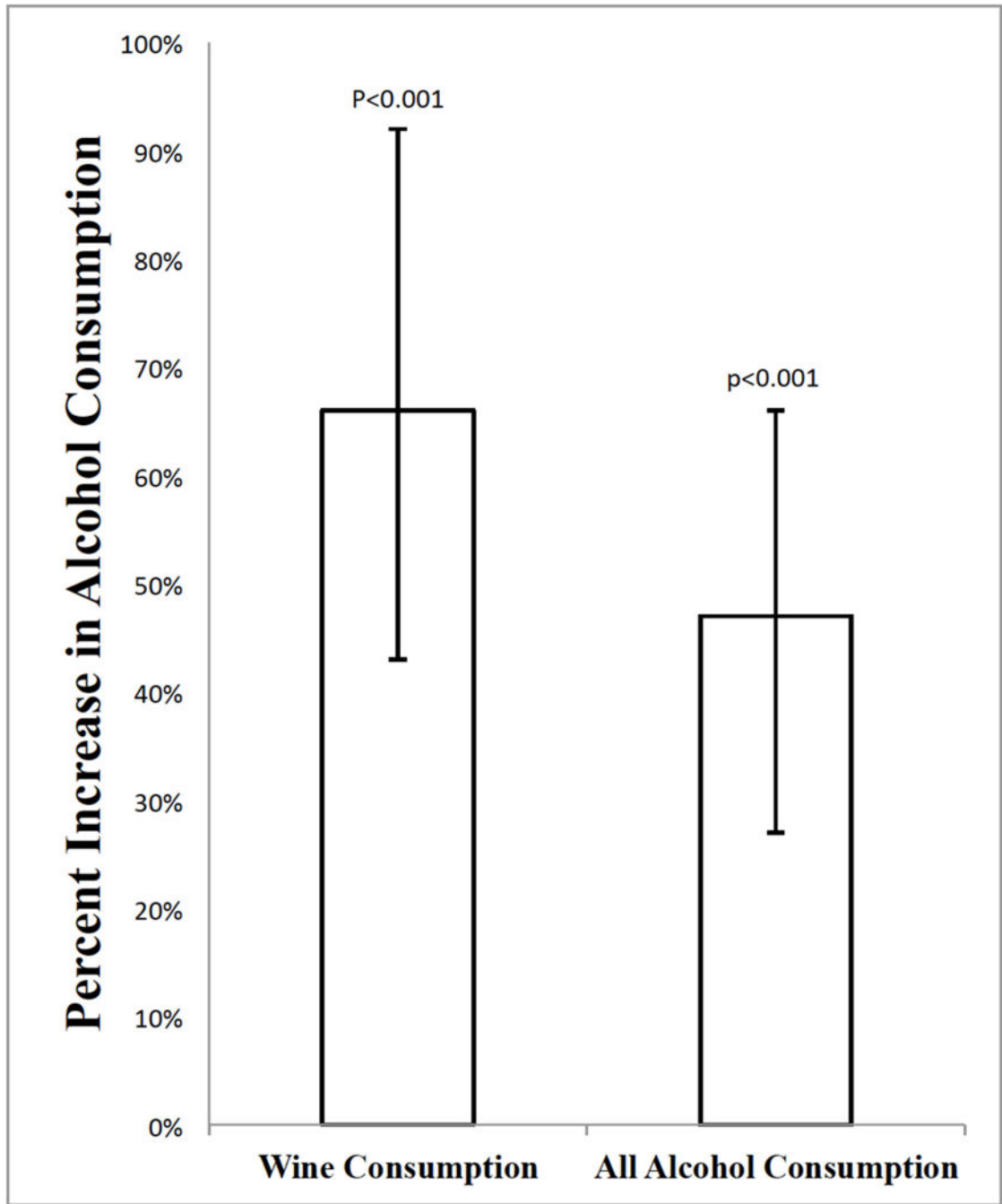
Grant Support: Research reported in this publication was supported by the National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health under Award Number R01AA022222 (G.M.M.). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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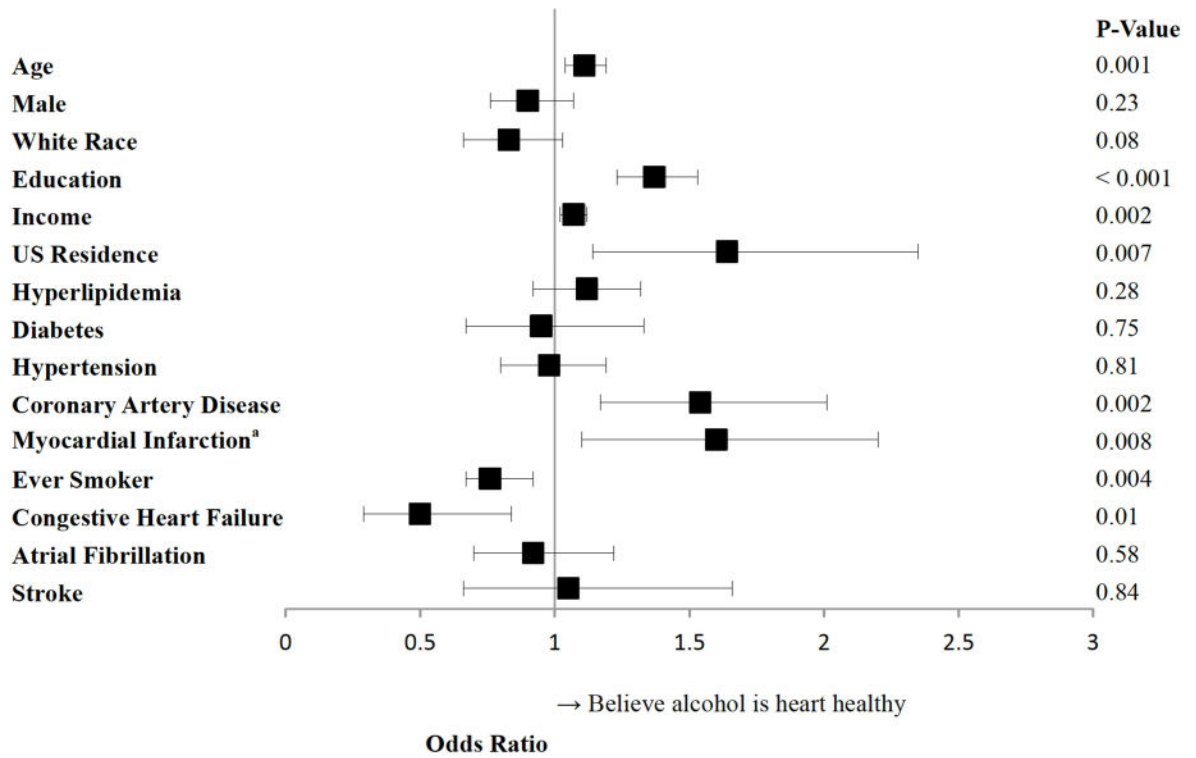
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**Figure 1. Among Participants that Reported Alcohol as Heart Healthy, The Distribution of Answers to The Question: “You believe alcohol is good for your heart because?”**

Note: Answers were not mutually exclusive (“check all that apply”).

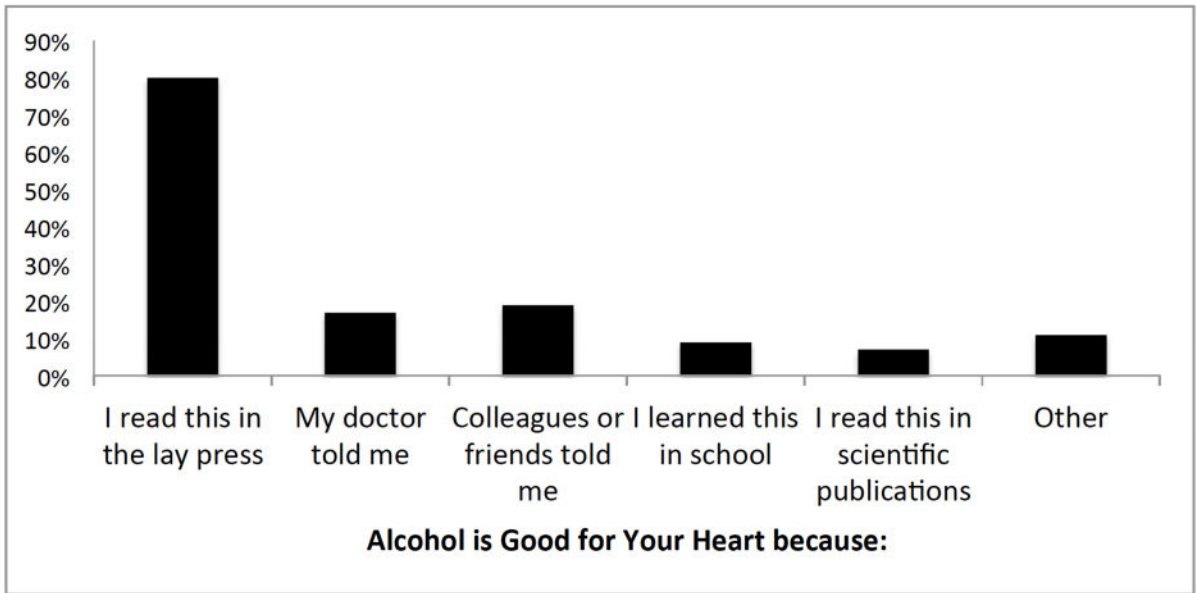


**Figure 2. Multivariable Adjusted Odds Ratios for the Relationships between Participant Characteristics and the Perception that Alcohol is Heart Healthy**

Multivariable analysis was adjusted for all other covariates listed in the table.

Y error bars denote 95% confidence intervals.

<sup>a</sup>Excluding coronary artery disease from the adjusted model due to collinearity



**Figure 3. Additional Amount of Alcohol Consumed among Those who Believe Alcohol is Heart Healthy Compared to Those who do not**

The percent increase in alcohol consumed after adjusting for age, gender, race, education, income, US residence, hyperlipidemia, diabetes, hypertension, coronary artery disease, smoking status, congestive heart failure, atrial fibrillation, and stroke is shown.

Y error bars denote 95% confidence intervals.

**Table 1**

Baseline Characteristics of Study Participants Stratified by Response to the Survey Question, “Do you believe that alcohol is good for your heart?”

	“Yes” (n = 1,707)	“No” or “Unsure” (n = 3,875)	P value
<b>Mean Age ± SD (years)</b>	52.4 ± 14.3	49.0 ± 15.6	<0.0001
<b>Male</b>	837 (43%)	1,670 (49%)	<0.001
<b>White</b>	1,357 (80%)	3,095 (80%)	0.75
<b>Education</b>			
<b>High school</b>	30 (2%)	178 (6%)	
<b>Some college</b>	176 (12%)	565 (18%)	
<b>Bachelor’s</b>	453 (31%)	1,002 (32%)	
<b>Post-graduate</b>	808 (55%)	1,352 (44%)	
<b>Annual Income (per \$1,000)</b>			<0.001
<b>&lt;10</b>	14 (1%)	78 (3%)	
<b>10K – &lt;20</b>	28 (2%)	107 (4%)	
<b>20K – &lt;30</b>	40 (3%)	141 (5%)	
<b>30K – &lt;40</b>	47 (4%)	143 (5%)	
<b>40K – &lt;50</b>	70 (5%)	172 (7%)	
<b>50K – &lt;75</b>	156 (12%)	329 (12%)	
<b>75K – &lt;100</b>	183 (14%)	397 (15%)	
<b>100K – &lt;150</b>	286 (22%)	516 (19%)	
<b>&gt;150</b>	476 (37%)	783 (29%)	
<b>US Residence</b>	1,165 (94.5%)	2,597 (89.6%)	<0.001
<b>National Region<sup>a</sup></b>			0.003
<b>West</b>	631 (51%)	1,366 (55%)	
<b>Midwest</b>	172 (14%)	366 (15%)	
<b>South</b>	217 (18%)	390 (16%)	
<b>Northeast</b>	209 (17%)	348 (14%)	
<b>Hyperlipidemia<sup>b</sup></b>	717 (48%)	1,378 (42%)	<0.001
<b>Diabetes mellitus</b>	90 (6%)	228 (7%)	0.2
<b>Hypertension</b>	547 (36%)	1,137 (35%)	0.3
<b>Coronary Artery Disease</b>	238 (14%)	442 (11%)	0.05
<b>Myocardial Infarction</b>	132 (9%)	247 (8%)	0.1
<b>Congestive Heart Failure</b>	42 (3%)	184 (6%)	<0.001
<b>Atrial Fibrillation</b>	161 (11%)	393 (12%)	0.1
<b>Stroke</b>	58 (4%)	136 (4%)	0.6
<b>Ever Smoker</b>	558 (29%)	1,448 (32%)	0.01

SD = standard deviation.

<sup>a</sup>Not included in multivariable analysis.

<sup>b</sup>Comorbid conditions were defined as present if the participant answered the following question in respect to a particular comorbidity in the affirmative: “Have you ever been told by a doctor or nurse that you have, or have been treated for, any of the following conditions (in the past or currently)?” Comorbidities were described in the survey as: “High cholesterol” = hyperlipidemia; “Diabetes; Do not include pre-diabetes” =

diabetes mellitus; “High blood pressure or hypertension (except that occurred during pregnancy and did not last after pregnancy)” = hypertension; “Coronary artery disease (blockages in your heart vessels) or angina (chest pain)” = coronary artery disease; “Heart attack” = myocardial infarction; “Congestive Heart failure (CHF, Heart Failure)” = congestive heart failure; “Atrial fibrillation (Afib, AF)” = atrial fibrillation; “Stroke or TIA (Transient Ischemic Attack or Mini-Stroke)” = stroke.

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Unadjusted Weekly Wine and Overall Alcohol Consumption by Response to the Survey Question, “Do you believe that alcohol is good for your heart?”

Table 2

	Wine			Overall Alcohol		
	Median quantity consumed (drinks/week)	Interquartile Range (drinks/week)	P-value	Median quantity consumed (drinks/week)	Interquartile Range (drinks/week)	P-value
“Yes”	2	1-5	0.0001	5	2-8	0.0001
“No” or “Unsure”	1	0-3		3	1-7	