

U.S. Wine Consumer Interest in Wine Ingredient and Nutritional Information

Terry M. Lease¹ (corresponding author), Deirdre Sommerlad-Rogers²

¹ College of Agriculture, Food and Environmental Science, California Polytechnic State University
1 Grand Avenue, San Luis Obispo, CA 93407 USA, E-mail: lease@calpoly.edu

² College of Agriculture, Food and Environmental Science, California Polytechnic State University
1 Grand Avenue, San Luis Obispo, CA 93407 USA, E-mail: dsommerl@calpoly.edu

Correspondence concerning this article should be addressed to Terry M. Lease, College of
Agriculture, Food and Environmental Science, California Polytechnic State University 1 Grand
Avenue, San Luis Obispo, CA 93407 USA, E-mail: lease@calpoly.edu

This article has been accepted for publication and undergone full peer review but has not been through
the copyediting, typesetting, pagination and proofreading process, which may lead to differences
between this version and the Version of Record.

Please cite this article as:

Lease T.M., Sommerlad-Rogers D. (2022), U.S. Wine Consumer Interest in Wine Ingredient and
Nutritional Information, **Wine Economics and Policy**, *Just Accepted*.

DOI: 10.36253/wep-12577

36 **Abstract**

37

38 In the United States, labelling for wine containing at least 7% alcohol by volume is regulated by the
39 Tax and Trade Bureau, which does not require wine labels to include ingredient or nutrition labelling,
40 except for added sulfites. With the European Union moving toward mandatory disclosure of nutrition
41 and ingredient information for wine, one may expect the level of debate in the U.S. to increase. We
42 conducted an online survey of consumers in the U.S. who are at least 21 years old (legal drinking age
43 in the U.S.) and consume wine at least once every two or three months to determine their interest in
44 wineries disclosing ingredient and nutrition information for wine. We asked about the importance of
45 ingredient information when deciding which wine to purchase and when determining willingness to
46 pay, and we asked about the importance of nutrition information when deciding which wine to
47 purchase. We separately regressed three dependent variables against Wine Consumption (frequency),
48 Price, Physical Activity, Diet, Wine Knowledge, Age, Income, and Education. Overall, respondents
49 indicated that having ingredient and nutrition information was only somewhat important, with mean
50 responses 3.04 on a 5-point scale (1 = Not Important, 5 = Very Important) for ingredient information
51 when choosing a wine, 3.01 for ingredient information when determining willingness to pay, and 2.48
52 for nutrition information when choosing a wine. The factor with the greatest impact on interest in
53 ingredient information was Price, with consumers who buy a higher-end wine at least monthly having
54 a higher level of interest, followed by Diet, with consumers with a healthy diet having a higher interest
55 in ingredient information, and Age, with older consumers having less interest in ingredient
56 information. Price, Diet, and Age also had the greatest impact regarding interest in nutrition
57 information, following the same direction but with Age being the most significant.

58

59 **Keywords:** ingredient and nutrition information, U.S. wine consumers

60

61

62 **1. INTRODUCTION**

63

64 In the United States (U.S.), the labelling requirements for prepared or processed food products are
65 regulated by the Food and Drug Administration (FDA). The FDA generally requires food
66 manufacturers to list all ingredients of a food product on the label and requires most foods to bear
67 nutrition labelling. However, labelling for wine containing at least 7% alcohol by volume is not
68 covered by FDA regulations and is instead regulated by the Tax and Trade Bureau (TTB). The TTB
69 does not require wine to bear nutrition labelling, and the only ingredient requiring listing is added

70 sulfites. Alcohol by volume must be listed, but alcohol is neither an added ingredient nor a nutrition
71 category.

72 In Europe, the European Commission has rejected self-regulation proposals from the beverage
73 alcohol industry, and the European Union (EU) is moving forward with a proposal for mandatory
74 ingredients and nutrition labelling on alcoholic beverages. The European Commission's proposal is
75 part of the "Europe's Beating Cancer Plan" adopted on February 3, 2021, with a 2021 – 2025
76 timeframe for the alcohol-related initiative. The debate on the issue in the U.S. has been building over
77 the past few years, but as of now the TTB has not indicated interest in expanding wine labelling
78 requirements for ingredients or nutrition information.

79 Public opinion on the topic in the U.S. is unclear. Forbes [1] quotes John Gillespie of the market
80 research company Wine Opinions as saying, "I can say from a number of consumer research projects
81 in the past, 'involved wine drinkers'—those who account for the greatest percentage of wine
82 purchases—are usually interested in having more information and detail, especially as concerns
83 health or wellbeing issues. I do think that would have an impact on how wineries respond to the
84 possibility of mandatory ingredient labeling."

85 However, in a survey conducted by the Wine Market Council (WMC) in May 2020 [2], 41% of
86 regular wine drinkers said they rarely want to know nutritional information or the ingredient list, and
87 only 21% said they always want to know. When asked to choose the top five categories of information
88 they wanted to see on a wine label, only 4% put nutritional information and ingredient list as most
89 important, and 81% did not include it in the top five. Interest in ingredients and nutrition information
90 was positively correlated with level of education and negatively correlated with age. Core wine
91 drinkers expressed more interest than Marginal wine drinkers in this information, but they expressed
92 more interest in most forms of information, and nutrition information and ingredient list were not
93 highly ranked in the list of types of information they want. Moreover, Core wine drinkers valued
94 having additional information for the sake of knowing more about the wine and did not place much
95 value on having information as an aid in making wine purchasing decisions.

96 With the EU moving toward mandatory disclosure of nutrition and ingredient information for wine,
97 one may expect the level of debate in the U.S. to increase, as illustrated by a pair of posts on the wine-
98 searcher.com website in which wine writer W. Blake Gray argued that the U.S. should follow the EU
99 on this issue [3] while wine maker Adam Lee responded with a list of challenges such regulation
100 would create and reasons why the labels could potentially cause consumer confusion [4]. This study
101 seeks to contribute additional information to the debate in the U.S. on adding the ingredient list and
102 nutrition information to required disclosure for wine and to add insight into the value of such
103 disclosure from a policy perspective.

104

105 2. LITERATURE REVIEW

106

107 Much of the academic literature related to nutrition information and ingredient list disclosure for wine
108 has centered on Europe, which is not surprising since the EU is closest to making such disclosure
109 mandatory. Bazzani, et al., [5] conducted an online survey of Italian red wine drinkers that included
110 questions on consumer attitudes toward wine and health-related aspects and a choice experiment
111 using attributes that are often associated with more natural and healthier foods. They found that health
112 consciousness is an important driver in the use of wine labels, but they did not specifically include
113 nutrition information or an ingredient list on the label.

114 Multiple studies show that the usefulness and value of nutrition and ingredient information vary
115 across countries. Employing a discreet choice experiment with representative samples of wine
116 consumers from Germany, Italy, and Australia, Pabst, et al., [6] found that consumers across all three
117 countries had a significant positive utility for detailed nutrition information. Ingredient information,
118 on the other hand, received a positive utility only in Italy, and a short ingredient list was preferred to
119 a long ingredient list. Grunert, et al., [7] utilized an online survey in Denmark, Germany, Netherlands,
120 Poland, Spain, and UK to examine consumer wants and use of ingredient and nutrition information
121 from a range of non-label sources. Information wants and use varied between the countries, was
122 highest in Spain, and was lowest in Denmark. Product involvement was a stronger predictor of
123 information wants than health interest. The effect of product knowledge was lower still and decreased
124 with more product knowledge. Previous ingredient knowledge led to lower ingredient information
125 wants, while previous nutrition information knowledge led to higher nutrition information wants. The
126 strongest predictor of information use was information wants.

127 Annunziata, et al., [8] conducted a survey in France, Spain, Italy, and the U.S. and found that interest
128 in receiving additional information on wine labels (e.g., about ingredients or nutrition information)
129 differed significantly between consumer groups based on the consumer's country. Among
130 respondents in the U.S. panel, 40% said they seldom change a habit because of the nutritional label,
131 and the mean response for the question "I find it difficult to understand nutritional labels" was 3.1 on
132 a 5-point scale (5 = strongly agree). Only 25% said they always read the front label on a bottle of
133 wine, and only 18% said they always read the back label. Still, the mean interest in having nutritional
134 information was 3.6, and the part-wise utility value for nutritional information was higher than for
135 price, health warnings, or units in bottle and units not to exceed.

136 Another consistent result in research studies is that the usefulness and value of nutrition and
137 ingredient information are not identical across consumer segments. Escandon-Barbosa and Rialp-

138 Criado [9] used eye tracking to study a sample of 114 individuals in a simulated supermarket with
139 more than 100 wines at a university in Columbia, focusing on purchase intention, related to wine
140 label information on denomination of origin, nutritional information, and health warnings. Expert
141 wine consumers used all three pieces of information to make a purchase decision. Non-expert wine
142 consumers, by contrast, made much less use of this information to make a purchase decision and
143 tended to focus on the origin information and health warnings and not make use of nutritional
144 information. The intent to purchase wine increased with the use of all three pieces of information for
145 both men and women. However, the effect was stronger for men. Women and men processed the
146 information differently, and the mean time to make a purchase decision was less than half as much
147 for men as it was for women.

148 Annunziata, et al., [8] found that interest in receiving additional information on wine labels differed
149 significantly between consumer groups based on the consumer's socio-demographic variables, wine
150 consumption habits, attitudes towards nutritional information in general, and the degree of
151 involvement with wine. In a survey of Italian wine consumers, Annunziata, et al., [10] found that
152 consumers who already have better knowledge of wine nutritional properties and a greater awareness
153 of the links between wine and health preferred a more detailed nutritional label than other consumers.
154 Those who generally find it more difficult to understand nutritional labels either show higher interest
155 in health warnings or prefer the specification of the number of glasses not to exceed and did not value
156 more detailed information. Pabst, et al., [11] assessed consumers' reactions to new back-label
157 information on ingredient and nutrition labelling in three focus groups with a total of twenty-one
158 wine-involved participants in three different cities in Germany. Of those participants who looked at
159 the back label (81%), almost two-thirds said they did not detect the nutrition or ingredient listing.

160 Pabst, et al., [12] conducted an online survey of German wine producers to examine producers'
161 expectations about consumer reactions to new label information, the consequences of mandatory
162 labelling on production processes, and relative competitive advantages for different producer sizes.
163 They found that producers expect the labelling regulations to create consumer confusion and
164 uncertainty; weaken wine's image as a natural product; and increase costs due to changes in
165 oenological practices, the increased need for laboratory analyses, and more challenging labelling
166 processes. Producers believe the regulations will create opportunities for wineries to focus on clean
167 labelling strategies by completely avoiding additives that require labelling and that large wineries
168 will be better able to react to the regulations.

169 Producers' concern for how consumers will react to the new labelling requirements is not unfounded.
170 Pabst, et al., [9] found that focus group participants who recognized the nutrition labelling and
171 ingredient list initially reacted to this information with insecurity, confusion, and incomprehension.

172 Pabst, et al., [6] found that presenting negative media information resulted in subjects in all three
173 countries surveyed significantly increasing their rating of importance of ingredients while also
174 increasing their preference for clean labelled products without ingredients. Further, a significantly
175 higher share of consumers in Germany and Italy prefer not to buy any wine. The effect of reading
176 positive media information on consumers' wine choice is significantly lower than that of reading
177 negative information.

178 Hayward, et al., [13] studied the influence an ingredient list had on the sensory perception of red
179 wines from Nova Scotia. In this study, participants used attributes associated with liking the wine
180 more often when the ingredient list was shorter and familiar. Hayward and McSweeney [14] studied
181 the influence calorie information had on the sensory perception of rosé wines from Nova Scotia and
182 found that the calorie information did not influence consumers' sensory perception.

183 One factor that is still undecided in the E.U. is the format of the disclosure, with producers generally
184 hoping that technology-enabled disclosure will be allowed in lieu of labelling on the bottle. Vecchio,
185 et al., [15] conducted an incentive compatible artefactual field experiment that indicated that Italian
186 wine consumers most prefer to have nutritional information presented in a panel and least prefer
187 having only a link to a website that contains the information. Grunert, et al., [7] found that the level
188 of both information wants (for ingredient and nutrition information) and information use was higher
189 for websites (product, public, and health) than for advertising, apps, or in-store sources.

190 Robinson, et al., [16] conducted a rapid systematic review and meta-analysis of eighteen studies to
191 assess consumer knowledge of energy content (calories) of alcoholic drinks, public support for energy
192 labeling, and effect of such labeling on consumer behavior. They found consistent evidence that
193 consumers tend to overestimate the number of calories in an alcoholic drink and that people are more
194 likely to support than oppose energy labeling of alcoholic drinks, but there was a high degree of
195 heterogeneity. (Two thirds of the studies used for this analysis examined nutrition information that
196 included calories, and one third looked specifically at calorie information disclosure.) The authors
197 concluded that the studies they included suggest that energy labeling did not affect consumer behavior
198 but that the overall quality of the evidence supporting that conclusion was very low. Generally, the
199 authors found that the use of self-reported information and lack of real-world settings resulted in most
200 (72%) of the studies they reviewed provided low evidential value with high levels of uncertainty.

201 Overall, the body of work shows there is inconsistency across consumers in the important of both
202 nutrition and ingredient labeling. This includes how they might use it and how much content on the
203 labels they would find important. Additionally, much of the research had been conducted in Europe.
204 The current project seeks to continue to fill the gap in how important information is to consumers,
205 targeting a U.S. sample.

206

207 3. MATERIAL AND METHODS

208

209 We conducted an online survey of consumers in the U.S. who are at least 21 years old (legal drinking
210 age in the U.S.) and either consume or purchase wine at least once every two or three months. A
211 professional panel recruitment agency recruited respondents across the U.S. using its internal
212 recruiting platform. Respondents who did not finish the questionnaire, including respondents who
213 failed a quality control check embedded in the survey, were eliminated. We received 331 completed
214 surveys. Thirteen respondents were rejected based on a speed test (completing the survey in less than
215 half the median time in a soft launch of the survey), and we obtained 318 useable responses, with an
216 average completion time of 10 minutes, 38 seconds. See Table 1 for demographic information on our
217 sample.

218 To verify that our respondent set is representative of regular wine drinkers in the U.S., we compared
219 it to the Wine Market Council's (WMC) U.S. Wine Consumer Segmentation study, one of the most
220 thorough such studies in the industry. Comparing our respondent set to wine drinkers in the 2019¹
221 U.S. Wine Consumer Segmentation study [17], our set skews older. Our respondents have an average
222 age of 53.8 compared to 48.2 for the WMC study, and we have a lower percentage of respondents in
223 each 10-year age group (21 – 29, 30 – 39, etc.) below 60. Females are overrepresented in our
224 respondent set, 66% compared to 54% in the WMC study². In terms of educational attainment, our
225 respondent set is highly comparable to the WMC study, with the same proportion of respondents who
226 did not earn any degree beyond high school (44%) and the same proportion with postgraduate work
227 or degree (20%). We have slightly more respondents with a technical or two-year degree (13 v. 11%)
228 and slightly less with a four-year degree (23% v. 25%). Respondents who identified as non-Hispanic
229 Caucasian are overrepresented (79% v. 67%). Blacks and African Americans are almost equally
230 represented in our study (10% v. 11%), but we have proportionately about half as many Hispanics
231 (7% v. 14%), Asians (2% v. 4%), and respondents identifying with another designation (2% v. 5%).

232

233 Table 1. Demographic Characteristics of the Sample

		Frequency	Percent
Gender	Female	208	65.409
	Male	110	34.591

¹ The most recent study available as of this writing

² None of the 318 respondents either identified as non-binary or preferred not to indicate a gender.

Race	Caucasian/Non-Hispanic	252	79.245
	Hispanic or Latino	21	6.604
	Black or African American	31	9.748
	Asian	7	2.201
	Mixed Race	4	1.258
	Other	3	0.943
Marital Status	Married, in an official civil union, or in a registered domestic partnership	148	46.541
	Living with a partner	31	9.748
	Single, never married	64	20.126
	Separated or divorced	51	16.038
	Widowed	24	7.547
Income	< \$35,000	106	33.333
	\$35,000 – \$49,999	56	17.610
	\$50,000 – \$74,999	48	15.094
	\$75,000 – \$99,999	44	13.836
	\$100,000 – \$149,999	37	11.635
	\$150,000 or above	21	6.604
	Prefer not to state	6	1.887
Education	High school graduate or less	68	21.384
	Some college	71	22.327
	Completed technical/2-year degree	42	13.208
	Completed 4-year degree	74	23.270
	Some graduate school	11	3.459
	Completed graduate Degree (e.g., MA, MS)	43	13.522
	Completed terminal degree (e.g., PhD, MD, JD)	9	2.830

N = 318

Note: percentages may not add to 100% due to rounding

234

235

236 Geographically, the northeast U.S. is slightly underrepresented compared to the WMC study (17% v.
 237 20%), with the difference divided nearly equally as overrepresentation of the mid-west, south, and

238 west regions. However, our sample set closely mirrors the distribution of the entire U.S. population,
 239 with less than one percentage point difference in any region (Table 2).

240

241 Table 2. Sample and U.S. Population Distribution by Region

	Sample		U.S.	
	Frequency	Percent	Frequency	Percent
Midwest	66	20.755	68,329,004	20.817
Northeast	53	16.667	55,982,803	17.055
South	120	37.736	125,580,448	38.259
West	79	24.843	78,347,268	23.869

N = 318

Note: percentages may not add to 100% due to rounding

242

243 Table 3 reports the frequency of wine consumption for our sample. The 318 usable responses include
 244 six whom the Wine Market Council would not consider a wine drinker, since four drink wine less
 245 than every 2 – 3 months and two never drink wine. We initially included these in the respondent set
 246 because they purchase wine regularly, at least once every 2 – 3 months. Because the number of
 247 respondents in this category was too small to analyze as a sub-group, we excluded them from further
 248 analysis. None of the six purchased wine at a high level of frequency, five only once every 2 – 3
 249 months and one 2 – 3 times per month.

250

251 Table 3. Wine Consumption Frequency

	Frequency	Percent
Every day	36	11.321
Not every day but more often than once a week	79	24.843
Once a week	69	21.698
2-3 times a month	74	23.270
Once every 2-3 months	54	16.981
Less than once every 2-3 months	4*	1.258
Never	2*	0.629

N = 318 (* excluded from further analysis)

252

253 The WMC defines Core wine drinkers as those who report drinking wine at least once per week and
254 Marginal wine drinkers as those who drink wine less often (but at least once every 2 – 3 months) and
255 say that they like wine. The WMC definition of Total Wine Drinkers also includes those who report
256 drinking wine at least once every 2 – 3 months but say that they do not like wine. Of the 312
257 respondents in our sample whom the WMC would classify as Total Wine Drinkers, 184 (59%) are
258 Core wine drinkers, 113 (36%) are Marginal, and 15 (5%) did not report liking wine³. We conducted
259 a Pearson's chi-squared test to compare our respondent set with the WMC 2019 segmentation study
260 regarding the proportion of Core wine drinkers, Marginal wine drinkers, and others in the Total Wine
261 Drinker category. Base on $X^2(2) = 4.655$ we rejected the null hypothesis that the two groups are
262 different at $p = 0.098$. For the remainder of our analysis, we define Core and Marginal wine drinkers
263 based only on the frequency of wine consumption and disregard whether they report liking wine.
264 To determine the importance of having information about a wine's ingredients, we asked respondents
265 to indicate the level of importance of knowing the wine's ingredients when purchasing wine for each
266 of five different occasions: giving wine as a gift; bringing wine to a large gathering; bringing wine to
267 a small dinner with friends; buying wine for a special occasion at home; and buying wine simply to
268 drink at home. Using a 5-point Likert scale, respondents indicated whether, for each occasion,
269 knowing a wine's ingredients is (1) Not Important, (2) Slightly Important, (3) Somewhat Important,
270 (4) Important, or (5) Very Important.
271 We first asked about the importance of having information about a wine's ingredients when deciding
272 which wine to purchase. Then we asked about the importance of having information about a wine's
273 ingredients when deciding how much the respondent would be willing to pay for the wine. We
274 calculated the mean response for each respondent across all five occasions for each question as the
275 dependent variables Ing-Choice and Ing-Pay, respectively.
276 To measure the importance of having nutritional information about a wine, we asked respondents to
277 indicate the level of importance on the same 5-point Likert scale of thirteen nutrition elements⁴ when
278 deciding which wine to purchase, and we calculated the mean response for each respondent as the
279 dependent variable Nutrition.
280 For each dependent variable we ran a separate regression using the following independent variables
281 that had some significance during preliminary bivariate analysis:
282 • Wine Consumption: We divided respondents into (1) Core or (2) Marginal wine drinker as
283 defined earlier.

³ One respondent reported being too new to wine to have a decided yet whether he or she would claim to like wine. We included that respondent in the third group for the Chi-square analysis.

⁴ The thirteen nutrition elements were Calories, Total Fat, Cholesterol, Sodium, Potassium, Total Carbohydrates, Sugar, Protein, Calcium, Iron, Vitamin B-6, Magnesium, and Phosphorus.

- 284 • Price: We categorized respondents based on the highest price level at which they purchase
285 wine at least monthly: (1) Do not purchase wine at least once a month, (2) Purchase wine at least
286 once a month costing under \$15 per 750 ml bottle, (3) Purchase wine at least once a month costing
287 \$15 – \$24.99 per 750 ml bottle, (4) Purchase wine at least once a month costing \$25 or more per 750
288 ml bottle.
- 289 • Physical Activity: We asked respondents whether they regard themselves as (1) Much less
290 active, (2) Less active, (3) About the same, (4) More active, or (5) Much more active compared to
291 others their age. This was dummy coded into healthy (4 or 5 = 1) and all others (0) to compare those
292 who were intentionally engaging in a healthy lifestyle to everyone else.
- 293 • Diet: We asked respondents whether they would describe their diet as (1) Very unhealthy, (2)
294 Unhealthy, (3) Neutral, (4) Healthy, or (5) Very healthy. This was dummy coded into a healthy diet
295 (4 or 5 = 1) and all others (0) to compare those who were intentionally engaging in a healthy lifestyle
296 to everyone else.
- 297 • Wine Knowledge: We asked respondents to describe their level of wine knowledge and
298 familiarity as (1) Almost none at all, (2) Low, (3) Average, (4) Connoisseur, or (5) Expert.
- 299 • Age: We asked respondents for their year of birth and calculated their age as of their birthday
300 in 2021. All respondents had to be the legal drinking age in the U.S. (minimum 21) at the time of the
301 survey.
- 302 • Income: We asked respondents to report their annual household income as (1) under \$35,000,
303 (2) \$35,000 - \$49,999, (3) \$50,000 - \$74,999, (4) \$75,000 - \$99,999, (5) \$100,000 - \$149,000, or (6)
304 \$150,000 or more.
- 305 • Education: We asked respondents to report their highest level of completed education as (1)
306 High school graduate or less, (2) Some college, (3) Completed technical/2-year degree, (4) Completed
307 4-year degree, (5) Some graduate school, (6) Completed graduate degree, or (7) Completed terminal
308 degree.
- 309 Six respondents chose “Prefer not to answer” for Income and four others were missing another data
310 point and were not included in the regression analysis. We tested the assumptions of regression and
311 there were no issues across the three regressions. We found that collinearity between the independent
312 variables was not an issue, as variance inflation factors (VIF) ranged from 1.097 to 1.366.

313

314 **4. RESULTS**

315

316 The respondents did not have a strong interest in ingredient and nutritional label information in
317 general. Less than half of the sample said that they read label information Often or Very Often,

318 whether it was ingredients (Often: 31.4%; Very Often: 17.9%) or nutritional information (Often:
 319 31.1%; Very Often: 18.6%). When it comes to using nutritional information to decide which alcoholic
 320 beverage to consume, or whether to consume one, barely a quarter (25.3%) said that it was Important
 321 or Very Important. The lack of a strong interest in general ingredient and nutritional information
 322 carries over to wine even though, overall, the respondents think that wine is associated with good
 323 health. When asked which alcoholic beverages, if any, are associated with a healthy lifestyle or diet,
 324 almost 75% selected wine. When asked if they would agree that moderate wine consumption is good
 325 for health, the mean response was 3.958 on a 5-point scale.

326

327 *4.1 Ingredient information when choosing a wine*

328

329 Overall, respondents think that knowing the ingredients when deciding which wine to purchase is
 330 somewhat important, with a mean response of 3.037. Table 4 presents the regression results for the
 331 question “For each of the wine purchase occasions listed, indicate how important it would be to you
 332 to know what the ingredients are in deciding which wine to buy” (Ing-Choice).

333 The model was a significant predictor of Ing-Choice ($F(8, 293) = 10.652, p < 0.001$), accounting for
 334 20.4% of the variance in the model. Price, Age, Physical Activity, Diet, Education, and Wine
 335 Consumption were all significant predictors of wanting to know ingredients when deciding which
 336 wine to purchase.

337 The higher the price category the respondent reported purchasing at least monthly, the more the
 338 importance of knowing the ingredients increased ($p < 0.001$). Those who were more active ($p = 0.019$)
 339 or had a healthy diet ($p = 0.014$) were more likely to want to know the ingredients in deciding which
 340 wine to purchase, and Core wine consumers wanted to know the ingredients more than Marginal wine
 341 consumers ($p = 0.077$). On the other hand, wanting to know the ingredients decreased with age ($p =$
 342 0.004) and education ($p = 0.058$).

343

344 Table 4. Regression results for dependent variable Ing-Choice

	B	SE	t	Sig.
Wine Consumption	0.223	0.126	1.772	*
Price	0.264	0.069	3.840	***
Physical Activity	0.308	0.131	2.356	**
Diet	0.314	0.127	2.483	**
Wine Knowledge	0.167	0.185	0.898	

Age	-0.010	0.003	-2.933	***
Income	0.052	0.039	1.328	
Education	-0.070	0.037	-1.905	*
Constant	2.830	0.284	9.974	***
F (8, 293)			10.652	***

Note: *, **, and *** indicate significance levels (two tailed) of 0.10, 0.05, and 0.01. N = 302. Adjusted R² = 0.204.

345

346 *4.2 Ingredient information when determining willingness to pay*

347

348 On average, respondents think that knowing the ingredients when deciding how much to pay for a
 349 wine is slightly less important than when deciding which wine to purchase. The mean response for
 350 this variable was 3.014. Table 5 presents the regression results for the question “For each of the
 351 following wine purchase occasions listed, indicate how important it would be to you to know what
 352 ingredients are in a bottle of wine in deciding how much you are willing to pay for the wine” (Ing-
 353 Pay).

354 The model was a significant predictor of importance of knowing ingredients for willingness to pay
 355 (F(8, 293) = 8.046, p < 0.001) and accounted for 15.8% of the variance in the model. Similar to the
 356 importance of knowing ingredients when deciding which wine to purchase, Price (p = 0.001), Diet (p
 357 = 0.008), and Age (p = 0.017), are significant predictors of wanting to know ingredients when
 358 deciding how much to pay for a wine, with the importance of knowing the ingredients increasing with
 359 the level for each variable except Age. When deciding how much to pay, Wine Knowledge is also a
 360 significant (p = 0.030) positive indicator of wanting to know the wine’s ingredients.

361

362 Table 5. Regression results for dependent variable Ing-Pay

	B	SE	t	Sig.
Wine Consumption	0.117	0.136	0.864	
Price	0.248	0.074	3.351	***
Physical Activity	0.226	0.140	1.607	
Diet	0.362	0.136	2.654	***
Wine Knowledge	0.435	0.199	2.179	**

Age	-0.009	0.004	-2.398	**
Income	0.015	0.042	0.347	
Education	-0.051	0.039	-1.289	
Constant	2.943	0.305	9.644	***
F (8, 293)			8.046	***

Note: *, **, and *** indicate significance levels (two tailed) of 0.10, 0.05, and 0.01. N = 302. Adjusted R² = 0.158.

363

364 *4.3 Nutrition information when choosing a wine*

365

366 Collectively, respondents were less interested in knowing nutrition information than in knowing a
 367 wine's ingredients. The mean response for the Nutrition variable was 2.481. The regression results
 368 for the importance of nutrition information for wine are reported in Table 6, which looks at the
 369 questions related to "For each of the following nutritional items, indicate how important you think
 370 that item is when considering which wine to purchase." The model was a significant predictor of the
 371 importance of nutrition information (F (8, 293) = 10.175, p < 0.001) accounting for 19.6% of the
 372 variance in nutrition information. Price (p = 0.001), Physical Activity (p = 0.088), Diet (p = 0.008),
 373 and Wine Knowledge (p = 0.072) were positive predictors while as Age increases the desire for
 374 nutrition information decreased (p < 0.001).

375

376 Table 6. Regression results for dependent variable Nutrition

	B	SE	t	Sig.
Wine Consumption	0.136	0.134	1.019	
Price	0.237	0.073	3.257	***
Physical Activity	0.236	0.138	1.712	*
Diet	0.359	0.134	2.682	***
Wine Knowledge	0.355	0.196	1.808	*
Age	-0.016	0.004	-4.401	***
Income	-0.011	0.041	-0.261	
Education	-0.050	0.039	-1.298	

(Constant) 2.839 0.300 9.452 ***

F (8, 293) 10.175 ***

Note: *, **, and *** indicate significance levels (two tailed) of 0.10, 0.05, and 0.01. N = 302. Adjusted R² = 0.196.

377

378

379 5. DISCUSSION AND CONCLUSIONS

380

381 5.1 Overall summary of results and implications

382

383 Price is the only variable that was highly significant ($p \leq 0.01$) across all three regression models.
384 Consumers who purchased a higher-priced wine at least once a month were more interested in having
385 wine ingredient and nutrition information. This result is consistent with the WMC Communications
386 Study [2] that indicated that high-end wine buyers tend to want more information about wine in
387 general and are more likely to agree that the information found on wine labels rarely helps them
388 choose a wine. This group represents a small portion of wine consumers. In our survey, less than 30%
389 of respondents said they purchase a bottle of wine at least monthly at a price of \$15 or more per bottle,
390 and almost half of those did not purchase a bottle priced at \$25 or more at least once a month. The
391 U.S. Wine Consumer Segmentation study [17] also found that almost half of regular wine consumers
392 say they never buy a bottle of wine in the \$25.00 - \$29.99 range and almost three-quarters never pay
393 more than \$50.00 a bottle.

394 Age was highly significant in two of the regression models (Ing-Choice and Nutrition) and significant
395 ($p \leq 0.05$) in the third (Ing-Pay). It is the most significant factor when considering nutrition
396 information. Younger consumers had more interest in ingredient and nutrition information than older
397 consumers. Younger consumers were also more likely to accept getting this information through
398 technology than the labels on a wine bottle. When presented with the statement in our survey,
399 “including the website (URL) or a QR code that links to that information would be a good alternative
400 to listing the ingredient or nutrition information directly on the bottle,” almost 70% of respondents
401 age 40 or younger chose either Agree or Strongly Agree, a significantly higher rate than respondents
402 between 41 and 64 (55%) and 65 and older (41%) [$X^2(8) = 23.336, p = 0.003$].

403 Diet is highly significant for Ing-Pay and Nutrition and significant for Ing-Choice. Respondents who
404 indicated having a healthy diet were more interested in ingredient and nutrition information than those
405 who do not. Similarly, respondents who say that they were more physically active than their peers

406 were more interested in ingredient and nutrition information, although that variable was only
407 significant for Ing-Choice and marginally significant ($p \leq 0.10$) for Nutrition. This result is consistent
408 with the finding of Bazzani, et al., [5] that health consciousness was positively related to the use of
409 wine labels information and the finding of Grunert, et al., [7] that interest in health is a predictor, but
410 not the strongest one, of information wants for nutrition and ingredients.
411 Similar to Annunziata, et al., [10] we found that better wine knowledge (as self-assessed by
412 respondents) is positively related to wanting more information. However, the variable was only
413 significant for Ing-Pay and marginally significant for Nutrition. It is worth noting that the WMC
414 Communications Study [2] indicated that more knowledgeable wine consumers tend to want more
415 information of all kinds about wine and were less likely to use that information in making a wine-
416 buying decision.
417 Surprisingly, frequency of wine consumption was not an important factor. Core wine drinkers were
418 more likely to want ingredient and nutrition information, but the variable only reached marginal
419 significance and only in the Ing-Choice model. In contrast, Escandon-Barbosa and Rialp-Criado [9]
420 found that expert wine consumers, defined by the amount and frequency of wine consumption, make
421 more use of nutrition information than non-experts.
422 The education level of respondents was negatively related to the interest in ingredient and nutrition
423 information but, like wine consumption, only reached marginal significance in the Ing-Choice model.
424 Income was the only variable not to be at least marginally significant in at least one regression model.

425

426 *5.2 Policy implications of results*

427

428 While some wine industry professionals and wine writers advocate for ingredient and nutrition
429 information disclosure (e.g., Pellechia [1] and Gray [3]), the primary push for government regulations
430 has come from the public health sector. In 2007, the TTB issued “Labeling and Advertising of Wines,
431 Distilled Spirits and Malt Beverages; Proposed Rule” [18] that, if enacted, would have required
432 alcoholic beverages covered by the rule to disclose “on any label affixed to the container” the alcohol
433 by volume and a statement of calories, carbohydrates, fat, and protein. The proposed rule notice noted
434 that almost 4 ½ years earlier the TTB had received a petition calling for such disclosure, and more,
435 from the Center for Science in the Public Interest, the National Consumer League, 67 other
436 organizations, and eight individuals (including four deans of schools of public health).
437 Government regulations should weight the costs of the regulations against the expected benefits. Our
438 study suggests the actual benefits of such regulation may be less than the intended benefits. Overall,
439 the respondents think that wine is associated with good health. Still, respondents had only a marginal

440 interest in having ingredient and nutrition information for wine. Our findings would suggest that the
441 benefit of requiring ingredient and nutrition information on wine bottle labels seems small, especially
442 given research that shows that people tend to use nutrition labels at lower rates than they claim and
443 that having such information often does not change consumers' choices. For example, Grunert, et al.
444 [19] demonstrated that self-reported use of nutritional labels may be overstated by 50% and that the
445 lack of use is mostly not attributable to not understanding the information on the label. In addition,
446 their results do not prove that the label information changed consumers' choices, compared to a
447 situation where such information is not available or is not read by the consumer. Furthermore, Köster
448 [20] showed that many food and beverage purchase and consumption decisions are based on routine,
449 habit, or other subconscious factors.

450 The operational cost for wineries, on the other hand, would be significant given the additional testing
451 and chemical analysis that would be required and the cost of having to create new labels and seek
452 TTB (and in some cases state) label approval with each new vintage as nutritional properties change
453 from year to year. One might expect that ingredient and nutrition labeling could lead to negative news
454 stories based on ignorance and fear rather than science and fact, and these stories could result in costs
455 of lost opportunities, especially considering the findings of Pabst, et al. [6], and current TTB
456 regulations related to advertising health claims could make it difficult for wineries to respond to such
457 stories.

458 As EU regulations come into effect, researchers will have opportunities to study the impact of the
459 regulations in the real-world settings that Robinson, et al., [16] concluded would be necessary to
460 produce studies with high evidential value. In the meantime, our study adds to the body of research
461 that calls into question the efficacy of requiring wine ingredient and disclosure information to meet
462 public health goals and suggests that the TTB could benefit from the opportunity to learn from the
463 EU's experience before issuing its own regulations.

464

465 *5.3 Limitations and Research Opportunities*

466

467 This study was based on a survey that asked respondents about their interest in having ingredient and
468 nutritional information available. We did not attempt to measure the extent to which they truly would
469 use ingredient and nutritional information in making wine purchase or consumption decisions or how
470 having ingredient and nutritional information would change such decisions.

471 We approached our study from a public health perspective rather than a marketing perspective. We
472 did not investigate whether consumers would be willing to pay more for wine that discloses ingredient
473 or nutrition information. Likewise, we did not study consumers' preference for ingredient or nutrition

474 information if having that information would require them to make a tradeoff between having access
475 to this information or some other information, such as food pairings or a description of the wine, that
476 they may use in making wine purchase and consumption decisions. These are all avenues for future
477 research on this subject.

478

479

480 REFERENCES

481

482 [1] “Ingredient Labeling May Soon Show Up on Your Favorite Wine,” Thomas Pellechia, Forbes,
483 May 22, 2020, [https://www.forbes.com/sites/thomaspellechia/2020/05/22/ingredient-labeling-may-](https://www.forbes.com/sites/thomaspellechia/2020/05/22/ingredient-labeling-may-soon-show-up-on-your-favorite-wine/?sh=69f88aa3654c)
484 [soon-show-up-on-your-favorite-wine/?sh=69f88aa3654c](https://www.forbes.com/sites/thomaspellechia/2020/05/22/ingredient-labeling-may-soon-show-up-on-your-favorite-wine/?sh=69f88aa3654c) (accessed 10/22/2021).

485 [2] “2020 Wine Market Council Communications Study,” Wine Market Council, September 25,
486 2020,

487 [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj9pGAyt](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj9pGAyt7zAhUBCTQIHxqrBXYQFnoECAkQAQ&url=https%3A%2F%2Fwinemarketcouncil.com%2Fw)
488 [7zAhUBCTQIHxqrBXYQFnoECAkQAQ&url=https%3A%2F%2Fwinemarketcouncil.com%2Fw](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj9pGAyt7zAhUBCTQIHxqrBXYQFnoECAkQAQ&url=https%3A%2F%2Fwinemarketcouncil.com%2Fw)
489 [p-](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj9pGAyt7zAhUBCTQIHxqrBXYQFnoECAkQAQ&url=https%3A%2F%2Fwinemarketcouncil.com%2Fw)

490 [content%2Fuploads%2Fdlm_uploads%2F2020%2F09%2FWMC_Communications_Study_Final_9](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj9pGAyt7zAhUBCTQIHxqrBXYQFnoECAkQAQ&url=https%3A%2F%2Fwinemarketcouncil.com%2Fw)
491 [-25-2020.pdf&usg=AOvVaw0Yu88_ZVju71laSmSW0UWE](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj9pGAyt7zAhUBCTQIHxqrBXYQFnoECAkQAQ&url=https%3A%2F%2Fwinemarketcouncil.com%2Fw) (accessed 10/22/2021).

492 [3] “Time for US Wine to Follow the EU,” W. Blake Gray, wine-searcher.com, May 24, 2020,
493 <https://www.wine-searcher.com/m/2020/05/time-for-us-wine-to-follow-the-eu> (accessed
494 10/23/2021).

495 [4] “Ingredient Labeling: A Winemaker Strikes Back,” Adam Lee, wine-searcher.com, May 28,
496 2020, <https://www.wine-searcher.com/m/2020/05/ingredient-labeling-a-winemaker-strikes-back>
497 (accessed 10/23/2021).

498 [5] Bazzani C, Capitello R, Ricci EC, Scarpa R, Begalli D. Nutritional Knowledge and Health
499 Consciousness: Do They Affect Consumer Wine Choices? Evidence from a Survey in Italy.
500 *Nutrients*. 2020; 12(1):84. <https://doi.org/10.3390/nu12010084>.

501 [6] Pabst E, Corsi A, Vecchio R, Annunziata A, Loose S. Consumers’ reactions to nutrition and
502 ingredient labelling for wine – A cross-country discrete choice experiment. *Appetite*. 2021; 156,
503 104843. <https://doi.org/10.1016/j.appet.2020.104843>.

504 [7] Grunert K, Hieke S, Juhl H. Consumer wants and use of ingredient and nutrition information
505 for alcoholic drinks: A cross-cultural study in six EU countries. *Food Quality and Preference*. 2018;
506 63:107. <https://dx.doi.org/10.1016/j.foodqual.2017.08.005>

- 507 [8] Annunziata A, Pomarici E, Vecchio R, Mariani A. Do Consumers Want More Nutritional and
508 Health Information on Wine Labels? Insights from the EU and USA. *Nutrients*. 2016; 8(7):416.
509 <https://doi.org/10.3390/nu8070416>.
- 510 [9] Escandon-Barbosa D, Rialp-Criado J. (2019). The impact of the content of the label on the
511 buying intention of a wine consumer. *Frontiers in Psychology*. 2019; 9:2761.
512 <https://doi.org/10.3389/fpsyg.2018.02761>
- 513 [10] Annunziata A, Pomarici E, Vecchio R, Mariani A. Nutritional information and health
514 warnings on wine labels: Exploring consumer interest and preferences. *Appetite*. 2016; 106: 58.
515 <https://doi.org/10.1016/j.appet.2016.02.152>.
- 516 [11] Pabst E, Szolnoki G, Loose S. The effects of mandatory ingredient and nutrition labelling for
517 wine consumers – A qualitative study. *Wine Economics and Policy*. 2019; 8(1):5.
518 <https://doi.org/10.14601/web-8216>.
- 519 [12] Pabst E, Szolnoki G, Loose S. How will mandatory nutrition and ingredient labelling affect
520 the wine industry? A quantitative study of producers' perspectives. *Wine Economics and Policy*.
521 2019; 8 (2):103. <https://doi.org/10.1016/j.wep.2019.05.002>.
- 522 [13] Hayward L, McSweeney M. Investigating caloric values and consumers' perceptions of Nova
523 Scotia rosé wines. *Food Research International*. 2020; 127, 108761.
524 <https://doi.org/10.1016/j.foodres.2019.108761>
- 525 [14] Hayward L, Finlay E, Lafortune M, Strother H, Tomchuk A, Selviz V, McSweeney M.
526 Investigating the disclosure of ingredient lists impact on consumers' sensory perceptions of red wines
527 produced in Nova Scotia, Canada. *Journal of Sensory Studies*. 2020; 35(6), e12608.
528 <https://doi.org/10.1111/joss.12608>
- 529 [15] Vecchio R, Annunziata A, Mariani A. Is More Better? Insights on Consumers' Preferences
530 for Nutritional Information on Wine Labelling. *Nutrients*. 2018; 10(11):1667.
531 <https://doi.org/10.3390/nu10111667>.
- 532 [16] Robinson E, Humphreys G, Jones A. Alcohol, calories, and obesity: A rapid systematic review
533 and meta-analysis of consumer knowledge, support, and behavioral effects of energy labeling on
534 alcoholic drinks. *Obesity Reviews*. 2021; 22(6), e13198. <https://doi.org/10.1111/obr.13198>
- 535 [17] “2019 Wine Market Council U.S. Wine Consumer Segmentation Slide Handbook,” Wine
536 Market Council, September 5, 2019, <https://winemarketcouncil.com/download/914/> (accessed
537 10/24/2021; membership required).
- 538 [18] “Labeling and Advertising of Wines, Distilled Spirits and Malt Beverages; Proposed Rule.”
539 72 Fed. Reg. 41859 (July 31, 2007). [https://www.govinfo.gov/content/pkg/FR-2007-07-31/pdf/E7-
540 14774.pdf](https://www.govinfo.gov/content/pkg/FR-2007-07-31/pdf/E7-14774.pdf)

- 541 [19] Grunert K, Wills J, Fernández-Celemín L. Nutrition knowledge, and use and understanding
542 of nutrition information on food labels among consumers in the UK. *Appetite*. 2010; 55(2): 177.
543 <https://doi.org/10.1016/j.appet.2010.05.045>.
- 544 [20] Köster E. Diversity in the determinants of food choice: A psychological perspective. *Food*
545 *Quality and Preference*. 2009; 20(2): 70. <https://doi.org/10.1016/j.foodqual.2007.11.002>.

Accepted Manuscript