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Survey Analysis of Consumer Actions At - and Post-Purchase of Wine

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Survey Analysis of Consumer Actions At - and Post-Purchase of Wine

By

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Abstract

Wine survey analysis has been utilized in previous research to assess a myriad of applications in the wine industry. These surveys typically evaluate the consumer bases within the wine industry and examine their perceptions, tendencies, and habits. This research aims to further supplement data in this context and surveyed consumers from across the world from a wide range of consumer types. By utilizing market segmentation, this vast consumer base can be separated into smaller groups which are more telling of how various segments differ from each other. This study evaluated consumer perceptions of red and white wine, wine closure type, wine label information, and wine serving temperature. Furthermore, an examination of how consumers treated their wine allowed us to identify differences in refrigeration preference, temperatures commonly used to store wine, how quickly the wine is consumed after opening, and how frequently the consumer drank wine.

Chi-square analysis demonstrated numerous significant results across multiple segments. Firstly, the question of knowledge appeared to be one of the most enlightening questions, as this seemed to connect with underlying motivations for consumer's habits and perceptions. Those that were more knowledgeable tended to be slightly older, more frequent consumers, were more interested in wine information, and more likely to own niche wine products such as wine refrigerators and wine preservation devices. Those that were not as knowledgeable about wine were the opposite, where they were less frequent consumers, less interested in wine information, and less likely to own niche wine products like wine refrigerators and wine preservation devices.

Regionally there were not many differences observed. Most regions that were evaluated were fairly consistent with each other. However, some regions like South Africa and the U.S. appear to show a higher preference for red wine compared to other regions. When considering price, South Africa seems to pay a fairly low price for wine compared to other regions. Australia was also observed to pay a

considerably higher price for red wine. European consumers also appeared to spend less on wine than those in the U.S. and also seemed to be less biased towards certain wine attributes than those in the U.S.

Overall, this study successfully demonstrated many significant differences among wine consumers, and further demonstrated the need to fully understand these different segments. By knowing the differences in these habits, the wine industry can more aptly anticipate wine consumer demands and tendencies. This information can help inform these decisions and alleviate the complexity in this vast consumer market.

1. Introduction

Global wine consumption has been steadily increasing since the 2008 financial crisis and in 2018 reached 246 million hL (International Organisation of Vine and Wine 2019). While it is difficult to estimate how many individual consumers this corresponds to, from an economic standpoint it would suggest that the size of this production is reflective of a large consumer market. This vast global market comprised of millions of consumers represents a complicated array of diversity, which can be difficult to appeal to, especially in such a competitive market. The wine market is made up of several, sometimes niche, segments which are influenced by demographics, psychographics, cultural standards and more (Hall and Mitchell 2008). Wine producers are faced with a demanding position in attempting to identify and understand their consumer base. This extends outward from just wine producers as well, as the entire market must deal with the task of distinguishing how wine consumers act and the reasons for those actions when it comes to interacting with wine. Given the vastness of the consumer base, not all consumers are the same and it is important to consider these differences when trying to understand how and why consumers treat and perceive wine.

There are a multitude of contextual indications that assist consumers when purchasing wine and the manner in which the consumer treats the wine. Due to the complexity of the product itself, as well as the market and consumer, at times it can be difficult to understand how and why the consumer interacts with wine in a particular manner. There has been a myriad of studies that have evaluated these contextual attributes and consumer habitual actions pertaining to wine. For wine attributes, research has examined how consumers perceive wine closures (Bleibaum et al 2005, Marin and Durham 2007, Marin et al. 2007) different wine styles (Olsen et al. 2007), wine label design (Atkin et al. 2007, Thomas and Pickering 2003) price (Bleibaum et al. 2005, Johnson and Bastian 2007) and more. Although somewhat lacking, research pertaining to consumer tendencies have evaluated wine consumption frequency (Martínez-Carrasco et al. 2006), temperature preference (Ross et al. 2012) and more. Many of these characteristics and attributes have then been compared among different age groups, ethnicities, nationalities, gender and

more. In doing so, these results inform the market on current consumer tendencies and preferences, which can be utilized in a multitude of applications.

This study evaluated wine consumers from around the world via an online survey. The purpose of this study was to evaluate various wine attributes, as well as consumer preferences and actions among different demographics. The intention was to successfully segment the market into meaningful sections and compare how particular segments differ or are alike among each other. This study addresses wine closure, style, and label information preferences as well as consumer actions such as how consumers store wine, wine temperature preference, how frequently the consumer consumes wine, their wine knowledge and more. Unique and significant comparisons can be drawn between various survey questions, which provides insight into any possible associations between two categorical variables. When significant results arise, hypotheses can be formed as to why this association may exist and why a particular consumer segment may be acting differently than another.

2. Literature Review

Firstly, it is important to address key points in the context of surveys. Surveys present an exciting opportunity to receive an abundance of responses fairly readily, and their minimal to no-cost is an additional benefit. However, there are fundamental aspects that uphold the integrity and quality of a survey. The sample design is a crucial step in the distribution and sampling for a survey, as sampling error can greatly alter the results and lead to an inaccurate hypothesis of the population (Couper 2000). Coverage error is described as the mismatch between the overall population and frame population and represents the biggest threat to the representativeness of sample surveys conducted via the Internet. Certainly, if the sampling for a survey is misguided and not comprehensive for a frame population, it loses its effectiveness in accurately describing the actions of the target population. Similar in fashion to this issue, is the nonresponse error. It has been shown that surveys conducted via e-mail receive a significantly lower response rate than mail surveys (Couper et al. 1999). This nonresponse error represents a size of the sample population that is unwilling to complete a survey. This is in part related to the coverage error, since if the nonresponse error is significantly high enough, it can undermine the validity of the results due to the fact that it may not truly reflect the target population. This could be a significant issue if the respondents that choose not to participate in surveys represent a proportion of the sample that are significantly different than those that are willing to complete a survey. Of similar weight in importance, is the response error. Response errors are the errors in responses that people give due to factors in the context of a survey (Iversen and Gergen 1997). For example, the wording of questions can influence the answers that respondents give. Questions may confuse respondents and lead to unintended outcomes. Respondents may also not have an opinion on the issue at hand at first, but wording may give a respondent an opinion based on the word choices offered. The arrangement of questions can also affect the results, as respondents may try to be consistent in their answers throughout a survey. Furthermore, the choices displayed for a question should be comprehensive enough to encompass the possible answers that a respondent might give. If this is not done, respondents may be forced into choosing a particular answer

that is not truly reflective of what they would answer, or they may skip the question entirely. These are all considerations to make when forming a survey for a study. When done properly, surveys can provide a wealth of information that is reliable and informative to the researcher.

Given that a large majority of the results from this study are analyzed via chi-square test, an evaluation of this statistical method will be discussed briefly. In this survey, the results are based on Pearson's chi-square test of independence. Chi-square analysis is a suitable test for the results in this study due to the fact that it is comparing two categorical variables based on frequencies. The data arranged for a chi-square analysis is formed in a contingency table which studies the relationship among categorical variables (Iversen and Gergen 1997). Typically, the objectives in analyzing the data in this manner are to evaluate any possible relationship between the two categorical variables, how strong the relationship is, if the results are applicable to the population, and whether the relationship is simply causal. With a frequency count for each cell within a contingency table, an expected count can be calculated. The chi-square test then measures how much the observed values differed from the expected values. This is a widely used test and its throughput allows researchers to find significant results for large data sets, however it is also commonly misinterpreted (Franke et al. 2011). One of the faults is statistically comparing proportions and concluding in definitive associations, which can only be done with the chi-square test of homogeneity. Furthermore, a common fault in utilizing this analysis is being too heavily reliant on the significant results that it provides. A correct interpretation of the chi-square test is often dependent on other factors outside of the data itself such as individual observations being independent from other individual observations in a contingency table, how the data was collected, and sampling procedures. This study compares proportions of responses but does not conclude in any statistically significant differences unless the chi-square test of independence indicated so. Also, with any statistical test, the sample size is heavily influential in the outcome of results. These points are consistently addressed throughout this paper in order to provide other contextual information.

Market segmentation is heavily utilized in this study in order to discern potential differences across various consumer bases using various differentiating characteristics such as age, gender, wine

preference and more. By doing so, deeper insight into the wine consumer market can be attained and used in a myriad of applications. In this review, multiple studies have shown significant results by conducting analysis in a similar manner. One of the most intriguing aspects of wine purchases by consumers is price point considerations. With such a competitive marketplace, there is a need to understand consumers who purchase wines within a specific price range. A comparable survey was conducted that focused on price segmentation in the U.S. for wine consumers and significant differences were observed for several different criteria (Thach and Olsen 2015). This research focused on heavy-users of wine as these consumers are of special importance to marketing research. Heavy-users of a consumer product, in this case wine, were defined as those that consume wine more than once a week. Of significance, this group consumes 81% of all the wine in the U.S. This study segmented the group into "Low Spenders" (less than $10), "Moderate Spenders" ($10 – 15), and "High Spenders" (more than $15). Low spenders were found to be the oldest group with an average age of 50, moderate spenders had an average age of 43, and the high spenders were the youngest with an average age of 38. The researchers found it surprising that no statistical difference was observed for the three groups based on educational attainment. Gender differences were only significant at the $\alpha < 0.10$ level and they found that moderate spenders were slightly more likely to be female and high spenders were slightly more likely to be male. Unsurprisingly, the wine knowledge of the consumer was related to the amount typically spent for a bottle of wine. High spenders were the most interactive with wine based on several criteria outlined in the research and possibly as a result, also considered themselves to be the most knowledgeable. In stepwise fashion, moderate spenders were less involved than high spenders and the low spenders were the least involved. It was also observed that high spenders found it more difficult to find the exact wine that they wanted. Other research has shown that most consumers in the U.S. (49%) and Australia (48%) most frequently spend between $9 – 15 (Bleibaum et al. 2005). This research was conducted through a questionnaire and considered the potential differences in perception of wine closure between American and Australian consumers (300 responses and 400 responses, respectively). This research showed that Australian consumers typically spent slightly more on wines they purchased. Marin and Durham (2007) also found the most common

price range for consumers was from $6 – 10, with 56% of participants paying this price for red wine and 58% for white wine. Older consumers paid more than $11 (38% for white, 46% for red) compared to younger consumers (27% for either white or red).

As has already been seen, age differences may significantly differentiate consumers. The role of age in wine purchases and wine treatment behavior is important and is consistently seen to vary among different age groups. Marin and Durham (2007) found that a greater percentage of older consumers from the age range of 36 – 65 years old drank red or white wine more than 3 times a week (14%), compared to younger consumers of 21 – 35 years old (5%). One study examining specifically the Millennial generation found that 48% of their respondents who drank wine preferred red, 18% preferred white, and 34% liked both (Thach and Olsen 2006). Another study found that the Millennial and Traditionalist generations most frequently indicated that they started drinking "dry red wines", whereas the Gen Xers more frequently indicated "wine coolers" and Baby Boomers started with either "sweet sparkling wines" or "fruit wines" (Olsen et al. 2007). However, currently all four generation groups showed that they were most likely to currently be drinking "dry red wines", with "dry white wines" being the second choice.

Some of the major decisions when producing a wine come after the vinification process has completed. Choices on label design, information described on the labels, and bottle closure can all have significant impacts on the consumer's perception of a wine. Certain qualities may be considered more attractive and appealing than others for particular consumers. While there has been a significant amount of research regarding labels and their designs, these will not be discussed in much detail in this thesis as they are not related to this research. A study done by Chaney (2000) examined how consumers valued external information of wine in terms of importance rating, though this information did not necessarily need to be on the bottle itself (i.e., Internet, from wine seller). Technical information, such as winemaking techniques utilized, was rated as one of the least important attributes when considering purchasing a wine. However, Thomas and Pickering (2003) found that consumers rated both front and back labels as important in their purchasing decisions. Charters and Lockshin (1999) also found that over half of the respondents in their study utilized back label information when purchasing a bottle of wine. When

considering knowledge and involvement in this context, those who are more involved and knowledgeable about wine, source from a wider range of cues and resources when making purchasing decisions compared to those that are not as involved and knowledgeable (Rasmussen and Lockshin 1999). Another wine packaging attribute that consumers frequently consider is the wine closure. Commonly, there are two types of wine closures: cork or screw cap. There is a consumer perception component, where it has been shown screw cap closures are positively correlated with lower price point expectations and in some cases lower perceived quality (Marin and Durham 2007). Consumers expected to pay significantly less for a bottle with a screw cap closure. Bleibaum and coworkers (2005) found that in rating wine attribute importance, U.S. consumers rated closure the most important attribute with price following, whereas Australian consumers rated price as most important with the closure following. Furthermore, screw cap had a negative impact on purchase intent for U.S. consumers while Australian consumers were less influenced by screw cap closures. A study comparing Chardonnay and Merlot wines through consumer ratings for liking and quality scores based upon bottle closure found that the mean liking and quality score for Chardonnay was significantly lower for screw cap compared to the unknown of the same bottle (α = 1%) through paired t-test comparison (Marin et al. 2007). Though this difference was observed for the Chardonnay, there was no significant difference for the Merlot, however there was a significantly higher mean quality score (α = 1%) when it was known that the wine had a natural cork. Further data from this study found that with the statement "I would buy wine with a screwcap", only 34.0% agreed compared to the same question but with synthetic cork where 83.0% agreed.

One of the seemingly mindless treatments of a wine that a consumer commits, is the way in which a wine is stored after purchase. Storage conditions for wine can greatly impact its integrity and sensorial characteristics throughout the aging process. Numerous studies have shown how significant storage temperature is on the aromatic compounds of wine. The formation of ethyl esters from tartaric acid during wine aging is slower at 13°C than at 34°C (Edwards et al. 1985). Other research has shown that non-refrigerated wines have significantly decreased volatile compound concentrations compared to wines that were stored at 5°C (Pérez-Coello et al. 2003). This is not only cause for concern for consumers

at home, but also for distribution channels, as wine that has undergone improper storage and transportation can depreciate in value (Pullman et al. 2010). Other research has shown similar results, where wines stored at a constant temperature of 40°C for 3 weeks displayed significant differences compared to storage at a constant temperature of 20°C (Robinson et al. 2010). Indeed, closure type contributes significantly to this aging process as well. When comparing temperature and closure type, one study found that white wines with screw caps stored at 20°C for 3 months were higher in SO_2 than the same wine with natural cork but were still sensorially similar in attributes through descriptive analysis (Hopfer et al. 2012). Temperature is not only an important consideration for storage, but also for serving as well. If particular attributes for a wine are not met, this can significantly hinder the consumer's ability to enjoy a wine. Temperature significantly influences the wine when served, as the volatility of aromatics are highly dependent on this factor. One study examined red wine served at varying temperatures and analyzed the sensory properties of the wine through projective mapping (Napping). This study found that red wines at lower temperatures (10°C and/or 16°C) were described more often as sour, bitter, high in astringency and low in aroma attributes than the same wine at 22°C (Ross et al. 2012). Though temperature can alter the sensory profile of a wine, it is also important to keep in mind that consumers have particular expectations for many wine attributes, one of them being temperature. One study which evaluated *post hoc* comparisons, revealed that participants significantly expected to enjoy white wine better cold, than at room temperature or hot (Zellner et al. 1988). Similarly, respondents expected red wine to be significantly worse when hot rather than cold or at room temperature. This temperature expectation can then influence a consumer's liking of the wine. It is also important to recognize that the temperature expectation for a wine may be governed by other non-sensory factors, such as cultural norms and habituation. Certain cultures may be influential in the way a consumer treats and perceives a wine.

As will be shown in this research, wine knowledge seems to be one of the most important factors when segmenting consumers. The wine knowledge of a consumer can greatly impact their purchasing behaviors and wine habits. This was seen previously with the study conducted by Thach and Olsen (2015), where high spenders were the most involved and in turn the most knowledgeable about wine.

Another study segmented consumers into how knowledgeable about wine they were, based on correct answers to specific wine-related questions and their correct aroma identification. Based on the respondent's percentage of correct answers to the two tests, they were segmented into different quartiles on knowledge. It was found that 100% of the high expertise respondents, 67% of the medium expertise respondents, and 60% of the low expertise respondents consumed wine at least a few times a week (Johnson and Bastian 2007). There was a negative correlation ($r = -0.3$ at $p < 0.05$) between wine consumption and wine expertise. It should be noted however, that the researchers for this study mention that due to the low sample size, these results should only be used as a potential indicator to consumers' wine purchasing behavior being influenced by their expertise, and a validated method to segment Australian wine consumers based on their wine expertise. It was also found that low and medium expertise males consumed significantly more red wine than females. Other research has also shown that males, regardless of knowledge, display a higher preference towards reds over whites (Atkin et al. 2007).

Wine preservation devices were of particular interest for our study. There has been a growing prevalence of various devices in the market, though not much research has been conducted in this field. The oxidative process in a wine can quickly lead to changes in a wine once it has been opened, and thus provides a need for wine preservation devices, since some scenarios would only require a small portion of the wine to be poured at a particular time. This can also be applied to individual consumers at their place of residence, since the devices utilized for these methods are widely available for purchase. Two of the wine preservation devices that are specifically mentioned in this survey are the Coravin, and Vacu Vin. Coravin is a company that produces a wine preservation device that inserts a needle through the cork of a wine and displaces the wine that has been poured out with inert Argon gas (Anonymous B n.d.). The company claims that by doing so, the wine is never exposed to oxygen and therefore preserves the wine, keeping it fresh. There are multiple Coravin models available, which range on the company's website from $149.95 – 499.95 (Anonymous C n.d.). The Vacu Vin, as the name might imply, creates a partial vacuum in the bottle of wine after it has already been opened and some wine poured out. Based on the company's website, the various models range from €12.99 – 24.99 (Anonymous D n.d.). One study

looked at the efficacy of various wine preservation methods that are typically used for wines by the glass programs in restaurants. Simply recorking the wine and letting it sit at room temperature for over 24 hours was shown to significantly impact the wine and not a suitable way of preservation (Jacob III and Neal 2011). On the other hand, wines that were preserved with vacuum pumps and gas displacement devices were shown to be consistently counted correctly in a Duo-Trio test after 48 and 72 hours at room temperature, whereas the recorked wines were significantly different.

3. Materials and Methods

3.1 Survey

The survey was designed through Qualtrics® XM software and the research project received IRB permission from the University of California at Davis (IRB #1634946-1). The survey can be viewed in Appendix 1: Survey. The survey was disseminated through various personal and professional connections via email, word of mouth, and social media. From the time of receiving the first response to when the survey was concluded, the survey received 1,152 responses within a 3-month period. The survey consists of 51 questions, though respondents were not shown every question. This is due to the formatting of the survey. Based upon a respondent's selection to a particular choice, the sequential follow-up question to that question was either shown or not depending on an underlying "if, then" logic statement, see for instance, for question 20 (Q20

The survey is comprised of different types of question formats. The majority of the questions are formatted as standard multiple-choice questions. One similar variant to this is an option within the choices that allows the respondent to enter their own text as an answer. This was typically seen as an "Other:" option. Another question format is text entry, where the respondent did not have any multiple choices and was instead asked to give an answer. The last type of question that was utilized was a multiple selection question where respondents were capable of selecting more than one answer for a single question. When analyzing this type of question, individual choices were counted rather than each unique respondent. Most significantly it is important to understand that respondents were allowed to skip any question within the survey, which was clearly outlined in the beginning disclaimer agreement within the survey. This resulted in a lot of unusable data as many respondents did not entirely complete the survey. Due to the original setup of the survey through Qualtrics® XM, the survey automatically recorded responses after 2 weeks from the time the respondent started the survey. Also, somewhat confusingly, the question numbers are not in any numerical order and question numbers are repeated though they represent entirely different questions (ex: Q16, Q16.2

Questions pertaining to price were formed originally in US Dollars in a manner that was thought to elucidate potential differences, while fully encompassing the breadth of potential price range. European, Australian, and New Zealand currencies were assumed to be relatively close to the US Dollar in exchange, which resulted in those respondents being displayed the same questions relating to price. For Chinese and South African respondents, price points were set at similar values as the aforementioned price points for the US Dollar group, while slightly adjusting it in order to obtain less confusing and seemingly normal price points. When comparing between prices, the exchange rate was determined from August 1st, 2020. Furthermore, for questions 13 and 15 (Q13 and Q15), since these were text entry questions, price ranges were formed post-survey only for analysis and were grouped together accordingly. These price ranges were formed in $10 USD increments, or the approximate equivalent for South African and Chinese respondents.

3.2 Data Analysis

Analysis was conducted through the XLSTAT (Addinsoft, 2020.4.1) plugin. This software provided easy analysis through its calculation programs. Heavily utilized was the chi-square option, which yielded theoretical frequencies and p-values via Fisher's exact test for a particular contingency table. Significant values were determined at the 95% confidence level ($\alpha = 0.05$). Any significant results found for cells with theoretical values less than 5 were not discussed and ignored due to high variability at this level. For chi-square tests, any column or row within the contingency table with a zero total summation was deleted in order to conduct the test, as the XLSTAT software would prevent the calculation from ensuing.

4. Results & Discussion

It should be noted that respondents were able to skip questions if they desired, therefore contingency table totals frequently varied from table to table. Furthermore, certain question types like multiple select questions altered the total as well, since respondents were able to choose more than one choice. Survey responses that were submitted by the respondents themselves (even if not completed entirely) were utilized in the data analysis. The majority of the data can be segmented into frequency or percentage results, and chi-square test results. The following sections are outlined by the overall results and then more specific comparisons between various consumer groups and regions.

4.1 Overall

Of the 1,152 responses that were originally recorded, 994 (86.28%) were complete and usable for analysis, which represents the "Overall" data. There were 372 (37.42%) responses from the United States, 21 (2.11%) from Australia, 26 (2.62%) from New Zealand, 157 (15.79%) from China, 241 (24.25%) from any European country (including the UK, since this this survey closed in 2020), 142 (14.29%) from South Africa, and 35 (3.52%) were from "Other". The total responses from these regions were expected and were mostly a result of personal connections and method of distribution. Therefore, it is not indicative of relative wine consumption. This segmentation was determined by what the respondent chose as their currency, and not physical location. Respondents chose currency based on "what they use", and if none of the currency options displayed were what they used, they were instructed to choose a currency that was the closest in exchange rate to the US Dollar. The analysis was performed this way in order to account for certain respondents who were residing in a foreign country but were more familiar with their native currency. In making this decision, familiarity with one's native currency seemed to be more apt and appropriate when asking respondents for their purchasing decisions. Due to the formatting, there were 35 responses from countries whose currency was not displayed. Due to the mixture of countries from this group, specific comparisons were not drawn from for this group as there was no shared connection other

than the aforementioned lack of their native currency being displayed. That being mentioned, when evaluating what respondents chose as their currency and the country they currently resided in, the far majority of respondents resided in the same country as the currency they chose (13 responses aside from the "Other" group differed from the country they resided in and the currency they chose). Another consequence of analyzing the data in this manner was the incapability of comparing the overall results for any questions pertaining to price due to the varying differences in exchange rate.

Surprisingly, there was a much larger percentage of female respondents 619 (62.53%) compared to male 357 (36.06%), with the remaining 14 (1.41%) being respondents who preferred not to say. The age range was expected, ranging from 21 – 74 with an average age of about 36 years old. The majority of respondents had completed either a bachelor's degree or a master's degree, 401 (40.46%) and 307 (30.98%) responses, respectively. As for wine knowledge, most responses were either very knowledgeable or somewhat knowledgeable at 322 (32.49%) and 475 (47.93%) responses, respectively.

4.1.1 Red or White Wine Preference

The first question of the survey asked respondents for their preference between red or white wine. They could also indicate no preference. The share of preferences was split nearly evenly among the three choices, though red wine was the most preferred at 38.53% compared to 28.87% for white wine, and 32.60% for no preference. Thach and Olsen (2006) found similar results for their market segmentation for young adult wine drinkers, with 48% preferring red, 18% preferring white, and 34% liking both. There is about a 10% difference between red and white drinkers between this research and the aforementioned study, though this may be attributed to the fact that the Thach and Olsen study examined only the Millennial generation and ages ranged from 21 – 27, whereas our study is comprised of respondents aged 21 – 74. Though somewhat trivial, this is a significant result in itself, as immediately it appears as though consumers tend to prefer red wine over white wine. Depending on the context under which these results are examined, this percent difference could be significant in some cases and not in others. When

considering age, significant chi-square results were obtained for age groups and wine preference, showing that red wine drinkers were more likely to be 21 – 29 years old and less likely to be 30 – 39 years old (**Table 1**).

Table 1 Wine preference compared to respondent age[a]

Wine preference (Q5)	Age (Q39)						Total
	21 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	
Red wine	159	83	55	45	26	6	374
White wine	109	84	37	37	14	2	283
No preference	102	115	45	35	21	2	320
Total	370	282	137	117	61	10	977

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Conversely, consumers who had no white/red wine preference were more likely to be 30 – 39 years old and less likely to be 21 – 29 years old. It should be noted that the 21 – 29 year old and 30 – 39 year old age groups made up the most responses for this question (37.87% and 28.86% respectively). With more results to follow, this is one of the first indications of the differences between the younger 21 – 29 year old and the 30 – 39 year old age group. Though significant results were obtained for education levels, this data did not seem to have much association and appeared to be somewhat random. One of the most telling questions of the survey, asked respondents how knowledgeable they considered themselves to be about wine; these chi-square results are shown below in **Table 2**.

Table 2 Wine preference compared to wine knowledge[a]

Wine preference (Q5)	Wine knowledge (Q43)				Total
	Very knowledgeable	Somewhat knowledgeable	Not very knowledgeable	Not knowledgeable at all	
Red wine	96	207	70	9	382
White wine	72	134	64	15	285
No preference	154	134	33	3	324
Total	322	475	167	27	991

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

The chi-square test is comparing the cell, row, and column total and demonstrates why certain values were more or less than expected. Red wine preferring consumers were more likely to be somewhat knowledgeable and less likely to be very knowledgeable. White wine preferring consumers were more likely to be not very knowledgeable and not knowledgeable at all, and less likely to be very knowledgeable, though the most responses were observed for being somewhat knowledgeable. The distinction is observed for consumers who have no preference, who were more likely to be very knowledgeable and less likely to be somewhat, not very, or not knowledgeable at all. Keep in mind that this wine knowledge question is simply asking respondents what they consider themselves to be and is rather subjective. There was no test done to discern how knowledgeable the consumers actually were about wine, and therefore this is a self-reflection on how knowledgeable respondents perceive themselves to be. This data suggests that those who consider themselves to be more knowledgeable about wine, do not have a particular preference between red or white wine. Meanwhile, those that have a preference towards either white or red may be groups of participants who are less knowledgeable about wine. As stated previously, the 30 – 39 year old group is more likely to not have a wine preference. This

connection may suggest that this group would consider themselves to be more knowledgeable about wine. This was in fact observed with questions later in the survey when comparing those two characteristics, shown in **Table 3**.

Table 3 Respondent age compared to wine knowledge[a]

Age (Q39)	Wine knowledge (Q43)				Total
	Very knowledgeable	Somewhat knowledgeable	Not very knowledgeable	Not knowledgeable at all	
21 – 29	113	163	80	14	370
30 – 39	116	133	28	3	280
40 – 49	35	75	25	2	137
50 – 59	28	64	21	3	116
60 – 69	22	30	7	2	61
70 – 79	4	1	3	2	10
Total	318	466	164	26	974

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Other demographic data for preferences between red and white wine showed that red wine consumers were more likely to be male and white wine consumers were more likely to be female. These results have been observed in other studies, where men had significantly higher preferences for red wine than women (Atkin et al. 2007).

One particular interest of this study was how frequently consumers drank wine. Any association between a consumer's wine preference and the frequency in which they drank wine would be of great importance, as high frequency users are considered to be crucial to marketing research (Thach and Olsen

2015). In **Table 4**, it was found that consumers who prefer white wine were more likely to be monthly drinkers, red wine preferring consumers were less likely to be daily drinkers, and no preference drinkers were more likely to be daily drinkers and less likely to be monthly drinkers.

Table 4 Wine preference compared to wine consumption frequency[a]

Wine preference (Q5)	Consumption frequency (Q6)					Total
	Daily	Weekly	Monthly	Once or twice a year	Other	
Red wine	63	202	78	23	17	383
White wine	54	142	66	18	7	287
No preference	83	178	38	11	14	324
Total	200	522	182	52	38	994

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

There was no expected association between these two variables. This data may suggest that consumers who prefer white wine may drink less frequently than drinkers who have no preference. For consumption frequency, weekly drinkers represented over half of the total responses (52.52%), followed by daily drinkers (20.12%). In each category of wine preference, the most responses were seen in weekly consumption. As seen in other research, those that are consuming wine more frequently may consider themselves more knowledgeable about wine (Johnson and Bastian 2007). With the results observed thus far, the no preference group is trending in the direction of being more knowledgeable about wine, more likely to be 30 – 39 years old, and more frequent drinkers than those who prefer white/red wine.

There was an overwhelming response towards drinking white wine at cooler than room temperature (80.63%). Only two respondents prefer white wine at warmer than room temperature. These

results were expected and unsurprising based on the convention of serving white wine at a cooler temperature than red wine, which is around 8 – 12°C for white and 18 – 22°C for red (Jackson 2002). *Red wine consumers* were more likely to prefer *white wine* at *about room temperature*, while *consumers who had no preference* between red or white wine were more likely to consume their *white wine* at a temperature which *depended on the wine.* The same relationship was observed between consumers who have no red or white wine preference and the red wine temperature, with a higher association with it depending on the wine. Though there was a higher association between *red wine preferring* consumers and preference for *white wine* at *about room temperature*, "about room temperature" for white wine only made up 1.92% of the total responses for this question. On the other hand, there was a clear difference for what temperature consumers prefer red wine, with "about room temperature" representing 52.12% of the responses. There was a higher association between consumers who prefer their white wine cooler than room temperature and about room temperature for red wine. A sequential question was displayed to respondents who chose "cooled setting" asking whether the red/white wine was stored in a refrigerator, wine refrigerator, or something else ("Other"). The vast majority of respondents chose refrigerator as their cooled setting for storing white wine (84.81%). Only 13.04% stored their white wine in a wine refrigerator. For storing red wines, similarly to white wines, 76.85% of the respondents chose to store in refrigerators, while 20.29% stored red wine in a wine refrigerator. Interestingly, there is about a 7% increase in storage for red wine in wine refrigerators. The only significant chi-square result for this set of "cooled setting" questions (Q21.2 Q23) showed that *white wine drinkers* were more likely to store *red wine* in a *refrigerator*. Since 84.81% stored their white wine in a refrigerator, this significant result may suggest that the white wine consumers will store red wine in the same manner. Of course, it is clear that refrigerators are more ubiquitous than wine refrigerators and thus, all types of wine will be more commonly stored this way. Given that the recommended refrigerator temperature is around 37°F (~3°C) (Wroclawski 2019) and can vary sometimes by 5°F, consumers may be overchilling their white wines. Though higher storage temperatures may be more problematic for wine storage, wines at cooler temperatures may exhibit muted aromas compared to slightly warmer temperatures (Ross et al. 2012).

Furthermore, wines that have not been previously cold stabilized may exhibit tartrate crystallization at cooler temperatures, as potassium bitartrate is less soluble at lower temperatures and more likely to precipitate and crystallize (Scott et al. 1981, Dharmadhikari n.d.). Consumers unaware of this may perceive it as a wine fault and thus lead to a diminished perception in quality of the wine.

Expected results were obtained for questions asking respondents whether they were more likely to purchase a red or white wine based on its closure. For white wine closure, 57.32% were indifferent, 25.53% chose screw cap, and 17.15% chose cork. Much different results were observed for red wine closure: 46.77% chose cork, 43.23% were indifferent, and 10.00% chose screw cap. Chi-square results revealed interesting relationships (**Table 5**).

Table 5 Wine preference compared to white and red wine closure preference[a]

Wine preference (Q5)	White wine closure (Q18)			Total
	Cork	Screw cap	Indifferent	
Red wine	93	91	198	382
White wine	39	100	148	287
No preference	38	62	222	322
Total	170	253	568	991

Wine preference (Q5)	Red wine closure (Q19)			Total
	Cork	Screw cap	Indifferent	
Red wine	205	42	135	382
White wine	133	36	117	286
No preference	125	21	176	322
Total	463	99	428	990

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Red wine drinkers were more likely to purchase a *red and white wine* with *cork* and were less *indifferent* to the *white and red wine closure*, demonstrating a preference towards cork regardless of whether it is white, or red. *White wine drinkers* were more likely to purchase a *white wine* with a *screw cap* and less *indifferent* to the *white wine closure*, however there were more responses for no preference to the white wine closure. Drinkers with *no preference* towards red or white wine were more likely to be *indifferent* to the wine closure for *both white and red wine*. This data reveals more on the individual tendencies within these three wine preferring consumers. In this case, the no preference group appears to not care as much about a wine's closure, especially in the case of white wine. Red wine preferring consumers appear to be more akin to cork in both red and white wine. Given the conventionality of using cork for most red wines, red wine consumers may then have this same expectation for white wines. This is again another case where the manner in which a consumer treats the wine they prefer, is similar or the same to the way they treat a wine that would not be their first preference. The increase in cork preference for red wine across the three groups is surprisingly high, though this was still expected. Other research supports the data found for this relationship, as screw cap closures have been shown to potentially engender negative perception of wines among particular consumer groups (Bleibaum et al. 2005, Marin et al. 2007). Interestingly the higher than expected responses for white wine screw cap among white wine preferring consumers was observed. Other associations later in this research may explain this observation, as some research has shown a lower price expectation for wines with screw cap (Marin and Durham 2007).

When asking respondents how quickly they finished a wine, the majority finished either white or red wine within either 24 hours or 2 days. For white wine, 36.57% finished within 24 hours and 33.54% finished within 2 days. For red wine, 29.17% finished within 24 hours and 33.98% finished within 2 days. Interestingly, there was a lower number of responses for finishing a red wine within 24 hours compared to white wine. This may suggest that respondents possibly take a longer amount of time to finish a bottle of red wine compared to a bottle of white wine. Furthermore, there may be an association between red or white wine drinkers and how long it takes for that consumer to finish a wine. Based on chi-square results, *red wine drinkers* were more likely to finish a bottle of *white wine within 1 week* and similarly, *white*

wine drinkers were more likely to finish a bottle of *red wine within 1 week*. This may suggest that based on a consumer's red or white wine preference, it may take the consumer longer to finish a bottle of wine that is not their first preference.

One topic of interest was any possible association between particular consumer bases and wine preservation devices. This question was a multiple selection question thus, the totals will be greater for this data than total respondents and will not be consistent with other questions since respondents were able to select more than one choice. For this question, 688 responses were recorded for having no wine preservation device, which was the large majority (64.84%). There were 123 responses (11.59%) recorded for owning a Coravin, 175 (16.49%) for Vacu Vin, 46 (4.34%) for inert gas can, and 29 (2.73%) for "Other". When considering chi-square results, *white wine* consumers were more likely to *not own a wine preservation device*, while *no preference drinkers* were less likely to *not own a preservation device*. Now that respondents had displayed whether they owned a wine preservation device, subsequent questions were interested in discerning any potential differences for wine preservation device owners. Most results were insignificant, though interestingly red wine consumers were more likely to store a wine at a different temperature after using a wine preservation device. This question did not specify exactly at what temperature difference that might have been, so it is unknown from this data how different the consumers store their red wine after using a wine preservation device. It should be noted that 52 of the 303 responses (17.16%) replied yes to storing wine at a different temperature after utilizing a wine preservation device. More significant results were expected in the comparison of wine preference and wine preservation device ownership, though the white wine preferring significant result does stand out. The white wine preferring group may consist of more individuals who are not as knowledgeable about wine, and therefore ownership of a niche device for very specific use may not be of great interest for these individuals.

A series of questions at the end of the survey were interested in consumer's opinion on information displayed on a bottle of wine. When asked whether consumers were more likely to purchase a bottle of red/white wine based on information on how it was made, 51.06% chose yes, 22.24% chose no,

and 26.69% were indifferent for this information on a bottle of white wine. Similar results were obtained for red wine, with 54.86% choosing yes, 19.94% choosing no, and 25.20% being indifferent for this information on a bottle of red wine. When asked whether consumers were more likely to purchase a bottle of red/white wine based on information on specific chemical data, it seemed less respondents were interested in this information. Nearly identical responses were obtained for red and white wine, with 41.96% choosing yes for white wine and 40.97% choosing yes for red wine. Similar to previous results, it seems respondents are less interested in wines that are not their first preference. In the context of this series of questions, red wine drinkers were not more likely to purchase a bottle of white wine with information on how it was made. The general interest in back label information has also been found in other research, showing that consumers will often utilize this information when considering wine purchases (Thomas and Pickering 2003).

4.1.2 Wine Consumption Frequency

As was observed in 4.1.1 *Red or White Wine Preference*, weekly drinkers were the highest response rate for all three wine preferring groups, though white wine consumers were more likely to be monthly drinkers and consumers with no preference were more likely to be daily drinkers. Another large amount of significant data was observed for consumers based on their frequency of consumption. It is important to recognize that this question did not ask how frequently respondents consumed either red or white wine, but rather wine in general.

Questions 16 and 17 (Q16, Q17) asked respondents at what temperature they preferred white or red wine. This data is shown in **Table 6**.

Table 6 Wine consumption frequency compared to white and red wine temperature preference[a]

Consumption frequency (Q6)	White wine temperature preference (Q16)				Total
	About room temperature	Warmer than room temperature	Cooler than room temperature	Depends on the wine	
Daily	1	0	148	50	199
Weekly	5	1	434	81	521
Monthly	8	1	150	23	182
Once or twice a year	5	0	41	6	52
Other:	0	0	26	11	37
Total	19	2	799	171	991

Consumption frequency (Q6)	Red wine temperature preference (Q17)				Total
	About room temperature	Warmer than room temperature	Cooler than room temperature	Depends on the wine	
Daily	84	2	58	55	199
Weekly	294	3	98	126	521
Monthly	101	5	43	32	181
Once or twice a year	22	4	18	8	52
Other:	15	1	12	9	37
Total	516	15	229	230	990

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

For *white wine consumption temperature*, there was a higher than expected count for *daily consumers* and it "*depending on the wine*", though nearly 75% of *daily drinkers* preferred *white wine* at *cooler than room temperature*. *Weekly drinkers* were more likely to prefer their *white wine cooler than room temperature*. Interestingly, a higher than expected count for *daily drinkers* and preference for *red wine at cooler than room temperature* was observed, while *weekly drinkers* were more likely to prefer their red wine at *about room temperature*. Still, the majority of daily drinkers preferred their red wine at about room temperature (42.21%), compared to cooler than room temperature (29.15%). This data may suggest that highly frequent consumers such as daily drinkers, may be more considerate in their storage and wine preference decisions. The higher counts for about room temperature for red wine compared to white wine fits conventions which show that consumers prefer red wine to be served at room temperature than at refrigeration temperature (Zellner et al. 1988).

Screw cap seemed to be the preference for red wine for less frequent drinkers as there was a higher than expected frequency for monthly and once or twice a year drinkers. Screw cap wines may represent a wine that is more easily drinkable and for a less frequent drinker, may be an appealing characteristic. Furthermore, simply being able to twist off the cap as opposed to opening a corked wine with a corkscrew represents an ease of consumption, which may be another a factor that less frequent consumers are considering. Possibly most telling is the association between screw cap wines and their price point, as screw cap wines may be less expensive than cork wines and therefore, less frequent drinkers may be more willing to purchase an inexpensive wine compared to an expensive wine (Marin and Durham 2007). However due to the differences in currency and format of the survey, these associations are not conducted for the overall data, and any price comparisons are made in 4.2.1 *Price Considerations*.

Unsurprisingly the frequency with which a respondent drank wine was associated with how quickly they finished white or red wine. For both red and white wine, daily drinkers were more likely to finish within 2 days, while monthly and once or twice a year drinkers were more likely to finish within 1 week. Though these results may be slightly intuitive, it is still a very important observation. By knowing

that more frequent drinkers are more likely to finish a bottle of wine more rapidly than a less frequent drinker, one can make more informed decisions on how to treat these two market segments. It may be in the best interest of a particular producer to market their wine to more frequent drinkers as their wine may be best when consumed rapidly, though not encouraging over-indulgence. Indeed, there are also significant monetary considerations to make as well, as more frequent drinkers may finish the wine more quickly and may make more frequent purchases. This essentially would expedite the cycle between purchase, consumption and re-purchase. Furthermore, these frequent drinkers (daily and weekly drinkers) consume around 81% of the wine in the U.S. (Thach and Olsen 2015).

A series of questions were concerned with how consumers stored their wine after the wine had already been opened. When storing white wine, weekly drinkers were more likely to store it in a cooled setting. Also, more frequent drinkers were more likely to store their wines in a wine refrigerator than a refrigerator (**Table 7**). *Daily drinkers* were more likely to store *both white and red wine* in a *wine refrigerator*, whereas *monthly* and *once or twice a year drinkers* were more likely to store *white and red wine in a refrigerator*. Again, the majority of responses for daily drinkers actually stored their white and red wine in a refrigerator, but still higher than expected responses were found for wine refrigerator storage. When considering this observation with the data above (**Table 6**), there may be a problematic storage tendency among less frequent drinkers. As shown in previous research, the storage temperature of a wine has a large impact on its maturity, especially once exposed to oxygen. Thus, less frequent drinkers who not only may be taking longer to finish their wine, are also not as likely to store their wines in a wine refrigerator, which would be a conducive environment in preserving the wine and slow the oxidative process (Pérez-Coello et al. 2003, Edwards et al. 1985).

Table 7 Wine consumption frequency compared to white and red wine stored cooled setting preference after opening[a]

Consumption frequency (Q6)	White wine storage choice after opening (Q21.2)			Total
	Refrigerator	Wine refrigerator	Other:	
Daily	139	39	6	184
Weekly	401	63	7	471
Monthly	143	10	3	156
Once or twice a year	40	1	0	41
Other:	25	2	3	30
Total	748	115	19	882

Consumption frequency (Q6)	Red wine storage choice after opening (Q23)			Total
	Refrigerator	Wine refrigerator	Other:	
Daily	54	34	2	90
Weekly	165	44	5	214
Monthly	69	6	0	75
Once or twice a year	23	0	1	24
Other:	11	1	4	16
Total	322	85	12	419

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Expected results were also observed for consumers who owned wine preservation devices (**Table 8**).

Table 8 Wine consumption frequency compared to wine preservation device ownership[a]

Consumption frequency (Q6)	Wine preservation device ownership (Q24)					Total
	Coravin	Vacu Vin	Inert gas can	None	Other:	
Daily	56	50	16	101	4	227
Weekly	52	104	22	360	16	554
Monthly	11	16	3	151	5	186
Once or twice a year	0	1	3	47	1	52
Other:	4	4	2	29	3	42
Total	123	175	46	688	29	1061

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Daily drinkers were more likely to own a Coravin, Vacu Vin, and/or inert gas can and less likely to not own a wine preservation device. Again, the most responses were seen with not owning a wine preservation device, though the expected responses for daily drinkers and the ownership of the aforementioned wine preservation devices was significantly lower. Monthly and once or twice a year drinkers were more likely to not own a wine preservation device. This is a crucial point, as these preservation devices are obviously used to preserve wines in the event that the consumer does not finish the entire bottle. When combining this information with the previous results, there seems to be a problematic association with less frequent drinkers taking longer to finish a bottle of wine but also being more likely to not own a wine preservation device. Certainly, wine preservation devices will help in preserving wines for more frequent consumers who may finish their wines within 2 days (Jacob III and Neal 2011). However, there appears to be a need for consumers who are less frequent drinkers and may take longer to finish their wine, and thus have a greater need for a wine preservation device. This would

allow less frequent drinkers to retain the integrity of the wine over the course of time that it takes for them to finish it, which evidenced by the data in this research, appears to be a longer period than more frequent drinkers.

For demographics within this frequency consumer group, the 60 – 69 year old age group was more likely to be daily drinkers and less likely to be weekly drinkers. On the younger side of the spectrum, 21 – 29 year olds were less likely to be daily and once or twice a year drinkers and more likely to be monthly drinkers. This is an interesting observation, as the 21 – 29 age group may represent a segment of the market that does not drink wine as frequently as older generations, but also not infrequent enough to be insignificant. It was also observed that male consumers were more likely to be daily drinkers, while female consumers were less likely to be daily drinkers. This relationship was also observed in other research where substantially more males were found to drink wine daily compared to females (Bruwer 2007). Finally, and maybe most enlightening, was the comparison between wine consumption frequency and wine knowledge (**Table 9**). Daily drinkers were more highly associated as being very knowledgeable and less association with not very and not at all knowledgeable. Meanwhile less frequent drinkers like monthly and once or twice a year drinkers were more likely to be not very knowledgeable and less likely to be very knowledgeable. This observation was an expected result, as frequent consumers are likely consuming a product more frequently that they are highly familiar with (Thach and Olsen 2015). This informs a lot of the previous results as well, such as the frequent drinkers being more likely to own a wine preservation device. With more significant results being shown for this question, it shows its importance and how influential it may be in consumer's treatment, tendencies and perception of wine. By educating less frequent drinkers, there may be a shift in their consumption rate, or maybe their decision making while still continuing to consume at the same rate. Of course, when considering the fact that wine is an alcoholic beverage, pushing for more consumption should not be the sole motivation, and moderation should be emphasized. Producers seeking to capitalize on the more frequent drinkers of wine, may instead look towards price shifts as consumers become more familiar with

wine. Again, price comparisons are not made in this section and will be considered in 4.2.1 *Price Considerations*.

Table 9 Wine consumption frequency compared to wine knowledge[a]

Consumption frequency (Q6)	Wine knowledge (Q43)				Total
	Very knowledgeable	Somewhat knowledgeable	Not very knowledgeable	Not knowledgeable at all	
Daily	105	86	9	0	200
Weekly	181	267	68	5	521
Monthly	24	89	61	7	181
Once or twice a year	1	20	21	9	51
Other:	11	13	8	6	38
Total	322	475	167	27	991

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

4.1.3 Closure Preference

Respondents were asked whether they were more likely to buy a wine with a cork or screw cap, which was split into two questions for white and red wine. As has been discussed already in 4.1.1 *Red or White Wine Preference*, cork closures were preferred by red wine consumers for both white and red wine, white wine consumers had an association with screw cap for white wines, and consumers with no preference were more likely to be indifferent for both red and white wine closure. Also, in 4.1.2 *Wine Consumption Frequency*, screw cap for red wines was at a higher than expected frequency for monthly

and once or twice a year consumption consumers. In this sub-section unsurprisingly, consumers were more likely to have the same closure preference for both white and red wine (i.e., those that prefer cork for white wine also prefer cork for red wine). This is another indication of consumers exhibiting a particular preference and perception of wine, regardless of the type of wine.

Interestingly, consumers who prefer *cork* for a *white wine* were more likely to *finish a bottle of red wine within 24 hours*, whereas those who prefer a *screw cap* for *white wine* were more likely to *finish a bottle of red wine within 1 week*. This observation was not made for consumers who prefer a certain type of closure for red wine. This may tie back into the question of how quickly consumers finish a bottle of wine. It was seen that drinkers who typically finish their wine more rapidly, were more likely to be more frequent drinkers, of whom were more likely to consider themselves very knowledgeable about wine. Another consideration is that red wine preferring consumers were shown to prefer cork for both red and white wine (**Table 5**). Therefore, this question may be a roundabout way of evaluating red wine consumers and white wine consumers, as it was also shown that consumers are more likely to finish a wine that is their dominant preference more quickly than one they do not prefer as much (4.1.1 *Red or White Wine Preference*). Essentially, those that prefer cork for a white wine were more likely to finish a bottle of red wine within 24 hours likely because this group was comprised mostly of red wine consumers. Similarly, those that prefer screw cap for white wine were more likely to finish a bottle of red wine within 1 week possibly due to the fact that this group may have been mostly white wine consumers. There is also a price consideration, as more frequent drinkers who finish their wines more rapidly, may also be spending more money on wine. Other research has shown an association between wine closure and price perception (Marin and Durham 2007). It was also observed that consumers who prefer cork or screw cap for white wine were more likely to dispose of white wine within 24 hours. This relationship was not observed for red wine closure.

It was also found that consumers who prefer *cork* or *screw cap* for *white wine* were more likely to store their *white wine at room temperature*, whereas respondents who were *indifferent* to *white wine closure* were less likely to store *white wine at room temperature*. However, this significance for cork and

screw cap for was in the minority, as most respondents chose a cooled setting as their white wine storage preference. Those who prefer *cork* for *red wine* were more likely to *store red wine at room temperature*, whereas *indifferent respondents* to *red wine closure* were more likely to be *unsure* or that it *depended on the red wine*. Recognize that one of the answers to this question was "unsure/depends" and thus were not separated. Therefore, whether the respondent was unsure or whether it depended on the wine is not discernable. If the respondents had chosen the "cooled setting" option for this question, the next question asked in what kind of setting: refrigerator, wine refrigerator, or other (**Table 10**).

Table 10 Red wine closure preference compared to red wine cooled setting storage preference after opening[a]

Red wine closure preference (Q19)	Red wine storage preference after opening (Q23)			Total
	Refrigerator	Wine refrigerator	Other:	
Cork	134	46	6	186
Screw cap	45	3	1	49
Indifferent	143	35	5	183
Total	322	84	12	418

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Respondents who tended to purchase a *red wine* with a *cork* were more likely to store it in a *wine refrigerator*, and less likely to store in a *refrigerator*. On the other hand, the *screw cap group* was more likely to store in a *refrigerator* and less likely to store in a *wine refrigerator*. Clearly the refrigerator option is still the majority choice for those that prefer cork for red wine, though the number of responses for storing red wine in a wine refrigerator was significant.

When asked whether respondents owned a wine preservation device, for *both red and white wine*, respondents who were more likely to prefer a *screw cap*, were more likely to *not own a wine preservation device*. Considering that wines under screw cap may be associated with wines that are quickly drank and unfit for long term aging, these observations are in support of this. The wine preservation device's purpose is to do just that, preserve and uphold the integrity of the wine against influential oxygen ingress. Consumers who are more likely to purchase a bottle of red/white wine with a screw cap are likely unconcerned about aging the bottle. However, as stated above from previous results, consumers who prefer white wine with a screw cap were more likely to finish a bottle of red wine within 1 week, which when considering other research, is a sufficient amount of time for the wine to be sensorially and chemically altered (Jacob III and Neal 2011).

Lastly, the only significant results obtained from the final question in the survey showed that consumers who were more likely to purchase a bottle of red wine with a screw cap, were more likely to be not very knowledgeable, and less likely to be very knowledgeable about wine. This was a surprising result, as this question typically had a significant result. Further research should examine the knowledge of a consumer and their wine closure preference.

4.1.4 Quick versus Slow Drinkers

Previous results showed that most respondents finish white and red wine within either 24 hours or 2 days and that those with a particular red or white wine preference may take longer to finish a bottle that is not their foremost preference (4.1.1 *Red or White Wine Preference*). Also, it was shown that more frequent consumers were more likely to finish a bottle of wine more quickly than less frequent drinkers (4.1.2 *Wine Consumption Frequency*). This section of the survey was interested in seeing how quickly a consumer will typically finish a bottle of wine. It was quite clear that consumers treated both white and red wines similarly, in terms of how quickly they finished a bottle of wine. Essentially, consumers were

more likely to finish a bottle of white wine in the same time frame for red wine and vice-versa. This data is shown below in (**Table 11**).

Table 11 Time to typically finish a bottle of white wine compared to time to typically finish a bottle of red wine[a]

Time to finish bottle of white wine (Q16.2)	Time to finish bottle of red wine (Q17.2)					Total
	Within 24 hours	Within 2 days	Within 4 days	Within 1 week	Other	
Within 24 hours	237	98	8	9	6	358
Within 2 days	28	193	72	19	11	323
Within 4 days	7	25	72	29	1	134
Within 1 week	8	12	9	86	9	124
Other	3	2	2	3	24	34
Total	283	330	163	146	51	973

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

For white wine the majority finished it quite rapidly: 36.57% finished within 24 hours, and 33.54% finished in 2 days. For red wine, a decrease was observed for consumers who finished their wine within 24 hours, with 29.17% choosing this option. This may suggest that it typically takes consumers longer to finish a bottle of red wine than a bottle of white wine. There was no increase for finishing a bottle of red wine within 2 days compared to white wine, but there were small increases for finishing it within 4 days, within 1 week, and "other". This would make sense, as the higher prevalence of polyphenolic concentration in red wines compared to white wines would provide greater protection against oxidative

pathways (Danilewicz and Standing 2018). Consumers who are aware of this phenomenon may then be less concerned with consuming a bottle of red wine as quickly as a white wine.

Results for time to finish and dispose of wine are shown below (**Table 12**, **Table 13**).

Table 12 Time taken to finish WHITE WINE compared to time to dispose of white and red wine[a]

Time to finish bottle of white wine (Q16.2)	Time to dispose of white wine (Q18.2)					Total
	Within 24 hours	Within 2 days	Within 4 days	Within 1 week	Other	
Within 24 hours	109	97	59	65	31	361
Within 2 days	12	75	106	95	40	328
Within 4 days	1	3	37	70	25	136
Within 1 week	5	4	5	66	46	126
Other	5	3	2	3	20	33
Total	132	182	209	299	162	984

Time to finish bottle of white wine (Q16.2)	Time to dispose of red wine (Q19.2)					Total
	Within 24 hours	Within 2 days	Within 4 days	Within 1 week	Other	
Within 24 hours	84	92	75	80	29	360
Within 2 days	13	54	92	126	45	330
Within 4 days	0	7	24	64	40	135
Within 1 week	8	7	9	55	46	125
Other	5	3	6	1	19	34
Total	110	163	206	326	179	984

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

A similar trend from **Table 12** was observed for **Table 13** and shows that the time to finish and dispose of a wine is similar for both white and red wine.

Table 13 Time to finish RED WINE compared to time to dispose of white and red wine[a]

Time to finish bottle of red wine (Q17.2)	Time to dispose of white wine (Q18.2)					Total
	Within 24 hours	Within 2 days	Within 4 days	Within 1 week	Other	
Within 24 hours	86	78	46	51	22	283
Within 2 days	28	68	102	90	42	330
Within 4 days	8	18	48	65	23	162
Within 1 week	6	9	7	77	47	146
Other	5	4	3	12	26	50
Total	133	177	206	295	160	971

Time to finish bottle of red wine (Q17.2)	Time to dispose of red wine (Q19.2)					Total
	Within 24 hours	Within 2 days	Within 4 days	Within 1 week	Other	
Within 24 hours	86	78	48	50	22	284
Within 2 days	8	72	113	102	35	330
Within 4 days	4	4	33	91	30	162
Within 1 week	8	4	3	73	57	145
Other	5	2	3	6	35	51
Total	111	160	200	322	179	972

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

From these results, it seems that respondents will typically finish or dispose of their red or white wine in similar time frames. Interestingly there was a significant increase in the "other" category when going from time to finish a bottle of wine, and time to dispose of a bottle of wine. These increases were ~13% for both red and white wine. Anecdotally evaluating the responses entered (since they were allowed this option when choosing "other") revealed that many respondents would not or never dispose of a wine. This is one fault of conducting surveys, where a lack of options for a subjective question may leave respondents with no ideal choice and are then forced into a different answer (Iversen and Gergen 1997). Thankfully for this question, the option to put "other" as an answer allowed this significant portion of participants to correctly voice their habits.

When asked how respondents stored a bottle of white wine after opening it, those who *finish a bottle of white wine within 1 week* had a higher than expected number of responses to *store it at room temperature*, and those who *finish a bottle of white wine within 2 days* were less likely to *store it at room temperature*. This shift seems to be problematic, as again there's an association with consumers potentially mishandling their wine. As stated previously, other research has shown the negative effects of storing a wine at elevated temperatures for extended periods of time, which would be further exacerbated after being opened (Hopfer et al. 2018, Danilewicz and Standing 2018). This set of consumers may then have a negative perception of the wine once they have finished it at the end of the week, as the wine's original sensory profile has likely changed significantly. It should be noted however, that this is a very small portion of the overall responses, as this significant difference was based upon 11 responses out of the 986 respondents (1.12%) for these two questions. The vast majority of respondents store their white wine in a cooled setting (89.29%). When following up with this question, for both *red and white wine*, those who finish their wine *within 24 hours* were more likely to store their *red or white wine in a wine refrigerato*r and were less likely to store in a r*efrigerator*.

For wine preservation devices, those who typically finish a bottle of *white wine within 24 hours* were more likely to *own a Coravin*, while those who typically finish a bottle of *white wine within 1 week* were less likely *to own a Coravin*, and more likely *to not own a wine preservation device*. Again, there is

a similar overlap seen here with consumers who do not consume wine as frequently. This data suggests that the consumers who take longer to consume a bottle of wine are less likely to own a wine preservation device. As stated previously, this is the group of individuals who would debatably need some sort of preservation the most, as their time to finish a bottle of wine is rather long, and potentially long enough for the oxidative process to alter the sensory profile of the wine. It should be noted that the individuals who typically take a week to finish a bottle of white or a bottle of red wine were a minor group (12.73% and 14.94% respectively), though still a substantial portion of the sample.

For demographics, an interesting observation was made, with *30-39 year old's* being more likely to finish a bottle of *white wine within 24 hours* and less likely *within 1 week*, whereas *21-29 year olds* were more likely to finish a bottle of *white wine within 1 week*. Transitioning into knowledge, those who typically finish a bottle of *white wine within 24 hours*, and *within 2 days* were more likely to consider themselves *very knowledgeable*; those who finish white wine *within 4 days* were less likely to be *very knowledgeable* and more likely to be *somewhat knowledgeable*, and those *within 1 week* were more likely to be *not very knowledgeable* and less likely to be *very knowledgeable*. This relationship ties into previous results from this study, showing that those who were more frequent drinkers were more likely to finish a bottle of wine more rapidly (4.1.2 *Wine Consumption Frequency*). Therefore, those who are drinking more frequently, in turn are drinking more rapidly, and this group has been shown in both cases to be more likely to consider themselves more knowledgeable about wine. From other research (Thach and Olsen 2015), this group is of special interest as heavy-users can be considered as consumers with intimate knowledge of a product. This knowledge can assist companies in their development in marketing strategies and more. Additionally, the significant results obtained from this section for age groups suggest that the younger drinkers at 21 – 29 years old, may not have had as much time to become accustomed to wine and therefore may not be as frequent consumers, and therefore not as knowledgeable about it. Contrarily, the 30 – 39 year old group were more likely to finish wine more rapidly, and therefore may be more frequent consumers and therefore more knowledgeable.

4.1.5 Storing at Room Temperature versus Cooled Setting

In 4.1.2 *Wine Consumption Frequency* it was seen that more frequent drinkers were more likely to store wine in a wine refrigerator. In 4.1.3 *Closure Preference*, those that preferred cork for red wine were more likely to store it at room temperature. Of those that stored red wine in a cooled setting, those that preferred cork for red wine were more likely to store it in a wine refrigerator while those that preferred screw cap were more likely to store it in a refrigerator. For this sub-section, respondents were asked how they stored white and red wine after opening it. If respondents stored red/white wine in a cooled setting, a sequential question was shown which asked whether it was stored in a refrigerator, wine refrigerator, or other. As seen with other results in this study, consumers treated their wine similarly regardless of whether it was white or red, with those who stored white wine at room temperature or in a cooled setting more likely to store it the same way for red wine and vice-versa. As stated previously, the large majority of respondents chose to store their wines in a cooled setting (89.29%), while a much lower number of responses were observed for cooled setting for red wine (42.49%). Interestingly, the subgroup that stored their *white wine in a refrigerator* were more likely to store their *red wine at room temperature* and less likely to store it in a *cooled setting*, and those that stored their *white wine in a wine refrigerator* were more likely to store their *red wine in a cooled setting* and less likely to store it at *room temperature*. This may demonstrate a group that enjoys white wine at cooled temperatures but does not own a wine refrigerator, but also recognizes that they do not prefer red wine at a cooled temperature, and therefore store it at room temperature. As expected, respondents were more likely to store their white or red wine in the same cooled setting (refrigerator or wine refrigerator) regardless of whether it was white or red.

Expected results were obtained for this group when asking about wine preservation devices. These results are shown in **Table 14**.

Table 14 White and red wine cooled setting preference after opening compared to wine preservation device ownership[a]

White wine cooled setting after opening (Q21.2)	Wine preservation device ownership (Q24)					Total
	Coravin	Vacu Vin	Inert gas can	None	Other:	
Refrigerator	71	125	31	542	21	790
Wine refrigerator	34	31	9	55	3	132
Other	7	5	1	8	0	21
Total	112	161	41	605	24	943

Red wine cooled setting after opening (Q23)	Wine preservation device ownership (Q24)					Total
	Coravin	Vacu Vin	Inert gas can	None	Other:	
Refrigerator	31	57	15	233	3	339
Wine refrigerator	28	28	8	34	2	100
Other	2	2	1	7	1	13
Total	61	87	24	274	6	452

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

Respondents who typically store their wine in a refrigerator were more likely to not own a wine preservation device, which was observed for both white and red wine. On the other hand, those who store in a wine refrigerator were more likely to own a Coravin and Vacu Vin and less likely to not own a wine preservation device, which was also observed for both white and red wine. Interestingly in this comparison, when asked whether respondents stored their wine differently after using a wine preservation

device, refrigerator storers for both white and red wine were not more likely to store it differently, while wine refrigerator storers for both white and red wine were more likely to store it differently.

There appears to be some association between the temperature in which consumers store their wine and their general interest in back label information for a wine, though somewhat convoluted. For *white wine*: very few significant results were obtained for the questions pertaining to wines with information on how it was made; however, those who store *white wine at room temperature* were more likely to purchase a bottle of *white and red wine* if it provided information on *specific chemical data*, while those who store *white wine* in a *cooled setting* were more likely to not purchase a bottle of *white nor red wine* if it provided information on *specific chemical data*. Now, following up with those that store their *white wine in a cooled setting*: *refrigerator storers* were less likely to purchase a bottle of *red wine with information on how it was made*, and responses were higher than expected to *be indifferent to this information* on a bottle of *white wine*; *wine refrigerator storers* were more likely to purchase a bottle of *red and white wine with information on how it was made*. Not much significant data was observed for the chemical data questions. For *red wine*: those that store in a *cooled setting* were more likely to purchase a bottle of *white and red wine if it provided information on how it was made*, and more likely to purchase a bottle *of red wine with specific chemical data*. Now following up with those that store their *red wine in a cooled setting*: those that stored in a *refrigerator* were more likely to *be indifferent to white and red wine with information on how it was made*, while *wine refrigerator storers* were more likely to purchase a bottle of *red wine with information on how it was made*, but surprisingly not more likely to purchase a *bottle of white wine with information on chemical data*. Though this set of connections is somewhat disjointed and not directly associated in some cases, there are some tentative conclusions that can be made. The data suggests that consumers may be more interested in how the wine is made, with 51.06% and 54.86% showing interest in this information for white and red wine, respectively. Information on chemical data may be of some interest to some consumers, but it does not carry as much weight in their purchasing decisions, with 41.96% and 40.97% demonstrating interest for white and red wine, respectively. Those that store in a cooled setting may be more likely to purchase a bottle of wine

containing either piece of information, though as already stated, the information on how a wine was made appears to be more significant to consumers. This cooled setting group can be segmented further into groups that store wine in refrigerators and those that store wine in wine refrigerators. Interestingly, though the overall cooled setting group showed significant interest in this information on a bottle of wine, those that store wine in a refrigerator may be more indifferent to this information and less interested than those that store in a wine refrigerator.

For demographics, 21 – 29 year olds had a higher than expected response rate for storing their white wine at room temperature and less than expected for storing in a cooled setting, whereas 40 – 49 year olds were more likely to store in a cooled setting. Again though, the majority for all age groups chose to store white wine in a cooled setting. For red wine, 50 – 59 year olds were more likely to store it at room temperature and less likely to store in a cooled setting. For wine knowledge, those who stored their white wine in a refrigerator were more likely to be not very knowledgeable, while wine refrigerator storers were more likely to be somewhat knowledgeable. No significant wine knowledge observations were made for red wine temperature and storage type. However, for red wine, 21 – 29 year olds were more likely to store red wine in a refrigerator and less likely to store it in a wine refrigerator. This again suggests that the 21 – 29 year old age group may be less knowledgeable about wine and in some cases, improperly storing their wine. Also, the difference in wine refrigerator and refrigerator storers is seen, as those who are storing in refrigerators may be less knowledgeable about wine than those who store in wine refrigerators. This would support the conclusions made earlier that showed more interest in back label information from those who stored wine in wine refrigerators. This wine refrigerator group is a group that is highly interested in wine, and frequent users, and thus would demonstrate interest in this type of information.

4.1.6 Wine Preservation Device Owners

First and foremost, again it is important to recognize that this question is a multiple selection question, and therefore responses are not indicative of individual respondents, as a respondent could own multiple wine preservation devices. Rather than asking respondents whether they owned a preservation device or not, this question allows for further segmentation within the wine preservation device owning group. The intent was to gain deeper insight into this group rather than just looking at the group as a whole. If respondents indicated they owned a wine preservation device, a series of questions were then displayed that only pertained to wine preservation devices. Previous results have shown that more frequent consumers were more likely to own a wine preservation device (4.1.2 *Wine Consumption Frequency*), screw cap preferring consumers were more likely to not own a wine preservation device (4.1.3 *Closure Preference*), those that finish white wine more quickly were more likely to own a wine preservation device (4.1.4 *Quick versus Slow Drinkers*), and wine refrigerator storers were also more likely to own a wine preservation device (4.1.5 *Storing at Room Temperature versus Cooled Setting*).

The first of these questions asked respondents whether they stored a wine differently after using a wine preservation device. Coravin owners were more likely to store wine differently, whereas Vacu Vin owners were not more likely to store wine differently. A similar relationship was observed when asking respondents if they kept a wine longer after using a wine preservation device. Coravin owners were more likely to keep a wine longer after using it, while Vacu Vin owners were more likely to not keep a wine longer after using it. This slight difference in results may suggest that there is a subtle distinction to be made between these two groups. With the cost difference in consideration (Anonymous C n.d.), there is a higher barrier of entry to owning a Coravin, and those that own this may be seriously considerate of their wine habits and decisions. Therefore, Vacu Vin owners may be interested in wine, but less concerned as those who own a Coravin.

For both Coravin and Vacu Vin owners, respondents were more likely to be 30 – 39 years old. Additionally, Vacu Vin owners were less likely to be 21 – 29 years old. Those who didn't own a wine preservation device were more likely to be 21 – 29 years old and less likely to be 30 – 39 years old.

Expected results were obtained for wine knowledge, where Coravin and Vacu Vin owners were both more likely to be very knowledgeable, and less likely to be not very knowledgeable, while those without wine preservation devices were more likely to be not very knowledgeable and not knowledgeable at all and less likely to be very knowledgeable. This again makes intuitive sense, as those more involved in wine, and therefore more knowledgeable, may generally show more interest in owning these types of devices. Moreover, it has been shown that these groups that are highly knowledgeable about wine, are frequent users, and therefore may see more of a need to own a device such as these.

4.1.7 Interest in Back Label Information

This set of four questions asked whether respondents were more likely to purchase a bottle of white or red wine if it had information on how it was made and information on specific chemical data. It was seen that wine refrigerator storers were more likely to be interested in this back label information (4.1.5 *Storing at Room Temperature versus Cooled Setting*). Similar to other questions in the survey, respondents answered the same way to white and red wine. Furthermore, given the similarity of these questions, respondents also answered the same way to the questions regarding information on chemical data and information on how the wine was made. In all comparisons of the four questions, those who answered yes, no, or indifferent were more likely to answer the same way for both red and white wine, and less likely to answer the other options.

Additionally, those who were more likely to purchase a bottle of white wine with information on how it was made were more likely to be 30 – 39 years old and consider themselves very knowledgeable about wine. Those who were not more likely to purchase a bottle of white wine with information on how it was made were more likely to be 50 – 59 years old and less likely to be 21 – 29 years old, and less likely to be very knowledgeable about wine. The same results were obtained for this question but with red wine, the addition of 21 – 29 year old's being more likely to purchase it as well. For white and red wine with information on chemical data, 21 – 29 year olds were more likely to purchase it, while 50 – 59 year

olds were not more likely to purchase it. The wine knowledge significance was not observed for the chemical data set of questions. Again, this ties into the previous hypothesis that consumers are less interested in chemical data compared to information on how the wine was made. This is also supported by the frequencies, where those who answered "yes" to being more likely to purchasing a bottle of white wine or red wine with information on how it was made comprised of 51.06% and 54.86% respectively. Meanwhile those answering "yes" for white and red wine with information on chemical made up 41.96% and 40.97% respectively. Furthermore, the 30 – 39 year old age group has again demonstrated a higher interest in this type of information compared to other age groups, which connects again with the knowledge of wine. Interestingly, other research has shown that more technical wine information (not necessarily on a wine label) such as winemaking techniques were some of the lowest rated attributes in importance (Chaney 2000). Though that study demonstrated rating importance, the survey question in the present study gauges respondents' interest in this information, which by these results, may be quite high depending on the consumer group. The results from this section are also supported by other research which has shown that as the involvement and knowledge of a consumer increases with wine, the more resources and information that consumer will utilize in purchasing decisions (Rasmussen and Lockshin 1999). There is an interesting observation, as the 21 – 29 year old group seems to be interested in this information, which would be somewhat conflicting with previous results. It would be expected that with less knowledge about wine, a consumer group would be less interested and involved with this kind of information. A couple of hypotheses could be formed from this observation. One, the 21 – 29 year old group may be segmented into smaller segments, with those that are more knowledgeable than others and are therefore more interested in this information. This survey may have sampled a disproportionately high amount from this segment, resulting in this higher than expected interest in this information. However, previous results did indicate that this group overall was more likely to consider themselves not very knowledgeable. Another hypothesis may be that this younger generation is interested in this kind of information regardless of their knowledge. Nonetheless, more research should be conducted in this area to discern any unique differences in terms of age, knowledge, and interest in specific wine information.

4.2 Regional Comparisons

The purpose of this section is to demonstrate highly significant or dramatic differences observed between different countries and regions. Most of the responses from the various regions agreed not only amongst one another but also with the overall data. Therefore, for conciseness, similar relationships for particular regions will not be reiterated. The first sub-section outlines price considerations, which have not yet been discussed in this study. In order to maintain consistency, and reduce the complexity in comparisons and redundancy, any noted U.S. Dollar prices for a region or country that is not the U.S. is shown as U.S. Dollar equivalents.

After splitting the responses into their respective regions, there were significantly smaller sample sizes for certain countries, namely Australia (n=21) and New Zealand (n=26). This was exacerbated by the fact that certain questions narrowed down the responses even further. Therefore, only for chi-square considerations, both Australia and New Zealand were combined to attain a larger sample size, given the similarity in culture, proximity, and price. Regardless, there were few significant chi-square results for this group, and even when significant, these agreed with the Overall results. Of more concern was the data obtained from the South African respondents. Though a sufficient sample size was obtained (n=142), an overwhelming majority of these respondents were 21-29 years old (78.99%). This is concerning, as the results obtained from South African respondents may not accurately reflect the true population and rather a reflection of this age group. This is something to keep in mind when considering the results obtained from this region.

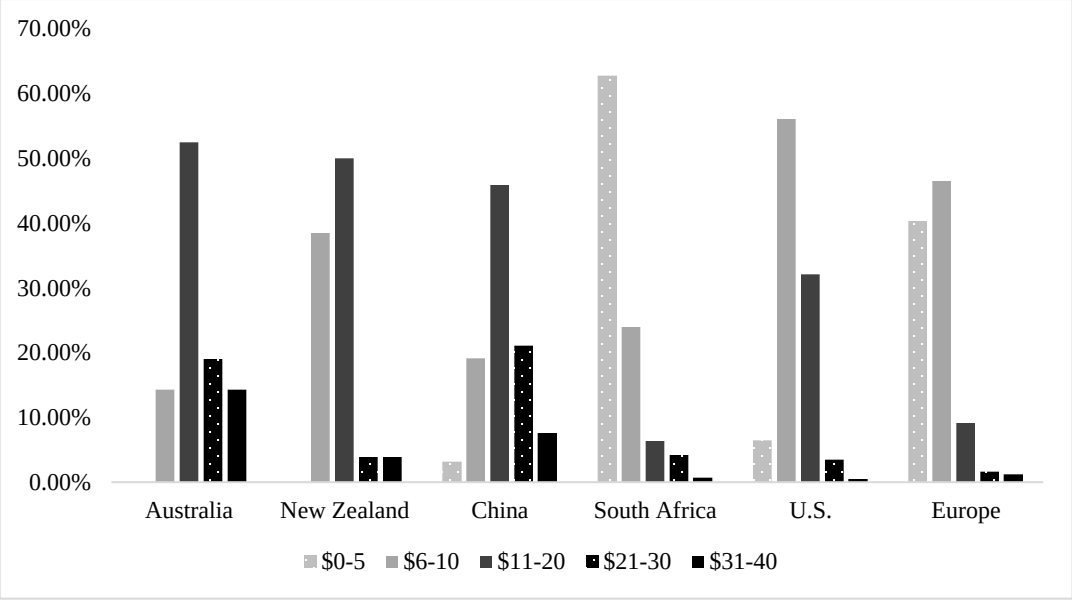
4.2.1 Price Considerations

Depending on which currency a respondent chose, a specific question was shown with the correct price points for that given currency (this explains the difference in question numbers that ask the same question). Price point ranges for foreign currencies were compared to the U.S. dollar on August 1st, 2020. Though these prices may vary slightly in range, in some cases this is only by a few U.S. dollars and likely

would not significantly affect the results dramatically. Australian (AUD), New Zealand (NZD), and European (EUR) respondents were displayed the same price ranges as the U.S. dollar. The only difference in price ranges were for South African (ZAR) and Chinese (Yuan) respondents.

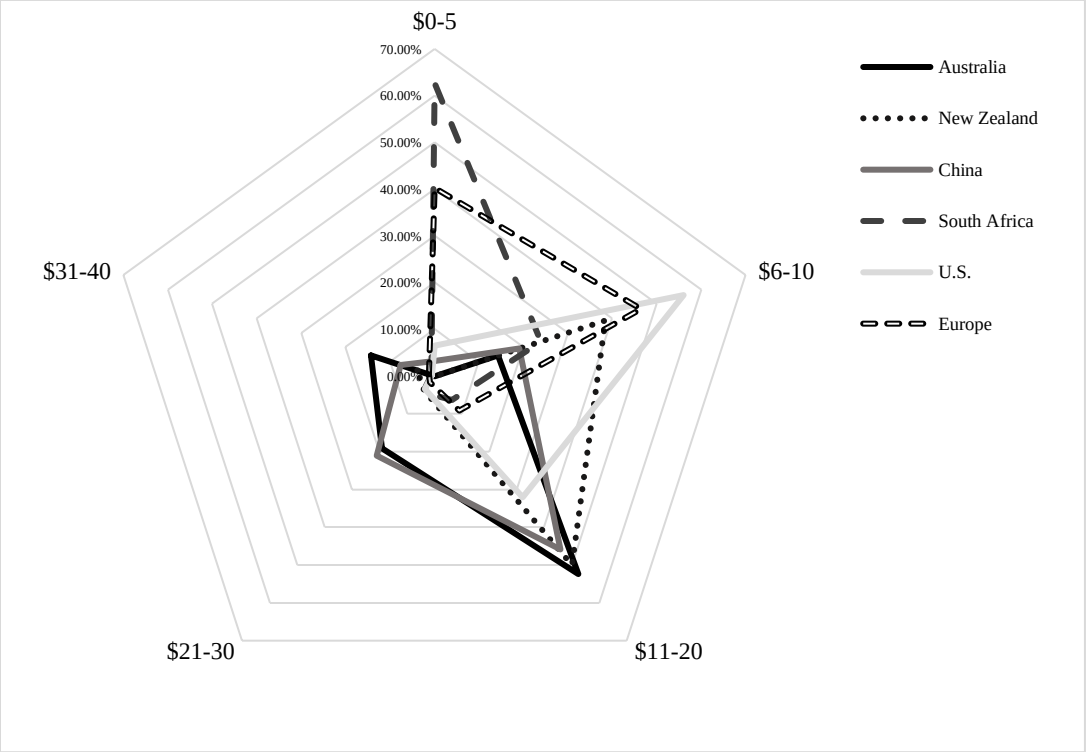
Two separate questions asked respondents what they considered to be an inexpensive price point for white and red wine. For white wine, the average percentage of Chinese, Australian, and New Zealand consumers who chose $11 – 20 was about 50%. However, for European, South African, and U.S. respondents this was 9.13%, 6.34%, and 32.08%, respectively. The data for white wine is displayed in **Figure 1** and **Figure 2**.

Figure 1 Percent of responses for price points considered to be inexpensive for white wine ($n_{Australia} = 21$, $n_{New\ Zealand} = 26$, $n_{China} = 157$, $n_{South\ Africa} = 142$, $n_{U.S.} = 371$, $n_{Europe} = 241$)



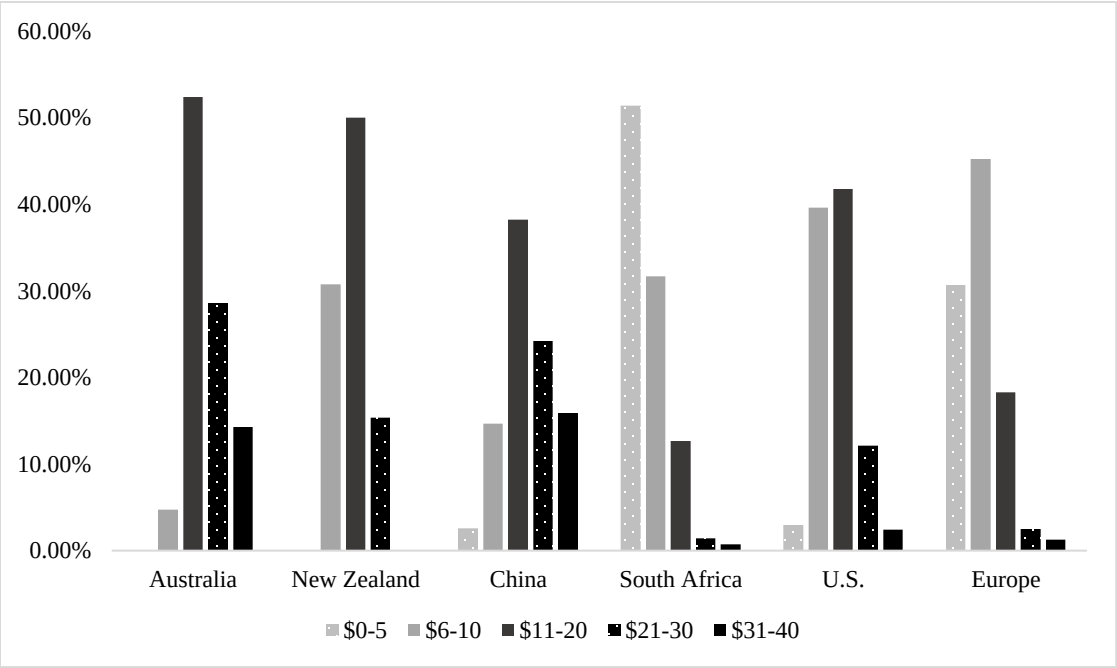
This data is also re-formatted and shown in **Figure 2**.

Figure 2 Percent of responses for price points considered to be inexpensive for white wine ($n_{Australia} = 21$, $n_{New\ Zealand} = 26$, $n_{China} = 157$, $n_{South\ Africa} = 142$, $n_{U.S.} = 371$, $n_{Europe} = 241$)



This may suggest that European and South African consumers consider $11 – 20 more expensive than Australian, Chinese, and New Zealand consumers. Generally, there was an increase in percentages for higher price points when asking the same question for red wine. These similar results are shown in **Figure 3** and **Figure 4**.

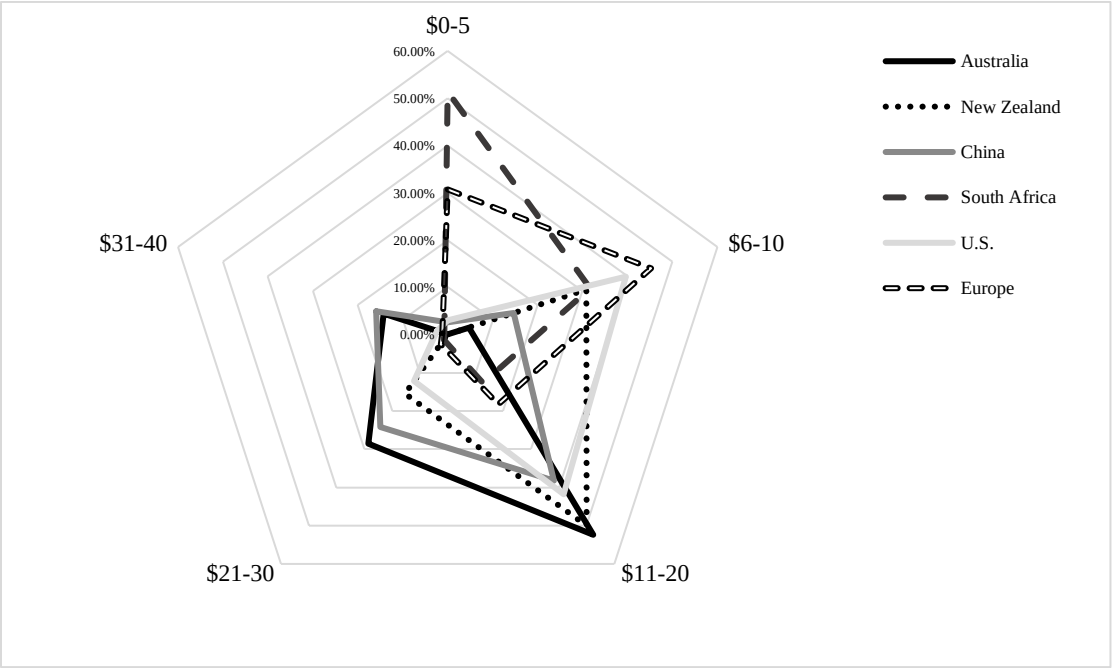
Figure 3 Percent of responses for price points considered to be inexpensive for red wine ($n_{Australia} = 21$, $n_{New\ Zealand} = 26$, $n_{China} = 157$, $n_{South\ Africa} = 142$, $n_{U.S.} = 371$, $n_{Europe} = 241$)



As before, this data is re-formatted and shown again in **Figure 4**.

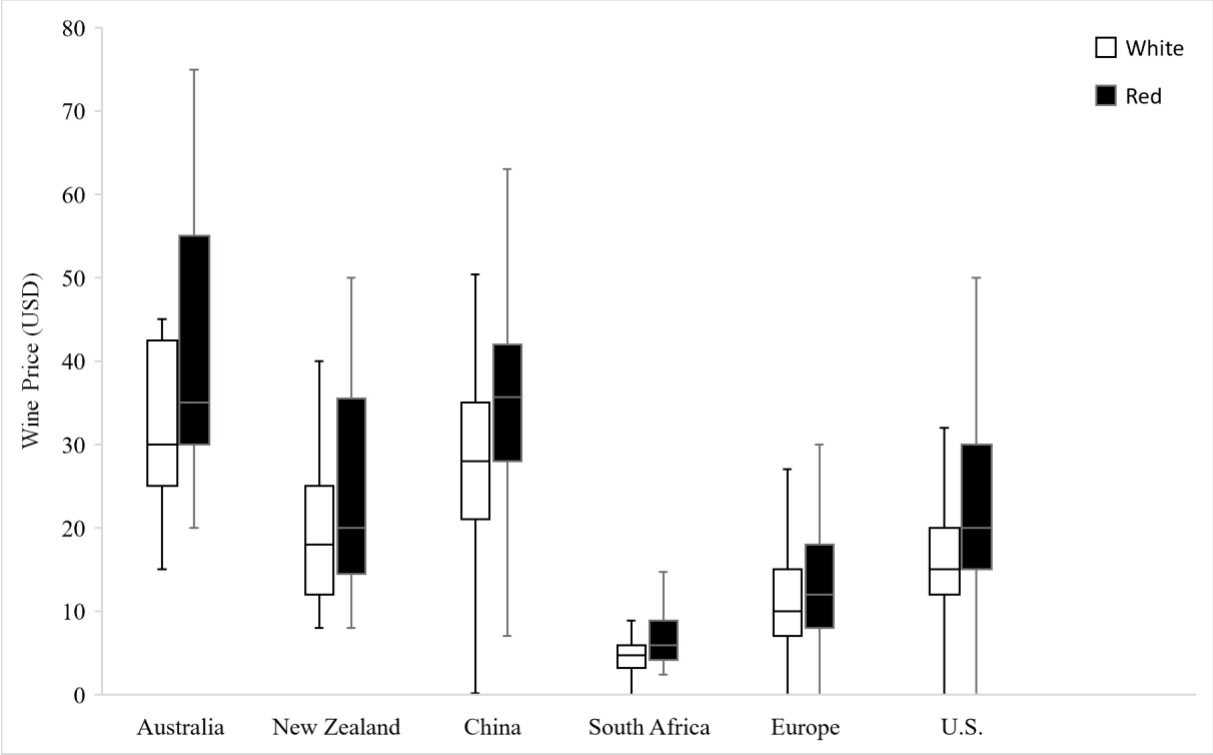
In several cases, consumers were more likely to consider the same price point to be inexpensive for red and white. However, there were instances where this differed. For *European consumers*, those who considered *$6 – 10 to be inexpensive* for *white wine* were more likely to *consider the same price and $11 – 20 as inexpensive for red wine; U.S. consumers* who considered *$11 – 20 as inexpensive for white wine* were more likely to consider the *same price and $21 – 30 as inexpensive for red wine*; *Chinese consumers* who considered *$21 – 30 to be inexpensive for white wine* were more likely to consider the *same price and the $31 – 40 as inexpensive for red wine*. More results support the general trend of increasing price paid for a red wine compared to white wine.

Figure 4 Percent of responses for price points considered to be inexpensive for red wine ($n_{Australia} = 21$, $n_{New\ Zealand} = 26$, $n_{China} = 157$, $n_{South\ Africa} = 142$, $n_{U.S.} = 371$, $n_{Europe} = 241$)



The average price point for typically buying white and red wine by region is shown in **Figure 5**. In every case for every region the average price point for typically buying red wines was higher than that of white wine. The relatively large increase in price for red wine for Australian consumers may simply be a result of small sample size (n=21) and further research should be done in order to make statistically sound conclusions on this substantial increase. However, other research has shown that Australian consumers tended to spend slightly more than U.S. consumers on wine (Bleibaum et al. 2005).

Figure 5 Price typically paid for a bottle of white and red wine separated by country (outliers not shown; $n_{Australia} = 21$, $n_{New\ Zealand} = 26$, $n_{China} = 156$, $n_{South\ Africa,\ white} = 141$, $n_{South\ Africa,\ red} = 142$, $n_{Europe} = 237$, $n_{U.S.} = 370$)



U.S. respondents who considered *$6 – 10 inexpensive for white wine* were more likely to prefer *red wine at about room temperature* and less likely to say it *depended on the wine*, whereas those that considered *$11 –20 inexpensive for white wine*, were less likely to prefer *red wine at about room temperature* and were more likely to say it *depended on the wine*. The same observation was made at the $6 – 10 price range for inexpensive red wine. For the *$11 – 20 inexpensive red wine price range*, *European consumers* were less likely to prefer *red wine at about room temperature*, and *U.S. and European consumers* were more likely to say it *depended on the red wine*. This relationship may show that as a consumer's price threshold increases, their treatment of the wine becomes more nuanced. At higher price points, these respondents may be more considerate of how they are treating their wine. This coincides with the wine knowledge results as well. At the $6 – 10 price range for inexpensive white wine, U.S. consumers were more likely to consider themselves somewhat knowledgeable and less likely to

consider themselves very knowledgeable, while at the $11 – 20 price range they were more likely to consider themselves very knowledgeable and less likely to be not very knowledgeable.

When considering region, price typically paid for white wine, and white wine closure preference, it was observed that *Europeans* in *the $0 – 10 range* were more likely to buy a *white wine with a screw cap* and less likely to be *indifferent*, whereas at the *$11 – 20 range*, they were more likely to be *indifferent*. This same relationship was observed within the European group for red wine price and white wine closure type. Interestingly, for red wine price point and red wine closure, at *$41 – 50, U.S. consumers* were more likely to purchase *a red wine with cork* and less likely to be *indifferent.* This is supported by other research, which found that U.S. consumers rated wine closure as the most important attribute when purchasing, and also that screw cap negatively impacted purchase intent (Bleibaum et al. 2005). This same relationship was observed for Chinese consumers but at a higher price point of over 350 Yuan or the equivalent of over $50 USD. These results also connect with U.S. consumers' wine closure preference, where much more were indifferent to white wine closure (67.03%) than red wine closure (45.95%), and only 4.05% preferred screw cap for red wine, while 50.00% preferred cork.

When asked how quickly respondents typically finished a bottle of white wine, the data suggested that at lower price points consumers typically took longer to finish, while at higher price points, consumers tended to finish it more quickly. *U.S. respondents* who considered *$6 – 10 inexpensive for white wine* were more likely to finish a bottle of *white wine within 1 week*, while at the *$11 – 20 price range* were less likely to *finish within 1 week*. For price typically spent on a bottle of white wine at *$0 – 10, European consumers* were more likely to *finish a bottle of white wine within 1 week* and less likely to *finish within 24 hours*. At the $11 – 20 price point, European consumers were more likely to finish within 24 hours and U.S. consumers were more likely to finish within 4 days. At the *$21 – 30 price point for white wine, U.S. consumers* were more likely to *finish within 24 hours* and less likely to *finish within 1 week*. A similar relationship was observed for price paid for red wine and time to finish a red wine (data not shown). While these observations were pieced together with some significant results at lower and higher price points for certain regions, there does appear to be a general relationship of finishing a bottle

of wine more quickly at higher price points. No significant results were obtained that were contradictory to this trend. As will be seen in other results, this may be connected to the consumers' wine knowledge.

When evaluating back label information in the context of price typically paid for wine, a higher association is observed between general interest in this information and higher price paid. For price typically spent on white and red wine, at $21 – 30 U.S. consumers were more likely to purchase a bottle of red and white wine with information on how it was made and with information on chemical data. This is four significant results and consistently was observed at higher price points as well. This may suggest that those who are spending more on wine may show more interest in specifics on wine information. Similar results were found in the study done by Thach and Olsen (2015), where it was hypothesized that those who spent more on wine were more involved with wine, which in this study may relate to information on wine. Once again this may be a result of the respondents' wine knowledge influencing how much interest they show in wine, and in turn how much they are willing to spend on it.

For wine preservation devices, expected results were obtained, where consumers who typically spent less on red wine were more likely to not own a wine preservation device, while those at higher price points were more likely. For price typically spent for red wine, at the $0 – 10 price range, U.S. and European respondents were more likely to not own a wine preservation device and less likely to own a Coravin. Meanwhile, Chinese consumers were more likely to own a Vacu Vin at the 211 – 280 Yuan price range (about $30 – 40) and more likely to own a Coravin at over 350 Yuan (about $50) for a red wine. As mentioned previously, these results are expected as the high barrier of entry cost for owning a Coravin (Anonymous C n.d.) may inhibit those who are not spending that much on wine originally. Furthermore, as seen with previous results, those who are more likely to own a wine preservation device are more likely to be more knowledgeable about wine (4.1.6 *Wine Preservation Device Owners*). Those that consider themselves more knowledgeable about wine may then be more willing to spend more money on a bottle of wine. These results are discussed in more detail below.

For wine knowledge and price typically spent on a bottle of white or red wine, at $0 – 10 both European and U.S. consumers were more likely to consider themselves as not very knowledgeable and

were less likely to be very knowledgeable. At the $11 – 20 price point typically paid for white wine, European consumers were more likely to consider themselves very knowledgeable, while this was only seen with U.S. consumers at a slightly higher price point of $21 – 30 for white wine. Interestingly, a similar trend was observed with U.S. consumers being more likely to consider themselves very knowledgeable about wine at the $21 – 30, $31 – 40, and $41 – 50 price range for red wine; however, at $11 – 20 for red wine, U.S. consumers were less likely to be very knowledgeable while European consumers were more likely to be very knowledgeable. This difference may suggest that very knowledgeable European consumers are less willing to spend more money on wine and therefore there is not as much of a price gap between those that are not as knowledgeable and very knowledgeable. For U.S. participants, the higher than expected response frequency for being very knowledgeable was not observed until $21 – 30. Below this price point there was no significant result for being very knowledgeable. This is supported directly from the study done by Thach and Olsen (2015), which found that "high spenders" (>$15) were more likely to consider themselves more knowledgeable about wine. This aligns with the previous results from this section, where at higher price points, respondents tended to be more involved with wine and therefore more likely to own a Coravin, be interested in back label information, and more considerate of how the wine was stored.

Other demographics demonstrated that males tended to spend more than females for a bottle of red wine. U.S. consumers who typically spent $21 – 30 for a bottle of red wine were more likely to be male and less likely to be female, while at $11 – 20 and $0 – 10 they were more likely to be female and less likely to be male. This result was also observed by Thach and Olsen (2015), where "high spenders" were slightly more likely to be male, though this was only observed at the 0.10 significance level. One study among U.K. wine consumers found that among lower socio-economic groups, males stated a dislike for the feminine image of drinking wine (Mitchell and Greatorex 1988). This may be in part a reason for this observation. As for age, the $31 – 40 price range for red wine was more likely to be 30 – 39 years old for U.S. consumers, and $21 – 30 for European consumers. Also, U.S. respondents who considered $11 – 20 inexpensive for white wine were more likely to be 21 – 29 years old and less likely to be 50 – 59 and

60 – 69 years old. Though this was observed, within this group of 21 – 29 year old's, 40% chose $11 – 20 and 50% chose $6 – 10 for an inexpensive white wine range. Regardless, younger respondents may tend to purchase wines at lower price points than older generations. This connects again with previous results where the 30 – 39 year old age group appears to be the most knowledgeable about wine, and therefore are more willing to spend more on wine. As seen previously, though similar results are observed between U.S. and European consumers, the same significant result for U.S. respondents at times seems to be at a slightly higher price range.

4.2.2 General Regional Differences

There were practically no significant chi-square results from regions that contradicted significant results found in the overall data set. The very few that may have been slightly different were somewhat convoluted in their comparison between questions and did not inherently make sense. Similarly, significant chi-square contradictions between regions were seldom. Again, some of these did not make inherent sense in their comparison, while others were at such a low frequency that it may have been a result of smaller sample sizes between regions. Nonetheless, some differences were still found and will be discussed in more detail in this section.

When comparing white wine closure preference, and back label information on how a white wine was made, it was found that within the white wine screw cap preferring consumer group, European respondents were more likely to purchase a white wine with information on how it was made, while U.S. respondents were not more likely and less likely to purchase a bottle of white wine with this information. This data is shown below in **Table 15**.

Table 15 White wine closure preference compared to likelihood of purchasing a white wine with information on how it was made for Europe and U.S consumers

Europe				
White wine closure preference (Q18)	More likely to purchase white wine with information on how it was made (Q33)			Total
	Yes	No	Indifferent	
Cork	24	7	14	45
Screw cap	42	15	7	64
Indifferent	58	38	33	129
Total	124	60	54	238
U.S.				
White wine closure preference (Q18)	Yes	No	Indifferent	Total
Cork	29	26	14	69
Screw cap	14	23	15	52
Indifferent	114	58	76	248
Total	157	107	105	369

[a] All values in cells are totals. Dark grey cells were significantly higher than expected values and light grey cells were significantly lower than expected values, at $\alpha = 0.05$

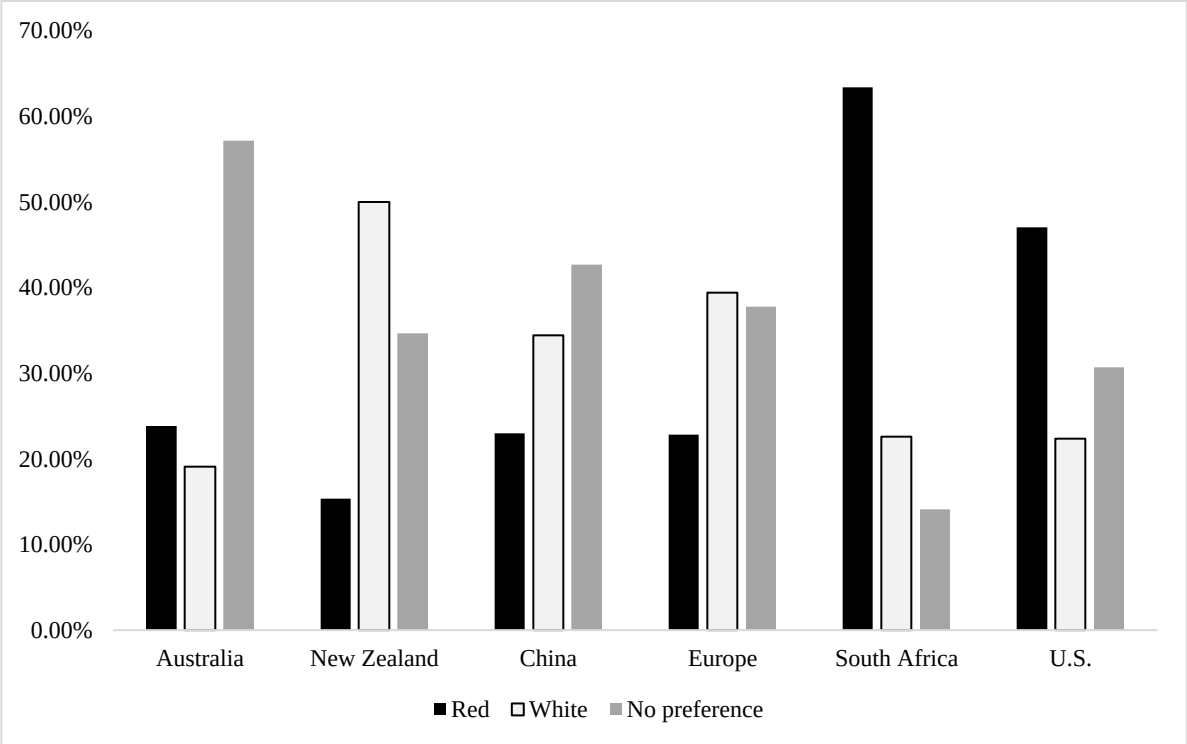
Of those that prefer screw cap for white wine, 26.92% from the U.S. and 65.63% from Europe were interested in information on how a white wine was made. For U.S. respondents it is clear to see the group that was indifferent to white wine closure made up the majority of those that were interested in this information. While the same holds true for European consumers, this was not nearly as pronounced.

There may be several reasons for this observation. European consumers may be less biased towards screw cap and therefore more likely to purchase it, thus leading to a higher proportion of those who are interested in this information, while also purchasing white wines with screw cap. Another consideration is that Europeans may be spending less on wine, and as seen with previous research (Marin and Durham 2007) there is a lower price point expectation with this. Thus, in order for a European consumer to purchase a wine within their desired price range, they may gravitate towards a screw cap wine, but also be highly interested in back label information. This information coincides with the results seen in 4.2.1 *Price Considerations* where European consumers tended to show the same relationship as U.S. consumers, but at a slightly lower price point. Another possibility is that this information is not nearly as prevalent in European wines compared to wines produced in the U.S. and therefore, European consumers may find this uniqueness appealing. This connection may have several underlying factors and therefore difficult to form a definitive conclusion.

Some incremental differences were observed in red and white wine preference among the different regions **Figure 6**. Notably, New Zealand consumers represented the region that preferred white wine the most at 50.00%. With Sauvignon Blanc making up 73.8% of the total tonnage of wine grapes harvested in 2020 in New Zealand (Anonymous A 2020), the market in New Zealand may be dominated by this variety and consumers may prefer white wine in this region. One of the most glaring results is the unexpectedly high preference for red wine among South African respondents (63.38%), and similarly for U.S. consumers as well (47.04%). Though the U.S. response rate was fairly high, this is in agreement with other research for U.S. consumers (Thach and Olsen 2006), which found similarly high preference for red wine, though that study only evaluated the Millennial generation. The high preference for red wine among South African respondents may be in part related to the fact that the responses were mostly from 21 – 29 year olds and as seen previously, this age group was shown to be more likely to prefer red wine (4.1.1 *Red or White Wine Preference*). However, other research specifically among South African consumers has shown that there is a higher quality perception of red wine (Weightman et al. 2019). South African respondents may believe that red wine is a superior product than white wine and therefore more

apt to prefer this over white wine. Interestingly, with the U.S. and South Africa being the countries that preferred red wine the most, the two may treat red wine differently. For South African respondents, 38.73% prefer red wine at about room temperature, and 48.59% prefer it to at cooler than room temperature. Compared to the U.S., 60.27% prefer red wine at about room temperature, while 21.89% prefer it at cooler than room temperature. As seen with the pleasure association with wine temperature expectation (Zellner et al. 1988), South African respondents may have negative perceptions of red wines that are served at about room temperature compared to those in the U.S., given the higher preference for red wine at cooler temperatures. Furthermore, this temperature expectation may be formed through cultural norms. Further research would need to be conducted to conclude on any significant differences in red wine temperature preference between these two countries.

Figure 6 Percent of responses for wine preference ($n_{Australia} = 21$, $n_{New\ Zealand} = 26$, $n_{China} = 157$, $n_{Europe} = 241$ $n_{South\ Africa} = 142$, $n_{U.S.} = 371$)



5. Conclusion

Survey data has proven to be a useful tool in assessing consumer habits and treatments in the context of wine. The usefulness of the data is largely dependent on the survey design, sample size, and size of the difference in effects, though of course other factors impact the results. Frequency results can display general tendencies among consumers, though any statistical differences must be concluded through a chi-square test of independence. This test has shown to be very sensitive to differences in data and signified numerous statistically significant results.

This data supports the hypothesis that not all wine consumers are the same, and market segmentation can be implemented to discern differences. Furthermore, wine consumers from different countries have shown different tendencies in the way they treat wine. Overall, there are cases in which consumers treat red and white wine very similarly and do not show any differences in certain preferences between the two, though other results show that in certain contexts, consumers will treat red and white wine differently. This was one of the main objectives of this survey and was the reasoning behind iterations of the same question that pertained to either white or red wine. By doing so, differences in treatments and perceptions between the two can be ascertained. Ultimately, there are situations that consumers do not significantly vary when it comes to white or red wine (time to finish wine, time to dispose of wine etc.), while others, consumers are much more considerate on the type of wine (serving temperature, closure preference etc.). Unsurprisingly, the regional results did not differ from the overall results, mostly due to the fact that the overall results are simply comprised of all the regional results combined. Though, inter-regional differences were observed, with some tendencies and significant differences found. Further research should be conducted on price evaluations and larger sample sizes among the regions, which would have assisted in this study in finding any more significant results.

Possibly the most significant consumer characteristic seen in this study that likely connected with almost all of the consumer's habits and tendencies was wine knowledge. The consumer's wine knowledge was shown to heavily influence the way in which they treat wine such as: the price point at which it's

bought, preferences in how wine is stored and served, wine preservation devices they may own, how consistently they drank wine and more. Though in some cases the chi-square analysis was not a direct comparison with knowledge, when evaluating the reasoning behind significant results, it seemed that wine knowledge consistently played a significant role in a myriad of cases. This is very useful and important information, as one could sufficiently estimate a consumer's tendencies simply based off of their wine knowledge alone. The large caveat with these results is that this question was not a direct measurement of their knowledge and that participants were indicating which level of knowledge they considered themselves to be. This may not be of issue though, since if a consumer perceives themselves to be very knowledgeable about wine, then they may act similarly to others that are also very knowledgeable. Nonetheless, participants were likely fairly accurate in their self-assessment of their own wine knowledge.

Multiple significant demographic differences were observed as well, further supporting the argument that wine consumers differ across multiple attributes and characteristics. For age, gender, and region it was observed that these different demographic groups differed. Other research could compare specific age groups among countries to see if any differences exist not only among countries, but more specifically among the generations within these countries. Closely related to wine knowledge, it seems that the 30 – 39 year old age group may be the most knowledgeable about wine and therefore fit certain characteristics that are attributed with high knowledge.

Survey analysis is not a perfect measure of evaluation, though this data suggests that it provides reliable information that is consistent. When designing a survey, it is very important to consider how consumers will perceive a question and attempt to provide all logical answers for that question. Furthermore, when analyzing via chi-square analysis, differences in frequencies and not simply the significant result obtained from the test should be noted. Though certain groups may have higher than expected responses for a certain categorical variable, there may be another answer in which most of the participants in that comparison actually answer. This consideration is important in explaining these results and informing readers. When carefully considered, these results can inform the wine industry on how

consumers perceive and treat wine. By understanding these tendencies and preferences, the industry can more sufficiently cater to their target market and understand their consumer base. If desired, informing consumers on how to properly treat the wine could also be utilized and directed at those who are improperly treating their wine.

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Appendices

Appendix 1: Survey

Q56 **Introduction and Purpose** You are being invited to join a research study. The purpose of this study is to see if there are potential differences in consumer treatments after purchasing a bottle of wine, mainly concerning the storage conditions in which the wine is kept. If you agree to participate in this research, you will be asked to complete a survey. You will be asked questions about how often you drink wine, what price points you purchase wine, and how you store wine. It will take about 5-10 minutes to complete the survey. There is no direct benefit to you from taking part in this study. We hope that the research will provide insight into how various consumers treat their wine and if there are any cultural differences in consumer preferences/tendencies. The risks of this research are minimal/nonexistent. **You must be 21 years or older in order to participate. Confidentiality** As with all research, there is a chance that confidentiality could be compromised; however, we are taking precautions to minimize this risk. Your responses to the questions will include information about your general location, age, and gender. This information alone could not be used to identify any one person, as each response is anonymous. This information will be handled as confidentially as possible. However, individuals from UC Davis who oversee research may access your data during audits or other monitoring activities. To minimize the risks of breach of confidentiality, we will be using a survey analytic service that provides security encryption for all transmitted data. **Compensation** You will not be paid for taking part in this study. **Rights** ***Participation in research is completely voluntary***. You are free to decline to take part in the project. You can decline to answer any questions and you can stop taking part in the project at any time. Whether or not you choose to participate, or answer any question, or

stop participating in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled. **Questions** If you have any questions about this research, please feel free to contact the investigator at 314-570-3757 or drpete@ucdavis.edu If you have any questions about your rights or treatment as a research participant in this study, please contact the University of California Davis, Institutional Review Board at 916-703-9158 or HS-IRBEducation@ucdavis.edu **If you agree to take part in the research, please proceed to the survey by clicking the arrow below.**

Q4 On behalf of the Viticulture and Enology Department at the University of California - Davis, we wholeheartedly appreciate and thank you for taking the time to participate in this study. The purpose of this study is to evaluate potential differences in how consumers treat wines after purchase. Your responses comprise the data for this study and truthful responses are of the utmost importance in order to provide reliable and reflective data. These responses will be recorded anonymously, and will only reflect the general region in which you live. The data will be part of my (Daniel Peters) Master's Thesis. Thank you for your participation.

Q5 Do you prefer red or white wine?

- ○ Red wine (1)
- ○ White wine (2)
- ○ No preference (3)

Q6 How often do you consume wine?

- ○ Daily (1)
- ○ Weekly (2)
- ○ Monthly (3)
- ○ Once or twice a year (4)
- ○ Other: (5) _____

Q43.2 What currency do you use? (If none of the currencies shown are what you use, please select one of these currencies that is closest in exchange rate to the US Dollar)

- ○ US Dollar (USD, $) (1)
- ○ New Zealand Dollar (NZD, $) (2)
- ○ Australian Dollar (AUD, $) (3)
- ○ Euro (EUR, €) (4)
- ○ South African Rand (ZAR, R) (5)
- ○ Chinese Yuan/Renmibi (CNY, RMB, ¥) (6)

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = US Dollar (USD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = New Zealand Dollar (NZD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Australian Dollar (AUD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Euro (EUR, €)

Q7 What price point would you consider to be **inexpensive** for a bottle of **white** wine? (The prices shown are in the currency you previously selected)

- ○ 0 - 5 (1)
- ○ 6 - 10 (2)
- ○ 11 - 20 (3)
- ○ 21 - 30 (4)
- ○ 31 - 40 (5)
- ○ Other (please give within a scale of 10 ex: 10 - 20): (6)

_____

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = US Dollar (USD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = New Zealand Dollar (NZD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Australian Dollar (AUD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Euro (EUR, €)

Q12 What price point would you consider to be **inexpensive** for a bottle of **red** wine? (The prices shown are in the currency you previously selected)

- ○ 0 - 5 (1)
- ○ 6 - 10 (2)
- ○ 11 - 20 (3)
- ○ 21 - 30 (4)
- ○ 31 - 40 (5)
- ○ Other (please give within a scale of 10 ex: 10 - 20): (6)

_____

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = South African Rand (ZAR, R)

Q44 What price point would you consider to be **inexpensive** for a bottle of white wine? (The prices shown are in the currency you previously selected)

- ○ 0 - 84 (1)
- ○ 85 - 170 (2)
- ○ 171 - 340 (3)
- ○ 341 - 500 (4)
- ○ 501 - 670 (5)
- ○ Other (please give within a scale of 150 ex: 150 - 300): (6)

_____

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = South African Rand (ZAR, R)

Q45 What price point would you consider to be **inexpensive** for a bottle of red wine? (The prices shown are in the currency you previously selected)

- ○ 0 - 84 (1)
- ○ 85 - 170 (2)

○ 171 - 340 (3)

○ 341 - 500 (4)

○ 501 - 670 (5)

○ Other (please give within a scale of 150 ex: 150 - 300): (6)

_____

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = Chinese Yuan/Renmibi (CNY, RMB, ¥)

Q46 What price point would you consider to be **inexpensive** for a bottle of white wine? (The prices shown are in the currency you previously selected)

○ 0 - 35 (1)

○ 36 - 70 (2)

○ 71 - 140 (3)

○ 141 - 210 (4)

○ 211 - 280 (5)

○ Other (please give within a scale of 70 ex: 50 - 120): (6)

_____

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = Chinese Yuan/Renmibi (CNY, RMB, ¥)

Q47 What price point would you consider to be **inexpensive** for a bottle of red wine? (The prices shown are in the currency you previously selected)

- ○ 0 - 35 (1)
- ○ 36 - 70 (2)
- ○ 71 - 140 (3)
- ○ 141 - 210 (4)
- ○ 211 - 280 (5)
- ○ Other (please give within a scale of 70 ex: 50 - 120): (6)

_____

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = US Dollar (USD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = New Zealand Dollar (NZD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Australian Dollar (AUD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Euro (EUR, €)

Q48 What price point would you consider to be **expensive** for a bottle of **white** wine? (The prices shown are in the currency you previously selected)

- 10 - 20 (1)
- 21 - 30 (2)
- 31 - 50 (3)
- 51 - 75 (4)
- 76 - 100 (5)
- Over 100 (6)

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = US Dollar (USD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = New Zealand Dollar (NZD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Australian Dollar (AUD, $)

Or What currency do you use? (If none of the currencies shown are what you use, please select one of... = Euro (EUR, €)

Q49 What price point would you consider to be **expensive** for a bottle of **red** wine? (The prices shown are in the currency you previously selected)

- ○ 10 - 20 (1)
- ○ 21 - 30 (2)
- ○ 31 - 50 (3)
- ○ 51 - 75 (4)
- ○ 76 - 100 (5)
- ○ Over 100 (6)

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = South African Rand (ZAR, R)

Q50 What price point would you consider to be **expensive** for a bottle of **white** wine? (The prices shown are in the currency you previously selected)

- ○ 170 - 340 (1)
- ○ 341 - 500 (2)

- ○ 501 - 840 (3)
- ○ 841 - 1250 (4)
- ○ 1251 - 1665 (5)
- ○ Over 1665 (6)

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = South African Rand (ZAR, R)

Q53 What price point would you consider to be **expensive** for a bottle of red wine? (The prices shown are in the currency you previously selected)

- ○ 170 - 340 (1)
- ○ 341 - 500 (2)
- ○ 501 - 840 (3)
- ○ 841 - 1250 (4)
- ○ 1251 - 1665 (5)
- ○ Over 1665 (6)

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = Chinese Yuan/Renmibi (CNY, RMB, ¥)

Q52 What price point would you consider to be **expensive** for a bottle of white wine? (The prices shown are in the currency you previously selected)

- 70 - 140 (1)
- 141 - 210 (2)
- 211 - 350 (3)
- 351 - 525 (4)
- 526 - 700 (5)
- Over 700 (6)

Display This Question:

If What currency do you use? (If none of the currencies shown are what you use, please select one of... = Chinese Yuan/Renmibi (CNY, RMB, ¥)

Q51 What price point would you consider to be **expensive** for a bottle of red wine? (The prices shown are in the currency you previously selected)

- 70 - 140 (1)
- 141 - 210 (2)

○ 211 - 350 (3)

○ 351 - 525 (4)

○ 526 - 700 (5)

○ Over 700 (6)

Q13 At what price point do you typically buy **white** wine (in your currency that you previously selected)? (Please enter just a number)

_____

Q15 At what price point do you typically buy **red** wine (in your currency that you previously selected)? (Please enter just a number)

_____

Q16 At what temperature do you prefer **white** wine?

○ About room temperature (1)

○ Warmer than room temperature (2)

○ Cooler than room temperature (3)

○ Depends on the wine (4)

Q17 At what temperature do you prefer **red** wine?

- ○ About room temperature (1)
- ○ Warmer than room temperature (2)
- ○ Cooler than room temperature (3)
- ○ Depends on the wine (4)

Q18 Are you more likely to buy a **white** wine with a cork or screw cap?

- ○ Cork (1)
- ○ Screw cap (2)
- ○ Indifferent (3)

Q19 Are you more likely to buy a **red** wine with a cork or screw cap?

- ○ Cork (1)
- ○ Screw cap (2)
- ○ Indifferent (3)

Q21 After purchasing, do you store a bottle of **white** wine with a screw cap differently than one with a cork and vice versa?

○ Yes (1)

○ No (2)

○ Sometimes (3)

○ Unsure (4)

Display This Question:

If After purchasing, do you store a bottle of white wine with a screw cap differently than one with... = Yes

Or After purchasing, do you store a bottle of white wine with a screw cap differently than one with... = Sometimes

Q13.2 Please explain which **white** wine (cork or screw cap) you store differently and how you store it differently:

_____

Q14 After purchasing, do you store a bottle of **red** wine with a screw cap differently than one with a cork and vice versa?

○ Yes (1)

○ No (2)

○ Sometimes (3)

○ Unsure (4)

Display This Question:

If After purchasing, do you store a bottle of red wine with a screw cap differently than one with a... = Yes

Or After purchasing, do you store a bottle of red wine with a screw cap differently than one with a... = Sometimes

Q15.2 Please explain which **red** wine (cork or screw cap) you store differently and how you store it differently:

_____

Q16.2 When you open a bottle of **white** wine, how quickly do you typically finish it?

○ Within 24 hours (1)

○ Within 2 days (2)

○ Within 4 days (3)

○ Within 1 week (4)

○ Other: (5) _____

Q17.2 When you open a bottle of **red** wine, how quickly do you typically finish it?

○ Within 24 hours (1)

- ○ Within 2 days (2)
- ○ Within 4 days (3)
- ○ Within 1 week (4)
- ○ Other: (5) _____

Q18.2 How long after opening a bottle of **white** wine until you typically dispose of it?

- ○ Within 24 hours (1)
- ○ Within 2 days (2)
- ○ Within 4 days (3)
- ○ Within 1 week (4)
- ○ Other: (5) _____

Q19.2 How long after opening a bottle of **red** wine until you typically dispose of it?

- ○ Within 24 hours (1)
- ○ Within 2 days (2)
- ○ Within 4 days (3)

○ Within 1 week (4)

○ Other: (5) _____

Q20 After opening a bottle of **white** wine do you store it at room temperature or in a cooled setting?

○ Room temperature (1)

○ Cooled setting (2)

○ Unsure/Depends (3)

Display This Question:

If After opening a bottle of white wine do you store it at room temperature or in a cooled setting? = Cooled setting

Q21.2 If in a cooled setting: in a refrigerator, wine refrigerator, or other?

○ Refrigerator (1)

○ Wine refrigerator (2)

○ Other: (3) _____

Q22 After opening a bottle of **red** wine do you store it at room temperature or in a cooled setting?

- ○ Room temperature (1)
- ○ Cooled setting (2)
- ○ Unsure/Depends (3)

Display This Question:

If After opening a bottle of red wine do you store it at room temperature or in a cooled setting? = Cooled setting

Q23 If in a cooled setting: in a refrigerator, wine refrigerator, or other?

- ○ Refrigerator (1)
- ○ Wine refrigerator (2)
- ○ Other: (3) _____

Q24 Which of the following wine preservation devices do you own? (You may select more than one)

- ☐ Coravin (1)
- ☐ Vacu Vin (2)
- ☐ Inert gas can (3)

☐ None (4)

☐ Other: (5) _____

Display This Question:

If Which of the following wine preservation devices do you own? (You may select more than one) != None

Q25 Do you store a wine differently if you use a wine preservation device?

○ Yes (1)

○ No (2)

○ Sometimes (3)

○ Unsure (4)

Display This Question:

If Do you store a wine differently if you use a wine preservation device? = Yes

Or Do you store a wine differently if you use a wine preservation device? = Sometimes

Q26 Do you store the wine at a different temperature after using a wine preservation device?

○ Yes (1)

○ No (2)

○ Other: (3) _____

Display This Question:

If Which of the following wine preservation devices do you own? (You may select more than one) != None

Q27 Do you keep a wine longer if you use a wine preservation device?

○ Yes (1)

○ No (2)

○ Sometimes (3)

○ Unsure (4)

Display This Question:

If Which of the following wine preservation devices do you own? (You may select more than one) != None

Q28 Do you believe the wine preservation device you use is able to preserve a white/red wine?

○ Yes (1)

○ No (2)

○ Unsure/Depends (3)

Q29 What style of **red** wines do you prefer?

- ☐ Fruit-forward (1)
- ☐ Tannic (2)
- ☐ Not tannic (3)
- ☐ No preference (4)
- ☐ Other: (5) _____

Q30 What is one **red** wine variety that you typically enjoy?

_____

Q31 What type of **white** wine do you prefer?

- ☐ Fruit-forward (1)
- ☐ Aromatic (2)
- ☐ Non-aromatic (3)
- ☐ No preference (4)

☐ Other: (5) _____

Q32 What is one **white** wine variety that you typically enjoy?

_____

Q33 Are you more likely to purchase a bottle of **white** wine if it provides information on how it was made?

○ Yes (1)

○ No (2)

○ Indifferent (3)

Q34 Are you more likely to purchase a bottle of **red** wine if it provides information on how it was made?

○ Yes (1)

○ No (2)

○ Indifferent (3)

Q36 Are you more likely to purchase a bottle of **white** wine if it provides information on specific chemical data (ex: sugar, pH, etc.)?

- ○ Yes (1)
- ○ No (2)
- ○ Indifferent (3)

Q37 Are you more likely to purchase a bottle of **red** wine if it provides information on specific chemical data (ex: sugar, pH, etc.)?

- ○ Yes (1)
- ○ No (2)
- ○ Indifferent (3)

Q39 What is your age? (Give only the number, do not write anything else)

_____

Q40 What is your gender?

- ○ Male (1)
- ○ Female (2)

- ○ Prefer not to say (3)

Q41 What country do you currently live in?

- ○ United States of America (1)
- ○ Italy (2)
- ○ France (3)
- ○ South Africa (4)
- ○ Australia (5)
- ○ New Zealand (6)
- ○ Germany (7)
- ○ China (8)
- ○ Other: (9) _____

Q42 What is your highest level of education completed?

- ○ Less than high school diploma (1)
- ○ High school diploma or GED (2)

- ○ Associate's degree (3)
- ○ Bachelor's degree (4)
- ○ Master's degree (5)
- ○ Professional degree (6)
- ○ Doctorate (7)

Q43 How knowledgeable about wine would you consider yourself to be?

- ○ Very knowledgeable (1)
- ○ Somewhat knowledgeable (2)
- ○ Not very knowledgeable (3)
- ○ Not knowledgeable at all (4)

Appendix 2: Contingency Tables

Due to the excessive length of this data, these tables are not included herein. For access to this data, please contact Hildegarde Heymann at hheymann@ucdavis.edu.