

Big Drinkers: How BMI, Gender and Rules of Thumb Influence the Free Pouring of Wine

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Abstract

Background: This research examines free pouring behavior and provides an account of how Body Mass Index (BMI) and gender might lead to the overpouring, and consequently the overconsumption – of wine.

Methods: An observational study with young adults investigated how BMI and gender affect free-pouring of wine over a variety of pouring scenarios, and how rules-of-thumb in pouring affect the quantities of alcohol poured by men and women across BMI categories.

Results: For men, the amount poured was positively related to BMI. However, BMI did not affect pours by women. The use of the “half glass” rule-of-thumb in pouring reduced the volume of wine poured by over 20% for both men and women. Importantly, this rule-of-thumb substantially attenuated the pours by men at high BMI levels.

Conclusions: Increasing awareness of pouring biases represents an early and effective step toward curbing alcohol consumption among men, and especially those who are overweight. Additionally, using a simple “half glass” rule-of-thumb may be an effective way to curb overpouring, despite non-standard glass sizes.

Key Words: Alcohol Pouring, Gender, BMI, Rules of thumb, Wine pouring, Drinking norms

**Mindless Drinking: How Rules of Thumb, BMI, and Gender
Influence the Free Pouring of Wine**

Introduction

A large body of research on alcohol consumption is based on self-reports of drinking behavior that assume participants' accurate recall of past drinking behavior and ability to estimate standard drink sizes. Fewer studies examined real-time drinking behavior and behaviors preceding drinking such as individuals' free-pouring of alcohol. This research addresses this knowledge gap by examining real-time alcohol pouring, as an antecedent of drinking behavior (Goddard, 2007; White et al. 2003; White et al., 2005). The scope of the present research is to examine how individual variables such as gender and BMI affect the amount of alcohol poured and ultimately consumed. In addition, we investigate how using arbitrary simple rules-of-thumb such as the "half glass rule" affects alcohol pouring behavior.

Assessing a standard drink size can pose challenges to consumers in situations or settings where free pouring is the norm. Goddard (2007) suggested that misperceptions of alcoholic strength and volume during pouring are major factors contributing to drinking problems in United Kingdom. The volume of beer and spirits consumed may be more accurately measured compared to that of wine. That is, beer is served from standardized single serving containers, cans, or full glasses (Devos-Comby & Lange, 2008), and spirits are generally measured in drinking establishments. In contrast, assessing wine consumption can be particularly challenging as wine is often self-poured at dinners, parties, and receptions. In addition, the amount poured may vary widely because the capacity of most wine glasses greatly exceeds one serving of

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alcohol, and the wide variety of glass shapes and sizes make poured volumes difficult to estimate relatively to a standard drink size metric (Goddard, 2007; Kerr et al., 2009; Walker et al., 2013).

To date, most of the research on alcohol pouring has focused on the effect of external cues on the quantities of alcohol poured by bartenders (Kerr et al., 2008; Wansink & van Ittersum, 2005) and fewer studies have focused on the individuals' self-serving of alcohol beverages (Gill & Donaghy, 2004; Banwell, 1999).

This research addresses this important gap in the literature and investigates how gender, BMI, and the use of rules-of-thumb relate to free-pouring of alcohol in a variety of consumption settings. We focused on wine to examine pouring biases because wine is consumed without ice or a mixer, and allows us to keep a constant % ABV (alcohol by volume) across participants.

BMI, Gender and Alcohol Consumption

Past research has found correlations between BMI and drinking quantity and/or frequency, however the results are mixed (Arif & Rohrer, 2005; Breslow & Smothers, 2005; French et al., 2010; Nies et al., 2012; Pajari et al., 2010). Some studies suggest that the quantity of alcohol consumed is positively related to BMI; consuming four or more drinks per day was associated with significantly higher BMI than consuming one drink a day (Breslow & Smothers, 2005). Also, binge drinkers and heavy drinkers had higher BMI than those who frequently consumed small amounts of alcohol (Arif & Roher, 2005; Breslow & Smothers, 2005). On the other hand, frequency of drinking alone was found to be negatively related to BMI. Frequent drinkers had lower BMI than participants who drank less frequently (Breslow & Smothers, 2005).

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Other studies found the relationship between BMI and drinking to be moderated by gender. These studies also present mixed results. Some studies suggest a negative correlation for women between BMI and both the frequency and quantity of alcohol consumed (Colditz et al., 1991; Lahti-Koski et al., 2002; Liu et al., 1994; Rohrer et al., 2005); others suggest a positive correlation between BMI and the number of drinks consumed weekly (Smarandescu et al. 2014). For men, the findings are also inconclusive. Some studies found the quantity of alcohol consumed to be positively correlated with BMI (Arif & Rohrer, 2005; Breslow & Smothers, 2005; French et al., 2010; Lahti-Koski et al., 2002; Nies et al., 2012; Pajari et al., 2010), while others reported a negative correlation, or no correlation with BMI (Colditz et al., 1991; Liu et al., 1994; Smarandescu et al., 2004; Williamson et al., 1987). Gearhardt and Corbin (2009) proposed that drinking quantity may differ with BMI levels because heavier individuals are likely to drink more in order to attain comparable blood alcohol concentration (BAC) levels. This may partly explain why men typically drink more than women (Berkowitz & Perkins, 1987; Johnson et al., 2004; Johnson, 1997; Lemle & Mishkind, 1989; McCreary et al., 1999; Perkins, 1992), as men have higher average weights than women.

Another factor that is likely to affect free-pouring and drinking behavior is individual perception of social norms. One of the reasons why men drink more than women is because drinking is perceived as more socially acceptable behavior for men than for women (de Visser & McDonnell, 2012). Research attributed the widespread use of alcohol among students to misperceptions of peer drinking norms (Baer & Carney, 1993; Baer, Stacy, & Larimer, 1991; Perkins & Wechsler, 1996) and suggested that students overestimate the alcohol consumption of their peers (Perkins & Berkovitz, 1986), which leads to increases in their own consumption. Studies have also found that gender moderates the relationship between perceived social norms

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and drinking (Adams & Nagoshi, 1999; Lo, 1995). Studies showed that individual perceptions of same-gender drinking (Lewis & Neighbors, 2004) were more strongly correlated with drinking than perceptions of drinking behavior of a typical student (without reference to gender) in particular for women. They suggested that while consuming alcohol, women are more likely to adhere to social norms derived from same-gender comparison than men.

Summary and Aims

To date, no research has examined how BMI moderates the relationship between gender and alcohol pouring behavior, which is an important antecedent of alcohol consumption. We expect to find gender differences in pouring behavior based on the fact that men drink more often and more heavily than women. Hence, on average, men would pour larger volumes than women. It is also expected that men are more likely to drink to attain a certain BAC level; therefore, men would pour larger volumes at higher levels of BMI. In comparison, women are expected to pour less than men and more constant across BMI levels for two reasons. First, drinking is still viewed as less socially acceptable for women than it is for men (de Visser & McDonnell, 2012), and given that self-pouring alcohol has high visibility in social situations, women would be more likely to monitor their pour volumes. Second, consistent with research that found that gender moderates the relationship between perceived social norms and drinking (Adams & Nagoshi, 1999; Lo, 1995), women are more likely to engage in same-gender comparisons than men (Lewis & Neighbors, 2004) and comparisons with an average pour would result in less variance in pouring across scenarios. In conclusion, pour amounts for women are expected to increase with BMI at a smaller rate than for men.

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Moreover, individuals' pouring behavior may also be influenced by the use of certain rules-of-thumb in pouring. For instance, wine connoisseurs suggest that glasses should be filled about one-third of the way for red wines, halfway for whites, and three-fourths of the way for sparkling wines. Individuals who regularly adhere to these rules-of-thumb are expected to adjust their pour amounts accordingly and pour less than individuals who do not use rules-of-thumb. We also pose that the use of rules-of thumb in pouring will interact with gender and BMI. For women, who are likely to pour more consistent amounts across BMI levels, this would imply a general downward shift in pour amounts. For men, in addition to a downward shift in the amount poured, the use of a rule-of-thumb would likely attenuate the effect of BMI on pouring, as pour amounts are expected to increase along with BMI for men.

A quasi-experimental study examined wine-pouring behavior for a young adult college population (students and staff members) and correlated quantity poured as a function of gender, BMI, and use of rules-of-thumb. Wine was chosen as our target beverage in this study because it is free-poured in different consumption contexts and in glasses of different shapes and sizes. Notably, wine is consumed in pure form, and we could control its % APV, allowing us to solely focus on differences in pouring behavior across gender and BMI. Various pouring scenarios were used to control for familiarity with any particular set-up.

Although it is important to realize that pouring behavior does not necessarily equate to drinking behavior, based on a significant body of research in nutrition and obesity, which shows that serving behavior is correlated with food intake and overeating (Wansink, 2004; Wansink et al., 2005; Wansink & Van Ittersum, 2007; Wansink et al., 2006), we anticipate wine-pouring behavior to provide an effective proxy for wine consumption.

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Materials and Methods

After getting approval from the university Institutional Review Board, a convenience sample of 74 college students and staff of legal drinking age was recruited. Participants were recruited based on the criteria that they drank at least one glass of wine per week. After filling out consent forms, participants were directed to different pouring stations and instructed to pour “as much wine as they would normally pour into a glass in one setting”. They did not drink the wine. This pouring task was repeated over sixteen scenarios for each participant. Participants were instructed to consider each pour as a one-time individual serving, which was unconnected to previous pours. The tables used for pouring contained scales that measured the weight of the empty and filled glass when the glass was placed on the table. To control for the possibility of a demand artifact, in addition to the wine pouring tables, individuals were directed to other tables where they served themselves with pasta and apple sauce in different plate sizes. Participants did not eat the food. Sample statistics are shown in Table 1.

Insert Table 1

In order to derive findings that would be meaningful and generalizable considering the wide range of wine glass shapes and sizes existing in the marketplace, in this study we provided participants with a variety of pouring scenarios. Each pouring station presented a different context, and the set-ups were comprehensive of most common pouring situations. Across scenarios, individuals poured different types of wine (red or white), from bottles with different fullness levels, into different glass sizes (small, medium, large) and shapes (narrow, standard, with and without stem, ornate, or simple), and in the presence or absence of water pitchers. To further control for familiarity with a particular pouring position, participants were also instructed

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to pour from different positions (standing, sitting at a table, holding the glass, or having the glass placed on the table), and these positions were also randomized across scenarios. All sixteen pouring scenarios were presented in random order to each participant; each scenario featured a unique combination of variable levels. The set of sixteen scenarios, out of a possible 10,368 combinations, allowed us to empirically control for the effects of each of the attributes and attribute levels in our model.

This comprehensive design allowed us to control for the effects of irrelevant contextual variables and individual familiarity with a setting, and focus on the effects of gender, BMI, and use of rules-of-thumb in pouring. Following the pouring task, the weights of the pours were recorded and participants stepped on a scale that measured their body weight. Next they completed a survey that asked them to report their height, demographics, and whether they used rules-of-thumb in wine pouring (see Table 1). Sixty-six percent of the individuals in our sample indicated that they were likely to use a rule-of-thumb when pouring wine (i.e. a score of greater than 5 on a 9-point scale anchored by “not at all likely” and “very likely”). The rules-of-thumb measures in pouring included, “I usually pour wine into a glass until there is a two finger gap between the wine and the top of the glass,” “When pouring wine to myself, I usually fill my glass to the top,” and “A person should never pour more than a half of glass of wine at one time.” No individuals reported that they were likely to use more than one rule-of-thumb. The “half glass” rule was used by 71% of the subjects reporting use of a rule-of-thumb and was therefore used in our analysis.

Analysis and Results

We modeled the amount poured, in grams, using a random parameters model, controlling for all the components of the sixteen different pouring scenarios and allowing for both observed and unobserved heterogeneity across subjects. The observed heterogeneity was specified as a function of the individual factors, gender, BMI, and the “half glass” rule-of-thumb, as well as all two and three-way interactions.

The parameter estimates for the hierarchical variables – the individual characteristics, appear in Table 2. Given the modeled interactions among the three individual factors, the effects $\gamma_1 - \gamma_6$ are all conditional ones, and must be carefully interpreted. These effects are presented in Figure 1 across the ranges of BMI for the males and females in our sample. A breakdown of the sample by gender and BMI appears in Table 3. Since we are interested in investigating differences in pour amounts at particular focal values of BMI, a spotlight analysis is particularly suited for interpreting our findings (Spiller et al., 2013). Specifically, the simple effects of gender (i.e. male), the rule-of-thumb (RofT), and the interaction between the two (Male x RofT), which are all conditional on BMI, can be tested for significance at each focal value of BMI.

The first column of estimates in Table 2 corresponds to BMI being mean-centered at the mean levels of BMI for both the males and females in our sample. Columns 2, 3, and 4 correspond to centering BMI at the focal levels of the midpoint of the normal range (21.75), the normal/overweight cutoff value (25.00), and the overweight/obese cutoff value (30.00), respectively.

Insert Table 2

Insert Figure 1

Insert Table 3

The most commonly used rule-of-thumb was the “half glass” rule (47%), followed by “to the top” (15%), and the “two finger gap” (4%) rules. Thirty-four percent of the sample did not use a rule-of-thumb. There was no significant difference in the use by rules-of-thumb by males vs. females. Because of the widespread use of the “half glass” rule and the less common usage of the other rules, subsequent analyses focus only on the former.

When the “half glass” rule was not used, males poured more than females for all three focal values of BMI. This effect can be seen graphically in Figure 1, where the solid black line has been shown to be significantly above the solid gray line at all three focal values of BMI. Without the “half glass” rule, at the midpoint of the normal range of BMI, males poured 9% more than females. At the normal/overweight cutoff, that percentage increased to 19%. Males poured 34% more than females at the overweight/obese cutoff.

The estimates for the “half glass” rule (γ_3) indicate that females poured less when they were using the “half glass” rule than when they were not. This effect can be seen in Figure 1 – the dotted gray line is lower than the solid gray line. At the midpoint of the normal BMI range, females poured 20% less when they used the “half glass” rule than when they did not use the rule. This percentage dropped slightly to 19% at the overweight/ obese cutoff.

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The interaction effect between gender and the use of the “half glass” rule (γ_5) is shown to be non-significant when BMI is at the midpoint of the normal range (see Table 2, column 2). However, when BMI is at the cutoff between normal and overweight, the interaction is significantly negative at the 0.05 level (Table 2, column 3). When BMI reaches the overweight/obese cutoff, the interaction is negative and significant at the 0.001 level. This effect highlights the magnitude of the impact of the “half glass” rule on pouring behavior of males and females, visible in Figure 1. The rule-of-thumb effect seems to be attenuated for females (shown as a slight reduction in the distance between the gray lines in Figure 1) as BMI increases. For males, the rule-of-thumb effect increases (shown as an increase in distance between the black lines in Figure 1) as BMI increases. Without using the “half glass” rule, males at the overweight/obese cutoff poured 31% more compared to 26% at the midpoint of the normal range.

For females who were not using the “half glass” rule, the effect of BMI on pour amounts (γ_2) is significantly negative (shown as the down-sloping solid gray line in Figure 1), although the effect size is small, consistent with the expectation that females’ pour amounts do not increase with BMI. The effect of BMI on male pours is of a significantly higher positive magnitude than for females (γ_4) – the slope of the solid black line in Figure 1 is steeper than the slope of the solid gray line. Males who were not using the rule-of-thumb poured 19% more at the overweight/ obese cutoff than at the midpoint of the normal range.

The positive interaction effect between BMI and use of the “half glass” rule for females (γ_6), is graphically represented in Figure 1, where the distance between the solid gray line and the dotted gray line in Figure 1 is reduced as BMI increases. Finally, the positive impact of BMI for

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males is attenuated when the “half glass” rule was used (γ_7), effect indicated by the greater slope of the solid black line in Figure 1 as compared to the dotted black line.

General Discussion

The study showed a strong positive relationship between BMI and the amount of wine poured for men, but not for women. The use of a “half glass” rule was effective for both men and women, reducing average pour amounts from more than a standard serving of alcohol (5 fl. oz.) to less than a standard serving. Importantly, this rule had higher impact on higher BMI males. This is consistent with an explanation that men pour and drink in order to experience the effect of alcohol, while women are less likely to be influenced by BMI in their pours as they are more likely to compare their pours with other women, which would lead to a regression toward the mean.

Limitations and Future Research

Although this research provides important insight into how gender and BMI impact wine pouring behavior, there are still limitations to consider. First, choosing wine as a target beverage allowed us to control for the percentage APV and to provide a proxy for other free pouring scenarios. One may argue that young adults are less likely to be regular wine drinkers, so they may be less experienced pouring wine than older adults. While it is true that preference for wine increases with age, in particular over the age 50, the national 2012 Gallup survey indicates that 24% of the 18- 29 year old individuals indicate wine as their first beverage choice, while 41% of

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the individuals in this age group prefer beer (Gallup, 2012). While regular wine drinkers may pour more per drink than non-regular wine drinkers due to increased tolerances, they may also be more calibrated in their pours. Past research found that experienced bartenders were prone to the same pouring biases as untrained novices, although these were of a smaller magnitude (Wansink & van Ittersum, 2005). We argue that experience with drinking wine is unlikely to eliminate the gender differences in pouring or the gender/ BMI interaction observed. Hence, the BMI effect on pouring is expected to be diminished for experienced drinkers, which would tend to be more calibrated and show less variance across pours. Therefore, would expect that for experienced wine drinkers, BMI would still affect the amount poured for men, while women would remain more calibrated across BMI levels.

Future research may find it useful to examine pouring biases across gender and BMI using beverages varying in % APV such as beer, or mixed drinks. Beer brands vary widely in % APV (from 3.88 to over 10%), and pitchers vary in volume and fullness, so pouring beer may present individuals with greater estimation challenges than wine pouring. In addition, beer is a high caloric beverage that has stronger associations with masculinity, so it is more likely to be overpoured by men.

It is also important to acknowledge that although pouring behavior is an important antecedent of alcohol consumption, it is not a direct measure of consumption. Further research may provide additional insight by examining the effects of gender and BMI on drinking behavior in environments where individuals self-pour. Nonetheless, consistent with previous research on overeating showing that the portion individuals serve is correlated with food intake (Wansink et al., 2005; Wansink & van Ittersum, 2007; Wansink et al., 2006) and ultimately with BMI levels (Wansink & Payne, 2008), we contend that the amount of alcohol poured will ultimately affect

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alcohol consumption. Moreover, considering that portion control has proved to be an effective mechanism for losing weight (Hannum et al., 2004; Pedersen et al., 2007), we posit that increasing awareness of biases in wine pouring is an important step toward controlling free-pouring and thereby toward curbing alcohol consumption.

Conclusions and Implications

Our findings show evidence of what might be an important link between BMI, gender, and a behavioral antecedent of alcohol consumption, the pouring of wine. BMI was positively related to the volume of wine poured for men but not for women. Also, the adoption of the “half glass” rule-of-thumb dramatically reduced poured amounts for both men and women by over 20%. These insights could be important highlights for public policy makers and safe driving PSA’s. Since men and women appear to differ in their pouring behavior across BMI levels, appeals to men and women may need to be emphasize different messages. For men, increasing awareness of how BMI affects their standard pour may be an effective way to curb alcohol consumption. Also, previous work by Smarandescu et al. (2014) that examined self-reports of drinking behavior across gender and BMI suggests that men also report consuming more drinks at higher BMI levels, so public messages addressed to men should aim at reducing both the amount poured and frequency of drinking.

Finally, emphasizing the effectiveness of simple rules-of-thumb during pouring such as the half-glass-rule is likely to reduce pouring by both men and women, with positive consequences for overall alcohol consumption. An important note is that the use of rules of thumb in pouring had a larger positive effect for men at higher BMI level because it attenuated the effect of BMI on pouring.

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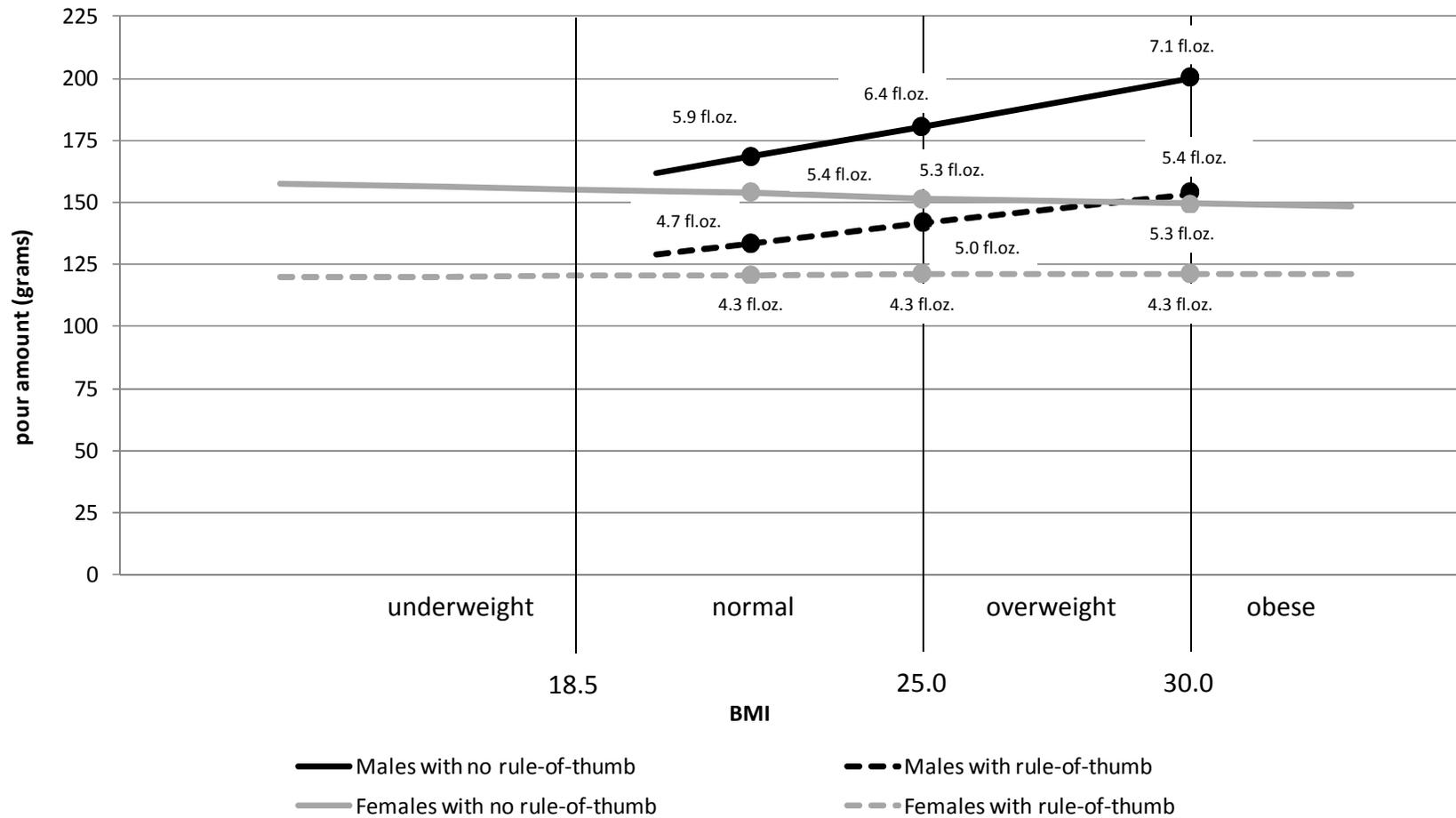
HOW BMI, GENDER AND RULES OF THUMB INFLUENCE THE FREE POURING OF WINE

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Figure 1: Pour Amounts by Gender, BMI, and Rule-of-Thumb



Note: 33.28 grams were added to the reported constant to represent the “average” scenario

Table 1: Sample Statistics

	Participants	Height (in.)	Weight (lb.)	BMI	Age
Total	74	66.9 (3.7)	145.8 (28.0)	22.8 (3.1)	26.6 (7.2)
Women	45	64.7 (2.4)	131.4 (20.6)	22.1 (3.4)	26.5 (8.1)
Men	29	70.2 (2.9)	168.0 (23.0)	23.9 (2.1)	26.6 (5.6)
Mean (standard deviation)					

Table 2: Parameter Estimates Interpretable at Focal Values of BMI

Variable	At mean BMIs for males (23.87) and females (22.09)	At midpoint of BMI normal range (21.75)	At normal/overweight BMI cutoff (25.00)†	At overweight/obese BMI cutoff (30.00)
Constant (γ_0)	120.217 (5.161)***	120.381 (5.164)***	118.176 (5.142)***	116.452 (5.161)***
Male (γ_1)	23.048 (2.197)***	14.756 (2.410)***	29.163(2.223)***	50.370 (3.254)***
BMI (γ_2)	-1.610 (0.370)***	-1.610 (0.370)***	-1.545(0.369)***	-1.610 (0.370)***
RofT (γ_3)	-32.948 (2.061)***	-33.135 (2.057)***	-30.545(2.183)***	-28.659 (2.687)***
Male x BMI (γ_4)	9.655 (0.917)***	9.655 (0.917)***	10.018(0.921)***	9.655 (0.917)***
Male x RofT (γ_5)	-5.180 (3.270)	-1.957 (3.475)	-8.393(3.432)*	-18.266 (5.250)***
BMI x RofT (γ_6)	1.834 (0.674)**	1.834 (0.674)**	1.800(0.675)**	1.834 (0.674)**
Male x BMI x RofT (γ_7)	-4.838 (1.420)***	-4.838 (1.420)***	-5.217(1.416)***	-4.838 (1.420)***
Coefficient (Std. Err.)				
LL = -5660.99				

*** Significant at < 0.001, ** Significant at < 0.01, * Significant at < 0.05

† Estimates of unconditional effects slightly different from other BMI levels due to convergence tolerances in maximizing the likelihood.

Table 3: Sample Breakdown by BMI and Gender

BMI range	BMI Category	Males	Females
< 16.0	Severely underweight	0	1
16.0 – 18.5	Underweight	0	2
18.5 – 25.0	Normal	20	35
25.0 – 30.0	Overweight	9	6
> 30.0	Obese	0	1
	Total (n)	29	45