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Michael T. French, University of Miami
Didra BrownTaylor
Ricky N. Bluthenthal

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Michael T. French\textsuperscript{1}

Didra BrownTaylor\textsuperscript{2}

Ricky N. Bluthenthal\textsuperscript{3}

\textsuperscript{1}Department of Sociology, Department of Economics, and Department of Epidemiology and Public Health, University of Miami, Coral Gables, FL

\textsuperscript{2}Integrated Substance Abuse Program, University of California, Los Angeles and Collaborative Alcohol Research Center, Charles R. Drew University, Los Angeles, CA

\textsuperscript{3}Drew Center on AIDS Research, Education and Service, Department of Psychiatry, Charles R. Drew University and the Health Program and Drug Policy Research Center, RAND, Los Angeles, CA

*Corresponding author (and reprint requests): Michael T. French, Professor of Health Economics, University of Miami, Department of Sociology, 5202 University Drive, Merrick Building, Room 121F, P.O. Box 248162, Coral Gables, FL 33124-2030; Phone: 305-284-6039; Fax: 305-284-5310; email: mfrench@miami.edu

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Abstract

**Objective.** Estimate the relative price elasticity of demand for malt liquor beer, regular beer, hard liquor, and a combined group of all other alcoholic beverages. **Methods.** Three hundred and twenty-nine alcohol consumers in South-Central Los Angeles answered a series of questions pertaining to expected consumption responses to hypothetical price increases. **Results.** Based on a 10% price increase, the mean price elasticity of demand (% change in quantity demanded ÷ % change in price) was -0.79 for malt liquor beer drinkers, -1.14 for regular beer drinkers, -1.11 for hard liquor drinkers, and -1.69 for the combined group of all other drinkers. **Conclusion.** Logistic regression models indicated that malt liquor beer drinkers were more likely to be older, not working, and homeless, while daily drinkers were more likely to be married, earning lower incomes, and hard liquor drinkers. This study is the first to investigate the price elasticity of demand for malt liquor beer drinkers and other heavy alcohol consumers in poor urban neighborhoods. Future research can use the methods from this pilot study to more rigorously examine and compare the price sensitivity among heavy drinking groups.
I. Introduction

Millions of responsible consumers worldwide enjoy drinking alcoholic beverages for their pleasant taste and conviviality. Beyond pleasure, moderate alcohol consumption has also been linked to health benefits (Renaud & Delorgeril, 1992; Thun, Peto, & Heath, 1998; Berger, Ajani, Kase, Giziano, Burning, Glynne, et al., 1999; Rimm, Williams, Fosher, Criqui, & Stampfer, 1999; Mukamal, Conigrave, Mittlemen, Camargo, Stampfer, Willett, et al., 2003; Gunzerath, Fadan, Zakhari, & Warren, 2004), employment success (French & Zarkin, 1995; Hein, 1995; Helen, 1995; Hamilton & Hamilton, 1997; Zarkin, French, Mroz, & Bray, 1998; Slater, Basil, & Maibach, 1999; Barrett, 2002), and social mobility (Peele & Brodsky, 2000). Yet these health, employment, and social advantages come at a very high cost, as alcohol abuse/dependence is a widespread and serious social problem in most countries. In the U.S., an estimated 17.6 million adults are classified as alcohol abusers or alcohol dependent (Grant, Dawson, Stintson, Chou, Dufour, & Pickering, 2004), and the estimated annual cost of alcohol abuse exceeds $185 billion (Harwood).

Alcohol abuse/dependence is a disease that cuts across all segments of society. However, statistics show that poor, urban, racial/ethnic minorities suffer disproportionately relative to other groups (Alaniz, 1998; Wallace, 1999; Galvan & Caetano, 2003). One of the potential reasons for this phenomenon is the wide availability of relatively inexpensive fortified alcoholic beverages such as malt liquor beer (> 5% alcohol content by volume) (BrownTaylor, 2000a). Malt liquor beer (MLB) producers and distributors recognize the appeal of their products to ethnic minority groups and correspondingly localize and intensify their marketing efforts in inner-city neighborhoods (BrownTaylor, 2000b).
Given the low price, wide availability, and high alcohol content of MLB, the potential it creates for excessive drinking may be greater than that created by other alcoholic beverages. If this is the case, then public policy could play an important role in harm reduction by strictly enforcing advertising laws and distribution regulations to encourage more responsible MLB consumption. Labeling and educational campaigns could highlight the elevated alcohol content of MLB and recommend volume guidelines or alternative products (Grube & Wallack, 1994; Kaskutas & Greenfield, 1997; MacKinnon, Nohre, Cheong, Stacy, & Pentz, 2001; Agostinelli & Grube, 2002). It is unclear, however, whether such campaigns would be effective for MLB drinkers, given that an important motivation for buying these products is their provision of a high alcohol content at a relatively inexpensive price. From an economic perspective, tax policies could be altered to establish financial disincentives for MLB consumption. Part of the additional tax revenue generated by these policies could then be used to offset some of the adverse consequences and negative externalities caused by alcohol misuse.

The primary purpose of this paper is to provide research methods and preliminary information on the reported behavior of MLB drinkers in response to hypothetical changes in the price of their preferred beverage. A secondary objective is to determine which socio-demographic factors are significantly related to being an MLB consumer and a daily drinker. In addition to MLB drinkers, the sample includes individuals in three other drinking categories (regular beer drinkers, hard liquor drinkers, all other drinkers), which permits comparisons in price sensitivity across the drinking groups. The full sample (N=329) of moderate to heavy drinkers comprises primarily lower socio-economic status Hispanics and African Americans residing in South-Central Los Angeles.

II. Review of the Literature on Price Elasticity of Demand for Addictive Substances
A comprehensive review of the economics and social sciences literature did not reveal any studies on the price elasticity of demand for MLB. However, a few studies have investigated the price elasticity of demand for general alcohol consumption, illicit drug use, and cigarette smoking.\footnote{Leung and Phelps (1999) found that the price elasticity of demand was approximately -0.3 for beer, -1.0 for wine, and -1.5 for spirits in their review of aggregate data analyses (i.e., analyses of data that report the amount of alcohol consumed by large groups of people). When individual-level data (i.e., data that report the amount of alcohol consumed by individuals) were used, studies showed that the demand for alcohol was more responsive to price (Chaloupka, Grossman, & Saffer, 2002). Clements, Yang, and Zhang (1997) estimated the price elasticities for beer (-0.35), wine (-0.68), and spirits (-0.98) based on data from seven countries, excluding the United States. In each of these countries, the demand for beer was found to be less price elastic than that for other alcoholic beverages.}

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Saffer and Chaloupka (1999) applied data from the Drug Enforcement Agency, the *Inter-City Cost of Living Index*, and the 1988, 1990, and 1991 National Household Surveys on Drug Abuse to determine that market forces such as price have a significant impact on the consumption of alcohol, cocaine, and heroin. Alcohol consumption was measured as the number of days in the past month that the individual consumed alcohol. Two dichotomous measures were established for marijuana, cocaine, and heroin use: one to reflect occasional use (i.e., use in the past year) and another to reflect regular use (i.e., use in the past month). The average price elasticity of demand for alcohol was found to be -0.30, while the average price elasticities of demand for cocaine and heroin were -0.28 and -0.94 for regular use and -0.44 and -0.82 for occasional use.
Most of the studies reviewed by Chaloupka, Grossman, and Saffer (2002) concluded that higher alcohol prices, which can be achieved through tax increases, effectively reduce consumption by young adults and underage individuals. Higher alcohol prices also reduce some of the negative outcomes associated with alcohol abuse, such as drinking and driving, liver cirrhosis, and violence (Chaloupka, Grossman, & Saffer, 2002). Chaloupka Grossman, and Saffer (2002) included in their survey an earlier study by Ruhm, who discovered an association between higher taxes on beer and reductions in vehicle fatalities, especially for nighttime car accidents and for deaths of people between the ages of 18 and 20 (Ruhm, 1996). The finding that higher prices can lead to a reduction in these negative consequences applies to most drinking categories and to society as a whole (Chaloupka, Grossman, & Saffer, 2002). In general, youths respond to higher beer prices by decreasing the frequency of drinking and the probability of drinking heavily. Results show, however, that the heaviest drinkers (i.e., the upper 5% of all drinkers) are generally unresponsive to price changes in alcohol. Chaloupka Grossman, and Saffer (2002) emphasized the need for more research on the estimated price elasticity of alcohol among different ethnic groups and drinker types.

To gain a deeper understanding of the impact of higher alcohol prices on different drinker types, Manning, Blumberg, & Moulton (1995) divided their focus between light, moderate, and heavy drinkers. The authors applied a two-stage regression model based on individual-level data from the 1983 National Health Interview Survey. The results demonstrated that moderate drinkers have a more elastic demand for alcohol than light or heavy drinkers. Overall, the price elasticity of demand for alcohol in this study was -0.42, but demand varied in a non-linear fashion as price changed, especially among light and moderate drinkers. Very heavy drinkers were found to be less responsive to changes in price than any other drinking group. The
implication of this finding is that while higher alcohol taxes may reduce consumption by light and moderate drinkers, it will have little impact on very heavy drinkers, many of whom impose considerable external costs on society.

Researchers have shown that the estimates for short-run and long-run elasticities may vary considerably. In a study by Grossman, Chaloupka, and Sirtalan (1998), the average long-run price elasticity for alcohol was found to be -0.65, while the short-run elasticity was -0.41. Alcohol demand thus appears to be more responsive to changes in price over the long run. In a more recent study, Freeman (2000), after controlling for income, found that alcohol taxes only modestly impacted the consumption of beer, with short-run and long-run elasticities around -0.01 and -0.1.

It should be noted that other studies have found a weak relationship between beer taxes and drinking (Dee, 1999; Nelson, 1997). Focusing specifically on college students, Chaloupka and Wechsler (1996) determined that higher alcohol prices affect the behavior of males and females differently. Female students who engaged in binge drinking or were underage exhibited demand that was relatively inelastic (but still altered their behavior), while male students were essentially unresponsive to the price of beer. Nevertheless, the opportunity exists for policymakers to generate additional revenue with higher taxes, which could be used to reduce external costs in other ways (Freeman, 2000). Policymakers must be careful, however, about using these results to justify tax increases, because heavy alcohol consumers can switch to less expensive brands or take advantage of lower unit prices through volume discounts.

While the studies above used large data sets of individuals, Petry and Bickel (1998) analyzed the behavior of 40 patients undergoing treatment for heroin addiction as they hypothetically purchased drugs in scenarios where income and the price of the drugs varied. The
patients included 15 women and 25 men with an average age of 36 and an average education of 12 years. Interviewers provided participants with imitation money and performed a series of three experiments: changing the price of heroin from $3 to $35 while income and the prices of marijuana, valium, cocaine, and alcohol remained constant; changing the prices of heroin ($3-$35/bag) and valium ($0.03-$10/pill) while the cost of the other drugs and income remained the same; and varying available income from $30 to $560 while all drug and alcohol prices remained stable. Participants were told that there would be no consequences for using the drugs, that they would have no access to any other drugs, and that they could not sell any of the items they “purchase.” With each change in price, the researchers calculated the price elasticities of the substance. In the first scenario, although 75% of subjects’ demand for heroin was initially inelastic, the demand became elastic as the price of heroin exceeded $6. When the prices of heroin and valium increased, the price elasticity of demand for these substances remained inelastic because prices had only a small impact on purchases. It is unclear if these individuals would make the same choices in natural settings, but their participation and response to the experimenters implied that they did relate the experiment to the real world, with some becoming excited when prices were low and others trying to convince the experimenter prices were too high under some scenarios.

Because many consumers obtain addictive substances through illegal markets, it is a challenge for economists to reliably investigate demand relationships. Gruber, Sen, and Stabile (2003), developed a technique for estimating the price elasticity of demand for cigarettes while taking into account smuggling. Their study focused specifically on Canada, where certain areas experienced heavy smuggling of cigarettes during the 1990s in response to tax increases. To correct for this, areas and times when smuggling was at its height were excluded from legal sales
data of cigarettes and replaced with household spending as reported in the Canadian Survey of Household Spending. Although the estimates derived from legal sales information initially appeared quite different from those based on consumer spending, they appeared less so once the smuggling provinces and time periods had been excluded, revealing a price elasticity of demand between -0.45 and -0.47. This range was comparable to the elasticity estimates in the United States. Findings showed that lower income groups, with an elasticity of -1.0, were more price sensitive than higher income groups, which demonstrated an elasticity of -0.3.

III. Data

Data collection for this study was funded as part of an exploratory initiative sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) to assess the impact of higher alcohol content beverages, such as MLBs and fortified wines, on drinking patterns, external costs, and health outcomes. Methods of measuring alcohol use have traditionally ignored or under-sampled MLB drinkers. To remedy this problem, a sampling strategy was developed to maximize the opportunity for MLB drinkers to be recruited into this study. Recruitment efforts were focused in South Los Angeles, Watts, and surrounding areas, including the cities of Compton and Lynwood (hereafter referred to as South-Central Los Angeles).

Off-sale general alcohol outlets were randomly selected within the study areas. Off-sale general outlets are permitted to sell beer (including MLB), wine, and hard liquors to be consumed off the premises, as opposed to beer and wine licensees, which can only sell beer (including MLB) and wine, or on-sale outlets, which can sell alcohol for on-site consumption. Alcohol outlets were identified using data provided by the California Department of Alcoholic Beverage Control (ABC). The statewide list of alcohol licensees provides information such as the name of the licensee, the name of the establishment, the address of the establishment, and the
type of license. Recruitment occurred between November 2001 and May 2003 at 17 different off-sale outlets out of a total of 241 off-sale outlets in South-Central Los Angeles.

Eligibility requirements for the study included being of legal drinking age (21 in the State of California) and reporting any alcohol consumption in the past 90 days. Individuals leaving outlets were approached by trained research personnel and informed about study procedures and eligibility requirements. Interviews were conducted on all days of the week, typically between 9:00 am and 5:00 pm. Most interviews took between 30 and 45 minutes to complete. Respondents received two adult tickets (valued at $14.00) to a local movie theater for participating in the study and referrals to alcohol and drug treatment services upon request. All study protocols were reviewed and approved by the Institutional Review Board at Charles R. Drew University of Medicine and Science.

Several noteworthy issues arose during the data collection process. First, Hispanics proved less likely to participate despite the use of Spanish-speaking interviewers. Field research staff reported that potential Hispanic respondents were less motivated than others by the incentive for participation and expressed distrust of research studies and concern about the language barrier. Individuals who arrived at outlets in a private vehicle and/or had a job also proved less likely to participate. Because refusal often occurred informally, systematic information on response rates was not recorded. Three alcohol outlets objected to participant recruitment near their places of business. Alcohol outlets in South-Central Los Angeles have periodically been targeted by local activists, and loitering laws around alcohol outlets have been implemented to reduce potential problems (Grills, Bass, Brown, & Akers, 1996). A few outlet owners were concerned that the present study might contribute to community mobilization against their establishment and refused to participate for that reason. Recruitment was originally
intended to continue beyond 5:00 pm and into the night. However, concern for the safety of research personnel resulted in a decision not to recruit after dark. Despite these various challenges and constraints, the study was able to recruit and interview 329 respondents in 18 months of data collection.

Each subject was assessed on a wide range of variables, including demographics, quantity and frequency of alcohol use, alcohol use by brand name, setting of alcohol consumption, and responses to price changes. Key demographic and alcohol use variables are reported in Table 1 and described below. Although item non-response was relatively rare, multiple imputation methods were used to estimate these observations through a hotdeck procedure in Stata 7.0.

The average age of the sample was 40 years, and the vast majority of subjects were male (76%) and African American (87%). All three of these measures varied significantly across the beverage categories. Twenty-one percent of the full sample reported being married or living as married, 40% being unemployed, and 7% being homeless. Financial resources were quite limited for this sample; only 25% of the participants had annual personal incomes greater than $20,000.

The two alcohol use measures in Table 1 demonstrate the heavy drinking profiles of the sample. Well over half of the sample reported being daily or nearly daily drinkers, with an average daily ethanol consumption of 5.44 ounces (See BrownTaylor, 2000; BrownTaylor, 2004; and BrownTaylor, Guzman, Waiters, & Blumenthal, in review for a discussion of the methods used to convert different beverage types and container sizes to ounces of ethanol). This amounts to approximately five 12-ounce cans of MLB (at 7% alcohol content) or nearly nine 12-ounce cans of regular beer (at 5% alcohol content). MLB drinkers had the highest prevalence of daily or nearly daily drinking (70%) and the largest average daily ethanol consumption (6.83 ounces).
IV. Methods

The conventional approach to empirically examining the price elasticity of demand using individual-level data utilizes a demand relationship, with alcohol consumption operating as the dependent variable and the price of alcohol, prices of other products, personal income, and tastes and preferences (proxied through personal characteristics) operating as the independent variables (Hyman, 1988; Parkin, 2003). Individual-level data for these analyses could be longitudinal and/or cross sectional. The key requirement is to have sufficient price and consumption variability across individuals to accurately measure the price elasticity of demand (i.e., percentage change in quantity demanded ÷ percentage change in price).

The empirical strategy for the present paper was somewhat different because we simulated the demand-side market for MLB and other alcoholic beverages (using reported drinking choices) rather than observing actual market behavior. Specifically, subjects first reported their primary, secondary, and tertiary beverage choices; their preferred container size (e.g., pint, quart, six pack, case, gallon); and the price they paid for that container size. The next set of questions asked them to reveal expected consumption changes in response to a 10%, 25%, and 50% increase in the price of the primary, secondary, and tertiary beverages. To keep the calculations simple, the percentage price increases were converted to dollar equivalents by the interviewer, and the respondents selected a consumption choice that ranged from “no change” (0%) to “stop using that beverage” (100%) in increments of 10%. The percentage changes in consumption were also converted to numerical values by the interviewer for easy reference.

The survey designers felt that a categorical approach for price and quantity changes would provide more reliable data than asking the respondents to provide point estimates. All analyses
were conducted within four beverage groups: MLB drinkers, regular beer drinkers, hard liquor drinkers, and all other drinkers.

This approach has several advantages. First, designing the questions in percentage terms allowed us to calculate price elasticity of demand directly from the percentage-percentage changes in price and consumption. Second, presenting the choices in percentage terms rather than actual units normalized the choices across individuals and allowed us to directly compare changes across individuals who reported different beverages, container sizes, and prices. Third, categorical choices for consumption changes with clear and consistent instructions from interviewers promoted standardization across respondents. Fourth, dividing the sample into four beverage classifications allowed comparisons between MLB (the primary category of interest) and other types of alcohol.

Besides the direct calculations of price elasticity of demand, we also estimated two logistic models of the following form:

\[
Pr(A = 1) = \frac{e^{b_0 + b_1X + b_2I + b_3D}}{1 + e^{b_0 + b_1X + b_2I + b_3D}},
\]

where \(A\) is one of two types of alcohol consumption (i.e., MLB is the primary beverage, and the subject is either a daily or a nearly daily drinker); \(X\) is a vector of personal characteristics, including age, gender, race, ethnicity, marital status, working status, and living situation; \(I\) is personal income; \(D\) is a vector of drinking measures, including daily drinker (in the MLB specification), average daily ethanol consumption, beverage type (in the daily drinker specification), and distance from home to alcohol outlet; and the \(b\)'s are parameters to estimate. The dependent variable was coded as 1 if the subject was an MLB drinker (or daily drinker for the other specification) and 0 otherwise. Coefficient estimates for these models are log odds ratios.
V. Results

The core descriptive analysis for price elasticity of demand is presented in Table 2. The columns identify the beverage categories (MLB drinkers, regular beer drinkers, hard liquor drinkers, all other drinkers), which represent the primary beverage reported by each respondent. The rows report the average percentage change in consumption of the primary beverage for a given percentage increase (i.e., 10%, 25%, 50%) in its price.

Average monthly spending on the primary beverage amounted to $70.75 for the full sample, ranging from $31.59 for all other drinkers to $83.69 for MLB drinkers. Monthly spending was statistically different across the beverage classifications.

Given the incremental concept of price elasticity of demand, the most meaningful estimates in Table 2 correspond to a relatively small, 10% increase in price. At a mean price of about $0.65 for a 16 ounce bottle/can of MLB (the most popular container size among this sample), a 10% price increase would raise the price to approximately $0.71. The corresponding consumption estimates range from -7.87% (ε_0 = -0.79) for MLB drinkers to -16.87% (ε_0 = -1.69) for all other drinkers. In fact, MLB is the only category with an inelastic demand within this range. Yet the variability in these estimates is quite large (SD = 25.82 for the full sample) because while most of the sample reported no change in consumption, a small number of individuals reported that they would eliminate consumption of this beverage altogether.

As expected, the average consumption response to a 25% increase in the price of the primary beverage was larger than that resulting from a 10% price increase, but not proportionally larger. Specifically, the percentage change in consumption for the full sample was -14.92%, as compared to -10.52% for a 10% price increase. Once again, MLB drinkers had the smallest average consumption response (-10.16%). The consumption estimates for a 50% price increase
were qualitatively similar to those for 10% and 25% price increases. For the full sample, a 50% increase in the price of the primary beverage would lead to a self-reported 23.74% decrease in consumption of that beverage.

Examining the distributions of the variables provides a clearer understanding of the nature of the reported consumption responses. Each of these measures is highly skewed (e.g., skewness = -2.68 for a 10% price increase), with a large number of individuals reporting no change in consumption (62.31% for a 50% price increase). These results demonstrate the strength of the connections to reported primary beverages among this sample.

It has often been claimed that tax increases on alcohol affect light and moderate drinkers much more than heavy drinkers. To investigate this claim with the present data, we calculated the average daily ethanol consumption for those individuals who reported no consumption response to price increases relative to those who would reduce consumption. The summary statistics below refute this common claim in that those individuals who would not change consumption of their primary beverage in response to a price increase share similar daily consumption patterns with those who would change. None of these differences are statistically significant (Wilcoxon rank-sum test).

<table>
<thead>
<tr>
<th>Price increase in primary beverage</th>
<th>No Δ in consumption</th>
<th>Any Δ in consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>5.32</td>
<td>5.84</td>
</tr>
<tr>
<td>25%</td>
<td>5.48</td>
<td>5.34</td>
</tr>
<tr>
<td>50%</td>
<td>5.42</td>
<td>5.48</td>
</tr>
</tbody>
</table>
Logistic regression models for MLB drinkers and daily or nearly daily drinkers are presented in Table 3. The primary intent of these analyses was to determine which personal characteristics were significantly related to being an MLB drinker and/or a daily drinker. The results show that MLB drinkers (primary beverage) were more likely to be older, not working, homeless, and daily drinkers. The estimates for daily or nearly daily drinking were somewhat different, indicating that daily drinkers were more likely to be married, earning lower incomes (i.e., less than $8,000 per year), and MLB drinkers. This significant association between daily drinking and MLB consumption highlights the potentially addictive nature of MLB and supports the earlier finding that MLB consumers have the lowest price elasticity of demand among the four groups of drinkers.

VI. Discussion

As demonstrated above, MLB drinkers are less responsive to price increases than regular beer, hard liquor, and all other drinkers. Although these results are comparable to the price elasticity estimates found in studies analyzing individual data, estimates derived from aggregate data are typically smaller (i.e., less elastic), ranging from -0.2 to approximately -1.8 for various types of alcohol (Chaloupka, Grossman, & Saffer, 2002; Saffer & Chaloupka, 1999). Much like the participants in the simulated market created by Petry and Bickel (1998), the MLB drinkers in this study would reduce consumption by 7.87% when the price increased 10%, but by only 18.44% when price increased 50%.

When evaluating these results, it is important to consider the characteristics of the sample, which may account for some of the variations between the elasticity estimates reported here and those that use aggregate data. Nearly 70% of MLB drinkers are daily drinkers, a factor that may contribute to their inelastic demand. As noted earlier, Manning, Blumberg, and
Moulton (1995) found heavy drinkers to be less responsive to price than moderate drinkers. Further, alcohol demand generally becomes more elastic as income increases. Over 75% of this sample had an annual income under $20,000, with more than 48% earning less than $8,000 per year. Interestingly, the group of MLB drinkers in this sample, which contained the smallest proportion of individuals earning more than $20,000, were also the least responsive to price changes compared to the other categories of drinkers.

While Chaloupka, Grossman, and Saffer (2002) found spirits and wine drinkers to be more price sensitive than beer drinkers, regular beer drinkers in the present study exhibited demand that was more elastic than hard liquor and MLB drinkers. The differences between these estimates and those of previous studies reinforce the need to distinguish between MLB drinkers and regular beer drinkers. In response to a 10% price increase, the average price elasticity of demand for MLB drinkers was -0.79, as compared to -1.14 for regular beer drinkers. This gap in price sensitivity widened as the percentage change in price increased. These estimates could imply very different approaches to harm reduction between MLB drinkers and regular beer drinkers, which would be masked if these groups were combined into a single beer drinking category.

Despite the novelty of its approach and the potential policy significance of its findings, the present study has several limitations that could impact its elasticity estimates. First, the sample was not selected at random. Individuals were purposely recruited for the study from designated off-sale alcohol outlets throughout South-Central Los Angeles. Given the differential participation patterns among certain demographic groups and locations, the analysis may contain some selection bias. The results may have relevance for the individuals residing in South-Central Los Angeles, but generalizability beyond this setting is unknown.
Second, the price elasticity estimates were derived through a simulated market with hypothetical price changes instead of through revealed preferences with actual price changes. Although there were no obvious incentives to do so, respondents could have misstated expected consumption changes to price increases. More likely, however, some respondents may have unintentionally overestimated consumption changes because the responses did not have any immediate impact on their purchases. Therefore, we view the price elasticity estimates as upper bound values relative to the true estimates.

Third, price elasticity of demand is a concept based on marginal analysis or infinitesimal changes. It would have been interesting and more theoretically precise to incrementally ask respondents about very small price increases (e.g., 1% or less), but such an approach is impractical because individuals would have a difficult time comprehending and reacting to these minute changes. For this reason, results from a 10% price increase are considered more reliable and therefore receive more emphasis in this paper than the 25% and 50% price increases. Similarly, point estimates for the consumption changes would seem more desirable than categorical choices. Again, we felt that comprehension would be higher and reported values more valid with categorical choices. This issue could be investigated empirically by modifying the questions and response options in a follow-up study.

Fourth, a reported non-zero consumption response to a primary beverage price increase does not necessarily imply that the individual would reduce consumption within that beverage category or reduce drinking overall. For example, a person who reported Colt 45 MLB as their primary beverage may switch to Old English MLB if the price of Colt 45 increased, while still maintaining overall consumption of MLB. Similar product substitution could also occur across, rather than within, beverage categories (e.g., distilled spirits for MLB). To the extent that this
type of beverage switching occurs, it could influence any policy implications that may evolve from the elasticity estimates. Acknowledging the data and conceptual limitations of this study does not diminish its unique contribution to the substance abuse, public health, and economics literatures. To the best of our knowledge, this is the first study to investigate the price elasticity of demand for MLB relative to other types of alcoholic beverages. Although not randomly selected or nationally representative, the sample has many desirable aspects pertaining to the primary research questions, most importantly the high prevalence of MLB drinkers. Budgetary constraints affected the size of the sample and the range of questions on the survey instrument, but future studies of price elasticity of demand for MLB now have a foundation to build upon.

For the reasons highlighted above, the price elasticity estimates and related policy implications should be approached with caution. The estimates suggest that this sample of relatively heavy drinkers would alter their primary beverage consumption if the price increased, but MLB drinkers reported the lowest price sensitivity among the beverage groups. Thus, a public policy response in the form of a tax increase on MLB may have less impact on consumption than if a similar tax were placed on other types of beverages. Additional analyses with larger samples in different settings should be initiated to improve the reliability and precision of these estimates.
VII. REFERENCES


End Notes

1 This point can be further explained by comparing the price per ounce of ethanol between MLB and regular beer. Namely, MLB has a typical price per ounce of ethanol ($0.70) that is approximately half the typical price per ounce of ethanol for regular beer ($1.40). Thus, if ethanol is the target feature among beverage choices and the consumer is severely income constrained, then MLB is a rational purchase.

2 Refer to DHHS for a review of the elasticity literature pertaining to alcohol consumption up until 2000.31

3 For a more detailed description of data collection procedures and file construction, please refer to Bluthenthal, BrownTaylor, Guzman-Becerra, & Robinson.42

4 The complete survey instrument is available from the corresponding author.

5 Respondents were also asked about potential beverage substitution in response to hypothetical price increases for their primary beverage. A detailed investigation of beverage substitution is beyond the objectives and scope of the present paper, but will be investigated in future analyses.

6 Figures 1A-1C, presenting histograms for 10%, 25%, and 50% price increases, are available from the corresponding author.

7 The elasticity estimates range from -0.79 to -1.69 for a hypothetical 10% price increase, depending on beverage.
### TABLE 1. VARIABLE MEANS AND PROPORTIONS BY PRIMARY BEVERAGE

<table>
<thead>
<tr>
<th>Variables</th>
<th>MLB Drinkers (N=122, 37.08%)</th>
<th>Regular Beer Drinkers (N=71, 21.58%)</th>
<th>Hard Liquor Drinkers (N=104, 31.61%)</th>
<th>All Other Drinkers (N=32, 9.73%)</th>
<th>Full Sample (N=329, 100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics and Other Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age in years (mean, (SD))**</td>
<td>40.11 (9.96)</td>
<td>41.21 (12.79)</td>
<td>38.90 (14.79)</td>
<td>40.28 (12.24)</td>
<td>39.98 (12.45)</td>
</tr>
<tr>
<td>Male (%)***</td>
<td>76.23</td>
<td>88.73</td>
<td>72.12</td>
<td>59.38</td>
<td>75.99</td>
</tr>
<tr>
<td>African American (%)***</td>
<td>88.52</td>
<td>76.06</td>
<td>93.27</td>
<td>81.25</td>
<td>86.63</td>
</tr>
<tr>
<td>Hispanic (%)**</td>
<td>10.66</td>
<td>19.72</td>
<td>5.77</td>
<td>15.63</td>
<td>11.55</td>
</tr>
<tr>
<td>Married or living as married (%)</td>
<td>22.13</td>
<td>28.17</td>
<td>17.31</td>
<td>15.63</td>
<td>21.28</td>
</tr>
<tr>
<td>Not Working (%)*</td>
<td>47.54</td>
<td>38.03</td>
<td>31.73</td>
<td>43.75</td>
<td>40.12</td>
</tr>
<tr>
<td>Annual personal income (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $8,000</td>
<td>58.20</td>
<td>36.62</td>
<td>45.19</td>
<td>53.13</td>
<td>48.94</td>
</tr>
<tr>
<td>$8,000 to $10,000</td>
<td>11.48</td>
<td>11.27</td>
<td>13.46</td>
<td>12.50</td>
<td>12.16</td>
</tr>
<tr>
<td>$10,001 to $20,000</td>
<td>9.84</td>
<td>15.49</td>
<td>19.23</td>
<td>9.38</td>
<td>13.98</td>
</tr>
<tr>
<td>&gt; $20,000</td>
<td>20.49</td>
<td>36.62</td>
<td>22.12</td>
<td>25.00</td>
<td>24.92</td>
</tr>
<tr>
<td>Homeless (%)***</td>
<td>12.30</td>
<td>1.41</td>
<td>1.92</td>
<td>12.50</td>
<td>6.69</td>
</tr>
<tr>
<td>Distance between home and outlet in miles (mean, (SD))***</td>
<td>1.01 (1.34)</td>
<td>1.32 (1.71)</td>
<td>2.11 (2.55)</td>
<td>1.50 (1.63)</td>
<td>1.47 (1.95)</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily/nearly daily drinker (%)***</td>
<td>69.67</td>
<td>50.70</td>
<td>50.96</td>
<td>50.00</td>
<td>57.75</td>
</tr>
<tr>
<td>Average daily ethanol consumption in ounces (mean, (SD))***</td>
<td>6.83 (8.34)</td>
<td>2.17 (2.50)</td>
<td>6.78 (11.06)</td>
<td>3.05 (4.43)</td>
<td>5.44 (8.45)</td>
</tr>
</tbody>
</table>

Notes: For all discrete variables, statistical test reflects test of association between beverage classifications using Fisher Exact or Chi-squared Test. Kruskal-Wallis equality of populations rank test was conducted between beverage classifications for continuous (but non-Gaussian) variables.
* Statistically significant, p ≤ 0.10; ** Statistically significant, p ≤ 0.05; *** Statistically significant, p ≤ 0.01.
<table>
<thead>
<tr>
<th>Variables</th>
<th>MLB Drinkers</th>
<th>Regular Beer Drinkers</th>
<th>Hard Liquor Drinkers</th>
<th>All Other Drinkers</th>
<th>Full Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly spending (§)**</td>
<td>83.63</td>
<td>56.13</td>
<td>77.68</td>
<td>31.59</td>
<td>70.75</td>
</tr>
<tr>
<td></td>
<td>(162.31)</td>
<td>(84.92)</td>
<td>(131.90)</td>
<td>(54.09)</td>
<td>(131.41)</td>
</tr>
<tr>
<td>% change in consumption for a 10% increase in price *</td>
<td>-7.87</td>
<td>-11.41</td>
<td>-11.06</td>
<td>-16.87</td>
<td>-10.52</td>
</tr>
<tr>
<td></td>
<td>(23.61)</td>
<td>(26.42)</td>
<td>(25.04)</td>
<td>(33.83)</td>
<td>(25.82)</td>
</tr>
<tr>
<td>% change in consumption for a 25% increase in price</td>
<td>-10.16</td>
<td>-17.18</td>
<td>-18.46</td>
<td>-16.56</td>
<td>-14.92</td>
</tr>
<tr>
<td></td>
<td>(24.15)</td>
<td>(32.52)</td>
<td>(33.00)</td>
<td>(34.04)</td>
<td>(30.10)</td>
</tr>
<tr>
<td>% change in consumption for a 50% increase in price</td>
<td>-18.44</td>
<td>-31.55</td>
<td>-24.33</td>
<td>-24.69</td>
<td>-23.74</td>
</tr>
<tr>
<td></td>
<td>(32.42)</td>
<td>(42.01)</td>
<td>(37.95)</td>
<td>(38.94)</td>
<td>(37.20)</td>
</tr>
</tbody>
</table>

Notes: Numbers in parentheses are standard deviations. Statistical tests assess distribution differences between beverage classifications, Kruskal-Wallis equality of populations rank test.
* Statistically significant, p ≤ 0.10.
** Statistically significant, p ≤ 0.05.
*** Statistically significant, p ≤ 0.01.
<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>MLB is Primary Beverage¹</th>
<th>Daily or Nearly Daily Drinker¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.31 (1.13-1.53)***</td>
<td>1.03 (0.91-1.17)</td>
</tr>
<tr>
<td>Age³</td>
<td>1.00 (0.99-1.00)***</td>
<td>1.00 (0.999-1.002)</td>
</tr>
<tr>
<td>Male</td>
<td>1.44 (0.80-2.56)</td>
<td>1.24 (0.68-2.27)</td>
</tr>
<tr>
<td>African American</td>
<td>1.41 (0.62-3.18)</td>
<td>1.30 (0.56-2.98)</td>
</tr>
<tr>
<td>Married or Living as Married</td>
<td>0.98 (0.53-1.82)</td>
<td>1.96 (1.03-3.74)**</td>
</tr>
<tr>
<td>Not Working</td>
<td>1.83 (1.06-3.15)**</td>
<td>1.42 (0.81-2.49)</td>
</tr>
<tr>
<td>Annual personal income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$8,000 to $10,000</td>
<td>1.11 (0.48-2.57)</td>
<td>0.45 (0.18-1.10)*</td>
</tr>
<tr>
<td>$10,001 to $20,000</td>
<td>0.82 (0.36-1.89)</td>
<td>0.37 (0.16-0.89)**</td>
</tr>
<tr>
<td>&gt; $20,000</td>
<td>0.64 (0.33-1.24)</td>
<td>0.96 (0.49-1.87)</td>
</tr>
<tr>
<td>Homeless</td>
<td>3.13 (1.13-8.64)**</td>
<td>1.03 (0.35-3.04)</td>
</tr>
<tr>
<td>Daily/nearly daily drinker</td>
<td>2.87 (1.63-5.04)***</td>
<td></td>
</tr>
<tr>
<td>Average daily ethanol consumption in ounces</td>
<td>1.02 (0.99-1.05)</td>
<td>1.21 (1.12-1.30)***</td>
</tr>
<tr>
<td>Beverage type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular beer drinker</td>
<td>—</td>
<td>0.69 (0.34-1.39)</td>
</tr>
<tr>
<td>Hard liquor drinker</td>
<td>—</td>
<td>0.27 (0.13-0.54)***</td>
</tr>
<tr>
<td>Other drinker</td>
<td>—</td>
<td>0.38 (0.15-0.96)**</td>
</tr>
<tr>
<td>Distance from home to outlet</td>
<td>0.86 (0.74-1.00)*</td>
<td>0.96 (0.84-1.11)</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.1584</td>
<td>0.2400</td>
</tr>
</tbody>
</table>

¹Estimated with logistic regression and coefficient estimates are log odds ratios. 95% confidence intervals are reported in parentheses.
* Statistically significant, p ≤ 0.10; ** Statistically significant, p ≤ 0.05; *** Statistically significant, p ≤ 0.01