

National Institute on Alcohol Abuse and Alcoholism
Report to the Extramural Advisory Board
August 16 - 17, 2006
Division of Epidemiology and Prevention Research
Strategic Planning Document

Strategic Planning Review

Division of Epidemiology and Prevention Research National Institute on Alcohol Abuse and Alcoholism

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I. EXECUTIVE SUMMARY

This is the strategic plan of the newly formed Division of Epidemiology and Prevention Research of the National Institute on Alcohol Abuse and Alcoholism. It is meant to be a statement to researchers in the field of the Division's judgment as to what the near-term priorities should be for research on the epidemiology and prevention of alcohol-related problems -- the areas that show the greatest need and promise for scientific advancement.

The process of developing the plan involved several steps. First, members of the Division met to develop a mission statement. Then they identified categories of mortality which could be attributable in significant fraction to alcohol consumption. Next, they investigated trends in these categories of alcohol-attributable morbidity and mortality. Also considered were a number of related areas of research endeavor which impact and/or interdigitate with the areas identified by considering alcohol attributable morbidity and mortality including health services, advertising, public policy, minorities, elderly, measurement, nosology and genetic epidemiology. NIAAA special initiatives lodged in the Division's research portfolio, or to which division members make a substantial contribution were also considered including college and underage drinking, AIDS, the Alcohol Policy Information System, and the Alcohol Epidemiology Data System. Division members reviewed research findings to assess the recent progress of science in each area. They reviewed the current research grant portfolio with an eye toward whether there were categories of considerable importance in terms of alcohol-attributable morbidity and mortality which had not been receiving commensurate research attention. All Division members attended and participated in an Institute wide Strategic Planning meeting where all Research Emphasis Teams and each Division presented its highest research priorities and the rationale for those priorities. Then, the Division held a series of discussions to identify what should be the key priorities for future research investment. These priorities are listed in bullet form at the end of each report subsection.

During these deliberations, Division members were careful to note areas where the Division's programmatic responsibilities overlapped with elements selected for emphasis by the Institute-wide strategic planning process. These were: (1) the development of tools for expanding the delivery of screening and brief interventions to adolescent drinkers and (2) the identification of gaps between need for alcohol treatment services and the actual receipt of treatment, combined with an analysis of whether this gap is widening and an identification of subpopulations among whom this gap reflects a substantial health disparity.

The final selection criteria were significance of the problem in terms of overall contribution to morbidity and mortality, scientific accomplishments that indicated that breakthrough advances were possible or likely, and relative neglect of subject areas in terms of numbers of grants funded in the current portfolio.

This overall process resulted in the identification of a number of research priority areas.

A. RESEARCH PRIORITY 1: ENHANCING MEASUREMENT AND TRENDS IN ALCOHOL-ATTRIBUTABLE MORTALITY

Although alcohol consumption is estimated to cause 75,000 or more deaths per year from a wide variety of causes, research is needed to improve our understanding of the mortality consequences of alcohol consumption and to document alcohol-attributable mortality levels and trends over time. Improving estimation of alcohol-related mortality will provide a stronger basis for assessing the changes in the overall burden of alcohol problems, including identifying progress resulting from NIAAA-funded research and assessing results of initiatives to reduce alcohol-related harm. Detailed examination of trends in alcohol-attributable deaths in specific categories will identify areas of notable progress as well as areas where progress is notably lacking. Specifically, future research should 1) Determine levels and 20-year trends for major categories of alcohol-attributable mortality (including all-cause mortality, deaths associated with acute consequences of alcohol consumption, and deaths from chronic alcohol-related conditions) and for specific alcohol-related causes of death (including, e.g., motor vehicle crashes, homicides, suicides, liver disease, heart disease, pancreatitis, cancers, etc.); 2) Refine estimates of alcohol-attributable fractions and disability-adjusted life years (DALY's) for various acute and chronic alcohol-related conditions to account for key subpopulations based on sex, age, and race/ethnicity and assess how attributable fractions for specific conditions have changed over the past 20 years; and 3) Assess the feasibility and utility of expanded routine comprehensive testing of injury deaths for alcohol involvement, including the potential of such testing to contribute to significant reductions in alcohol-related injury mortality.

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B. RESEARCH PRIORITY 2: UNDERSTANDING ALCOHOL-NUTRITION INTERACTIONS ACROSS THE LIFESPAN

At all stages of the lifespan, there is a need to understand relationships between alcohol and nutrition. Alcohol may interact with nutrition to reduce or increase risk for cognitive, behavioral, and health outcomes during fetal development, childhood, adolescence, adulthood, and old age. Observing relationships may depend on how alcohol and nutrition are measured. Alcohol can be measured in many ways, for example, average volume, quantity, frequency, binge drinking, weekend or weekday drinking. Nutrition is multidimensional, including dietary intake of foods and food groups, eating patterns, nutrient intakes, nutrient biomarkers, and anthropometrics. Research is needed to understand the role of alcohol-nutrition interactions in the development and prevention of Fetal Alcohol Syndrome, the developmental origins of adult disease, youth drinking, and alcohol-related acute and chronic disease outcomes including liver disease, obesity, cardiovascular disease, cancers, and depression. In all these areas, nutrient alcohol-gene interactions are of particular interest. Risk due to physical inactivity and smoking should also be considered. Cultural considerations are important as intakes of both alcohol and diet differ according to racial/ethnic groups. An area of particular concern is the association between alcohol and obesity. The morbidity associated with obesity is considerable, including increased risk for hypertension, elevated cholesterol, Type 2 diabetes, coronary heart disease, stroke, sleep apnea, and respiratory problems (<http://www.cdc.gov/nccdphp/dnpa/obesity/index.htm>). Since the 1980s, there has been a doubling of the prevalence of obesity among adults, and a tripling of the number of children who are overweight. The trend continues. At present, 31% of adults are obese, and 16% of children are overweight (Flegal, 2005¹). There is a need to understand causal links between alcohol and obesity as drinking, particularly heavy drinking, may be contributing to the epidemic of overweight and obesity. Recent data show that higher quantity drinkers have a higher body mass index than lower quantity drinkers (Breslow and Smothers, 2005²).

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¹ Flegal KM. Epidemiologic aspects of overweight and obesity in the United States. *Physiol Behav.* 86(5): 599-602, 2005.

² Breslow RA and Smothers BA. Drinking patterns and body mass index in never smokers: National Health Interview Survey, 1997-200. *Am J Epidemiol.* 161: 368-376, 2005.

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C. RESEARCH PRIORITY 3: EXPANDING SCREENING AND BRIEF INTERVENTIONS IN UNDERAGE AND YOUNG ADULT POPULATIONS

Recent analyses of the National Epidemiologic Survey on Alcohol and Related Conditions indicate the earlier people begin to drink, the more rapidly they develop dependence. Nearly half of people who experience alcohol dependence first do so by age 21 and 2/3 by age 25. Those first dependent at younger ages are less likely to seek treatment and more likely to develop chronic relapsing dependence characterized by multiple episodes, episodes of longer duration and more symptoms.

Recent studies in pediatric emergency departments and college settings have indicated that screening and brief motivational interventions can reduce drinking and related problems among adolescents and young adults. However, only a small fraction of adolescents and young adults with alcohol use disorders receive any counseling or treatment. Therefore it is essential that we further evaluate and expand the utilization of screening and brief interventions in these populations. More specifically, we need to 1) develop screening instruments for adolescent alcohol abuse and dependence that consider developmental stage and are sensitive to the unique characteristics of adolescent development; 2) expand screening of and brief interventions among adolescents and young adults into other health care settings where these populations are seen; 3) evaluate the efficacy, effectiveness and cost benefits of screening and brief interventions in these additional settings; 4) explore barriers to screening and brief interventions among adolescents and young adult populations; and 5) assess the impact of strategies to remove those barriers; 6) assess whether interventions that reduce adolescent alcohol use/abuse/dependence also reduce adverse consequences and alcohol abuse and dependence throughout the life span; and 7) evaluate the relative effectiveness, and cost-effectiveness of intervening early versus later in the life-course.

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D. RESEARCH PRIORITY 4: EXPANDING COMPREHENSIVE COMMUNITY INTERVENTIONS TO REDUCE ALCOHOL-RELATED INJURIES AND OTHER PROBLEMS

Research indicates that comprehensive community programs focusing on environmental interventions can reduce alcohol-related mortality, morbidity and other problems. Screening brief interventions and family interventions can also reduce drinking and related problems. Few comprehensive community programs to date have combined these approaches. Research is needed to compare interventions that combine environmental prevention initiatives with efforts to increase screening, brief interventions and/or family and alcohol treatment for those who need it with initiatives that do one or the other. This need is especially urgent in adolescent and young adult populations and certain special populations such as college students that disproportionately experience these negative consequences. The effects of community interventions on drinking and related problems need to be evaluated and effectiveness and cost effectiveness comparisons made between interventions that are environmentally oriented only, those that focus on increased screening, brief interventions, family interventions, and treatment only, and those that promote both types of interventions.

Such research would go beyond previous studies of comprehensive interventions which have focused on reducing underage and adult drinking, binge drinking, abuse/dependence and alcohol impaired driving and related morbidity and mortality. Such research should also examine the effects of these interventions on a wider range of outcomes including: alcohol-related unintentional injuries (falls, drowning, burns, poisonings), intentional injuries (homicide, suicide, assaults including sexual assaults and child abuse), academic and job performance, quality of life at later stages in the life course, illicit drug use, and liver cirrhosis.

The sections most relevant to this research priority are:

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E. OTHER STRATEGIC REVIEW EMPHASIS AREAS

Strategic review of alcohol-related mortality and morbidity, recent trends, and distribution across the lifespan underscores the need for research focused on prevention and youth. Focusing more attention on alcohol-related injury deaths than chronic alcohol-related disease deaths is warranted because injuries are the leading causes of alcohol-attributable deaths and the causes which account for the greatest number of preventable years of life lost as a consequence of alcohol misuse. Motor vehicle crashes is the largest single category of alcohol-attributable deaths and also the category where the greatest reductions have been documented in the last 25 years.

Liver disease is the largest category of chronic disease alcohol-attributable deaths and warrants more DEPR research attention. Special populations, such as Native Americans and some Hispanic sub-populations deserve research focus because of high rates of risky drinking, and Asian Pacific Americans because of low rates. Given the expansion of alcohol advertising in recent years, more research should examine the effects of advertising on drinking behavior, particularly among youth. Because of the investment NIAAA has made in the Alcohol Policy Information System (APIS), DEPR intends to stimulate use of the APIS in public health policy and health services research.

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II. INTRODUCTION

In January 2005, the Division of Epidemiology and Prevention Research of the National Institute on Alcohol Abuse and Alcoholism (NIAAA) began, along with the rest of the Institute, a Strategic Planning Review in order to inform the development of a strategic plan for NIAAA for 2006-2010.

First, members of the Division met to develop a mission statement (see box). Because the Division was formed from two separate branches at the Institute, the Epidemiology Branch from the former Division of Biometry and Epidemiology, and the Prevention Branch from the former Division of Clinical and Prevention Research, as well as staff from the former Office of Collaborative Research, this was the first time a mission statement was prepared combining the goals of each. The new mission statement, not only defines the research and administrative goals of the Division, it outlines how the Division relates to the other NIAAA divisions and to NIAAA's research priority teams.

Summary of Mission Statement

The Division of Epidemiology and Prevention Research (DEPR) seeks to reduce alcohol-related mortality and morbidity and other alcohol-related problems and consequences through the integration and application of epidemiology and prevention science by:

- Setting research priorities;
- Stimulating and supporting research, training and career development;
- Conducting research and publishing in the scientific literature;
- Promoting dialogue and collaboration between DEPR and other organizations;
- Contributing to alcohol-related surveillance;
- Disseminating scientific information

(For Complete Mission Statement See Appendix A)

Next, the Division reviewed recent publications on the magnitude of alcohol-related mortality in the U.S. Midanik et al. (2004) reported that there were over 75,000 alcohol attributable deaths in the United States in 2001, and identified excessive alcohol consumption as the third leading preventable cause of death in the U.S. Approximately 40,000 of the 75,000 deaths resulted from acute conditions such as unintentional and intentional injuries and the balance from chronic diseases (See Table 1).

Third, the Division undertook an analysis of trends over the last 20 years in the major categories of alcohol attributable deaths per 100,000 population. For some types of deaths (e.g. traffic deaths), estimates of alcohol involvement can be derived on an annual basis. In the case of traffic deaths, estimates are based on the testing of fatally injured drivers. For certain other conditions (e.g. alcohol-related liver cirrhosis, alcohol

psychosis, alcohol dependence and alcohol abuse), alcohol is the cause of the disease or disorder and is mentioned in its name. For these, the alcohol attributable fraction³ is 100%. However, alcohol also plays a role in many other causes of death, for which, the alcohol attributable fraction is not 100% and must be estimated. It is not known whether alcohol attributable fractions have changed over time, in particular over the past two decades (e.g. declines in tobacco use may have affected the alcohol-attributable fraction for oral cancers). And while it is possible to track the overall numbers of deaths from certain causes (e.g. falls, drownings, burns, homicides, suicides), alcohol involvement in these cases is typically not documented, so it is not possible to track the numbers of these types of deaths that are alcohol-related, or to assess whether the proportions of these various types of deaths that are alcohol attributable have changed over time.

Also considered were a number of research areas that influence alcohol-related mortality and morbidity such as health services, advertising, public policy, minorities, elderly, nosology, measurement and genetic epidemiology. Further, we considered NIAAA initiatives lodged in the Division, or to which division members make a large contribution: college and underage drinking, AIDS, the Alcohol Policy Information System, and the Alcohol Epidemiology Data System.

As a next step, the Division undertook a review of its current research portfolio examining both the numbers of grants and dollars spent on grants in certain categories. The portfolio was evaluated according to: whether a grant is focused primarily on epidemiology or prevention; the population under study (e.g. age, gender, race/ethnic group); and the type of mortality, morbidity or social problem under study. This was done to assess whether there are important causes of mortality and morbidity and/or population subgroups not receiving sufficient research attention. (For a summary of the Division's Research Portfolio according to these categories, see Appendix B.)

Finally, members of the division met to review the information accrued from the four steps outlined above. All division members attended the Institute wide Strategic Planning meeting in July 2005 and were asked during these deliberations to also consider the strategic plan priorities and rationales for those priorities posed by the various Institute Research Emphasis Teams and other Divisions. Division members discussed key aspects of the relationship of alcohol, and health and well-being in order to identify priorities for future alcohol research. Division members were then asked to prepare brief reviews of each of the areas identified. The reviews include a discussion of the magnitude and consequences of the particular alcohol-related problem for the nation, recent trends in the magnitude and consequences of that problem, which groups in the population are most affected, what is known about the etiology of the problem, how alcohol contributes to the problem, what is known from rigorous scientific research about what can be done to prevent the problem, and a summary of recent relevant research funding and findings from that research. Finally, Division staff was asked to articulate key research questions in each domain, the answers to which would better enable society to address the problem, and thereby reduce alcohol attributable mortality and morbidity.

³ An alcohol-attributable fraction, or AAF, represents the proportion of death or illness from a particular condition that can be attributed to alcohol consumption.

This report combines those reviews into a Division-wide statement of research progress and priorities.

Table 1

TABLE. Number of deaths and years of potential life lost (YPLLs) attributable to the harmful effects of excessive alcohol use, by cause and sex — United States, 2001

| Cause | Deaths | | | YPLLs | | |
|---|---------------|---------------|---------------|------------------|----------------|------------------|
| | Male | Female | Total | Male | Female | Total |
| Chronic conditions | | | | | | |
| Acute pancreatitis | 370 | 364 | 734 | 7,138 | 6,054 | 13,192 |
| Alcohol abuse | 1,804 | 517 | 2,321 | 50,375 | 16,433 | 66,808 |
| Alcohol cardiomyopathy | 443 | 56 | 499 | 10,195 | 1,552 | 11,747 |
| Alcohol dependence syndrome | 2,770 | 750 | 3,520 | 71,782 | 22,017 | 93,799 |
| Alcohol polyneuropathy | 3 | 0 | 3 | 86 | 0 | 86 |
| Alcohol-induced chronic pancreatitis | 224 | 71 | 295 | 6,209 | 2,135 | 8,344 |
| Alcoholic gastritis | 6 | 2 | 8 | 130 | 46 | 176 |
| Alcoholic liver disease | 8,927 | 3,274 | 12,201 | 221,369 | 94,952 | 316,321 |
| Alcoholic myopathy | 2 | 0 | 2 | 49 | 0 | 49 |
| Alcoholic psychosis | 564 | 178 | 742 | 12,609 | 3,996 | 16,605 |
| Breast cancer | N/A* | 352 | 352 | N/A | 6,786 | 6,786 |
| Cholelithiasis | 0 | 0 | 0 | 0 | 0 | 0 |
| Chronic hepatitis | 3 | 3 | 6 | 55 | 63 | 119 |
| Chronic pancreatitis | 126 | 106 | 232 | 2,608 | 1,952 | 4,560 |
| Degeneration of nervous system attributable to alcohol | 93 | 21 | 114 | 1,668 | 486 | 2,154 |
| Epilepsy | 96 | 81 | 177 | 2,912 | 2,235 | 5,147 |
| Esophageal cancer | 394 | 53 | 447 | 6,213 | 788 | 7,000 |
| Esophageal varices | 50 | 21 | 71 | 1,063 | 342 | 1,405 |
| Fetal alcohol syndrome | 3 | 2 | 5 | 210 | 137 | 347 |
| Fetus and newborn affected by maternal use of alcohol | 0 | 1 | 1 | 0 | 80 | 80 |
| Gastroesophageal hemorrhage | 19 | 9 | 28 | 301 | 139 | 440 |
| Hypertension | 632 | 552 | 1,184 | 9,458 | 6,460 | 15,918 |
| Ischemic heart disease | 635 | 273 | 908 | 8,012 | 2,898 | 10,909 |
| Laryngeal cancer | 203 | 30 | 233 | 3,146 | 519 | 3,665 |
| Liver cancer | 518 | 172 | 690 | 8,640 | 2,633 | 11,273 |
| Liver cirrhosis, unspecified | 3,917 | 2,802 | 6,719 | 80,616 | 54,528 | 135,144 |
| Low birthweight, prematurity, and intrauterine growth retardation | 96 | 50 | 146 | 7,139 | 3,961 | 11,100 |
| Oropharyngeal cancer | 303 | 57 | 360 | 5,280 | 889 | 6,169 |
| Portal hypertension | 23 | 14 | 37 | 451 | 298 | 750 |
| Prostate cancer | 233 | N/A | 233 | 2,224 | N/A | 2,224 |
| Psoriasis | 0 | 0 | 0 | 1 | 1 | 2 |
| Spontaneous abortion | N/A | 0 | 0 | N/A | 0 | 0 |
| Stroke, hemorrhagic | 1,399 | 290 | 1,690 | 22,476 | 4,592 | 27,068 |
| Stroke, ischemic | 520 | 191 | 711 | 5,331 | 1,853 | 7,184 |
| Supraventricular cardiac dysrhythmia | 73 | 92 | 165 | 639 | 796 | 1,435 |
| Total† | 24,448 | 10,385 | 34,833 | 548,386 | 239,619 | 788,005 |
| Acute conditions | | | | | | |
| Air-space transport | 122 | 37 | 159 | 3,917 | 1,404 | 5,321 |
| Alcohol poisoning | 253 | 78 | 331 | 8,798 | 2,952 | 11,750 |
| Aspiration | 97 | 99 | 196 | 1,865 | 1,692 | 3,557 |
| Child maltreatment | 100 | 71 | 171 | 7,086 | 5,386 | 12,472 |
| Drowning | 671 | 141 | 812 | 25,461 | 4,633 | 30,093 |
| Excessive blood alcohol concentration | 1 | 1 | 2 | 35 | 26 | 61 |
| Fall injuries | 2,560 | 2,206 | 4,766 | 41,627 | 24,288 | 65,914 |
| Fire injuries | 702 | 465 | 1,167 | 18,991 | 11,729 | 30,720 |
| Firearm injuries | 113 | 18 | 131 | 4,434 | 695 | 5,129 |
| Homicide | 5,963 | 1,692 | 7,655 | 262,379 | 71,543 | 333,922 |
| Hypothermia | 164 | 83 | 247 | 3,692 | 1,343 | 5,035 |
| Motor-vehicle–nontraffic injuries | 171 | 33 | 204 | 5,712 | 1,072 | 6,784 |
| Motor-vehicle–traffic injuries | 10,674 | 3,000 | 13,674 | 442,943 | 136,558 | 579,501 |
| Occupational and machine injuries | 121 | 6 | 127 | 3,467 | 151 | 3,619 |
| Injuries from other road vehicle crashes | 178 | 53 | 231 | 6,139 | 1,709 | 7,849 |
| Poisoning (not alcohol) | 2,782 | 1,182 | 3,964 | 103,917 | 45,127 | 149,043 |
| Suicide | 5,617 | 1,352 | 6,969 | 186,568 | 49,297 | 235,865 |
| Suicide by and exposure to alcohol | 21 | 5 | 26 | 777 | 231 | 1,008 |
| Water transport | 90 | 10 | 100 | 3,220 | 454 | 3,674 |
| Total | 30,399 | 10,534 | 40,933 | 1,131,028 | 360,289 | 1,491,317 |
| Total | 54,847 | 20,918 | 75,766 | 1,679,414 | 599,908 | 2,279,322 |

* Not applicable.

† Because of rounding, numbers might not sum to totals.

Source: Midanik et al. (2004). *MMWR*. 53(37): 866-870

III. ALCOHOL-RELATED MORTALITY AND MORBIDITY

A. OVERVIEW

Alcohol consumption ranks among the leading causes of death and poor health in the United States. Adverse health consequences of alcohol consumption include a wide range of injuries, both unintentional and intentional, as well as numerous chronic health conditions. Because of the wide range of adverse health effects associated with alcohol consumption, no single measure can provide a complete representation of the burden to population health that results from alcohol consumption. Instead, a variety of measures may provide insights into the nature and extent of alcohol-attributable harms to health. Indicators of the health burden attributable to alcohol include direct measures of mortality and morbidity, indirect measures of adverse health consequences based on health care utilization, synthetic measures of population health that integrate mortality and morbidity in a single metric, and broader measures of the adverse economic effects of alcohol consumption.

Methodological and measurement factors affect indicators of the health burden attributable to alcohol, leading to significant variation across measures that might be expected to yield similar findings. Among the main sources of variation are differences in the specific conditions that may be caused by alcohol consumption that are included or excluded in a particular study, and the degree of causation attributed to alcohol consumption for specific conditions and outcomes. Despite the uncertainties arising from these considerations, the clear conclusion across the spectrum of indicators is that alcohol consumption causes or contributes to a significant share of death and poor health in the United States.

MORTALITY

Recent estimates of alcohol-related mortality range from 64,000 to 140,000 per year for 2000 or 2001 (Midanik et al., 2004; Mokdad et al., 2004; Rivara et al., 2004), with “best judgment” point estimates in the range of 76,000-85,000. Earlier estimates reported by NIAAA for 1979-1996 ranged from 103,000 to 113,000 (NIAAA QuickFacts). Analyses of external modifiable factors that contribute to death, labeled “actual causes of death,” have placed alcohol consumption as the third leading such cause for 1990 and 2000, after (1) tobacco use, and (2) poor diet and physical inactivity (Mokdad et al., 2004; McGinnis and Foege, 1993).

Available evidence indicates that total mortality attributable to alcohol has declined in recent years, although methodological changes may influence the estimates. The *Quick Facts* section of the NIAAA Web site reports that alcohol-related mortality for the United States declined from a high of 112,933 in 1980 to a low of 103,247 in 1983, followed by

12 years of steady increases to a peak of 111,290 in 1995 before leveling off at 110,640 in 1996.

Several recent studies have estimated alcohol-attributable mortality for 2000 or 2001 at levels substantially below those reported for earlier years. Midanik et al. (2004) estimated alcohol-attributable deaths at 75,766 for 2001 based on condition-specific alcohol-attributable fractions, most of which were calculated using estimates of relative risk drawn from Australian meta-analyses (English et al., 1995; Ridolfo and Stevenson, 2001). Alcohol was the third ranked preventable cause of death in the United States. Rivara et al. (2004) estimated 63,718 alcohol-attributable deaths for 2000 using generally similar methods but based their findings on relative risk estimates comparing heavier alcohol consumption levels to lower-level consumption (rather than to abstention). Mokdad et al. (2004) reported estimates of alcohol-attributable deaths for 2000 based on several alternative methods, including a condition-specific approach using the Australian relative risk estimates that yielded an overall estimate of 69,989 and a best-judgment estimate of approximately 85,000. The differences between recent estimates and earlier findings appear to be due in part to differences in methodology, as the specific conditions and associated attributable fractions included in the recent studies differ significantly from those that factored into the earlier estimates (Bloss, 2005). Taken collectively, however, the clear conclusion to be drawn from these recent studies is that overall alcohol-attributable mortality in the U.S. around the turn of the current century is somewhat lower than had been reported for the late 1980s and early 1990s. As will be discussed, there is strong evidence that alcohol-related traffic deaths, the largest single category of alcohol-related deaths, have shown marked declines since the early 1980s. One analysis indicates reductions in drinking and driving in the U.S. saved 153,000 lives between 1982 and 2001 – more than increased use of seat belts, airbags, bicycle helmets, and motorcycle helmets combined (Cummings et al., 2006)

Studies have also examined the years of potential life lost (YPLLs) due to alcohol, which incorporates information on the age of decedents in alcohol-attributable deaths. Relative to life expectancy, an estimated 2.3 million YPLLs were attributed to alcohol consumption in 2000 (Midanik et al., 2004), accounting for approximately half as many YPLLs as smoking (estimated for 1999) even though smoking accounts for nearly six times as many deaths. An earlier study estimated alcohol-attributable YPLLs for 1987 at 2.7 million (Shultz and Rice, 1990).

A number of studies have examined the risk relations between alcohol consumption and all-cause mortality. The central finding is a clear increase in risk of mortality with increasing consumption above a threshold level of moderate consumption. The majority of studies have found U-shaped or J-shaped relationships between consumption levels and overall mortality, suggesting that low-level alcohol consumption may confer a protective effect on some fatal outcomes relative to abstention (Poikolainen, 1995; Rehm, 2000; Gmel et al., 2003). Two recent studies have questioned the existence of a beneficial effect of low or moderate consumption on all-cause mortality (Fillmore et al., 2006) or cardiovascular mortality (Naimi et al., 2005) on methodological grounds.

MORBIDITY

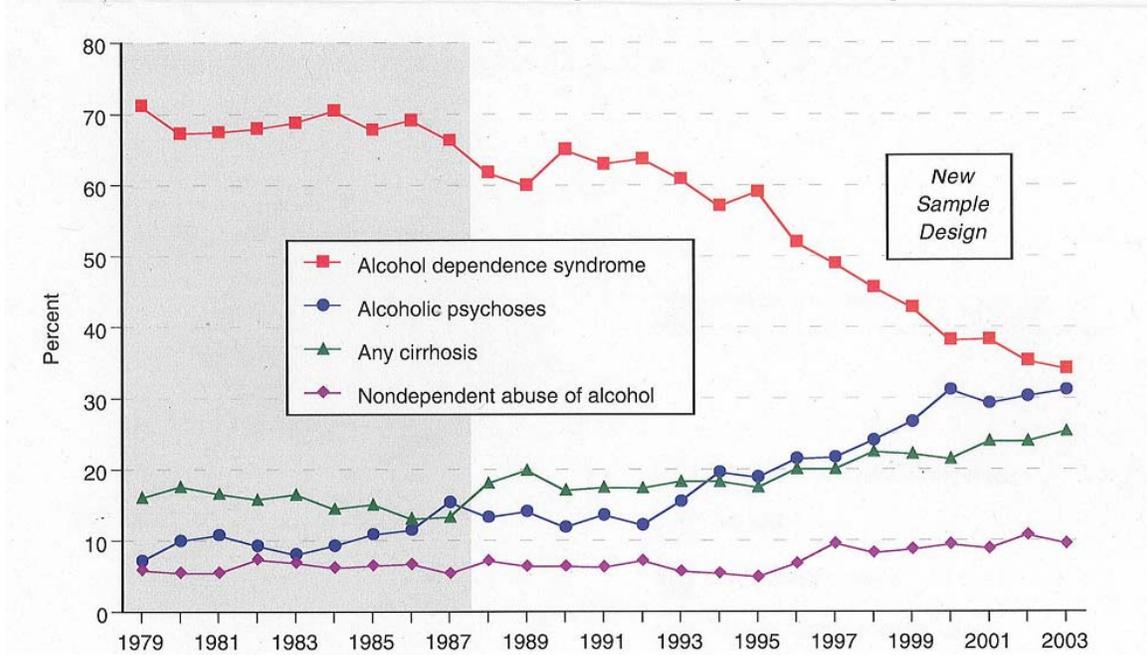
Measuring the extent of poor health attributable to alcohol consumption is more difficult than measuring deaths caused by alcohol consumption. Few direct measures of alcohol-related morbidity are available. The National Epidemiologic Survey on Alcohol and Related Conditions found that 5.4 percent of men age 18 and older and 2.3 percent of women 18 and older met DSM-IV criteria for alcohol dependence within the past 12 months in 2001-2002. These figures represent modest but significant decreases compared to estimates based on the National Longitudinal Alcohol Epidemiologic Survey for 1991-1992. In contrast, the prevalence of DSM-IV alcohol abuse increased over the same period, from 4.7 percent to 6.9 percent for men, and from 1.5 percent to 2.6 percent for women (Grant et al., 2004).

For conditions other than alcohol use disorders, the role of alcohol in generating poor health is usually inferred from data on health care utilization. A report on alcohol-related hospital discharges (Chen et al., 2005) based on data from the National Hospital Discharge Survey finds that 424,000 hospital discharge episodes in 2003 for persons 15 and older had a principal (first-listed) alcohol-related diagnosis, and approximately 1.6 million discharges had any alcohol-related diagnosis. Discharges with any alcohol-related diagnosis accounted for between 5 and 6 percent of all hospital discharges in 2003 (excluding discharges for females with delivery of a baby). The alcohol-related diagnoses that formed the basis of these findings were limited to alcoholic psychoses, alcohol dependence syndrome, nondependent abuse of alcohol, and chronic liver disease and cirrhosis. While the final category included some discharges for liver disease that were not caused by alcohol, the overall estimates are surely very conservative because they omit a wide range of conditions known to be partially caused by alcohol consumption, including various cancers, cardiac conditions, stroke, gastro-intestinal conditions, various unintentional and intentional injuries, and fetal effects caused by alcohol. Males accounted for slightly more than twice as many alcohol-related discharges as females, and the rate of alcohol-related hospitalization per 10,000 population was greatest among the 45-64 age group, slightly lower for 65 and older and 25-44 year olds, and considerably lower for 15-24 year olds. The highest rates of hospitalization were for alcohol dependence syndrome and alcoholic psychoses, with lower hospitalization rates for non-dependent abuse of alcohol and for chronic liver disease and cirrhosis. The study also found increasing frequency of alcohol-related diagnoses from 1979-2003, although the frequency of alcohol-related conditions appearing as the first-listed diagnosis declined over the same period. These trends are shown in Figure 1.

Another report examined hospitalizations for alcohol abuse disorders for 2003 based on a different data source and considering only diagnoses of alcoholic psychoses, alcohol dependence syndrome, and nondependent abuse of alcohol. This study found that these alcohol abuse disorders were principally responsible for almost 210,000 hospitalizations and were listed as concomitant conditions for nearly 1.1 million additional hospital stays (Russo and Elixhauser, 2006). An earlier study using a broader set of alcohol-related conditions estimated the total number of hospital days attributable to alcohol at 5.3 million for the United States for 1992 (Harwood et al., 1998).

Figure 1

Trends in percent of discharges with principal (first-listed) or any (all-listed) mention of an alcohol-related diagnosis among all discharges, 1979–2003.



*Note: Shaded area represents the period before implementation of a new sample design which may affect the trend data. Caution should be taken when making comparisons between the new and old sample design periods.

Source: Chen et al., 2005

Further indicators of the contributions of alcohol consumption to acute health problems are available from studies of alcohol-related visits to emergency departments. McDonald et al. (2004) estimated that the number of emergency department (ED) visits in the United States attributable to alcohol averaged 7.6 million per year over from 1992 to 2000, accounting for 7.9 percent of all ED visits over that period, with a rising trend showing an overall 18 percent increase in alcohol-related ED visits over the 9-year study period. Elder et al. (2004) considered alcohol-related ED visits among 13-25 year-olds, and found 244,331 visits to U.S EDs during 2001 by patients age 13-25, with half of these patients under the legal drinking age. Cherpital and colleagues (2005) used meta-analytic methods to estimate risks attributable to drinking before the injury (evidenced by positive BAC or self-report) and to a pattern of binge drinking (5+ drinks at least once per month) for both all-cause and violence-related injuries. They found that only between 2 percent (positive BAC) and 6 percent (self-report) of all-cause injuries were attributable to drinking before the occurrence of the injury, and 6 percent were attributable to binge drinking patterns. Violence-related injuries, however, showed a much stronger relationship to alcohol consumption, with between 28 percent (positive BAC) and 43 percent (self-report) of such injuries attributable to drinking before the occurrence of the injury, and 27 percent attributable to binge-drinking patterns. For each category, attributable risks were at least three times as large for men as for women.

The clear conclusion that emerges from studies of morbidity attributable to alcohol is that alcohol consumption accounts for a significant share of poor health in the United States.

OTHER MEASURES OF HEALTH BURDEN

Recent research has emphasized summary measures of population health that incorporate mortality and morbidity effects into a single measure (Gold et al., 2002; Murray et al., 2000). A leading measure of the health burden of specific diseases or risk factors is disability-adjusted life years (DALYs). Conceptually, DALYs represent the sum of life-years lost to a particular condition plus a weighted fraction of years lived with disability as a result of the condition, with the fractional weights increasing with greater degrees of disability. A recent study of the contribution of various diseases and risk factors to the overall burden of disease in the United States found that alcohol use was the 5th-leading source of DALYs for men and the 11th-leading source of DALYs for women in 1996 (McKenna et al., 2005). For both groups, the burden of disability attributed to alcohol far outweighed the years of life lost (by a factor of 8 for men and a factor of more than 16 for women). This estimate may err on the conservative side, however, as there is no indication of the range of health consequences attributed to alcohol consumption. In addition, an earlier study using DALYs to assess the burden attributable to various risk factors in an international framework reported deaths attributable to alcohol use net of deaths averted as a result of alcohol use through the hypothesized protective effect of alcohol consumption on cardiovascular disease (Murray and Lopez, 1997). The low number of deaths (6,000) attributed to alcohol use in the more recent study suggests that a similar procedure may have been used. Thus, the burden of the adverse consequences of alcohol use may be greater than this study suggests.

POPULATIONS AT RISK

Numerous studies have documented increasing risk of all-cause mortality with heavier average consumption levels, indicating that heavy drinkers face increased alcohol-related mortality risks. For some conditions, particularly various outcomes associated with acute intoxication, evidence suggests that concentrating a given amount of consumption in fewer drinking occasions leads to increases in risk (Gutjahr et al., 2001). These considerations indicate, not surprisingly, that risks of alcohol-related death and illness may be greatest among drinkers with heavy average consumption levels and those who drink heavily on an episodic basis. A study of U.S. data found that increases in risk among heavy drinkers were found among those who met criteria for alcohol dependence, while protective effects associated with moderate alcohol consumption were limited to those without alcohol dependence (Dawson, 2000). Alcohol-related mortality is greater among males than among females, reflecting males' greater consumption levels. Because alcohol-related motor vehicle crash injuries represent the largest single category of alcohol-related deaths, drinking drivers and their passengers are also identifiable as an at-risk group.

RESEARCH PROGRESS

Estimation of alcohol-related mortality may be accomplished through cause-specific or all-cause estimation methods. In either case, alcohol-attributable fractions are generally derived from estimates of relative risk (RR) for various exposure levels combined with prevalence rates for those exposure levels. The current state-of-the-art involves meta-analyses of individual studies to arrive at pooled estimates of relative risk. This approach was advanced by English et al. (1995) with refinements by Ridolfo and Stevenson (2001) and is the subject of a NIAAA-contracted study conducted by Harvard University School of Public Health.

Use of alcohol-attributable fractions raises a number of methodological and conceptual issues (Rockhill et al., 1998). Based on the detail available in the underlying studies, relative risk estimates may differentiate by population groups (e.g., sex, age groups). Different relative risks for specific conditions may also be associated with different patterns of consumption (e.g., consumption parameters beyond measures of average volume of ethanol) and the extent to which potential confounders such as diet, physical activity, and smoking have been controlled. To the extent that consumption patterns may vary across population groups, these two categorizations may be confounded (Bloss, 2005; Rehm and Gmel, 2003; Rehm et al., 2002).

There is now substantial evidence of beneficial effects of moderate alcohol consumption for cardiovascular disease (Mukamal and Rimm, 2001; Corrao et al., 2000). Additional beneficial effects have been suggested, but not conclusively determined, for ischemic stroke, diabetes, and cholelithiasis (gallstones) and may be present for other conditions as well (Ashley et al., 2000). Particularly given the apparent strength of the beneficial effect and the aggregate number of deaths attributable to cardiovascular disease, it is important to report such effects appropriately. This may not mean, however, offsetting beneficial effects against adverse consequences, but instead may require separate reporting of beneficial and adverse effects at various levels of consumption.

RESEARCH QUESTIONS/ DIRECTIONS

- Have alcohol-attributable fractions for different acute and chronic disease deaths changed over time and what are the best estimates of trends in acute and chronic disease alcohol attributable deaths over time?
- How do relative risks for specific conditions vary with drinking pattern and across subpopulations?
- How are alcohol and potential confounders such as diet and physical activity best measured to limit residual confounding?
- Does alcohol consumption (at specific levels; within specific population groups) confer any protective effects for stroke and/or diabetes?

- How can methodological and data sources be standardized to permit better assessment of changes over time in alcohol-related morbidity and mortality?
- What metrics are best suited for assessing the overall burden of alcohol-related morbidity and mortality (e.g., Disability-Adjusted Life Years)?

B. UNINTENTIONAL INJURY

According to the U.S. Center for Disease Control, 40,933 injury deaths in 2001 were attributable to alcohol [See Table 1]. Unintentional injuries are the leading cause of death in the United States for persons ages 1-44 and intentional injury is the second leading cause for persons age 8-34 (CDC WISQARS, 2005). In 2001, the numbers of alcohol attributable deaths for the major types of unintentional injuries were 13,878 for motor vehicle crashes, 4,766 for deaths due to falls, 812 for drownings, and 3,964 for poisonings (not alcohol only). There were also 7,655 alcohol attributable homicides and 3,964 alcohol-attributable suicides. Injury deaths are attributed to alcohol if the persons who died had a blood alcohol level of .10%. (The legal blood alcohol limit for intoxication for operating a motor vehicle is .08%.)

A review of over 300 medical examiner studies published in scientific peer review journals in the U.S. from 1975-1995 (Smith et al., 1999) revealed alcohol is a factor in 40% of motor vehicle deaths, 39% of other unintentional injury deaths, 47% of homicides and 29% of suicides. Thus, alcohol is a, if not the leading contributor to unintentional and intentional injuries, the leading causes of death among persons aged 1-44.

1. Motor Vehicle Crash Deaths

MAGNITUDE OF THE PROBLEM

Traffic deaths are the leading type of alcohol attributable death in the U.S. surpassing every other category of acute or chronic alcohol attributable death. They are the leading cause of death for persons ages 2-33 in the U.S. (NHTSA, 2003 a-e). According to NHTSA, 41 percent of people fatally injured in traffic crashes were in alcohol-related crashes (i.e., those in which a driver or pedestrian had a blood alcohol concentration [BAC] greater than zero), and 35 percent were in crashes involving someone with a BAC of 0.08 percent or higher. Of the total number of people injured in traffic crashes, 9 percent were injured in alcohol-related crashes (225,000 out of 2,926,000).

Traffic crashes are more likely to result in death or injury if alcohol is involved. Of all alcohol-related crashes in 2002, 4 percent resulted in a death, and 42 percent in an injury. In contrast, of the crashes that did not involve alcohol, 0.6 percent resulted in a death, and 31 percent in an injury.

Many people other than drinking drivers are killed in crashes involving drinking drivers. Overall in 2002, 44 percent of those who died in traffic crashes involving a drinking

driver with a BAC of 0.01 percent or higher were people other than the drinking driver: 7 percent were other drivers in vehicles struck by drinking drivers, 22 percent were passengers in vehicles with drinking drivers or struck by drinking drivers, 13 percent were pedestrians, and 2 percent were bicyclists. In 2002, 573 children younger than age 16 died in crashes involving drinking drivers (Hingson and Winter, 2003).

TRENDS

In 2004, 39% of persons fatally injured in traffic crashes (16,654/42,800) were in alcohol-related crashes and 8% of people injured in traffic crashes were in alcohol-related crashes 228,000/2,757,000 (NHTSA, 2005a, b).

In 1982 NHTSA first began reporting alcohol-related and non alcohol-related traffic death totals for the nation. Alcohol-related traffic crash deaths declined from 26,173 in 1982 to 16,654 in 2004, a 36% decline. During the same time period non alcohol-related traffic deaths increased from 17,772 to 25,989 a 46% increase. Per 100,000 population alcohol-related traffic deaths declined 50% from 11.3 to 5.67 while non alcohol-related traffic deaths increased 16% from 7.67 to 8.90 [Figure 2].

POPULATIONS AT RISK

Males are more likely than females to be involved in alcohol-related (i.e. driver or pedestrian BAC greater than zero) fatal crashes. In 2002, 78 percent of people killed in alcohol-related crashes (including drivers, passengers, and pedestrians) were male (NHTSA, 2003a). Forty-six percent of male traffic deaths are alcohol-related, compared with 29 percent of female traffic deaths.

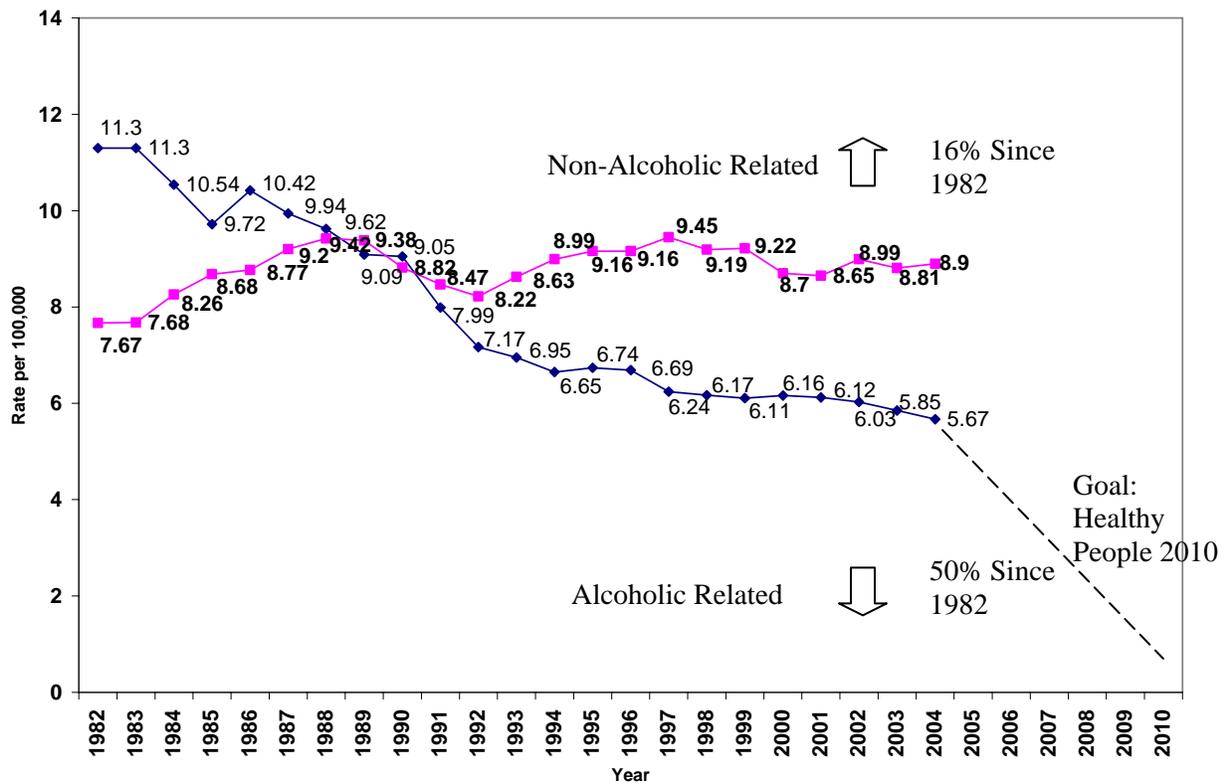
Traffic deaths among elderly people and children are less likely to be alcohol-related than those among young and middle-aged adults. Only 15 percent of traffic deaths among adults age 65 and over were alcohol-related, compared with 23 percent of traffic deaths among children under age 16, 37 percent among 16- to 20-year-olds, 57 percent among 21- to 29-year-olds, 53 percent among 30- to 45-year-olds, and 38 percent among 46- to 64-year-olds. Alcohol-related traffic deaths are more likely to occur at lower BACs among 16- to 20-year-olds, compared with other age groups. A majority of alcohol-related traffic deaths among 16- to 20-year-olds occur at below 0.15 percent BAC (i.e., referring to the highest BAC of a driver or pedestrian involved in the crash). In the general population, however, a majority of traffic deaths occur at above 0.15 percent BAC (NHTSA 2003a).

The earlier that people begin to drink the greater their likelihood of being in motor vehicle crashes not only as adolescents but also as adults (Hingson et al., 2002). Those who begin drinking prior to age 14 are seven times more likely to be in a motor vehicle crash than those who wait to age 21 or older to start drinking. These relations are still significant after controlling for age, gender, race, income, marital status, personal history of smoking and illicit drug use as well as family history of alcohol abuse.

A special initiative linked nearly 200,000 records from the 1990 to 1994 FARS data with death certificate information on race and ethnicity from the National Bureau of Health Statistics (Voas and Tippetts, 1999). Information was available only for people who died in crashes, not drivers who survived fatal crashes. During that time period, 72 percent of people killed in alcohol-related fatal crashes were White, 12.1 percent African American, 2.4 percent Native American, 1.2 percent Asian Americans and Pacific Islanders (AAPIs), and 12.7 percent Hispanic (including Mexican Americans [8.7 percent], Puerto Ricans [0.6 percent], Cubans [0.3 percent], Central and South Americans [1.1 percent], and people of other Hispanic origins [2.0 percent]). During the same period, according to the U.S. Census Bureau, 83 percent of the U.S. population was White, 13 percent African American, 1 percent Native American, 3 percent AAPI, and 10 percent Hispanic.

Figure 2

Alcohol and Non-Alcohol-Related Traffic Fatalities
Per 100,000 Population



| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | |
|--------------------------------|-------|-------|-------|------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Alcohol-Related Fatalities | 11.30 | 11.30 | 10.54 | 9.72 | 10.42 | 9.94 | 9.62 | 9.09 | 9.05 | 7.99 | 7.17 | 6.95 | 6.74 | 6.65 | 6.74 | 6.69 | 6.24 | 6.17 | 6.11 | 6.16 | 6.12 | 6.03 | 5.85 | 5.67 |
| Non-Alcohol-Related Fatalities | 7.67 | 7.68 | 8.26 | 8.68 | 8.77 | 9.20 | 9.42 | 9.38 | 8.82 | 8.47 | 8.22 | 8.63 | 8.99 | 9.16 | 9.16 | 9.45 | 9.19 | 9.22 | 8.70 | 8.65 | 8.99 | 8.81 | 8.90 | |

Source: Midanik et al. (2004). *MMWR*. 53(37): 866-870

The proportion of traffic fatalities that were alcohol-related varied considerably by race and ethnicity. Among all groups, 38 percent of traffic deaths were alcohol-related. Native Americans had the highest percentage of traffic deaths that were alcohol-related (68 percent). Whites and African Americans had similar proportions (38 percent and 39

percent, respectively). Within Hispanic groups there was considerable variability: Alcohol was involved in 50 percent of traffic deaths among Mexican Americans, 42 percent among Central/South Americans, 36 percent among Puerto Ricans, and 24 percent among Cubans. AAPIs had the lowest percentage of alcohol-related traffic deaths of any ethnic group (19 percent).

In every racial or ethnic group examined, a higher proportion of male than female deaths were alcohol-related. This was true for drivers, passengers, pedestrians, and cyclists. In almost every racial/ethnic group, the age group with the highest percentage of drivers and pedestrians who died in alcohol-related crashes was the 21- to 49-year-old group (Voas and Tippetts, 1999).

Evidence about the relationship between alcohol dependence and alcohol-related crashes is available from the National Longitudinal Alcohol Epidemiologic Survey (NLAES). This 1992 national survey of adults 18 and older (N=42,000) used the Alcohol Use and Associated Disabilities Interview Schedule (AUDADIS) (Grant and Hasin, 1992) to determine whether respondents would be diagnosed with alcohol dependence or alcohol abuse based on criteria from the Diagnostic Statistical Manual Fourth Edition (DSM-IV) American Psychiatric Association (APA) 1994.

Thirteen percent of respondents were diagnosed as having been alcohol dependent at some point in their lives. This group represents 65% of those who reported ever being in a motor vehicle crash because of having too much to drink (based on self report) and 72% of those who had been in alcohol-related crash during the year prior to the interview (Hingson and Winter, 2003).

ALCOHOL DRUGS AND DRIVING

According to the National Household Survey on Drug Use and Health, a nationally representative survey of 67,784 persons 12 and older in the U.S. conducted in 2003, during the survey year 50% of respondents, representing 119 million persons nationwide, drank alcohol and 8.2% used illicit drugs, representing 19.5 million people. Just under one third of drinkers 13.6%, 32.3 million people, drove under the influence of alcohol. Over half of illicit drug users drove after drug use, 4.6% of respondents representing 10.9 million people. One percent, 2.4 million people, drove after using drugs but not alcohol while 3.6%, 8.6 million people, drove after both drug use and consumption of alcohol. The traffic safety risks posed by alcohol impairment among drivers have been clearly established for decades through both experimental research and case-controlled studies.

Research on the traffic safety risks of drug use are not so clear for numerous reasons including:

- While alcohol can be reliably measured through breath tests, more intrusive tests are needed for drugs (blood, urine or oral fluids).
- The correlation between blood levels of drugs and behavioral and performance impairment is low and variable for many drugs.

- A wide range of drugs are used by drivers requiring more elaborate and expensive analysis.
- Elimination of alcohol over time from the body is more predictable than drugs.
- Incidence of driving after drug use, at least in the U.S., appears to be lower than driving after drinking. Larger numbers of drivers, and drivers injured or killed in crashes, will need to be studied to identify whether drugs alone or in combination with alcohol increase fatal or injury crash risk

In a review article on this topic Ogden and Moskowitz (2004) observed that drugs in combination with alcohol may increase collision risk through effects on

- Alertness (e.g. sedation stimulation)
- Vision (e.g. visual blurring, delayed recovery from glare)
- Psychomotor functioning (e.g. impaired performance on skills testing)
- Psychosocial functioning (e.g. changes in behavior, risk taking)
- Cognition (e.g. changes in processing information)

The authors of the study state that the effects on these domains of functioning from substances other than alcohol is more complex because of the number of substances of potential interest, the difficulty of estimating drug levels and the complexities of drug/subject interaction. The drugs of concern are marijuana, benzodiazepines, and other psychoactive medications including stimulants and narcotics. They conclude, therefore, that no single test or group of tests currently meets the need for detecting and documenting impairment either in the laboratory or at roadside. They further expressed concern that diverting traffic safety resources at this point into a “war on drugs” will probably be counter productive for traffic safety.

Only a handful of case control studies have been completed that explore the risks of driving after drug use and driving after drug use in combination with alcohol. In perhaps the most intriguing of these, Mathejssen and Howig (2006) recently studied 3374 (99%) drivers stopped at 50 different research sites over 28 consecutive six hour periods in Tilbourg, Netherlands. These drivers were given alcohol breath tests or blood or urine drug tests which were confirmed by either gas chromatography/mass spectrometry, high performance liquid chromatography or enzyme multipliers immunoassay technique (depending on type of sample and/or drug). They were compared to 184 seriously injured drivers treated at the Emergency Department of the Tilbourg St. Elizabeth Hospital. Blood samples were available from 121 cases and urine from 63 for testing alcohol or drug use.

An eight fold increased risk for serious road injury was found at BAC's of 0.05% to 0.08% and rose exponentially as BAC levels increased consistent with prior case control studies in the U.S. (Borkenstein et al., 1964). At BAC levels below 0.05%, the injury odds among benzodiazepine using drivers was OR= 2.98 [95% CI (1.31, 6.75)]. At a BAC of 0.01-0.08%, use of a combination of drugs was associated with an increase of serious injury [OR=12.9 (3.78-44.2)]. At a BAC of 0.08% or higher, use of a combination of drugs increased the odds further [OR=179 (49.9-638)].

While intriguing, it should be noted that the study had case and control groups too small to identify significantly increased odds of serious injury in crashes involving the use of specific drugs consumed in combination with alcohol. Moskowitz (2006) in reviewing the Mathijessen case/control study noted that both cases and controls gave either urine or blood thereby making determination of drug influence more difficult. Further, he questioned whether the control group (a representative sample of area drivers) were similar or different than case drivers on other characteristics that could influence injury crash risk.

Many people drive after using drugs and drugs and alcohol in combination. Further, preliminary studies indicate driving after drinking and drug use in combination may dramatically increase injury crash risk. However, because the effects of these behaviors in combination are poorly understood, research is needed to assess the crash risks linked with driving after drinking and driving after drug use. This need is heightened because of scarce resources for traffic safety enforcement.

RESEARCH PROGRESS ON POLICY DEVELOPMENTS

Since 1982 when the National Highway Traffic Safety Administration first began recording alcohol-related traffic fatalities in all states, the sharpest decline in alcohol-related traffic deaths has been among persons 16-20 years old. From 1982 through 2004 alcohol-related deaths in this age group have declined 60% from 5,244 to 2,115. Over the same period, among persons in this age group, non-alcohol-related traffic deaths increased 38% as more young people were licensed to drive and drove more miles. During the same period, alcohol related traffic deaths declined 36% among persons of all ages from 26,173 to 16,654. The greater decline in alcohol-related traffic deaths among persons 16-20 is in part attributable to adoption of the age 21 minimum legal drinking age. A review of 49 studies of changes in the legal drinking age revealed that in the 1970's and 1980's when many states lowered the drinking age, states lowering the age experienced on average a 10% increase in alcohol-related crashes involving drivers in the targeted ages. In contrast, when states raised the drinking age, they experienced on average a 16% decline in alcohol-related crashes involving drivers in the targeted ages (Shults et al. 2001). Wagenaar and Toomey (2002) who examined 48 studies of the effects of these laws on drinking and 57 on traffic crashes concluded that of all interventions studied to reduce youth drinking problems "[raising] the age of legal purchase has been the most successful to date." One national study of laws raising the drinking age to 21 indicated that persons who grew up in states that raised the age of legal purchase to 21 not only drank less when they were younger than 21, but also when they were 21-25 (O'Malley and Wagenaar, 1991). NHTSA estimates that the legal drinking age of 21 prevents 700-1000 traffic deaths per year, resulting in more than 23,000 deaths that have been prevented by those laws since 1976.

Other laws targeting adult drivers have also contributed to declines in alcohol-related fatal crashes. Criminal per se laws make it a criminal offense to drive above the legal blood alcohol limit. Administrative license revocation (ALR) laws allow the police to administratively seize at the scene the drivers license of a driver operating a motor

vehicle with a blood alcohol level above the legal limit. Criminal per se laws are in effect in all 50 states and administrative license revocation laws in 41 states. Criminal per se laws have been shown to reduce alcohol-related traffic deaths (Zador et al., 1989; Voas et al., 2000) but the ALR laws produce greater deterrent effects and fatal crash reductions because the license suspension is more swift and certain than with per se offenses which often result in trials and variable rates of conviction. Zero Tolerance laws making it illegal for drivers under 21 to drive after any drinking have been associated with approximately a 20% decline in alcohol-related fatal crashes and driving after drinking (Hingson et al., 1994; Wagenaar et al., 2001; Tippetts et al., 2005).

In 2000 Congress passed legislation to withhold federal highway construction funds from states unless they lowered the legal limit from .10% to .08%. By 2003 all 50 states adopted .08% laws. To reach a blood alcohol level of .08% a typical 170 pound male would need to consume 5 drinks over a two hour period and a 135 pound female 4 drinks, an amount recently classified by NIAAA as binge drinking. Some single state studies of lowering legal limits to 0.08% found insignificant effects of the law either because of low statistical power (Foss et al. 1998) or because other laws like ALR were passed in close proximity to 0.08% laws (Rogers 1995). However, ten studies of the passage of 0.08% in multiple states have found the law to be associated with significant declines in alcohol-related fatal crash and fatality measures (Johnson and Fell, 1995; Hingson et al., 1996; Hingson et al., 2000; Apsler et al., 1999; Voas et al., 2000; Shults et al., 2001; Dee, 2001; Eisenberg, 2003; Bernat et al., 2004; Tippetts et al., 2005).

All of the above laws are *general deterrence* laws aimed at preventing drivers from operating motor vehicles under the influence of alcohol. *Specific deterrence* laws seek to reduce recidivism, re-arrests and subsequent alcohol-related crash involvement among drivers convicted of driving while intoxicated. Mandating screening and alcohol treatment for drivers convicted of driving under the influence of alcohol, the law in 41 states, has been shown to reduce recidivism one third more than license actions alone (Wells-Parker et al., 1995). Setting lower legal blood alcohol limits for convicted offenders (Hingson et al., 1998; Jones and Rodriguez- Iglesias, 2005), vehicle impoundment of cars driven illegally by convicted DUI offenders (Voas et al., 1997; 1998) and mandated use of ignition interlock devices to detect positive blood alcohol levels in convicted DUI offenders (Beck et al., 1999) have all been shown to reduce recidivism among convicted offenders.

OTHER RESEARCH PROGRESS

Enforcement and educational strategies informing the public of drunk driving laws and their enforcement can produce alcohol-related crash declines that exceed those achieved solely by passage of a law.

Publicized sobriety check points are a highly effective impaired driving deterrent (Castle et al., 1995; Lacey et al., 1999; Shults et al., 2001) and in some statewide quasi experimental studies have yielded declines up to 20% in alcohol-related fatal crashes.

Checkpoint effectiveness is linked to the deterrent effects of checkpoints, not the likelihood of arresting high percentages of drivers stopped (Fell et al., 2004).

Elder et al. (2004) in a systematic review of eight mass media campaigns to reduce alcohol-related traffic crashes concluded that media campaigns that are carefully planned, well executed, attain adequate audience exposure and are implemented in conjunction with other ongoing prevention activities such as enhancing alcohol impaired driving law enforcement are effective in reducing alcohol impaired driving and alcohol-related crashes.

Individual Oriented Interventions

These interventions focus on changing the knowledge, attitudes, beliefs and behaviors of individuals. Alcoholism treatment for alcohol abusers/dependents has been associated with reductions in drinking/driving offenses (Dinh-Zarr et al., 1999). Trauma Centers and Emergency Department experimental studies of screening and brief intervention counseling for alcohol problems among people who have experienced alcohol-related injuries have been associated with reductions in drinking and driving offenses, and alcohol-related injuries (Gentilello et al., 1999; Monti et al., 1999; Longabaugh et al., 2001). Brief interventions are short sessions designed to motivate people to cut down or stop drinking. Annually, there are approximately 8 million alcohol-related admissions to Emergency Departments in the U.S. (McDonald et al., 2004). Of these 2.2 million are recorded as being alcohol-related (McCaig and Burt, 2003). This is likely an underestimate due to laws in 28 states and DC that allow insurance companies to withhold reimbursement for persons injured under the influence of alcohol (NIAAA APIS, 2005).

A recent review (Elder et al., 2005) identified five papers examining six different school based institutional programs that sought to reduce driving after drinking or riding with a drinking driver. All of the programs provided information to students about the risks associated with these behaviors. Most also focused on skills development, in particular life skills and refusal skills. Reductions in riding with drinking drivers were reported in four studies (Sheehan et al., 1990; Newman et al., 1992; Harre and Field, 1998; Wilkins, 2000). Klepp et al. (1995) found a reduction in driving after drinking as did Harre and Field (1998) for girls but not boys. Most of these studies relied on self report. Only Shope et al. (2001) examined official records regarding moving violations and crashes.

Environmental Interventions

Increasing the price of alcohol has with rare exceptions (Chaloupka and Wechsler, 1996; Dee, 1999) been associated with reductions in motor vehicle deaths (Dee, 2001; Kenkel, 1993; Saffer and Grossman, 1987).

Dram shop laws (Grube and Stewart, 2004), beer keg registration (Cohen et al., 2001), and compliance check surveys to monitor and prevent underage access to alcohol have been found to reduce alcohol-related traffic crashes (Preussner and Williams, 1992; Grube, 1997; Wagenaar et al., 2000b). Off premise monopoly systems can reduce drinking and driving (Howat et al., 2004) as can mandated server training (Wagenaar and Holder, 1991).

Comprehensive Community Programs

Several carefully conducted community-based interventions have had particular success in reducing alcohol-related traffic crashes and deaths (most were NIAAA supported). These programs typically coordinate efforts of city government, school, health police, private citizens and their organizations, students, parents and merchants who sell alcohol. Six comprehensive community programs have shown significant reductions in alcohol problems including driving after drinking among adolescents and adults: the Communities Mobilizing for Change Program (Wagenaar et al., 2000a, 2000b), the Community Trials Program (Holder et al., 2000), the Saving Lives Program (Hingson et al., 1996), the Matter of Degree Program (Weitzman et al., 2004), a college community intervention (Clapp et al., 2005), and the Fighting Back Program (Hingson et al., 2005). Two programs (Holder et al., 2000; Wagenaar et al., 2000a, 2000b) concentrated program efforts on underage purchase attempt surveys with feedback to alcohol sales merchants and the community about the proportion of attempts that resulted in sales, and penalties for continued violation. Three programs (Holder et al., 2000; Wagenaar et al., 2000a, 2000b; Weitzman et al., 2004) used environmental intervention to reduce alcohol availability to underage drinkers. Three programs (Holder et al., 2000; Hingson et al., 1996; Clapp et al., 2005) focused on publicized police enforcement of drunken driving laws, and one program targeted risky motorist behaviors disproportionately engaged in by drinking drivers such as speeding, running red lights, failure to wear safety belts, and failure to yield to pedestrians in crosswalks (Hingson et al., 1996). Most recently a group of Fighting Back communities combined efforts to increase participation in individually oriented substance abuse treatment with environmental interventions to reduce alcohol availability (Hingson et al., 2005).

RESEARCH QUESTIONS/ DIRECTIONS

- Research on general deterrence for drinking-driving should be encouraged. Current NIAAA research projects tends to focus more on preventing DWI recidivism among convicted offenders (specific deterrence) rather than preventing DWI among all drivers (general deterrence). Because the large majority of alcohol impaired drivers in fatal crashes have never been arrested and convicted, general deterrence research has a greater potential to reduce the problem.
- Research is needed on how to increase screening, brief intervention and counseling in clinical settings outside the criminal justice system, such as emergency departments, and whether such programs can reduce alcohol-related traffic crash deaths and injuries. The vast majority of drinking drivers in fatal crashes have never been arrested for impaired driving.
- Research should determine whether recent changes in legal blood alcohol limits, primary enforcement safety belt laws, and UPPL insurance laws regarding medical reimbursement for treating patients injured under the influence of alcohol, as well as alcohol price, and outlet density changes are effective means of reducing traffic injuries.

- Research should study the barriers to the adoption of promising legal and community interventions to reduce traffic fatalities. It should also identify ways to overcome these barriers. The effects of numerous legal and community interventions have been demonstrated to reduce alcohol-related traffic fatalities. However, not all of these laws and programs have been widely adopted.
- Studies should determine whether the use of prescription and/or illicit psychoactive drugs has independent, additive, or interactive effects with alcohol, thereby increasing crash risk. Whether changes in drug driving as well as drinking driving laws can reduce alcohol and drug related driving crashes, injuries and deaths also warrants high priority investigation.

2. Non-Traffic Injury Deaths

MAGNITUDE OF THE PROBLEM

In 2001 the major types of alcohol attributable non-traffic unintentional injury deaths were falls (4,766), poisonings (3,964), deaths from fires (1,167), drowning (812), and alcohol poisoning (331).

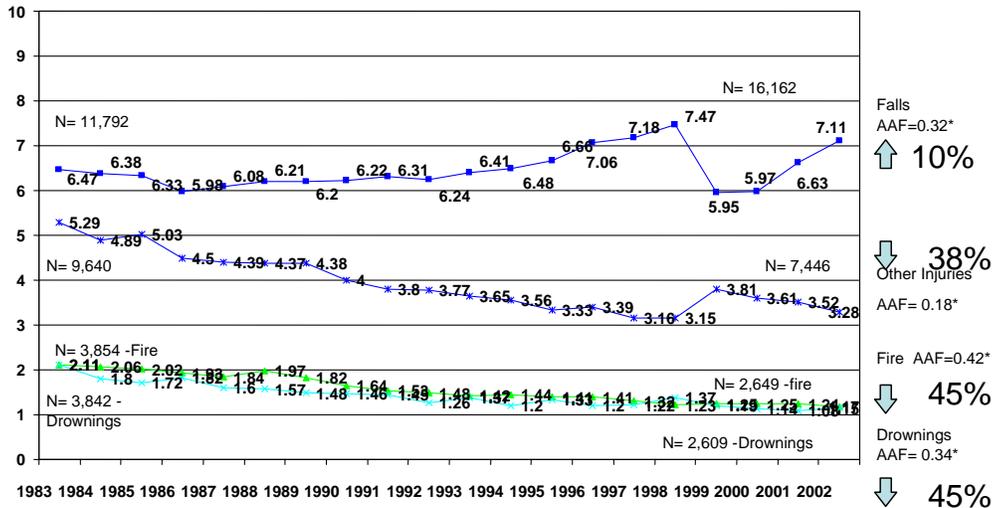
TRENDS

Over the 20 year period from 1982 to 2002 deaths per population from falls have increased 10% and from poisonings 230%. Whether the proportion and numbers of poisoning deaths not labeled as alcohol poison deaths that can be attributed to alcohol has changed over time is not known. Rates of alcoholic poisoning have declined 14% while fire deaths and drownings have each declined 45%. Because unintentional injury deaths other than motor vehicle deaths are not routinely tested for alcohol, it is unknown whether the proportion and numbers of these deaths that involve alcohol are increasing or decreasing over time [Figures 3 and 4]. An important data improvement priority is to collect alcohol test results from all unintentional and intentional injury deaths. Such tests would cost about \$50 per test, and would also require some states to reorganize their medical examiner offices.

Part of the reason progress has been made over the last two decades in reducing alcohol-related traffic deaths is that most fatally injured drivers are tested for alcohol. Comparisons can be made before and after community and state legal and program changes aimed at reducing alcohol impaired driving. States and communities implementing changes can be compared to those that do not. These types of studies have provided guidance to policy makers about what interventions are successful. The field lacks and needs comprehensive testing for other unintentional injuries as well as intentional injuries.

Figure 3

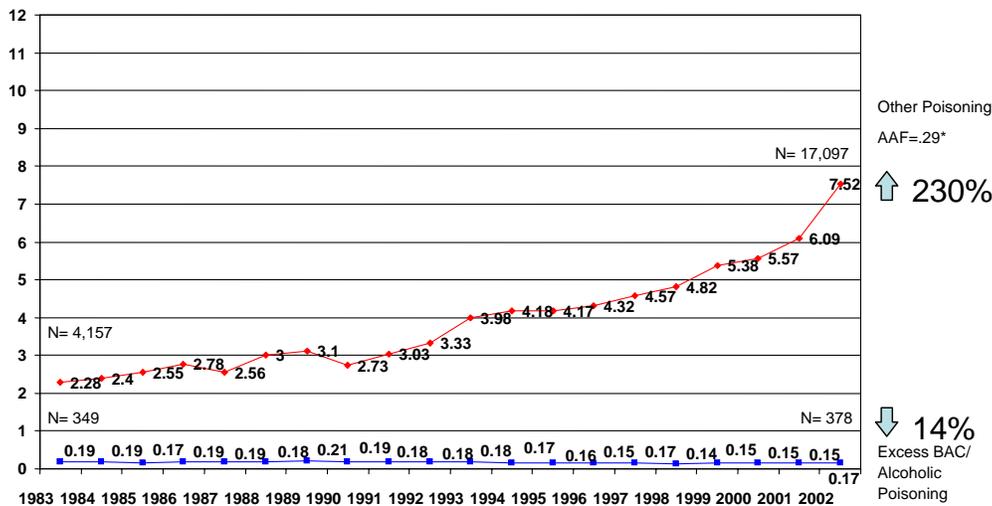
Falls, Fire, Drownings, and Other Injuries 1983-2002 Rates/100,000 Population



Source: CDC WISQARS, US Census Data 2005

Figure 4

Excess BAC/Alc. Poisoning and Other Poisonings 1983-2002 Rates/100,000 Population



Source: CDC WISQARS, US Census Data 2005

POPULATIONS AT RISK

Fall deaths among men slightly outnumber those for women (2580 vs. 2206). In contrast men are more heavily represented among poisoning deaths (2,782 vs. 1,182). Men are also overrepresented among fire deaths (702 vs. 465) and especially among drowning (671 vs. 141) and alcohol poisoning (253 vs. 78).

Fall deaths are highest among those over age 65. In contrast drowning deaths are highest among persons in their late teens and early 20's and in children under 5. Alcohol is a factor in over 1/3 of drowning deaths usually among adults. Fire and burn deaths are highest among the elderly 65+ and children. Poisoning deaths are the greatest among persons ages 20-40 whereas alcohol poisoning is highest among persons age 40-60.

Persons who begin drinking at earlier ages are more likely to be unintentionally injured after drinking and to be in physical fights after drinking both as adolescents and as adults. Compared to persons who wait until age 21 or older to start drinking, those who begin prior to 14 are 11 times more likely to be in a physical fight after drinking (Hingson et al. 2003). These relations are still significant after controlling for age, gender, race, income, marital status, personal history of smoking and illicit drug use as well as family history of alcohol abuse and dependence.

RESEARCH PROGRESS

Interventions to reduce alcohol-related non-traffic injuries that have been evaluated include alcoholism treatment, screening and brief motivational interventions with persons admitted with alcohol-related injuries to emergency departments and trauma centers, and interventions that reduce the availability of alcohol such as raising the legal drinking age or increasing the price of alcohol.

A review of alcoholism treatment studies in the U.S. concluded that alcohol problems among alcohol dependent persons who receive pharmacotherapy and/or counseling are reduced by two thirds and alcohol-related injury and the amount of alcohol consumed are cut in half with about one third achieving abstinence or drinking moderately without consequences (Miller et al. 2001). A systematic review of randomized control trials to reduce alcohol dependence and abuse among the general population (Dinh-Zarr et al., 1999) found reduced alcohol consumption and domestic violence, as well as fewer drinking driving offenses, falls, drinking related injuries and hospitalizations, and suicide attempts. Trauma Center and Emergency Department experimental studies of screening and brief intervention counseling for alcohol problems (i.e. 30 to 40 minute sessions designed to motivate people to cut down or stop their drinking) among people experience alcohol-related injuries have also shown reductions in drinking and driving offenses and alcohol-related injuries including non-traffic injuries (Gentilello et al., 1999; Monti et al., 1999; Longabough et al., 2001).

The 8 million annual alcohol-related admissions to Emergency Department in the U.S. (McDonald et al., 2004) afford tremendous opportunity to engage people in counseling

that can reduce alcohol-related injury. Unfortunately as already noted, only 2.2 million are recorded as being alcohol-related in the patients records (McCaig and Burt, 2003); other cases involving alcohol are not so designated.

A disincentive for diagnosing alcohol problems in emergency department are laws currently in place in 28 states and DC that allow insurance companies to deny medical reimbursement for treatment of people who have been injured under the influence of alcohol or impairing drugs (NIAAA APIS, 2005). Whether repeal of those insurance laws will result in non Emergency Department Patients being screened for alcohol problems and offered alcohol counseling and whether that in turn will reduce alcohol-related traffic and other alcohol-related unintentional injuries and deaths warrants research attention. Six states have repealed these laws since 1998 (NIAAA APIS 2005).

Wagenaar and Toomey, in a review of studies on the minimum legal drinking age and non-traffic unintentional injury, found changes in drowning (Howland et al., 1998) and non-traffic injury deaths (Hingson et al., 1985) after drinking ages were raised. It should be noted, however, that the absence of specific alcohol testing makes it difficult to assess whether alcohol-related non-traffic injury deaths increased or decreased in absolute numbers or as a proportion of all non-traffic unintentional injury deaths. Further, raising the drinking age has been associated with significant decreases in fighting (Davis and Reynolds, 1990), disorderly conduct, vandalism, assaults (Jones et al., 1992; Joksch and Jones, 1993) and suicide (Jones et al., 1992; Birckmayer and Hemenway, 1999). Given that raising the drinking age has been associated with a decrease in alcohol-related traffic crash deaths and the above mentioned intentional injuries, it seems plausible that it would also be associated with declines in non-traffic injury deaths. However, the limited number of studies on the topic are insufficient to fully address this hypothesis.

The potential impact on non-traffic alcohol-related unintentional injuries of other environmental interventions that have been examined in relation to alcohol-related motor vehicle crashes has not been assessed. These interventions include reducing alcohol outlet density, restrictions on hours of alcohol sales, dram shop and social host liability laws, beer keg registration, mandatory responsible beverage service training and monitoring, monopoly alcohol sales systems, restrictions on where alcohol can be consumed (e.g. public places, sports venues, beaches and swimming areas, skiing locations), and lowering legal blood alcohol limits for boaters and persons using other recreational vehicles.

To date the effects of such policies on a variety of non-traffic alcohol-related injury deaths has received minimal research examination. Clearly more attention to these research questions is warranted.

RESEARCH QUESTIONS/ DIRECTIONS

- Research should determine whether repeal of UPPL insurance regulations will increase the proportion of trauma center patients, emergency department patients and patients seen in other health care settings who are screened and

who receive brief intervention and counseling for alcohol problems, and whether that reduces rates of non-traffic alcohol-related unintentional injuries.

- Research should investigate whether screening and brief intervention with adolescent patients in other health care or school settings can reduce drinking, and alcohol-related injuries not only during adolescence but also in adulthood.
- Environmental interventions that have been examined in relation to alcohol-related motor vehicle crashes should also be examined with regard to their potential impact on non-traffic alcohol-related unintentional injuries. These interventions include reducing alcohol outlet density, restrictions on hours of alcohol sales, dram shop and social host liability laws, beer keg registration, mandatory responsible beverage service training and monitoring, monopoly by alcohol sales, restrictions on where alcohol can be consumed (e.g. public places, sports venues, beaches and swimming areas, skiing locations), and lowering legal blood alcohol limits for boaters and persons using other recreational vehicles.
- Comprehensive community interventions have been shown to reduce alcohol-related traffic injuries and deaths but their impact on reducing non-traffic alcohol-related unintentional injuries has been less well explored and should be a focus of future investigation.

C. INTENTIONAL INJURY

MAGNITUDE OF THE PROBLEM

Smith et al. (1999) completed the most comprehensive study to date of alcohol involvement in injury deaths. They reviewed over 300 peer-reviewed medical examiner studies published over a 25 year period in the United States. In 2002 17,638 persons died from homicide and 31,655 from suicide (CDC WISQARS, 2004). Smith's meta-analysis identified 28,696 homicides of which 88% of the victims were tested for alcohol and 19,347 suicides of which 82% were tested for alcohol; 47% of the homicide victims tested positive for alcohol, 32% at .10% or higher. Twenty-nine percent of suicides tested positive, 23% above .10%. Thus an estimated 8,290 homicide victims and 9,740 suicides had positive blood alcohol levels in 2002.

Annually an estimated 2.7 million people are victims of a violent crime perpetrated by someone who had been drinking; this represents one of four of all violent crimes (Greenfield, 1998). Studies have generally found that the more serious the crime, the more likely alcohol was involved. Greenfield (1998) reported that 15% of robberies, 26% of aggravated and simple assaults and 37% of rapes and sexual assaults are perpetrated by drinking offenders. Greenfield (1998) reported that 41% of convicted violent offenders in local jails or on probation and 38% in state prisons reported that they had been drinking when they committed the offense.

The National Family Violence Survey of 1975 and 1985 estimated that nearly 1 in 6 US couples experienced 1 or more episodes of intimate partner violence (IPV) in the year prior to the survey (Straus and Gelles, 1990), while the 1995 National Longitudinal Couples Survey estimated that more than 1 in 5 US couples had experienced 1 or more IPV over the previous 12 months (Schafer et al., 1998). In a national sample of couples 18 years of age or older who were interviewed in 1995 and again in 2000, recurrence of female-to-male partner violence (44%) was slightly higher than was recurrence of male-to-female partner violence (39%); incidence rates were 6% and 5.7%, respectively (Caetano et al., 2005). In data collected in 1995 and 1996 from adolescent women who participated in both Wave 1 and Wave 2 of the National Longitudinal Study of Adolescent Health, 7% of respondents reported at Wave 1 that they had ever been forced into sexual intercourse; of these, 8% were revictimized in the following year (Raghavan et al., 2004).

In a study that used recent data from over 100 colleges (Mohler-Kuo et al., 2004), 4.7% of women reported being raped, 72% of them experiencing the rape while intoxicated. In this study, those women who were at higher risk of rape while intoxicated were under 21, white, resided in sorority houses, used illicit drugs, drank heavily in high school, and attended colleges with high rates of heavy episodic drinking. In a survey of over 900 female college students from 4 New England colleges and universities, 55% of the victims of sexual aggression since age 16 (25% of the sample) reported that they had been at least somewhat drunk at the time of the act (Harrington and Leitenberg, 1994). In a sample of college women, the odds of experiencing sexual aggression were 9 times higher on heavy drinking days and 3 times higher on non-heavy days compared with days of no alcohol consumption (Parks and Fals-Stewart, 2004). In the same study, college women's odds of experiencing *nonsexual* aggression were more than 7 times higher on heavy drinking days and almost 3 times higher on non-heavy drinking days compared with days of no alcohol consumption.

TRENDS

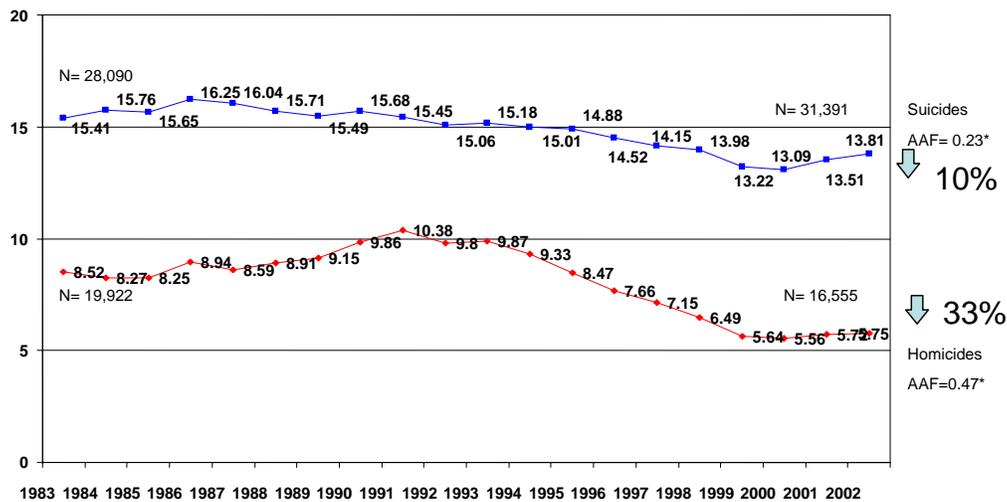
During the past 20 years, homicide rates in the U.S. population have declined from 8.5 homicides per 100,000 population in 1983 to 5.8 per 100,000 in 2002 [Figure 5]. Initially, rates rose between 1983 and 1992, reaching a high of 10.4 per 100,000, but they have declined considerably thereafter. Rates for suicides have also declined from a rate of 15.4 per 100,000 in 1983 to 13.8 per 100,000 in 2002. This represents a 10% decrease over the 20 year period.

Whether there have been changes in the alcohol attributable fraction of suicide or homicide deaths is uncertain. One can compare the attributable fractions offered by Harwood et al. (1998), (28 percent for suicides and 46 percent for homicides), with the earlier estimates of Rice et al. (1990), (26 percent for suicides and 42 percent for homicides). Given that both sets of estimates lack precision, the most reasonable conclusion current evidence allows us to reach is that these attributable fractions have remained essentially unchanged. Given this, it would appear that alcohol attributable suicides have remained approximately stable while alcohol attributable homicide rates

have fallen somewhat. An equally important conclusion, however, is that empirical knowledge of these trends is weakly grounded; therefore, producing more solid trend estimates should be a priority for future study.

Figure 5

Homicides and Suicides 1983-2002
Rates/100,000 Population



Source: CDC WISQARS, US Census Data 2005

Data from the national Youth Risk Behavior Survey indicates that most violence-related behaviors among US high school students (e.g., physical fighting, carrying a weapon on school property, physical fighting on school property) decreased significantly between 1991 and 2003, corresponding with a decline in the national youth homicide rate (CDC 2004). However, the prevalence of being injured in a physical fight remained stable across subgroups during this period, and the prevalence of being threatened or injured with a weapon on school property increased among white and black students in recent years (CDC, 2004). Moreover, preliminary data drawn from a new US surveillance system, the national Violent Death Reporting System (NVDRS)—which collects detailed information regarding violent deaths from multiple sources—indicates, for the first six states participating in the NVDRS, substantial increases in both homicide and suicide rates among males between 2000 and 2003 and in homicide rates among young males (25 years or younger) between 2002 and 2003 (CDC, 2005).

POPULATIONS AT RISK

Specific populations that appear to be at elevated risk for injury attributable to alcohol-fueled violence/aggression include couples in which at least one partner drinks frequently, college students, young women, and bar patrons.

Prior research has indicated that alcohol problems are common among partner violent men, while men who drink heavily are more likely to perpetrate wife abuse and women who abuse alcohol are more likely to be victims of violence. Fifty to 60% of male alcoholics have been violent toward a female partner in the year before alcoholism treatment (O'Farrell et al., 2004), and at least two-thirds of women alcoholic patients have been the victims of violence from a male partner in the previous year (Chase et al., 2003). In data from a representative national sample of couples living in the continental US, drinking problems—along with a history of being physically harmed by parental figures during childhood and impulsivity—were identified as risk factors for IPV in the US general household population (Schafer et al., 2004). Data from a nationally representative US study of alcohol consumption in young men indicate that alcohol use is strongly related to marital aggression, with the presence of either low marital satisfaction or high hostility sufficient, when combined with high scores on a measure of alcohol dependence, to increase the risk for marital aggression (Leonard and Blane, 1992). Moreover, a review of 60 studies that tested the relationship between alcohol use and three marital functioning domains (satisfaction, interaction, and violence), provided overwhelming support for the notion that alcohol use is maladaptive, and that it is associated with dissatisfaction, negative marital interaction patterns, and high levels of marital violence (Marshall, 2003).

Nearly 600,000 college students between the ages of 18 and 24 are assaulted by another student who has been drinking (Hingson et al., 2005).

In the National College Women Sexual Victimization (NCWSV) study (Fisher et al., 2000), utilizing a national telephone survey of randomly-selected women attending a 2- or 4-year college or university in the U.S. during the fall of 1996, nearly 5% of college women were found to have been sexually victimized in any given calendar year, suggesting that a campus of 10,000 women might expect to see in excess of 350 rapes in a given academic year. Research has also shown that women who regularly drink in bars experience a substantial amount of bar-related physical and sexual aggression (Parks and Zetes-Zanatta, 1999; Parks and Miller, 1997).

Researchers have found that city blocks that include bars have higher rates of assaults, robberies, and rapes than do other city blocks, even after controlling for unemployment and poverty (Roncek and Maier, 1991), and some observers have concluded that alcohol outlet density may be related to violent assaults when certain conditions prevail (Gorman et al., 1998; Treno et al., 2001; Speer et al., 1998; Scribner et al., 1995, 1999; Alaniz et al., 1998).

RESEARCH PROGRESS

The Epidemiology of Alcohol Use and Violence

Approximately 40 percent of inmates incarcerated for murder report that they had been using alcohol at the time of their offense (Greenfield et al., 2001). As is the case with other violent crimes, alcohol use frequently is found to precede homicides, but the potential causal relationships that are involved are controversial, complex, and poorly understood and studies have not conclusively demonstrated a causal role for alcohol availability in the occurrence of violent events (NIAAA, 2000; Lipsey et al., 1997; Parker and Rebhun, 1995; Parker and Cartmill, 1998). Clearly, more research is needed in order to illuminate the ways in which alcohol availability interacts with other factors in the causal process.

It appears that alcohol use is linked to violent behavior by way of interacting pharmacological, physiological, endocrinological, genetic, situational, psychological, environmental, and sociocultural determinants (Miczek et al., 1993). Insofar as theoretical explanations that focus on only one of these domains are likely to result in an incomplete understanding of the role of alcohol in escalation to violence, theoretical models that bridge these frameworks are urgently needed (Chermack and Giancola, 1997; Von der Pahlen, 2005; Graham et al., 2000).

Research on suicide has focused on five predisposing factors: aggression/impulsivity, alcohol dependence, negative affect, interpersonal disruption, and depression (Connor and Duberstein, 2004). Roughly the same constellation of factors is discussed in the literature on suicidality among adolescents (Windle, 2004). However, treatments that address co-occurring alcohol dependence and suicidality have been slow to develop (Esposito-Smythers and Spirito, 2004; Goldsmith et al., 2002). Biomedical research is just beginning to explore two critical issues that bear on the connection between suicide and alcohol dependence. COGA studies have suggested that chromosome 2 contains linkages for phenotypes of both alcohol dependence and suicidality (Hesselbrock et al., 2004). Neuroscience research, however, indicates that alcohol dependence and suicidality are related to separate serotonergic and noradrenergic systems (Underwood et al., 2004).

Studies of behavior, cognition and expectancies

Psychological explanations of the means by which alcohol increases aggression tend to focus on its effects on cognitive and attentional abilities, including reactions to cues of punishment, decreased response flexibility, and reduced intellectual functioning (Leonard, 2001; Bushman, 1997; Kantor and Jasinski, 1998; Steele and Josephs, 1990; Bushman and Cooper, 1990; Pihl et al., 1984). The term “alcohol myopia” (Steele and Josephs, 1990) has been used to describe alcohol-induced cognitive impairment, specifically referring to the drinker’s inability to attend to inhibitory cues and, therefore, more likely to act upon impelling cues which are thought to require relatively little cognitive processing. Alcohol’s effects on cognitive and attentional abilities are presumed to affect communication, raising the likelihood of misinterpretation, perception

of a threat, and interpersonal violence as a defensive reaction (Ogle and Miller, 2004; Pernanen, 1981, 1991; Sayette et al., 1993).

It is also clear that drinking of alcohol gives rise to certain expectations in people that may increase the risk of aggression. When male and female college students read vignettes depicting a young woman and man consuming either alcoholic or nonalcoholic beverages (Abbey and Harnish, 1995), both genders of readers perceived the males and females in the vignettes to be most sexual when they were drinking alcohol, suggesting not only that alcohol consumption is seen as a sexual cue, but also suggesting that alcohol use increases the odds that a woman's expression of platonic friendliness will be misperceived by a male companion as a sign of sexual interest (Abbey et al., 2000). Similarly, in an experiment conducted by Norris et al. (2002) with male social drinkers who were asked to read a violent pornographic story, both the indirect effects of pre-existing sex-related alcohol expectancies and the direct effects of expected and actual alcohol consumption increased men's self-reported likelihood of behaving in a sexually aggressive manner. Furthermore, alcohol-related cognitive impairments may make it difficult for a woman to correct any misperceptions and to resist any unwanted sexual advances.

Availability

Any understanding of alcohol-related violence must recognize the primary importance of alcohol *availability*. Findings from ecological studies have demonstrated that homicides, along with other violent crimes, are higher in areas where alcohol availability and outlet density are higher (Scribner et al., 1999; Parker and Rebhun, 1995). However, this suggestive relationship is obscured by a number of potential confounders, including urbanicity and poverty. While research should clarify the role of availability relative to these other factors, it should also capitalize on natural experiments to investigate whether reductions in availability or outlet density are subsequently followed by reductions in homicide rates. Cross sectional studies have found high alcohol outlet density to be associated with violent assaults, robberies and rapes (Scribner et al., 1995, Alaniz et al., 1998, Stevenson et al. 1999). Further, Grube and Stewart (2004) identified six prospective studies of changes in outlet density; however, results were small and inconsistent. Most recently, Gruenewald and Remer (2006) reported associations between alcohol-related violence and geographic outlet density in a prospective study in California.

A systematic review of randomized controlled trials to reduce alcohol dependence and abuse in the general population found reduced alcohol consumption was accompanied by reductions in domestic violence and suicide attempts (Dinh-Zarr et al., 1999). On the other hand, studies examining the effects of increasing the legal drinking age increase on violence have been mixed. While Engs and Hanson (1998) reported increases in fighting, Davis and Reynolds (1990) found decreases in fighting, Joksich and Jones (1993) reported reduction in disorderly conduct, vandalism and assaults, and Jones et al. (1992) and Birkmayer and Hemenway (1999) noted reductions in suicides.

Reductions in violence have also been achieved by community-wide efforts to promote more alcohol-safe environments. Holder et al. (2000) conducted interventions in two California communities and one South Carolina community (each with a matched control) to encourage responsible beverage service, enforce drinking and driving laws, reduce underage access to alcohol, and limit availability through local zoning powers. The results showed that self-reported drinking-driving, night-time injury crashes, and assault injuries observed in emergency departments all declined in the experimental communities. Weitzman et al. (2004) studied ten colleges that implemented interventions designed to affect alcohol availability, legal sanctions for alcohol-related infractions, the quality of the physical settings where alcohol is consumed, and the levels of alcohol advertising and promotion. Positive results were obtained only on those campuses that more faithfully implemented protocols to effect environmental change. Among those colleges there were statistically significant reductions in self-reports of binge drinking, vandalism, injuries, assaults, and unwanted sexual advances.

A landmark analysis examined the impact of local policy changes in Barrow, Alaska. During a 33 month period, citizens of that community, through referendum imposed, then withdrew, and then reimposed a total ban on alcohol sales. There were significant decreases in emergency room visits (including those due to assaults) during the period in which alcohol was banned. When the ban was lifted, these incidents returned to the pre-ban level, and when the ban was reimposed, these events declined again (Chui et al., 1997).

A number of studies suggest that levying excise taxes on alcohol can result in significant reductions in rates of violence. Higher alcohol prices which affect consumption levels have been found to reduce robberies and rapes (Cook and Moore, 1993a, 1993b; Cook and Tauchen, 1982). Cook and Moore (1993a, 1993b), Chaloupka et al. (1998) and Markowitz and Grossman (1998, 2000) all found that raising taxes on alcohol reduces problems (e.g. homicides, suicides, rape, robbery, assaults, motor vehicle thefts, domestic violence or child abuse). Markowitz and Grossman (2000) reported data suggesting that a 10% increase in the excise tax on beer may reduce the probability of severe child abuse by 2.1%.

RESEARCH QUESTIONS/ DIRECTIONS

Epidemiology of Alcohol Use and Violence

The goal for future research should be to move beyond establishing the presence of alcohol prior to a crime and toward greater clarification of alcohol's role in the causal chain leading to the act. Epidemiological investigations are necessary to clarify the correlates of alcohol-related violence in human populations and in various subgroups. Investigations of the alcohol-violence relationship that are of particular interest are:

- Studies that disentangle the relationship between alcohol availability and rates of suicide, homicide, assault, rape, and intimate partner violence.

- Studies that investigate the risk and protective factors (e.g., personal, environmental, genetic) for alcohol-related violence, and determine how these factors vary and/or interact in different populations and/or are moderated by factors such as family history, education, and socioeconomic status.
- Studies that clarify our understanding of how heavy alcohol use interacts with impulsivity, negative affect, interpersonal disruption, and depression to increase risk for suicide. Based on this theoretical foundation, researchers should develop and test clinical interventions that address co-occurring suicidality and alcohol dependence.

Studies of behavior, cognition and expectancies

Investigations of how alcohol consumption may alter behavior, including aggression, by influencing the processing of social information are of particular interest. These include:

- Studies of how alcohol-related behavioral expectancies regarding post drinking aggression vary by age, sex, manner of drinking, drinking history, pre-existing aggressive inclinations and personality traits (such as impulsivity and dominance).
- Studies that investigate the mediating role of personality variables on the relationship between alcohol consumption and violent behavior.
- Studies of the process of decision making in the context of alcohol-related aggression under varying levels of provocation while controlling for individual differences in alcohol expectancies and dispositional aggressiveness.

Availability

Changes in laws and other public policies--and the subsequent social changes brought about by their adoption--provide "natural experiments" through which the nature of alcohol-related violence can be examined. Needed are:

- Investigations of the nature and strength of the relationship between geographic density of public drinking places, off-premise alcohol outlets, and violence.
- Studies that assess the impact of changes in laws regulating the availability of alcohol on rates of alcohol-related violence.
- Studies of the ways in which bar clientele, bar management practices, and the physical settings of bars affect the likelihood of bar violence.

D. CHRONIC DISEASES

MAGNITUDE OF THE PROBLEM

Chronic diseases include numerous diseases and conditions related to alcohol consumption. The chronic condition most strongly related to alcohol is liver disease. In 2001, 12,201 deaths from alcoholic liver disease and 6,719 deaths from unspecified liver cirrhosis were attributable to alcohol. Together these 18,920 deaths accounted for more than half of all chronic disease deaths attributable to alcohol as well as over half of the years of life lost attributable to chronic alcohol conditions.

Aside from diseases of the liver, chronic diseases associated with alcohol consumption include (but are not limited to) heart disease, cancer, and diabetes mellitus. These three chronic diseases are respectively the first, second, and sixth leading causes of death in the United States (Hoyert et al., 2005). Cardiovascular disease accounts for approximately 45% of deaths in men older than 35 years and 37% of deaths in women older than 35 years (Gunzerath et al., 2004). Cancer accounts for about 23% of US deaths, with the three most common cancers, lung, breast, and colorectal cancers accounting for more than one-third of cancer deaths (Jemal et al., 2005a). Almost 9% of Americans age 20 and older have diabetes (National Diabetes Information Clearinghouse, 2004). Compared to non-diabetics, diabetics have double the risk of death. DEPR is currently conducting under contract, a meta-analysis project to estimate alcohol attributable fractions for chronic diseases including heart disease, cancer and diabetes mellitus.

TRENDS

Liver Disease

During the past 20 years alcoholic liver disease deaths have declined 14% from 6.79 per 100,000 population to 5.86. Liver cirrhosis per 100,000 population declined 27% during the same period from 9.99 to 7.25 (Figure 6).

Cardiovascular Disease

In 2002 the death rate for heart disease was 59 percent lower than the rate in 1950. The death rate for stroke declined 69 percent since 1950.

Cancer

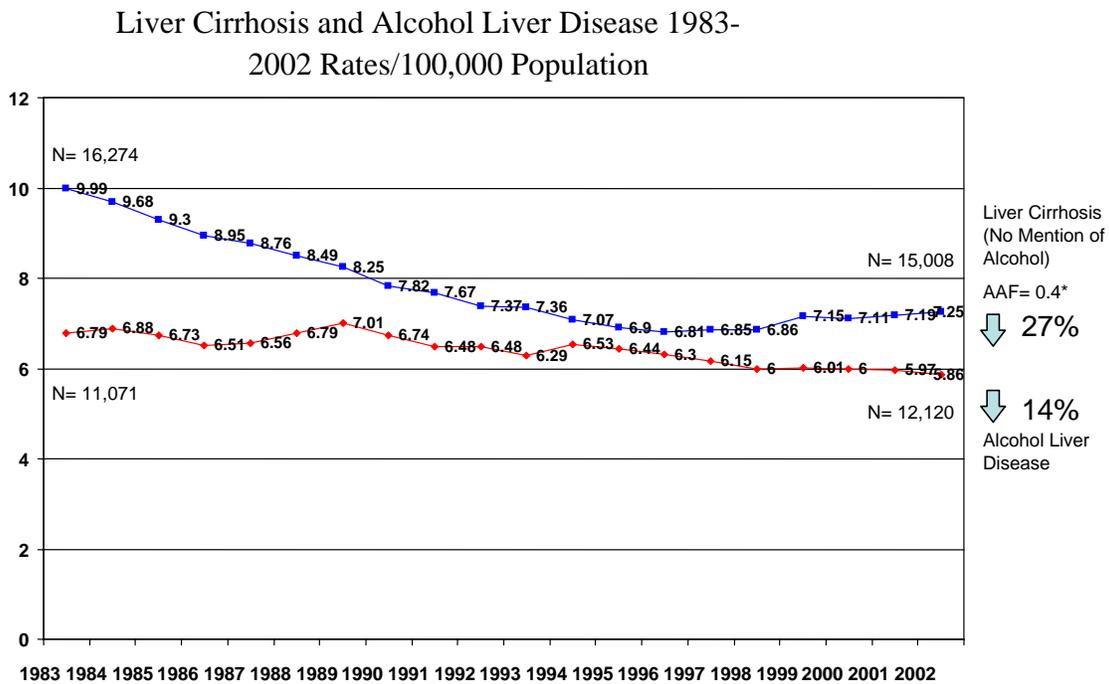
A total of 1,372,910 new cancer cases and 570,280 deaths were expected in the United States in 2005 (Jemal et al., 2005b). When deaths are aggregated by age, cancer surpasses heart disease as the leading cause of death for persons younger than 85. The death rate from all cancers combined has decreased by 1.5% per year since 1993 among men and by 0.8% per year since 1992 among women. The mortality rate has also continued to decrease from the three most common cancer sites in men (lung and bronchus, colon and rectum, and prostate) and from breast and colorectal cancers in women. Lung cancer mortality among women has leveled off after increasing for many decades.

Diabetes

In 2003, more than 1.3 million adults between 18 and 79 years of age were diagnosed with diabetes. From 1997 through 2003, the number of new cases of diagnosed diabetes increased by 52% (CDC National Diabetes Surveillance System, 2005).

The incidence of diagnosed diabetes increased 43%, from 4.9 per 1000 population in 1997 to 7.0 per 1000 population in 2003. Similarly, age-adjusted incidence increased 41%, suggesting that the majority of the change was not due to the aging of the population.

Figure 6



Source: CDC WISQARS, US Census Data 2005

POPULATIONS AT RISK

Liver Disease

Men, older persons, and male White Hispanics are at higher risk for alcoholic liver disease and unspecified liver disease. By gender, the age adjusted rates for alcoholic liver disease in 2001 were 6.6 per 100,000 for men and 2.2 for women (Yoon et al., 2004). For unspecified liver disease, the comparable rates were 6.5 for men and 3.6 for women. Rates increase after the age of 45.

Cardiovascular Disease

In 2001, the rate of death from heart disease was 31% higher among blacks than whites and 49% higher among men than women. Major risk factors include high blood pressure, high blood cholesterol, tobacco use, diabetes, physical inactivity, and poor nutrition. (<http://www.cdc.gov/nccdphp/burdenbook2004/toc.htm>).

Cancer

In analyses by race and ethnicity, African American men and women have 40% and 18% higher death rates from all cancers combined than White men and women, respectively. Furthermore, minority populations are more likely to be diagnosed with advanced stage disease than are Whites (Jemal et al., 2006).

Diabetes

The estimated lifetime risk of developing diabetes for individuals born in 2000 is 32.8% for males and 38.5% for females. Females have higher residual lifetime risks at all ages. The highest estimated lifetime risk for diabetes is among Hispanics (males, 45.4% and females, 52.5%). Individuals diagnosed as having diabetes have large reductions in life expectancy (Narayan et al., 2003).

RESEARCH CONTROVERSIES

Among the chronic diseases, liver disease has the most clear-cut association with alcohol. The association is less clear for cardiovascular disease and diabetes where low levels of alcohol appear to be beneficial while higher levels are harmful, and for breast cancer where moderate drinking may increase risk (Gunzerath et al., 2004). Evaluation of the dichotomy is complicated by numerous problems, including the choice of a reference group (Fillmore et al., 2006), confounding by lifestyle (diet, obesity, smoking, physical activity; Smothers and Bertolucci, 2001; Breslow et al., 2006), and measurement issues.

The US Dietary Guidelines (USDA, 2005) recommendation that those who drink should do so in moderation is based, in part, on the apparent cardiovascular benefits of moderate drinking. While this is not meant to encourage those who do not drink to do so, there has been considerable media coverage on the benefits of moderate drinking. Given that alcohol, even consumed in moderation, could have negative consequences, including unintentional injury and harmful interactions with prescription and over-the-counter medications, and for women, elevation of breast cancer risk, it is important to determine whether drinking in moderation is indeed beneficial and whether benefits outweigh harms.

In epidemiologic studies, choice of the reference group impacts the strength of observed risks. The majority of studies on moderate drinking and mortality have shown a J-shaped curve with coronary heart disease (CHD) and total mortality (driven by CHD mortality), with abstainers and heavier drinkers at increased risk, and moderate drinkers at reduced risk (Fillmore et al., 2006). The relationship persisted when former drinkers and persons with CHD were removed from analyses. However, a recent meta-analysis (Fillmore et al., 2006) found no protection for moderate drinkers when former drinkers (no drinks in past

year) were separated from complete abstainers and occasional drinkers (drinks once a month or less) were separated from complete abstainers. While this is a single study, albeit a meta-analysis, countering a large, consistent literature finding the J-shape, it does suggest that the impact of misclassification of drinkers on relative risks for CHD and total mortality could be further considered.

Measurement is an important issue in alcohol research, both in terms of alcohol and in terms of confounders. Most studies of alcohol consumption and chronic diseases have measured alcohol as average volume, a measure that may not fully explain important relationships between quantity of drinking, frequency of drinking, and health outcomes (Bondy, 1996; Rehm et al., 1996; Room, 2000). Average volume may obscure substantially different drinking patterns due to quantity alone or frequency alone (Breslow and Smothers, 2004). Quantity and frequency have been differentially associated with myocardial infarction (Mukamal et al., 2003), high blood pressure (Russell et al., 1991), diabetes (Conigrave et al., 2001), and body mass index (Breslow and Smothers, 2005). Studies of alcohol and chronic diseases that measure drinking patterns, as well as the typically measured average volume, are needed. Drinking patterns include quantity alone, frequency alone, stratified combinations of quantity and frequency, and graduated frequency measures. For more on these measurement issues, see the section entitled "Measurement of Alcohol Consumption".

Confounders, including diet, obesity, smoking, and physical activity, may obscure associations between alcohol and chronic diseases. In studies of associations between alcohol and disease outcomes, measurement of confounders may be as important as measurement of alcohol. For example, nutrition may be assessed in numerous ways including dietary intake of foods and food groups, eating patterns, nutrient intakes, nutrient biomarkers, and anthropometrics including body mass index and waist circumference. Studies are needed to determine the extent to which control for confounding can be improved by better measurement.

RESEARCH PROGRESS

Liver Disease

It has long been established that alcohol consumption is a cause of liver disease. Work which began in the 1920's has continued through several studies demonstrating that heavy drinkers are at increased risk of death by liver cirrhosis (see reviews by Schmidt and de Lint, 1972; Pell and D'Alonzo, 1973; Thun et al., 1997; and Mann et al., 1993, 2004). Consistent with this, the relative risk of cirrhosis morbidity rises with increasing levels of alcohol consumption (Tuyns and Pequignot, 1984; Coates et al., 1986). In addition, cirrhosis mortality rates are higher in societies where the average per capita consumption of alcoholic beverages is higher (Lederman, 1956; Bruun et al., 1975; Skog, 1980; Smart and Mann, 1991). This has led to the use of cirrhosis mortality rates as a benchmark for evaluating the preventive impact of policies to reduce the availability of alcoholic beverages (Bruun et al., 1975; Edwards et al., 1994). In the US, alcoholic liver disease mortality rates have declined since the 1970s. It has been suggested that the declines may be due to increased participation in alcohol treatment, decreases in alcohol

consumption, and changes in consumption of certain types of alcoholic beverage (Mann et al., 2003). However, the specific causes are unknown and in need of further research. While it is clear that heavy, long-term alcohol consumption can cause alcoholic liver disease in susceptible people, not all heavy drinkers develop cirrhosis or alcoholic hepatitis. This suggests the importance of additional risk factors including heredity, gender, and diet.

Current research is investigating whether variation in alcohol-metabolizing enzymes may affect susceptibility to alcoholic liver damage. ALDH and CYP2E1 variants are of particular interest as polymorphisms in these genes have been associated with liver disease. The fact that women develop cirrhosis at a lower cumulative dose than men, combined with the fact that dietary intake and metabolic processing of key nutrients, including fatty acids, differs by gender suggests the need for gender-specific studies of genetic susceptibility, taking nutritional status into account.

Recent research has also concentrated on alcohol's role in mortality from hepatitis C (HCV). Heavy alcohol consumption accelerates the progression of Hepatitis C (HCV) (Poyard et al., 1997, Schiff and Ozden, 2004). Heavy alcohol consumption also interferes with the effectiveness of HCV treatment (Poyard et al., 1997). Leading issues for future HCV research include the role of light and moderate drinking in HCV progression, the relative contribution of alcohol consumption, tobacco use, and nutrition in HCV progression, and the effectiveness of alcohol cessation programs among HCV patients.

Cardiovascular Disease

Studies of cardiovascular disease and mortality consistently show a J- or U-shaped curve among persons who are middle aged or older. As noted under 'research controversies' above, it is important to study and perhaps challenge the methodologic conventions used in studies finding that relation, as well as consider the measurement of alcohol and confounders. Measuring consumption separately as quantity and frequency rather than than average volume, the measure commonly used in epidemiologic studies appears to be important. Mukamal et al. (2003) found that the protective effect of alcohol was more a function of *frequency* of consumption than of *volume*; small amounts consumed several times a week reduced risk of disease to a greater extent than the same amount consumed over fewer occasions. A recent study by Mukamal et al. (2005) suggested that alcohol consumption may be linked to potential hazards among patients who survive acute MI. Although moderate intake has been associated with lower mortality, binge drinking, even among light drinkers, was associated with a 2-fold higher mortality. While the association between alcohol and cardiovascular disease has been generally considered independent of confounding by diet, a recent study (Breslow et al., 2006) suggests that the way the confounding relationship is measured could affect study outcomes. It is unlikely, due to ethical concerns, that a randomized, controlled trial of drinking and CHD could be performed. Therefore, the best possible observational epidemiologic data must be gathered to inform public health policy. A recent NIAAA-sponsored workshop (Lucas et al., 2005) suggested that epidemiologic areas needing research include determining the potential benefits of alcohol in individuals who may be at increased risk

(genetic and environmental) of developing cardiovascular disease, and confirming the influence of beverage type and/or patterns of drinking on the relationship between alcohol consumption and the risk of developing CHD.

Cancer

There have been numerous studies on the association between alcohol and cancer (World Cancer Research Fund, 1997). Convincing evidence demonstrates that alcohol increases the risk of cancers of the liver, mouth and pharynx, larynx, esophagus. However, the evidence is less clear for lung, breast and colorectal cancers.

For all alcohol-related cancers, interactions between alcohol and dietary components or nutrients impacted by alcohol (whether due to altered intake or metabolism) may increase or decrease risk. Interactions between alcohol and nutrients that are antioxidants or have antioxidant activity are important because ethanol metabolism generates reactive oxidant species that damage tissue. These nutrients include carotenoids, vitamins C and E, and the trace minerals zinc, copper, selenium and manganese. Also of interest are methyl donors including folate and choline, total energy intake, and dietary patterns. Gene-environment interactions are particularly important given genetic susceptibility for many cancers, polymorphisms in alcohol-metabolizing enzymes and polymorphisms in nutrient-metabolizing enzymes. Gene-environment studies of alcohol-related cancers are clearly needed.

Diabetes

Alcohol has a J or U-shaped relation with risk of type 2 diabetes similar to that found for cardiovascular disease (Koppes et al., 2005). Moderate drinking appears to reduce risk while heavier drinking appears to result in no increase or a modest increase in risk. Obesity and physical inactivity are largely responsible for the US epidemic of type 2 diabetes. About 65% of deaths among people with diabetes are due to heart disease and stroke (CDC National Diabetes Surveillance System, 2005). Analogous to cardiovascular disease, plausible biologic mechanisms may explain the apparently beneficial effects of alcohol on type 2 diabetes. However, confounding by lifestyle and other factors could also be at least partly responsible for the effects seen. Diabetes has a strong genetic component, making gene-environment studies important in teasing out the role of alcohol as an apparent protective factor. However, methodologic studies should also be undertaken to determine whether observed protective effects are potentially due to misclassification of drinkers.

Because of the importance of obesity in the development of diabetes and because of studies relating alcohol consumption to obesity, studies of the interactions between alcohol and obesity leading to diabetes are warranted. Further, studies of diets of children who drink – and whether interactions between diet and alcohol contribute to their risk of obesity are important. Other important areas include relations between alcohol and food cravings, satiety and food intake, relationships between dietary patterns and drinking patterns, and environmental variables influencing both food and alcohol intake. As with cardiovascular disease, gene-environment studies would be beneficial in determining the extent to which genetic susceptibility can potentially be modulated.

OTHER AREAS OF IMPORTANCE

While this section has focused on diseases most strongly associated with mortality outcomes, alcohol is associated with other important diseases and conditions including, but not limited to: alcoholic lung disease, alcoholic cardiomyopathy, asthma, osteoporosis, dementia, Alzheimer's disease, depression, hypertension, pancreatitis, and stroke. Further, alcohol impacts immune and endocrine function, which in turn impacts risk for alcohol-related diseases including cardiovascular disease and certain cancers. Epidemiologic studies of these other diseases, including gene-environment studies, as well as the interactions between biologic factors and alcohol in their development, are needed. Also important are studies of the fetal origins of adult chronic diseases. Another area of interest is how diet and nutrients interact with alcohol to influence brain development, physiology and function.

RESEARCH QUESTIONS/ DIRECTIONS

- What are the age and sex-specific alcohol-attributable fractions for each of the four ICD-10 coded conditions that make up "liver cirrhosis, unspecified" in standard mortality tables?
- What are the causes of continuing high rates of liver disease deaths among White Hispanic men?
- What is the contribution of alcohol use to Hepatitis C?
- What is the role of light and moderate drinking in HCV progression, the relative contributions of alcohol consumption, tobacco use, and nutrition in HCV progression, and the effectiveness of alcohol cessation programs among HCV patients?
- How do alcohol-nutrition interactions contribute to the development of alcoholic liver disease?
- Are drinking patterns associated with risk or mortality for cardiovascular disease, cancer, or type 2 diabetes? (i.e. quantity, frequency, stratifications of quantity/frequency, alcohol consumed at meals, alcohol not consumed at meals, heavy episodic drinking).
- Are drinking patterns associated with dietary patterns that increase risk for cardiovascular disease, cancer, or type 2 diabetes? More specifically do certain types of drinking patterns lead to increased or decreased consumption of foods or nutrients associated with greater risk?
- Do certain types of drinking patterns lead to changes in patterns of other risk factors for cardiovascular disease, cancer, or type 2 diabetes?

- Is there a relation between alcohol abuse and dependence and various chronic diseases?
- Is there a relation between early drinking onset and early binge drinking, and chronic disease?
- Is there a relation of early onset of drinking and diet?
- Can nutrition and physical activity modify the development of alcohol-related chronic diseases?
- Which measures of nutrition and physical activity best minimize residual confounding in studies of alcohol and chronic diseases?
- What is the contribution of gene-environment interactions to the development of alcohol-related diseases, including cardiovascular disease, cancer, and diabetes?
- Does alcohol consumption during pregnancy or breastfeeding contribute to the origins of adult chronic disease?
- How do diet and nutrients interact with alcohol to influence brain development, physiology and function?

IV. KEY ISSUES OF ENVIRONMENTAL/ PSYCHOSOCIAL/CULTURAL CONTEXT

A. MINORITIES

MAGNITUDE OF THE PROBLEM

Table 2 presents tabulations made for this report from the NLAES (1991-1992) and NESARC (2001-2002) surveys. While we comment on alcohol use among Asians/Native Hawaiians/Pacific Islanders and American Indian- Alaska Natives, we must mention that NESARC did not oversample in these groups as it did with Hispanic and African American populations. The prevalences of heavier drinking, binge drinking, and alcohol dependence are substantially elevated in the American Indian - Alaska Native population. Among Hispanic men, the prevalences of alcohol dependence (5.9% in NESARC) and binge drinking (23.2% in NESARC) were slightly higher than among White, Non-Hispanic men. All three indices were higher in American Indian women and White-non-Hispanic women than for women in the other groups reported.

TRENDS

Comparisons between the 2001-2002 NESARC estimates and the 1991-1992 NLAES estimates in Table 2 present a mixed picture that does not lead to clear conclusions regarding either trends in minority drinking habits or changes in intragroup disparities over time. Among American Indian - Alaska Native men, heavier drinking appears to have increased while dependence has fallen. Among American Indian - Alaska Native women, heavier drinking seems to have increased slightly, but binge drinking and dependence have both declined. Among Hispanic men, binge drinking increased, but rates of dependence fell. Among Hispanic women, rates of heavier drinking and dependence were essentially stable while binge drinking rose somewhat. Prevalence trends among White, non-Hispanics and for the total population also show a mixed pattern of increases in some indicators but declines in others. Prevalence trends increased across all indices for Asian/Native Hawaiian/Pacific Islanders as a whole.

POPULATIONS AT RISK

High rates of heavy drinking, binge drinking, and alcohol dependence among minority populations have long been of concern. However, in general population survey data, such as that presented above, there are usually too few Native Americans and Alaska Natives included in the sample to make precise estimates. Similarly, there have been few studies of treatment or prevention protocols developed explicitly for or adapted to Native American - Alaska Native populations.

Table 2

Prevalence (%) of heavier drinking, binge drinking once a month or more, alcohol abuse, and alcohol dependence in the past year, among total adult population, by sex and race/ethnicity, United States, 1991–1992 and 2001–2002.

| Sex and race/ethnicity ¹ | Heavier drinking ² | | Binge drinking ³ once a month or more | | Alcohol dependence ⁴ | |
|--|-------------------------------|--------|---|--------|---------------------------------|--------|
| | NLAES | NESARC | NLAES | NESARC | NLAES | NESARC |
| Both sexes | | | | | | |
| White, non-Hispanic | 9.90 | 11.29 | 11.73 | 13.00 | 4.35 | 3.83 |
| Black, non-Hispanic | 7.83 | 8.72 | 9.96 | 8.58 | 3.84 | 3.57 |
| American Indian/Alaska Native, non-Hispanic | 10.59 | 12.75 | 17.09 | 14.43 | 9.01 | 6.35 |
| Asian/Native Hawaiian/Pacific Islander, non-Hispanic | 3.15 | 4.75 | 4.03 | 6.40 | 2.26 | 2.41 |
| Hispanic or Latino | 7.43 | 7.04 | 12.01 | 14.15 | 5.78 | 3.95 |
| Total | 9.28 | 10.26 | 11.36 | 12.38 | 4.38 | 3.81 |
| Male | | | | | | |
| White, non-Hispanic | 11.40 | 13.75 | 18.39 | 20.44 | 6.16 | 5.41 |
| Black, non-Hispanic | 11.16 | 12.45 | 16.38 | 14.95 | 5.86 | 5.09 |
| American Indian/Alaska Native, non-Hispanic | 10.63 | 14.16 | 21.93 | 20.78 | 11.00 | 8.38 |
| Asian/Native Hawaiian/Pacific Islander, non-Hispanic | 3.45 | 6.66 | 5.64 | 10.64 | 3.06 | 3.56 |
| Hispanic or Latino | 10.31 | 9.63 | 20.74 | 23.24 | 9.40 | 5.90 |
| Total | 11.01 | 12.81 | 17.99 | 19.81 | 6.33 | 5.42 |
| Female | | | | | | |
| White, non-Hispanic | 8.50 | 9.02 | 5.53 | 6.11 | 2.66 | 2.37 |
| Black, non-Hispanic | 5.14 | 5.82 | 4.79 | 3.62 | 2.21 | 2.39 |
| American Indian/Alaska Native, non-Hispanic | 10.55 | 11.46 | 13.12 | 8.66 | 7.38 | 4.49 |
| Asian/Native Hawaiian/Pacific Islander, non-Hispanic | 2.83 | 2.98 | 2.30 | 2.45 | 1.41 | 1.34 |
| Hispanic or Latino | 4.52 | 4.36 | 3.21 | 4.72 | 2.15 | 1.94 |
| Total | 7.69 | 7.92 | 5.25 | 5.56 | 2.58 | 2.32 |

¹ Total includes other or unknown race/ethnicity.

² Average daily ethanol intake greater than one drink (0.6 oz) for women and greater than two drinks (1.2 oz) for men.

³ Five or more drinks in a single day.

⁴ With or without abuse.

Source: NIAAA 1991–1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES) and 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC).

More data on Hispanics is becoming available. Results of recent surveys typically show significant differences between men and women such that there is concern about drinking and alcohol-related problems among men but less concern about women. Whereas in past surveys, the magnitude of gender differences in drinking patterns within the Hispanic population was relatively large, these differences are diminishing. As noted in the "Liver Disease" section above, there is a corresponding disparity in cirrhosis mortality rates among Hispanic men and women.

Black drinkers who have alcohol use disorders are of concern with regard to health disparities in access to treatment services and health insurance coverage for such services. However, all the indicators in Table 2 show that heavier drinking, binge drinking, and alcohol dependence remain lower in the Black, non-Hispanic population than in the White, non-Hispanic population.

RESEARCH PROGRESS

Over the past several decades, epidemiologic research has documented substantial variation in patterns of alcohol consumption and differential consequences of that consumption across various racial and ethnic groups. Recent studies have continued to indicate important differences within as well as between ethnic and racial groups (e.g., Caetano, 2003; Spicer et al., 2003). We have also learned that racial, ethnic, and cultural disparities in alcohol-related problems vary with the problem under consideration. For example: the alcohol-related death rate (i.e., for all categories of alcohol-related mortality combined) is higher among African Americans than whites (NIAAA 1996); cirrhosis death rates are very high among white Americans of Hispanic origin, lower among non-Hispanic African Americans, and lower still among non-Hispanic Whites (Stinson et al. 2001); alcohol-related traffic deaths are many times more frequent (per 100,000 population) among American Indians or Alaska Natives than among other minority populations (U.S. DHHS, 2000); the incidence of fetal alcohol syndrome (FAS) is higher in some African American and American Indian communities than in the general population (Stratton et al., 1996); and recent increases in risky drinking behavior (i.e., drinking and driving) have been reported among Hispanics (Voas et al., 1998).

Problems related to alcohol are particularly elevated in Native American populations. A study of Mission Indians found that 70% of men and 50% of women met lifetime diagnostic criteria for alcohol dependence (Ehlers et al., 2004). When compared to dependent individuals in the Collaborative Study on the Genetics of Alcoholism Study (COGA), Mission Indian alcoholics were significantly more likely to experience binge drinking, fights, and driving while intoxicated. The incidence of fetal alcohol syndrome (FAS) in Native American populations is also of great concern, which has led to the development of FAS diagnostic tools that are applicable specifically to Native American groups (Hoyme et al., 2005).

Intimate partner violence (IPV) among minorities has received recent research attention. Significant ethnic differences exist in the prevalence of IPV, and alcohol use is related to the occurrence of IPV in minority populations just as it is in the general population. The

role that alcohol use plays in the occurrence of IPV appears to be stronger among Hispanics than among Blacks or Non-Hispanic Whites (Field and Caetano, 2004).

RESEARCH QUESTIONS/DIRECTIONS

- Secondary analysis of existing data sets to broaden the array of available findings on minority drinking patterns and problem prevalences. Many existing data sets remain unexploited and could potentially yield important findings on health disparities and intragroup differences in alcohol use and alcohol use disorders.
- New studies oversampling Asians/Native Hawaiians/Pacific Islanders should be conducted to better understand trends toward more alcohol use and dependence. These groups are too small in ordinary general population surveys for stable estimates of alcohol use and problem prevalence to be made.
- NIAAA should partner with NIDA, NIMH, and NICHD to sponsor bi-national (U.S./Canadian and U.S./Mexican) Native American - Alaska Native research conferences. The goal should be to examine problems in these groups, identify research priorities, and develop plans to initiate a program of research and develop young investigators to carry out the work.
- Research aimed at developing improved prevention strategies for Native American and Alaska Native populations, both broadly and as alcohol relates to suicide, is needed.
- NIAAA should increase efforts to expand the pool of Asian/Native Hawaiians/Pacific Islanders - Pacific Islander and American Indian - Alaska Native investigators.

B. AGING

MAGNITUDE OF THE PROBLEM

America's population of older adults is rapidly expanding. In the year 2000, about 35 million Americans were age 65 years or older (U.S. Census Bureau, 2000). It is estimated that by the year 2020, 54 million, or one in six, will be age 65 years or older.

Population-level data show that about 48% of older men (age 65 and older) and 32% of older women drink (Breslow et al., 2003). Most do so in moderation as defined by the US *Dietary Guidelines* (USDA, 2005). Only 10% of older men and 2.4% of older women are heavier drinkers (Breslow et al., 2003). However, population-level data could obscure problem-drinking occurring in certain populations. Studies suggest that a significant proportion of "hidden" alcoholics may be age 60 and older (Cox et al., 1997). The diagnosis of alcohol abuse and dependence can be difficult in older people because its symptoms can be erroneously attributed to other age-related medical or psychiatric

conditions (e.g. depression, insomnia, poor nutrition, and frequent falls) or to medication side-effects. In addition, current DSM IV criteria for alcohol abuse and dependence may not adequately assess alcohol problems in older adults due to the absence of adverse social consequences that can be experienced by younger at-risk drinkers (e.g., employment or legal problems) (Oslin, 2004; Fink et al., 2002) and age-related physiological changes leading to tolerance at lower consumption levels (Vestal et al., 1977). Hospital staff are significantly less likely to recognize alcohol problems in an older than in a younger patient (Curtis et al., 1989). In fact, physicians rarely ask their older patients about alcohol consumption.

TRENDS

Results of cross-sectional (Breslow et al., 2003; Breslow and Smothers, 2004) as well as longitudinal (Grant et al., 2004) studies have shown that older adults consistently consume less than younger age groups. However, there is a paucity of published, generalizable data on long-term trends in alcohol consumption among older adults. For example, one study comparing survey responses from two large national surveys showed increased prevalence of alcohol abuse but not dependence among respondents over 65 years of age from 1992-2002 (0.25 and 1.21 % respectively) (Grant et al., 2004). Another longitudinal study (Moore et al., 2005) based on national survey data found that while alcohol consumption declined with age from 1975 to 1992, consumption declined more slowly among more recent birth cohorts. These results are suggestive of a potential shift in consumption patterns among older adults as birth cohorts continue to age. Thus, these data provide the basis for development of improved surveillance of consumption patterns through the life course.

POPULATIONS AT RISK

Older persons differ biologically, psychologically and socially from younger people, resulting in different health needs and health care utilization patterns. Older men (and women of all ages) have a smaller volume of total body water than younger men; therefore, they attain a higher blood alcohol concentration from a given dose (Vestal et al., 1977). The greater vulnerability of older persons to the effects of alcohol may be augmented by age-related changes in functional status, nutritional status, and psychological and cognitive status. Body composition continues to change with age; therefore an 85 year old may be more vulnerable to alcohol's effects than a 65 year old (Vestal et al., 1977).

Alcohol also may affect the health of an older person by exacerbating sleep problems (Brower and Hall, 2001), elevating blood pressure (Camargo et al., 1997), and negatively affecting bone mineral metabolism (Ganry et al., 2001). Alcohol use in older adults is also associated with hip fractures due to falls (Rose and Maffulli, 1999) and other unintentional injuries including automobile crashes (Higgins et al., 1996). The increased risk of hemorrhagic stroke seen in the general population may be especially important in this age group (Hillbom et al., 1996). Consumption of over one to two drinks a day poses

significant risks for cancer (Bagnardi et al., 2001), liver cirrhosis, brain damage, and unintentional injuries (Rehm and Sempos, 1995).

The majority of older persons take medications, and alcohol interacts adversely with many prescription and over-the-counter drugs. Studies indicate that between 60 to 90 percent of elderly persons use some form of medication, often more than one at a time (Chrischilles et al., 1992; Dufour and Fuller 1995; Pollow et al., 1994). Medications commonly taken by older people which have a high potential for a negative reaction with alcohol include analgesics, antihypertensives, anticoagulants, diuretics, antiarthritics and psychoactive agents (Forster et al., 1993).

On the other hand, there is evidence of benefits from modest alcohol use. Moderate alcohol consumption has been associated with increased survival in older adults (Simons et al., 1996). Low to moderate consumption may offer some protection against cardiovascular disease (CVD), including ischemic stroke, especially for those at moderate risk for CVD (Mukamal and Rimm, 2001) and some studies have shown increased bone mineral density in postmenopausal women who drink at moderate levels (Rapuri et al., 2000).

Not only is America's population graying, but cohorts of persons aging currently (e.g. the so-called baby boomers) consumed more alcohol and other substances during their early and middle years than the current cohort of elderly persons. As a result, they may be more likely than current older adults to continue to misuse alcohol as a coping mechanism in their later years (Moos et al., 2004; Blow et al., 2004). In addition, we know that some people increase their alcohol consumption later in life, often leading to late-onset alcoholism (Atkinson et al., 1990). However, the etiologic agents which produce late onset drinking have not been well described.

RESEARCH PROGRESS

Although studies have shown that the prevalence of excessive alcohol consumption declines with age, a substantial proportion of older adults engage in consumption patterns that exceed suggested guidelines (Moos et al., 2004). In addition to the risk of adverse interactions with comorbidities and medications, changes in life course conditions are believed to contribute to increased risk for alcohol problems among older adults. These conditions may include retirement-related unstructured free time and availability of disposable income, gambling associated with binge drinking, or losses due to death of loved ones (Oslin, 2004; Levens et al., 2005). Rates of problem drinking vary widely depending on methods and definitions of alcohol abuse and dependence (Moos et al., 2004; Blow et al., 2004; Oslin 2004). Reported rates range from as low as 4% among representative longitudinal samples to well over 50 % among smaller targeted community samples of at-risk drinkers (e.g., in primary care and hospitals, geriatric mental health clinics, nursing homes). A current study of older workers' transition into retirement found that a shift from full-time work to bridge employment and full retirement was associated with higher amounts of alcohol consumption per drinking occasion (Bacharach et al., 2004). Other studies of community-based samples in primary care have

demonstrated the efficacy of providers' use of screening protocols to identify older adults at risk for alcohol problems and reduction in at-risk drinking following brief motivational interventions (Fink et al., 2002).

RESEARCH QUESTIONS/ DIRECTIONS

There is an important need for more epidemiologic information on alcohol consumption by elderly persons; risks, benefits, predictors, and interactions with chronic diseases of aging and their treatments. Future research should:

- Increase knowledge about the incidence, prevalence, etiology, course, and natural history of alcohol-related problems, including, alcohol abuse and alcohol dependence, among older adult populations, and among subgroups of this population (e.g. racial/ethnic groups, men and women, the very old, those in group housing).
- Examine consumption patterns (e.g., frequency, quantity, duration, beverage type) to further clarify criteria for development of appropriate alcohol consumption guidelines across the lifespan, including, relationships between environmental, personal, socio-cultural and genetic factors in the development and course of short- and long-term alcohol-related problems among older adult populations.
- Examine the role of alcohol-nutrition interactions in alcohol-related disease in the elderly.
- Test and refine screening protocols in primary care settings to assess alcohol use problems and implement interventions to reduce alcohol consumption to appropriate, safe levels.
- Elucidate the role of alcohol consumption in unintentional and intentional injury (e.g., falls, vehicular crashes and suicide) and medical complications from prescription and over the counter medication use (e.g. regular vs. intermittent use, type of medication) in older adults.
- Examine the relationship of alcohol consumption and alcohol abuse and dependence to the development, course and outcomes of other psychiatric disorders and medical conditions (e.g., heart disease, cancer, liver disease and degenerative brain disorders) among older adult populations.

C. HEALTH SERVICES

MAGNITUDE OF THE PROBLEM

In 2004 in the United States 15.2 million people were dependent on or abused alcohol and 3.9 million were dependent on or abused both alcohol and drugs, all total about 7.6% of the population⁴. These numbers have been relatively consistent since 2002 (SAMHSA, 2005).

An estimated 3.8 million people ages 12 and older 1.6% of the population received treatment for a problem related to alcohol or drug use in 2004. Of those 1.2 million received treatment only for alcohol problems and 1.5 million for both alcohol and drugs while 0.7 million for drug problems only. Changes between 2003 and 2004 were not significant (SAMHSA, 2005).

Based on a survey date of March 31, 2002, SAMHSA determined that about 13,720 facilities provided services to about 1.13 million clients in treatment. However, there were small absolute *decreases* in those numbers during 2003, down to about 13,623 treatment facilities providing care to about 1.09 million clients (SAMHSA N-SSATS). On the other hand, in 2001 SAMHSA reported about 1.8 million substance abuse treatment admissions in the U.S., for which about 436,142 (24.3 percent) were attributable to “alcohol only” problems, and an additional 359,521 admissions (20.0 percent) were attributable to “alcohol with secondary drug” substance abuse problems. Those counts showed small absolute *increases* during 2002, when there were 1.9 million admissions, of which about 450,263 (23.6 percent) were “alcohol only” problems and about 367,740 additional admissions (19.3 percent) were for “alcohol and secondary drug” problems (SAMHSA TEDS).

TRENDS

Figure 7 shows that the percentage of substance abuse admissions for an alcohol problem without a concomitant drug problem has declined during the past decade. At the same time, the percentage of admissions for a drug problem without a concomitant alcohol problem has increased and the percentage of admissions for combined drug and alcohol problems has remained roughly stable. It remains true that the great majority of admissions include an alcohol problem, whether combined with a drug problem or not (Figure 8).

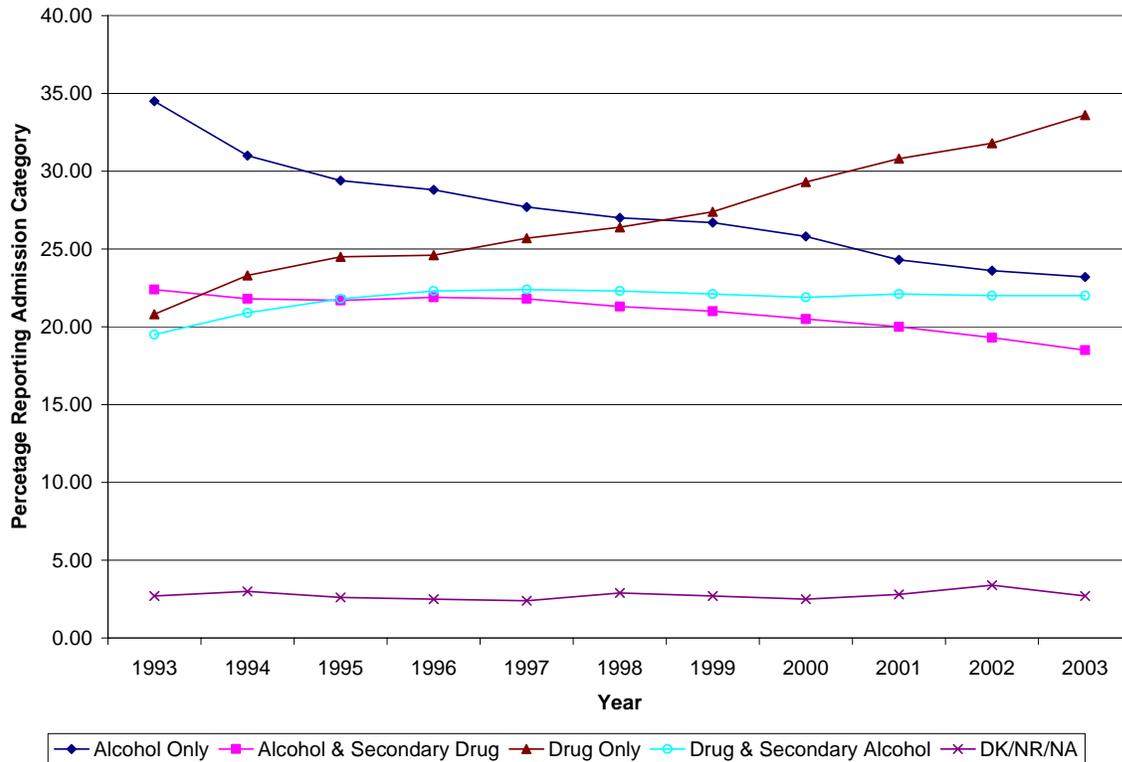
In the past decade substance abuse spending expressed as a percentage of total health care spending decreased even more than other types of health care spending. In 1992, substance abuse expenditures accounted for 1.16 percent of total health care expenditures; this declined to 0.2 percent by 2001. The percentage of privately-insured beneficiaries using any substance abuse services declined by 23 percent from 1992 to

⁴ 3.9 million were dependent on or abused drugs only bringing the total number of substance abusers and dependents to 22.5 million or 9.4% of the U.S. population.

2001, from 0.64 percent of enrollees to 0.49 percent of enrollees. That decline was evident in all categories: inpatient, outpatient, and pharmaceutical utilization. Substance abuse spending per covered life (in adjusted dollars) dropped from about \$21.16 in 1992 to about \$4.46 in 2002 (Mark and Coffey, 2004).

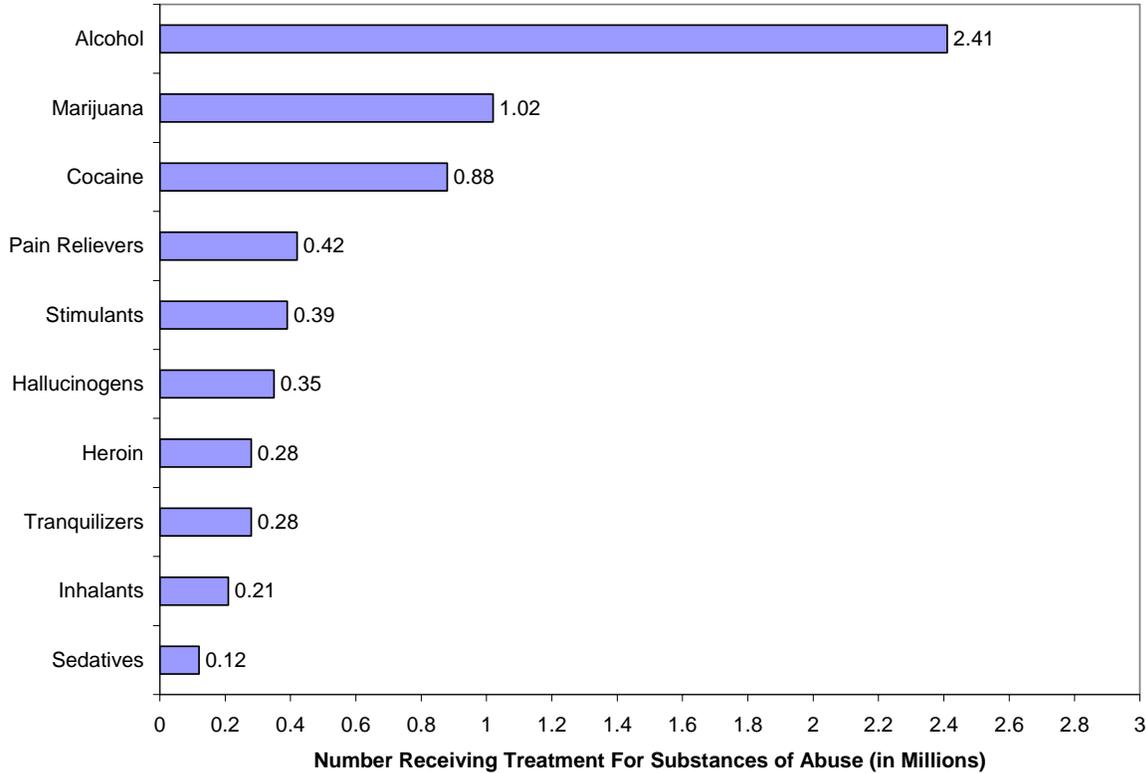
Figure 7

Substance Abuse Treatment Admissions, by Category of Primary Alcohol or Drug Problem and by Year, Among Persons Who Were Admitted to Any Illicit Drug or Alcohol Treatment in the Past Year, United States, 1993-2003



Source: SAMHSA, Office of Applied Studies, Treatment Episode Data Set (TEDS).

Figure 8
Substances for Which Last or Current Treatment was Received,
Among Persons Age 12 or Older Who Received Substance Use Treatment in the Past
Year, United States, 2004



Source: SAMHSA, National Survey on Drug Use and Health (NSDUH), 2004 Detailed Tables, Table 5.49A. Substance Dependence, Abuse and Treatment

At the same time, there has been a dramatic shift in substance abuse expenditures away from private financing and toward public payers. There has also been a shift away from hospital treatment settings and toward outpatient settings. Overall, research evidence has indicated that prospective growth in substance abuse expenditures had been contained and might remain constant relative to the growth in other types of health care spending (Dilonardo et al., 2000).

These trends have paralleled developments within the risk structure of health insurance markets. Managed behavioral health care organizations, or so-called “carve-out” arrangements have generally transferred economic risk and accountability from the primary payor to the contracting vendor, thereby diminishing overall quality of care, in the context of generally reduced access to such services (Garnick et al., 2001). Overall, the largest American firms are the most likely to engage in contractually “carving out” behavioral health care services, suggesting on one hand that employees of the largest firms might face diminished access (Hodgkin et al., 2000).

POPULATIONS AT RISK

Age

Among older adults (ages 55 or older) admitted for substance abuse treatment alcohol was the most frequently reported primary substance of abuse in the years between 1995 and 2002. These admissions increased 19 percent for men and 24 percent for women (1995: 33,100 men and 7,000 women; 2002: 39,300 men and 8,700 women) (SAMHSA TEDS, 2005). Among adolescents, between 1992 and 2002 substance abuse treatment admissions in which alcohol had been reported as the primary substance of abuse decreased from 56 percent to 20 percent of all adolescent substance abuse treatment admissions (SAMHSA TEDS, 2004).

Mental health Comorbidities

NIAAA-supported research determined that the one-year prevalence rates of a diagnosis of depression, alcoholism, and depression and alcoholism were 39.2, 2.0, and 1.0 per thousand persons, respectively. Among persons with depression, only 2.5 percent were identified as having alcoholism. Nevertheless, patients with both depression and alcoholism utilized twice the number of mental health and substance abuse visits over the two years after their diagnosis and exhibited five times the rate of psychiatric hospitalizations than patients who had depression alone. Inpatient and outpatient mental health and substance abuse expenditures were 80 percent and 68 percent higher among patients with alcoholism and depression, respectively, than among those with alcoholism alone. Overall, total medical care expenditures for persons with both alcoholism and depression were 44 percent higher (\$7,323 greater) on average than those for persons with depression alone over a two-year period. Total inpatient costs were 59 percent higher (\$3,341 greater) for persons with both diagnoses, and total outpatient costs were 46 percent higher (\$3,878) (Mark, 2003).

At the same time, successful treatment for comorbid mental health conditions assists successful recovery from alcohol dependence. Investigators in a managed care organization examined the relationship between use of psychiatric services and alcohol and drug treatment outcomes five years following the completion of substance abuse treatment. They hypothesized that utilization of psychiatric services would serve as a predictor of long term abstinence. They determined patients who received a threshold level of psychiatric services, at least 2.1 hours a year on average, were more likely to be abstinent at five years than patients who received less than that threshold level, such that utilization of psychiatric services among patients with chemical dependency is associated with enhanced long-term outcomes (Ray et al., 2005).

Chronic medical conditions

Substantial evidence exists that persons with diagnosable alcohol disorders exhibit elevated rates of co-morbid conditions and yield higher health care costs, but until recently little evidence had discerned whether those effects could also be associated with “hazardous drinkers,” defined as “those whose consumption increases their risk of physical and psychological harm.” In a NIDA-funded study, investigators discerned a hazardous drinking prevalence rate of 7.5 percent within a retrospective sample of HMO

primary care clinic patients. This prevalence was comparable to that of hypertension and diabetes in the same HMO population. The investigators suggested that screening and brief intervention at lower-threshold alcohol abuse levels would detect both anticipated and unanticipated co-morbid conditions sooner (Mertens et al., 2005).

RESEARCH PROGRESS

Recent research has focused on several means of improving care. These include encouraging treatment practice improvements such as the use of screening and brief interventions and the use of pharmacotherapy in treating alcohol dependence. They also include moving toward a chronic care model by providing continuing care and making use of self-help groups in the aftercare phase.

Investigators determined that the cost of a managed care organization-based screening and brief intervention strategy is modest, and that it could be recommended as a conventional prevention tool within such payment environments. They compared a model in which brief interventions were delivered by a brief intervention "specialist" to those where the brief intervention was delivered by a "daily practitioner." Findings indicated that the increased costs of both models were modest: \$2.59 per patient for the "specialist" model vs. \$3.43 per patient for the "daily practitioner" model (Mark, 2003).

Few physicians are prescribing naltrexone as an adjunct to therapy. Investigators in an NIAAA-supported study determined that the two main self-reported reasons why physicians did not prescribe Naltrexone among their alcohol dependent patients were (a) patients' refusal to comply with prescribing regimes (23 percent), and (b) patients' inability to afford this medication (21 percent). Physician perceptions of Naltrexone's effectiveness and safety were significantly associated with their prescribing patterns. Physicians who had more exposure to information about Naltrexone were more likely to prescribe it (Mark et al., 2003).

In a study of the characteristics associated with successful continuing care regimens, investigators found that a combination of brief, weekly telephone contacts, and support group attendance during the first month following outpatient completion, yielded outcomes that were as successful as those generated by more intensive face-to-face continuing care interventions (McKay et al., 2005).

In the report of key research findings from a 2001 consensus-development conference on addiction-related self-help groups, a working group of national experts recommended that all health care professionals "should have some knowledge about how to refer patients effectively to [self-help] groups" and that a credentialing program related to self-help group referral practices might facilitate this outcome. They also recommended that government policies work to encourage wider use of self-help organizations by underserved populations, especially by making them more widely available to adolescents and persons living in rural areas (Humphreys et al., 2004).

Other research has focused on the role of health insurance. These studies have concentrated on changes in Medicaid policy, potential barriers to screening and brief intervention, and the relationship between insurance status and access to care.

In an NIAAA- and NIDA-funded study, researchers determined that the effects of an overhaul of a state's Medicaid system led to diminished outcomes for substance abuse treatment. They found that a plan to create a modified Oregon Health Plan that integrated substance abuse treatment service with physical care for Oregon's Medicaid beneficiaries evolved in a multi-layered, "carved-out" approach. Changes in the administration and management of the chemical dependency benefit, financial losses by participating health plans, and lack of training and incentives created poorer overall treatment outcomes (Laws et al., 2002).

Another study reviewed the degree to which emergency physicians refrained from delivering brief interventions due to concerns about patient confidentiality and prospective denial of insurance coverage for an emergency department episode. The investigators also surveyed state insurance commissioners to determine whether state statutes allowed denial of coverage for injuries sustained while impaired by alcohol. They determined that regulations that would limit an emergency physician's freedom to deliver a brief intervention existed in 38 states. They recommended segregating information about alcohol use in a medical record and assigning substance abuse counselors to screen all trauma patients, as the practical approaches toward ensuring the confidentiality of alcohol information under current federal regulations (Rivara et al., 2000). A follow-up survey identifying physician barriers, investigators found that 27% of trauma surgeons perceived alcohol screening to be a threat to reimbursement, 2% predicted that screening and intervention would substantially increase health care costs, 7% considered screening too time-consuming, and 14% expressed concerns that screening would compromise patient confidentiality (Schermer et al., 2003).

A final study examined how different types of health coverage influence the likelihood of entering alcohol treatment. The project studied the extent to which persons in treatment were able to utilize their insurance resources to help cover the costs of their care. The findings were that having private insurance coverage did not significantly alter the odds of treatment entry compared to being uninsured or being on Medicaid. Being in a private managed care plan, as compared to traditional indemnity coverage, also did not appear to affect the chances of treatment entry. Furthermore, 10% of those who were privately insured reported having paid for all of their treatment costs out of pocket. Thus, there are significant gaps between insurance coverage and access to care (Schmidt and Weisner, 2005).

RESEARCH QUESTIONS/ DIRECTIONS

- Studies should examine the effectiveness and cost effectiveness of screening and brief interventions delivered to adolescents and young adults. While these strategies have shown great promise among adults, they may also be of particular value in interrupting the developmental course that leads from early onset of

drinking toward the development of abuse and dependence. Both primary care and emergency room settings should be studied as sites for these interventions.

- Research should analyze the gap between the need for treatment in the general population and the receipt of treatment. Research should determine whether this gap is widening or narrowing over time and whether this gap is especially pronounced among any age, gender, ethnic, or income groups.
- Studies should be conducted of the costs and cost-effectiveness of improved services delivery. Given current financial constraints, improved treatment techniques will need to demonstrate not only that they are more effective but also that they are more cost-effective than standard treatment.
- Research should identify and quantify the sources of variation in access to and utilization of alcohol-related prevention interventions and treatment programs.
- Assessments should be made of the behavior of alcohol treatment providers. This research should concentrate on identifying the kinds of provider training and clinical supervision that yield quantifiably better treatment outcomes and the training and supervision strategies that promote innovation.

D. PUBLIC POLICY

MAGNITUDE OF THE PROBLEM

A wide range of public policies may affect alcohol consumption and other behaviors relating to alcohol, and therefore can have important influences on public health outcomes. Many have not been subjected to extensive scholarly examination. Public policy toward alcoholic beverages and alcohol-related behaviors in the United States is complex, involving statutes, regulations, and case law established at the Federal, State, and local levels of government. Research efforts to identify the effects of specific policy interventions on particular outcomes of interest confront challenges that are common across much of the social science enterprise, including issues of measurement, confounding, and multiple causal pathways, to name a few. The scientific challenges are further complicated because of the complex ways in which public policies influence particular aspects of alcohol-related behavior. Thus, the overall effects of policy measures on health-related outcomes may depend on the detailed characteristics of the causal pathways through which policies work (Edwards et al., 1994; Babor et al., 2003).

In the United States, laws, regulations, and jurisprudence address (1) alcoholic beverage production, packaging, transportation, marketing, taxation, sales, and consumption, (2) financing and delivery of alcohol-related treatment and preventive services, and (3) behaviors that may be affected by alcohol, such as driving and boating. In addition, public policy may take in to account the context in which behavior occurs, such as public vs. private locations, in or near educational/correctional/transportation facilities, the ages

of the individuals involved, time of day, and other considerations. Alcohol-related public policies and laws may be established by governments at all levels (Federal, State, county, and municipal). However, following the ratification of the 21st Amendment to the United States Constitution, the primary authority to regulate alcoholic beverages rests with the States (NIAAA APIS, 2006).

Scientific research has identified a number of alcohol-related policies that have significant effects on public health outcomes. As noted in two of our chapter sections on unintentional injury and intentional injury, among the policies with the best evidence of effectiveness is the minimum legal drinking age of 21, which has been shown to reduce consumption and alcohol-related traffic crash deaths among youth 16-21. (Hingson and Winter, 2003; O'Malley and Wagenaar, 1991; Shults et al., 2001; Wagenaar and Toomey, 2002). Although every State now sets the minimum age for possession and purchase of alcoholic beverages at 21, there is still a substantial degree of variation in State policies toward underage drinking. Many States afford significant exceptions to the laws against possession and consumption (e.g., except for in a private residence, or only in a public place) (NIAAA APIS, 2006).

Alcoholic beverage taxes are another policy for which there is substantial evidence of effectiveness. Although tax rates are most often established for fiscal rather than public health purposes, a number of studies (but not all) have found significant relationships between higher taxes on alcoholic beverages and lower rates of traffic crash fatalities or drunk driving, particularly among younger drivers or during nighttime hours. Other research has found associations between higher alcoholic beverage taxes and lower rates of some types of violent crime, reduced incidence of physical child abuse committed by women, and lower rates of sexually transmitted diseases and liver cirrhosis mortality, as well as with increases in college graduation rates. Although considerable uncertainty persists about the magnitudes of the relationships involved, the weight of evidence suggests that higher taxes on alcoholic beverages are related to reductions in consumption and in a range of adverse consequences associated with alcohol use (Chaloupka et al., 1998; Cook and Moore, 2002; Kenkel and Manning, 1996; Leung and Phelps, 1993).

Policies addressing drinking and driving have been shown to reduce traffic fatalities. Every State has now established a law that makes driving with a blood alcohol concentration of .08 percent a *per se* offense, meaning that it is not necessary to present evidence of intoxication or impairment to establish that a violation has occurred. All States have also adopted so-called "zero tolerance" laws that set BAC limits for drivers under the age of 21 at no more than .02 percent. These laws, combined with a variety of other policies designed to deter driving after drinking, have helped reduce alcohol-related traffic fatalities per population in the United States by 50% since 1982 (Hingson et al., 1994; Hingson et al., 1996; Hingson and Sleet, 2006; Shults et al., 2001).

Public policies affecting the delivery and financing of alcohol-related treatment and preventive services may have important effects on access to treatment services. Most States now require health insurers to cover treatment for alcoholism, and a number of other States require such coverage to be offered but not necessarily included in every

insurance contract. However, no Federal laws require coverage for alcoholism treatment, and Federal law exempts many large employers from State laws making such requirements. As a result, many insurance policies may not include coverage for alcoholism treatment (Sing et al., 1998; NIAAA, 2006).

Many States have laws, known as “Uniform Accident and Sickness Policy Provision Laws,” or UPPL, that permit health insurers to deny payment for losses that are the result of the insured person being intoxicated. Researchers have suggested that these policies create a disincentive for health care providers in emergency and primary care settings to screen for alcohol problems, with the result that fewer individuals in need of treatment for alcohol problems are referred to treatment just when such referrals might be most effective (Chezem, 2004; Rivara et al., 2000). While studies have not yet established the true effects of UPPL provisions on treatment referrals, a few States have recently enacted laws that prohibit exclusion of insurance benefits on the basis of intoxication.

TRENDS

No broadly generalizable information on changes in alcohol-related public policies has been reported. However, with respect to specific policy topics, the following trends are clear:

- 1) Restrictions relating to drunk driving have become more stringent and penalties more severe. All states have established a legal *per se* blood alcohol limit of 0.08% and 41 states have adopted administrative license revocation allowing laws immediate license seizure for persons above the legal limit. All states have made it illegal for persons under 21 to drive after any drinking (Zero Tolerance Laws).
- 2) Restrictions relating to underage drinking and access to alcohol have become somewhat more stringent over the past 25 years. This follows a period of relaxation of these laws through the 1970s. All states have adopted a legal drinking age of 21 making it illegal for those under 21 to purchase or possess alcohol, and illegal for those 21 or older to sell or furnish alcohol to persons under 21. However, a number of exceptions apply to these general prohibitions, potentially weakening their effect. For example, in 28 states, parents can legally provide alcohol to their children, at least in some settings, and 11 states permit minors to possess alcohol in some locations regardless of approval or supervision by their parents.
- 3) Tax rates on alcoholic beverages have tended to decrease in real (inflation-adjusted) terms over time, punctuated by sudden increases, most notably the 1990 increases in Federal excise rates on beer and wine and the 1985 and 1988 increases in Federal excise rates on distilled spirits.
- 4) Laws have increasingly encouraged or required health insurance coverage for treatment of alcoholism. A number of States have repealed laws permitting

denial of health insurance benefits for injuries sustained as a result of intoxication.

- 5) Long-term trends have favored increased legal availability of alcoholic beverages, from the repeal of national prohibition, privatization of some State monopoly operations, relaxation of restrictions on Sunday sales and extended opening hours, and local zoning laws permitting alcoholic beverage sales in broader categories of events and settings.

POPULATIONS AFFECTED

Public policies that plausibly affect alcohol-related outcomes address a broad range of population groups. In many cases, the individuals or organizations targeted by a particular policy are not the actors whose behavior is the primary or ultimate target. For example, health insurance parity laws place restrictions on health insurers in terms of the provisions that may be included in health insurance policies, but the target behavior is treatment-seeking and referral by individuals with drinking problems and by physicians, employers, courts and law enforcement agencies, etc.

Public policies that affect alcohol consumption or related behaviors may affect numerous specific outcomes. Many studies of the effects of specific policies treat these behaviors (including consumption levels) as the outcomes of interest. Dependent variables in such studies may include average consumption, participation in (or frequency of) heavy (binge) drinking, participation in (or frequency of) driving after drinking, etc.

Other studies examine the relationship between the presence or absence of a particular policy and one or more downstream outcomes thought to be affected without assessing changes in consumption or other intermediate alcohol-related behaviors. Traffic crash fatality rates are probably the most commonly studied of such downstream outcomes. A growing literature has studied the effects of changes in alcoholic beverage prices or taxes on such other outcomes as cirrhosis rates, educational outcomes, violent crime, domestic violence, and sexually transmitted diseases.

In principle, policies that affect consumption may influence any and all alcohol-related outcomes. However, it is likely that certain policies have stronger effects on some categories of consumption than others (for example, frequency of heavy consumption, or maximum number of drinks per occasion, or drinking by potential drivers, or drinking by relatively light drinkers) and thereby have stronger associations with some outcomes rather than with others. The issue of such differential effects has received relatively little research attention to date, and represents a key area for future research.

RESEARCH PROGRESS

A few categories of alcohol-related policies have received significant scientific study, while most others have received little if any research attention. In addition, most studies have examined one or two specific policies at a time, without detailed consideration of

possible interactions among policies. Among the policy areas that have received the greatest research attention are minimum drinking age laws, taxation of alcoholic beverages, drinking driving laws (especially blood-alcohol concentration limits), restrictions on alcohol availability, and, to a lesser degree, laws facilitating access to treatment and restrictions on advertising and marketing.

The recent volume *Alcohol: No Ordinary Commodity* (Babor et al. 2003) reviews evidence for a range of public policy interventions from an international perspective. The stated purpose of the book is "... to describe recent advances in alcohol research that have direct relevance to alcohol policy on the local, national, and international levels." Similar reviews of policy effects include Cook and Moore (2002) and Edwards et al. (1994). Hingson et al. (2006) have recently reviewed alcohol policies that have reduced injury.

The weight of evidence from numerous studies suggests that beverage taxes may be among the most effective of policy measures at reducing consumption and ameliorating a variety of adverse outcomes. Although there is broad consensus that higher prices lead to reductions in consumption, there is significant variation in the magnitude of estimated effects, and some of this variation may be attributable to methodological challenges that confront research in this area (Leung and Phelps, 1993; Kenkel and Manning, 1996; Chaloupka et al., 1998; Cook and Moore, 2002). Some recent research has begun to examine the empirical relationship between alcoholic beverage taxes and prices (Young and Bielinska-Kwapisz, 2002; Kenkel, 2005). A few analyses have explored how prices may exert differential effects on consumption by moderate and heavy drinkers (Manning et al., 1995; Kenkel, 1996). A number of studies have reported significant effects of beverage taxes on traffic crash fatalities (Saffer and Grossman, 1987; Chaloupka et al. 1993; Kenkel 1993; Ruhm 1996). However, several recent studies have found effects of taxes on traffic crash fatalities to be insignificant, smaller than previously estimated, or unreliable (Dee, 1999; Mast et al., 1999; Young and Likens, 2000). Methodological factors may help to explain these differences in findings. Chief among these factors is the possibility of unmeasured State-specific factors that influence both tax rates and alcohol-related outcomes. Clearer understanding of the mechanisms through which beverage taxes affect alcohol consumption and related behaviors remains an important area for further research.

Other research supports the conclusion that minimum drinking age laws are effective in reducing alcohol consumption and alcohol-related problems among young people (Shults et al., 2001; Wagenaar and Toomey, 2002). In addition, Chisholm et al. (2004) estimated the relative cost-effectiveness of several interventions (taxation of alcoholic beverages, drunk driving legislation and random breath testing, reduced hours of sale, advertising bans, and brief physician interventions), concluding that both individual-based interventions (e.g., brief physician advice) and population-wide interventions (e.g., taxation) can improve public health, but that the relative cost effectiveness of alternative approaches varies across countries with patterns of consumption and problems associated with alcohol.

Because of the complexity of alcohol-related public policies, researchers face the challenge of identifying how specific policy measures affect health outcomes. The Alcohol Policy Information System (APIS), developed by the National Institute on Alcohol Abuse and Alcoholism (NIAAA), provides authoritative, detailed, and comparable information on alcohol-related public policies in the United States at both the State and Federal levels. The APIS Web site (<http://alcoholpolicy.niaaa.nih.gov>) provides public access to detailed information on a wide variety of alcohol-related public policies. Intended primarily as a tool for researchers, APIS features compilations and analyses of alcohol-related statutes and regulations designed to simplify the process of ascertaining the state of the law for studies on the effects and effectiveness of alcohol-related policies.

APIS currently provides information on 36 policy topics in several formats and at varying levels of detail. This information includes summary descriptions, maps, detailed comparison tables, specific dates on which provisions became or ceased to be effective, and excerpts providing the full text of relevant passages of statutes and regulations. For most policy topics, APIS coverage begins January 1, 1998. A list of current APIS policy topics is provided in Table 3; additional details are available through the APIS web site.

RESEARCH QUESTIONS/ DIRECTIONS

- How do various policies relating to underage drinking affect adverse alcohol-related outcomes?
- Are there categories of policies in which enforcement and other aspects of implementation are especially critical in contributing to desired outcomes?
- To what extent can repeal of “UPPL” laws contribute to increased access to treatment, and how much would that improve alcohol-related health outcomes?
- How do restrictions on physical availability (e.g., restrictions on days and hours of sale; limits on numbers of outlets; and limitations on brand selection and package sizes) and beverage taxation compare in effectiveness at reducing alcohol-related problems?
- Through what mechanisms, and among which population groups, do taxes and other policies that are effective in reducing adverse alcohol-related outcomes operate? Do they reduce the prevalence of consumption, the frequency of consumption, the maximum number of drinks per occasion, the frequency of heavy drinking occasions, or other aspects of drinking related behavior, such as the propensity to drive after drinking or to engage in risky sexual behaviors? Are heavier drinkers more or less susceptible to policy effects than more moderate drinkers? Does this relationship vary across ages, socioeconomic classes, or other discernable categories?

Table 3
Current APIS Policy Topics

| | |
|---|--|
| <p>1. Alcohol Beverage Control</p> <p>Alcohol Control Systems: Retail Distribution Systems for Wine</p> <p>Alcohol Control Systems: Wholesale Distribution Systems for Wine</p> <p>Alcohol Control Systems: Retail Distribution Systems for Beer</p> <p>Alcohol Control Systems: Wholesale Distribution Systems for Beer</p> <p>Alcohol Control Systems: Retail Distribution Systems for Spirits</p> <p>Alcohol Control Systems: Wholesale Distribution Systems for Spirits</p> <p>Keg Registration</p> <p>Beverage Service Training and Related Practices</p> <p>Bans on Off-Premises Sunday Sales</p> | <p>4. Underage Drinking and Access to Alcohol</p> <p>Underage Possession of Alcohol</p> <p>Underage Consumption of Alcohol</p> <p>Underage Purchase of Alcohol</p> <p>Furnishing Alcohol to Minors</p> <p>Minimum Ages for On-Premises Servers and Bartenders</p> <p>Minimum Ages for Off-Premises Sellers</p> <p>Loss of Driving Privileges for Alcohol Violations by Minors ("Use/Lose" Laws)</p> <p>Hosting Underage Drinking Parties: Criminal Liability</p> <p>False Identification for Obtaining Alcohol</p> |
| <p>2. Taxation and Pricing</p> <p>Alcohol Beverage Taxes: Beer</p> <p>Alcohol Beverage Taxes: Spirits</p> <p>Alcohol Beverage Taxes: Wine</p> <p>Alcohol Beverage Taxes: Sparkling Wine</p> <p>Alcohol Beverage Taxes: Coolers</p> | <p>5. Health Care Services and Financing</p> <p>Insurers' Liability for Losses Due to Intoxication ("UPPL")</p> <p>Health Insurance Parity for Alcohol-Related Treatment</p> |
| <p>3. Transportation, Crime, and Public Safety</p> <p>Open Containers of Alcohol in Motor Vehicles</p> <p>Blood Alcohol Concentration Limits: Adult Operators of Noncommercial Motor Vehicles</p> <p>Blood Alcohol Concentration Limits: Youth (Underage Operators of Noncommercial Motor Vehicles)</p> <p>Blood Alcohol Concentration Limits: Recreational Watercraft</p> <p>Vehicular Insurance Exclusion</p> | <p>6. Alcohol and Pregnancy</p> <p>Alcohol & Pregnancy: Mandatory Warning Signs</p> <p>Alcohol & Pregnancy: Limitations on Criminal Prosecution</p> <p>Alcohol & Pregnancy: Civil Commitment</p> <p>Alcohol & Pregnancy: Priority Treatment</p> <p>Alcohol & Pregnancy: Legal Significance for Child Abuse / Child Neglect</p> <p>Alcohol & Pregnancy: Reporting Requirements</p> |

E. ADVERTISING

MAGNITUDE OF THE PROBLEM

Alcohol messages and the modeling of drinking behavior are ubiquitous in contemporary American society. One part of this is the advertising of alcoholic beverages. Alcohol ads appear in print media, on television, on the radio and on billboards. In addition, alcohol is promoted through product placements, sponsorships, Internet advertising, point-of-sale materials, and items with brand logos.

Media exposure to alcohol other than in advertising is also widespread. Apart from direct advertisements, drinking is also widely portrayed in television programming and is regularly shown in movies for persons of all ages. Nielsen research from 1998 estimated

that American children watch on average 21 hours of television a week (Villani, 2001). Many programs have alcohol content, which is most often neutral or positive, and only rarely negative. The same is true for movies the vast majority of which depict drinking. A recent study (Sargent et al., 2006) found an association between exposure to movie alcohol use and early onset of drinking among teenagers.

TRENDS

In 2001, alcohol companies spent \$4 billion to advertise and promote their products. Of this \$1.57 billion was in the traditional measured media which includes television, radio, print and outdoor advertisements and the rest was for unmeasured promotions such as sponsorships, Internet advertising, point-of-sale materials, product placement, items with brand logos, and other means (CSPI, 2003). Growth in measured alcohol advertising since 1975 has been 20% greater than can be accounted for by inflation.

The Center on Alcohol Marketing and Youth (CAMY) monitors the scope and extent of underage youth to alcohol advertising in magazines, on television and through other media. In the years from 1998 to 2002, expenditures for beer advertising on television increased 45% (to 972 million dollars) while expenditures on liquor advertising increased 530% (to 18 million dollars; CSPI, 2003).

POPULATIONS AT RISK

Who sees/hears alcohol advertising and who is affected by it is an important issue. While almost all persons are exposed to significant amounts of alcohol advertising, certain populations may be at particular risk in terms of “overexposure” and/or vulnerability to alcohol’s effects, for example youth, minorities and dependent drinkers. Further some groups such as underage drinkers and members of certain ethnic populations may be “targeted” by certain advertisers. Others such as dependent drinkers, or those in recovery, for whom alcohol ads may provide drinking cues or triggers, may be especially vulnerable to advertising. A recent study comparing teens with and without alcohol use disorders (AUD) found that teens with AUD showed substantially more brain activation to pictures of alcoholic beverages than controls (Tapert et al., 2003).

Youth

The amount and types of alcohol advertising youth experience and its impact on their decisions about drinking are important concerns. Alcohol advertising on television is pervasive, often appealing to youth, and shown at times when many youth are likely to see it. For example, half of televised beer ads air on Saturday or Sunday afternoons during sporting events when they are very likely to be seen by youth (Snyder et al., 2000). Youth are also routinely exposed to print ads for alcoholic beverages, in magazines, on billboards and on the Internet. Descriptive research from the Center on Alcohol Marketing and Youth (CAMY, 2002) found that youth saw 45% more beer, 27% more distilled spirits ads, and 60% more “malternative” magazine ads than adults and that youth 12-17 were also “overexposed” to alcohol ads on the radio relative to adults 21 years and over, in the majority of markets monitored (CAMY, 2004). Further, radio

alcohol ads were frequently placed on stations with youth formats and were aired when youth were most likely to be listening (CAMY, 2003). A study of internet use by youth found the alcohol websites contained features appealing to youth, such as video games and cartoons, but few effective mechanisms to keep underage youth from accessing the websites (CAMY, 2004).

Minorities

The literature on minority population exposure to advertising is not as well developed as it is for youth exposure to advertising. However, there is an emerging interest in understanding the targeting of products like tobacco and alcohol to minorities (Gardiner, 2004) and examining the exposure that comes from a greater geographic density of outlets and large outdoor ads, which have been found disproportionately in African American and Hispanic neighborhoods (Hackbarath et al., 2001).

RESEARCH PROGRESS

The majority of studies of the effect of alcohol advertising on attitudes about drinking and on actual consumption have been done in youth populations. Some research with youth has directly studied young people's reactions to alcohol ads, and correlates of those reactions. For example, a study of third, sixth, and ninth graders showed that the third-grade children who found alcohol ads desirable were also more likely to see positive benefits from drinking and desire products with alcohol logos. Older children (ninth grade) in the study who found the ads and logo products appealing were more likely to already be engaged in drinking behaviors (Austin and Knaus, 2000). On the other hand, Zogg et al. (2004; supported by AA 12128) in a study of perceived positive and negative outcomes of alcohol use among 8th and 10th grade students found no predictive effects of exposure to televised alcohol advertisements, televised sports (which is dense in alcohol advertising) or first-hand observation of others drinking. More recently, Austin et al. (2006), using a complex information processing model found that media portrayals influence children's drinking through a progressive decision-making process. They also found that the interpretation of messages is at least as important as media exposure per se, and that decisions are both logic and affect based and incorporate inputs from multiple sources including media and parents.

Another group of studies has examined the relationship of advertising exposure and drinking outcomes. While two recent cross-sectional studies found positive associations between advertising and consumption (Collins et al., 2003; Chen et al., 2005), results of earlier cross-sectional studies that examined the relationship between liking alcohol advertising and current and future intentions to drink were mixed (Kelly and Edwards, 1998; Wylie et al., 1998). The results of a longitudinal study of New Zealand youth indicated that liking of alcohol advertising at age 18 was related to higher levels of beer consumption at age 21 (Casswell and Zhang, 1998). While there are some methodological problems, as there are in many of these studies, two prospective studies indicate a positive relationship between exposure to advertising and consumption. Ellickson et al. (2005) found in a sample of 7th grade drinkers and non-drinkers from North Dakota that several forms of advertising predicted future adolescent drinking for

both groups (AA12127) and Stacy et al. (2004) found that exposure to advertising increased the risk of subsequent beer consumption.

In another recent study, Snyder et al. (2006) interviewed a sample of youth aged 15 to 26, from 24 Nielsen media markets, on four occasions over a period of 21 months about their drinking. Advertising exposure in the study was measured both subjectively in terms of reported exposure and objectively in terms of advertising expenditures. Results indicated that each additional advertisement seen increased the number of drinks consumed in the past month by 1%. Further, youth in markets with greater advertising expenditures drank more: for each additional dollar spent per capita, the number of drinks consumed per month increased by 3%.

Another group of potentially informative investigations are econometric studies of the relationship between alcohol advertising and consumption. Results of these studies have also been mixed. A study by Saffer and Dhaval (2002) found that advertising increased consumption while others found that alcohol advertising affects brand choice but not overall consumption (Nelson and Morgan, 1995; Gius, 1996). Another recent study by Saffer (2003) suggests that a complete ban on alcohol advertising might reduce the prevalence of monthly drinking by adolescents, 12-18 years of age, from about 25% to 21% and of binge drinking from 12 % to 7%. However, while comprehensive advertising bans are potentially effective in reducing youth consumption, they are not likely to receive public support and partial bans are likely to result in the industry increasing their ads in other media (Saffer, 2002). A more recent study (Hollingworth et al., 2006) reached a similar conclusion noting that advertising bans have the potential to significantly reduce alcohol-related mortality and years of lost life due to premature alcohol-related deaths, but also that a complete media ban is unlikely since the risks of low levels of alcohol consumption are low.

In sum, results of research on the impact of alcohol advertising on actual drinking behavior by youth has been mixed and observed effects have been small. Furthermore many studies have been cross-sectional making it difficult to draw definitive conclusions about the relationship between advertising and alcohol consumption.

RESEARCH QUESTIONS/ DIRECTIONS

- We need more definitive studies of the fundamental question in this area which is whether exposure to alcohol advertising influences alcohol consumption. We need to understand the parameters of advertising that affect this relationship such as type of exposure, context of exposure and type of content as well as the aspects of drinking such as frequency of consumption, volume of consumption and context of consumption that are affected.
- Some studies have focused on expectancy and intention to drink as intermediate outcomes. While we need enhanced understanding of the processes by which advertising affects these outcomes, we also need greater understanding of the processes by which advertising affects the most important and more distal outcome of actual consumption.

- We need a better understanding of how advertising affects decision making about drinking among young people during a time of life when people are inclined to engage in more risk behaviors, including alcohol consumption, and a developmental period during which they may be especially vulnerable to alcohol's effects and adverse consequences.

V. OVERARCHING METHODOLOGICAL ISSUES

This final section covers overarching methodological issues that affect more than one of the substantive areas described above. Because these issues are crosscutting, we use a different format than that used in the preceding sections, presenting first a description of the methodological issues and then a set of research recommendations.

A. MEASUREMENT OF ALCOHOL CONSUMPTION

METHODOLOGICAL ISSUES

An important goal of alcohol epidemiology is to link alcohol consumption with alcohol-related problems. At the level of a large population, analyses, such as those that compare variation in per capita alcohol consumption and mortality rates over time, are useful in demonstrating links between consumption and its sequelae. Consumption data for such aggregate analyses typically are based on information about alcohol sales or shipments. In the United States, these data represent the standard against which other estimates of alcohol consumption are based.

In contrast, analyses that link drinking behavior with related outcomes at the individual level generally rely on survey data. Surveys of consumption allow researchers to ask individuals about their drinking patterns and to obtain other potentially related information, such as sociodemographic characteristics, health status, and alcohol-related experiences. This approach enables investigators to link alcohol consumption with various outcomes at the aggregate level as well as to adjust for other aggregate characteristics that might confound the associations being studied. In addition, survey data permit researchers to identify abstainers and to separately examine the impact of drinking frequency and drinking quantity. Finally, survey data allow for tracking of specific patterns of risk drinking, generally defined as drinking at a level that might result in psychomotor impairment.

Because of the importance of survey data for estimating relationships between drinking and alcohol outcomes, the general approaches and specific questions used to assess alcohol consumption have received much attention (Alanko, 1984; Armor and Polkich, 1982; Midanik and Harford, 1994; Rehm, 1998; Room, 1990). The National Institute on Alcohol Abuse and Alcoholism has had a strong and continuing involvement in the measurement of alcohol consumption as evidenced by the convening of conferences (Dawson and Room, 2000; NIAAA, 2003) and publications (NIAAA, 2004; 2005) directed to both researchers and the clinical community. These developments are summarized below.

THE DATA COLLECTION REFERENCE PERIOD

The first issue faced in designing an alcohol consumption survey is to decide the reference period for which consumption data are collected (e.g., the past year, past month, past week, or most recent drinking occasion). With short reference periods, (i.e., one week or less) respondents can be asked to describe the exact number, size and type of drinks they consumed each day. This approach, referred to as exact recall, is thought to minimize problems with memory loss and avoids the problems inherent in trying to describe a respondent's "usual" pattern of intake. Despite these advantages, exact recall procedures are associated with significant limitations. First, the short recall period may not accurately represent the respondent's typical consumption throughout the year, particularly in populations where drinking volumes or patterns vary according to season or are influenced by holidays. Second, the exact recall approach is not well suited to populations where many drinkers consume alcohol on an infrequent or irregular basis. In these cases, an exact recall approach is likely to misclassify many infrequent drinkers as abstainers even though it may accurately estimate the volume of consumption at the population level (assuming that a representative week is selected). Third, a short recall period generally is inadequate for simultaneously assessing alcohol-related problems, many of which occur rarely and can be measured with sufficient precision only over a longer period of time, typically a year.

A longer reference period (typically one year) is recommended for assessing both drinking behavior and problems in countries such as the United States, where many people are light, irregular drinkers and where large-scale surveys assessing both alcohol consumption and related problems permit individual level linkage of both types of data. With such a reference period, respondents cannot be asked to recall each drink they consumed during that time. Instead, researchers have developed various approaches to estimate the respondents' usual consumption. The challenge with these approaches is how best to collect information that can simultaneously yield accurate estimates of drinking frequency, volume, quantity, and variability, as well as the prevalence of risk drinking. Over the course of several decades of nationwide alcohol surveys conducted in the United States, two general ways of obtaining summary consumption data have evolved –the quantity/frequency (QF) approach and the graduated frequency (GF) approach (Room, 1990; Greenfield, 2000).

The Quantity/Frequency and Graduated Frequency Approaches

In most surveys, the QF and GF questions pertain to consumption in the past year, which is typically thought to reflect the respondent's current drinking status. However, these approaches can also be applied to other reference periods, such as the past month, which is the time-frame most often recommended for use with adolescent drinkers, or they can be designed to cover various life stages or periods of heavy drinking e.g. the period of heaviest drinking or to various life stages. In general, investigators have devoted less attention to measuring lifetime consumption (Lemmons et al., 1997; Russell et al., 1997; Skinner and Sheu, 1982; Sobell and Sobell, 1992) than to measuring current consumption.

In its most basic form, the QF approach measures alcohol consumption with two questions that inquire about (1) the overall frequency of alcohol consumption within the reference period, and (2) the usual number of drinks consumed on days when the respondent drank alcohol. The variable “usual number of drinks” theoretically measures the most commonly consumed quantity (i.e., the mode). Although past research suggests that responses actually may reflect a quantity somewhere between the mode and the mean (Gruenewald et al., 1996).

The GF approach, which since 1979 has been used in varying forms in the National Alcohol Surveys, conducted by the Alcohol Research Group, asks respondents how often during the designated reference period they drank various quantities of standard drinks. In contrast to the QF approach, the GF approach provides a standard set of drinking pattern measures (i.e., the quantities of drinks for which frequencies are reported are the same for all respondents), thereby facilitating the analysis of drinking patterns, estimation of risk curves, and presentation of results.

The Beverage-Specific Approach

The basic QF and GF structures lend themselves equally well to questions on overall alcohol consumption or the consumption of individual types of beverages. Past studies have consistently shown that data from beverage-specific questions, when summed across beverages, yield higher estimates of consumption than data from a single series of questions on overall consumption of all types of alcoholic beverages (Dawson, 1998; Russell et al., 1991). Investigators cannot simply add drinking frequencies across beverages to estimate overall drinking frequency because respondents may consume more than one type of beverage per day. In order to collect optimal data on both volume and pattern of drinking, surveys should include both beverage-specific questions and questions on overall consumption. Questions about overall consumption need not be asked in comparable detail to the beverage-specific questions but should at least contain questions on overall frequency of consuming any alcohol and overall frequency of consuming 5+ drinks, or a similar indicator of risk drinking (e.g. frequency of being intoxicated or feeling the effects of alcohol).

Precoded Response Categories

Alcohol surveys typically provide the respondents with precoded response categories representing frequency of drinking rather than asking for the actual number of drinking days. For example, research has shown that respondents find it easier and less embarrassing to report a frequency of “once a week” than “52 times”, at least when reporting sensitive information, such as frequency of heavy drinking in the past year (Ivis et al., 1997). The order of response categories can influence the accuracy of the respondent’s answers. Ordering response categories so that the highest frequencies are at the top of the list helps to make higher frequencies seem more normal and less embarrassing to the respondent (Dawson and Room, 2000). A disadvantage of precoded response categories is that they limit the number of possible responses, especially in the upper ranges of frequencies. Questions on the usual and largest quantity of alcohol consumed often are asked in an open ended format.

Definitions of Drinking Status

Most surveys aimed at determining past year consumption begin with a short series of questions intended to ascertain the respondent's drinking status. Based on these introductory questions, respondents generally are classified into one of three categories of drinking status – lifetime abstainer, former drinker, and current (i.e. past year) drinker. Distinguishing lifetime abstainers from former drinkers is particularly important in epidemiological research because any health benefits of light to moderate drinking (e.g., reductions in coronary heart disease) (Rimm et al., 1996) may be exaggerated when former drinkers, who may have been heavy drinkers who stopped drinking because of adverse health effects, are included in the category of abstainers (Shaper, 1995).

Overall Alcohol Consumption

To determine a respondent's overall alcohol consumption, researchers must create analytic measures that describe drinking pattern and volume. At a conference devoted to measuring alcohol consumption, participants recommended the following items for presentation and analysis of consumption data (Dawson and Room, 2000):

- ~Drinking status
- ~Volume of pure alcohol (i.e. ethanol) consumed
- ~An indicator of the frequency of risk drinking (i.e., drinking at a level that might result in psychomotor impairment, such as frequency of drinking 5+ drinks)⁵.

Binge and Risk Drinking

Drinking too much, too fast and/or too often results in risks to drinkers and those around them. Various definitions of binge drinking have been used; most incorporated drinking 5 or more drinks on an occasion or in a row for men and 4 or more for women. In 2004, the NIAAA National Advisory Council approved the following definition which also incorporates a two hour time frame: A "binge" is a pattern of drinking that brings blood alcohol concentration (BAC) to 0.08 gram percent or above. For the typical adult, this pattern corresponds to consuming 5 or more drinks (male), or 4 or more drinks (female) in about 2 hours. Binge drinking is clearly dangerous for the drinker and for society (NIAAA, 2004).

NIAAA also recently published a clinicians guide for primary care and mental health clinicians which described risky drinking for men as 5 or more standard drinks a day (or 15 or more per week) and 4 or more in a day (or 8 or more per week) for women (NIAAA, 2005). The guide pointed out that drinking at lower levels may be problematic depending on many factors, such as age, co-existing conditions, and medication use.

Event-Level Data Collection

While the above methods are used to get a picture of the relationship between an individual's overall or typical drinking behavior and risk for alcohol-related problems or consequences, studies are sometimes interested in the amount of "event-specific" drinking that takes place on a particular drinking occasion. For example, researchers

⁵ See Dawson, 2003 for a discussion of the operationalization of the volume of ethanol and the frequency of risk drinking.

interested in alcohol's contribution to violent crime or to HIV risk are interested not only in the respondent's overall drinking habits but also in the respondent's drinking on a particular occasion when a crime was committed or when unsafe sex occurred.

Event-level data, in which each “event” (or each day) is its own data point, capture the complex patterns of drinking and other high risk behaviors that typical aggregate approaches cannot⁶. They provide more detailed data on the specific context of the drinking occasion, allowing a researcher to better record the context for more diverse substantive research regarding frequency, quantity, and variability in alcohol use patterns and the co-variation between alcohol use and associated behaviors. Because of their richness, methodologies that incorporate event-level data are becoming more common in alcohol research.

Until recently, collection of event-level data was appealing, but practically difficult. However, recent advances in technology have enhanced the ability of researchers to collect valid event-level data and analyze the data in ways that capitalize on the complexity of the data. Event-level data may be collected in a variety of ways each of which represents an advance beyond the collection of aggregate data. Early efforts to collect more ecologically valid data utilized the timeline follow-back procedure (TLFB) (Sobell and Sobell 2000), or related measures. These methods allow for estimation of quantity of alcohol consumption, as well as risk behaviors. Prospective methods have also been used to assess daily alcohol use via paper-and-pencil daily drinking diaries and, more recently through the use of advanced technology including palm-pilot or personal data assistant (PDA) assessments, interactive voice response (IVR), cell phones, and the internet.

RESEARCH QUESTIONS/ DIRECTIONS

Comparisons are needed of data obtained by using the QF and GF approaches with data obtained through diary/daily recall, TLFB, IVR, and PDA approaches both in terms of volume estimates and in terms of accuracy in capturing overall drinking frequency and frequency of risk drinking.

- What are the advantages and disadvantages of particular event-level data collection procedures for particular respondent sub-groups and sample sizes?
- Are current measurement techniques equally suitable for all population subgroups (e.g. different age groups, ethnicities). Furthermore, serious challenges remain in adapting measurement techniques to the drinking patterns of other societies, especially tribal cultures where drinking may be a communal activity delineated in terms of time rather than quantity.

⁶ The following discussion of event-level consumption data is adapted from Neal DJ et al. "Capturing the moment: Innovative approaches to daily alcohol assessment." *Alcohol Clin Exp Res.* 30(2):828-291, 2006.

- How well do existing measurement approaches capture atypical light drinking among subgroups whose predominant drinking pattern is one of infrequent heavy drinking?

B. NOSOLOGY OF ALCOHOL USE DISORDERS

METHODOLOGICAL ISSUES

“The most widely used definitions for alcohol use disorders are those determined by editions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) of the American Psychiatric Association and the International Classification of Diseases (ICD) of the World Health Organization. These are dichotomous categories. Alcoholism treatment studies, human genetics studies, and epidemiology all rely on these definitions, which constitute a near-universal feature of research on alcoholism. Studies consistently show high reliability for DSM-IV and ICD-9 alcohol dependence but lower reliability for alcohol abuse/harmful use. Validity studies indicate that DSM-IV and ICD-9 alcohol dependence diagnoses have good validity, but the validity for alcohol abuse/harmful use is much lower. The hierarchical relationship of abuse to dependence may contribute to the reliability and validity problems of abuse ----.” (Hasin, 2003)

The American Psychiatric Institute for Research and Education (APIRE) convened a panel of international experts in each of the major disorders in order to review the evidence base for proposing revisions in diagnostic criteria for DSM nomenclature. The results of that panel's discussions are summarized here⁷. The process of creating the DSM-V definitions is due to begin in 2008, and the publication of the definitions is scheduled for 2012. The key question being addressed by the panel is whether the DSM definitions should remain categorical or whether a dimensional component should be included in the revision.

Bucholz (in Helzer et al., 2006) maintains that this issue extends beyond substance abuse nomenclature to all of psychiatric classification. She argues that one perspective that has been given little attention in the discussion of dimensionality is that of a longitudinal perspective. Bucholz points out that course of disorder has been an important element of diagnostic validity, so that the extent to which a dimensional approach may enhance that construct merits consideration as the process of revision of diagnostic criteria begins. In order to illustrate this, she presents data from the collaborative study on the genetics of alcoholism (COGA). Categorical DSM-IV alcoholism dependence diagnoses were cross-tabulated at two points in time, about five years apart. The cross-classified data suggest that the phenotype of alcohol dependence is very unstable. However, in evaluating the results from a latent transition analysis, the overwhelming impression is one of stability. Bucholz suggests that findings such these may encourage further elaboration of a dimensional sub- classification to improve both patient care and research.

⁷ This discussion is adapted from the Helzer et al. "Should DSM-V include dimensional diagnostic criteria for alcohol use disorders?" *Alcoholism: Clinical and Experimental Research* 30(2):303-310, 2006.

Bierut (in Helzer et al., 2006) cites evidence that alcoholism is a diagnosis based on a continuum (e.g. Bucholz et al., 1996), with increasing severity of illness. Using data from COGA, she investigated the question of whether evidence of a continuum extends beyond alcohol-related conditions to comorbid disorders and treatment. Comorbid conditions such as smoking, drug dependence and major depressive disorder were examined in alcohol-dependent and non-dependent individuals using an ordinal measure of lifetime DSM-IV symptoms count compared with a categorical DSM-IV lifetime diagnosis of alcohol dependence. The prevalence of the comorbid conditions among dependent and non-dependent men and women using a categorical classification was greater among the dependent groups. Furthermore, there were increasing prevalences of the comorbid conditions correlated with the number of lifetime DSM-IV alcohol dependence symptoms. Therefore, alcoholism was shown to lie on a severity index. Treatment interventions were found to follow similar patterns. Bierut concluded that the simple DSM-IV symptom count provides more information than can be obtained with the categorical diagnosis alone.

Helzer and Guth (in Helzer et al., 2006) propose that the diagnostic work group create the new DSM-V categorical definition as in the past. After the categorical definition has been specified, a dimensional approach would be created to reflect the categorical definition. They affirm that their proposal would offer both clinicians and investigators the convenience of a categorical diagnosis for communication, coding, and investigative assignment, among other purposes, but it would also offer the greater breadth of a dimensional score for measuring initial severity and tracking treatment progress or for adding statistical power to investigative designs.

Schuckit (in Helzer et al., 2006), supports Helzer and Guth's proposal to base diagnoses on categories and offer dimensions as qualifiers. He suggests that this approach might be useful across the entire DSM-V and need not be limited to substance use disorders. Schuckit also suggests that a combined categorical and dimensional approach would be very useful if a companion research manual is developed to go along with the DSM. Such a manual would inform researchers how they might best operationalize concepts within the DSMs.

A recent study used item response theory to determine whether the DSM-IV diagnostic criteria for alcohol abuse and dependence are arrayed along a continuum of severity (Saha et al., 2006). Saha et al. point out that: 1) only a few studies in the alcohol field have applied Item Response Theory (IRT) to examine the possibility of an alcohol problem continuum in which multiple alcohol problems map to a broad dimension of severity; 2) the samples used in previous studies were not representative of all individuals with alcohol problems; and 3) the sample sizes were too small to capitalize on IRT methodology to examine whether each criterion functioned differently among subtypes of the general population defined in terms of gender, age, and race-ethnicity in a manner independent of the distribution of the construct across these groups. On the basis of their results, which were based on the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions, Saha et al. concluded that: 1) DSM-IV diagnostic criteria for

alcohol abuse and dependence form a continuum of severity, calling into question the abuse-dependence distinction and the interpretation of abuse as a milder disorder than dependence; 2) the criteria tapped the more severe end of the alcohol use disorder continuum, highlighting the need to identify other criteria to capture the mild to intermediate range of severity; and 3) the drinking larger amounts or longer than intended dependence criterion may be a bridge between drinking patterns that incur risk of alcohol use disorder at the milder end of the continuum, with tolerance, withdrawal, impaired control and serious social, and occupational dysfunction at the more severe end of the continuum.

Carpenter et al. (2006) point out that the DSM-IV alcohol dependence diagnosis includes problem drinkers with different etiological pathways to dependence, comorbid diagnoses, and varying manifestations of alcohol problems (Grant 2000; Grant et al., 1992; Hasin and Grant, 2004). They suggest that this heterogeneity may obscure etiological factors relevant only to specific subgroups of problem drinkers or attenuate the predictive power of risk factors already identified. There have been numerous attempts to identify more homogeneous groups of dependent drinkers (Babor, 1996; Cloninger, 1987; Morey and Skinner, 1986; Zucker, 1994). Overall, multidimensional subgrouping procedures have demonstrated more discriminating and predictive power than unidimensional procedures that are based only on dependence diagnosis, drinking behavior, or antecedent factors of drinking.

The Type A-Type B distinction (Babor et al., 1992) is a multidimensional model for identifying subgroups of dependent drinkers based on a statistical grouping procedure (k-means cluster analysis). This model has been used in numerous studies and has been found to be applicable among alcohol and drug dependent and non-dependent selected samples (e.g. Babor et al., 1992; Ball, 1996; Basu et al., 2004). Type A dependence is characterized by less familial risk, fewer physical and social consequences, milder dependence, less psychopathology, and a more favorable course following treatment. Greater familial alcohol problems, more severe alcohol dependence, polysubstance use, psychiatric comorbidity, and a more chronic course characterize Type B dependence. Carpenter et al. (ibid.) note that studies of the Type A-Type B distinction have demonstrated discriminate and predictive validity in treated alcohol dependent samples (Ball, 1996; Ball et al., 2000; Morgenstern et al., 1998; Schuckert et al., 1995) as well as in community samples of dependent substance abusers (Feingold et al., 1996). Therefore, the validity of the A- B distinction has held for both treated and untreated dependent populations.

Carpenter et al. (2006) investigated the Type A-Type B distinction in a community sample of problem drinkers as well as its predictive validity among problem drinkers with no history of dependence. The results demonstrated that the Type A-Type B dimensions have prognostic significance greater than those of an abuse diagnosis or the number of dependence symptoms. They maintain that by predicting differences in the onset of dependence among problem drinkers with no history of alcohol dependence, the distinction can be an important method for identifying a group of problem drinkers who may account for a relatively large proportion of those with alcohol problems.

Chung et al. (2005) point out that diagnostic criteria for alcohol use disorders (AUDs) were derived largely from clinical and research experience with adults, and have been applied to adolescents with no modification of the criteria or diagnostic thresholds. Although research generally supports the reliability and validity of diagnostic interviews with adolescents, research also indicates that certain symptoms, particularly tolerance and drinking more or longer than intended, may not be appropriately scaled or operationally defined for the developmental period of adolescence (Chung et al., 2005). Furthermore, the high yet variable prevalence of these symptoms has had a significant impact on estimates of AUD prevalence in teens. Multiple developmental trajectories of adolescent alcohol disorders have been found (e.g. Schulenberg et al., 2001) and have been characterized as developmentally limited or persistent, with problems that may be relatively continuous or intermittent (Zucker et al., 1994). Chung et al. (2005) conclude that a key issue for future research involves increased understanding of the course of AUDs in the context of developmental transitions, and other substance use and co-occurring psychopathology.

RESEARCH QUESTIONS/ DIRECTIONS

- Are abuse and dependence separate entities?
- Does abuse precede dependence more than dependence precedes abuse?
- How does amount and pattern of actual drinking relate to DSM symptoms and diagnoses?
- Should DSM definitions remain categorical or should a dimensional component be included in the revision?
- The discriminate and predictive validity of multidimensional sub-grouping procedures, particularly the Type A-Type B distinction should be investigated. Furthermore, the prognostic significance of the A-B distinction compared to the dimensional component of DSM should be investigated.
- Research should be undertaken aimed at increased understanding of the course of adolescent AUDs in the context of developmental transitions, and other substance use and co-occurring psychopathology.

C. GENETIC EPIDEMIOLOGY AND ALCOHOL

METHODOLOGICAL ISSUES

New strategies need to be developed for investigating the interactions between genes for alcoholism (and alcohol-related diseases) and environmental factors (Rutter et al, 2001, 2006; Rutter and Silberg, 2002). The Division of Epidemiology and Prevention research

should assist in the study and implementation of gene and environment interaction studies in several domains. A variety of environments (environmental candidates) have already been identified through behavior genetics research which influence the development of alcohol use disorders and related diseases (Bouchard and McGue, 2003). NIAAA is currently identifying likely gene candidates which will work in tandem with these environments (and vice-versa) to promote the development of alcohol dependence and predict responsiveness to treatment and recovery. Exposure to an environmental pathogen, whether behavioral or biological, may be conditional on both the genes regulating exposure and those genetic processes that are impacted directly by the presence of the pathogen (or triggering events such as sufficient parental care; Reiss et al., 1995; Rutter, 2005). Further conceptualization of the G x E interaction is necessary to move on to an appropriate measurement strategy (Almasy, 2003; Moffitt et al., 2005)

Gene-environment (GxE) interactions were previously thought to be rare for psychiatric illnesses such as alcoholism, but findings and models are now emerging which begin to detail potential G x E issues in the alcohol area (Boomsma and Martin, 2002; Rutter et al., 2006). These include findings from behavioral genetics centers and genetics studies that focus on identifying gene candidates for alcoholism through a variety of methods which also collect individual and environmental information. However, while there is a high level of curiosity about G x E interactions, and speculation about whether these interactive factors are significant as mediators of gene expression, there is still great uncertainty about how to proceed to best identify important interactions, document them in large population level data sets, and intervene to prevent significant environmental exposure to risky environments (Khoury et al., 2005). Several practical suggestions for current and future DEPR activities are outlined below.

Collaboration with ERGE Team

A plan of action is being developed in collaboration with the Etiology of Risk Gene and Environment Team (ERGE) which is also developing a request to form an advisory panel with significant representation of the area of genetic epidemiology. The focus of the genetic epidemiology will be on life course (longitudinal) developmental research issues and the role of G x E interaction/interplay in early onset drinking. This initiative will take advantage of current epidemiological data sets and those augmented with genetic information and employ a wide diversity of transdisciplinary approaches (Goldsmith et al., 2003)

Genetic epidemiology studies are needed to identify gene-environment interactions with environmental factors including lifestyle (smoking, diet, physical activity), medications, occupational exposures, and infectious diseases. Particularly challenging is the need to develop statistical methods for studying the multi-factorial origins of alcohol-use disorders and other alcohol-related outcomes. Gene-environment studies can help to target preventive efforts by identifying individuals at highest risk.

Secondary analysis of existing data can be informative on several levels. In datasets with genotypes, direct studies of gene-environment interaction can be undertaken. In datasets without genotypes, but with family history of alcoholism, clues about gene-environment

can be discerned. In studies without genotypes or family history, relationships between drinking, drinking patterns, and disease outcomes or biomarkers can identify important environmental agents that should be considered in datasets with genotypes or family history.

RESEARCH QUESTIONS/ DIRECTIONS

- Identify Highest Risk Individuals, Groups, and Environments: The individuals at highest risk for alcohol use disorders as a result of the interaction of predisposing vulnerabilities and exposure to environmental triggers need to be identified. This requires that all components of the G x E equation be measured accurately (Botto and Khoury, 2004). There needs to be a parallel procedure to gene sampling for assessing a variety of environments that may be important for the gene by environment perspective.
- Develop Conceptual and Statistical Models for Analysis of Large Longitudinal Cohort Datasets: Promote active management and analysis of large genetic epidemiologic datasets incorporating genetic association studies using traditional epidemiologic measures and collection of biologic samples. Such analyses would allow for varied designs, including prospective cohort or case-control studies and retrospective examination of environmental and gene by environment interaction effects (Davey Smith et al., 2005; Moffit et al., 2005).
- Individual and Family Genetic Counseling: Develop a counseling protocol appropriate for individuals with a high degree of familial risk. An important prevention intervention is the implementation of counseling for individuals at greatest risk for developing alcohol dependence.

VI. SPECIAL INITIATIVES: GRANTS* AND CONTRACTS†

In the preceding sections we have overviewed key issues of concern for the Division of Epidemiology and Prevention Research (DEPR). In this section, we briefly discuss a number of additional areas which NIAAA has already identified as priorities, through prior initiatives, through its research emphasis teams, through NIH set-asides, or through contracts for specific projects. These are discussed here so that the investment in these areas can be understood in the context of DEPR's entire portfolio and NIAAA's overall priorities.

A. COLLEGE DRINKING^{δ*}

BACKGROUND

The use of alcohol by college students is accepted by many as a rite of passage. Drinking is considered a normal, even expected, behavior among college students -- data from several national surveys indicate that about 80 percent of college students drink. Indeed, many freshmen come to college with an established pattern of drinking developed in high school and even middle school.

Since 1976, when NIAAA issued its first report on abusive drinking by college students, research advances have transformed our understanding of alcohol abuse and related problems. For example, we now know that a broad array of factors affect college student drinking behavior. These include an individual's susceptibility to alcohol, campus norms related to drinking, and conditions within the larger community that make alcohol readily accessible and fail to penalize inappropriate use. Together, these influences contribute to a culture of drinking that is more damaging and deadly than previously recognized.

MAGNITUDE OF THE PROBLEM

Despite the widespread acceptance of drinking on college campuses, alcohol-related tragedies never fail to create shock and generate calls for immediate action. High-risk drinking results in unnecessary deaths, serious injuries, assaults, and other health and academic problems. The consequences of excessive drinking affect virtually all college campuses, college communities, and college students, whether they choose to drink or not.

The fact that so many people other than drinking college students experience negative consequences from college student drinking underscores the need for colleges and

^δ The following is adapted from NIAAA's Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism. "A Call to Action: Changing the Culture of Drinking at U.S. Colleges" report.

surrounding communities to learn how to more effectively reduce these problems and act on that knowledge.

- **Death:** 1,700 college students between the ages of 18 and 24 die each year from alcohol-related unintentional injuries, including motor vehicle crashes (Hingson et al., 2005). One-half of people 18 – 24 who die in crashes involving alcohol are persons other than the drinking driver.
- **Injury:** 599,000 students between the ages of 18 and 24 are unintentionally injured under the influence of alcohol (Hingson et al., 2005).
- **Assault:** More than 696,000 students between the ages of 18 and 24 are assaulted by another student who has been drinking (Hingson et al., 2005).
- **Sexual Abuse:** More than 97,000 students between the ages of 18 and 24 are victims of alcohol-related sexual assault or date rape (Hingson et al., 2005).
- **Unsafe Sex:** 400,00 students between the ages of 18 and 24 had unprotected sex and more than 100,000 students between the ages of 18 and 24 report having been too intoxicated to know if they consented to having sex (Hingson et al., 2002).
- **Academic Problems:** About 25 percent of college students report academic consequences of their drinking including missing class, falling behind, doing poorly on exams or papers, and receiving lower grades overall (Engs et al., 1996; Presley et al., 1996a, 1996b; Wechsler et al., 2002).
- **Health Problems/Suicide Attempts:** More than 150,000 students develop an alcohol-related health problem (Hingson et al., 2002) and between 1.2 and 1.5 percent of students indicate that they tried to commit suicide within the past year due to drinking or drug use (Presley et al., 1998).
- **Drunk Driving:** 2.8 million students between the ages of 18 and 24 drove under the influence of alcohol last year (Hingson et al., 2005).
- **Vandalism:** About 11 percent of college student drinkers report that they have damaged property while under the influence of alcohol (Wechsler et al., 2002).
- **Property Damage:** More than 25 percent of administrators from schools with relatively low drinking levels and over 50 percent from schools with high drinking levels say their campuses have a “moderate” or “major” problem with alcohol-related property damage (Wechsler et al., 1995).
- **Police Involvement:** About 5 percent of 4-year college students are involved with the police or campus security as a result of their drinking (Wechsler et al., 2002) and an estimated 110,000 students between the ages of 18 and 24 are

arrested for an alcohol-related violation such as public drunkenness or driving under the influence (Hingson et al., 2002).

- **Alcohol Abuse and Dependence:** 31 percent of college students met criteria for a diagnosis of alcohol abuse and 6 percent for a diagnosis of alcohol dependence in the past 12 months, according to questionnaire-based self-reports about their drinking (Knight et al., 2002).

TRENDS

Several of the consequences cited above have shown changes over time. The following are data as reported in 2002 compared with data as reported in 2005:

| | <u>2002</u> | <u>2005</u> |
|---|-------------|-------------|
| • Deaths (per year) | 1400 | 1700 |
| • Injuries (per year) | 500,000 | 599,000 |
| • Assaults (per year) | 600,000 | 696,000 |
| • Sexual Abuse (per year) | 70,000 | 97,000 |
| • Drunk Driving (per year) | 2.1 million | 2.8 million |

POPULATIONS AT RISK

The proportion of college students who drink varies depending on where they live. Drinking rates are highest in fraternities and sororities, followed by on-campus housing (e.g., dormitories, residence halls) (Presley et al., 1996a, 1996b; Wechsler et al., 1998, 2000b). Students who live independently off-campus (e.g., in apartments) drink less, while commuting students who live with their families drink the least (O’Hare, 1990; Wechsler et al., 2002).

A number of environmental influences working in concert with other factors may affect students’ alcohol consumption (Presley et al., 2002). Colleges and universities where excessive alcohol use is more likely to occur include schools where Greek systems dominate (i.e., fraternities and sororities), schools where athletic teams are prominent, and schools located in the Northeast (Presley et al., 1996a, 1996b; Wechsler et al., 1996, 1997, 1998, 2000b; Werner and Greene, 1992).

Some first-year students who live on campus may be at particular risk for alcohol misuse. During their high school years, those who go on to college tend to drink less than their non-college-bound peers. But during the first few years following high school, the heavy drinking rates of college students surpass those of their non-college peers, and this rapid increase in heavy drinking over a relatively short period of time can contribute to difficulties with alcohol and with the college transition in general (Schulenberg et al., 2001). Anecdotal evidence suggests that the first 6 weeks of enrollment are critical to first-year student success. Because many students initiate heavy drinking during these early days of college, the potential exists for excessive alcohol consumption to interfere

with successful adaptation to campus life. The transition to college is often so difficult to negotiate that about one-third of first-year students fail to enroll for their second year (Upcraft, 2000).

- **Students who Drink the Most** (Johnston et al., 2001; Meilman et al., 1994, 1999; Presley et al., 1996a, 1996b; Wechsler et al., 1996, 1997, 1998, 2000b):
 - Males
 - Whites
 - Members of fraternities and sororities
 - Athletes
 - Some first-year students

- **Schools Where the Least Amount of Drinking Occurs** (Meilman et al., 1995; Presley et al., 1996a, 1996b; Wechsler et al., 2000b):
 - 2-year schools
 - Religious schools
 - Commuter schools
 - Historically Black Colleges and Universities (HBCUs)

RESEARCH PROGRESS

New techniques have enabled researchers to compare alcohol-related problems in large groups of college students and their non-college peers and to map the extent of these problems, nationally and regionally. With this information, researchers can determine how new laws and policies, alcohol-prevention programs, and trends in the general population affect drinking patterns among college students and their non-college peers.

Research shows that a number of personal factors, from family background to alcohol use during high school, influence college students' drinking patterns. And as discussed previously, additional factors in the college environment contribute to drinking patterns; for example, membership in fraternities and sororities, sports teams, or other social groups and college organizational factors such as size, location, and number of commuter students.

In April 2002, NIAAA issued a major report on college drinking: *A Call to Action: Changing the Culture of Drinking at U.S. Colleges*. This report was developed by the NIAAA-supported Task Force on College Drinking, a group consisting of college presidents, researchers, students, and NIAAA staff. The report describes new understandings of dangerous drinking behavior by college students and the consequences for both drinkers and non-drinkers.

To provide practical assistance to colleges and universities, the Task Force developed a series of recommendations on integrating research-based principles and practices in alcohol program planning. The Task Force also prepared recommendations specifically for researchers and NIAAA on the direction of future research and areas for potential

collaboration with colleges and universities. All recommendations were based on scientific evidence and represent the most objective guidance available on preventing risky drinking by college students.

3-in-1 Framework

The research strongly supports the use of comprehensive, integrated programs with multiple complimentary components that target: (1) individuals, including at-risk or alcohol-dependent drinkers, (2) the student population as a whole, and (3) the college and the surrounding community (Hingson and Howland, 2002; DeJong et al., 1998; Institute of Medicine, 1989). The *3-in-1 Framework* focuses simultaneously on each of the three primary audiences and is designed to encourage consideration of multiple stakeholders, both on and off campus.

Task Force Recommendations

The Task Force identified four categories (tiers 1-4) of prevention strategies. **Tier 1** strategies are those with evidence of effectiveness among college students: combining cognitive-behavioral skills with norms clarification and motivational enhancement interventions; offering brief motivational enhancement interventions; and challenging alcohol expectancies. **Tier 2** strategies are those with evidence of success with general populations that could be applied to college environments: increased enforcement of minimum drinking age laws; implementation, increased publicity, and enforcement of other laws to reduce alcohol-impaired driving; restrictions on alcohol retail outlet density; increased prices and excise taxes on alcoholic beverages; responsible beverage service policies in social and commercial settings; formation of a campus and community coalition involving all major stakeholders may be critical to implement these strategies effectively. **Tier 3** strategies are those with evidence of logical and theoretical promise, but require more comprehensive evaluation: adopting campus-based policies and practices that appear to be capable of reducing high-risk alcohol use; increasing enforcement at campus-based events that promote excessive drinking; increasing publicity about and enforcement of underage drinking laws on campus and eliminating “mixed messages;” consistently enforcing disciplinary actions associated with policy violations; conducting marketing campaigns to correct student misperceptions about alcohol use; provision of “safe ride” programs; regulation of happy hours and sales; informing new students and their parents about alcohol policies and penalties before arrival and during orientation periods. **Tier 4** strategies are those with evidence of ineffectiveness: informational, knowledge-based, or values-clarification interventions about alcohol and the problems related to its excessive use, when used alone; providing blood alcohol content feedback to students.

Since the 2002 NIAAA report, several additional studies have reported positive benefits of individually-oriented screening and brief intervention (Larimer et al, in review). Two studies have identified reductions in drinking and alcohol-related problems specifically among college students associated with the implementation of comprehensive college/community programs focused on environmental strategies to reduce alcohol availability and violation of drinking driving statutes (Weitzman et al, 2004; Clapp et al, 2005).

Rapid Response to College Drinking Problems

In December 2002, NIAAA issued an RFA AA-03-008: “Research Partnership Awards for Rapid Response to College Drinking Problems.” The purpose of this RFA was to provide a mechanism for developing and conducting research requiring rapid funding to address unexpected and time-sensitive research opportunities for college campus drinking projects. This RFA was aimed at established alcohol research scientists with expertise in college drinking who could serve as resources for college and university administrators experiencing alcohol-related problems on their campuses. Five (5) U01 grants were awarded in September 2003. Each grant is for up to 5 years and provides up to \$500,000 per year in direct costs.

In June 2003, NIAAA issued a companion solicitation: PAR-03-133; “Rapid Response to College Drinking Problems.” This PAR was intended to support studies of services or interventions that could capitalize on “natural experiments” (e.g., unanticipated adverse events, policy changes, new media campaigns, formation of campus-community coalitions, etc.). The intended applicants for this PAR were college administrators who saw an urgent need to quickly address an alcohol-related problem on their campuses. Fifteen (15) U18 grants were awarded between September 2004 and September 2005. Each grant is for up to 3 years and provides up to \$200,000 per year in direct costs.

The key feature of the rapid response program is that each U18 college grantee is required to partner with a U01 researcher grantee. Together, these pairs, working with NIAAA Scientific Staff Collaborators, jointly design, develop, implement, and evaluate college drinking projects on the U18 campuses.

These projects include individually-focused strategies and environmentally-focused strategies. For example: protective influence of Residential Learning Communities, peer-facilitated alcohol interventions, campus-community coalitions, peer-led motivational enhancement with freshman women, freshman parent-student initiative, fraternity and sorority interventions, alcohol screening and interventions in a college health clinic, reducing high-risk drinking among first-year students, a University Assistance Program, intervention for freshman violators, social norms program, and reducing high-risk drinking among students celebrating their 21st birthday.

In addition to the 5 U01 grants and the 15 Rapid Response grants, NIAAA is supporting 32 other grants examining college drinking and prevention. These are administered by DEPR.

RESEARCH QUESTIONS/ DIRECTIONS

- How does alcohol use in college influence academic trajectories? What are the effects of different drinking patterns on test performance? What is the effect of excessive alcohol consumption on the developing brain?
- What are the barriers to screening and counseling among college and underage individuals? How can screening and brief intervention be expanded to reach a

majority of college students with alcohol use disorders and be more effective in reducing those problems? What is the impact of programs to reduce these barriers on students who need alcohol counseling? Will this yield population level reductions in binge drinking and alcohol-related problems?

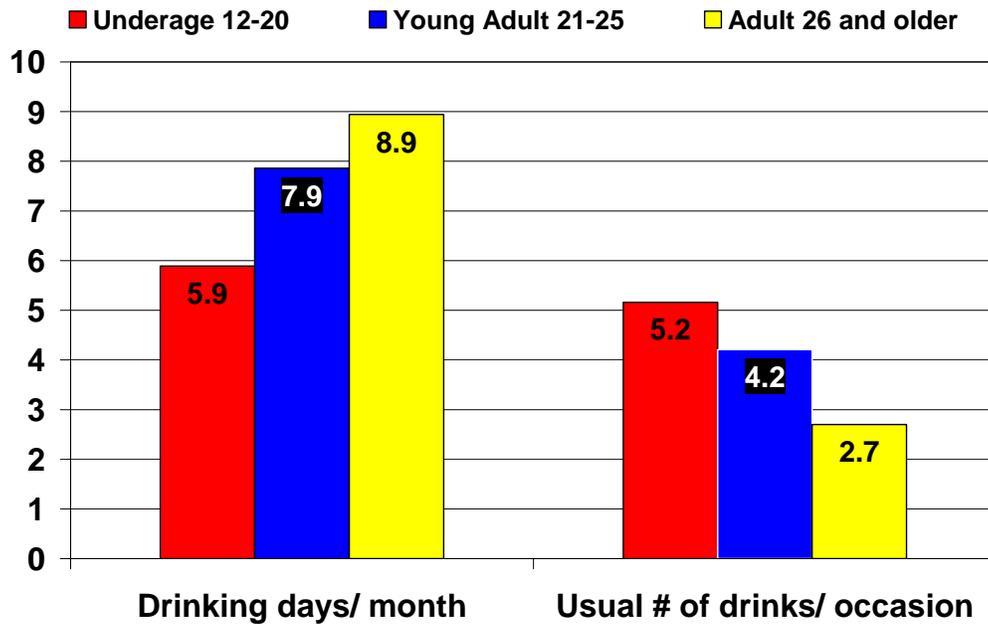
- Are interventions that combine environmental prevention initiatives with efforts to increase screening, brief interventions, and treatment more effective in reducing college drinking problems than programs that focus only on a single approach?
- What are the most effective environmental prevention initiatives to reduce college drinking problems? (e.g. substance-free dorms, parental notification of alcohol problems, reinstatement of Friday classes, alcohol advertising bans on college property and in publications, and amnesty for reporting alcohol problems).
- How can students who are concerned about college drinking problems at their universities be identified and given an opportunity to help plan and implement strategies to reduce these problems, including the second-hand effects of drinking? How effective are these strategies in reducing alcohol-related problems?
- How can parents be most effectively enlisted in efforts to reduce college drinking problems?
- Can consortia of schools be effective in addressing college drinking problems? Is there value in identifying strategies that can be effective across multiple settings? Will findings from groups of schools have an impact on changing other schools' policies and practices?

B. UNDERAGE DRINKING*

A SERIOUS AND WIDESPREAD PROBLEM

Alcohol is the drug of choice among youth. Data from the 2005 Monitoring the Future (MTF), an annual survey of U.S. youth, show that more than three-fourths of 12th graders, nearly two-thirds of 10th graders, and more than two-fifths of 8th graders have consumed alcohol at some point in their lives. And when youth drink, they tend to drink heavily. Underage drinkers consume on average four to five drinks per occasion about five times a month. By comparison, adult drinkers ages 26 and older consume on average two to three drinks per occasion about nine times a month (Figure 9).

Figure 9
Adolescents Drink Less Frequently Than Adults, but Drink More Per Occasion



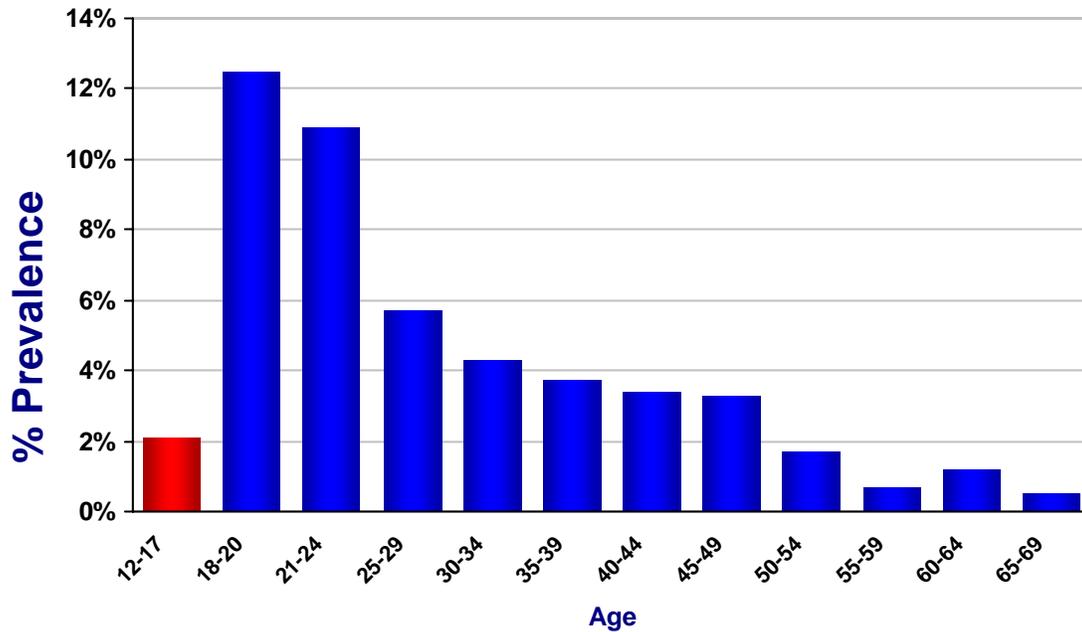
Number of Drinking Days per Month and Usual Number of Drinks per Occasion for Youth (12-20), Young Adults (21-25) and Adults (26 and older).

Source: U.S. Substance Abuse and Mental Health Services Administration. 2004 National Survey on Drug Use and Health (NSDUH)

A particularly worrisome aspect of underage drinking is the high prevalence of heavy episodic drinking, defined as drinking five or more drinks in a row (or five for boys and four for girls depending on the survey) in the past two weeks (or thirty days depending on the survey). MTF data show that more than 10 percent of 8th graders, 20 percent of 10th graders, and 25 percent of 12th graders engage in heavy episodic drinking. Underage drinking can result in a range of adverse short-and long-term consequences, including academic and/or social problems; physical problems such as hangovers or illnesses; unwanted, unintended, and unprotected sexual activity; physical and sexual assault; memory problems; increased risk of suicide and homicide; alcohol-related car crashes and other unintentional injuries such as burns, falls, and drownings; and death from alcohol poisoning (NIAAA, 2004/2005).

Recognizing the seriousness of the problem, NIAAA has designated underage drinking as a research priority area. In addition, the convergence of a number of developments contributes to the timeliness of this research focus. First, new findings from NIAAA-supported research indicate that the kind of serious drinking problems previously associated with middle adulthood (including what has been called alcoholism) often begin to emerge during adolescence and young adulthood (Figure 10).

Figure 10
 18-24 Year Olds Have the Highest Prevalence of DSM-IV Alcohol Dependence



Prevalence of Past-Year DSM-IV Alcohol Dependence – U.S.

Source: National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) 2001-2002

These findings, and other results that enhanced our understanding of alcohol consumption during adolescence, have led to a reconceptualization of alcohol dependence within a developmental framework. Second, accumulating neurobiological research suggests that adolescence may be a period of particular vulnerability to the effects of alcohol. Third, the National Research Council and Institute of Medicine report, *Reducing Underage Drinking: A Collective Responsibility*, emphasized the dangers of underage drinking, even when the level of drinking falls short of a diagnosable condition. And finally, Congress established the Interagency Coordinating Committee on Preventing Underage Drinking (ICCPUD) further underscoring the importance of the problem. NIAAA provides the scientific foundation for ICCPUD.

UNDERAGE DRINKING AND DEVELOPMENT

Pervasive drinking by youth and the emergence of alcohol misuse and dependence in late adolescence, are intertwined with developmental processes. Significant changes occur in the body over the course of adolescence, including hormonal alterations, and the formation and pruning of neural networks in the brain. Adolescence is also a time of

heightened emotions, increased risk taking, and trying new experiences and activities that emphasize socializing with peers and conforming to peer-group standards. This confluence of factors may place young people at particular risk for initiating and escalating alcohol consumption. The overarching goal of NIAAA's initiative on underage drinking is to enhance understanding of alcohol-related problems by approaching them in a developmental framework and to intensify research, evaluation, and outreach efforts to address this important public health problem which affects our Nation's young people.

THE WORK OF THE TEAM AND ITS ADVISORS

About two years ago the Underage Drinking Team recruited a Steering Committee of expert advisors in order to help it accomplish its goals. This interdisciplinary group of advisors includes experts on adolescent alcohol use and problems, on overall adolescent development, and on policy and communications. The Steering Committee has met with the Underage Team three times over the past two years to advise the team as it formulates its research priorities. The priorities that emerged include: a better understanding of adolescent decision making, the effect of alcohol on the developing brain, and the special case of very early initiators.

To date, the team has published a special issue of Alcohol Research and Health entitled "Alcohol and Development in Youth: A Multidisciplinary Overview," issued an RFA entitled "Underage Drinking: Enhancing Healthcare System Responses for which the awards will be made this summer, and participated in a NIDA RFA addressing substance use and the developing brain (two NIAAA awards were made). In addition, working groups of the Steering Committee have produced drafts of three age specific (under 10, 10-15 and 16-20) reports which will form the basis of a developmentally focused report on underage drinking. The work of the team has also provided the scientific foundation for the upcoming Surgeon General's Call to Action on Underage Drinking. For further information about the Initiative please go to the following web address:
<http://www.niaaa.nih.gov/AboutNIAAA/NIAAASponsoredPrograms/underage.htm>.

UNDERAGE DRINKING AND THE DIVISION OF EPIDEMIOLOGY AND PREVENTION RESEARCH

The work of the Underage Team and the Division are closely linked. Many of the studies funded by NIAAA that focus on underage alcohol consumption, in particular, epidemiologic studies of risk and protection, and prevention trials, are in the portfolio of this Division.

C. AIDS*

OVERVIEW OF HIV/AIDS PREVENTION ACTIVITIES FOR NIH

"The human immunodeficiency virus (HIV), the cause of AIDS, has now infected more than 65 million people worldwide, of whom 25 million have died, according to estimates

of the Joint United Nations Programme on HIV/AIDS (UNAIDS). AIDS is the deadliest pandemic of our generation and one of the worst in history. In the year 2005 alone, approximately 4.1 million people worldwide, half of them women, became infected with HIV, and about 2.8 million individuals with HIV/AIDS died. More than 95 percent of these infections and deaths occurred in developing countries, most of which are also burdened by other significant health challenges. In these nations, HIV/AIDS threatens not only human welfare, but social, political and economic stability as well.

In the United States, an estimated one million people are living with HIV infection, and 40,000 new infections occur each year. HIV infection rates continue to climb among women, racial and ethnic minorities, young homosexual men, individuals with certain addictive disorders and people over 50 years of age. To date, HIV/AIDS has killed more than half a million people in our country.

The magnitude of the HIV/AIDS pandemic requires a robust, multi-faceted and sustained global response from all sectors of society. At the U.S. National Institutes of Health (NIH), we are committed to accelerating the research that will help end the scourge of HIV/AIDS. The NIH effort represents the largest public investment in HIV/AIDS research anywhere in the world. In fiscal year 2006, \$2.9 billion has been appropriated for NIH AIDS-related research. The resources devoted to HIV/AIDS research by our many partners in the research enterprise also have been significant.”

Statement of Elias A. Zerhouni, M.D., Jack Whitescarver, Ph.D., and Anthony S. Fauci, M.D., National Institutes of Health on The 25th Anniversary of the First Published Reports of AIDS (<http://www.nih.gov/news/pr/jun2006/niaid-01.htm>)

Alcohol and HIV/AIDS

To respond to the AIDS pandemic, the NIAAA in conjunction with NIH has developed a biomedical and behavioral research program to better understand the basic biology of HIV, develop effective therapies to treat and control HIV disease, and design interventions to prevent new infections from occurring in alcohol using, abusing and dependent individuals. The FY 2006 and FY2007 research agenda continues the following over-arching themes: research to prevent and reduce HIV transmission; research to test the impact of therapies for those who are already infected; international research, particularly to address the pandemic in developing countries; and biomedical and behavioral research targeting the disproportionate impact of AIDS on minority populations in the United States.

SCOPE OF RESEARCH WITHIN DEPR: A SUMMARY

The alcohol and AIDS area has a separate but overlapping mandate with the Division of Epidemiology and Prevention Research within NIAAA. The prevention and treatment of HIV/AIDS includes the study of the epidemiology of risk factors including alcohol use, abuse, and dependence which contribute to HIV infection, disease manifestation, clinical

decision making, and interventions to prevent transmission. These areas will be only briefly described here because of their separate research objectives generally outlined in the NIH Plan for HIV/AIDS Research, their separate funding status, and plans for separate Extramural Advisory Board review activity in the future. Currently NIAAA funds approximately 60 grants broken down within the areas of Epidemiology (11), Primary Prevention (29) and Basic Behavioral Research for HIV/AIDS (21). Each of these areas represents a substantive focus for alcohol and AIDS activities at NIAAA with cross-cutting implications for special populations of minorities, youth, women, gay men, and other special populations.

INDEPENDENT EXTRAMURAL ADVISORY BOARD FOR HIV/AIDS

An Extramural Advisory Board meeting to discuss strengthening Alcohol and AIDS biomedical research is planned for October. This meeting will not directly address behavioral prevention issues present in the applications within DEPR. It is expected that an additional meeting(s) focusing on Alcohol and AIDS Prevention Science Initiatives will be targeted for FY2007 and FY2008.

EPIDEMIOLOGICAL GOALS

Surveys and qualitative studies of the general population provide information on levels of infection among alcohol users and their partners, culturally-related risk factors for HIV transmission, and information on appropriate venues in which to implement alcohol and HIV prevention strategies. In addition, clinical epidemiological samples of AIDS patients contribute greatly to our knowledge of how HIV+ individuals with alcohol use disorders manifest the disease-related consequences of chronic and acute infection. These epidemiological studies inform prevention researchers and clinicians about screening, diagnosis, and treatment of HIV+ individuals. Two clinical cohorts of HIV+ alcohol dependent individuals and matched case controls which support alcohol and AIDS research are of note, The Veteran's Aging Cohort Study in collaboration with the Veteran's Administration (VACS) and the HIVLIVE, an earlier clinical cohort based in the Boston area. Both have been productive in identifying both behavioral and biomedical issues for these populations in the context of the changing epidemic and treatment availability.

NIAAA supports approximately 11 grants in the combined area of Natural History and Epidemiology for a total cost of 1.2 million dollars.

PREVENTION GOALS

Behavioral prevention issues for alcohol and AIDS research are also represented within the portfolio of DEPR. These prevention issues are divided primarily into two areas. First those applications which examine how levels of alcohol use and the psychological and social processes impacted by alcohol use make individuals more likely place themselves at risk for HIV infection through sexual risk taking and to a lesser extent by combining alcohol and IV drugs. This focus informs primary prevention activities through schools,

educational programs, bars, peer influence, modifications of drinking environments, server training and safer sex messages, and general public health campaigns targeted at high-risk communities. New interventions are being proposed which focus on social and structural factors which have been successfully used to avert or reduce levels of infection in specific targeted populations particularly international populations (military, sex workers, etc). These Alcohol and AIDS prevention activities which have proved to be successful are being translated through the Presidential Emergency Plan for AIDS Relief (PEPFAR) into broadly disseminated interventions.

NIAAA supports approximately 29 grants in the area of Preventive Interventions for both domestic and international populations with a special emphasis on women and minorities for a total of 10.7 million dollars. In addition, 21 grants are supported in the Basic Behavioral Sciences area for 4.5 million dollars.

There are three distinct alcohol and HIV/AIDS prevention goals:

Primary Prevention

The first goal is to develop preventive interventions targeted at “at-risk” populations and consist of primary prevention for uninfected individuals who misuse alcohol either as a result of hazardous or harmful consumption or as a result of participation in high risk social networks or venues such as bars. These programs focus on adolescents, youth, women, gay men and other special populations impacted by drinking and risk for HIV. Interventions include brief motivational counseling, testing and screening, and cognitive behavioral, group, social, and structural interventions through changes in policies. For example, understanding the role of bar-based culture for gay men was critical in the development of effective interventions by “opinion leader.” These interventions are based on the use of social diffusion of innovation theory and provide public health messages and interventions focused on safer sex and condom distribution. However, these interventions do not directly take into account the impact of past and current alcohol consumption on judgment and decision-making processes. Improved interventions are being proposed to directly address the effects of alcohol.

Basic Behavioral Science

The second focus is on developing the theoretical underpinnings for intervention research through the identification of risk factors and risk processes that may occur at the individual, group or environmental - structural level contexts. Theoretical frameworks are evolving to take into account alcohol-specific theories such as cognitive narrowing, “alcohol myopia”, decisional balance, sexual expectancy, and physiological arousal. Future workshops and conferences are planned to increase this “theory to practice” relationship and increase intervention effectiveness. Further development and pairing of theory-based interventions with specific settings, situations, and multilevel interventions will increase the benefits of alcohol-specific theories.

Preventing Negative Consequences of Infection

The third focus is on preventing the negative consequences of HIV infection and AIDS treatment. AIDS is now being treated as a chronic disease in many countries where anti-

retrovirals are readily available. However, stigmatization continues to have a negative impact on the access and availability of treatment, and subsequently the quality of patients' life. Interventions have been characterized by screening for HIV and early intervention to change the course of the disease. In general, alcohol users who are HIV+ are not easily recruited or retained in interventions and often show up later in the course of their disease (with more medical complications) than those without alcohol problems. The avoidance of medical interventions for their HIV has multiple consequences from the point of view of treatment and coinfection. Subsequently, secondary prevention for both non-adherence to medication regimens and resulting disease progression, and sexual risk behavior that often escalates around relapse to alcohol use can be targeted by both behavioral and pharmacological interventions. The difficulty of addressing multiple needs in these populations (which often includes homelessness and psychiatric comorbidity) and the need for alcoholism treatment and relapse prevention is quite evident.

Addressing DEPR Themes: Four areas of complimentary research:

1) Measurement issues: Event Level and Social Outcomes

Measurement of alcohol consumption is important in establishing past and present host response to potential infection events. This requires not only the accurate measurement of alcohol quantity and frequency (e.g. where the alcohol is "home brew" and of unknown alcohol content as is often encountered in international settings), but also the proximity of the alcohol use to a specific sexual or needle use activity that results in infection. It remains important to understand the causal links between risk behavior and infection events that are mediated by cognitive processes such as "alcohol myopia" or physiological disinhibition. These relationships also extend to biological processes such as impaired host immunity or viral shedding, which may impact susceptibility and infectivity respectively.

These broader dimensions around disease transmission need to be integrated into models that estimate total population costs (and benefits) for differential rates of transmission of disease and disease progression among alcohol users. As therapeutics become more effective among individuals without alcohol use disorders, the potential benefits increase for these individuals. These individuals may live up to an additional 30 years after infection with adequate treatment. However, recent research has shown that the direct effects of hazardous drinking may reduce life expectancy by 6-12 years and that any drinking may be risky and result in treatment failure and premature mortality (Braithwaite et al., 2005).

2) Nutrition among HIV+ Alcohol Abusing Pregnant Women

Nutritional status remains an important mediator of HIV treatment outcome. In most developing countries where anti-retrovirals (ARVs) are being offered an additional nutritional package of vitamins (micronutrients) and food are being offered to boost the effectiveness of ARVs. Research on nutrition among alcohol users, and potentially HIV+ alcohol users, indicates that there may be specific nutritional deficits and organ damage (liver) that needs to be ameliorated prior to delivery of a full course of potentially

hepatotoxic ARVs. A specific subset of these impacted HIV+ Alcohol dependent group, pregnant women, may need special attention relative to short-course niverapine interventions for prevention of Mother to Child Transmission. FAS research is being expanded in South Africa to begin to address this need to more fully understand maternal and fetal outcomes in this targeted group.

3) Structural Interventions

The need for interventions targeted at levels beyond the individual have clearly been recognized. In the past these interventions have examined dyadic (partner) and group level (social network) domains. High social, ecological, and economic levels of influence need to be examined and preventive interventions developed to impact these structural characteristics. Research clearly shows the importance of access and availability of alcohol as a contributing factor to the spread of sexually transmitted infections (STIs). Changes in density of liquor outlets and taxation impact the rates of gonorrhea in the US. Increasing density leads to higher rates while increasing taxation and reduction in availability of inexpensive alcohol leads to reduced rates of infection. Similar findings are expected for HIV particularly in resource poor settings with limited regulation of alcohol sales and distribution. This research calls for multilevel interventions to moderate the impact of alcohol on the spread of STIs including HIV with a particular focus on venue-based interventions. In addition, policies need to be developed and enforced for the sale of alcohol in regions with regard to both cultural and socioeconomic impact. The Special Presidential Initiative Outlined below is one such preventive intervention approach being put into place as a translational research activity in specific regions of Africa.

4) Special Presidential Prevention Initiative

Interventions to Reduce Alcohol-Related Sexually Transmitted HIV Infection in High Risk Venues in Africa for consideration under the Special Initiative on Alcohol, Presidential Emergency Plan for AIDS Relief (PEPFAR)

This preventive intervention focus is currently being coordinated with the President's Emergency Plan for AIDS Relief to Africa. This is the extension meeting in Tanzania, Dar es Salaam (August 2005) with the White House Office of the Global AIDS Coordinator (OGAC); 2) DHHS: a) CDC; b) SAMHSA; 3) USAID; 4) DoD in which NIAAA (Kendall J. Bryant, Ph.D. and Deidra Roach, M.D.) provided technical assistance for the development of FY 06 Country Operational Plan and Country Assistance Plans to African nations that receive funds under the President's Emergency Plan for AIDS Relief (PEPFAR). Specifically, the technical assistance addressed the rationale and recommended approaches to incorporate alcohol-related HIV risk reduction strategies in these plans. The alcohol and AIDS plan is being developed further with support from the OGAC.

Proposed Program Design and Implementation. High-risk venues provide opportunities for intervening with a range of public health, evidence-based, low-cost feasible interventions that can reach high risk populations and enable them to reduce their risk taking behaviors and potential for transmission of HIV.

This program will identify multiple sites in Africa where heavy alcohol use has been documented in conjunction with HIV prevalence. The program will focus on venue-based interventions that can be implemented across a variety of sites and among appropriate target populations. Money for this activity has been set aside by the Global AIDS coordinator to be integrated into country operational plans for targeted sites (approximately \$3 million, FY 2007).

Implementation of this program in each site will include the following:

- 1) Identification of specifically targeted high risk populations (e.g. transport workers, commercial sex workers, deployed military personnel) who engage in alcohol-related sexual risk behaviors that increase their risk of acquiring HIV (e.g. multiple partners, concurrent sexual partners, failure to use condoms correctly and consistently).
- 2) Identification, description and mapping of high risk venues (bars, shabeens, or other formal or informal drinking establishments) suitable for implementation of interventions. The general context, social dynamics, and timing of alcohol consumption and HIV risk behaviors among the population should be described and understood.
- 3) Engagement and involvement, as appropriate, of key stakeholders (e.g. NGOs, local health and social service providers, community leaders) in the community with an interest in reducing alcohol-related, sexually transmitted HIV.
- 4) Training and education on alcohol-related HIV risk reduction for bar-based personnel, including bar owners and managers, servers such as bartenders or “beer girls,” and other related personnel, such as brothel managers or procurers for commercial sex workers, who interact with the target populations and are in a position to influence drinking and sexual behaviors.
- 5) Development and delivery of appropriately tailored interventions for the identified target populations. Interventions should include messages regarding alcohol and the potential for increased HIV risk, appropriate HIV prevention messages and skills-based training for behavioral risk reduction, and distribution of condoms in high risk settings.
- 6) Depending upon the local cultural context and capacity for delivering such interventions, a range of different models may be appropriate. Interventions may include KIE (knowledge, information, education) or social marketing of condom campaigns as well as group or community-level social network or diffusion of innovation behavioral interventions.

Feasibility. Feasibility of this intervention program is high if sites are successful in recruiting and engaging those members of the community who profit from the sale and consumption of alcohol, namely bar owners and personnel. Sites should also have the organizational capacity to add the alcohol component to existing HIV prevention program activities. Each program should be a PEPFAR funded program. The focus should be on interventions that address reduction of HIV-related risk behaviors that take

place within the context of drinking. Interventions should also address the issue of alcohol as it relates to adherence to treatment for HIV. Interventions for HIV requiring the support of owners and managers have been carried out successfully in high risk venues in the US; for example, in bars and bathhouses frequented by males seeking males (MSM), and in brothels and drinking establishments in Southeast Asia.

Impact. Outcome measures can be behavioral in terms of movement to action, attitude change, or service utilization (getting tested for HIV, STDS). Measures can also include specific alcohol-related outcomes such as unprotected sexual intercourse with casual partners, negotiated safety, and the proportion who knew their own and their partner's HIV status. Biomarkers such as measures of STIs can also be used.

D. ALCOHOL POLICY INFORMATION SYSTEM†

The Alcohol Policy Information System (APIS) contract (N01AA12009) supports NIAAA by encouraging and facilitating research on the effects and effectiveness of alcohol-related public policies by providing researchers with:

- authoritative, detailed, and comparable information on alcohol-related policies, including the dates on which they became effective;
- user-searchable access to policy information through a public web site; and
- information at several levels of detail, including charts, maps, summaries and full text of laws

The contract was awarded to the CDM Group, Inc. in September 2001 with effective dates of 14 September 2001 to 13 September 2006. The budget for FY 2005 was \$1,491,595.

A separate advisory committee of public policy researchers and academic legal experts has been formed to provide oversight, evaluation and advice to NIAAA regarding APIS and future plans after September 2006. Particular focus will be placed on stimulating expansion of use of the system by alcohol policy researchers.

The main product of the APIS project is information on alcohol-related public policies provided through a public web site. The APIS web site provides user-searchable access to alcohol-related policy information at several levels of detail (up to and including the full texts of laws and regulations). Specific policy topics to be covered through APIS were selected on the basis of: 1) public health significance; 2) research salience; 3) recent or anticipated policy-making activity; 4) relatively straightforward legal research requirements for adequate characterization; and 5) diversity in terms of the topic areas addressed.

The contractor's responsibilities include the following major tasks, each incorporating rigorous quality assurance procedures to ensure the utility, reliability, and integrity of the system and its various components:

- (1) performing legal research and related tasks to identify and acquire accurate and detailed information documenting the status of alcohol-related public policies adopted at the Federal and State levels and changes to those policies (including the dates on which policy changes became effective);
- (2) developing summary indicators, measures, and variables to characterize alcohol-related policies in ways that facilitate comparisons of policies across jurisdictions and/or over time;
- (3) establishing and managing appropriate electronic data storage systems for maintaining APIS policy information (including all related descriptions and variables and relevant portions of the full-text of statutes and regulations) to facilitate search and retrieval of policy information by a variety of flexible criteria as required to operate and maintain the APIS;
- (4) designing, developing, operating, maintaining, and updating of the APIS web site to provide users with searchable access to APIS policy information (<http://alcoholpolicy.niaaa.nih.gov>);
- (5) devising suitable display formats to represent policy characteristics and variation through the APIS web site; and
- (6) responding to inquiries and providing technical assistance to users of APIS information.

As a unique research resource, the APIS has been developed “from scratch” under the present contract, with no closely analogous model available. Plans for establishing a successor contract are currently underway.

APIS Policy Topics – The centerpiece of APIS's services for researchers is the detailed information provided for each of the 36 APIS policy topics. A list of current APIS policy topics has been shown previously in Table 3 (page 68 in the Alcohol Policy section).

For each APIS policy topic, structured information is provided in the following categories:

Policy Description – a brief narrative description of the features and importance of the policy topic

Definitions – where needed, definitions for specialized terms used in the description and documentation of the policy topic

Explanatory Notes and Limitations – detailed notes identifying specific issues that affect the documentation and interpretation of policy information (the inclusion of these notes is one feature that distinguishes APIS policy information from most other sources of information on specific policies)

Variables – definitions for the specific variables (i.e., policy attributes) used to characterize the status of a State’s policy in the area defined by the policy topic

Federal Law – a brief narrative summary of Federal laws pertaining to the policy topic, followed by excerpts of relevant sections of statutory and regulatory codes

Selected References – a short list of relevant Federal publications pertaining to the policy topic.

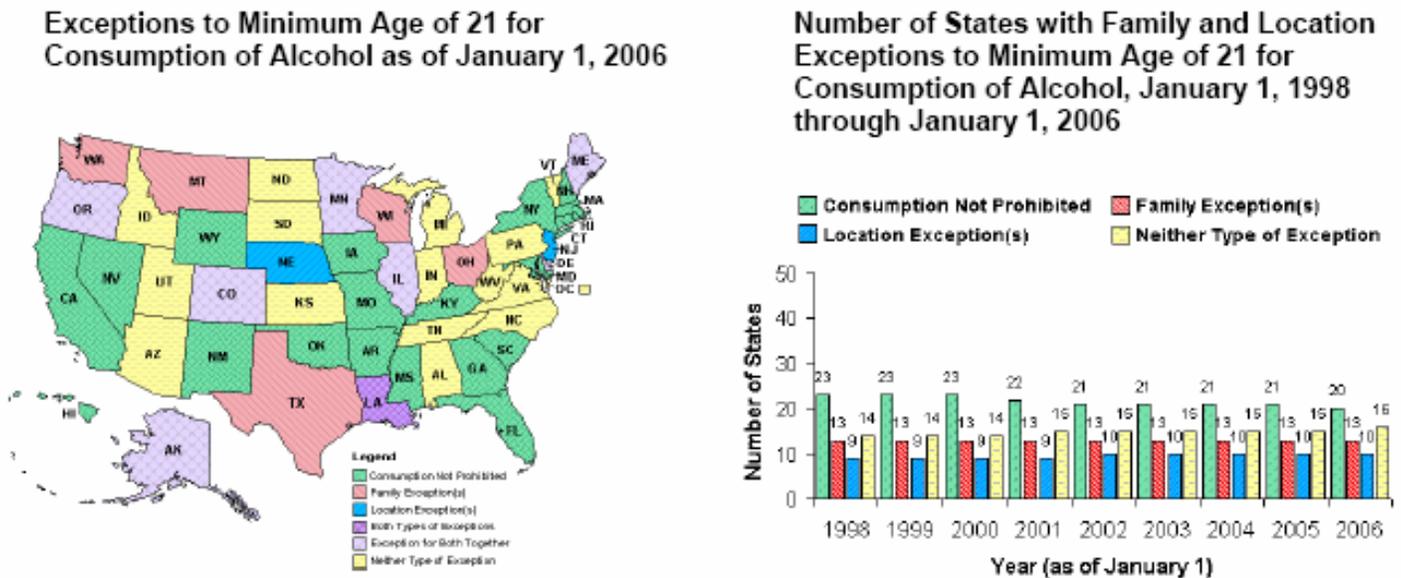
Comparison Tables – these tables provide the detailed policy information that is of greatest use to researchers. The layout of each type of comparison table is consistent across all policy topics. Each set of comparison tables presents three alternative views:

- **Policies in Effect on a Specific Date**: This view allows the user to specify any date within the APIS coverage period (1/1/1998 – 1/1/2006 for most policy topics) and compare the status of policy characteristics across States as of that date. User controls allow selection of a subset of specific States and sorting of results according to any of the policy characteristics. Links within the table provide the full text of relevant sections of State statutory and regulatory codes to document the basis for APIS coding; additional links provide explanatory notes that pertain to individual State circumstances as needed. Data from this table view may be downloaded in a format suitable for use by most statistical software.
- **Policy Changes Over Time**: For each State (or, in the default display, for each State in which there have been changes in policy status during the APIS coverage period), this view displays “before-and-after” coding of the policy status with identification of the exact dates on which policy changes took effect. Overall layout is identical to the Policies In Effect on a Specific Date table, except that the date column displays date ranges instead of individual dates. Data from this table view may be downloaded in a format suitable for use by most statistical software.
- **Timeline of Policy Changes**: This alternate view that makes identifying the timing and general categories of policy changes across States easier to discern than in the Policy Changes Over Time view. Table entries in the Timeline view provide pop-up summary information about the change in an individual State and are clickable to provide a restricted view of the Policy Changes Over Time table for the specific State in question (which provides full documentation of before-and-after policy characteristics and links to full text excerpts).

Maps and Charts – Summary maps display variation in key policy attributes across States as of the latest update of APIS information for the policy topic. Summary charts display changes over time in the numbers of States with particular policy attributes. The colorful figure provides easy overviews of variation in a specific policy area in both cross-sectional and longitudinal terms. These visuals are designed to generate interest and draw users into the more detailed information in the comparison tables on which the maps and charts are based. Figure 11 shows a sample map and chart as they appear on the APIS web site.

Related Policy Topics – links to other APIS Policy Topics that bear a significant relationship to the policy topic on display.

Figure 11
Examples of APIS Maps and Charts



Source: <http://www.alcoholpolicy.niaaa.nih.gov/>

Additional APIS Resources – APIS also provides detailed information on alcohol-related public policies in several other categories.

- A section on *Enforcement and Compliance* provides description and documentation of data resources that can assist researchers in measuring the policy variables, as well as scholarly literature reviews on enforcement and compliance from the perspectives of Public Health and Public Policy research, Sociology and Criminology, and Economics.

- The *Enacted Bills and Adopted Regulations* section of the APIS web site provides a search tool for identifying newly-enacted policies relevant to alcohol and links to the statutory and regulatory code sections that they amend. Search capabilities include structured category-based search using the Alcohol Policy Classification System, a 77-category taxonomy with additional 35 cross-cutting categories used for classifying alcohol-related policies, as well as full-text searching on the bills and regulations using Boolean search strings. Work on this section was suspended for budgetary reasons, so coverage is limited to bills enacted and regulations adopted in 2002 and bills enacted in 2003.
- The section of the APIS web site titled *NHTSA Alcohol-Highway Safety Digest Topics* provides information transcribed from the 1988-2003 editions of this hard-copy resource in several policy topic areas, including underage drinking and BAC limits (extending APIS historical coverage by an additional ten years), and drinking and driving (providing coverage of topics not yet available through standard APIS procedures). The inclusion of this material marks first time that this information has been made publicly available in electronic format.
- The new *State Profiles of Underage Drinking Laws* section provides a useful alternate view of eleven policy topics pertaining to underage drinking and access to alcohol for one user-selected State at a time. This facility of the web site was developed through discussions with Federal Trade Commission staff who identified this summary narrative approach to displaying information from the policy database as a useful adjunct to a web site they were developing on the issue of underage drinking. This feature also serves as a pilot test for possible expansion of a State Profiles view for the larger set of policy topics.

The information on alcohol-related public policies provided through APIS is designed to provide researchers with reliable information that can be incorporated in analyses of the effects and effectiveness of such policy measures. In most cases, such studies will use APIS policy information in conjunction with data on alcohol-related behaviors and outcomes from other sources. Examples of outcome data that could be used in conjunction with APIS policy information in analytic studies include data from the Fatality Analysis Reporting System on alcohol-involved traffic crashes or fatalities; measures of average alcohol consumption by State such as those published annually by the Alcohol Epidemiology Data System; health outcome data such as hospital discharge statistics available from the Agency for Healthcare Quality and Research; and survey data reflecting alcohol-related behaviors and outcomes, such as the National Epidemiologic Survey on Alcohol and Related Conditions and the National Survey of Drug Use and Health. Studies can use statistical methods that capitalize on both cross-sectional and longitudinal variation in alcohol-related policies and outcomes to identify the effects of policy changes. In areas where there have been significant changes in policy status over time (for example, there have been more than 40 changes in laws pertaining to underage drinking and access to alcohol over the period from 1998 through January 1, 2006), this

variation can provide the statistical power needed to identify key policy attributes that are most effective in reducing the adverse consequences of alcohol consumption.

E. ALCOHOL EPIDEMIOLOGY DATA SYSTEM†

Alcohol Epidemiology Data System (AEDS) Contract

The AEDS contract (N01AA32007) is a 5-year cost-reimbursement contract with a performance-based award fee provision. The successful proposal from CSR, Incorporated, submitted in April 2003 pursuant to RFP number AA0303, was awarded in September 2003 with effective dates of September 16, 2003 to September 15, 2008.

The purpose of the contract is to support NIAAA by:

- Maintaining and acquiring alcohol-related national data sets
- Conducting research studies utilizing alcohol epidemiologic data
- Providing analytic reports annually on liver cirrhosis mortality, alcohol-related fatal and other traffic accidents, and other subjects
- Responding to alcohol epidemiologic data questions
- Establishing and maintaining epidemiologic research consultants.

The contract supports the NIAAA mission by:

- Conducting and supporting research in a wide range of scientific areas related to alcohol epidemiology
- Coordinating with international, national, state, and local institutions, organizations, agencies and programs engaged in alcohol-related work
- Translating and disseminating research findings to health care providers, researchers, policymakers, and the public.

Specific requirements of the contract include the following 5 tasks:

Task 1: Maintenance and extension of an alcohol-related epidemiologic data bank.

This task includes acquisition of major datasets, collection of state-level and manufacturer data on alcohol consumption, and yearly production of an Alcohol Epidemiologic Data Directory.

The contractor continually downloads the most recent versions of major publicly available datasets including alcohol such as the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. In addition, the contractor continually acquires state-level data on alcohol consumption which are included in an annual report on per capita alcohol consumption in the US.

The Alcohol Epidemiologic Data Directory is a current listing of surveys and other relevant data suitable for epidemiologic research on alcohol. It is available on the NIAAA

website at <http://pubs.niaaa.nih.gov/publications/surveillance.htm>. Some surveys included in the *Directory* are designed specifically to answer alcohol-related questions. Other surveys may address other issues but still contain alcohol-related data. The *Directory* provides alcohol researchers with one-stop access to an index of alcohol-related surveys and the other variables they contain.

Task 2: Data analysis and support.

This task includes preparation of analytic reports, the Alcohol Epidemiologic Data Reference Manual, a series of Surveillance reports, Alcohol Epidemiologic Bulletins.

Analytic reports, generally first-authored by contract staff, are submitted to peer-reviewed journals. Recent submissions include: *Alcohol and Hepatitis C Mortality among Males and Females in the United States: A Life Table Analysis*; *Residence and Alcohol-Related Health Risk Behaviors among Undergraduate College Students*; and *Alcohol Abuse and Dependence in College and Non-College Samples: A Ten-Year Prospective Follow-up in a National Survey*.

The Alcohol Data Reference Manuals are statistical compendiums of alcohol-related data useful to researchers and others interested in alcohol problems. The most recent Manual, published in 2006, is *Alcohol Use and Alcohol Use Disorders in the States: Main Findings from the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)*. This Manual and others including *U.S. Apparent Consumption of Alcoholic Beverages Based on State Sales, Taxation, or Receipt Data*; *U.S. Alcohol Epidemiologic Data Reference Manual, Volume 1, Fourth Edition, June 2004*; *State Trends in Drinking Behaviors, 1984-2000*; and *Alcohol Consumption and Problems in the General Population: Findings From the 1992 National Longitudinal Alcohol Epidemiologic Survey* are available on the NIAAA website (<http://pubs.niaaa.nih.gov/publications/manual.htm>).

Surveillance reports are analyses of trends based on compilations of data for various topics. Several reports are updated annually. These include: *Apparent Per Capita Alcohol Consumption: National, State, and Regional Trends, 1977-2003*; *Trends in Alcohol-Related Morbidity Among Short-Stay Community Hospital Discharges, United States, 1979-2003*; *Trends in Alcohol-Related Fatal Traffic Crashes, United States, 1977-2003*; and *Liver Cirrhosis Mortality in the United States, 1970-2002*. A new surveillance report *Trends in Underage Drinking in the United States, 1991-2003*, will be updated every-other year. The surveillance reports are available on the NIAAA website (<http://pubs.niaaa.nih.gov/publications/surveillance.htm>).

Alcohol Epidemiologic Bulletins are short articles, written by the contractor, for publication in NIAAA's journal, *Alcohol Research and Health*. Recent publications in *Alcohol Research and Health* include: *Alcohol Consumption among Young Adults ages 18 to 24 in the US: Results from NESARC*; and *Gaps in Health Care Coverage for Hospitalizations with Alcohol-Related Diagnoses*.

Task 3: NIAAA-sponsored National Survey Support Services.

This task provides survey-related technical resources to the public.

In a typical 6-month period, the contractor responds to approximately 50 public requests for assistance with: access to the NESARC website, problems with downloading data and documentation files, obtaining NESARC publications, and technical questions. The contractor also produces CD ROMS containing NESARC and NLAES data and documentation for public requestors. Technical support ranges from answering questions about the survey design and sampling characteristics of NESARC, to supplying SAS code for exceeding low risk drinking limits.

Task 4: Technical assistance and referral services.

This task fills literature requests, provides Quick Facts for the NIAAA website, provides technical help with poster production, and provides programming/analytic support for NIAAA staff.

The contractor provides assistance locating alcohol-related journal articles and books for NIAAA and the public. Using data on alcohol consumption acquired in Task 1, the contractor produces up-to-date estimates of alcohol consumption from nationally representative surveys including the National Health Interview Survey and the Behavioral Risk Factor Surveillance System, data on per capita alcohol consumption, and data on other alcohol-related topics. These estimates are available on the NIAAA website (<http://www.niaaa.nih.gov/Resources/DatabaseResources/QuickFacts/default.htm>).

In a highly collaborative relationship, the contractor assists NIAAA with the preparation of posters, including programming and analysis as well as graphics and printing. In the past year, the contractor assessed feasibility for numerous study proposals by NIAAA staff (involving brief literature searches and data exploration) and provided programming services to several staff.

Task 5: Alcohol Epidemiologic Research Specialists

This task maintains a listing of specialized consultants and provides their services, as needed.

In the past year, consulting services were used to review a report on new methods for per capita alcohol consumption estimates, and to provide statistical consultation.

Currently, DEPR is briefing all NIAAA Divisions and Research Teams about data based in the Alcohol Epidemiologic Data Directory and reviewing with them priority research issues to explore using the AEDS contract.

Contract cost

At issuance on 16 September 2003, estimated contract cost (exclusive of base fee and award fee) was \$5,330,770, with a base fee of \$106,615 and an award fee maximum of \$426,462 for a total value over 5-years of \$5,863,847.

On 3 June 2004, a formal contract modification reduced the estimated cost to \$4,809,201, with a base fee of \$96,184 and a maximum award fee of \$384,736 for a total value over the 5-years of \$5,290,121. This represents a 10% reduction.

Future Plans

AEDS activities will be reviewed in 2007 by an independent advisory board. The contract expires in 2008 and will be re-competed for 2008-2013.

VII. STRATEGIC PLANNING REVIEW OF THE ALLOCATION OF DEPR'S PORTFOLIO

For purposes of examining the DEPR portfolio, grants were coded in several ways. Each grant was coded according to 1) the population studied; 2) whether the study was primarily epidemiology, primarily prevention or a combination; and 3) the problem/topic addressed. The coding for population and type of study was mutually exclusive (i.e. only one population, and one type of study) could be identified for each project. By contrast, the coding for problem/topic addressed allowed for coding of projects into more than one category since many projects address multiple problems. In addition, for grants addressing acute and chronic alcohol-related conditions, mutually exclusive coding for acute versus chronic condition was performed. The results of this coding are presented in graphic or tabular form in Appendices B-D.

POPULATIONS STUDIED

Research indicates that most alcohol-related mortality occurs among adolescents and young adults. Further, nearly half the people ever alcohol-dependent become dependent by age 21 and two thirds by age 25. Finally, it is clear that the earlier youth begin to drink the greater their likelihood of experiencing alcohol dependence, multiple dependence episodes, episodes with more dependence symptoms as well as alcohol-related injuries and other problems both during their adolescent and adult years. Therefore it is appropriate that the largest amount of the Division's research dollars devoted to any population group, nearly \$30.6 million, targets adolescents or college students. Another \$12.4 million focuses on women (\$4.9) and minorities⁹ (\$7.5) while \$26 million focuses on the adult population in general. These totals are based on the mutually exclusive population coding.

EPIDEMIOLOGY AND PREVENTION

The DEPR portfolio of research is fairly evenly balanced between epidemiology and prevention research, an appropriate distribution.

PROBLEM/TOPIC ADDRESSED

Mutually exclusive coding revealed that the Division is currently funding 32 grants costing \$12.3 million dollars that examine acute alcohol-related conditions and 14 grants costing \$6.2 million dollars that examine chronic alcohol-related conditions. This allocation of resources is appropriate because acute alcohol-related deaths outnumber chronic alcohol-related deaths and produce twice the number of preventable years of life lost. Examining the non-mutually exclusive coding of problem/topic area reveals that grants totaling \$5.8 million address motor vehicle injuries, grants totaling \$6.4 million address other unintentional injuries, grants totaling \$4.0 million address homicide and

⁹ Minorities was also coded as a problem/topic area which allowed for a project to be assigned to multiple categories; using this approach results in \$20.4 million dollars addressing minority populations.

grants totaling \$2.1 million address suicide. Because motor vehicle injury deaths are the largest single category of alcohol-related deaths, and because research in this area has translated into substantial reductions in such deaths over time, this problem deserves somewhat greater emphasis than it is currently receiving. Of the grants which study chronic conditions in which alcohol is a factor, grants totaling \$5.1 million address liver disease, grants totaling \$5.1 million address cardiovascular disease, grants totaling \$4.1 million address cancer, grants totaling \$3.8 million address diabetes, and grants totaling \$3.9 million address other chronic diseases. Because liver disease accounts for over half of alcohol attributable chronic disease deaths, this area warrants more research attention.

Among the other topic areas, grants totaling \$11.3 million are studying community interventions, grants totaling \$7.8 million address public policy, grants totaling \$5.5 million address aging, grants totaling \$6.0 million address health services, grants totaling \$9.8 million address measurement, grants totaling \$1.1 million address nosology, grants totaling \$2.6 million address genetic epidemiology and grants totaling \$0.6 million address advertising. Because of the recent expansion in alcohol advertising and promotion, more attention should be focused on the effects of advertising on drinking behavior. In addition, given the investment that has been made in the Alcohol Policy Information System, DEPR hopes to stimulate more public policy and health services research.

VIII. APPENDICES

A. *DEPR MISSION STATEMENT*

DEPR's Public Health Mission

- The Division of Epidemiology and Prevention Research seeks to reduce alcohol-related mortality and morbidity and other alcohol-related problems and consequences through the application and integration of epidemiology and prevention science.

Primary Goal

- Set research priorities
 - Review and critically evaluate the state of the science
 - Evaluate and improve quality of ongoing research
 - Identify knowledge gaps and scientific opportunities

Secondary Goals

- Stimulate and support research, training and career development by:
 - Providing technical assistance and guidance to researchers
 - In the alcohol field and other fields as appropriate
 - To NIAAA scientists
 - Working to attract new investigators to the alcohol epidemiology and prevention fields and facilitate their progress
- Conduct research and publish in the scientific literature:
 - Secondary analyses
 - Critical literature reviews
 - Evaluation of study designs, measurement and analysis
- Promote dialogue and collaboration between DEPR and:
 - research and infrastructure teams
 - other NIAAA Divisions
 - other NIH institutes
 - other federal agencies
 - public interest groups
 - academic and research institutions
- Contribute to surveillance by:
 - Monitoring trends in alcohol consumption and problems related to consumption
 - Setting alcohol-related public health goals and tracking progress toward meeting those goals
 - Identifying programs and policies that can help achieve those goals
 - Identifying needed but uncollected surveillance measures
 - Identifying critical research questions whose answers would further achievement of those goals
- Disseminate information by:
 - Publishing in the scientific literature

- Collaborating with NIAAA’s Office of Science Policy and Communications
- Organizing scientific conferences
- Presenting at scientific conferences
- Participating on task forces

Two major areas of focus for the Division are:

Epidemiology of Alcohol Use and Alcohol-Related Problems

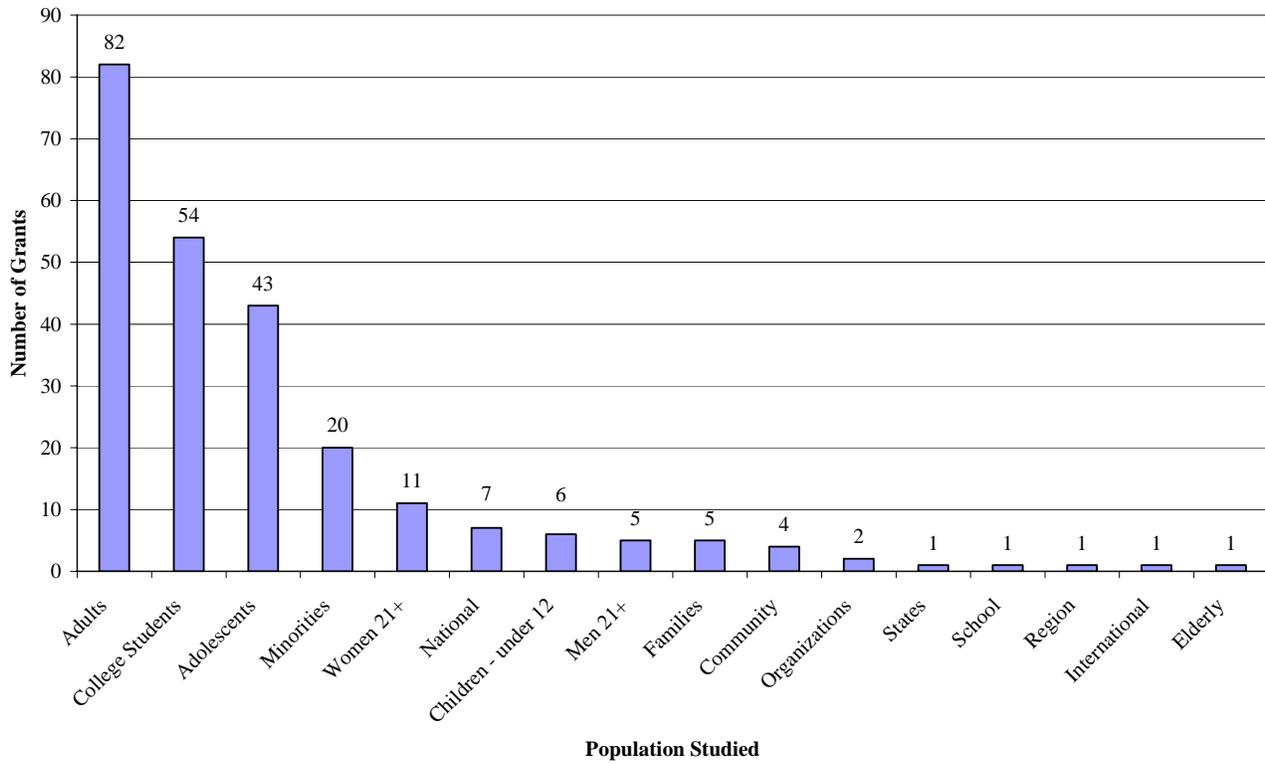
- This broad area includes the study of:
 - Etiology (risk and protective factors) and course of alcohol-related problems including AUDs
 - Relationship of alcohol consumption and AUDs to other diseases and disorders
 - Psychiatric comorbidity
 - Relationship to chronic diseases such as diabetes and cardiovascular disease
 - Potential health benefits of alcohol consumption
 - Relationship to sexually transmitted diseases
 - Alcohol-related consequences
 - Mortality and morbidity
 - Violence
 - Risky and unprotected sex
 - Compromised academic/vocational achievement
 - Economic costs
 - The distribution, mediation and moderation of the above by demographic characteristics
 - Organization, financing, costs and effectiveness of alcohol-related health and preventive services
 - Methodology
 - Nosology
 - Research design and analysis
 - Measurement (e.g. of alcohol consumption)
 - Developing and supporting innovative research approaches

The Prevention of Alcohol Use and Alcohol-Related Problems

- This broad area includes the study of:
 - the efficacy and effectiveness of:
 - screening and brief interventions
 - prevention interventions – individual, family, school, other organization based, comprehensive/community
 - drinking-driving countermeasures
 - the impact of:
 - public policy
 - media
 - alcohol marketing and promotion

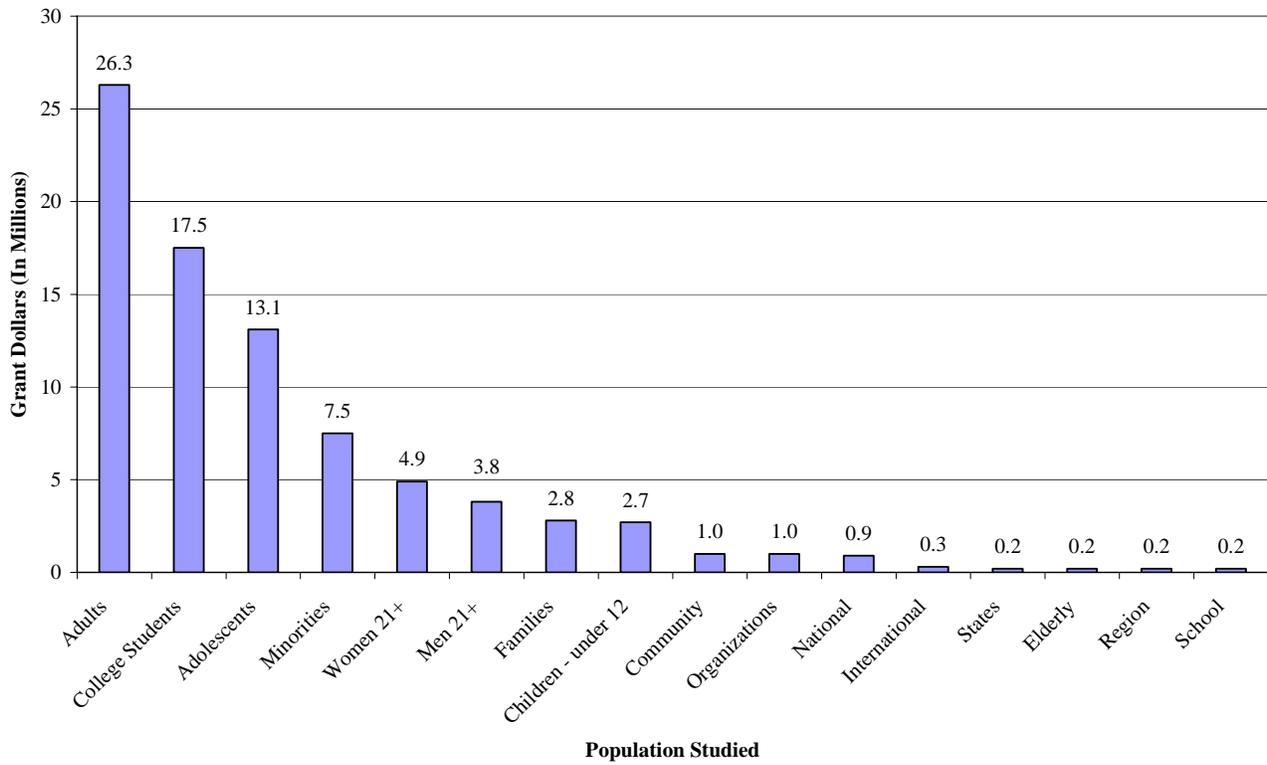
B. GRANT AND GRANT DOLLAR ALLOCATION BY POPULATION

DEPR Grants by Population Studied



(Mutually Exclusive Classification)

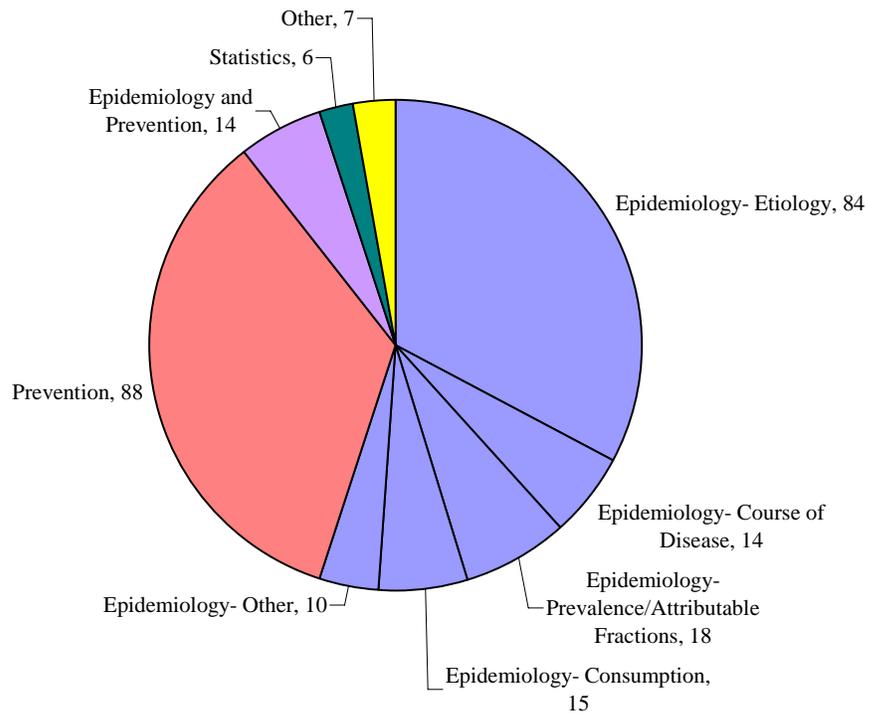
DEPR Grant Dollars by Population Studied



Total DEPR Portfolio: \$85.7 million
(Mutually Exclusive Classification)

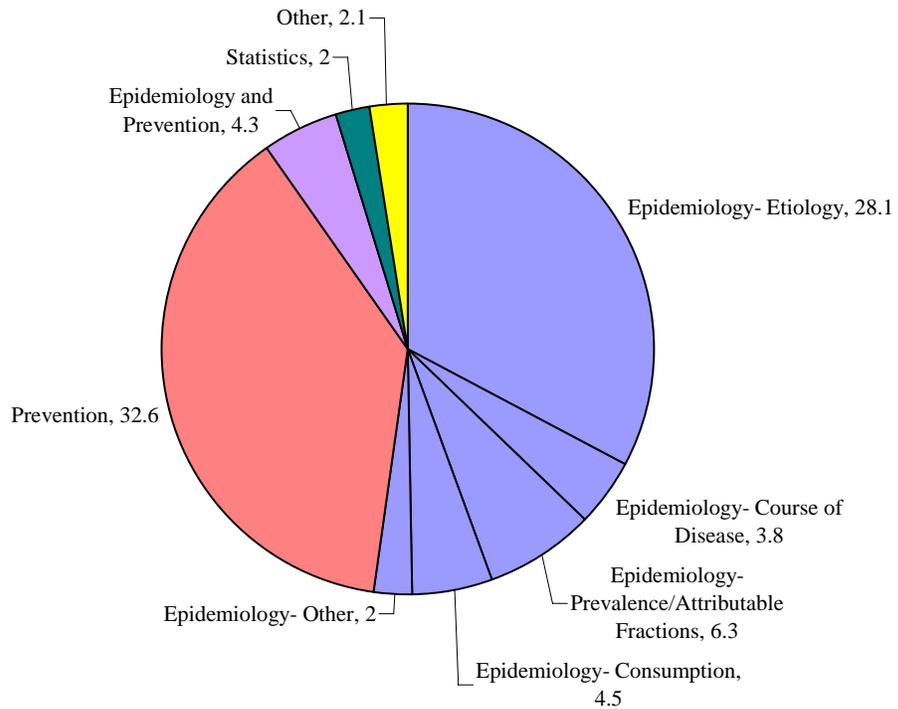
C. GRANT AND GRANT DOLLAR ALLOCATION BY EPIDEMIOLOGY, PREVENTION OR BOTH

DEPR Grants by Broad Category



(Mutually Exclusive Classification)

DEPR Grant Dollars by Broad Category (In Millions)



Total: \$85.7 million

(Mutually Exclusive Classification)

Current Contracts:

Alcohol Policy Information System (APIS) Budget FY 2005 - \$1,491,595

Alcohol Epidemiologic Data Set (AEDS) 5-Year Budget - \$5,290,121

D. GRANT AND GRANT DOLLAR ALLOCATION BY SUBJECT CATEGORY OF GRANT

| Subject Category (not mutually exclusive) | Number of DEPR Grants | Budget Allocation (In Millions) |
|--|------------------------------|--|
| Unintentional Injury – Motor Vehicle | 18 | \$5.8 |
| Unintentional Injury – Falls, Drownings, Burns and Other | 11 | \$6.4 |
| Intentional Injury – Homicide | 10+1* | \$4.0 |
| Intentional Injury - Suicide | 6+1* | \$2.1 |
| Chronic Diseases – Cancer | 7 | \$4.1 |
| Chronic Diseases – Liver Disease | 9 | \$5.1 |
| Chronic Diseases – Cardiovascular Disease | 10 | \$5.1 |
| Chronic Diseases – Diabetes | 4 | \$3.8 |
| Chronic Diseases – Other | 5 | \$3.9 |
| Minorities | 52+3* | \$20.4 |
| Aging | 8 | \$5.5 |
| Health Services | 13 | \$6.0 |
| Public Policy | 22+1* | \$7.8 |
| Community Interventions | 18+1* | \$11.3 |
| Advertising | 3 | \$0.6 |
| Measurement Issues | 29 | \$9.8 |
| Nosology of AUDs | 6 | \$1.1 |
| Genetic Epidemiology | 7 | \$2.6 |
| College Drinking | 50+1* | \$17.7 |
| Underage Drinking | 77+3* | \$28.7 |
| AIDS | 36+2* | \$14.6 |
| Other Grants | 28+2* | \$6.5 |
| Subject Category (mutually exclusive) | | |
| Acute Conditions | 32 | \$12.3 |
| Chronic Conditions | 14 | \$6.2 |

* +1 means 1 Supplement, +2 means 2 Supplements, etc.

If a single grant explores more than one topic, it may be listed under more than one category.

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