Estimate of the Commercial Value of Underage Drinking and Adult Abusive and Dependent Drinking to the Alcohol Industry

Susan E. Foster, MSW; Roger D. Vaughan, DrPH; William H. Foster, PhD; Joseph A. Califano, Jr, LLB

Objectives: To document quantity and cash value of underage and adult Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)–defined abusive and dependent drinking as well as underage drinking and adult DSM-IV–defined abusive and dependent drinking combined to the alcohol industry.

Design: Analysis of multiple cross-sectional national data sets.


Participants: A total of 260,580 persons aged 12 years and older across 4 data sources.

Main Exposure: Underage drinking or pathological drinking defined as meeting the DSM-IV criteria for abusive or dependent drinking.

Main Outcome Measures: Total amount of alcohol consumed and the cash value for alcohol consumed among underage and adult drinkers with DSM-IV–defined alcohol abuse and dependence as well as all underage drinkers combined with adult drinkers with DSM-IV–defined alcohol abuse and dependence.

Results: The short-term cash value of underage drinking to the alcohol industry was $22.5 billion in 2001—17.5% of total consumer expenditures for alcohol. The long-term commercial value of underage drinking is the contribution of underage drinking to maintaining consumption among adult drinkers with alcohol abuse and dependence, which was equal to at least $25.8 billion in 2001.

Conclusions: The combined value of illegal underage drinking and adult pathological drinking to the industry was at least $48.3 billion, or 37.5% of consumer expenditures for alcohol, in 2001. Alternative estimates suggest that these costs may be closer to $62.9 billion, or 48.8% of consumer expenditures for alcohol.


A n important national health objective in the United States is to prevent and reduce the incidence of pathological drinking among Americans.1 Federal dietary guidelines recognize that “higher levels of alcohol intake raise the risk for high blood pressure, stroke, heart disease, certain cancers, accidents, violence, suicides, birth defects, and overall mortality. Too much alcohol may cause cirrhosis of the liver, inflammation of the pancreas, and damage to the brain and heart.”2 Abusive and dependent drinking is recognized clinically as a pathological condition in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV).3 Alcohol abuse and alcoholism cost the nation $184 billion in 1998,4 more than cancer ($107 billion) or obesity ($100 billion).5

Research suggests that an effective way to prevent pathological drinking is to delay the onset of regular drinking.6-14 For example, Grant and Dawson6 found that individuals who begin drinking before age 15 years are 4 times likelier to become alcohol dependent than those who do not drink before age 21 years, and they also found that the odds of lifetime alcohol dependence were reduced by 14% with each increasing year of age at first use. Expanding on these findings, DeWit et al12 found that the incidence of lifetime alcohol abuse and dependence is greatest for those who begin drinking between the ages of 11 and 14 years. Despite knowledge of this relationship between early onset of drinking and later abuse and dependence, more than 13,000 teens younger than age 21 years take their first drink each day.15 Slightly more than 6000 of these beginning drinkers are younger than age 16 years.15 In 2001, 47% of 12- to 20-year-olds reported that they were current drinkers; 30% of them admitted to binge drinking in the past month.15

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Not only are younger drinkers likelier to become pathological drinkers, but pathological drinkers—young and old—consume a disproportionate share of the alcohol. For example, in 1981, Gerstein\(^6\) estimated that 10% of the drinkers drank 57% of the alcohol. Greenfield and Rogers\(^7\) found that 2.5% of drinkers aged 18 years and older—the heaviest drinkers—drink 27% of the alcohol. Foster et al\(^8\) confirmed and expanded on the findings by Greenfield and Rogers. However, to our knowledge, no research has determined the share of the nation’s alcohol consumption that is attributable to pathological drinking. Foster and colleagues have documented the commercial value of underage drinking and adult excessive drinking to the alcohol industry, but no research has documented the combined commercial value of underage drinking and adult pathological drinking to the industry.

In this article, we close this gap in research. First, we reexamine the incidence of underage and adult drinking. Next, we consider the proportion of underage and adult drinking that can be clinically characterized as abusive and dependent drinking as well as the percentage of alcohol consumed by such drinkers. Finally, we document the commercial value of underage and adult abusive and dependent drinking to the alcohol industry as well as the combined commercial value of underage drinking and adult abusive and dependent drinking to the industry.

### METHODS

#### DATA SOURCES AND MEASURES

We relied on several national data sets to help define the following: (1) the number and proportion of underage and adult drinkers; (2) alcohol consumption by underage and adult drinkers as well as by underage and adult drinkers with alcohol abuse and dependence; and (3) the cash value of underage drinking as well as of underage and adult abusive and dependent drinking to the alcohol industry.

#### NUMBER AND PROPORTION

OF UNDERAGE AND ADULT DRINKERS

To compute alcohol consumption by age group, we first used the 2000 US Census\(^9\) to estimate the number of people in the United States aged 12 to 20 years and 21 years and older.

To estimate the proportion of people aged 12 to 20 years who drank in the past month (ie, current drinkers), we considered several data sets, including the 2001 National Household Survey of Drug Abuse (NHSDA)\(^10\), the 2001 National Household Survey of Youth Risk Behavior Survey (YRBS)\(^11\). The NHSDA, administered by the Substance Abuse and Mental Health Services Administration, Rockville, Md, used a nationally representative sample of 55,561 persons, including 24,269 persons aged 12 to 20 years and 31,297 persons aged 21 years and older. The YRBS, administered by the Centers for Disease Control and Prevention, Atlanta, Ga, used a nationally representative sample of 13,601 persons in grades 9 through 12, with observed ages from 12 to 18 years (if the participating high school students were older than 18 years, they were recoded as 18-year-olds). We concluded that the YRBS data are the most accurate for purposes of estimating the proportion of underage individuals (aged 12-20 years) who drank in the past 30 days. Several studies\(^12\) have demonstrated that the NHSDA data tend to underestimate the proportion of underage drinkers who consume alcohol and the amounts they consume since it is based on personal inter-

views performed in a household and because children are only interviewed when a parent is in the home. The YRBS provides more accurate estimates because it is administered in schools, with the added benefit of anonymity, and because of the order and content of the survey questions.\(^13\)

To estimate the proportion of persons aged 21 years and older who drank in the past month, we used the 2001 Behavioral Risk Factor Surveillance Survey,\(^14\) which was also administered by the Centers for Disease Control and Prevention. The 2001 Behavioral Risk Factor Surveillance Survey is a telephone survey of 212,510 respondents, including 148,325 persons aged 21 years or older.

#### CASH VALUE OF UNDERAGE DRINKING

AND UNDERAGE AND ADULT

ABUSIVE AND DEPENDENT DRINKING

TO THE ALCOHOL INDUSTRY

To estimate consumer expenditures linked to underage drinking and to underage and adult drinkers who met or did not meet the DSM-IV criteria for abusive or dependent drinking, the total amount (in gallons and liters) of beer, distilled spirits, and wine consumed by each group in 2001 was calculated using data on consumer expenditures for alcohol reported by the alcohol industry and published by Adams Business Research.\(^15\)

Estimating the cash value of underage and adult drinkers also requires information on the proportion of the type of drink (beer vs distilled spirits vs wine) consumed by underage and adult drinkers and by those who met vs did not meet the DSM-IV criteria for alcohol abuse or dependence. To our knowledge, no data documenting the proportions by type of alcoholic beverages consumed by underage drinkers aged 12 to 18 years are available. However, Foster et al\(^16\) found that the pattern of drinking among underage drinkers aged 12 to 20 years closely resembles the pattern of drinking among adult excessive drinkers.
We estimated patterns of alcohol consumption using the 2001 to 2002 National Epidemiological Survey on Alcohol and Related Conditions (NESARC). This nationally representative survey of those aged 18 and older, administered by the National Institute on Alcohol Abuse and Alcoholism, asked participants to identify type of drink by the categories of beer, distilled spirits, wine, and “coolers” of all types. Because the price of coolers is typically similar to that of beer,33-35 we redistributed the percentage of cooler consumption into the beer category, producing consumption estimates for adults who met the DSM-IV criteria for abuse or dependence of 70.8% beer, 18.3% distilled spirits, and 10.9% wine whereas other adult drinkers consumed 56.1% beer, 16.7% distilled spirits, and 27.2% wine. Using this same data set, we found that underage drinkers (aged 18-20 years) who met the DSM-IV criteria for abuse or dependence consumed 79.6% beer, 17.5% distilled spirits, and 2.9% wine whereas other underage drinkers consumed 71.5% beer, 20.8% distilled spirits, and 7.7% wine. We applied the estimated beverage type computed among those aged 18 to 20 years to all of the underage drinkers.

To present a range of estimates of the cash value of underage and pathological drinking, we also used the NESARC to compute alternative estimates of drinking rates, consumption, and pathological drinking rates among adults aged 21 years and older.

STATISTICAL ANALYSIS

To calculate the amount of alcohol consumed by underage and adult drinkers who met and did not meet the DSM-IV criteria for alcohol abuse and dependence, we followed a basic formula: $T_i = P_i \times A_i \times C_i$, where $T_i$ is the total estimated number of drinks consumed in the past 30 days by those in the $i$th age category, $P_i$ is the estimated proportion of the population in the $i$th age category who drank in the past 30 days, $A_i$ is the mean number of drinks consumed by drinkers in the $i$th age category in the past 30 days, $C_i$ is the number of people in the population in the $i$th age category, and $i$ refers to those who are aged either 12 to 20 years or 21 years and older. To compute these equations, we estimated the number of persons aged 12 to 20 years as well as 21 years and older (ie, $A_i$) using the 2000 US Census data, and we multiplied that by the proportion of that amount that was estimated to be beer, distilled spirits, or wine and finally by the average computed price per drink for beer, distilled spirits, and wine ($1.05, $1.34, and $1.30, respectively).29-31

Although we have accounted for the fact that underage and adult drinkers with alcohol abuse and dependence consume lower-cost beverages (ie, more beer), they also may consume lower-cost products within each beverage type. If so, our results will be underestimated since, in the absence of empirical data, we were unable to calculate the impact that such behavior would have on consumer expenditures among these groups.

Using these procedures, we accounted for all but 0.3% of consumer expenditures. We reallocated this small remainder of the $128.6 billion reported by Adams Beverage Group29-31 across the age and drinking categories according to their computed percentages of all alcohol expenditures. All of the analyses using nationally representative data sets incorporated the appropriate weighting variables provided with each data set.

RESULTS

CASH VALUE OF UNDERAGE DRINKING AND ABUSIVE AND DEPENDENT DRINKING TO THE ALCOHOL INDUSTRY

A summary of the data sets and how they were used is presented in Table 1. We calculated the proportion of people in each age group who drank in the past 30 days in 2001 and the percentage of each category who met the DSM-IV criteria for alcohol abuse or dependence. Among youth aged 12 to 20 years, 47.1% were current drinkers. The percentages of drinkers who met the DSM-IV crite-
and the percentage of drinks consumed by age and categories are presented in Table 1. Among all drinkers (aged 21 years and older) who met the DSM-IV criteria for alcohol abuse or dependence, 52.8% (52.1-53.5) of all drinkers in that age category. Adult drinkers who met the criteria for alcohol abuse or dependence drank, on average, 3 times as much per month as those who did not meet the criteria for alcohol abuse or dependence as compared with adult drinkers. These results are presented in Table 2.

The mean number of drinks, the total number of drinks, and the percentage of drinks consumed by age and DSM-IV categories are presented in Table 3. Those who met the DSM-IV criteria for alcohol abuse or dependence drank, on average, 3 times as much per month as those who did not meet the criteria. Underage drinkers (aged 12 to 20 years) who met the DSM-IV criteria represent one quarter (25.9%) of drinkers in that age group, but they consumed nearly half of all drinks (47.3%) in that age category. Adult drinkers (aged 21 years and older) who met the DSM-IV criteria represent 9.6% of drinkers in that age group, but they consumed 25.0% of all drinks in that age category.

The cash value of alcohol consumption is presented in Table 4. An estimated $128.6 billion was spent on alcohol in the United States in 2001.29-31 Of this amount, 28.3%, or $36.3 billion, was attributable to abusive or dependent drinking. Underage abusive and dependent drinking alone accounted for 8.2% of total consumer expenditures for alcohol; adult abusive and dependent drinking accounted for 20.1% of all of the expenditures.

The total cash value of underage drinking was $22.5 billion in 2001, or 17.5% of total consumer expenditures for alcohol. Adult drinkers who met the DSM-IV criteria for alcohol abuse or dependence accounted for another $25.8 billion in consumer expenditures for alcohol. Underage drinkers and adults who met the DSM-IV criteria for alcohol abuse or dependence together were responsible for 37.5% ($48.3 billion) of all of the consumer expenditures for alcohol.

<table>
<thead>
<tr>
<th>Age, y</th>
<th>No. of Drinks/mo, Mean (95% CI)*</th>
<th>Drinks/y, No. in Millions (95% CI)†</th>
<th>Drinks Consumed Within Age Category, % (95% CI)‡</th>
<th>All Drinks Consumed, % (95% CI)§</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-20</td>
<td>35.2 (32.9-37.5)</td>
<td>20 104.0 (17 650.1-22 817.7)</td>
<td>100.0 (NA)</td>
<td>18.1 (17.3-18.8)</td>
</tr>
<tr>
<td>Met DSM-IV criteria</td>
<td>64.3 (58.9-69.7)</td>
<td>9509.9 (8864.9-10 126.9)</td>
<td>47.3 (46.1-48.3)</td>
<td>8.5 (8.0-9.1)</td>
</tr>
<tr>
<td>Did not meet DSM-IV criteria</td>
<td>25.0 (22.7-27.4)</td>
<td>10 594.1 (8785.2-12 690.8)</td>
<td>52.7 (51.7-53.9)</td>
<td>9.5 (7.9-11.4)</td>
</tr>
<tr>
<td>21</td>
<td>25.4 (24.0-26.8)</td>
<td>91 226.8 (80 285.9-113 484.5)</td>
<td>100.0 (NA)</td>
<td>61.9 (61.2-62.7)</td>
</tr>
<tr>
<td>Met DSM-IV criteria</td>
<td>66.4 (60.3-72.5)</td>
<td>22 791.1 (20 856.2-34 788.8)</td>
<td>25.0 (22.6-27.3)</td>
<td>20.5 (18.7-22.2)</td>
</tr>
<tr>
<td>Did not meet DSM-IV criteria</td>
<td>21.0 (19.7-22.4)</td>
<td>68 435.7 (59 429.7-78 695.7)</td>
<td>75.0 (72.7-77.4)</td>
<td>61.5 (53.4-70.1)</td>
</tr>
<tr>
<td>Total</td>
<td>28.7 (25.2-28.3)</td>
<td>111 330.8 (97 935.3-136 302.2)</td>
<td>100.0 (NA)</td>
<td>100.0 (NA)</td>
</tr>
<tr>
<td>Met DSM-IV criteria</td>
<td>65.8 (59.9-71.8)</td>
<td>32 301.0 (29 271.1-44 915.7)</td>
<td>29.0 (NA)</td>
<td>29.0 (NA)</td>
</tr>
<tr>
<td>Did not meet DSM-IV criteria</td>
<td>21.5 (20.1-22.9)</td>
<td>79 029.9 (68 214.9-91 386.5)</td>
<td>71.0 (NA)</td>
<td>71.0 (NA)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

*Data are from the 2001 National Household Survey of Drug Abuse.

†Calculated values.

‡Calculated values.

§Data are from the 2001 National Household Survey of Drug Abuse.

The cash value of alcohol consumption is presented in Table 4. An estimated $128.6 billion was spent on alcohol in the United States in 2001.29-31 Of this amount, 28.3%, or $36.3 billion, was attributable to abusive or dependent drinking. Underage abusive and dependent drinking alone accounted for 8.2% of total consumer expenditures for alcohol; adult abusive and dependent drinking accounted for 20.1% of all of the expenditures.

The total cash value of underage drinking was $22.5 billion in 2001, or 17.5% of total consumer expenditures for alcohol. Adult drinkers who met the DSM-IV criteria for alcohol abuse or dependence accounted for another $25.8 billion in consumer expenditures for alcohol. Underage drinkers and adults who met the DSM-IV criteria for alcohol abuse or dependence together were responsible for 37.5% ($48.3 billion) of all of the consumer expenditures for alcohol.

CASH VALUE OF UNDERAGE DRINKING AND ABUSIVE AND DEPENDENT DRINKING TO THE ALCOHOL INDUSTRY USING AN ALTERNATIVE ESTIMATE

We used the NESARC data instead of the NHSDA and Behavioral Risk Factor Surveillance Survey data to compute alternative estimates of drinking rates, consumption, and pathological drinking rates for adults aged 21

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years and older. Because the NESARC did not include persons aged 12 to 17 years, we continued to use the YRBS data to estimate drinking rates and the NSHSDA data to estimate drinking amounts and pathological drinking rates among underage drinkers. In this alternative analysis, we found that underage drinkers and adults who met the DSM-IV criteria for alcohol abuse or dependence together were responsible for nearly half (48.8%, or $62.9 billion) of all of the consumer expenditures for alcohol.

There are several limitations of our research. First, several data sets were used to derive various estimates for youth and adults. Although it would have been preferable to have 1 source of data, thereby controlling for possible moderating factors such as item construction, method of administration, and time, no such single data source exists. Therefore, as in other research of this nature, we used the data sources that provided valid estimates of all of the quantities of interest and provided a conservative and alternative estimate. All of the data that we used were publicly available national data sources.

We also made several assumptions about the proportion of each type of alcoholic beverage consumed by the various age and drinking groups. More research is clearly necessary, especially among underage drinkers, to obtain direct estimates of consumption amount by type and cost. The operational definition of the term drink also needs further exploration. The estimates produced by the NSHSDA were based on the number of drinks of wine, beer, or distilled spirits whereas alternative approaches (the 2001-2002 NESARC, the study by Kaskutas and Graves, and the study by Dawson) were based on the actual size of the beverage consumed rather than on the number of drinks.

For the alcohol industry, increases in alcohol consumption come either from new customers or from increased drinking among existing customers. This analysis demonstrates that early initiation of alcohol use provides substantial financial value to the alcohol industry in both areas. The short-term cash value is the immediate return of at least $22.5 billion in consumer expenditures linked to alcohol consumed by minors—ie, new customers. Because these underage drinkers are likelier to become adult drinkers with alcohol abuse and dependence, the longer-term cash value of early initiation is their significant contribution to the $25.8 trillion dollars in cash revenues for the alcohol industry over the next decade—an extraordinary commercial motive to insure that such consumer behavior continues unabated.

The drinking behavior of 25.9% of the underage drinkers already met clinical criteria for alcohol abuse and dependence. Although youth aged 12 to 20 years composed 15.4% of the population aged 12 years and older, they made up 30.1% of all of the drinkers in the United States who met the DSM-IV criteria for abusive and dependent drinking. Of the $128.6 billion in consumer expenditures for alcohol in the United States in 2001, $36.3 billion, or 28.3% of market sales, came from drinking on the part of adults and children who met the DSM-IV criteria for alcohol abuse and dependence in the past year. A drinker with alcohol abuse and dependence is 3 times more valuable to the alcohol industry since such drinkers consume 3 times the amount of alcohol that other drinkers consume.

With at least 37.5% of sales linked to underage drinking and adult abusive and dependent drinking, the alcohol industry has a compelling financial motive to attempt to maintain or increase rates of underage drinking. Alcohol advertisements in magazines, for example, expose youth aged 12 to 20 years to 45% more beer advertisements and 27% more advertisements for distilled spirits than adults of legal drinking age. The same pattern of overexposure of children relative to adults with advertisements for beer and distilled spirits also can be seen in radio and television advertising.

Furthermore, exposure of children and teens to magazine and television alcohol advertisements has increased, even more so for girls than boys, despite national reports calling for limits on advertising by the alcohol industry to children and teens younger than 21 years. Allegations that the alcohol industry profits from unfair and deceptive marketing practices aimed at underage drinkers to assure this flow of profits is the subject of several lawsuits filed against the alcohol industry.

The financial interests of the alcohol industry appear to be antithetic to the public health interests of the nation in preventing and limiting pathological drinking. The public health implications of this research are two-fold. First, because of this apparent conflict of interest, the alcohol industry is not a good candidate to regulate its own marketing and sales practices, particularly as they relate to underage drinking.

### Table 4. Expenditures on Alcohol by Age Category and Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Criteria for Alcohol Abuse or Dependence Using Total Sales Reported by Industry

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Drinks, No. in Billions</th>
<th>Total Dollars in Billions</th>
<th>Total Dollars, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-20</td>
<td>Met DSM-IV criteria</td>
<td>9.5</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Did not meet DSM-IV criteria</td>
<td>10.6</td>
<td>12.0</td>
</tr>
<tr>
<td>&gt;21</td>
<td>Met DSM-IV criteria</td>
<td>22.8</td>
<td>25.8</td>
</tr>
<tr>
<td></td>
<td>Did not meet DSM-IV criteria</td>
<td>68.4</td>
<td>80.3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>111.3</td>
<td>128.6</td>
</tr>
</tbody>
</table>

Abbreviation: DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.
drinking. Second, the fact that 25.9% of underage drinkers (12.2% of youth aged 12-20 years) already met DSM-IV criteria for abusive and dependent drinking underscores the critical importance of comprehensive prevention strategies and treatment options tailored to the needs of teens.

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