

# Predicting Wine Consumption Based on Previous ‘Drinking History’ and Associated Behaviours

Lauro Melo

CSIRO Food Futures National Research and CSIRO Food and Nutritional Sciences  
PO Box 10041, Adelaide BC SA 5000, Australia

Greg Evans

CSIRO Food Futures National Research and CSIRO Food and Nutritional Sciences  
PO Box 10041, Adelaide BC SA 5000, Australia

Nicolas Le Pollès

AgroParisTech, 16 rue Claude Bernard 75231 Paris cedex 05, France

Conor Delahunty

CSIRO Food Futures National Research and CSIRO Food and Nutritional Sciences  
PO Box 54, North Ryde, NSW 1670, Australia

David N. Cox (Corresponding author)

CSIRO Food Futures National Research and CSIRO Food and Nutritional Sciences  
PO Box 10041, Adelaide BC, SA 5000, Australia  
Tel: 61-883-038-899 E-mail: david.cox@csiro.au

Received: August 29, 2011

Accepted: September 15, 2011

Published: February 1, 2012

doi:10.5539/jfr.v1n1p79

URL: <http://dx.doi.org/10.5539/jfr.v1n1p79>

## Abstract

Associative learning processes may be related to and shape consumers' current consumption and preferences. Past consumption, experiences and behaviour with food and beverage products are likely to have an important role. Data were collected in order to predict current wine consumption based on past experiences. Longitudinal quantitative data (N=564) on past alcoholic beverage consumption behaviour ('drinking history') was collected retrospectively. Results of multiple linear regression analysis showed that previous 'drinking history' explained 40-70% of the variance in later wine consumption patterns and that red wine consumption is a more complex behaviour compared to white wine consumption. In addition, belief-evaluations towards intrinsic product characteristics are more likely to be drivers of red wine consumption ( $p < 0.05$ ), but not of white wine. Results indicated how past behaviour and experiences influence current behaviour, and identified possibilities for influencing specific wine consumption patterns.

**Keywords:** Past experiences, Linear regressions, Factor analysis, Current behaviour, Wine involvement, Habit formation

## 1. Introduction

Past consumption, experiences and behaviour with food and beverage products are likely to shape consumers' current consumption and preferences through associative learning processes, described by the theory of evaluative conditioning (De Houwer et al., 2001, Walther et al., 2005). Ratchford (2001) proposes that consumers will direct their consumption and search activities in ways that maximize the impact of their

accumulated expertise. Particular past experiences (and associations) may be related to current wine consumption or particular wine choice. According to Ouellette and Wood (1998) and Olson and Fazio (2001), past behaviour guides future responses. Frequency of past behaviour reflects habit strength and has a direct effect on future responses/reactions.

Most past wine studies provide only cross-sectional data on alcoholic beverage consumption for different age groups, or so-called generations (Beverland, 2001, Dodd et al., 2010, Olsen et al., 2007, Teagle et al., 2010). The studies that have collected data on past wine consumption and behaviour, retrospectively, so that different generations could be compared over wider age periods, were limited in terms of sample size and qualitative data (Thach & Olsen, 2004; Wilson, Rungie, & Lockshin, 2003; Wilson, 2007).

In this sense, collecting reliable quantitative data on consumers' past alcoholic beverage consumption and behaviour is the first step to better understand changes in consumption patterns, possible associations with those changes and current preferences. The broad objective of this research was to better understand the relationships between past experiences and current preferences. To meet this objective, an adaptation of validated dietary history and alcohol dependency methods was undertaken. There is evidence that past alcohol consumption is particularly well remembered (Melo et al., 2010c). Indeed Chu et al. (2010) recently reported that recalled alcohol intake after 15 and 23 years of follow-up is remarkably reliable. Therefore, a new tool that retrospectively measures consumption patterns and behaviours associated with wine, beer, and liquor consumption with an emphasis on understanding wine preferences was created (Melo et al., 2010c). The recent development and validation of this tool, a questionnaire eliciting the recall of past alcoholic beverage consumption and behaviour during consumers' lifetimes (their 'drinking histories'), is described in Melo et al. (2010c).

The preliminary findings (Melo et al., 2010a) reinforced the suggestion that past alcoholic beverage consumption, behaviours and experiences are likely to shape current wine consumption. Recently Cox (2009) reported that wine knowledge and underlying psychological personality traits predicted wine involvement, which, in turn, was a modest predictor of wine consumption. Whilst knowledge and involvement are potentially malleable, personality traits may not be, therefore seeking relationships between 'attitudes' (belief-evaluations) and involvement may be more useful. The specific objectives of the current project are to seek an understanding of past alcoholic beverage consumption and attitudes, and how these may relate to current wine consumption.

Behavioural theory, such as the Expectancy-Value Theory (Conner and Armitage, 2006), the Theory of Reasoned Action (Shepherd and Sparks, 1999) and the Theory of Planned Behaviour (Shepherd and Raats, 1996; Fishbein, 1967, Ajzen and Fishbein, 1980, Ajzen, 1988), considers 'attitudes' as products of behavioural beliefs and outcome evaluations. Individuals' attitudes are composed of three components: 'cognitive' (beliefs), 'affective' (emotions and preferences) and 'behavioural' (actions) (Ajzen and Fishbein, 1980, Eagly and Chaiken, 1993, Fishbein and Ajzen, 1975) and finding malleable predictors of consumption (beliefs) might help to guide future consumption (actions). Smith and Swinyard (1983) demonstrated that when attitudes are based on actual product trials (as opposed to advertising) they predict purchase very well and that cognitive and affective components were important in forming attitudes through advertising. Indeed, it has been argued that what finally determines a specific food choice will depend on a combination of general lifestyle attitudes, product-related attitudes and situational factors (Brunso and Grunert, 2007).

From a very large dataset, a focus was made on predictive models that included potentially malleable attitudes (the belief-evaluation items summarized as 'attitude' factors) in order to explain wine consumption. There is evidence that attitudes are malleable variables compared to personality traits (Ajzen, 2005) or most socio-demographics. Additionally, previous alcoholic beverage consumption could be indicators of early exposure and possible habit formation (Carrasco et al., 2005, Dynan, 2000, Naik and Moore, 1996) that, in themselves, describe the acquisition of alcoholic beverage and wine preferences. Ultimately, only the identification of more malleable variables that may be used to shape specific patterns of wine consumption has practical application, as well as understanding current behaviours less resistant to change.

The aim of the current paper was to test if past alcoholic beverage consumption, belief-evaluations towards wine and wine involvement are significant predictors of current red and white wine consumption behaviour. This process included factor analysis of 29 belief-evaluation items and a series of multiple linear regressions to find predictors of wine consumption, based on previous drinking experiences. Two age groups (30-40y and 50-60y) were selected in order to test if predictors were stable or differed by age cohorts. In addition, the approach provides information that traditional cross-sectional studies cannot, such as comparing the two groups when they were at the same age (period).

## 2. Methods

Data was collected using a validated computer based questionnaire. The previous validation process (test–re-test) indicated reliability (Melo et al., 2010c); for instance, for specific items for each time-phase including frequency, quantity and percentages of alcoholic beverages, most items had high internal consistency and no statistically significant differences over time ( $p>0.05$ ). Unreliable items, tended to be least consumed wines (i.e. sparkling, fortified and dessert) in contrast to red and white wines. These results showed that it is easier for participants to recall average consumption patterns from the past when consumption was more frequent and more regular. Measures of current average weekly red and white wine consumption were also validated (see more details in Melo et al., 2010c).

### 2.1 Sample

Six-hundred wine drinkers (divided into two age groups: 30-40y and 50-60y) were recruited throughout metropolitan Adelaide, South Australia. Study inclusion criteria included reporting consumption of bottled wine at least once a week and exclusion criteria included employment in the wine industry and possible alcohol dependency problems, detected using the validated Cage questionnaire (Ewing, 1984, King, 1986).

### 2.2 Data collected

Participants were asked to divide their past alcoholic beverage consumption into phases, based upon individual life-grid timelines previously completed (Melo et al., 2010c). For each phase they were asked to report frequency of alcoholic beverage consumption (days/month), quantity (drinks/drinking day), type of beverage (% of wine, beer and liquor) and type of wine (% of red, white, sparkling, fortified and dessert).

For each reported drinking phase, participants answered socio-demographic questions on employment situation, level of education, number of people at home and living situation. Socio-demographics income (only for the current situation), gender and age were asked as well. In addition, participants answered, for each drinking phase, belief-evaluation questions (antecedents of attitudes) (Conner and Armitage, 2006), in order to determine the main associations for different types of beverage consumption. For instance, ‘taste’ as an association for wine consumption was measured by the belief statement ‘I usually drank wine at that time because of its taste’ and by the evaluation ‘At that time taste was important to me when choosing an alcoholic beverage’. Participants indicated on 7-point labelled scales how much they agreed or disagreed with the first statement and how unimportant or important the second statement was. The belief-evaluation was calculated as a multiple of the two responses. A validated measure of wine involvement (Mittal and Lee, 1989) was also undertaken for each reported drinking phase.

Finally, participants also answered questions about their current wine consumption patterns, regarding average glass volume, weekly frequency and quantity, and number of bottles purchased/month at home, restaurants and bars.

### 2.3 Data management and statistical analysis

As participants were free to report any number of drinking phases (and any duration for each), in order to facilitate data analysis and comparisons, participants had their drinking phases condensed into three common age periods: Phase 1 (beginning-29y), Phase 2 (30-45y) and Phase 3 (46-60y). With this approach, at the time of data collection, all 30-40y age group participants were in drinking Phase 2 and all 50-60y age group participants were in Phase 3.

Belief-evaluations towards wine (29 items) were factor analysed for each ‘drinking history’ phase using Principal Components Analysis with a varimax rotation. To predict what factors and consumption variables in previous drinking phases were driving wine consumption a series of multiple linear regressions were undertaken, including collinearity checks. The method chosen was simultaneous/block entry (Harrell, 2001).

In these analyses, it is important to establish the difference between current wine consumption variables and ‘ongoing’ ‘drinking history’ phase variables. The former were collected and calculated from participants’ answers to questions about their current wine consumption patterns – relating to their current ‘average week’. The latter (ongoing phase variables), were calculated from participants reported ‘drinking history’ phases and are the phase they were at the time of the study (‘drinking history’ Phase 2 for the 30-40y group and Phase 3 for the 50-60y group, see section 2.2 and Figure 1). Thus, ongoing phase variables cover behaviours and belief-evaluations over a wider period of years. Both (current wine consumption and ongoing ‘drinking history’ phase variables) were investigated and are presented below with the aim of eliciting whether, using past behaviour, it is possible to explain more about current consumption behaviour (current average week

consumption) or longer term (ongoing phase) consumption behaviours (consumption patterns). An additional aim was to understand how ongoing phase behaviour may influence current behaviour.

### 3. Results

#### 3.1 Participants

After data cleaning, 564 participants remained: 282 participants in each age group, 53% male in the 30-40y age group (mean 35.3y, SD 3.27) and 51.5% male in the 50-60y age group (mean 54.8y, SD 3.10).

#### 3.2 Factor analysis

The preliminary statistics indicated that the data matrix was factorable (Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.834 and the Bartlett's Test of Sphericity was 3588,  $df=406$ ;  $p<0.001$ ). Inspection of the factors indicated that there was a high degree of overlap between both age groups and phases. However, in order to make the structure logically coherent and to simplify the data interpretation, the few non-common items (factor components) throughout 'drinking history' phases were allocated from the original factors to other factors. The chosen final common (for all 'drinking history' phases) factors were then calculated to be used in linear regressions. In summary, the 29 belief-evaluation variables were grouped into 6 factors labelled: 'Social & Pleasure', 'Detail', 'Regular', 'Intimate', 'Sensory', and 'Value' (see belief-evaluation items within each factor in Table 1).

In addition, reliability among belief-evaluation items within each wine factor over time (phases) was tested using the intraclass correlation coefficient (ICC). ICC estimates the squared correlation of average scores and is the most widely used psychometrics measure for estimating the internal consistency of multi-item scales (McGraw and Wong, 1996). ICC was applied to check the internal consistency of each factor in the three 'drinking history' phases (Table 1). An ICC of 1 represents a perfect reliability into one category and an ICC higher than 0.5 is arbitrarily acceptable (Bak, 2001, Cox and Evans, 2008, Meiselman et al., 1999). In the factor named 'Sensory' (factor 5, see Table 1), the 'Sweet wines' item was the opposite of the 'Dry wines' item whilst the 'Light wines' item was the opposite of the 'Heavy wines' item. Thus, 'Sensory' factors (and their ICCs) for the three 'drinking history' phases were calculated using the opposite signals for 'Sweet wines' and 'Light wines' items.

Results showed that the wine factors determined were consistent (reliable) over the three 'drinking history' phases (i.e. over time) and therefore had the potential to be used in linear regression models to find predictors of wine consumption based on different previous drinking phases.

#### 3.3 Multiple linear regressions

Table 2 summarizes all regression models (cases) undertaken for both age groups: predicting average red or white wine consumption during a given 'drinking history' phase based on the previous phase (cases 1 and 2), predicting current red or white wine consumption based on the previous phase (cases 3 and 4), and predicting current red or white wine consumption based on the ongoing phase (cases 5 and 6).

In general, wine consumption in a drinking phase based on the previous phase (cases 1 and 2) presented higher variance explanations ( $R^2$  values) as opposed to current wine consumption (cases 3 to 6) – and current wine consumption presented higher explanations by the ongoing drinking phase (cases 5 and 6) than by the previous phase (cases 3 and 4). Also, the models for white wine consumption dimensions had higher explained variance compared to the red wine consumption models.

##### 3.3.1 Predicting red and white wine consumption (number of drinks/year) in a 'drinking history' phase based on the previous phase

Red or white wine consumption (in number of drinks/year) in a given drinking phase was regressed against 'current' socio-demographics (gender, age and income), socio-demographics at previous phases (employment situation, level of education, number of people at home and living situation), consumption variables at the previous phase (total number of years drinking, total number of drinks of beer, liquor (spirits), red wine and white wine), and belief-evaluation factors (Table 1) and total wine involvement at the previous phase.

Table 3 shows the cases that had at least one belief-evaluation factor amongst the significant predictors ( $p<0.05$ ) of wine consumption in a 'drinking history' phase. Generally, socio-demographic variables did not appear to be consistent drivers of wine consumption applicable to any type of wine, phase or age group.

Participants' alcoholic beverage consumption patterns in the previous 'drinking history' phases (the alcoholic beverage consumption variables) were important predictors ( $p<0.05$ ). More importantly, participants' previous wine belief-evaluations (the belief-evaluation factors, see Table 1) were important in defining their red or white wine consumption in a given phase (Table 3).

In addition, previous alcoholic beverage consumption patterns also influenced ongoing phase red and white wine consumption. In general, red and white wine consumption at the previous 'drinking history' phase was associated with increased red and white wine consumption, respectively. However, for the older group at Phase 3 as predicted by the previous Phase 2, earlier consumption of one type of wine was associated with changes in another type. Specifically, white wine consumption at Phase 2 was associated with increased red wine consumption at Phase 3; whilst red wine consumption at Phase 2 was associated with decreased white wine consumption at Phase 3. Moreover, a pattern across types of alcoholic beverages was found with the number of drinks of liquor at Phase 1 (beginning-29y) positively associated with the younger group's red wine consumption at Phase 2.

### 3.3.2 Predicting current average weekly red and white wine consumption (total mL/week) based on the previous or ongoing 'drinking history' phase

Table 4 shows the cases that provided significant models ( $p < 0.05$ ) with at least one belief-evaluation factor amongst the significant predictors ( $p < 0.05$ ) of current red or white wine consumption (total mL/week), regressed against 'current' socio-demographics (gender, age and income), socio-demographics at the previous or ongoing phase (employment situation, level of education, number of people at home and living situation), consumption variables at the previous (total number of years drinking, total number of drinks of beer, liquor, red wine and white wine) or ongoing (total number of years drinking, number of drinks per year of beer, liquor, red wine and white wine) phase, and belief-evaluation factors and total wine involvement at the previous or ongoing phase.

Socio-demographic variables did not appear amongst the significant predictors (Table 4). Belief-evaluation factors were rarely significant predictors of current average weekly wine consumption based on the previous phase, whilst they were significantly predictive ( $p < 0.05$ ) of wine consumption in a 'drinking history' phase based on the previous phase (Table 3). Again, white wine consumption at the previous phase was positively associated with white wine consumption; whilst the older group's red wine consumption was positively associated with the red wine consumption over the ongoing 'drinking history' phase. Liquor consumption at the previous phase was associated with the older group's increased white wine consumption.

## 4. Discussion

Given that it is widely recognized that the result of behavioural studies are quite variable (Stevens, 2002), the predictive models'  $R^2$  values of between 0.3 and 0.7 (Tables 2 to 4) would appear to be moderate to good. They demonstrated the importance of collecting longitudinal (recalled) data on alcoholic beverage consumption patterns and behaviour covering personal 'drinking histories' in order to better understand consumption and behaviour changes during people's lifetimes.

Results showed that, in general, specific interventions may not change consumers' current wine consumption patterns immediately; however, they might influence consumers' average wine consumption in the next 'drinking history' phase, with stronger results if they are applied in earlier stages (highest  $R^2$  values were found for a previous phase explaining the ongoing phase in contrast to lower explained variance for the current average weekly wine consumption, Table 2). Also, the highest  $R^2$  values were found for white wine (as opposed to red wine), confirming preliminary results showing that consumers were found to have stronger associations between white wine consumption patterns, wine belief-evaluations and involvement compared to the red wine data (Melo et al., 2010b).

It was decided to present models that included belief-evaluation factors because they are more malleable (Ajzen, 2005). Comparison of two age groups would show whether belief-evaluation influences changed from when the older group experienced a given 'drinking history' phase to a younger group's experiences. Moreover, a 'time'/consumption effect was found, described by red and white wine consumption in an earlier phase significantly influencing ongoing phase red and white wine consumption (cases 1a2, 1b1, 2a and 2b, Table 3), respectively, indicating reinforcement effects and habit formation. Khare and Inman (2006) stated that food consumption habits can free a person from exerting effort in repetitive decisions and, as found by Naik and Moore (1996) for food consumption, the present study's results suggest habit formation and acquisition/reinforcement of liking for alcoholic beverages over time, consumption and exposure. White wine consumption reinforcing red wine consumption (case 2a, Table 3) confirmed the previously suggested 'drinking history' evolution, from white to red wine (Melo et al., 2010b). In other words, when a consumer starts consuming wine, he/she is likely not only to keep consuming the product (habit formation) but also to increase the consumption over time and, more specifically, in the direction of red wine consumption.

Influences across types of alcoholic beverage (case 1a1, Table 3) may be reflecting different historic moments, considering the age groups and alcoholic beverages availability. For instance, 'ready-to-drink' (RTD)

flavoured/sweetened liquor-based products, or 'alcopops', were launched in the Australian market in mid-90's (Barnard and Forsyth, 1998, Shakeshaft et al., 2009) and might have influenced the younger group's consumption patterns, the demographic focus of this beverage category (Chikritzhs et al., 2009, Copeland et al., 2007, Shakeshaft et al., 2009, Smith et al., 2005, Stevenson et al., 2007), as evidenced by the reported higher liquor consumption during 'drinking history' Phase 1 (beginning-29y, see Figure 1) in contrast to the older group in the same age period (Melo et al., 2010b). It is often assumed that habits constitute an important component in human behaviour. However, Davidov (2007) showed that there was no effect of habits on behaviour in a new context, in accordance with the definition of habits (Khare and Inman, 2006, Neal et al., 2006, Orbell and Verplanken, 2010, Wood and Neal, 2007). Therefore, the new offer of RTD liquor-based beverages has possibly changed the younger group's alcoholic beverage consumption habits, which later influenced their wine consumption patterns.

This early encounter with liquor (possibly flavoured/sweetened RTD) consumption appears to have led to their later red wine consumption suggesting early flavour/post-ingestive consequence pairing learning responses (Yeomans, 2006, Yeomans, 2010) to alcoholic beverages. In contrast, the older group reported a higher liquor consumption at Phase 2 (30-45y) (Melo et al., 2010b), and this liquor consumption was associated with their current white wine consumption (case 4b, Table 4) suggesting again liquor consumption leading to later wine consumption. Therefore, it appears to be easier to derive wine consumers from liquor consumers whereas beer consumers seem to be more loyal to beer preferences. Those 'progressions' may be noteworthy for the wine industry.

Participants' previous wine belief-evaluations were important to define their red or white wine consumption in a given phase. Past studies have shown that attitudes towards specific food products may predict willingness to use and accept those products (Urala and Lahteenmaki, 2004, Verbeke, 2005). In addition, other studies showed the importance of intrinsic product characteristics on consumers' wine purchase decision (Batt and Dean, 2000, Skuras and Vakrou, 2002). However, results in the present paper are the first to indicate that intrinsic product characteristics, such as those underlying 'Detail' (factor 2) and 'Sensory' (factor 5), are more likely to be drivers of red wine consumption not of white wine consumption (Table 3).

Belief-evaluation factors from the previous phase, significantly predicted wine consumption in a 'drinking history' phase. This demonstrates the importance of collecting longitudinal (recalled) data on alcoholic beverage consumption patterns and behaviour over wide age periods, instead of collecting only current wine consumption variables, to better understand consumption.

According to Wood and Neal (2007), one challenge to regulating habits is that they do not merge readily with conflicting goals, and therefore habit dispositions are not changed simply by adopting new goals or engaging in short-term behaviour change. Habit dispositions undergo minimal change to reflect current goals or occasional counterhabitual responses. Only with extended repetition in stable contexts are behaviour patterns likely to be represented in habit learning (Wood and Neal, 2007). Thus, behaviour-change campaigns still fail. The popular explanation for this tendency is that no habits were actually developed for the new behaviour. The problem of changing everyday behaviour does not involve the breaking of old habits but rather the lack of habits for the new behaviour. Until these new habits are developed, measures such as reminders and implementation intentions are necessary for the behaviour to be performed frequently (Tobias, 2009). Therefore, if the wine industry applies the present study's results, it should consider the time needed for the new habit formation.

The belief-evaluations were reflected in some weaker, however still statistically significant ( $p < 0.05$ ), predictors of wine consumption (Tables 3 and 4). More importantly, as the past alcoholic beverage consumption variables were strong predictors (standardized betas), it seems that the context is characterized by 'motivated cuing', instead of 'direct cuing'. In the motivated cuing, habit associations arise from the reward value of response outcome (Wood and Neal, 2007), which for wine consumption would be the post-ingestive psychoactive effects of alcohol (Rogers, 1996).

In addition, habits are informative when people reflect on how they have acted in the past in order to make inferences about their goals and related dispositions, such as attitudes and personality traits. In the model suggested by Wood and Neal (2007), habits are repeated responses that come to be cued by recurring features of contexts. Context cues refer broadly to the many elements of the performance environment that potentially can recur as actions are repeated, including physical locations, other people, and preceding actions in a sequence. Once a habit is formed, perception of contexts triggers the associated response without a mediating goal. In the current study models were found with belief-evaluation factors as statistically significant predictors of red and white wine consumption confirming that context is important for the habit of alcoholic beverage consumption.

One limitation of the study was possibly the age groups and ranges. An 'age effect' was previously found cross-sectionally with significant differences between age groups in total wine and red wine consumption and no significant differences were found when comparing age groups' wine consumption when they were in the same age periods; for example, when the two age groups were at 'drinking history' Phase 2 (Melo et al., 2010b). However, age was not a driver of red and white wine consumption for models within each age group, possibly because the age range (10 years for each age group) was not long enough to cause a significant effect in multiple linear regressions. However, it may be possible to find an age effect if the sample age were continuous, for instance, from 30 to 60 years old.

The relationship between current and past consumption may reflect habits and implies a condition relating the strength of habits to the evolution of consumption over time (Carrasco et al., 2005, Dynan, 2000). The present study demonstrates consumption habit formation in the wine domain (characterized by the stronger beta weights of past consumption, rather than belief-evaluation factors, on current and ongoing phases' wine consumption). This has been previously described by Naik and Moore (1996) within the food domain whereby increases in previous food consumption significantly increased current food consumption. The importance of habit formation has also been demonstrated in other domains, such as water consumption (Gregory and Di Leo, 2003), consumption of food nutrients (Khare and Inman, 2006) and college students' demand for alcohol (Williams, 2005). This latter study showed that high-school drinking has a significant and positive impact on college drinking, indicating the existence of habit formation. The author also suggests that habit formation has a stronger effect on the decision on how much to drink rather than on the decision on whether to drink.

In general, the basic techniques described above may have application in other consumer choice domains. However questionnaires must be adapted and validated for new product domains and particular cultures. The next step of the project is to evaluate whether different 'drinking histories' lead to specific current wine sensory preferences. Previous results showed that belief-evaluations related to some specific wine sensory properties – namely 'Sweet wines', 'Dry wines', 'Light wines', and 'Heavy wines' – longitudinally changed over participants' 'drinking histories' and were different across age groups when they were in the same age periods (Melo et al., 2010b). This observation together with the generally good explanations found in this study between past alcoholic beverage experiences and current wine consumption (including 'Sensory', as a significant predictor of wine consumption), suggests that past alcoholic beverage experiences may shape wine sensory preferences. With this in mind, additional work evaluated a sub-sample of the participants for their current wine sensory preferences regressed on their 'drinking history' (Melo, Delahunty, & Cox, 2011).

## 5. Conclusions

This is the first study to demonstrate relations between experiences (in terms of alcoholic beverage consumption, belief-evaluations towards wine and wine involvement) and current wine consumption patterns. Results showed that previous 'drinking history' phases influence later wine consumption patterns, with red wine consumption being a more complex behaviour compared to white wine consumption. On the other hand, intrinsic product characteristics are more likely to be drivers of red wine consumption, but not of white wine. Additionally, it is easier to derive wine consumers from liquor consumers whereas beer consumers seem to be more loyal to beer preferences. The main findings of this study, especially in terms of the malleable belief-evaluation factors and wine involvement, indicated how past behaviour and experiences influence current consumption patterns. In general, interventions are likely to be more effective in earlier stages of consumers' 'drinking history'.

## Acknowledgments

Authors wish to thank Haidee Lease for setting up the computer based questionnaire, Justine Colin for data collection and management and ex-colleague Ciarán Forde for being part of this study at the design stage.

## References

- Ajzen, I. (1988). *Attitudes, personality and behavior*, Open University Press.
- Ajzen, I. (2005). *Attitudes, personality and behavior*, Open Univ Pr.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*, Prentice-Hall.
- Bak, H. J. (2001). Education and public attitudes toward science: Implications for the "deficit model" of education and support for science and technology. *Social Science Quarterly*, 82, 779-795. <http://dx.doi.org/10.1111/0038-4941.00059>
- Barnard, M., & Forsyth, A. (1998). Alcopops and under-age drinking: changing trends in drink preference. *Health Education*, 98, 208-212. <http://dx.doi.org/10.1108/09654289810238131>

- Batt, P. J., & Dean, A. (2000). Factors influencing the consumer's decision. *Australian & New Zealand Wine Industry Journal*, 15, S34-S41.
- Beverland, M. (2001). Generation X and wine consumption. *Australian & New Zealand Wine Industry Journal*, 16, 91-96.
- Brunso, K., & Grunert, K. G. (2007). Consumer attitude measures and food product development. In H. MacFie (Ed.). *Consumer-led food product development* (pp. 197-222). CRC Press, Cambridge, England.
- Carrasco, R., Labeaga, J. M., & David Lopez-Salido, J. (2005). Consumption and Habits: Evidence from Panel Data. *Economic Journal*, 115, 144-165. <http://dx.doi.org/10.1111/j.1468-0297.2004.00963.x>
- Chikritzhs, T. N., Dietze, P. M., Allsop, S. J., Daube, M. M., Hall, W. D., & Kypri, K. (2009). The "alcopops" tax: heading in the right direction. *The Medical Journal of Australia*, 190, 294-295.
- Chu, A. Y., Meoni, L. A., Wang, N. Y., Liang, K. Y., Ford, D. E., & Klag, M. J. (2010). Reliability of Alcohol Recall After 15 Years and 23 Years of Follow-Up in the Johns Hopkins Precursors Study. *Journal of Studies on Alcohol and Drugs*, 71, 143-149.
- Conner, M., & Armitage, C. J. (2006). Social psychological models of food choice. In R. Shepherd & M. Raats (Eds.). *The Psychology of Food Choice* (pp. 41-57). CABI Publishing, Oxfordshire. <http://dx.doi.org/10.1079/9780851990323.0041>
- Copeland, J., Stevenson, R. J., Gates, P., & Dillon, P. (2007). Young Australians and alcohol: the acceptability of ready-to-drink (RTD) alcoholic beverages among 12-30-year-olds. *Addiction*, 102, 1740-1746. <http://dx.doi.org/10.1111/j.1360-0443.2007.01970.x>
- Cox, D. (2009). Predicting Consumption, Wine Involvement and Perceived Quality of Australian Red Wine. *Journal of Wine Research*, 20, 209-229. <http://dx.doi.org/10.1080/09571260903450963>
- Cox, D. N., & Evans, G. (2008). Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: The food technology neophobia scale. *Food Quality and Preference*, 19, 704-710. <http://dx.doi.org/10.1016/j.foodqual.2008.04.005>
- Davidov, E. (2007). Explaining habits in a new context - The case of travel-mode choice. *Rationality and Society*, 19, 315-334. <http://dx.doi.org/10.1177/1043463107077392>
- De Houwer, J., Thomas, S., & Baeyens, F. (2001). Associative learning of likes and dislikes: A review of 25 years of research on human evaluative conditioning. *Psychological Bulletin*, 127, 853-869. <http://dx.doi.org/10.1037/0033-2909.127.6.853>
- Dodd, T., Kolyesnikova, N., & Wilcox, J. (2010). A matter of taste: Consumer preferences of sweet and dry wines. In *Proceedings of the 5th International Conference of the Academy of Wine Business Research*. Auckland, New Zealand.
- Dynan, K. E. (2000). Habit formation in consumer preferences: Evidence from panel data. *American Economic Review*, 90, 391-406. <http://dx.doi.org/10.1257/aer.90.3.391>
- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*, Harcourt Brace Jovanovich College Publishers.
- Ewing, J. A. (1984). DETECTING ALCOHOLISM - THE CAGE QUESTIONNAIRE. *Jama-Journal of the American Medical Association*, 252, 1905-1907. <http://dx.doi.org/10.1001/jama.1984.03350140051025>
- Fishbein, M. (1967). A behaviour theory approach to the relations between beliefs about an object and the attitude toward the object. In M. Fishbein (Ed.). *Readings in Attitude Theory and Measurement* (pp. 389-400). Wiley, New York.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: an introduction to theory and research*, Addison-Wesley Pub. Co.
- Gregory, G. D., & Di Leo, M. (2003). Repeated behavior and environmental psychology: The role of personal involvement and habit formation in explaining water consumption. *Journal of Applied Social Psychology*, 33, 1261-1296. <http://dx.doi.org/10.1111/j.1559-1816.2003.tb01949.x>
- Harrell, F. (2001). *Regression modeling strategies*, Springer New York.
- Khare, A., & Inman, J. J. (2006). Habitual behavior in American eating patterns: The role of meal occasions. *Journal of Consumer Research*, 32, 567-575. <http://dx.doi.org/10.1086/500487>

- King, M. (1986) At risk drinking among general-practice attenders - validation of the Cage questionnaire. *Psychological Medicine*, 16, 213-217. <http://dx.doi.org/10.1017/S0033291700002658>
- Mcgraw, K. O., & Wong, S. P. (1996). Forming inferences about some intraclass correlation coefficients. *Psychological Methods*, 1, 30-46. <http://dx.doi.org/10.1037/1082-989X.1.1.30>
- Meiselman, H. L., Mastroianni, G., Buller, M., & Edwards, J. (1999). Longitudinal measurement of three eating behavior scales during a period of change. *Food Quality & Preference*, 10, 1-8. [http://dx.doi.org/10.1016/S0950-3293\(98\)00013-5](http://dx.doi.org/10.1016/S0950-3293(98)00013-5)
- Melo, L., Colin, J., Delahunty, C., Forde, C., & Cox, D. N. (2010a). Lifetime wine drinking, changing attitudes and associations with current wine consumption: A pilot study indicating how experience may drive current behaviour. *Food Quality and Preference*, 21, 784-790. <http://dx.doi.org/10.1016/j.foodqual.2010.07.012>
- Melo, L., Delahunty, C., & Cox, D. N. (2010b). Longitudinal wine consumption, attitudes and associations over consumers' drinking histories. In: *Proceedings of the the 14th Australian Wine Industry Technical Conference*. Adelaide, Australia.
- Melo, L., Delahunty, C., & Cox, D. N. (2011). A New Approach Using Consumers' 'Drinking Histories' to Explain Current Wine Acceptance. In: *Abstracts of the 9th Pangborn Sensory Science Symposium*. Toronto, Canada.
- Melo, L., Delahunty, C., Forde, C., & Cox, D. N. (2010c). Development and validation of a tool to recall alcoholic beverage and wine consumption over consumers' lifetimes. *Food Quality and Preference*, 21, 697-704. <http://dx.doi.org/10.1016/j.foodqual.2010.05.014>
- Mittal, B., & Lee, M. S. (1989). A CAUSAL MODEL OF CONSUMER INVOLVEMENT. *Journal of Economic Psychology*, 10, 363-389. [http://dx.doi.org/10.1016/0167-4870\(89\)90030-5](http://dx.doi.org/10.1016/0167-4870(89)90030-5)
- Naik, N. Y., & Moore, M. J. (1996). Habit formation and intertemporal substitution in individual food consumption. *Review of Economics and Statistics*, 78, 321-328. <http://dx.doi.org/10.2307/2109934>
- Neal, D. T., Wood, W., & Quinn, J. M. (2006). Habits- A repeat performance. *Current Directions in Psychological Science*, 15, 198-202. <http://dx.doi.org/10.1111/j.1467-8721.2006.00435.x>
- Olsen, J. E., Thach, L., & Nowak, L. (2007). Wine for my generation: Exploring how US wine consumers are socialized to wine. *Journal of Wine Research*, 18, 1-18. <http://dx.doi.org/10.1080/09571260701526816>
- Olson, M. A., & Fazio, R. H. (2001). Implicit attitude formation through classical conditioning. *Psychological Science*, 12, 413-417. <http://dx.doi.org/10.1111/1467-9280.00376>
- Orbell, S., & Verplanken, B. (2010). The Automatic Component of Habit in Health Behavior: Habit as Cue-Contingent Automaticity. *Health Psychology*, 29, 374-383. <http://dx.doi.org/10.1037/a0019596>
- Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, 124, 54-74. <http://dx.doi.org/10.1037/0033-2909.124.1.54>
- Ratchford, B. T. (2001). The economics of consumer knowledge. *Journal of Consumer Research*, 27, 397-411. <http://dx.doi.org/10.1086/319617>
- Rogers, P. (1996). Food choice, mood and mental performance: some examples and some mechanisms. In H. L. Meiselman & H. J. H. MacFie (Eds.). *Food choice, acceptance and consumption* (pp. 319-345). Blackie Academic and Professional. London. [http://dx.doi.org/10.1007/978-1-4613-1221-5\\_9](http://dx.doi.org/10.1007/978-1-4613-1221-5_9)
- Shakeshaft, A., Doran, C. M., & Byrnes, J. (2009). The role of research in the failure of the alcopops excise in Australia: what have we learned? *Medical Journal of Australia*, 191, 223-225.
- Shepherd, R., & Raats, M. M. (1996). Attitudes and beliefs in food habits. In H. L. Meiselman & H. J. H. MacFie (Eds.). *Food Choice Acceptance and Consumption* (pp. 346-364). Black Academic and Professional, London. [http://dx.doi.org/10.1007/978-1-4613-1221-5\\_10](http://dx.doi.org/10.1007/978-1-4613-1221-5_10)
- Shepherd, R., & Sparks, P. (1999). Modelling food choice. In H. J. H. MacFie & D. M. H. Thomson (Eds.). *Measurement of Food Preferences* (Pp, 202-226). An Aspen Publication, Gaithersburg, Maryland.
- Skuras, D., & Vakrou, A. (2002). Consumers' willingness to pay for origin labelled wine: a Greek case study. *British Food Journal*, 104, 898-912. <http://dx.doi.org/10.1108/00070700210454622>

Smith, A., Edwards, C., & Harris, W. (2005). Bottleshops and 'ready-to-drink' alcoholic beverages. *Health promotion journal of Australia : official journal of Australian Association of Health Promotion Professionals*, 16, 32-36.

Stevens, J. (2002). *Applied multivariate statistics for the social sciences*, Lawrence Erlbaum.

Stevenson, R. J., Copeland, J., & Gates, P. (2007). The role of experience in liking "read-to-drink" alcoholic beverages. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, 21, 564-569.

Teagle, J., Mueller, S., & Lockshin, L. (2010). How do millennials' wine attitudes and behaviour differ from other generations? In *Proceedings of the 5th International Conference of the Academy of Wine Business Research*. Auckland, New Zealand.

Thach, E., & Olsen, J. (1993). The search for new wine consumers: Marketing focus on consumer lifestyle or lifecycle. *International Journal of Wine Marketing*, 16, 44-57. <http://dx.doi.org/10.1108/eb008778>

Urala, N., & Lahteenmaki, L. (2004). Attitudes behind consumers' willingness to use functional foods. *Food Quality and Preference*, 15, 793-803. <http://dx.doi.org/10.1016/j.foodqual.2004.02.008>

Verbeke, W. (2005) Consumer acceptance of functional foods: socio-demographic, cognitive and attitudinal determinants. *Food Quality and Preference*, 16, 45-57. <http://dx.doi.org/10.1016/j.foodqual.2004.01.001>

Walther, E., Nagengast, B., & Trasselli, C. (2005). Evaluative conditioning in social psychology: Facts and speculations. *Cognition & Emotion*, 19, 175-196. <http://dx.doi.org/10.1080/02699930441000274>

Williams, J. (2005). Habit formation and college students' demand for alcohol. *Health Economics*, 14, 119-134. <http://dx.doi.org/10.1002/hec.908>

Wilson, D. M. (2007). *Generating retrospective panel data on the patterns of repeat behaviour*. PhD Thesis. Adelaide: University of South Australia (School of Marketing).

Wilson, D., Rungie, C., & Lockshin, L. (2003). The importance of investigating the existence of age cohort groups in wine marketing. ANZMAC: University of South Australia.

Wood, W., & Neal, D. T. (2007). A new look at habits and the habit-goal interface. *Psychological Review*, 114, 843-863. <http://dx.doi.org/10.1037/0033-295X.114.4.843>

Yeomans, M. R. (2006). The role of learning in development of food preferences. In R. Shepherd & M. Raats (Eds.). *The Psychology of Food Choice* (pp. 93-112). Cabi, Wallingford UK. <http://dx.doi.org/10.1079/9780851990323.0093>

Yeomans, M. R. (2010). Understanding Individual Differences in Acquired Flavour Liking in Humans. *Chemosensory Perception*, 3, 34-41.

Table 1. Phase 1 belief-evaluations grouped into 6 factors and intraclass correlation coefficients (ICC) for each 'drinking history' phase<sup>a</sup>, using the same set of factors

Factors (% of variance)	Belief-evaluations towards wine (loadings)	ICC		
		Phase 1	Phase 2	Phase 3
1) 'Social & Pleasure': (22.1%)	Social life (0.800) Party/celebration (0.784) To be part of a group/culture (0.729) Bars/hotels (0.718) Fun/relax/enjoy time (0.709) Outdoor-BBQ picnics (0.651) Business related meals (0.410)	0.830	0.811	0.845
2) 'Detail': (15.5%)	Region of origin (0.806) Wine new experiences (0.786) Knowledge of wine (0.739) Grape variety (0.688) Experts' opinions (0.683) Country of origin (0.678)	0.874	0.870	0.874
3) 'Regular': (6.04%)	Regular meals at home (0.767) Complement food (0.674) Health benefits (0.598) Routine/habits (0.504) Taste (0.432) Treat (0.429)	0.727	0.778	0.777
4) 'Intimate': (5.59%)	Friends' and/or families suggestions (0.689) Higher prices for special occasions (0.658) Intimate dinner (0.630) Meal with friends (0.611)	0.748	0.731	0.732
5) 'Sensory': (4.93%)	Dry wines (0.708) Sweet wines (-1) (-0.707) Light wines (-1) (-0.511) Heavy wines (0.352)	0.551	0.593	0.603
6) 'Value': (4.61%)	Price (0.811) Value for money (0.663)	0.696	0.593	0.597

<sup>a</sup> Phase 1: beginning-29y; Phase 2: 30-45y; Phase 3: 46-60y.

Table 2. Multiple linear regressions for red and white wine consumption depending on the 'drinking history' phases<sup>a</sup> and age groups

Wine consumption (number of drinks/year) in a 'drinking history' phase						
Case	Type of wine	Age group	At	Based on	<i>p</i>	<i>R</i> <sup>2</sup>
1a1	Red wine	30-40y	Phase 2	Phase 1	0.000	0.509
1a2	Red wine	50-60y	Phase 2	Phase 1	0.000	0.676
1b1	White wine	30-40y	Phase 2	Phase 1	0.000	0.606
1b2	White wine	50-60y	Phase 2	Phase 1	0.000	0.651
2a	Red wine	50-60y	Phase 3	Phase 2	0.000	0.702
2b	White wine	50-60y	Phase 3	Phase 2	0.000	0.762
Current average weekly wine consumption (total mL/week)						
Case	Type of wine	Age group		Based on	<i>p</i>	<i>R</i> <sup>2</sup>
3a	Red wine	30-40y		Phase 1 (previous)	0.093	0.368
3b	White wine	30-40y		Phase 1 (previous)	0.050	0.499
4a	Red wine	50-60y		Phase 2 (previous)	0.001	0.350
4b	White wine	50-60y		Phase 2 (previous)	0.000	0.575
5a	Red wine	30-40y		Phase 2 (ongoing)	0.000	0.530
5b	White wine	30-40y		Phase 2 (ongoing)	0.000	0.538
6a	Red wine	50-60y		Phase 3 (ongoing)	0.000	0.419
6b	White wine	50-60y		Phase 3 (ongoing)	0.000	0.532

<sup>a</sup> Phase 1: beginning-29y; Phase 2: 30-45y; Phase 3: 46-60y (only 50-60y age group reached its 'drinking history' Phase 3).

Table 3. Significant predictors ( $p < 0.05$ ) of red and white wine consumption (number of drinks/year) in a 'drinking history' phase<sup>a</sup> based on the previous phase using multiple linear regressions (significant models that presented belief-evaluation factors<sup>b</sup> as predictors)

Case <sup>c</sup>	Dependent variable	Significant predictors	Un-standardized coefficients (SE)	Standardized betas	t score	<i>p</i>
1a1	<b>Red</b> wine consumption -Age group: 30-40y (N = 282) -At Phase: 2 -Based on: Phase 1 - model $p < 0.001$ - model $R^2 = 0.509$	'Sensory' (factor 5) <sup>b</sup>	15.597 (5.111)	0.365	3.052	0.003
		Total number of drinks of liquor	0.021 (0.007)	0.341	2.864	0.006
		Wine involvement	2.674 (1.301)	0.275	2.056	0.044
		Age	-10.207 (4.589)	-0.223	-2.224	0.030
1a2	<b>Red</b> wine consumption -Age group: 50-60y (N = 282) -At Phase: 2 -Based on: Phase 1 - model $p < 0.001$ -model $R^2 = 0.676$	Total number of drinks of red wine	0.089 (0.021)	0.595	4.253	0.000
		'Detail' (factor 2) <sup>b</sup>	8.296 (3.554)	0.263	2.334	0.023
		Income	13.534 (6.190)	0.228	2.286	0.033
		Employment situation (not working)	-216.931 (100.224)	-0.228	-2.164	0.035
		Number of people at home	-29.406 (13.029)	-0.220	-2.257	0.028
1b1	<b>White</b> wine consumption -Age group: 30-40y -At Phase: 2 -Based on: Phase 1 -model $p < 0.001$ -model $R^2 = 0.606$	Total number of drinks of white wine	0.053 (0.010)	0.539	5.244	0.000
		Gender (female)	59.615 (26.901)	0.293	2.216	0.030
		Living situation (alone)	-62.897 (30.283)	-0.202	-2.077	0.042
		'Value' (factor 6) <sup>b</sup>	-3.137 (1.567)	-0.188	-2.002	0.050
2a	<b>Red</b> wine consumption -Age group: 50-60y -At Phase: 3 -Based on: Phase 2 -model $p < 0.001$ -model $R^2 = 0.702$	Total number of drinks of red wine	0.037 (0.004)	0.637	9.557	0.000
		Total number of drinks of white wine	0.023 (0.005)	0.270	4.350	0.000
		'Value' (factor 6)	5.855 (2.282)	0.171	2.566	0.012
		Age	9.762 (4.005)	0.139	2.438	0.016
2b	<b>White</b> wine consumption -Age group: 50-60y -At Phase: 3 -Based on: Phase 2 -model $p < 0.001$ -model $R^2 = 0.762$	Total number of drinks of white wine	0.056 (0.004)	0.857	15.445	0.000
		'Regular' (factor 3) <sup>b</sup>	-9.716 (2.664)	-0.276	-3.646	0.000
		Total number of drinks of red wine	-0.006 (0.003)	-0.141	-2.347	0.019

<sup>a</sup> Phase 1: beginning-29y; Phase 2: 30-45y; Phase 3: 46-60y (only 50-60y age group reached its 'drinking history' Phase 3).

<sup>b</sup> See belief-evaluation factors in Table 1.

Table 4. Significant predictors ( $p < 0.05$ ) of current average weekly red and white wine consumption (total mL/week) based on the previous or ongoing 'drinking history' phase<sup>a</sup> using multiple linear regressions (significant models that presented belief-evaluation factors<sup>b</sup> as predictors)

Case <sup>c</sup>	Dependent variable	Significant predictors	Un-standardized coefficients (SE)	Standardized betas	t score	<i>p</i>
3b	<b>White</b> wine consumption -Age group: 30-40y (N = 282) -Based on: Phase 1 (previous) -model $p < 0.05$ -model $R^2 = 0.499$	Total number of drinks of white wine	0.193 (0.089)	0.378	2.164	0.037
		'Value' (factor 6) <sup>b</sup>	-33.085 (15.038)	-0.324	-2.200	0.034
4b	<b>White</b> wine consumption -Age group: 50-60y (N = 282) -Based on: Phase 2 (previous) -model $p < 0.001$ -model $R^2 = 0.575$	Total number of drinks of white wine	0.153 (0.040)	0.644	3.859	0.000
		'Social & Pleasure' (factor 1) <sup>b</sup>	72.420 (21.273)	0.495	3.404	0.001
		'Regular' (factor 3) <sup>b</sup>	-58.141 (27.913)	-0.364	-2.083	0.042
		Total number of drinks of liquor	0.080 (0.031)	0.320	2.542	0.014
6a	<b>Red</b> wine consumption -Age group: 50-60y -Based on: Phase 3 (ongoing) -model $p < 0.001$ -model $R^2 = 0.419$	Number of drinks of red wine per year	0.208 (0.042)	0.510	5.001	0.000
		'Social & Pleasure' (factor 1)	87.804 (22.344)	0.447	3.930	0.000
		Wine involvement	-20.240 (7.858)	-0.296	-2.576	0.011
		'Sensory' (factor 5) <sup>b</sup>	40.557 (19.151)	0.189	2.119	0.036

<sup>a</sup> Phase 1: beginning-29y; Phase 2: 30-45y; Phase 3: 46-60y (only 50-60y age group reached its 'drinking history' Phase 3).

<sup>b</sup> See belief-evaluation factors in Table 1.

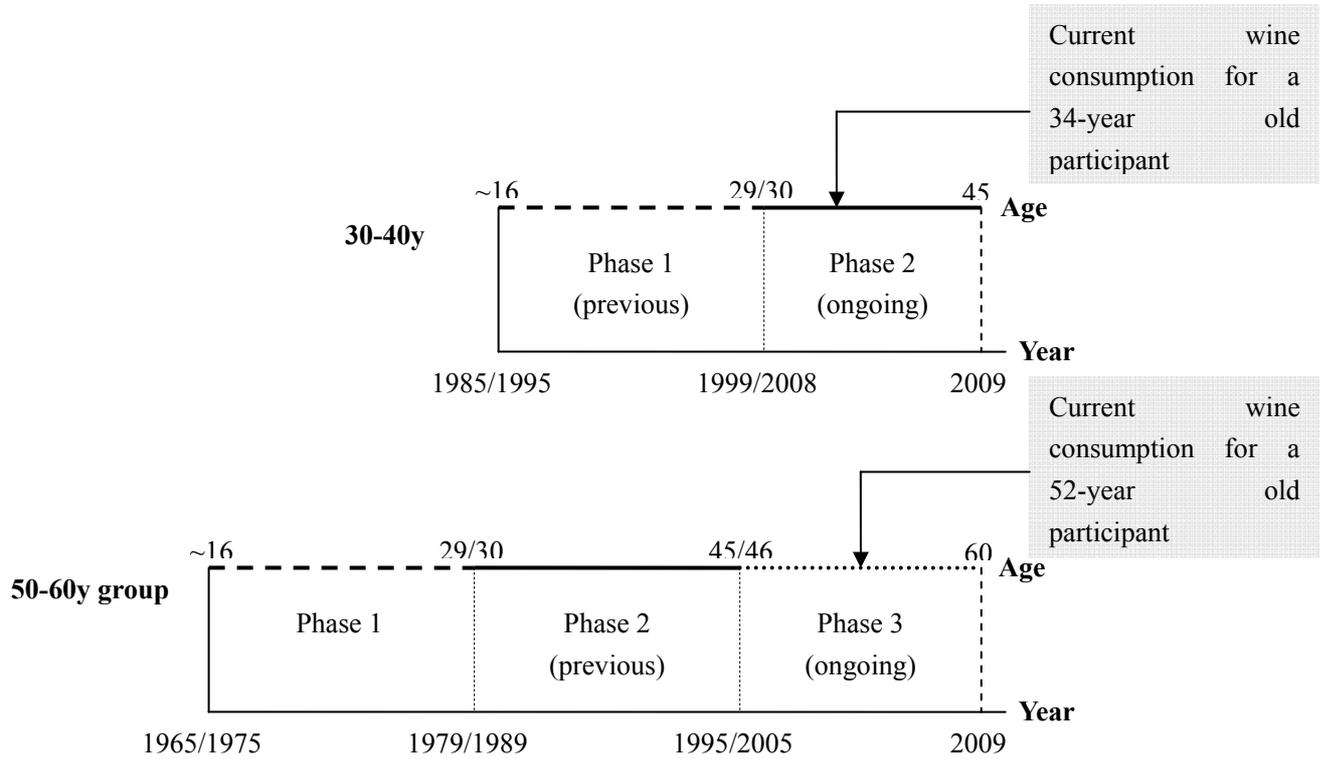


Figure 1. 'Drinking history' phases and current wine consumption