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# Economic Costs to Society of Alcohol and Drug Abuse and Mental Illness: 1980



Henrick J. Harwood
Diane M. Napolitano
Patricia L. Kristiansen
James J. Collins



POST OFFICE BOX 12194 RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

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Submitted by:

Henrick J. Harwood
Diane M. Napolitano
Patricia L. Kristiansen
James J. Collins
Research Triangle Institute

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Alcohol, Drug Abuse, and Mental Health Administration
Office of Program Planning and Coordination
Parklawn Building, Room 13C-15
5600 Fishers Lane
Rockville, MD 20857

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# I. INTRODUCTION AND SUMMARY

## A. Background

There are many serious consequences of alcohol and drug abuse, and mental illness. Society suffers the burden of health problems, death, debilitation and incapacitation, crime, motor vehicle crashes, family disruption, pain and suffering and other social problems. Certain aspects of these health problems can be assigned economic values that estimate their impact on our society's economic well-being. The primary emphasis of this report is on identifying and estimating the economic costs to society of alcohol and drug abuse and mental illness (ADM).

There have been several economic analyses of ADM problems. The most comprehensive was a 1981 study by Cruze, Harwood, Kristiansen, Collins, and Jones* in which costs were estimated for 1977. At the time of the research, 1977 was the most recent year for which necessary data were available.

Prior to the 1981 RTI study, a number of monographs had separately analyzed the costs of alcohol abuse or drug abuse or mental illness. These works developed progressively more inclusive estimates of the economic impacts of the disorders, identifying tangible ADM consequences, and using established economic principles to assign monetary values. Each new study improved on its predecessor.

The 1981 RTI study produced the first cost estimates for the three disorders that were generally comparable to each other. Comparability was accomplished in three steps: first, a meticulous review and analysis of the most recent studies on the separate disorders was performed; second, a single consistent methodology for cost estimation was developed; and finally, the estimates of economic cost to society were made.

## B. Objectives and Approach

The purpose of this project has been very specific:

> To improve the methodology to update the 1977 estimates of the economic costs of alcohol and drug abuse and mental illness (ADM), to seek better and more comprehensive data sources, and to develop a procedural guide for updating the cost estimates.

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*Henceforth, the Cruze, Harwood, Kristiansen, Collins, and Jones study will be referred to as the 1981 RTI study.

The 1977 estimates became outdated. They no longer reflected the economic impact of ADM due to the passage of time. One of the first tasks was to select a more recent year for which improved data was available to make cost estimates.

An important part of selecting a more recent year was to thoroughly assess data availability, both for this study and for future cost updates by the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) or its Institutes. Some costs were not assessed in the 1981 study because appropriate data and analyses did not exist. The availability of data vis-a-vis costs not previously estimated was reassessed. RTI assembled appropriate data on the incidence and prevalence of the ADM disorders and related problems, health services utilization, and productivity and earnings estimates and projections. For each analytic cost category, the project team assessed data availability and currency, suitability of data sets, and frequency of data collection and publication. Based on this assessment, it was recommended that the new estimates be made for 1980. In addition, simplified procedures for updating these cost estimates to 1981, 1982, and 1983 have been developed.

The new estimates are based on and consistent with the concepts and methodology formulated by a Public Health Service task force on cost-of-illness studies (Hodgson and Meiners, 1979). Cost of illness estimates for other illnesses made by the National Center for Health Statistics also employ this methodology, so the cost estimates for ADM can be directly compared with current values for other disorders.

Fundamental improvements have been made in the course of this study. The economic costs of the fetal alcohol syndrome, crime and mental illness, and violent crime due to drug abuse have been added and estimates of productivity of the workforce due to alcohol and drug abuse have been greatly improved.

An advisory panel met in December, 1983 to review the cost estimates from the 1981 study and to identify new data sets and research which could contribute to this project. The discussions also identified a number of aspects of ADM impacts that could not be addressed in this study but which should be addressed in future research. Advisory panel comments have

contributed to the improvement of the cost estimates and to the outlining of future directions for ADM cost of illness studies.

C. Results

The economic burden of alcohol abuse, drug abuse, and mental illness in 1980 was an estimated $190.7 billion. Alcohol abuse contributed the largest share of these costs, at $89.5 billion. The expense of mental illness was $54.2 billion, and drug abuse was $46.9 billion. Estimates are broken down by type of cost in table I-1. These values have changed from the 1977 values due to changes in inflation, significant methodological improvements, and population growth factors. The reader is further cautioned that the estimate for mental illness is not completely comparable with those for alcohol and drug abuse because a potentially major impact of mental illness, reduced productivity of the workforce, cannot be estimated at the present time. Comparable values have been estimated for reduced productivity attributed to both alcohol abuse and drug abuse, and these are the largest single components for these two disorders.

Employees with ADM problems are likely to be less productive than otherwise comparable persons. The reduced productivity impact due to alcohol abuse and drug abuse was estimated in this study to be $50.6 billion and $25.7 billion, respectively, or 56 and 55 percent of the total alcohol abuse and drug abuse costs. The estimate of $3.1 billion for reduced productivity due to mental illness appears in table I-1, but it only represents persons reporting partial work disability due to severe emotional or chronic nervous disorders. It does not reflect the costs of the true prevalence of mental illness in our nation.

In contrast, mental illness exacts $18.5 billion due to lost employment (complete disability) of its victims, involving incapacitation either at home or in hospitals. Alcohol and drug abuse have lower costs for lost employment at $4.1 billion and $312 million, respectively.

Treatment services for ADM problems is another major cost category, with a combined value of $31.6 billion, divided among mental illness ($21.0 billion), alcohol abuse ($9.5 billion), and drug abuse ($1.2 billion). This represents direct health services provided to victims of ADM, including long- and short-term hospitalization, services from physicians and other sources.

Table I-1

Costs to Society of Alcohol Abuse, Drug Abuse and Mental Illness, 1980
($ in millions)

| | Alcohol Abuse | Drug Abuse | Mental Illness | Total |
|---|---|---|---|---|
| Core Costs | $79,607 | $29,451 | $52,418 | $161,476 |
| Direct | | | | |
| Treatment | 9,487 | 1,200 | 20,961 | 31,647 |
| Support | 984 | 243 | 2,597 | 3,823 |
| Indirect | | | | |
| Mortality[a] | 14,456 | 1,980 | 7,196 | 23,632 |
| Morbidity[b] | 54,680 | 26,028 | 21,664 | 102,372 |
| Reduced productivity | (50,575)[c] | (25,716)[c] | (3,122)[c] | (79,413) |
| Lost employment | (4,105) | (312) | (18,542) | (22,959) |
| Other Related Costs | 9,919 | 17,485 | 1,818 | 29,222 |
| Direct | | | | |
| Motor vehicle crashes (property loss) | 2,185 | d | - | 2,185 |
| Crime[b] | 2,347 | 5,910 | 870 | 9,127 |
| Public | (2,062) | (4,454) | (635) | (7,151) |
| Private | (261) | (1,345) | (235) | (1,841) |
| Property loss/damage | (24) | (111) | (-) | (135) |
| Social welfare program | 38 | 2 | 201 | 241 |
| Other | 2,912 | 537 | 659 | 4,108 |
| Indirect | | | | |
| Victims of Crime | 172 | 845 | - | 1,017 |
| Crime careers | - | 8,725 | - | 8,725 |
| Incarceration | 1,801 | 1,466 | 88 | 3,356 |
| Motor vehicle crashes (time loss) | 464 | d | - | 464 |
| Total | $89,526[c] | $46,936[c] | $54,236[c] | $190,698 |

Totals may not add due to rounding.

[a]At 6 percent discount rate. As suggested by the PHS Guidelines document, the present value of lost future productivity due to premature mortality was also calculated using discount rates of 10 and 4 percent. The use of a 10 percent rate decreases indirect costs by the following amounts: alcohol abuse--$4,881 million; drug abuse--$704 million; and mehtal illness--$2,444 million. The use of a 4 percent rate increases indirect costs by the following amounts: alcohol abuse--$4,455 million; drug abuse--$638 million; and mental illness--$2,177 million.

[b]Components are indicated in parentheses.

[c]The total costs to society for each of the three ADM disorders are not comparable, since the completeness of data available for each cost category varied significantly. For example, the estimate of reduced productivity is relatively complete for alcohol abuse, only partially complete for drug abuse, and incomplete for mental illness.

[d]Although costs are hypothesized to occur in this category, sufficient data are not available to develop a reliable estimate.

Source: Research Triangle Institute.

Premature mortality is another serious consequence of these disorders, resulting from drug overdoses, liver disease, suicide, homicide, motor vehicle crashes and other causes. The value for alcohol abuse was $14.5 billion, of which $5.9 billion was motor vehicle deaths caused by alcohol abuse. Cirrhosis of the liver represented $3.4 billion and homicide $2.4 billion. Drug abuse cost $2.0 billion (for accidental overdoses), and mental illness cost $7.2 billion (mainly for suicide). These values were estimated at the six percent discount rate.

Motor vehicle crashes due to alcohol abuse have a number of different cost impacts. In addition to mortality (mentioned above), there are property losses ($2.2 billion), time losses of motorists ($464 million), and assorted public criminal justice and highway safety expenditures.

Alcohol abuse is also strongly related to violent crime. Criminal justice system costs ($2.3 billion), incarceration losses ($1.8 billion), and victim of crime losses ($172 million) were due to alcohol involvement in the personal victimizations of assault and homicide, and in property crimes such as robbery, burglary, and larceny.

The involvement of drug abuse in crime carries extensive economic costs. Crime careers (drug trafficking, property crime, and various consensual offenses) motivated by drug addiction were estimated to cost society $8.7 billion because addicts pursued socially non-productive careers. Additional costs were public and private criminal justice expenses ($5.9 billion), lost employment of crime victims ($845 million) and the ultimate incarceration of convicted criminals ($1.5 billion). These costs do not include the value of illicit drugs consumed, estimated by various sources at between $9 and $74 billion annually.

Mental illness is also related to crime as is apparent from the costs of public and private expenditures ($870 million) and incarceration. These costs are dissimilar to the values for alcohol and drug abuse, however. It is contended that deinstitutionalization of many mentally impaired persons has made them a burden on the criminal justice system due to public order offenses of vagrancy and disorderly conduct, and these costs have been estimated for this study. There is still a lack of consensus on the role of mental illness and violent crime, and these costs have not been estimated.

## D. Comparison With Previous Study

### 1. General

Economic cost studies of ADM should not, in general, be used as indicators of changes in the severity of these disorders over time. While these estimates do convey important knowledge of the relative magnitude of the problems at a point in time, there are many changes over time that make interpretation of decreases and increases difficult. One of these factors is inflation in prices and wages, which may change at different rates for different components. Other factors that may contribute to interpretation of cost changes over time include changes in the true prevalence of the problem, population growth, and the age and sex distribution of the population who suffer from these problems.

Changes in the severity and nature of alcohol and drug abuse are routinely monitored in our society. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) and the National Institute on Drug Abuse (NIDA) sponsor recurrent surveys on the incidence, prevalence, and impacts of alcohol abuse and drug abuse in our society. Both series use survey methodologies that are consistent from year to year, making these appropriate vehicles for monitoring trends in the levels and severity of the two disorders.

The trend in problems from alcohol abuse was constant during the 1970s. The most recent study in the series concluded that there was no indication that the level or severity of alcohol problems in the United States changed throughout the 1970s. The prevalence rates of problem drinking and its specific consequences remained relatively constant over the period studies. However, the total magnitude of the problem has increased with population growth.

Throughout the 1970s there was an upward trend in the use of psychoactive substances. Analysis has indicated that drug use peaked in 1979 and that there was a statistically significant decline in use between 1979 and 1982.

The level and severity of mental illness in our society have not been followed on as regular a basis. However, the National Institute of Mental Health has recently begun the Epidemiologic Catchment Area surveys (Eaton, Regier, Locke, and Taube, 1981), which may ultimately yield methodologies and data useful for making periodic estimates of the prevalence of mental illness as well as alcohol abuse and drug abuse in the United States.

Table I-2

Change in Cost to Society of Alcohol Abuse, 1977-1980
($ in millions)

| Cost Items | Value | Share of Change (percent) |
|---|---|---|
| Total in 1980 | $89,526 | |
| Total in 1977 | 49,374 | |
| Change 1977-1980 | 40,152 | 100.0 |
| Change due to | | |
| Inflation | 15,286 | 38.1 |
| New methodology for | | |
| Reduced productivity | 18,872 | 47.0 |
| Fetal alcohol syndrome | 3,236 | 8.1 |
| (Subtotal, changes above) | (37,394) | (93.1) |
| Other changes | 2,758 | 6.9 |

Source: Research Triangle Institute

2. Changes in Specific Cost Components

The economic burden on society of ADM was an estimated $190.7 billion in 1980. To identify differences between the 1977 and 1980 estimates, each 1977 cost component estimate was adjusted upward by an appropriate price index to reflect 1980 dollars. Using this methodology, inflation between 1977 and 1980 was estimated at $32.872 billion for the three disorders. This increase (38.8 percent) was the largest single factor in the three-year change.

No cost change is authoritatively attributed to change in the incidence, prevalence, or severity of the disorders. However, improvements in knowledge about the disorders have made it possible to include the value of impacts that were omitted from the 1977 estimates. Among these, the largest were reduced productivity in the work force due to alcohol abuse and drug abuse. These contributed 22.3 percent and 26.0 percent of the $84.7 billion increase, respectively. Other new estimates, changes in methodology, and new data sources accounted for the balance of the change between 1977 and 1980; within this group, the addition of estimates for fetal alcohol syndrome was the largest factor, accounting for 3.8 percent of the total 1977-1980 increase.

The total cost of alcohol abuse and alcoholism in 1980 was estimated at $89.5 billion. The 1977 estimate was $49.4 billion. The difference of $40.1 billion was almost completely due to inflation and a change in the methodology for estimating the effect of alcohol abuse in the workforce (table I-2). Inflation accounted for $15.3 billion of the total increase, or 38.1 percent.

Productivity losses in the economy were the largest source of change in total costs with growth over inflation of the 1977 value at $18.9 billion (47.0 percent of total growth). New analyses performed as part of this study found that alcohol abuse affects productivity by more than had been previously estimated. It is now estimated that problem drinking reduces individual productivity 21 percent below that of otherwise similar persons. The prior estimated impact was a 14 percent reduction.

Inclusion of fetal alcohol syndrome (FAS) in the study was the other major change in methodology, accounting for cost increases of $3.2 billion (8.1 percent of the total increase). FAS is a serious combination of birth defects that researchers have linked to maternal alcohol use during pregnancy.

Both physical and mental defects are involved. In addition to the health treatment required by FAS victims, the associated mental impairment requires special education, training, and support services throughout their lives. The mental impairment causes reduced productivity and in some cases institutionalization.

These three factors--inflation, reduced productivity in the workforce, and fetal alcohol syndrome--account for 93 percent of the differences between the 1977 and 1980 estimates. Of the remainder, 3 percent can be attributed to population growth. The final 4 percent is due to other minor changes.

Cost estimates for drug abuse in 1980 are $46.9 billion, a 286 percent increase over the 1977 estimate of $16.4 billion. Simply inflating the 1977 estimates would have led to an increase of $5 billion (16.4 percent of the total increase). All changes are itemized in table I-3.

The change of $22 billion resulted from findings in this study that high levels of marijuana abuse are related to reduced productivity in the workforce. Although the problem had been suspected, it had not been rigorously studied previously. It was found that persons who had ever used marijuana daily for a month or longer had household incomes 27.9 percent lower than persons with otherwise similar characteristics.

Violent crime has been increasingly linked to illicit drugs. Costs due to this problem have been included in this study for the first time. The violent crime-drug link is estimated to have cost society $1.3 billion in 1980 (4.4 percent of the increase).

The remaining change of $2.2 billion (7.2 percent) is due to changes in a number of different components, including the effect of 3 percent population growth.

The costs of mental illness grew from $40.3 billion to $54.2 billion, 34.6 percent over the three-year period 1977-1980. Virtually all of the growth was due to inflation. Merely adjusting the 1977 figures for inflation accounts for 90.2 percent of the increase (table I-4). There were changes in two components that bear further discussion. The value for reduced productivity increased by $962 million over inflation. The assumed level of impairment of the partially disabled mentally ill was increased from 14 percent to 24 percent.

Table I-3

Change in Cost to Society of Drug Abuse, 1977-1980
($ in millions)

| Cost Items | Value | Share of Change (percent) |
|---|---|---|
| Total in 1980 | $46,936 | |
| Total in 1977 | 16,387 | |
| Change, 1977-1980 | 30,549 | 100.0 |
| Change due to | | |
| Inflation | 5,010 | 16.4 |
| New methodology for | | |
| Reduced productivity | 22,003 | 72.0 |
| Violent crime | 1,338 | 4.4 |
| (Subtotal, changes above) | (28,351) | (92.8) |
| Other changes | 2,198 | 7.2 |

Source: Research Triangle Institute

Table I-4

Change in Cost to Society of Mental Illness, 1977-1980
($ in millions)

| Cost Items | Value | Share of Change (percent) |
|---|---|---|
| Total in 1980 | $54,236 | |
| Total in 1977 | 40,287 | |
| Change, 1977-1980 | 13,949 | 100.0 |
| Change due to | | |
| Inflation | 12,576 | 90.2 |
| New methodology for | | |
| Reduced productivity | 962 | 6.9 |
| Social welfare administration | -506 | -3.6 |
| (Subtotal, changes above) | (13,032) | (93.4) |
| Other changes | 917 | 6.6 |

Source: Research Triangle Institute

The cost of administering social welfare benefits to the mentally ill declined by $506 million, or about 3.6 percent of the total increase. This major change occurred because better data about the cost of these programs were used and not because benefits or levels of service changed.

The major increases in costs between the 1977 and 1980 studies are due primarily to changes in methodology, or to inflation in wages and prices and population growth. The authors do not attribute any of the growth in costs to changes in the incidence, prevalence, or severity of ADM. Making such a determination is extremely difficult due to the large number of different cost impacts studied and the many different data sets used. Because many of the values used in preparing cost estimates are derived from sample estimates, sampling error must be taken into account if costs are to be compared. That task is beyond the scope of the present effort.

E. Organization of This Report

The following chapter (II) provides an introduction to the concepts involved in estimating the economic costs of ADM and of all illnesses in general. Specific topics discussed include prior ADM cost studies, the nature of economic costs (versus transfers), direct versus indirect costs and double counting. An examination of recent findings about the prevalence of alcohol and drug abuse and mental illness follows this discussion.

The majority of this report (chapter III) describes the methodology used to estimate costs in this project. Because this project is primarily an update of a prior study, the text focuses on any improvements on or modifications of the previous study's methodology and does not offer detail about the rationale for including particular costs or the specific computations performed. Details not found here are documented in the 1981 study.

There are strong implications of cost of illness studies for evaluations of public interventions. These implications are explored in chapter IV in a discussion of the application of cost benefit and cost effectiveness analysis to ADM public policies. Suggested areas for further research in ADM cost-of-illness studies are discussed in the last chapter. A series of appendices that present selected details of the application of the cost-of-illness approach to ADM problems concludes this report.

A protocol for producing updated cost estimates for ADM also appears in the appendix. The protocol has been used to calculate values for 1981, 1982, and 1983, which are included in the appendix.

Perhaps the most significant contribution of this report is the rigorous analysis of the impact of alcohol and drug abuse on productivity in the economy. The largest cost elements in this study, the productivity impacts of ADM, are very significant. A full discussion is included in the appendix.

Another major impact of ADM, the fetal alcohol syndrome, is analyzed in this report for its economic implications. Evidence on its incidence and health impacts is presented in the appendix. At the outset of this study, it was hoped that cost estimates could be made for the impact of alcohol abuse on neoplasms of the gastrointestinal tract. Knowledge about these health problems has grown, but it is premature to make cost estimates. The implications of attributing all or some of these neoplasms to alcohol abuse are explored in a section of the appendix.

The relationship of crime to ADM was more carefully analyzed in this report than in the earlier study. Recent findings indicated that the methodology with respect to mental illness and criminal justice system costs, as well as drug abuse and violent crime, required change. These changes are discussed. There is additional discussion of the relationship of drug abuse to property crime. In addition, a number of selected topics relating to the impacts of ADM on the economy, including social welfare programs (the value of program transfers, and the costs of administering programs) and expenditures on illegal drugs and alcohol, are discussed in the appendix sections.

## II. CONCEPTUAL PRINCIPLES FOR COST OF ILLNESS STUDIES

Alcohol and drug abuse and mental illness are disorders which pervade every level of our society, with many different manifestations in all age groups - infants, children, adults, and the elderly. It has been estimated that up to 20 percent (Regier, Goldberg, and Taube, 1978) of the adult population experience these problems during a year. The dimensions of the disorders seem limitless - causing thousands of deaths and legal, personal, and occupational problems and requiring enormous amounts of health-care resources.

One particular dimension of these disorders, the economic cost, has been singled out for study because it offers a framework for integrating many of the problems. The economic framework offers a manner of valuing the real resources that are affected by the disorders and makes it possible to make comparisons between different health problems at a point in time or a single health problem at different times.

### A. Background

One of the earliest cost-of-illness studies was performed by Rashi Fein (1958) on the cost of mental illness. At that time, he estimated that the direct and indirect costs were well in excess of $3 billion. However, this was considered a conservative estimate since many costs could not be calculated due to data limitations.

The pioneering work by Fein was further developed by Rice (1965, 1966) in her studies of cardiovascular illnesses and, subsequently, all illnesses. Rice's cost analyses laid a solid methodological base on which more recent estimates of the costs of illnesses (notably, Cooper and Rice, 1976, and Paringer and Berk, 1977) have been built.

Rice (1966), Cooper and Rice (1976), and Paringer and Berk (1977) estimated the costs of mental illness. These studies indicated that the costs of mental illness were close to 10 percent of the nation's health expenditures. Each of these studies included some of the costs of alcohol and drug abuse in addition to the other clinically diagnosed mental disorders, but these costs were not distinguished. The unique nature and problems associated with alcohol and drug abuse motivated the performance of separate cost-of-illness studies for the two disorders.

A Research Triangle Institute (Rufener, Rachal, and Cruze, 1977) study of drug abuse indicated that high proportions of actual economic costs were not reflected in the traditional cost-of-illness framework. The authors identified cost components related to manifestations of trauma (e.g., drug overdoses), employment problems, and large nonhealth social costs (e.g., disability and support payments and criminal justice costs), and crime careers.

The economic costs of drug abuse had been previously assessed in examinations by Lemkau, Amsel, Sanders, Amsel, and Seif (1974), Rufener et al. (1977), and Goldman (1978). A number of manifestations of drug abuse were included in these studies, such as the more general categories of mental illness, different kinds of trauma (accidental overdoses and suicidal overdoses of drugs), and activities outside the health sector. As with alcohol abuse, many of the impacts of drug abuse involve crime.

A study of the costs of alcohol abuse by Berry and Boland (1977) identified large cost components due to alcohol abuse that had been included previously under illnesses other than mental disorders, or that had been entirely ignored by the health cost studies. Examples of these misclassified or ignored costs included alcohol abuse-related trauma (accidents, violence and poisoning), productivity losses in the work place, and other nonhealth social costs.

Levine and Levine (1975) gave more detailed analyses of the economic cost of mental illness than that offered by Rice (1966), Cooper and Rice (1976) and Paringer and Berk (1977). Levine and Levine used essentially the same estimation approach as the studies of all illnesses, although they looked beyond the formal mental illness-related diagnostic codes to examine the costs and relationship of suicide (which in cost-of-illness studies is traditionally classified as trauma along with accidents, violence and poisoning). However, there was no identification of mental illness costs associated with alcohol abuse and drug abuse.

The first study to make comparable, consistent economic cost estimates for alcohol and drug abuse and mental illness was performed by the Research Triangle Institute (Cruze et al., 1981). This cost analysis started with a thorough analysis of the three principal cost studies for each disorder (mentioned immediately above), examining them for methodology, cost framework, conceptual development and data sources. The three studies were

carefully compared for substantive differences in approach, and the reasons for these differences were noted. In particular, they were compared with respect to a document produced by the Public Health Service on guidelines for cost-of-illness studies (Hodgson and Meiners, 1979). The guidelines document established an analytical framework, laid out conceptual and methodological issues, and recommended procedures for cost estimation that were all intended to assist researchers in producing cost studies that were consistent and readily comparable.

The study by the Research Triangle Institute developed a methodology for estimating costs of the three disorders that was consistent with the guidelines and produced comparative cost estimates for the three problems. This methodology was reviewed and accepted for implementation by an advisory panel from the institutes of ADAMHA.

Other key features of this study were identification and documentation of alternative cost estimation methodologies, analysis of further interactions of alcohol and drug abuse and mental illness with the economy, and identification of cost components of the three disorders for which there were insufficient data to make estimates. Cost overlaps between the three disorders were identified and eliminated from the final cost estimations. In addition, cost components were specifically defined so that the estimates could be compared with each other, and with estimates for other illnesses.

## B. Conceptual Framework

A number of conceptual issues must be addressed regardless of the specific procedures used to develop estimates of the economic costs to society of alcohol and drug abuse and mental illness (ADM). These are discussed in two parts. The first outlines an overall conceptual framework for developing cost-of-illness estimates, moving from general principles of cost and cost-of-illness measurement to the application of these principles to ADM problems. The second section discusses five specific conceptual issues that must be addressed in estimating the economic costs to society of ADM problems.

### 1. Principles for Economic Analysis

The first step in developing an overall framework for measuring the costs of ADM disorders is to select the basic theories and concepts for measuring these costs. A basic assumption of the economic theory underlying the concepts used in this study is that resources are finite or "scarce."

Therefore, when resources are allocated to the production of certain goods and services, they are consumed and cannot be used in the production of other goods and services. The loss of the opportunity to use resources for another purpose is the "opportunity cost."

Economic transfers, as the name implies, do not represent a consumption of resources per se but only the shift in control over the use of resources from one segment of society to another. Because they are distinct from economic costs, it is inappropriate to include transfers in an estimate of the economic cost to society of an illness. Previous estimates of the value of property stolen due to drug abuse, for example, have been as high as $6.2 billion per year. Although these losses are legitimate costs to the individuals from whom the property is stolen, from society's perspective the property is transferred from one individual to another and no social cost is incurred. However, resources are used to administer property insurance programs, and resources are required to replace lost or damaged property. Procedures for estimating these real costs will be detailed in this study.

Economic or opportunity costs may be measured from various perspectives. Employers incur costs when treatment is provided for employees with ADM or other health problems at company expense or when production is lost due to factors such as lowered productivity or absenteeism. Costs are borne by an entire society as current resources are used for prevention, treatment, and rehabilitation and as potential resources are lost due to lower productivity, absenteeism, or withdrawal from the workforce because of death or disability. Since the primary purpose of this study is to provide information for policy making and resource allocation decisions within ADAMHA and other government agencies, costs from the perspective of our entire society are the most relevant and will be explored in this study.

Costs are either direct or indirect. A direct or explicit cost is one in which resources are consumed, and a formal payment is made in cash or in kind (i.e., through the direct provision of some commodity or service). When resources are used to treat an ill person, the labor is paid for in wages, the materials used are paid for as direct purchases, and the capital used is paid for in principal and interest payments. On the other hand, an indirect or implicit cost is one in which no formal payment is made for resources used. For example, hospital patients are not paid for the value

of the goods and services they would have produced had they not been in treatment. Indirect costs include the value of foregone production of household goods and services. When alternative resources (e.g., housekeepers, babysitters, launderers) are hired to supply household services to family members, the foregone production is a cost.

Indirect costs are frequently incurred over a period of time. The principal example of this is foregone production due to premature death. In this situation, the lost stream of future earnings is counted as a cost in the year the death occurs. This technique reduces or "discounts" the value of a dollar in a future time period into an appropriate value for the current time period.

Illness and disease frequently cause a wide variety of psychosocial problems whose cost cannot be readily measured in monetary terms. Social costs include loss of a body part or speech, disfigurement, anticipation of death, pain, and grief. In addition, the environment created by an illness reduces self-esteem and feeling of well-being and induces anxiety, resentment, and emotional problems that often require psychotherapy. Problems of living may develop, leading to family conflict, antisocial behavior, or suicide. Despite rehabilitation efforts, the quality of life enjoyed before the illness may not be restored. Although social factors are important components of the total burden of an illness, appropriate measures of these social costs are not well developed. The focus of this study, therefore, is on estimating the economic costs which can be readily quantified in dollars. These will be referred to as economic costs to society throughout the remainder of this report.

2. Principles for Cost-of-Illness Studies

In applying the above general principles to the estimation of the cost of an illness, it becomes apparent that the costs of an illness or disease may be divided into two major categories: "core costs," primarily those occurring in the health sector, and "other related" costs. Each category contains both direct and indirect costs.

As outlined in the PHS guidelines document on cost-of-illness studies (Hodgson and Meiners, 1979), direct core costs are the costs of diagnosis, treatment, continuing care, rehabilitation, and terminal care for illness and trauma. These include expenditures for hospitalization; outpatient clinical care; nursing home care; home health care; services of primary

physicians and specialists, dentists, and other professionals; drugs and drug sundries; rehabilitation counseling; and other rehabilitation costs to overcome illness-related impairments.

Indirect core costs result from losses in output as time is lost from paid work, or household services are not provided because of treatment, injuries, premature mortality, or other reasons. As indicated above, the measures of output loss are foregone earnings and the imputed market value of unperformed housekeeping services. In addition to extended time lost from work, indirect core costs may also be incurred when an illness lessens productivity on the job or causes excessive absenteeism.

Other related direct costs in the nonhealth sector which must be borne by patients and other individuals include costs of: transportation to health providers; hiring household help for cleaning, laundering, cooking, and babysitting; special diets; items for rehabilitation and comfort; and vocational, social, and family counseling services. These direct costs may also include the value of property damaged or destroyed in vehicular accidents or crimes caused by drug or alcohol abuse.

Examples of other related indirect costs include the opportunity cost of time spent in prison or pursuing a criminal career and of time spent by family members and friends in visiting hospital patients, their physicians, or other health professionals.

3. Application of Concepts to ADM Problems

The concepts summarized above may be readily incorporated into a conceptual framework to estimate ADM costs. Direct core costs include primarily the costs of treatment for the various ADM problems. In the case of mental illness, these costs are incurred as a direct consequence of the illness as individuals seek treatment in public and private mental health treatment facilities. In the case of alcohol abuse and drug abuse, these costs are incurred as individuals seek treatment for problems directly and indirectly caused by their substance abuse. In addition, the direct core costs include costs for such supportive activities as prevention and the various research, training, and administrative functions that are carried out by both public and private agencies to support ADM treatment activities.

Indirect core costs for ADM problems arise primarily from morbidity or premature mortality, measured in terms of both foregone earnings and the imputed market value of lost household services. Additional indirect costs

may occur from lost work or household production due to outpatient or inpatient treatment or from lowered productivity for those with ADM problems who continue to work or perform household activities.

Other related direct costs for ADM problems are quite diverse. The two largest categories of these costs stem from ADM-induced crimes and from property destruction (e.g., due to vehicular accidents or crime). In addition, other related direct costs include an appropriate share of the administrative costs of various social welfare programs providing services to individuals with ADM problems.

Other related indirect costs involve time and productivity losses not directly related to the health of the ADM victim. There is a very significant cost for drug abusers whose crime careers and incarceration take them away from productive activities and constitute a loss for society as a whole that is causally related to drug addiction or to the drug trade. This cost component is not very large for alcohol abuse and mental illness.

A summary of the specific cost elements suggested for use in cost-of-illness studies is provided in table II-1. These costs are organized according to the core costs/other related costs framework presented in the PHS guidelines document.

C. Specific Issues

1. Definitions

By definition, ADM exists when a diagnosis of the disorder is made by a health professional using professionally accepted criteria. Established diagnostic systems include the International Classification of Diseases - 9th Edition (ICD-9) and the Diagnostic and Statistical Manual III (DSM-III). Most health system diagnostic data are now maintained using the ICD-9 system. There is a cross-reference to data that were coded using earlier editions. The use of DSM-III is advocated by mental health professionals because there are specific codes and criteria for alcohol and drug abuse and mental illness. The ADM diagnostic conditions used in this study are based on ICD-9 and are specified in tables III-4, III-7, III-8, and III-9. The ADM-specific conditions are primarily those in the large category of mental illness (codes 290-316). Because ADM effects many aspects of health, other conditions are defined as "ADM-related." These are completely or partially attributed to ADM in the cost estimates. Notable examples are liver cirrhosis, drug overdoses, suicide, and other trauma.

Table II-1

Cost Elements for Cost-of-Illness Studies

I. CORE COSTS

A. Direct
1. Hospitalization
2. Outpatient clinical care
3. Nursing home care
4. Home health care
5. Services of primary physicians, specialists, and other professionals
6. Drugs and drug sundries
7. Rehabilitation counseling
8. Rehabilitation aids

B. Indirect
Lost productivity due to:
1. Mortality
2. Morbidity (lost productivity)
   a. Reduced productivity
   b. Lost productive time

II. OTHER RELATED COSTS

A. Direct

1. Transportation
2. Household expenditures and help for the household
3. Special equipment or alteration of property for rehabilitation or comfort
4. Counseling, retraining, and reeducation
5. Property losses (destruction, for instance, from vehicular accidents or criminal activity)
6. Criminal justice system
7. Welfare system administration (not the transfers themselves)

B. Indirect

1. Lost productivity of family and friends
2. Lost productivity resulting from incarceration due to ADM problem
3. Lost productivity from full-time pursuit of a crime career in order to support a drug habit
4. Lost productivity of persons other than crash victims due to ADM-caused motor vehicle accidents

Source: Derived from Hodgson and Meiners (1979).

Consequences of ADM outside of the health sector have been determined based on established causal links between ADM (chronic or episodic) and tangible consequences (for example, drinking and driving, and drugs and crime).

2. Incidence and Prevalence

In estimating these costs to society, the distinction between incidence and prevalence of ADM has been carefully made. Strictly speaking, incidence of an ADM problem is defined as the number of new cases of a problem that occur in a given period of time. Prevalence refers to the total number of cases at a point in time or over a given period of time. Since the purpose of this study has been to estimate the costs to society of ADM problems, we were primarily interested in the prevalence of each of the ADM problems for a specific time period (i.e., 1981).

It would be interesting to examine the pattern of costs caused by an individual's problem over time from a benefit/cost perspective. The benefits derived from successful treatment of a problem could then be subtracted from the costs. However, incidence data are not readily available, and the primary emphasis of this study is on prevalence.

3. Association and Causality

Behaviors may be caused by ADM problems or they may merely be associated with them. The importance of distinguishing between cause and association has been pointed out in previous efforts. In addition, the literature review conducted for the previous RTI study indicated the difficulty in establishing valid measures of causality. Despite these problems, this study has attempted to estimate costs to society by using measures of causality rather than correlation or association. Wherever possible, the results of previous studies that have used appropriate designs and analytic techniques to develop estimates of the degree of causality were incorporated into the estimation procedure. Nonetheless, the ideal of establishing causality could not always be achieved due to current state-of-the-art limitations. When no reasonable causality estimate was available, rational assumptions and indirect statistical techniques were used to approximate the extent of causality. Whenever simple associations were relied upon, that fact is noted.

4. Foregone Earnings

As indicated earlier, a critical input to estimating the indirect costs of ADM is the value of foregone earnings of individuals with ADM

problems who die prematurely or who for other reasons become unproductive. In order to develop a consistent approach to estimating the value of this cost component across the three ADM problem areas, a single set of earnings profiles for the general population subgroups (e.g., classified by age, sex, race, educational attainment) was used. The profiles were then adjusted to reflect the demographic characteristics of the populations with each of the three ADM problems. Choices have been made on the use of adjustments for expected labor force participation and unemployment for populations with ADM problems and for a less than full employment national economy, discount rates for future earnings values, and rates of labor productivity growth. Additional decisions were made on the conceptual bases for estimating the costs of lowered on-the-job productivity due to ADM problems, the costs of foregone household production by individuals not in the officially-defined labor force, and the value of production lost when individuals volunteer to work in the ADM treatment/prevention system.

Recently developed unpublished data on the present values of age/sex-earnings profiles prepared by the staff of the National Center for Health Statistics provided an appropriate source for estimating many of these indirect costs. The assumptions underlying the development of these profiles were carefully reviewed, and the resulting profiles were found to be appropriate for use in this study.

5. Double Counting

The final problem addressed was that of double counting the costs of a given condition in developing the total cost of ADM problems. This might happen, for example, when foregone earnings are counted in the general estimate of premature death from alcohol abuse and again in specific estimates of traffic fatalities. This double counting might also occur in situations in which an individual with an ADM problem (e.g., an alcoholic) is treated in a specialty setting that is not organized primarily to treat the problem (e.g., a Community Mental Health Center). This person's costs would be counted twice in estimating the costs to society of ADM problems (e.g., once as an alcohol abuse cost and again as a mental illness cost). Such situations should be identified and the double counting eliminated in developing a composite estimate of the costs to society of ADM. One possible approach is to specifically identify the various specialty settings in which more than one ADM problem is treated and the proportions of treatment

resources used to treat the separate ADM problems in each of these specialty settings. This procedure enables us to develop estimates of both the treatment costs for each ADM problem and the treatment costs for each type of specialized ADM facility.

Double counting may also occur in situations where it is difficult to specify to which of the three ADM problems a particular cost element should be assigned. Where, for example, should the costs for the treatment of an individual with more than one ADM problem be assigned? The costs might be reported as an unallocated total and not be included in the cost estimates of the separate ADM problems, or they may be assigned to a single problem (such as the primary diagnosis) or to multiple problems according to appropriate procedures. A second example is the difficulty in assigning the costs of administration of an agency concerned with more than one ADM problem. Here, too, the costs might be assigned to an unallocated total and not to separate ADM problems, or they can be assigned to one ADM problem by some rule. A third alternative is to allocate them to the separate ADM components in proportion to other direct agency costs.

D. Definition of ADM

One of the most difficult facets of this economic cost study is defining the nature of alcohol, drug abuse, and mental illness in order to discern the incidence or prevalence rates of these disorders and in order to estimate their economic impact.

Mental disorder is generally defined to include alcohol abuse and alcohol dependence, as well as drug abuse and drug dependence. The large category in the International Classification of Diseases, "Mental Illness," includes specific subcategories for alcoholic psychoses, alcoholism, and alcohol abuse, as well as drug abuse, and drug dependence. A widely used classification system, DSM-III, gives distinct diagnostic criteria for diagnoses of alcohol abuse, alcohol dependency, drug abuse, and drug dependency.

One of the greatest challenges in performing an economic cost study is in clearly differentiating among diagnoses, but it is not uncommon for an individual to suffer from more than one mental disorder at a time. For example, schizophrenics may also abuse alcohol and/or drugs. Where it is desirable to differentiate between alcohol abuse/dependence, drug abuse/dependence, and other mental disorders, the definitional problems become enormous.

The distinctions among multiple disorders are a major problem in the fields under study. Nonetheless, an attempt to differentiate among the different types of disorders was made in this study, and the results reported in the balance of this report reflect our best attempts. Fortunately, the diagnostic data typically used in studies of these populations usually distinguish between the disorders. Unfortunately, although patients or individuals whose ADM problems have economic impacts usually have a primary diagnosis, they may also have additional diagnoses secondary to the primary cause or equivalent to it. In some data sets, multiple diagnoses are made, with no indication of their order of importance.

In this study, an individual's "principal" problem is defined as the "primary" diagnosis or, if there is no priority given, the "first listed" diagnosis. The cost estimates made for alcohol abuse, drug abuse, or other mental disorders using this rule are somewhat arbitrary. For the present, these imprecisions are unavoidable.

E. Prevalence of ADM

Recent studies have estimated an unduplicated count for alcohol abusers, drug abusers, and other mental illnesses at 15 percent of the population. A study by Regier et al. (1978) estimated that 15 percent of the U.S. population, including individuals of all ages, experienced alcohol and/or drug abuse problems or a mental disorder during 1975. While it excluded alcohol and drug abusers who received treatment only in clinics specializing in those disorders, it included people with alcohol and drug abuse problems seen in other specialty mental health sectors and in the general health sector. It was estimated that 6.7 million persons were treated in the specialty mental health sector, 1.1 million were inpatients in general hospitals or nursing homes, and 19.2 million received outpatient services in the general health sector. Another 6.9 million individuals were judged to have not received treatment. These estimates included adjustments to avoid duplications for individuals seen across different settings and sectors.

The epidemiological catchment area (ECA) studies supported by NIMH have yielded data supporting the 15 percent prevalence estimate. The ECA studies use the recently developed Diagnostic Interview Schedule (DIS) which contains information necessary to make DSM-III diagnoses of specific mental disorders. Myers et al. (1983) estimated the 12-month prevalence

rates of DIS/DSM-III psychiatric disorders to be 12 to 13 percent in three communities over a 6-month period, and 13 to 15 percent over a 1-year period (see table II-2). These prevalence estimates exclude values for phobia and dysthymia but include values for alcohol abuse/dependence and drug abuse/dependence. The estimates of the prevalence of alcohol abuse/dependence and drug abuse/dependence made in this study are presented in table II-2. By averaging the rates for the three different communities, the prevalence of mental illnesses, including phobias, was estimated at 18 percent over a 6-month period. Excluding phobias, the average was 12.6 percent. Again using the diagnostic criteria as specified in DSM-III, the rate of alcohol dependency in the three communities was 3.2 percent, alcohol abuse was 1.9 percent, drug dependency was 1.0 percent, and drug abuse was 1.1 percent. Neither these nor other estimates based on ECA studies have adjusted for persons with multiple disorders.

Similar work has resulted from epidemiological studies of alcohol abuse and drug abuse. General population surveys have indicated significant prevalence rates for each of the disorders, although they have not yet attempted to identify overlaps between the respective populations.

The prevalence of problem drinking, or alcohol abuse/dependence, has been estimated to be about 10 percent of the adult population. A series of national household surveys conducted since the middle 1960s has generated prevalence estimates utilizing a variety of diagnostic criteria. The most recent survey (Clark and Midanik, 1982) estimated that 10 percent of the adult population exhibited symptoms of loss of control while drinking or dependency on alcohol during the survey year and that 5 percent of the adult population attributed at least one social consequence to abuse of alcoholic beverages.

The prevalence of specific problems associated with drinking in national surveys conducted in 1967 and 1979 is presented in table II-3. The national surveys have demonstrated that a wide variety of problems are associated with alcohol abuse. For both national surveys, the most prevalent problems were psychological dependence and symptomatic drinking. Other problems include health problems, job problems, belligerence, difficulties with the law or one's spouse, and binge drinking.

Table II-2

Six Month Prevalence of Mental Illness, Alcohol Abuse/Dependence and Drug Abuse/Dependence in Three Communities

| | New Haven | Baltimore | St. Louis | Simple Average |
|---|---|---|---|---|
| Any Mental Illness[1] | 16.9 | 22.6 | 14.8 | 18.1 |
| Any Mental Illness [2] | 13.2 | 12.9 | 11.6 | 12.6 |
| Alcohol Abuse/Dependence | 4.8 | 6.1 | 4.5 | 5.1 |
| Alcohol Dependence | 2.8 | 4.2 | 2.6 | 3.2 |
| (Alcohol Abuse)[3] | (2.0) | (1.9) | (1.9) | (1.9) |
| Drug Abuse/Dependence | 1.8 | 2.3 | 2.2 | 2.1 |
| Drug Dependence | 1.1 | 0.8 | 1.1 | 1.0 |
| (Drug Abuse)[3] | ( .7) | (1.5) | (1.1) | (1.1) |

[1]Excludes dysthmyia (DSM-III, an episode of depression that does not meet diagnostic criteria for "Major Depression").

[2]Excludes dysthymia and phobia (large variation in prevalence estimates for phobia were obtained from three sites, suggesting caution in use of its estimates).

[3]This value is the difference between the two prior values.

Source: Myers, Weisman, Tischler, Holzer, Leaf, Orvaschel, Anthony, Boyd, Burke, Kramer, and Stoltzman (1983)

Table II-3

Prevalence of Problems Associated with Drinking in the Past 12 Months for Males and Females in the 1967 and 1979 National Surveys (in Percentages)

| Problem Area | 1967 Survey | | | 1979 Survey | | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total |
| Health problems | 6 | 5 | 5 | 4 | 2 | 3 |
| Belligerence associated with drinking | 5 | 3 | 4 | 8 | 4 | 6 |
| Problems with friends | 2 | * | 1 | 3 | 1 | 2 |
| Symptomatic drinking | 11 | 5 | 8 | 20 | 9 | 14 |
| Psychological dependence | 49 | 29 | 37 | 26 | 17 | 21 |
| Job problems | 3 | 2 | 2 | 7 | 2 | 4 |
| Problems with the law, police, accidents | 1 | * | * | 2 | 1 | 1 |
| Binge drinking | 1 | * | 1 | 1 | * | 1 |
| Problems with spouse** | 1 | 0 | 1 | 2 | * | 1 |
| (N) | (751) | (608) | (1,359) | (762) | (1,010) | (1,772) |

Note: The percentages are weighted figures and may not total to 100 percent due to rounding; totals shown are the actual number of cases. Slight variations in these totals occur because of nonresponse, etc.

*Less than 0.5 percent.

**Last 2-1/2 years for National 1967; last 3 years for National 1979.

Source: Clark and Midanik, 1982.

A series of national studies conducted between 1971 and 1979 which examined trends in alcohol consumption (see table II-4) found little change in the level of drinking over that time. While an upward trend in heavier drinking by males was seen between 1971 and 1976, the 1979 national survey indicated that heavier drinking by males reverted to the 1971 and 1972 levels.

The prevalence of use of illicit drugs was monitored between 1972 and 1982 by a series of national household surveys. The 1982 national survey (Miller, Cisin, Gardner-Keaton, Harrell, Wirtz, Abelson, and Fishburne, 1983) indicated that 10.9 percent of all adults used marijuana within the month prior to the survey. This included 27.4 percent of young adults (ages 18 to 25) and 6.5 percent of older adults (see table II-5). The surveys indicated that current use of marijuana by youth and young adults peaked in 1979 and dropped significantly by 1982 (see table II-6). Data indicated no statistically significant change in the level of use by older adults.

The national surveys also assessed use of cocaine, heroin, and hallucinogens, as well as nonmedical use of various prescription drugs. Current heroin use for youth in 1982 was below one-half of 1 percent, and current use of each of the other drugs (use in past month) was between 1 and 2 percent. Current use of drugs by young adults was in the same range for everything except cocaine (6.8 percent) and stimulants (4.7 percent). The drop in cocaine use by young adults from the 9.3 percent observed in 1979 was statistically significant. Abuse of other drugs by older adults in the month prior to the survey was less than 1 percent for everything except cocaine (1.1 percent).

Studies of alcohol abuse have focused on both lifetime patterns and current levels of consumption as well as impacts of alcohol consumption on social functioning. Alcohol abuse has been increasingly defined in terms of its consequences. Close attention has been paid to undesirable impacts on family, friends, strangers, and those in the household and at work, as well as in social situations.

The diagnostic criteria used in making prevalence estimates for drug abuse differed significantly from those used for alcohol abuse and other mental illnesses estimates. In the field of drug abuse, primary emphasis has been placed on lifetime patterns and recency of use of illicit sub-

Table II-4

Trends in Alcohol Consumption, 1971-1979, by Type of Drinker and Sex (in Percentages)

| | Harris 1971 | Harris 1972 | Harris Spring 1973 | Harris Fall 1973 | Harris 1974 | ORC 1975 | RAC 1976 | National 1979 |
|---|---|---|---|---|---|---|---|---|
| Type of Drinker | | | | | | | | |
| Abstainer | 36 | 36 | 34 | 37 | 36 | 36 | 33 | 33 |
| Lighter | 34 | 32 | 29 | 30 | 28 | 31 | 38 | 34 |
| Moderate | 20 | 23 | 23 | 21 | 28 | 21 | 19 | 24 |
| Heavier | 10 | 10 | 14 | 11 | 11 | 12 | 10 | 9 |
| (N)* | (2,195) | (1,544) | (1,583) | (1,603) | (1,578) | (1,071) | (2,510) | (1,772) |
| Males | | | | | | | | |
| Abstainer | 30 | 28 | 25 | 26 | 24 | 27 | 26 | 25 |
| Lighter | 29 | 29 | 24 | 29 | 24 | 27 | 33 | 29 |
| Moderate | 26 | 28 | 29 | 26 | 34 | 26 | 24 | 31 |
| Heavier | 15 | 15 | 22 | 19 | 18 | 20 | 18** | 14 |
| Females | | | | | | | | |
| Abstainer | 42 | 44 | 42 | 47 | 42 | 45 | 39 | 40 |
| Lighter | 40 | 34 | 35 | 32 | 32 | 35 | 44 | 38 |
| Moderate | 13 | 18 | 17 | 17 | 21 | 15 | 15 | 18 |
| Heavier | 5 | 4 | 6 | 4 | 5 | 4 | 3 | 4 |

Note. Percentage are weighted figures and may not total to 100% due to rounding.

*N's presented are the same as in the Third Special Report to the U.S. Congress on Alcohol and Health (Noble, 1978); however, actual N's used in this analysis varied slightly.

**Statistically significant linear trend ($p<.05$), indicating an increase (excluding 1979 survey).

Source: Clark and Midanik, 1982.

Table II-5

Prevalence of Drug Abuse by Type of Drug and Age Groups, 1982
(in Percentages)

| | Youth (age 12-17) | | Young Adults (age 18-25) | | Older Adults (age 26+) | |
|---|---|---|---|---|---|---|
| | Used Ever | Month | Used Ever | Month | Used Ever | Month |
| Marijuana | 26.7 | 11.5 | 64.1 | 27.4 | 23.0 | 6.6 |
| Hallucinogens | 5.2 | 1.4 | 21.1 | 1.7 | 6.4 | * |
| Cocaine | 6.5 | 1.6 | 28.3 | 6.8 | 8.5 | 1.2 |
| Heroin | * | * | 1.2 | * | 1.1 | * |
| Nonmedical use of: | | | | | | |
| Stimulants | 6.7 | 2.6 | 18.0 | 4.7 | 6.2 | .6 |
| Sedatives | 5.8 | 1.3 | 18.7 | 2.6 | 4.8 | * |
| Tranquilizers | 4.9 | .9 | 15.1 | 1.6 | 3.6 | * |
| Analgesics | 4.2 | .7 | 12.1 | 1.0 | 3.2 | * |
| Any Nonmedical Use | 10.3 | 3.8 | 28.4 | 7.0 | 8.8 | 1.2 |
| Alcohol | 65.2 | 26.9 | 94.6 | 67.9 | 88.2 | 56.7 |
| Cigarettes | 59.5 | 14.7 | 76.9 | 39.5 | 78.7 | 34.6 |

*Less than 5%.

Source: Miller et al., 1983.

Table II-6

Use of Drugs in Past Month, 1972-1982, by Young Adults

| Young Adults: Age 18-25 | 1972 (772) | 1974 (849) | 1976 (882) | 1977 (1500) | 1979 (2400) | 1982 (1283) | Change '79-'82** |
|---|---|---|---|---|---|---|---|
| Marijuana | 27.8 | 25.2 | 25.0 | 27.4 | 35.4 | 27.4 | SSS |
| Hallucinogens | † | 2.5 | 1.1 | 2.0 | 4.4 | 1.7 | SSS |
| Cocaine | † | 3.1 | 2.0 | 3.7 | 9.3 | 6.8 | S |
| Heroin | † | * | * | * | * | * | -- |
| Nonmedical Use of: | | | | | | | |
| Stimulants | x | 3.7 | 4.7 | 2.5• | 3.5 | 4.7 | § |
| Sedatives | x | 1.6 | 2.3 | 2.8• | 2.8 | 2.6 | § |
| Tranquilizers | x | 1.2 | 2.6 | 2.4• | 2.1 | 1.6 | § |
| Analgesics | x | x | x | x | 1.0 | 1.0 | § |
| Any Nonmedical Use | xx | xx | xx | xx | 6.2 | 7.0 | § |
| Alcohol | x | 69.3 | 69.0 | 70.0 | 75.9# | 67.9# | SSS |
| Cigarettes | x | 38.8 | 39.3 | 37.2 | -- | 39.5 | -- |
| (Alternate Definition-Cigarettes)•• | | | | | (42.6) | (38.0) | (S) |

*Less than .5%

xNot asked.

xxSince questions on use of analgesics were not asked in surveys prior to 1979, the nonmedical use of any psychotherapeutic (including analgesics) could not be reported for these earlier years.

†Not tabulated

•1977 estimates based on split sample: N=750.

••In 1979, recency of cigarette use was asked only of those who had smoked at least five packs during their lifetime. In all other years, no such restriction was applied. For 1982, this version was calculated separately.

#In both 1979 and 1982, private answer sheets were used for alcohol questions; in earlier years respondents answered these questions aloud.

**Significance levels: SSS, .001; SS, .01; S, 05; $, .10; NS, not significant; §, significance test not performed (79-82 procedures not comparable).

Source: Miller et al., 1983.

stances or nonmedical use of various prescription drugs. While undesirable impacts of drug abuse are hypothesized and, in fact, observed, they have not been rigorously examined in a manner analogous to that for alcohol abuse. The inclusion of drug abuse and drug dependency in DSM-III and, in the ECA projects, the Diagnostic Interview Schedule may lead to notable developments in the drug abuse field. As the DSM-III is refined, and eventually implemented through community-wide and nationwide surveys, it can be expected that an increasingly better understanding of the extent and manifestations of drug abuse will be gained.

# III. COST ESTIMATES

## A. Introduction

The estimates produced in this cost study have been generated using the general methodology described in the 1981 RTI study. The report of the previous study documents the rationale behind individual cost components, the equations used to generate the estimates, and the sources of data that were utilized. The reader is encouraged to review this methodology. Wherever possible, this study has used the same or similar data sources. New data sources and minor modifications to the 1981 methodology are described below.

Significant changes and extensions in cost estimation have been made for several components. The basic estimates and computations for these components are presented in this section. More detailed discussion and documentation appears in the appendix on fetal alcohol syndrome, reduced productivity due to alcohol abuse and drug abuse, the relationship of homicide and other violent crimes to drug abuse, mental illness and crime, and the cost of administering social welfare benefits to ADM victims.

Total cost estimates are presented in table III-1. A guide to these data and tables used to derive the final estimates are provided in table III-2. For a specific cost component of interest in table III-1, identify the component name and the ADM disorder, and refer to table III-2 to obtain the reference table numbers.

## B. Core Direct Costs--Treatment

Inpatient and outpatient services are available from many types of institutions and health treatment and service providers. A first step in the prior study was to identify a consistent and reasonably exhaustive set of treatment settings that provide health care. After adjusting the data using information from NIMH, a list of settings consistent with data maintained by the Health Care Financing Administration (HCFA) of DHHS, NIAAA, NIDA, and NIMH was established.

For each setting, the study team accumulated information on the total value of goods and services provided. These values were obtained from HCFA, NIDA, NIAAA, and NIMH (see table III-3 for sources). For the same settings, data on service utilization by individuals with particular diseases and illnesses (ICD-9 diagnostic codes) were also obtained (see table III-3

Table III-1

Costs to Society of Alcohol Abuse, Drug Abuse and Mental Illness, 1980
($ in millions)

| | Alcohol Abuse | Drug Abuse | Mental Illness | Total |
|---|---|---|---|---|
| Core Costs | $79,607 | $29,451 | $52,418 | $161,476 |
| Direct | | | | |
| Treatment | 9,487 | 1,200 | 20,961 | 31,647 |
| Support | 984 | 243 | 2,597 | 3,823 |
| Indirect | | | | |
| Mortality[b] | 14,456 | 1,980 | 7,196 | 23,632 |
| Morbidity[b] | 54,680 | 26,028 | 21,664 | 102,372 |
| Reduced productivity | (50,575) | (25,716) | (3,122) | (79,413) |
| Lost employment | (4,105) | (312) | (18,542) | (22,959) |
| Other Related Costs | 9,919 | 17,485 | 1,818 | 29,222 |
| Direct | | | | |
| Motor vehicle crashes (property loss) | 2,185 | a | - | 2,185 |
| Crime[b] | 2,347 | 5,910 | 870 | 9,127 |
| Public | (2,062) | (4,454) | (635) | (7,151) |
| Private | (261) | (1,345) | (235) | (1,841) |
| Property loss/damage | (24) | (111) | (-) | (135) |
| Social welfare program | 38 | 2 | 201 | 241 |
| Other | 2,912 | 537 | 659 | 4,108 |
| Indirect | | | | |
| Victims of Crime | 172 | 845 | - | 1,017 |
| Crime careers | - | 8,725 | - | 8,725 |
| Incarceration | 1,801 | 1,466 | 88 | 3,356 |
| Motor vehicle crashes (time loss) | 464 | a | - | 464 |
| Total | $89,526[c] | $46,936[c] | $54,236[c] | $190,698 |

Totals may not add due to rounding.

[a]Although costs are hypothesized to occur in this category, sufficient data are not available to develop a reliable estimate.

[b]Components are indicated in parentheses.

[c]The total costs to society for each of the three ADM disorders are not comparable, since the completeness of data available for each cost category varied significantly. For example, the estimate of reduced productivity is relatively complete for alcohol abuse, only partially complete for drug abuse, and incomplete for mental illness.

Source: Research Triangle Institute.

Table III-2

Table Reference List for Chapter 3

| | Alcohol Abuse | Drug Abuse | Mental Illness |
|---|---|---|---|
| Core Costs | | | |
| Treatment | 3,4,5 | 3,4,5 | 3,4,5 |
| Support | 6 | 6 | 6 |
| Mortality[a] | 7,10,11 | 8,10,12 | 9,10,13 |
| Morbidity[b] | | | |
| Reduced productivity | 14,15,16,17,18 | 14,15,22,23 | 14,15,25 |
| Lost employment | 19,20,21,37 | 24,37 | 26,27 |
| Other Related Costs | | | |
| Motor vehicle crashes (property loss) | 28 | - | - |
| Crime[c] | | | |
| Public | 29 | 30 | 31 |
| Private | 32 | 32 | 32 |
| Property loss/damage | 33 | 33 | - |
| Social welfare program | 34,35 | 34,35 | 34,35 |
| Other | 36 | 36 | 36 |
| Victims of crime | 37 | 37 | - |
| Crime careers | - | 38 | - |
| Incarceration | 39 | 39 | 39 |

Table III-3

Sources of Cost and Diagnostic Data Used to Estimate Costs for ADM Settings, 1980

| Setting | Data Sources: Costs | Data Sources: Diagnoses |
|---|---|---|
| **ADM facilities** | | |
| Hospital-based | | |
| State and county psychiatric hospitals | NIMH[1] | NIMH[10] |
| Private psychiatric hospitals | NIMH[1] | NIMH[10] |
| VA neuropsychiatric hospitals | NIMH[1] | NIMH[10] |
| Non-Federal general hospitals with separate psychiatric units | NIMH[1] | NIMH[10] |
| **Other ADM facilities and services** | | |
| Federally funded CMHCs | NIMH[1] | NIMH[11] |
| Residential treatment centers for children | NIMH[1] | NIMH[1] |
| Halfway houses | | |
| Freestanding facilities | NIMH[1], NIDA[2], NIAAA[3] | NIDA[2], NIAAA[3], NIMH[10] |
| Other facilities | NIMH[1], NIDA[2], NIAAA[3] | NIMH[1], NIDA[2], NIAAA[3] |
| ADM units in correctional facilities | NIDA[2], NIAAA[3] | NIDA[2], NIAAA[3] |
| Private practice psychiatrists | NIE[4] | NCHS[12] |
| Private practice psychologists | ADA[5] | NCHS[12] |
| **General health facilities** | | |
| Hospital-based | | |
| Non-Federal community hospitals (excluding psychiatric units) | NIE[4] | NCHS[13] |
| VA general hospitals and other facilities | Statistical Abstract[6] Special data analysis[7] | Special data analysis[7] |
| Other Federal facilities | Federal agencies[8] Statistical Abstract[6] | Federal agencies[14] |

Table III-3 (continued)

| Setting | Data Sources | |
|---|---|---|
| | Costs | Diagnoses |
| Other general health facilities and services | | |
| Nursing homes | NHD[4] | NCHS[15] |
| Private practice physicians | NHE[4] | NCHS[12] |
| Dentists | NHE[4] | Estimated[16] |
| Other health professionals | NHE[4] | Estimated[16] |
| Drugs and drug sundries | NHE[4] | Estimated[16] |
| Other health services | NHE[4] | Estimated[16] |
| Volunteer services | ACTION[9] | Estimated[16] |

[1]U.S. DHHS, NIMH (1983a).

[2]U.S. DHHS, NIDA, special data analysis of 1980 NDATUS files.

[3]U.S. DHHS, NIAAA, special data analysis of 1980 NDATUS files.

[4]Gibson and Waldo (1981).

[5]Vandenbos, Stapp, and Kilburg (1981).

[6]U.S., DOC, BOC, Statistical Abstract (1982).

[7]Special data analysis, VA Department of Medicine and Surgery.

[8]Letters from: Department of the Air Force, Navy, Army, Public Health Service, and Indian Health Service.

[9]ACTION (1975; 1976).

[10]U.S. DHHS, NIMH (1983b).

[11]U.S. DHHS, NIMH (1981).

[12]U.S. DHHS, NCHS, unpublished 1980 Ambulatory Care Survey data.

[13]U.S. DHHS, NCHS, unpublished 1980 Hospital Discharge Survey data.

Table III-3 (continued)

[14]Unpublished reports from:

| | |
|---|---|
| Public Health Service | - Primary Diagnosis by Sex and Age Group by Average Length of Stay for Single and Multiple Diagnosis, October 1976 through September 1977. |
| Indian Health Service | - Inpatient Report 2B - Number of Discharges and Hospital Days by External Cause of Current Injury, by Age Group. Direct Inpatient on Request Report No. 21 - Hospital Discharges, Days and Average Length of Stay by Admission Diagnosis, Sex and Age Groups. |
| Department of the Army | - Disposition, Bed Days, and Length of Stay by Selected Diagnosis, Patients in U.S. Army Hospitals Worldwide, CY 1977. |
| Department of the Air Force | - Total Inpatient Discharges and Total Bed Days at Air Force Medical Treatment Facilities by Diagnosis Class and for Selected Diagnosis Within Selected Classes, Worldwide: FY 1977. |
| Department of the Navy | - Incidence, Patients Treated in Navy Medical Treatment Facilities by Patient Category, 1976. |

[15]U.S. DHEW, NCHS (1979).

[16]Estimates based upon distribution of ADM illness costs in VA general hospitals, community hospitals, and for physician services.

for sources). Total expenditures within a given setting were allocated to alcohol abuse, drug abuse, and mental illness on the basis of service utilization data. This approach involved identifying specific diseases and illnesses that are related to alcohol, drug abuse and mental illness (see table III-4) and allocating costs based on the portions of the illnesses or diseases that are ADM-related. The causal relationship factors used here are identical to those in the 1981 study, except for the addition of alcoholic cardiomyopathy. For this study, HCFA provided 1980 expenditure data for most health care settings. For a number of ADM speciality settings (community mental health centers and various freestanding facilities), expenditure data were obtained from NIMH for 1979, the most recent year for which data had been collected. The 1979 estimates were inflated to 1980 values using the health care component index of the Consumer Price Index.

Sources of current utilization data included the Hospital Discharge Survey data for general hospitals, the Ambulatory Care Survey data for private practice physician visits, and inpatient data for all hospitals run by the Veterans Administration. Health care providers covered by these three data sources accounted for nearly 60 percent of all health care services utilized in the United States in 1977. Where 1980 data were unavailable, the 1977 utilization data for these settings were used.

Costs estimated using national expenditure and utilization data are presented in table III-5. The total costs for alcohol abuse, drug abuse, and mental illness, respectively, were $8.8 billion, $1.2 billion, and $21.0 billion, respectively, for a total of $30.9 billion. ADM accounted for approximately 14 percent of the $223.8 billion spent on personal health care for all illnesses in 1980.

Nearly half of total expenditures for mental illness ($21.0 billion) were for specialized services ($10.0 billion) such as psychiatric hospitals, CMHC's, and psychiatrists and psychologists. In contrast, 38 percent of expenditures for drug abuse and 12 percent for alcohol abuse were in specialized settings.

A major modification was made to this cost component with the introduction of cost estimates for the fetal alcohol syndrome (FAS). FAS may be described as a "set" of serious birth defects including mental impairment,

Table III-4

Diagnostic Categories Used to
Estimate ADM Treatment Costs

A. ALCOHOL ABUSE

1. Alcohol Abuse-Specific Illnesses

| ICDA-8 Code | ICD-9-CM Code | Diagnosis | Percent Associated with Alcohol Abuse |
|---|---|---|---|
| 291 | 291 | Alcohol psychosis | 100 |
| 303 | 303 | Alcohol dependence syndrome | 100 |
| | 305.0 | Alcohol abuse | 100 |
| 571.0 | 571.0 | Alcoholic fatty liver | 100 |
| 571.0 | 571.1 | Acute alcoholic hepatitis | 100 |
| 571.0 | 571.2 | Alcoholic cirrhosis of liver | 100 |
| 571.0 | 571.3 | Alcholic liver damage, unspecified | 100 |
| 980.0 | 980.0 | Toxic effects of ethyl alcohol | |
| | 425.5 | Alcoholic cardiomyopathy | 100 |

2. Alcohol Abuse-Related Illnesses

| | | | |
|---|---|---|---|
| **Cancer** | | | |
| 140-149 | 140-149 | Malignant neoplasm of lip, oral cavity and pharynx | 2 to 43 |
| 150 | 150 | Malignant neoplasm of esophagus | 28.8 to 80 |
| 151 | 151 | Malignant neoplasm of stomach | .3 to 20 |
| 153 | 153 | Malignant neoplasm of colon | .3 |
| 154 | 154 | Malignant neoplasm of rectum, rectosigmoid junction, and anus | .3 |
| 155.0 | 155.0 | Liver, primary | 12.6 |
| 157 | 157 | Malignant neoplasm of pancreas | 1.2 to 75 |
| **Mental Disorders** | | | |
| 296 | 296 | Affective psychoses | 2.8 to 42 |
| 300 | 300 | Neurotic disorders | 5.6 |
| **Infectious Diseases** | | | |
| 011 | 011 | Pulmonary tuberculosis | 10.2 to 70 |
| 012 | 012 | Other respiratory tuberculosis | 10.2 to 70 |
| 480-486 | 480-486 | Pneumonia | 1.1 to 4 |

Table III-4 (continued)

| ICDA-8 Code | ICD-9-CM Code | Diagnosis | Percent Associated with Alcohol Abuse |
|---|---|---|---|
| **Gastrointestinal Tract** | | | |
| 456 | 456 | Varicose veins of other sites | 26.7 |
| 531 | 531 | Gastric ulcers | 1.2 |
| 536 | 536 | Disorders of function of stomach | .8 |
| 532 | 532 | Duodenal ulcer | .8 to 6.7 |
| 533 | 533 | Peptic ulcer, site unspecified | .6 to 24.4 |
| 534 | 534 | Gastrojejunal ulcer | 1.8 |
| 535 | 535 | Gastritis and duodenitis | 2.9 |
| 577 | 577 | Diseases of pancreas | 11.6 to 68 |
| **Liver Disease** | | | |
| 571 | 571 | Chronic liver disease and cirrhosis | 64.75 |
| **Nervous Disease** | | | |
| 345 | 345 | Epilepsy | 3.3 |
| **Heart** | | | |
| 427.4 | 427.3 | Cardiac arrhythmias | 1.3 to 3.7 |
| **Endocrine System** | | | |
| 240-246 | 240-246 | Disease of thyroid gland | .8 to 34.8 |
| 250-258 | 250-259 | Diseases of other endocrine glands | .8 to 34.8 |
| **Nutritional Deficiency** | | | |
| 260-269 | 260-269 | Nutritional deficiencies | 4.3 to 60 |
| 274 | 274 | Gout | 1.7 to 25.3 |
| 275 | 273 | Other and unspecified metabolic diseases | 1.4 |
| | | **3. Alcohol Abuse-Related Trauma** | |
| 800-999 | 800-999 | Injury and poisoning | 10 |

Table III-4 (continued)

| ICDA-8 Code | ICD-9-CM Code | Diagnosis |
|---|---|---|
| **B. DRUG ABUSE** | | |
| 304 | 304 | Drug dependence |
| | 292 | Drug psychosis |
| | 305 | Nondependent abuse of drugs |
| 960-977 | 960-977 | Poisonings of drugs, medicinal and biological substances |
| **C. MENTAL ILLNESS** | | |
| 290 | 290 | Senile and presenile organic psychotic disorders |
| | 293 | Transient organic psychotic conditions |
| | 294 | Other organic psychotic conditions |
| 295 | 295 | Schizophrenic disorders |
| 296 | 296 | Affective psychoses |
| 297 | 297 | Paranoid states |
| 298 | 298 | Other nonorganic psychoses |
| 299 | 299 | Psychoses with origin specific to childhood |
| 300 | 300 | Neurotic disorders |
| 301 | 301 | Personality disorders |
| 302 | 302 | Sexual deviations and disorders |
| 305 | 306 | Physiological malfunction arising from mental disorders |
| 306 | 307 | Special symptoms or syndromes, nec |
| | 308 | Acute reaction to stress |
| 307 | 309 | Adjustment reaction |
| | 310 | Specific nonpsychotic mental disorders due to organic brain damage |
| | 311 | Depressive disorders, nec |
| | 312 | Disturbance of conduct, nec |
| | 313 | Disturbance of emotion specific to childhood and adolescence |
| | 314 | Hyperkinetic syndrome of childhood |
| | 315 | Specific delays in development |
| | 316 | Psychic factors associated with diseases classified elsewhere |
| 794 | 794 | Senility without mention of psychosis |

Source: Research Triangle Institute.

growth retardation, hearing problems, heart defects, and other abnormalities. The defects occur at varying rates within the syndrome, with no single combination of defects predominant.

The costs of FAS could not be estimated using the established methodology for several reasons. Children with birth defects may not be identified as FAS victims when they are treated and, therefore, are not identified in health treatment statistics. Each of the individual defects also may arise due to other causes. The syndrome was only recently identified by health researchers, and it is not widely understood in the profession. Although FAS has a rate of incidence close to those of Down's syndrome and spina bifida, it is still relatively infrequent.

Estimation of the majority of treatment costs for FAS was based on nationally representative data sources for health treatment expenditures and utilization. The methodological technique and results are presented in the appendix. The mid-range cost for FAS treatment in 1980 was $2.4 billion. The largest cost component was for the provision of institutional and day services for adult FAS victims with mental retardation. The findings are consistent with and additive to the other direct health treatment costs for alcohol abuse and have been included in tables III-1 and I-1.

C. Core Direct Costs--Support

The methodology for these costs has been reproduced from the prior study (table III-6).

D. Core Indirect Costs--Mortality

The methodology for these costs has been reproduced from the prior study. There are three crucial elements in deriving the mortality cost estimates: the identification of the diagnoses related to ADM deaths, the numbers of ADM deaths, and the value of these lost lives. A number of illnesses and diseases have been identified in publications by NIAAA, NIDA, and NIMH as being ADM-related (see tables III-7, III-8, and III-9). This study and the prior effort generally used factors that have been identified in published work. Alcoholic cardiomyopathy, a higher proportion of mortality due to "other" cirrhosis of the liver, and 10 percent of homicides (due to violence in the drug distribution network) were added in this study. The second element is the number of deaths by illness or disease type. Mortality data for 1980 were obtained from the National Center for Health Statistics, Vital Statistics Branch. The third element is the value placed on those lost lives.

Table III-5

ADM Costs by Setting, 1980
($ in millions)

| Settings | Costs | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | All Alcohol Abuse Illnesses | Alcohol Abuse Specific Illnesses | Alcohol Abuse Related Trauma | Alcohol Abuse Related Illness | Drug Abuse | Mental Illness | All ADM | All Illnesses |
| ADM facilities | $1,058 | $1,011 | $ [a] | $ 47 | $ 452 | $10,020 | $11,531 | $ 12,375 |
| Hospital-based | 341 | 341 | | | 85 | 5,665 | 6,090 | 6,549 |
| State and county psychiatric hospitals | 217 | 217 | | | 54 | 3,605 | 3,876 | 4,167 |
| Private psychiatric hospitals | 43 | 43 | | | 11 | 713 | 767 | 824 |
| VA neurosychiatric hospitals | 33 | 33 | | | 8 | 543 | 584 | 628 |
| Non-Federal general hospitals with separate psychiatric units | 48 | 48 | | | 12 | 804 | 864 | 929 |
| Other ADM facilities and services | 717 | 670 | a | 47 | 367 | 4,357 | 5,440 | 5,827 |
| Federally funded CMHCs | 181 | 181 | | | 50 | 997 | 1,228 | 1,481 |
| Residential treatment centers for children | 0 | 0 | | | 0 | 484 | 484 | 484 |
| Freestanding facilities | 379 | 379 | | | 265 | 565 | 1,208 | 1,254 |
| Other facilities | 49 | 49 | | | 33 | 179 | 261 | 276 |
| ADM units in correctional facilities | 2 | 2 | | | 8 | - | 10 | 10 |
| Private practice psychiatrists | 58 | 11 | a | 47 | 6 | 1,150 | 1,213 | 1,286 |
| Private practice psychologists | 49 | 49 | | | 5 | 982 | 1,036 | 1,036 |
| General health facilities | 7,730 | 3,442 | 1,788 | 2,500 | 747 | 10,940 | 19,417 | 211,390 |
| Hospital-based | 4,800 | 2,386 | 882 | 1,532 | 527 | 5,088 | 10,415 | 93,046 |
| Non-Federal community hospitals (excluding psychiatric units) | 3,979 | 1,795 | 822 | 1,362 | 421 | 3,933 | 8,332 | 83,500 |
| VA general hospitals and other facilities | 544 | 435 | 18 | 91 | 46 | 861 | 1,451 | 5,313 |
| Other Federal facilities[b] | 278 | 157 | 43 | 78 | 60 | 294 | 631 | 4,233 |
| Other general health facilities and services | 2,930 | 1,056 | 906 | 968 | 221 | 5,852 | 9,002 | 118,350 |
| Nursing homes | 167 | 105 | 62 | - | - | 2,783 | 2,951 | 20,700 |
| Private practice physicians | 726 | 61 | 373 | 291 | 28 | 870 | 1,624 | 45,514 |
| Dentists | 621 | 271 | 144 | 206 | 59 | 670 | 1,350 | 15,900 |
| Other health professionals | 171 | 74 | 39 | 57 | 16 | 184 | 371 | 4,364 |
| Drugs and drug sundries | 750 | 327 | 173 | 249 | 71 | 810 | 1,631 | 19,200 |
| Other health services | 359 | 157 | 83 | 119 | 34 | 388 | 781 | 9,195 |
| Volunteer services | 136 | 59 | 31 | 45 | 13 | 146 | 295 | 3,472 |
| Total | $8,787 | $4,453 | $1,788 | $2,546 | $1,200 | $20,961 | $30,947 | $223,770 |

Note: Totals may not add due to rounding.

[a] Less than $.5 million.

[b] A small portion of these were in non-hospital-based facilities.

Source: Research Triangle Institute.

Table III-6

Support Costs for ADM Health Care Provision, 1980
($ in millions)

| Expenditure Category | Total Health Expenditures | Share of Total Health Services and Supplies Due to | | | Costs | | | |
|---|---|---|---|---|---|---|---|---|
| | | Alcohol Abuse (percent) | Drug Abuse (percent) | Mental Illness (percent) | Alcohol Abuse | Drug Abuse | Mental Illness | All ADM Disorders |
| Research[a] | $ 5,400 | 0.70 | 2.10 | 6.30 | $ 37.8 | $113.4 | $ 340.2 | $ 491.4 |
| Training & education[b] | 7,600 | 3.93 | 0.54 | 9.40 | 298.0 | 40.7 | 710.7 | 1,049.0 |
| Construction[b] | 6,100 | 3.93 | 0.54 | 9.40 | 239.5 | 32.7 | 571.4 | 843.6 |
| Health insurance administration[b] | 10,400 | 3.93 | 0.54 | 9.40 | 408.4 | 55.8 | 974.2 | 1,438.0 |
| Total | $29,500 | | | | $983.7 | $242.5 | $2,596.5 | $3,822.8 |

[a]From the Report by the President's Commission on Mental Health (1978).

[b]Calculated by assuming that the ADM portions of total expenditures for this category are the same as the ADM portion for direct health care treatment.

Totals may not add due to rounding.

Source: Research Triangle Institute.

Table III-7

Causes of Mortality Related to Alcohol Abuse

| Cause | Proportion of Mortalities Due to Alcohol Abuse (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9 Code |
|---|---|---|---|---|
| Direct causes - primary | | | | |
| Alcoholic psychoses | 100.0 | 454 | 291 | 291 |
| Alcoholism | 100.0 | 4,345 | 303 | 303 |
| Cirrhosis, alcoholic | 100.0 | 12,705 | 571.0 | 571.0-571.3 |
| Accidental poisoning by alcohol | 100.0 | 343 | E860 | E860 |
| Cardiomyopathy, alcoholic | 100.0 | 650 | 425 | 425.5 |
| Direct causes - secondary | | | | |
| Cirrhosis, other | 64.3 | 16,170 | 571.8,571.9 | 571.4-571.9 |
| Respiratory tuberculosis | 25.0 | 1,634 | 011-012 | 011-012 |
| Neoplasm | | | | |
| Tongue, malignant | - | 1,874 | 141 | 141 |
| Mouth, floor malignant | - | 509 | 144 | 144 |
| Mouth, other, malignant | - | 1,399 | 145 | 145 |
| Pharynx, malignant, oro | - | 1,127 | 146 | 146 |
| Pharynx, malignant, naso | - | 585 | 147 | 147 |
| Pharynx, malignant, hypo | - | 634 | 148 | 148 |
| Pharynx, malignant, unspecified | - | 1,501 | 149 | 149.0 |
| Esophagus, malignant | - | 7,985 | 150 | 150 |
| Stomach, malignant | - | 14,372 | 151 | 151 |
| Rectum, malignant | - | 7,435 | 154.1 | 154.1 |
| Liver, malignant, primary | 56.0 | 2,395 | 155.0 | 155.0 |
| Liver, bile duct type[b] | - | 455 | 155.1 | 155.1 |
| Pancreas, malignant | - | 19,640 | 157.9 | 157.9 |
| Larynx, malignant | - | 3,412 | 161 | 161 |
| Liver, malignant, unspecified | - | - | 197.8 | 197.7 |
| Esophagus, benign | - | - | 211.0 | 211.0 |
| Liver, benign[b] | - | 11 | 211.5 | 211.5 |
| Rectum, benign | - | 1 | 211.4 | 211.4 |
| Pancreas, benign | - | 9 | 211.6 | 211.6 |
| Larynx, benign | - | 1 | 212 | 212.1 |
| Stomach, unspecified | - | 2 | 230 | 230.2 |
| Esophagus, unspecified | - | 1 | 230.0 | 230.1 |
| Liver, unspecified | - | - | 230.5 | 230.8 |
| Pancreas, unspecified | - | - | 230.6 | 230.9 |
| Rectum, unspecified | - | - | 230.4 | 230.4 |
| Larynx, unspecified[b] | - | 1 | 231 | 231.0 |
| Tongue, unspecified[b] | - | 4 | 239 | 230 |

Table III-7 (continued)

| Cause | Proportion of Mortalities Due to Alcohol Abuse (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9 Code |
|---|---|---|---|---|
| Hypoglycemia, spontaneous | - | 167 | 251 | 251.0, 251.2 |
| Malabsorption[b] | - | 11 | 261 | 265.1 |
| Beriberi | - | 2 | 261 | 265.0 |
| Polyneuropathy[b] | - | 11 | 261 | 265.1 |
| Niacin deficiency[b] | - | 4 | 262 | 265.2 |
| Pellagra | - | 4 | 262 | 265.2 |
| Malabsorption<br>Cyanocobalamine deficiency[b]<br>Folic acid deficiency[b] | - | 4 | 263.8 | 266.2 |
| Other vitamin B deficiencies, unspecified | - | - | 263.9 | 266.9 |
| Wernicke's encephalopathy[b] | - | - | 263.9 | 266.9 |
| Ascorbic acid deficiency | - | 4 | 264 | 267 |
| Malabsorption syndrome, unspecified | - | - | 269.1 | - |
| Plasma protein abnormalities | - | 375 | 275 | 273 |
| Other and unspecified metabolic diseases | - | 1,361 | 279 | 277 |
| Folic acid deficiency anemia | - | 14 | 281.2 | 281.2 |
| Other acquired hemolytic anemias | - | 25 | 283.9 | 283.9 |
| Progressive muscular dystrophy | - | 589 | 330.3 | 359.1 |
| Other demyelinating diseases of central nervous system | - | 182 | 341 | 341 |
| Marchiafava's disease[b] | - | 4 | 341 | 341.8 |
| Other and unspecified diseases of peripheral nerve except autonomic | - | 109 | 357.9 | 356.8, 356.9 |
| Hypertension[b] | - | 2,840 | 401 | 401 |
| Diseases of capillaries | - | 45 | 448 | 448 |
| Inflammatory diseases of esophagus | - | 248 | 530.1 | 530.1 |
| Gastritis and duodenitis | - | 695 | 535 | 535 |
| Pancreatitis, acute | 35.5 | 1,390 | 577.0 | 577.0 |
| Pancreatitis, chronic | 35.5 | 261 | 577.1 | 577.1 |
| Rosacea | - | 0 | 695.3 | 695.3 |
| Chronic ulcer of skin, other[b] | - | 70 | 707.9 | 707.8, 707.9 |
| Other and unspecified disease of muscle, tendon, and fascia | - | 72 | 733.9 | 728.8, 728.9 |

Table III-7 (continued)

| Cause | Proportion of Mortalities Due to Alcohol Abuse (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9 Code |
|---|---|---|---|---|
| Myopathy, primary | - | 72 | 733.9 | 728.8, 728.9 |
| Myopathy, progressive | - | 72 | 733.9 | 728.8, 728.9 |
| Convulsions[b] | - | 354 | 780.2 | 780.3 |
| Keto-acidosis, alcoholic[b] | - | 710 | 788.0 | 276.2 |
| Senility without mention of psychosis | - | 1,233 | 794 | 797 |
| Indirect causes | | | | |
| Motor vehicle crashes | 37 | 52,979 | E810-E823 | E810-E825 |
| Accidental falls | 44.4 | 13,312 | E880-E887 | E880-E888 |
| Accidents caused by fires and flames | 25.9 | 5,865 | E890-E899 | E890-E899 |
| Homicide | 30.0 | 23,902 | E960-E969 | E960-E969 |
| Other accidents | 11.1 | 30,573 | E830-E845, E910-E929 | E800-E807 E830-E845 EE860-E879 E900-E949 |
| Suicide | 0 | 26,852 | | |

[a]Because the proportion of mortalities due to alcohol abuse is unknown, some cells in this column lack a number giving a proportion. These causes are excluded from the analysis.

[b]This illness is a subcategory of the ICD-9 class for which mortality data are available. Therefore, the number of deaths due to this cause is less than the value listed.

Source: Keller (1971; 1974); Noble (1978); unpublished mortality data from the Vital Statistics files provided by NCHS (U.S. DHHS, NCHS, no date).

Table III-8

Causes of Mortality Related to Drug Abuse

| Cause | Proportion of Mortalities Due to Drug Abuse (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9-CM Code |
|---|---|---|---|---|
| Drug Dependence | 100 | 629 | 304 | 304 |
| Accidental Overdose of Psychoactive Drugs | | | | |
| Heroin | 100 | 322 | E853.0 | E850.0 |
| Methadone | 100 | 75 | E853.0 | E850.1 |
| Other opiates and related narcotics | 100 | 21 | E853.0 | E850.2 |
| Other nonnarcotic analgesics | 100 | 0 | | E850.7 |
| Other specific analgesics and antipyretics | 100 | 97 | E858.9 | E850.8 |
| Unspecified analgesics and antipyretics | 100 | 0 | E853.9 | E850.9 |
| Barbiturates | 100 | 154 | E854.0 | E851 |
| Other sedatives and hypnotics | 100 | 59 | E854 | E852 |
| Tranquilizers | 100 | 110 | E855.1 | E853 |
| Other psychotropic agents (inc. antidepressants) | 100 | 161 | E855.2 | E854 |
| Other drugs acting on central and autonomic nervous system | 100 | 159 | E856 | E855 |
| Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers | 100 | 24 | E865 | E863 |
| Accidental Overdose of Drugs and Medicaments | | | | |
| Accidental poisoning by antibiotics | 100 | 50 | E850 | E856 |
| Accidental poisoning by other anti-infectives | 100 | 7 | E850 | E857 |
| Hormones and synthetic substitutes | 100 | 20 | E851 | E858.0 |
| Primarily systemic agents | 100 | 12 | E852 | E858.1 |
| Agents primarily affecting blood constituents | 100 | 17 | E852 | E858.2 |
| Salicylates | 100 | 2 | E853.1 | E850.3 |
| Aromatic analgesics, nec | 100 | 2 | E853.4 | E850.4 |
| Pyrazole derivatives | 100 | 117 | E853.5 | E850.5 |
| Antirheumatics | 100 | 0 | | E850.6 |

Table III-8 (continued)

| Cause | Proportion of Mortalities Due to Drug Abuse (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9-CM Code |
|---|---|---|---|---|
| Agents primarily affecting cardiovascular system | 100 | 190 | E857 | E858.3 |
| Agents primarily affecting gastrointestinal system | 100 | 3 | E858 | E858.4 |
| Water mineral and uric acid metabolism drugs | 100 | 13 | E859.3 | E858.5 |
| Agents primarily acting on the smooth and skeletal muscles and respiratory system | 100 | 13 | E859.4 | E858.6 |
| Agents primarily affecting skin and mucus membrane ophthalmological, otorhinolaryngological, and dental drugs | 100 | 9 | E859.5<br>E859.6<br>E859.7 | E858.7 |
| Other specified drugs | 100 | 404 | E859.8 | E858.8 |
| Unspecified drug | 100 | | E859.9 | E858.8 |
| Injury Undetermined Whether Accidental or Purposely Inflicted | | | | |
| Analgesics, antipyretics and antiheumatics | 100 | 201 | E980.1 | E980.0 |
| Barbiturates | 100 | 65 | E980.0 | E980.1 |
| Other sedatives and hypnotics | 100 | 28 | | E980.2 |
| Tranquilizers and other psychotropic agents | 100 | 140 | E980.2 | E980.3 |
| Other specified drugs and medicinal substances | 100 | 174 | E980.3 | E980.4 |
| Unspecified drug or medicinal substance | 100 | 217 | E980.3 | E980.5 |
| All other solid or liquid substances | 100 | 507 | E980 | E980 |

Source: Unpublished mortality data from the Vital Statistics files provided by NCHS (U.S. DHHS, NCHS, no date).

Table III-9

Causes of Mortality Related to Mental Illness

| Cause | Proportion of Mortalities due to Mental Illness (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9-CM Code |
|---|---|---|---|---|
| Psychoses | | | | |
| Senile and presenile organic psychotic | 100 | 1,713 | 290 | 290 |
| Transient organic psychotic conditions | 100 | 2 | | 293 |
| Other organic psychotic conditions | 100 | 41 | | 294 |
| Schizophrenic disorders | 100 | 165 | 295 | 295 |
| Affective psychoses | 100 | 48 | 296 | 296 |
| Paranoid states | 100 | 7 | 297 | 297 |
| Other nonorganic psychoses | 100 | 437 | 298 | 298 |
| Psychoses with origin specific to childhood | 100 | 1 | 299 | 299 |
| Neuroses | | | | |
| Neurotic disorders | 100 | 66 | 300 | 300 |
| Personality disorders | 100 | 2 | 301 | 301 |
| Sexual deviations and disorders | 100 | 1 | 302 | 302 |
| Physiological malfunction arising from mental disorders | 100 | 25 | 305 | 306 |
| Special symptoms or syndromes, nec | 100 | 162 | 306 | 307 |
| Acute reaction to stress | 100 | 32 | | 308 |
| Adjustment reaction | 100 | 2 | 307 | 309 |
| Specific nonpsychotic mental disorders due to organic brain damage | 100 | 4,170 | 794 | 310 |
| Depressive disorders, nec | 100 | 217 | | 311 |
| Disturbance of conduct, nec | 100 | 0 | | 312 |
| Disturbance of emotion specific to childhood and adolescence | 100 | 0 | | 313 |
| Hyperkinetic syndrome of childhood | 100 | 0 | | 314 |
| Specific delays in development | 100 | 4 | | 315 |
| Psychic factors associated with diseases classified elsewhere | 100 | 0 | | 316 |

Table III-9 (continued)

| Cause | Proportion of Mortalities Due to Mental Illness (percent)[a] | Mortalities in 1980 | ICDA-8 Code | ICD-9-CM Code |
|---|---|---|---|---|
| Suicide and self-inflicted poisoning by solid or liquid substances | 100 | 216 | E950.4<br>E950.9 | E950.6<br>E950.9 |
| Suicide and self-inflicted poisoning by: analgesics, antipyretics, and antirheumatics, barbiturates, other sedatives and hynotics | 100 | 607 | E950.1<br>E950.0 | E950.1<br>E950.1<br>E950.2 |
| Tranquilizers and other psychotropic agents | 100 | 754 | E950.2 | E950.3 |
| Other specified drugs and medicinal substances | 100 | 562 | E950.3 | E950.4 |
| Unspecified drug or medicinal substances | 100 | 538 | E950.3 | E950.5 |
| Suicide: (excluding drug overdoses): E950.1, E950.2, E950.3, E950.4, E950.5 | 100 | 24,391 | | E950-E959 |

Source: Unpublished mortality data from the Vital Statistics files provided by NCHS (U.S. DHHS, NCHS, no date).

This study and its predecessors used the human capital approach which sums the present discounted value of productivity over the expected remaining lifetime. In this approach, a value is assigned to production lost due to premature death. These factors were obtained from Dr. Thomas Hodgson of NCHS (see table III-10). The cost estimates are presented as tables III-11, III-12, and III-13, respectively, for alcohol, drug abuse, and mental illness.

E. Core Indirect Costs--Morbidity

1. Alcohol Abuse

Reduced Productivity

Alcohol abuse is recognized as a significant problem in the workplace. This component estimates the losses to society due to impaired productivity on the job of persons that may or may not be recognized by employers as problem drinkers. A detailed discussion of the issues and methodology is found in the appendix.

This component was estimated at $50.6 billion in 1980, a 114 percent increase over the 1977 estimates. As the result of an analysis reported in the appendix, the impact of problem drinking on productivity in the workforce is now estimated at 21 percent instead of the 14 percent figure used in the previous study. The overall prevalence rate has not changed: it is estimated to be 10 percent of the workforce (see table III-17 for the age/sex prevalence).

Several other changes were made. Wages, salaries, and employee benefits increased by 31 percent between 1977 and 1980, and the workforce grew by 8 percent. To be consistent with the prior estimates for alcohol- and mental illness-related disabilities, costs were imputed to all problem drinkers in the labor force (an extra 9 percent), not just to those who were employed.

Fundamental information used in these calculations is found in tables III-14 to III-18. Average expected productivity rates by age and sex are shown in table III-14, while the total age/sex distribution of the labor force is shown in table III-15. Basic rates of problem drinking in the adult U.S. population from the most recent national household survey (Clark and Midanik, 1982) are found in table III-16. These are presented for comparison to the prevalence rates developed in that study (table III-17).

Table III-10

Present Values of Expected Future Lifetime Earnings and Housekeeping Services According to Age, Sex, and Discount Rate, 1980

| Age | Male | | | Female | | |
|---|---|---|---|---|---|---|
| | 10% | 6% | 4% | 10% | 6% | 4% |
| 0-1 | $56,173 | $200,992 | $415,998 | $51,194 | $166,303 | $330,065 |
| 1-4 | 68,085 | 222,067 | 438,242 | 62,002 | 183,597 | 347,443 |
| 5-9 | 95,842 | 264,604 | 479,294 | 87,229 | 218,641 | 379,771 |
| 10-14 | 140,028 | 321,232 | 529,007 | 127,380 | 265,301 | 418,954 |
| 15-19 | 195,970 | 382,235 | 576,855 | 171,579 | 308,166 | 448,842 |
| 20-24 | 247,482 | 429,152 | 604,379 | 198,450 | 325,736 | 448,982 |
| 25-29 | 279,025 | 446,490 | 597,040 | 201,908 | 314,918 | 418,703 |
| 30-34 | 288,553 | 434,295 | 557,084 | 191,522 | 288,221 | 372,595 |
| 35-39 | 278,238 | 397,573 | 492,083 | 176,550 | 256,285 | 322,318 |
| 40-44 | 253,340 | 344,695 | 412,732 | 158,732 | 221,311 | 270,522 |
| 45-49 | 217,538 | 281,249 | 325,967 | 136,295 | 182,338 | 216,805 |
| 50-54 | 170,539 | 209,546 | 235,464 | 109,535 | 140,696 | 163,014 |
| 55-59 | 113,364 | 132,720 | 145,110 | 79,530 | 98,510 | 111,643 |
| 60-64 | 54,830 | 62,538 | 67,446 | 49,785 | 60,224 | 67,282 |
| 65-69 | 20,535 | 23,810 | 25,887 | 27,906 | 33,453 | 37,104 |
| 70-74 | 10,271 | 11,750 | 12,666 | 15,965 | 18,772 | 20,557 |
| 75-79 | 5,074 | 5,719 | 6,108 | 8,855 | 10,159 | 10,952 |
| 80-84 | 2,578 | 2,847 | 3,002 | 3,722 | 4,115 | 4,340 |
| 85+ | 852 | 892 | 914 | 1,116 | 1,169 | 1,197 |

Source: Unpublished data from Dr. Thomas Hodgson, NCHS (1984).

Table III-11
Economic Cost of Mortalities Due to Alcohol Abuse - for Various Discount Rates, 1980
($ in millions)

| Cause of Death - Primary Diagnosis | Mortalities in 1980 | | | Discount Rates | | |
|---|---|---|---|---|---|---|
| | Total | Attributed to Alcohol Abuse Percent | Number | 10% | 6% | 4% |
| Direct Primary Causes | 18,497 | 100 | 18,497 | $2,325 | $3,076 | $3,645 |
| Alcohol psychosis | 454 | 100 | 454 | 60 | 80 | 96 |
| Alcoholism | 4,345 | 100 | 4,345 | 564 | 748 | 888 |
| Alcohol cirrhosis of liver | 12,705 | 100 | 12,705 | 1,555 | 2,047 | 2,418 |
| Alcohol poisoning | 343 | 100 | 343 | 59 | 85 | 107 |
| Alcoholic cardiomyopathy | 650 | 100 | 650 | 87 | 115 | 136 |
| Direct Secondary Causes | 92,218 | | 13,086 | 1,183 | 1,563 | 1,856 |
| Cirrhosis of liver-other | 16,170 | 64.3 | 10,397 | 1,002 | 1,321 | 1,565 |
| Malignant primary liver neoplasm | 2,395 | 56 | 1,341 | 78 | 104 | 126 |
| Other malignant neoplasms of gastrointestinal tract | 60,958 | a | - | - | - | - |
| Pancreatitis | 1,651 | 35.5 | 939 | 79 | 107 | 129 |
| Respiratory tuberculosis | 1,634 | 25 | 409 | 24 | 31 | 36 |
| Other associated diseases | 9,410 | a | | - | - | - |
| Indirect Causes | 153,483 | | 37,597 | 6,067 | 9,817 | 13,410 |
| Motor vehicle crashes | 52,979 | 37 | 19,602 | 3,596 | 5,919 | 8,162 |
| Falls | 13,312 | 44.4 | 5,911 | 317 | 462 | 594 |
| Fires | 5,865 | 25.9 | 1,519 | 169 | 287 | 413 |
| Other[b] | 30,573 | 11.1 | 3,394 | 485 | 789 | 1,090 |
| Homicide | 23,902 | 30 | 7,171 | 1,500 | 2,358 | 3,148 |
| Suicide | 26,852 | 0 | - | 0 | - | 0 |
| Total | 264,198 | | $69,180 | $9,575 | $14,456 | $18,911 |

[a]Values of causal factors unknown and are assumed to be zero for this study.

[b]Includes all accidents not listed above but excludes accidents incurred in medical and surgical procedures and psychoactive drugs.

Totals may not add due to rounding.

Source: Research Triangle Institute; unpublished mortality data from the Vital Statistics files provided by NCHS (U.S. DHHS, NCHS, no date).

Table III-12

Economic Cost of Mortalities Due to Drug Abuse - for Various Discount Rates, 1980 ($ in millions)

| Cause of Death - Primary Diagnosis | Mortalities in 1980 | | | Discount Rates | | |
|---|---|---|---|---|---|---|
| | Total | Attributed to Drug Abuse Percent | Number | 10% | 6% | 4% |
| Drug dependence | 629 | 100 | 629 | $157 | $242 | $317 |
| Accidental overdose of psychoactive drugs | 1,182 | 100 | 1,182 | 239 | 371 | 490 |
| Accidental overdose of other drugs and medicaments | 859 | 100 | 859 | 129 | 200 | 265 |
| Suicidal overdose of drugs and medicaments | 2,461 | 0 | 0 | 0 | 0 | 0 |
| Overdose of drugs and medicaments, reason undetermined | 1,332 | 100 | 1,332 | 251 | 381 | 497 |
| Homicide | 23,902 | 10 | 2,390 | 500 | 786 | 1,049 |
| Total | 30,365 | | 6,392 | $1,276 | $1,980 | $2,618 |

Totals may not add due to rounding.

Source: Research Triangle Institute; unpublished mortality data from the Vital Statistics file provided by NCHS (U.S. DHHS, NCHS, no date).

Table III-13

Economic Cost of Mortalities Due to Mental Illness - for Various Discount Rates, 1980 ($ in millions)

| Cause of Death - Primary Diagnosis | All Mortalities | Mortalities Attributed to Mental Illness | | Discount Rates | | |
|---|---|---|---|---|---|---|
| | | Percent | Number | 10% | 6% | 4% |
| Psychoses and neuroses[a] | 7,095 | 100 | 7,095 | $108 | $141 | $169 |
| Alcoholic psychoses and alcoholism | 454 | 0 | 0 | 0 | 0 | 0 |
| Drug dependence | 629 | 0 | 0 | 0 | 0 | 0 |
| Suicide (excluding drug overdoses) | 24,391 | 100 | 24,391 | 4,242 | 6,460 | 8,441 |
| Suicidal overdose of drugs or medicaments | 2,461 | 100 | 2,461 | 403 | 595 | 763 |
| Homicide | 23,902 | 0 | 0 | 0 | 0 | 0 |
| Total | 58,932 | | 33,947 | $4,752 | $7,196 | $9,373 |

Totals may not add due to rounding.

[a]Excluding alcohol and drug abuse-related deaths.

Source: Research Triangle Institute; unpublished mortality data from the Vital Statistics file provided by NCHS (U.S. DHHS, NCHS, no date).

Table III-14

Values of Market and Household Productivity
by Age and Sex Cohort, 1980

| Age | Males | | Females | | |
|---|---|---|---|---|---|
| | Full-time Earnings with Wage Supplement | Imputed Household Value | Full-time Earnings with Wage Supplement | Employed Household Value | Nonemployed Household Value |
| 15-19 | $10,572 | $ 70 | $ 8,225 | $ 89 | $ 9,902 |
| 20-24 | 15,529 | 807 | 11,712 | 1,959 | 11,113 |
| 25-29 | 21,293 | 1,685 | 15,307 | 5,657 | 12,233 |
| 30-34 | 25,243 | 1,925 | 15,161 | 6,745 | 11,921 |
| 35-39 | 27,221 | 1,860 | 14,886 | 7,070 | 11,429 |
| 40-44 | 28,733 | 1,863 | 14,994 | 6,658 | 10,697 |
| 45-49 | 29,121 | 1,825 | 15,054 | 6,253 | 10,011 |
| 50-54 | 28,074 | 1,817 | 15,219 | 5,840 | 9,369 |
| 55-59 | 27,173 | 1,633 | 14,460 | 5,430 | 8,768 |
| 60-64 | 25,030 | 1,593 | 14,373 | 4,189 | 6,416 |

Sources: Paringer and Berk (1977); U.S. DOL, BLS, Monthly Labor Review (September, 1983).

Table III-15

U.S. Labor Force and Employment
by Age and Sex, 1980
(number in thousands)

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| Age | Labor Force | Unemployed | Employed | Labor Force | Unemployed | Employed |
| 16-17 | 2,069 | 419 | 1,649 | 1,740 | 340 | 1,400 |
| 18-19 | 3,121 | 477 | 2,644 | 2,618 | 404 | 2,214 |
| 20-24 | 9,022 | 1,033 | 7,989 | 7,170 | 733 | 6,437 |
| 25-34 | 16,943 | 1,094 | 15,849 | 11,890 | 852 | 11,038 |
| 35-44 | 11,901 | 474 | 11,426 | 8,605 | 460 | 8,145 |
| 45-54 | 9,989 | 361 | 9,627 | 6,974 | 316 | 6,658 |
| 55-64 | 7,165 | 241 | 6,925 | 4,592 | 150 | 4,441 |
| 65+ | 1,877 | 58 | 1,819 | 1,444 | 36 | 1,108 |
| Total | 62,087 | 4,157 | 57,928 | 44,733 | 3,291 | 41,441 |

Source: U.S. DOL, BLS, Employment and Earnings (1981).

Table III-16

Proportions of Age-Sex Cohorts with Problems Due to Alcohol Abuse

| Age | Proportion with Social Consequences | | Proportion with Loss of Control or Dependence | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| 18-20 | 15 | 5 | 35 | 16 |
| 21-25 | 13 | 6 | 25 | 13 |
| 26-30 | 10 | 3 | 25 | 7 |
| 31-40 | 8 | 5 | 16 | 8 |
| 41-50 | 2 | 4 | 8 | 5 |
| 51-60 | 3 | 1 | 5 | 4 |
| 61-70 | 5 | 0 | 6 | 0 |
| 70+ | 4 | 0 | 2 | 0 |
| Total | 7 | 3 | 15 | 6 |

Source: Research Triangle Institute; Clark and Midanik, 1982.

Table III-17

Proportions of Age-Sex Cohorts with Productivity Reductions Due to Alcohol Abuse

| Age | Proportion with One or More Problem Drinking Symptoms | |
|---|---|---|
| | Males | Females |
| 18-19 | 16.4 | 5.7 |
| 20-24 | 21.0 | 15.4 |
| 25-34 | 18.5 | 4.5 |
| 35-44 | 11.9 | 8.2 |
| 45-54 | 13.3 | 5.6 |
| 55-64 | 6.0 | 0.8 |

Source: Research Triangle Institute; analysis of 1979 national household survey on alcohol abuse (Clark and Midanik, 1982).

The cost estimates of reduced productivity by age and sex are in table III-18. The number of persons in the workforce in each age/sex group was multiplied by the problem drinker prevalence rate for that group to indicate the number of problem drinkers. That number was then multiplied by the productivity values of III-14 and the rate of impairment (21 percent) to yield the value of their reduced productivity. The values in table III-18 for age groups 18 to 34 are reduced by 25 percent to adjust for the occurrence of alcohol abuse and drug abuse in the same people in this age range.

Another element was added to this cost component. The productivity of adult FAS victims is impaired due to their mental deficiencies. Impairments for minimal brain dysfunction, and mild and moderate mental retardation were assumed to be 10, 25 and 50 percent, respectively. The 219,000 non-institutionalized FAS victims had costs of $749 million. See the appendix for discussion of these estimates.

Lost Employment

There are four elements of this component: persons who experience acute problems and losses of productive time due to injuries from motor vehicle accidents, work place accidents, home accidents, violent crimes, or other kinds of trauma (table III-19); persons with chronic physical impairments which either prevent them from working or impair their ability to work (table III-20); persons out of the labor force receiving inpatient treatment (table III-21); and adult FAS victims severely/profoundly mentally retarded.

Acute short-term loss of employment due to trauma was estimated at $938 million in 1980, a 72 percent increase over the 1977 estimate of $545 million. The growth is due primarily to increases in wages and salaries in the labor force; however, the estimate also increased by an additional 30 percent due to better data from the U.S. DOJ, BJS (1984) on work loss due to violent crimes (see table III-37).

Lost employment due to physical impairments resulted in estimated costs of $2.2 billion in 1980 compared to $1.6 billion in 1977. This is an increase of about 37.5 percent, representing the combined effects of increases in wages and salaries and labor force growth over the three-year period.

Table III-18

Reduced Productivity in 1980: Alcohol Abuse
Number of Problem Drinkers and Value of Reduced Productivity, by Age and Sex Cohort
(Number in thousands, $ in millions)

| Age | Males | | Females | | | Total | |
|---|---|---|---|---|---|---|---|
| | | | Employed | | Housewives | | |
| | Number | Value | Number | Value | Value | Number | Value |
| 18-19 | 699 | $ 858 | 240 | $ 195 | $ 42 | 939 | $1,096 |
| 20-24 | 2,178 | 4,875 | 1,596 | 2,378 | 554 | 3,773 | 7,806 |
| 25-34 | 3,285 | 12,338 | 817 | 1,804 | 476 | 4,102 | 14,619 |
| 35-44 | 1,482 | 8,852 | 1,078 | 3,232 | 783 | 2,560 | 12,868 |
| 45-54 | 1,456 | 8,487 | 652 | 1,737 | 470 | 2,108 | 10,694 |
| 55-64 | 594 | 2,525 | 89 | 150 | 69 | 683 | 2,743 |
| Total | 9,694 | $37,935 | 4,471 | $9,496 | $2,394 | 14,165 | $49,826 |

Totals may not add due to rounding.

Source: Research Triangle Institute; special analysis of the 1979 national household survey on alcohol abuse (Clark and Midanik, 1982).

Table III-19

Lost Employment in 1980: Victims of Alcohol-Related Trauma (Accidents and Violence)
(Number in thousands, $ in millions)

| | Person Years | Cost |
|---|---|---|
| Motor vehicle accidents | 8.2 | $147.7 |
| Work place accidents | 9.9 | 178.7 |
| Home accidents | 9.1 | 157.2 |
| Other accidents | 14.5 | 256.8 |
| Violent crimes | 11.2 | 198.0[a] |
| Total | 52.9 | $938.4 |

Source: Research Triangle Institute; U.S. DHEW, NCHS; U.S. DOJ, LEAA, 1979c.

[a]Unpublished data from the U.S. DOJ, BJS.

Table III-20

Lost Employment in 1980: Persons with Physical Impairments Due to Alcohol Abuse (Number in thousands, $ in millions)

| | Complete | | Partial | | Total | |
|---|---|---|---|---|---|---|
| | Number | Value | Number | Value | Number | Value |
| Paralysis, | 5.1 | $ 105.2 | 5.0 | $ 14.4 | 10.1 | $ 119.6 |
| Absence of major extremities | 0.9 | 18.9 | 2.4 | 7.7 | 3.3 | 26.6 |
| Orthopedic impairments (except paralysis) of back or spine | 23.3 | 465.2 | 92.8 | 263.9 | 116.1 | 729.1 |
| Orthopedic impairments (except paralysis or absence) of upper extremity or shoulder | 6.4 | 178.4 | 29.3 | 82.7 | 35.7 | 261.1 |
| Orthopedic impairments (except paralysis or absence) of lower extremity or hip | 18.4 | 372.4 | 40.2 | 116.1 | 58.6 | 488.5 |
| Orthopedic impairments (except paralysis or absence), other, multiple, and ill-defined of limbs, back or trunk, not elsewhere classified | 22.0 | 458.8 | 39.3 | 115.5 | 61.3 | 574.3 |
| Total | 76.1 | $1,598.9 | 209.0 | $600.3 | 285.1 | $2,199.2 |

Source: Research Triangle Institute.

Table III-21

Value of Lost Employment in 1980:
Alcohol Abusers in Residential Treatment
($ in millions)

| Age | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | Number | Value | Number | Value | Number | Value |
| 18-19 | 1,887 | $ 15 | 542 | $ 3 | 2,429 | $ 18 |
| 20-24 | 4,330 | 62 | 1,244 | 15 | 5,575 | 76 |
| 25-34 | 8,138 | 195 | 2,338 | 42 | 10,475 | 236 |
| 35-44 | 8,138 | 232 | 2,338 | 41 | 10,475 | 273 |
| 45-54 | 4,964 | 138 | 1,426 | 23 | 6,391 | 161 |
| 55-64 | 4,038 | 84 | 1,160 | 14 | 5,199 | 98 |
| 65+ | 728 | 0 | 209 | 0 | 937 | 0 |
| Total | 32,222 | $725 | 9,259 | $138 | 41,481 | $863 |

Totals may not add due to rounding.

Source: Research Triangle Institute; NDATUS; verbal communication with Pat Reed of NIAAA.

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Table III-21
Value of Lost Employment in 1980:
Alcohol Abusers in Residential Treatment
($ in millions)

| Age | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | Number | Value | Number | Value | Number | Value |
| Under 18 | 546 | $ 0 | 150 | $ 0 | 696 | $ 0 |
| 18-19 | 1,218 | 10 | 283 | 2 | 1,501 | 12 |
| 20-24 | 2,521 | 36 | 542 | 7 | 3,064 | 43 |
| 25-34 | 4,623 | 111 | 1,023 | 18 | 5,646 | 129 |
| 35-44 | 4,623 | 132 | 1,023 | 18 | 5,646 | 150 |
| 45-54 | 4,196 | 117 | 678 | 11 | 4,874 | 128 |
| 55-64 | 3,518 | 73 | 527 | 6 | 4,044 | 79 |
| 65+ | 718 | 0 | 104 | 0 | 822 | 0 |
| Total | 21,963 | $478 | 4,330 | $62 | 26,293 | $540 |

Totals may not add due to rounding.

Source: Research Triangle Institute; NDATUS (unpublished data from NIAAA).

Revised October 1, 1984

Table III-22

Labor Force Age-Sex Cohorts with
Productivity Reductions Due to Drug Abuse

| Age | Proportion with Daily Use (Ever) of Marijuana | |
|---|---|---|
| | Males | Females |
| 18-19 | 18.9 | 14.3 |
| 20-24 | 21.8 | 11.0 |
| 25-34 | 12.5 | 4.5 |
| 35-44 | 0.0 | 0.0 |
| 45-54 | 0.0 | 0.0 |
| 55-64 | 0.0 | 0.0 |

Source: Research Triangle Institute: analysis of 1982 National Household Survey (Miller et al., 1983).

Table III-23

Reduced Productivity in 1980: Drug Abuse
Number of Problem Users and Value of Reduced
Productivity, by Age and Sex Cohort
(Number in thousands, $ in millions)

| Age | Males | | Females | | | Total | |
|---|---|---|---|---|---|---|---|
| | | | Employed | | Housewives | | |
| | Number | Value | Number | Value | Value | Number | Value |
| 18-19 | 806 | $ 1,313 | 601 | $ 651 | $ 140 | 1,407 | $2,105 |
| 20-24 | 2,261 | 6,723 | 1,140 | 2,256 | 526 | 3,400 | 9,505 |
| 25-34 | 2,220 | 11,076 | 817 | 2,396 | 633 | 3,036 | 14,106 |
| 35-44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45-54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 55-64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 5,286 | $19,112 | 2,557 | $5,303 | $1,299 | 7,844 | $25,716 |

Totals may not add due to rounding.

Source: Research Triangle Institute; special analysis of the 1982 National Household Survey (Miller et al., 1983).

Table III-24

Value of Lost Employment in 1980:
Drug Abusers in Residential Treatment
($ in millions)

| Age | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | Number | Value | Number | Value | Number | Value |
| 18-19 | 1,206 | $ 9 | 391 | $ 3 | 1,597 | $ 12 |
| 20-24 | 3,462 | 49 | 1,014 | 12 | 4,476 | 61 |
| 25-29 | 2,837 | 62 | 788 | 14 | 3,625 | 76 |
| 30+ | 3,015 | 79 | 588 | 11 | 3,603 | 89 |
| Total | 10,520 | $199 | 2,781 | $39 | 13,301 | $238 |

Totals may not add due to rounding.

Source: Research Triangle Institute; verbal communication with NIDA.

Lost employment due to inpatient treatment cost an estimated $863 million in 1980, compared to an estimated $328 million in 1977. The prior study estimated that there were about 19,000 adults in residential facilities. The most recent data from CODAP indicate that nearly 39,000 adults received residential treatment in 1980. The remainder of the change can be attributed to wage inflation.

It is estimated that there were 6,000 adults with severe/profound mental retardation attributable to fetal alcohol syndrome. The expected productivity of these persons was $104.3 million (see the appendix, table B-4).

2. Drug Abuse

Reduced Productivity

Drug abuse is hypothesized to impair productivity of workers in a manner similar to the impact of alcohol abuse. State-of-the-art analysis reported in the appendix supports this contention.

It was found that individuals who reported that they had ever used marijuana daily for at least a month had household incomes 27.9 percent lower than those of persons with similar characteristics who had not used marijuana. The prevalence rates reported in table III-22, which indicate 7.8 million young men and women aged 18-34 had used marijuana at that level. The number in each age/sex group of table III-23 was multiplied by the (1) labor force participation rate (to adjust for persons unlikely to pursue employment), (2) age/sex productivity rates, and (3) impairment rate (27.9 percent) to obtain a value for reduced market productivity of $25.7 billion.

The prior study estimated that 17 percent of males aged 18-24 had an marijuana abuse-related productivity impairment of 14 percent (identical to the alcohol abuse impairment rate in that study), a cost of $2.8 billion. This study has found a prevalence rate of approximately 21 percent for males aged 18-24, and an impairment rate of 27.9 percent, twice that of the previous study. This study has included 12.5 percent of males aged 25-34 and approximately 8 percent of females aged 18-34 with productivity losses due to marijuana abuse. These latter estimates were not previously made.

Lost Employment

This figure has increased only marginally, from $223 million in 1977 to $238 million in 1980 (table III-24). The growth of 6.7 percent is much

smaller than the increase in wages of 31 percent over the period. The difference is attributable to a decrease of over 20 percent in the population of drug abusers in residential facilities between 1977 and 1980.

3. Mental Illness

Estimates of indirect morbidity costs for mental illness increased with inflation and population growth over the 1977-80 period. Costs of partial disability grew from $1.6 billion in 1977 to $3.1 billion in 1980, while costs of complete disability grew from $12.7 to $16.8 billion. Losses due to institutionalization of the mentally ill were estimated at $1.3 billion in 1977. Updating these estimates for the effects of inflation yielded a 1980 estimate of $1.7 billion for this component (see tables III-25 to III-27).

Potentially, the largest component of economic cost from mental illness is that of reduced productivity in the work force. These costs are potentially of the same magnitude as estimates of reduced productivity due to alcohol abuse. Unfortunately, at the present time the lack of good data makes it difficult to assess productivity impairments associated with diagnoses of mental illness.

F. Other Related Direct Costs

1. Motor Vehicle Crashes

These costs increased from $1.8 billion in 1977 to $2.2 billion in 1980 (table III-28). This was an increase of 22 percent, which was several percentage points below the general inflation rate of 27.6 percent over the same time period.

The cost estimates are based on a recently completed study by the U.S. Department of Transportation (U.S. DOT, NHTSA, 1983) of the costs of motor vehicle crashes. These estimates used the causal factors developed by Berry and Boland and used in the prior RTI study.

2. Crime

Criminal justice system costs related to alcohol abuse increased from $1.5 billion in 1977 to an estimated $2.1 billion in 1980, an increase of 39.4 percent (table III-29). The largest components of this increase were felonious assault (which includes various types of interpersonal violence such as spouse and child abuse), driving under the influence, and public drunkenness.

Table III-25

Reduced Productivity in 1980:
Mental Illness, Partial Work Disability,
Number of Persons and Value of Reduced Productivity
(Number in thousands, $ in millions)

| Age | Males | | Females | | | Total | |
|---|---|---|---|---|---|---|---|
| | | | | Employed | Housewives | | |
| | Number | Value | Number | Value | Value | Number | Value |
| 18-19 | 16 | 31 | 10 | $ 12 | $ 3 | 26 | $ 46 |
| 20-24 | 40 | 138 | 24 | 56 | 13 | 64 | 207 |
| 25-34 | 75 | 441 | 73 | 252 | 68 | 148 | 760 |
| 35-44 | 58 | 403 | 78 | 271 | 66 | 135 | 740 |
| 45-54 | 71 | 483 | 85 | 264 | 71 | 156 | 818 |
| 55-64 | 64 | 319 | 81 | 158 | 73 | 145 | 551 |
| Total | 324 | $1,814 | 350 | $1,013 | $294 | 674 | $3,122 |

Totals may not add due to rounding.

Source: Research Triangle Institute; Rehab Group Inc. (1979).

Table III-26

Lost Employment in 1980:
Mental Illness, Complete Work Disability,
Number of Persons and Value of Lost Employment
(Number in thousands, $ in millions)

| Age | Males | | Females | | | Total | |
|---|---|---|---|---|---|---|---|
| | | | | Employed | Housewives | | |
| | Number | Value | Number | Value | Value | Number | Value |
| 18-19 | 11 | $ 85 | 10 | $ 51 | $ 11 | 21 | $ 147 |
| 20-24 | 27 | 377 | 24 | 230 | 54 | 51 | 661 |
| 25-34 | 66 | 1,611 | 78 | 1,090 | 293 | 143 | 2,994 |
| 35-44 | 62 | 1,750 | 84 | 1,197 | 290 | 145 | 3,238 |
| 45-54 | 113 | 3,133 | 168 | 2,129 | 576 | 281 | 5,838 |
| 55-64 | 102 | 2,066 | 160 | 1,283 | 594 | 262 | 3,942 |
| Total | 380 | $9,022 | 523 | $5,981 | $1,818 | 903 | $16,821 |

Totals may not add due to rounding.

Source: Research Triangle Institute; Rehab Group Inc. (1979).

Table III-27

Lost Employment in 1980: Mental Illness
Number of Adults (aged 16-64) Institutionalized
and Value of Lost Employment
(Number in thousands, $ in millions)

| Type of Institution | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | Number | Cost | Number | Cost | Number | Cost |
| Nursing Homes | 76.5 | $ 328 | 90.7 | $286 | 167.2 | $ 614 |
| Psychiatric Hospitals | 31.1 | 732 | 25.4 | 375 | 56.7 | 1,107 |
| Total | 107.8 | $1,060 | 116.1 | $661 | 223.9 | $1,721 |

Totals may not add due to rounding.

Source: U.S. DOC, BOC (1979); unpublished data from NIMH (U.S. DHHS, NIMH, 1981); U.S. DOL, BLS, Monthly Labor Review, 1983.

Table III-28

Motor Vehicle Crash Costs Due to Alcohol Abuse, 1980
($ in millions)

| Cost Category | Fatalities | Minimum/ Moderate Injury | Severe/ Critical Injury | Property Damage Only | Total |
|---|---|---|---|---|---|
| Legal/court costs | $ 684 | $2,006 | $ 804 | $ 370 | $3,865 |
| Insurance administration | 641 | 2,044 | 693 | 4,050 | 7,427 |
| Accident investigation | 7 | 149 | 21 | | 176 |
| Vehicle damage | 174 | 3,268 | 557 | 16,984 | 20,983 |
| Total | $1,505 | $7,467 | $2,075 | $21,404 | $32,451 |
| Percent caused by alcohol abuse | 37.0 | 10.5 | 9.75 | 3.0 | |
| Total costs caused by alcohol abuse | $ 557 | $ 784 | $ 202 | $ 642 | $2,185 |

Totals may not add due to rounding.

Source: Research Triangle Institute; U.S. DOT, NHTSA, 1983; Berry and Boland, 1977.

Table III-29

Alcohol Abuse: Other Related Direct Costs - Public Financed Criminal Justice System, 1980
($ in millions)

| Offense Types | (1) Causal Factor[1] | (2) Percent of All Persons Arrested for Nonalcohol Offenses[2] | (3) Police Protection Costs (PPC) (1x2xtotal PPC)[3] | (4) Percent of All Persons Charged for Nonalcohol Offenses[4] | (5) Legal and Adjudication Costs (LAC) (1x4xtotal LAC)[5] |
|---|---|---|---|---|---|
| Homicide | 0.300 | 0.3 | $ 15 | 0.2 | $ 4 |
| Felonious assault | 0.269 | 4.2 | 184 | 3.5 | 65 |
| Robbery | 0.039 | 2.0 | 13 | 1.7 | 5 |
| Burglary | 0.047 | 6.9 | 53 | 7.1 | 23 |
| Larceny | 0.038 | 16.1 | 100 | 18.9 | 49 |
| Auto theft | 0.046 | 1.9 | 14 | 2.1 | 7 |
| Driving under the influence | 1.000 | 1,426,700[6] | 31 | 1,141,360 | 25 |
| Liquor law | 1.000 | 463,500[6] | 10 | 370,800 | 8 |
| Public drunkenness | 1.000 | 1,125,800[6] | 25 | 900,640 | 20 |
| Total | | | $445 | | $206 |

[1]See text for a discussion of causal factors.

[2]Federal Bureau of Investigation (U.S. DOJ, FBI, 1981). See text for discussion of alcohol-defined offense categories.

[3]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). PPC = police protection expenditures plus proportionate allotments of other criminal justice costs. Total PPC = $16,274 million.

[4]Federal Bureau of Investigation (U.S. DOJ, FBI, 1978). Number of persons charged in alcohol-defined offense categories is 80 percent of those arrested for these offenses; see text.

[5]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). LAC = Judicial plus legal services plus public defense plus a proportionate allotment of other criminal justice costs. Total LAC = $6,861 million.

[6]See text for explanation of why arrest and charging frequencies are indicated instead of percentages of persons arrested and persons charged. The PPC and LAC costs for alcohol offenses were each estimated to be $21.84.

Table III-29 (continued)

| Offense Types | (6) Percent of State and Federal Inmates[7] | (7) State and Federal Correctional Costs (SCC) (1x6xtotal SCC)[8] | (8) Percent of All Persons Charged[9] | (9) Local Correctional Costs (LCC) (1x8xtotal LCC)[10] | (10) Total Public Criminal Justice Costs (Alcohol) (3+5+7+9) |
|---|---|---|---|---|---|
| Homicide | 17.6 | $255 | 0.10 | $ 1 | $ 275 |
| Felonious assault | 12.6 | 164 | 2.30 | 16 | 429 |
| Robbery | 24.9 | 47 | 1.20 | 1 | 66 |
| Burglary | 18.1 | 41 | 4.70 | 6 | 123 |
| Larceny | 4.8 | 9 | 1.30 | 1 | 159 |
| Auto theft | 1.9 | 4 | 1.40 | 2 | 26 |
| Driving under the influence | 0.0 | 0 | 10.70 | 274 | 330 |
| Liquor law | 0.0 | 0 | 5.90 | 151 | 169 |
| Public drunkenness | 0.0 | 0 | 17.20 | 440 | 485 |
| Total | | $520 | | $892 | $2,062 |

[7]Bureau of Justice Statistics (U.S. DOJ, BJS, 1982). Few individuals are incarcerated in state and Federal institutions for alcohol-defined offenses.

[8]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). Other criminal justice costs have been proportionately distributed. Total SCC = $4,847 million.

[9]Federal Bureau of Investigation (U.S. DOJ, FBI, 1978).

[10]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). Other criminal justice costs have been proportionately distributed. Total LCC = $2,558 million.

Totals may not add due to rounding.

Source: Research Triangle Institute.

There is no information to indicate that the causal relationship of alcohol abuse to criminality has changed since the prior report. Therefore, the assumptions for the causal factors used in the previous study have been used for this effort.

The estimate of direct criminal justice system costs in 1980 incorporates a change in methodology. Recent studies have implicated drug traffic in homicide and other violent crimes (this is discussed in the appendix). The new estimates reflect a 10 percent causal factor for drug abuse in homicide and assault, responsible for an increase of $250 million in the criminal justice system costs. Total direct criminal justice system costs due to drug abuse increased by 33 percent over three years, from $3.3 billion to $4.5 billion (table III-30). The low rate of increase was primarily due to a reduction in expenditures related to the enforcement of the drug laws. Drug related arrests declined as a proportion of all arrests during this period. Drug law offenders made up a smaller proportion of all prison inmates in the most recent prison survey (1978) than in the prior survey (1974).

Another change is introduced for mental illness (see table III-31). Persons arrested for the minor offenses of disorderly conduct, vagrancy, and others are often found to be mentally incompetent or ill and become the responsibility of the criminal justice system. This is also discussed in the appendix.

Private expenditures for legal services and protection against crime, which are estimated as a proportion of public expenditures, are relatively small. It has been estimated that private protection expenditures are 56.4 percent of public expenditures on police protection (Goldman, 1978). This suggests that alcohol abuse related private protection expenditures were $251 million in 1980 compared to $177 million in 1977 (table III-32). Correspondingly, drug abuse related private protection expenditures grew from $1.0 billion to $1.3 billion in 1980. The mental illness cost was $227 million.

Private expenditures on legal defense were also relatively small. For alcohol abuse, this cost component was estimated at $10 million in 1980. The comparable figures were $48 million for drug abuse and $8 million for mental illness.

Table III-30

Drug Abuse: Other Related Direct Costs - Public Financed Criminal Justice System, 1980
($ in millions)

| Offense Types | (1) Causal Factor[1] | (2) Percent of All Persons Arrested for Nonalcohol Offenses[2] | (3) Police Protection Costs (PPC) (1x2xtotal PPC)[3] | (4) Percent of All Persons Charged for Nonalcohol Offenses[4] | (5) Legal and Adjudication Costs (LAC) (1x4xtotal LAC)[5] |
|---|---|---|---|---|---|
| Homicide | 0.010 | 0.3 | $ 5 | 0.2 | $ 1 |
| Felonious assault | 0.010 | 4.2 | 68 | 3.5 | 24 |
| Robbery | 0.268 | 2.0 | 87 | 1.7 | 31 |
| Burglary | 0.224 | 6.9 | 252 | 7.1 | 109 |
| Larceny | 0.186 | 16.1 | 487 | 18.9 | 241 |
| Auto theft | 0.186 | 1.9 | 56 | 2.1 | 27 |
| Stolen goods | 0.186 | 1.7 | 51 | 1.3 | 17 |
| Prostitution | 0.128 | 1.2 | 25 | 1.0 | 9 |
| Drug law | 1.000 | 7.8 | 1,269 | 7.5 | 515 |
| Total | | | $2,300 | | $974 |

[1]See text for a discussion of causal factors.

[2]Federal Bureau of Investigation (U.S. DOJ, FBI, 1981).

[3]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). PPC = police protection expenditures plus proportionate allotments of other criminal justice costs. Total PPC = $16,274 million.

[4]Federal Bureau of Investigation (U.S. DOJ, FBI, 1978).

[5]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983. LAC = Judicial plus legal services plus public defense plus a proportionate allotment of other criminal justice costs. Total LAC = $6,861 million.

Table III-30 (continued)

| Offense Types | (6) Percent of State and Federal Inmates[6] | (7) State and Federal Correctional Costs (SCC) (1x6xtotal SCC)[7] | (8) Percent of All Persons Charged[8] | (9) Local Correctional Costs (LCC) (1x8xtotal LCC)[9] | (10) Total Public Criminal Justice Costs (Drugs) (3+5+7+9) |
|---|---|---|---|---|---|
| Homicide | 17.6 | $ 84 | 0.1 | $ 1 | $ 91 |
| Felonious assault | 12.6 | 61 | 2.3 | 6 | 159 |
| Robbery | 24.9 | 323 | 1.2 | 8 | 449 |
| Burglary | 18.1 | 197 | 4.7 | 27 | 585 |
| Larceny | 4.8 | 43 | 1.3 | 6 | 777 |
| Auto theft | 1.9 | 17 | 1.4 | 7 | 107 |
| Stolen goods | .01 | 0 | 0.9 | 4 | 72 |
| Prostitution | .01 | 0 | 0.7 | 2 | 36 |
| Drug law | 5.7 | 276 | 5.0 | 128 | 2,178 |
| Total | | $1,001 | | $189 | $4,454 |

[6]Bureau of Justice Statistics (U.S. DOJ, BJS, 1982).

[7]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). Other criminal justice costs have been proportionately distributed. Total SCC = $4,847 million.

[8]Federal Bureau of Investigation (U.S. DOJ, FBI, 1978).

[9]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). Other criminal justice costs have been proportionately distributed. Total LCC = $2,558 million.

Totals may not add due to rounding.

Source: Research Triangle Institute.

Table III-31

Mental Illness: Other Related Direct Costs - Public Financed Criminal Justice System, 1980
($ in millions)

| Offense Types | (1) Causal Factor[1] | (2) Percent of All Persons Arrested for Nonalcohol Offenses[2] | (3) Police Protection Costs (PPC) (1x2xtotal PPC)[3] | (4) Legal and Adjudication Costs (LAC) (1x2xtotal LAC)[4] | (5) Local Correctional Costs (LCC) (1x2xtotal LCC)[5] | (6) Total Public Criminal Justice Costs (Drugs) (3+5+7+9) |
|---|---|---|---|---|---|---|
| Disorderly conduct | .10 | 7.4 | $120 | $ 51 | $19 | $190 |
| Vagrancy | .10 | 0.3 | 5 | 2 | 1 | 8 |
| Other offenses | .10 | 17.0 | 277 | 117 | 43 | 437 |
| Total | | | $402 | $170 | $ 63 | $635 |

[1]See text for a discussion of causal factors.

[2]Federal Bureau of Investigation (U.S. DOJ, FBI, 1981).

[3]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). PPC = police protection expenditures plus proportionate allotments of other criminal justice costs. Total PPC = $16,274 million.

[4]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). LAC = Judicial plus legal services plus public defense plus a proportionate allotment of other criminal justice costs. Total LAC = $6,861 million.

[5]Bureau of Justice Statistics (U.S. DOJ, BJS, 1983). Other criminal justice costs have been proportionately distributed. Total LCC = $2,558 million.

Totals may not add due to rounding.

Source: Research Triangle Institute.

Table III-32

Private Expenditures Related to Crime in 1980
($ in millions)

| | Protection | | Legal Defense | | Total Private |
|---|---|---|---|---|---|
| | Public | Private[a] | Public | Private[b] | |
| Alcohol Abuse | $ 445 | $ 251 | $ 20 | $10 | $ 261 |
| Drug Abuse | 2,300 | 1,297 | 95 | 48 | 1,345 |
| Mental Illness | 402 | 227 | 16 | 8 | 235 |
| Total | $3,147 | $1,775 | $131 | $66 | $1,841 |

[a]Calculated as 56.4 percent of public expenditures.

[b]Calculated as 50.7 percent of public expenditures.

Source: U.S. DOJ, BJS (1983), Goldman (1978), analysis by Research Triangle Institute.

Another element of crime costs is due to destruction of property. This value has grown from $15 to $24 million for alcohol abuse, and from $73 to $111 million for drug abuse (table III-33). All data are from the National Crime Survey program (U.S. DOJ, BJS, 1984). The causal factors have remained the same.

3. Other Direct Costs

The estimated costs of social welfare programs in 1980 were $201 million for mental illness, $38 million for alcohol abuse and $2 million for drug abuse (table III-34). The prior estimates (for 1977) were reported as $548 million, $142 million, and $12 million respectively. This represents an apparent decrease of substantial proportion over the 3-year period.

Using the same data sources as for the 1980 estimates, the figures for 1977 were reassessed at $184 million, $35 million, and $2 million, respectively. The growth over 3 years between 1977 and 1980, then, was 9.2 for mental illness, nothing for alcohol abuse, and 8.6 percent for drug abuse. The increased cost in administration of all funds listed in table III-34 was 16 percent( $3.2 billion to $3.7 billion). For purposes of comparison, the revised figures for 1977 are included in table III-35.

From 1977 to 1980, fire losses, fire protection and highway safety expenditures attributed to alcohol abuse increased from an estimated $832.0 million to $1.23 billion, an increase of 48 percent( table III-36). Expenditure data for 1980 were obtained from the National Fire Protection Association. Karter, 1981) and the Statistical Abstract of the United States (U.S. DOC, BOC, 1982).

The fetal alcohol syndrome caused extra expenditures of $1.7 billion for special education, training, and rehabilitation programs. These estimates are highly contingent on the estimated prevalence of FAS in juvenile and adult cohorts, which must be confirmed in future studies. See the appendix for a discussion of how these costs were estimated. This value was not estimated previously.

There was a 73 percent increase in drug traffic control expenditures between 1977 and 1980, from $311 million to $537 million. Expenditures for 1980 were obtained from a report prepared for the President by the Strategy Council on Drug Abuse (Drug Abuse Policy Office, 1982).

Table III-33

Property Destruction Due to Crime in 1980
($ in millions)

| Crime | Value | Causal Factor | | Value | |
|---|---|---|---|---|---|
| | | Alcohol Abuse (percent) | Drug Abuse (percent) | Alcohol Abuse | Drug Abuse |
| Robbery | $ 12 | 3.9 | 26.8 | $ 0.5 | $ 3.2 |
| Rape | 3 | 26.9 | 0.0 | 0.8 | - |
| Personal Larceny | 206 | 3.8 | 18.6 | 7.8 | 38.3 |
| Burglary | 151 | 4.7 | 22.4 | 7.1 | 33.8 |
| Household Larceny | 87 | 3.8 | 18.6 | 3.3 | 16.2 |
| Motor Vehicle Theft | 106 | 4.6 | 18.6 | 4.9 | 19.7 |
| Total | $565 | - | - | $24.4 | $111.2 |

Source: Unpublished data from the U.S. DOJ, BJS, 1984.

Table III-34
Public Program Social Welfare Administrative Expenditures and Costs Due to ADM Problems, 1980
($ in millions)

| Program | Total Expenditures[1] | Percent Administrative Costs | Total Administrative Costs[1] | Costs Alcohol Abuse Percent | Costs Alcohol Abuse Amount | Costs Drug Abuse Percent | Costs Drug Abuse Amount | Costs Mental Illness Percent | Costs Mental Illness Amount |
|---|---|---|---|---|---|---|---|---|---|
| OASDHI-disability payments | $15,437 | 2.4 | $ 370 | 3.4 | $12 | [3] | $[3] | 8.9 | $ 33 |
| Unemployment insurance | 16,503 | 11.0 | 1,815 | - | - | - | - | - | - |
| Railroad temporary disability insurance | 64 | 7.8 | 5 | 3.4 | [2] | [3] | [2] | 8.9 | 1 |
| State temporary disability insurance[4] | 1,330 | 3.2[6] | 43 | 3.4 | 1 | [3] | [2] | 8.9 | 4 |
| Workers compensation[4] | 9,588 | 4.4[6] | 422 | - | - | - | - | - | - |
| Public assistance[5] | 1,219 | 15.3 | 186 | 4.8 | 9 | 0.5 | 1 | 4.7 | 9 |
| Supplemental security income | 7,446 | 8.8 | 655 | 0.8 | 5 | [3] | [2] | 18.8 | 123 |
| Food stamps | 644 | 4.4 | 28 | 4.8 | 1 | 0.5 | [2] | 4.7 | 1 |
| Veteran's pensions and compensation | 11,306 | 0.8 | 90 | 9.7 | 9 | 0.9 | 1 | 23.6 | 21 |
| Vocational rehabilitation[4] | 976 | 4.7[6] | 46 | - | - | - | - | 19.3 | 9 |
| Total | $64,513 | | $3,661 | | $38 | | $2 | | $201 |

[1] Source: Social Security Administration, Office of Retirement and Survivors Insurance, personal communication.

[2] Less than $.5 million.

[3] Less than .0005.

[4] Excludes hospital and medical benefits.

[5] Excludes vendor medical payments and social services.

[6] Percent does not exclude hospital and medical program administrative costs.

(-) No causal relationship is assumed, or no beneficiaries reported ADM as primary cause of eligibility.

Totals may not add due to rounding.

Source: Research Triangle Institute.

Table III-35
Public Program Social Welfare Administrative Expenditures and Costs Due to ADM Problems, 1977
($ in millions).

| Program | Total Expenditures[1] | Percent Administrative Costs | Total Administrative Costs[1] | Costs Alcohol Abuse | | Costs Drug Abuse | | Costs Mental Illness | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Percent | Amount | Percent | Amount | Percent | Amount |
| OASDHI-disability payments | $11,463 | 3.5 | $ 401 | 3.4 | $ 14 | [2] | [2] | 8.9 | $ 36 |
| Unemployment insurance | 13,823 | 11.8 | 1,631 | - | - | - | - | - | - |
| Railroad temporary disability insurance | 79 | 4.9 | 4 | 3.4 | [2] | [2] | [2] | 8.9 | [2] |
| State temporary disability insurance[4] | 966 | 3.3 | 32 | 3.4 | 1 | [2] | [2] | 8.9 | 3 |
| Workers compensation[4] | 5,902 | 4.0 | 236 | - | - | - | - | - | - |
| Public assistance[5] | 1,112 | 13.7 | 152 | 4.4 | 7 | 0.7 | 1 | 3.0 | 5 |
| Supplemental security income | 6,240 | 8.5 | 530 | 0.8 | 4 | [2] | [2] | 18.8 | 100 |
| Food stamps | 376 | 7.8 | 29 | 4.4 | 1 | 0.7 | [2] | 3.0 | 1 |
| Veteran's pensions and compensation | 9,082 | 0.8 | 73 | 11.8 | 9 | 1.1 | 1 | 36.2 | 26 |
| Vocational rehabilitation[4] | 1,007 | 6.5 | 65 | - | - | - | - | 20.9 | 14 |
| Total | $50,050 | | $3,154 | | $35 | | $2 | | $184 |

[1]Source: Social Security Administration, Office of Retirement and Survivors Insurance, personal communication.

[2]Less than $.5 million.

[3]Less than .0005.

[4]Excludes hospital and medical benefits.

[5]Excludes vendor medical payments and social services.

[6]Percent does not exclude hospital and medical program administrative costs.

(-) No causal relationship assumed.

Totals may not add due to rounding.

Source: Research Triangle Institute.

Table III-36

Additional Other Related Direct Costs Due
to Alcohol and Drug Abuse and Mental Illness, 1980
($ in millions)

| Cost Element | Total Expenditures | Source | % Due to Disorder | Amount |
|---|---|---|---|---|
| Alcohol Abuse | | | | $1,229 |
| Fire losses | $6,254 | Karter (1981) | 6.1 | 381 |
| Fire protection | 5,718 | Statistical Abstract of U.S. (U.S. DOC, BOC 1982) | 11.2 | 640 |
| Highway safety | 1,126 | Statistical Abstract of U.S. (U.S. DOC, BOC 1982) | 18.5 | 208 |
| Drug Abuse | | | | $537 |
| Drug traffic control | 537 | Drug Abuse Policy Office (1982) | 100.0 | 537 |
| Mental Illness | | | | $659 |
| Education | 659 | Frank and Kamlet (1984) | 100.0 | 659 |

Source: Research Triangle Institute and references in above table.

In addition, a value of $659 million has been included for special care of the mentally ill in the education system. This value was produced by Frank and Kamlet (1984). No figure was estimated in 1977.

G. Other Related Indirect Costs

1. Lost Work Time Due to Crime

Victims of crime often are uncompensated, even though they experience short term hardships from their victimization. This represents an important cost to the victim which has no offsetting transfer. The National Crime Survey performs victimization surveys to evaluate the extent of this hardship. They estimated the total number of victimizations for 1980 and work time lost (U.S. DOJ, BJS, 1984).

Using the crime/drug and crime/alcohol attribution factors developed in the 1981 report, the value of victim time by type of crime has been calculated (see table III-37). The value for drug abuse property crime was $845 million, and for the violent crime of felonious assault it was $74 million. These same figures for alcohol abuse were $172 million and $198 million.

2. Crime Careers: Drug Abuse

These costs increased from $5.1 billion in 1977 to $8.7 billion in 1980 (table III-38). There are several reasons for this large increase. First, the number of opiate addicts was estimated to have increased by about 10 percent, from 450,000 in 1977 to 492,000 in 1980. Secondly, wage inflation was greater than 30 percent over the three-year span.

For heroin addicts, these costs reflect the time spent engaged in crime, rather than legal employment, motivated primarily by their addiction. Studies of this population generally find that heroin addicts commit a large number of income-generating crimes, but more and more surveys also find that these individuals often have jobs. The Treatment Outcome Prospectives Survey (TOPS) (Rachal, Hubbard, Cavanaugh, Bray, Collins, Allison, and Craddock, 1981) has found that while large proportions of opiate abusers report illegal activities as their major source of income, it is not their only income source. In fact, a significant proportion report jobs as a primary activity.

For estimation of the lost productivity due to crime careers of heroin addicts, we distributed the estimated population of 492,000 in 1980 across sex and age groups in proportion to CODAP (U.S. DHHS, NIDA, 1981) admissions of opiate abusers. Analysis of TOPS data indicates that in the 1979 cohort

Table III-37

Lost Work Time Due to Crime in 1980:
Number of Persons and Value of Reduced Productivity

| Type | Number[a] (thousands) | Average Work[b] Days Lost | Proportion of Offenses Due to (percent) | | Value Attributed to ($ in millions) | |
|---|---|---|---|---|---|---|
| | | | Alcohol Abuse | Drug Abuse | Alcohol Abuse | Drug Abuse |
| Rape | 171 | 3.3 | 26.9 | 10.0 | $(11)[c] | $ (4)[c] |
| Assault | 4,732 | 2.1 | 26.9 | 10.0 | (187)[c] | (70)[c] |
| Robbery | 1,038 | 3.1 | 3.9 | 26.8 | 9 | 61 |
| Burglary | 6,704 | 2.0 | 4.7 | 22.4 | 45 | 215 |
| Larceny | 26,402 | 1.5 | 3.8 | 18.6 | 108 | 527 |
| Auto Theft | 1,365 | 2.3 | 4.6 | 18.6 | 10 | 42 |
| Total | 40,412 | 14.3 | - | - | $172 | $845 |

[a]Data from 1978 victimization series.

[b]Value of average daily productivity (employment plus household) in 1980 was $21,675 for males, $14,798 for females, or an average of $70 per day for both.

[c]These values have been included as lost employment due to violent crimes under core indirect costs in table III-19.

Source: Unpublished data, U.S. DOJ, BJS, 1984.

Table III-38

Drug Abuse Costs of Lost Productivity Due to Crime Careers in 1980:
Number of Persons Foregoing Legitimate Productive Pursuits and Value of Loss
($ in millions)

| | Opiates | | | | | | Nonopiates | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males | | Females | | Total | | Males | | Females | | Total | | Total | |
| Age | Number | Value | Number | Value | Number | Value | Number | Value | Number | Value | Number | Value | Number | Value |
| < 18 | 1,207 | $ 0 | 884 | $ 0 | 2,091 | $ 0 | 88,509 | $ 0 | 49,394 | $ 0 | 137,902 | $ 0 | 139,993 | $ 0 |
| 18-19 | 3,839 | 16 | 3,170 | 8 | 7,009 | 24 | 54,397 | 195 | 19,574 | 36 | 73,972 | 231 | 80,981 | 255 |
| 20-24 | 48,889 | 375 | 31,422 | 143 | 80,312 | 518 | 121,099 | 792 | 38,608 | 131 | 159,706 | 922 | 240,017 | 1,440 |
| 25-29 | 128,195 | 1,506 | 53,362 | 365 | 181,557 | 1,872 | 75,634 | 757 | 25,946 | 132 | 101,580 | 889 | 283,136 | 2,761 |
| 30-44 | 158,925 | 2,381 | 41,580 | 288 | 200,505 | 2,669 | 69,301 | 884 | 24,560 | 127 | 93,861 | 1,011 | 294,365 | 3,680 |
| > 44 | 17,383 | 271 | 3,144 | 20 | 20,527 | 291 | 19,605 | 260 | 7,630 | 37 | 27,235 | 297 | 47,762 | 589 |
| Total | 358,438 | $4,550 | 133,562 | $825 | 492,000 | $5,374 | 428,545 | $2,888 | 165,711 | $462 | 594,256 | $3,350 | 1,086,256 | $8,725 |

Source: Research Triangle Institute; U.S. DHHS, NIDA, CODAP (1981).

54 percent of male opiate abusers reported crime as their major source of income, as did 39 percent of the females. These proportions were assumed to be involved in crime full time, consequently putting no time into productive activity. The value of this time was estimated at $5.374 billion in 1980.

The other large contribution to the increase in this cost component was an increase in the estimated size of the nonopiate drug abuser population. To make a lower bound estimate of the entire nonopiate user population, it was assumed that nonopiate drug users are as likely to require treatment during the course of a year as opiate addicts. Of the estimated 1980 opiate addict population of 492,000, 115,000 were admitted to treatment for a penetration rate of 23 percent. Assuming that the 23 percent penetration rate applies to the nonopiate user population, the 139,000 admissions of nonopiate users reported in CODAP in 1980 would come from a population of nearly 600,000 nonopiate users. The large increase in productivity losses due to crime careers is attributable to the 65 percent increase since 1977 in nonopiate users' admissions to drug abuse treatment.

Some perspective is gained on these estimates by recalling that the ECA study (Myers et al., 1983) yielded a rough estimate that 1 percent of the population surveyed were drug dependent. Application of this rate to the 162.8 million adults found in the 1980 Census predicts a total of 1.628 million drug dependent persons. NIDA estimates that there were 492,000 heroin addicts in 1980, leaving about 1.136 million nonopiate drug dependent persons in 1980. This estimate is likely to be too high because the early ECA survey results are from urban areas. The NIDA national surveys have consistently found lower prevalence of drug abuse in smaller urban and rural areas than in large urban areas. Given these caveats, the estimates of 600 thousand nonopiate drug abusers may be considered conservative.

Nonopiate users also engage in income-generating crime, although not to the extent that heroin addicts do. TOPS has reported that 46 percent of the male and 29 percent of the female nonopiate abusers claimed that crime was their major source of income. Again, these proportions of the population are assumed to be entirely involved in crime and not engaged in market or household activity. When applying sex- and age-specific productivity rates, the lost productivity was estimated at $3.35 billion for 1980.

3. Incarceration

The productivity of incarcerated individuals is usually entirely lost to society. The value of this cost component for alcohol abuse increased to $1.8 billion in 1980, a 27 percent increase over the 1977 value of $1.4 billion (table III-39). Lost productivity from incarceration due to drug abuse increased from $1.3 million in 1977 to an estimated $1.5 million in 1980. The prior study estimated that nearly 38,000 persons were incarcerated during 1977 for violation of drug laws, compared with a 1980 estimate of 26,000, a decrease of almost 12,000. The 1977 estimates were developed from data from the 1974 Census of Prisons and Jails, while the 1980 estimates of incarceration were developed from data in the 1978 Census of Prisons and Jails, published in 1982.

4. Motor Vehicle Crashes: Alcohol Abuse

The 1977 estimate of $354 million was inflated to $464 million based on the inflation factor for wages and salaries. There are no data yet with which to estimate the number and cost of drug-related motor vehicle crashes.

Table III-39

Lost Productivity Due to Incarcerations in 1980: Number and Proportions of Incarcerations Due to Alcohol and Drug Abuse and Value of Loss ($ in millions)

| Offense | Adults Incarcerated Due to Offense in: Federal & State Prisons | Local Jails | Total | Proportion of Offenses Due to: Alcohol Abuse (percent) | Drug Abuse (percent) | Mental Illness (percent) | Person Years Served in 1980 for Crime Due to: Alcohol Abuse (person years) | Drug Abuse (person years) | Mental Illness (person years) | Value Attributed to: Alcohol Abuse ($ in millions) | Drug Abuse ($ in millions) | Mental Illness ($ in millions) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Homicide | 53,059 | 183 | 53,242 | 30.0 | 10.0 | 0.0 | 15,625 | 5,208 | 0 | $ 311 | $ 104 | $ 0 |
| Felonious assault | 37,985 | 4,212 | 42,197 | 26.9 | 10.0 | 0.0 | 11,099 | 4,126 | 0 | 220 | 82 | 0 |
| Robbery | 75,066 | 2,197 | 77,264 | 3.9 | 26.8 | 0.0 | 2,947 | 20,254 | 0 | 59 | 403 | 0 |
| Burglary | 54,566 | 8,607 | 63,173 | 4.7 | 22.4 | 0.0 | 2,903 | 13,835 | 0 | 57 | 274 | 0 |
| Larceny | 14,471 | 2,381 | 16,851 | 3.8 | 18.6 | 0.0 | 626 | 3,064 | 0 | 12 | 61 | 0 |
| Auto theft | 5,728 | 2,564 | 8,292 | 4.6 | 18.6 | 0.0 | 373 | 1,507 | 0 | 7 | 30 | 0 |
| Drug laws | 17,184 | 9,156 | 26,340 | 0.0 | 100.0 | 0.0 | 0 | 25,729 | 0 | 0 | 503 | 0 |
| Receiving stolen property | 301 | 1,648 | 1,950 | 0.0 | 18.6 | 0.0 | 0 | 353 | 0 | 0 | 7 | 0 |
| Prostitution | 301 | 1,282 | 1,583 | 0.0 | 12.8 | 0.0 | 0 | 198 | 0 | 0 | 4 | 0 |
| Driving under the influence[a] | 0 | 19,594 | 19,594 | 100.0 | 0.0 | 0.0 | 19,086 | 0 | 0 | 359 | 0 | 0 |
| Liquor laws | 0 | 10,804 | 10,804 | 100.0 | 0.0 | 0.0 | 10,524 | 0 | 0 | 198 | 0 | 0 |
| Public drunkenness | 0 | 31,497 | 31,497 | 100.0 | 0.0 | 0.0 | 30,680 | 0 | 0 | 577 | 0 | 0 |
| Disorderly Conduct | 0 | 13,500 | 13,500 | 0.0 | 0.0 | 10.0 | 0 | 0 | 1,350 | 0 | 0 | 26 |
| Vagrancy | 0 | 539 | 539 | 0.0 | 0.0 | 10.0 | 0 | 0 | 54 | 0 | 0 | 1 |
| All Other Offenses | 0 | 31,140 | 31,140 | 0.0 | 0.0 | 10.0 | 0 | 0 | 3,114 | 0 | 0 | 61 |
| Other | 42,809 | 43,819 | 86,628 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 301,470 | 183,124 | 484,594 | - | - | - | 93,863 | 74,273 | 4,518 | $1,801 | $1,466 | $88 |

[a]Due to the exceedingly low proportion of prison sentences for persons arrested for driving while under the influence of alcohol, the Census of Prisons did not report this as an individual category.

Totals may not add due to rounding.

Source: Research Triangle Institute; U.S. DOJ., BJS, Sourcebook of Criminal Justice Statistics (1983).

## IV. FRAMEWORK FOR EXTENSION OF RESULTS TO PROGRAM EVALUATION AND PUBLIC POLICY DECISIONMAKING

The results of this study indicate that ADM has major impacts on the economic well-being of our society, due to the costs associated with both the undesirable consequences of ADM and society's efforts to address these disorders. The total value of all costs in 1980 was $190.7 billion, or $89.5 billion for alcohol abuse, $46.9 billion for drug abuse, and $54.2 billion for mental illness. In the health sector alone, expenditures on personal health services were $31.6 billion, with another $3.8 billion spent on research, training, and construction of facilities. These real expenditures of $35.4 billion were 14.3 percent of all health expenditures, and 1.3 percent of U.S. gross national product in 1980.

Cost benefit and cost effectiveness analyses (CBA and CEA) are naturally related to cost of illness (COI) studies such as the present one. COI estimates the total cost (economic impact) of a disorder by first identifying the tangible consequences of an illness, then quantifying their level of occurrence and, finally, assigning appropriate values to them. CBA uses the same three steps to indicate the relative effectiveness of intervention strategies at reducing total costs to society. The first step is to identify the consequences of the disorder which the intervention might effect. The second step is to quantify the effects, and the third step is to assign values to the different intervention effects so that expenses of the intervention (costs) can be compared to the value of the avoided consequences (benefits). The benefits and costs may be directly compared because they are expressed in common units. Cost benefit analysis (CBA) may be used to answer questions such as:

- How do the economic benefits to society compare to the costs of a new treatment regimen?
- Which of two or more alternative public strategies has a higher ratio of benefits to costs?
- What is the benefit or cost to society of increasing (or decreasing) the size of particular programs?
- Given some sum of money, which of several alternative programs will yield the greatest economic benefit to society?

In contrast, cost effectiveness analysis (CEA) has a narrower use. Its purpose is to find the cost of achieving a single dimension outcome. The outcome is expressed in physical terms such as improvement in health status, or number of patients treated, rather than being translated into dollars saved on treatment or economic loss associated with illness. The emphasis is on how to identify the least-cost program, intervention, or technique for achieving the specific objective. CEA answers questions such as:

- To save 5,000 alcohol-related deaths from motor vehicle crashes, is it least expensive to institute safety features in cars, reduce the speed limit, or increase law enforcement efforts?
- Can manic depressives be treated less expensively (with equal effectiveness) as inpatients or outpatients?

Of course, some impacts of public policies have no market value and can not be assigned a dollar value for incorporation into cost benefit studies. These intangible impacts of public policies may be more, less, or equally as important as economic benefits in shaping policy decisions. Whenever an economic cost benefit study is performed, it is essential that the noneconomic impacts of policies also be assessed so that policy decision-makers may weigh them simultaneously with economic benefits.

Increasing emphasis has been placed on cost benefit and cost effectiveness analysis in the past 15 years. Particular emphasis has been placed on use of these studies in health policymaking. National health expenditures grew from $42 billion in 1965 to $247 billion in 1980 (Gibson and Waldo, 1981). As a share of gross national product, health expenditures increased from 6 percent in 1965 to approximately 9.5 percent in 1980.

Interest in cost effectiveness and cost benefit analysis has been further spurred by the rapid advances made in medical technology. Organ transplants have been performed successfully and failing organs have been successfully assisted by technologies such as kidney dialysis, respirators, and now potentially artificial hearts. Increasingly complex technology is often very expensive.

Probably a greater motivation for the federal government's interest in cost benefit analysis is that its share of the nation's health bill has expanded dramatically, from 10.1 percent in 1965 to 28.7 percent in 1980 due to the expansion of the Medicare and Medicaid programs. The shares

paid by state and local government (about 11 percent) and private health insurance (about 25 percent) remained roughly constant over the entire 15 year period though total dollars have increased. A recent study performed under the auspices of the Office of Technology Assessment (OTA) resulted in a multiple volume report that examined the theory and practice of cost benefit and cost effectiveness analysis as applied to a number of specific health problems (U.S. Congress, OTA, 1980a). The work produced general outlines for performance of CBA and CEA studies, as well as reviewing and producing some state-of-the-art studies for Congress.

A limited set of conclusions was offered in another study commissioned by OTA (Saxe, 1983) which examined the approaches to alcohol treatment, research on treatment benefits, costs and benefits of treatment, and reimbursement issues. The study concluded that results of evaluations performed to date are mixed.

The 1980 OTA study (U.S. Congress, OTA, 1980b) similarly concluded that though studies performed to date are not completely comparable due to differences in evaluation design, the costs and benefits examined, and the method of placing a value on those costs and benefits, it appears that psychotherapy has positive effects. The studies of drug abuse treatment reviewed in this volume were found to be in accord with psychotherapy CBA and CEA studies which have found favorable cost benefit ratios for treatment.

A useful product of the OTA studies was a set of ten general principles of analysis for CEA/CBA methodology. The principles are:

- Define problem
- State objectives
- Identify alternatives
- Analyze benefits/effects
- Analyze costs
- Differentiate perspective of analysis
- Perform discounting
- Analyze uncertainties
- Address ethical issues and
- Interpret results.

These principles establish a solid foundation upon which cost effectiveness and cost benefit analysis of intervention strategies for ADM

problems can be based. An in-depth presentation of these principles can be obtained from the OTA study. This chapter will discuss how the framework and cost concepts used in this ADM cost-of-illness study fit into, and complement, the performance of cost benefit and cost effectiveness studies of ADM interventions. The remaining materials are organized around the 10 principles of the OTA study.

A. Define the Problem

A CBA or CEA should only be undertaken when there are alternative approaches to a problem that can be clearly and logically defined. Both CBA and CEA yield measures that compare the relative costs, benefits, and impacts of alternative strategies to addressing the problem. Where there are alternative strategies to address a well-defined problem, CBA and CEA allow them to be compared on economic criteria. Where there is only one way to address a particular problem, the problem is probably defined too narrowly and should be respecified.

The first step in performing a cost benefit or cost effectiveness analysis is to determine the scope of the problem and to define it at a level that is suitable to the intended intervention, program, or strategy which is to be analyzed. For instance, in a comprehensive study examining drug abuse policy alternatives, the problem might be "the economic burden of drug abuse on society." With such a broad definition of the problem, the analyst must examine a full range of consequences of drug abuse, starting with health problems and drug overdoses, proceeding to criminal careers, impacts on the criminal justice system, and incarceration of criminals, as well as the effect of drug abuse on productivity in the workforce. A more narrowly defined problem would be that of heroin addiction, with its attendant consequences. A still narrower problem definition would be the issue of marijuana use and its effect in the workplace.

A problem definition for alcohol abuse may have similar breadth or specificity. One might examine all of the cost-related consequences of alcohol abuse or only specific problems such as drinking and driving, brain dysfunction, chronic hepatitis, pancreatitis, or liver cirrhosis.

B. State Objectives

The objectives of the evaluation of a particular public policy should be clearly defined. The objectives may be very broad in scope, or very specific. A very broad scope objective may be "reduce the economic cost to

society." More specific objectives can be used in evaluating similar intervention strategies. A narrowly defined objective would be to reduce the number of motor vehicle crash deaths due to alcohol abuse. Other objectives might be to increase enrollment of heroin addicts in treatment, or to encourage depressed persons to seek assistance.

A strategy would be evaluated vis-a-vis its impact on the consequences that can be assigned economic values such as utilization of health care treatment, premature mortality, productivity at home and in the workforce, and a series of other impacts including criminality and motor vehicle crashes.

C. Identify Alternatives

Many different approaches can be taken to reduce the impact of alcohol abuse, drug abuse, and mental illness. The CBA or CEA must specify which alternatives can be targeted to the defined scope of the problem and policy objectives. Evaluations should focus on those options that are most likely to directly achieve policy objectives. Table IV-1 lists various strategies employed to combat ADM in the United States. These range from inpatient and outpatient treatment to legal restrictions and sanctions, and to education and other prevention efforts.

There are a variety of strategies for reducing mental illness. These include treatment in assorted inpatient settings, including long-term and short-term facilities, and from a growing variety of outpatient care providers such as psychiatrists and psychologists social workers, counselors, and various therapists. Drug therapy has also been found useful in treating various mental illnesses, a notable example being the lithium treatment for manic depression.

A major technique for public intervention into mental illness occurs when the government pays some or all of the price for treatment from various providers. This occurs for individuals who are eligible for treatment under Medicare or Medicaid, for example. Subsidized services may also be obtained in some circumstances from community mental health centers and other free standing facilities. Of course, a significant proportion of the population is not eligible for subsidized health care services and must cover the expenses either through private insurance or out-of-pocket payments.

Table IV-1

Examples of ADM Public Strategies and Programs

- Subsidize special treatments with utilization at own option (may be subsidized by government or private entities)
  - Inpatient (long or short term)
    - State, county, or private mental hospitals
    - Intermediate term specialized facilities
    - Short term general facilities
  - Outpatient (various types of providers)
    - Psychiatrists
    - Psychologists
    - Social workers
    - Other (specialized or not)
  - Supplies (drugs or prostheses)
    - Methadone
    - Antabuse-disulfiram
    - Lithium
- Mandate specific treatment regimes
  - "Commitment" to inpatient facility
    - Health
    - Corrections
  - Probation to an outpatient program
    - Care of a professional (health or criminal justice)
    - Treatment at program
    - Complete education (drinking and driving)
- Supply reduction/restriction
  - Alcoholic beverage laws
    - Age restrictions
    - Zoning and licensing restrictions
    - License (and tax) production
  - Drug laws
    - Regulate/restrict domestic production
    - Drug interdiction
- Other deterrence
  - Differential penalties for alcohol-related consequences
  - Differential penalties for drug-related consequences
- Education and other prevention efforts
- Research and development

A range of strategies comparable to those for mental illness are offered for the addictive disorders. Strong emphasis has been placed on drug demand reduction strategies such as providing drug abuse treatment programs and preventing new "starts" through education. Substantial resources have been put into education and other prevention efforts intended to reduce the incidence and prevalence of substance abuse and to ultimately reduce their social consequences. For instance, there have been concerted efforts made through the various media to convey the message that drunk driving is a threat to self and society. A similar set of public service messages has been used to discourage drug abuse. Another example of prevention efforts is the information that is provided to young women about the association of birth defects and substance abuse.

Public policies that address alcohol and drug abuse also include supply reduction efforts for both alcohol and drug abuse. All levels of government, for example, are mandated to interdict the flow of illegal drugs in order is to reduce their availability and, presumably, to increase their price, discouraging consumption. Nonmedical consumption of a long list of psychoactive substances is also proscribed, with sanctions for possession, consumption, and distribution.

There is a comparable set of supply reduction laws for alcohol abuse. First of all, purchase, possession, and consumption of alcohol by those who are underage is forbidden by law. Rules regarding where, when and under what conditions alcohol can be purchased and consumed affect all drinkers. Secondly, alcoholic beverages are taxed, increasing the price and potentially reducing consumption. The manufacture of alcoholic beverages is licensed and regulated. Furthermore, retailers are subject to licensing and zoning laws.

D. Analyze Benefits and Effects

The economic benefits from any public intervention strategy are the reduction in unfavorable consequences of those disorders which can be assigned a market value. Avoiding the tangible consequences constitutes a benefit to society of the intervention strategy. A major contribution of the present study for cost benefit analysis is the enumeration and identification of a number of these consequences of the ADM disorders. These assigned economic values are shown in chapter III of this report. A short list of these is repeated in table IV-2.

Table IV-2

Benefits and Costs to be Assessed in CBA or CEA Analysis

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Quantifiable benefits and costs

- Health consequences framework
  - Health treatment
  - Mortality
  - Morbidity
  - Property destruction (crime or accidents)
  - Criminal justice response
  - Victim's time
  - Crime career
  - Incarceration
  - Other
- Other impacts
  - Transfers of income via social welfare programs
  - Amount/value of substances illicitly consumed
  - Crimes commited
    - Number by type
    - Value of property transferred

Generally nonquantifiable benefits and costs

- Pain and suffering
- Bereavement
- Psychosocial development
- Familial health

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Intervention strategies may reduce the need for health treatment services or for more expensive treatment strategies by persons with ADM problems. For example, the introduction of antidepressive drugs has allowed people to be treated as outpatients, thereby avoiding the cost of maintaining them in residential treatment facilities. Other benefits may include allowing persons to return to productive endeavors and to prevent suicide.

Another very significant impact of ADM is premature mortality. An intervention strategy that can reduce premature mortality can be said to avoid the loss in market and household productivity associated with those deaths. Some strategies may reduce the number of premature deaths due to alcohol-related trauma such as death from motor vehicle accidents, falls, fires, drownings, and other accidents. Such strategies would include public interventions (for example, identification of drinking drivers and referral to treatment, and changes in drinking age laws) as well as community and school based prevention efforts.

The ADM disorders can cause productivity losses through lost employment (while incapacitated either at an inpatient facility or at home) or reduced productivity while at work or in the home. Again, an intervention strategy that can improve the productivity of ADM victims or make it possible for them to rejoin the workforce "avoids" those costs. This avoidance is considered the benefit of the intervention.

Certainly, the backbone of any evaluation is establishing the effectiveness of an intervention. The impact of a program, strategy, or technology should be quantified along all consequences that it might affect. The nature, degree, and value of changes must be accurately measured and related to the size, duration, strength and cost of the intervention undertaken. The CBA or CEA must establish a clear causal link between the intervention and abatement of consequences that can be reasonably expected to be achieved at full scale operation. Evaluation designs need to be very rigorous to meet this requirement.

After identifying the potential benefits from intervention strategies is the equally important step of quantifying the benefits. The issues become: How much impact will an intervention strategy of a particular level have on the tangible consequences of the ADM problem? How much drug use will be avoided or mitigated by prevention efforts? Will intervention strategies result in fewer drug overdoses, fewer medical costs involving

toxic doses, and fewer premature mortalities? Will the efforts eventually prevent people from abusing the most dangerous drugs at high frequencies, behaviors which are associated with impairments in productivity and psychological and physiological dependence?

Many of the benefits of prevention efforts effect future years as well as the present year. Alcohol abuse, drug addiction, and mental illness often are long-term problems with impacts over many years. Problem drinking may adversely affect a person's productivity over his/her entire lifetime. Prevention or treatment which is partially or completely successful may yield benefits over many years to the problem drinker and society. Preventing the start of a criminal career or drug use prevents future consequences as well as current consequences. Effective outpatient treatment for mental illness allows those in treatment to remain productively involved in society and yields long-term benefits that ought to be included in current evaluations of the alternative interventions. The expected future benefits from current interventions are vital for rigorous cost benefit studies.

Other benefits of ADM intervention strategies may be valued above and beyond their contribution to social costs. These include transfers of income through social welfare programs, the amount and value of psychoactive substances which are illicitly consumed, and the number of crimes committed due to ADM. It should be emphasized that each of these impacts has already been assigned a value, discussed above, that would constitute a benefit under the cost benefit criteria. However, additional aspects of these impacts are also important for policy evaluation and should be quantified for their additional contribution to the economic cost. Finally, even though the avoidance of intangible consequences such as the pain and suffering associated with ADM is not ordinarily assigned a value, these dimensions are affected to the extent that the incidence, prevalence, and consequences of ADM disorders are reduced.

E. Analyze Costs

So far, we have discussed the benefits of an intervention strategy. In determining the other part of the ratio, cost, the market cost of operating an intervention strategy should be used. These costs should include, not only the expense of providing direct services to individuals, but also the accruals, overhead expenses, and capital costs that are connected to the service.

Average and marginal costs must be distinguished in evaluating a program or a strategy. For existing programs, average cost data are most readily available. The average costs are equal to the total costs of operating a program at its current level divided by the units of services produced or delivered. This yields a cost per service unit. Marginal costs are most appropriate in evaluating the potential expansion or contraction of an existing program. Marginal cost is the anticipated cost for increasing or decreasing (but not eliminating) services produced or delivered.

Marginal cost analysis can be highly significant in studying the expansion or contraction of an inpatient or outpatient program. Such a program is likely to have large fixed costs for buildings, equipment, property, and administrative personnel. If the program has excess physical capacity and ample administrative support, an increase in the level of services delivered may not substantially affect any of these fixed factors but may only involve costs for additional treatment personnel and assorted supplies. Some treatment programs, however, may be at maximum capacity and expansion may only be possible by moving to bigger quarters, improving record systems, adding managerial staff, etc. A decreased level of services (that is, fewer clients and/or fewer units of service delivered), however, could raise the unit cost of services delivered because fixed costs often remain the same.

F. Differentiate Perspective of Analysis

The costs and benefits of an intervention strategy in ADM problems differ depending on whether they are viewed from the perspective of the person with the problem, the perspective of the people or organizations who contact that person, or the perspective of the society as a whole.

An important example of this principle occurs with employed substance abusers and employed mentally ill persons that do not obtain treatment for their ADM problem. Such persons are often unable to meet the demands of the work environment. Normally, when an employer first discovers an employee is a substance abuser or mentally ill, the problem is ignored. Sometimes workers leave "voluntarily" because they are unable to cope with the working environment, but if the problem persists and reprimands are ignored, the worker is fired. This is particularly true for lower-level jobs where

the employer has invested little in training and where there is a ready pool of qualified replacements.

Unskilled jobs are disappearing. As unemployment rates improve, the pool of ready replacements is drying up. More and more, employers have a significant investment in developing the skills of an employee as well as indoctrinating the employee to firm-specific knowledge. Passively allowing an obviously troubled employee to resign or summarily firing a problem employee sacrifices this investment. Out of the expectation that the cost of rehabilitating an employee will be outweighed by the benefits to the company, employers are increasingly referring problem employees to treatment, allowing them to participate in treatment and, even, providing the treatment.

From society's vantage point, a program is considered to be justified if the benefits to society outweigh the social costs. For example, people who are terminated from their employment or who cannot find an employer willing to hire them because of an ADM problem constitute a social economic cost because their potential productivity is unused. Those who terminate often have firm-specific knowledge and experience that is lost when they terminate. Should they find new employment, they initially will not be as valuable to the new employer as to the old employer because their old knowledge is useless, and they do not yet have firm-specific knowledge for the new employer. The net contribution to society's productivity is, therefore, lowered.

A second reason that the corporate cost benefit calculation may differ from the social cost benefit calculation is that rehabilitation for substance abuse has been found to be more effective with employed individuals than unemployed individuals. Rehabilitation may be more difficult and, consequently, more costly to society for a person dismissed from work because of a substance abuse problem. Once again, the social cost benefit equation is different than that for the private corporation. These factors may be significant in evaluating whether society might support an intervention strategy for rehabilitation of workers with substance abuse problems: the social costs and benefits of such treatment regimens may be quite different from the private cost and benefits, which may justify public support for EAP services in private corporations.

In this study, social (rather than private or individual) economic costs are weighed. Voluntary and involuntary transfers of income are not part of that equation. Only the loss of resources while effecting the transfer and administration costs (or property damage) is a dead weight loss to all concerned. Nonetheless, it may be relevant to identify transfers that occur because policymakers may consider them significant factors in evaluating the impact of public policies. This is particularly the case when one particular segment of society (income group, racial group, or resident of a particular area such as cities) gains or loses at the expense of another segment.

The net value of income transferred to recipients does not constitute a cost from society's perspective. The income received by beneficiaries for their use has been simply transferred to them from the taxpayers. These transfers occur through public subsidization of treatment services, social welfare programs, and drug-related crime. From society's perspective, one group gains what the other loses, with a net slippage equal to the administrative costs. These administrative expenses (a small proportion of the value of funds transferred between the two groups) yield no benefit to those who paid for the social welfare programs and no benefits to the recipients: it is simply a dead weight loss in effecting the transfer between the two groups.

In involuntary transfers through crime, the value of resources gained by criminals is roughly equal to the value of resources lost by the victims. One segment of society gains approximately what the other loses. The net slippage in this transfer is the value of property destroyed or damaged in the commission of the crime, a loss to both the criminal and the victim.

G. Perform Discounting

Social intervention strategies may involve long-term and short-term benefits. In economic analysis it is appropriate to adjust benefits accruing over different time periods to reflect their present benefit to society because many of the consequences of the ADM disorders are long lasting, and there is reason to believe that effective interventions yield long-term, as well as, current benefits. The most obvious example is that of premature mortality where alcohol abuse, drug abuse, and mental illness exact substantial tolls from suicide, homicide, motor vehicle crashes, cirrhosis of the liver, and drug overdoses. A rationale for discounting future benefits to

the present is . . ."the observation that, all things being equal, people prefer benefits (including health benefits) today rather than at a future time." (U.S. Congress, OTA, 1980a.)

Future benefits are discounted into present values using an appropriate rate of interest. Usually calculations are made with several discount rates: recommended rates are 2.5 percent, 6 percent, and 10 percent.

Even if the ADM disorders do not result in premature death, they may have long-term impacts on employment and productivity. Timely rehabilitation of alcohol and drug abusers may save them from a lifetime of marginal and erratic participation in productive society. Appropriate and timely treatment of addictive and mental disorders may save victims from incapacitation or long-term institutionalization.

With drug abuse, the most feared consequence is death. Almost as important is the fear that an abuser will become addicted to expensive drugs and be propelled into a life of crime. A crime career involves extensive economic cost for society over a long period of time, including damage and destruction of property; injuries to victims; expenditures for police protection, prosecution and adjudication of court cases, incarceration of criminals; and the time that addicted criminals spend incarcerated or in criminal activities rather than socially-approved productive pursuits. Obviously, the economic impacts of drug-related crime are enormous. The estimates presented in this report indicate that over one-third of the economic costs of drug abuse are crime-related.

Public intervention strategies that prevent or interrupt addiction crime careers have current year benefits as well as benefits that accrue over the expected balance of the crime career. For purposes of making cost benefit estimates, the avoided future economic impacts of crime careers are discounted to the year in which the intervention strategy becomes effective.

The future costs of implementing intervention strategies should also be discounted to the present if expenditures stretch into the future. These costs of the intervention strategies are discounted in a manner completely parallel to that for discounting future benefits.

H. Analyze Uncertainties

The impact and effectiveness of ADM intervention strategies are, at best, estimated with some margin for error. The values of important relationships are measured under the best of circumstances with some confidence

interval. Other crucial values may have to be inferred, or assumed, based on related studies that do not have ideal information.

For example, some studies use sample surveys. It is well-known that estimates from samples involve potential measurement errors which are reflected by measures such as standard errors of estimates. These measures indicate the probability that true values may be a certain amount greater or less than the estimated value.

Where there is uncertainty in key values for cost benefit analysis, the impact of using alternative (and plausible) values and employing estimates that are considered to be mid-range, low, and high should be explored. This is true for estimates of the benefits, the value of the benefits, and the costs of intervention strategies. Although evaluations of possible intervention strategies should use the most likely estimates, the judgment of decisionmakers should be tempered by the quality and reliability of the available values.

I. Address Ethical Issues

Cost benefit analyses might well identify highly cost-effective interventions, treatments, and techniques that raise ethical, legal, and moral questions. Intervention strategies that involve potential issues of this nature should be carefully scrutinized, and the ethical issues should be laid out for examination by decisionmakers as well as the public.

As the state of medical technology improves and becomes more costly, new ethical issues arise. Some of these issues include access to health care, who shall be treated in the face of scarce health resources, and what level of treatment must be provided. These issues are also relevant to ADM interventions.

Concern with the number of motor vehicle crashes involving teenagers has led many states to raise the legal drinking age limit. Forbidding young adults from drinking alcoholic beverages while otherwise giving them the full rights and responsibilities of majority, however, raises questions of equity. Another policy to fight drunken driving might be to authorize the police to stop and check more drivers on the road at periods of high risk. Several policies and procedures proposed to combat alcohol and drug abuse involve issues of entrapment, invasion of privacy, harrassment, and due process.

There may also be ethical problems with utilization of randomized clinical trials to evaluate alternative treatment regimens. Random assignment of human participants to different types and levels of treatment with unknown levels of effectiveness poses questions for our society.

Such issues must be identified and their merits and demerits debated in parallel with a cost benefit analysis of any proposed public intervention strategy.

J. Interpret Results

The Office of Technology Assessment study points out that cost benefit analyses are used by policymakers and health professionals in deciding what intervention strategies to use, and at what levels. Moreover, the results will be used by the media, and laypeople in the course of debating the merits and demerits of particular programs.

The final responsibility of a professional preparing a cost benefit analysis or cost effectiveness analysis is to provide a careful, clear statement of the findings. The underlying principle of these types of studies should be identical to that for any thorough research study. The procedures and assumptions employed should be documented in sufficient detail to enable an independent party to reproduce the results of the CBA or CEA. The documentation of the results of this and the previous RTI ADM cost-of-illness study has been developed with this principle in mind.

K. Conclusion

The ADM cost-of-illness studies to date are essential inputs to the performance of CBA/CEA analysis and program evaluation. Greater availability of disaggregated data and refinement of methods to estimate indirect and intangible costs should allow continued improvement in computation of ADM cost of illness.

The overall magnitude of ADM cost of illness provides a sense of the relative amount and the nature of resources consumed in the process and treatment of disease. The team of expert consultants who assisted the current study emphasized the need to disaggregate data, to unravel the joint possibility of multiple ADM disorders, and to explore the systemic effects of illness. Available data are certainly not precise enough to account for the overlapping among drug abuse, alcohol abuse, and mental health problems. Consequently, the cost-of-illness estimates (with respect to indirect economic costs) are probably overstated. Better data and

econometric technique will help to alleviate this problem in future studies.

Program administration and evaluation can benefit from the improved estimation and analysis of cost of illness. Estimates of COI, however, often are referred to without specificity as to which cost components may be affected by program actions. What costs can be lessened by existing or proposed health programs? A "magic bullet" will not, unfortunately, reduce the costs of ADM illness to zero. The use of CBA/CEA will permit the analysis of alternative actions by a health agency when less than complete eradication of disease is an acceptable and realistic goal.

## V. FUTURE DIRECTIONS IN ADM COST OF ILLNESS STUDIES

Crucial and difficult issues regarding the economic costs of ADM to society remain to be addressed. State-of-the-art estimates have been developed and presented in the preceding sections. In performing the analysis, even more issues have been identified. Many of these were mentioned in appropriate portions of earlier sections of this report.

A final objective of the present study is to highlight methodological issues that should be addressed in order to improve future cost-of-illness estimates. The issues to be highlighted are:

- Overlaps in the ADM populations
- ADM in the workplace
- ADM overlaps in specialty treatment settings
- ADM and other health problems
- Crime
- Fetal alcohol syndrome in adult cohorts.

These are not the only remaining issues for future cost studies of ADM. All of the data and analysis used in these computations can be improved by more intensive and periodical study. These highlighted problems have been studied before, and this report has benefitted from recent advances. They deserve further attention primarily because they are associated with major costs estimated in this study, and the potential for making significant improvements seems high.

### A. Overlaps in the ADM Populations

The ADM disorders are often treated as three very separate problems for society although, in fact, they are very closely intertwined. The present study and its predecessor have made separate estimates for the economic costs of alcohol abuse, drug abuse, and mental illness. These have been modeled on cost studies stretching back to 1958 that treated mental illness, alcohol abuse, and drug abuse separately.

The objective of making separate but concurrent cost estimates for each of the ADM disorders required the disentanglements at the overlaps. The data used in these attempts have not been entirely satisfactory for this purpose, making this an important area for improvement in future cost studies.

The most obvious examples where overlaps are important is in the periodic national household surveys of alcohol abuse and drug abuse. These are extremely important data sources about the extent and nature of these two addictive disorders in our society. However, neither the survey on alcohol abuse nor the survey on drug abuse adequately addresses the issue of the abuse of a broad range of substances. The 1979 National Survey on Alcohol Abuse included no questions about abuse of psychoactive substances other than alcoholic beverages.

The 1982 National Household Survey on Drug Abuse included a very small set of questions about alcohol abuse by respondents. However, it has insufficient detail to determine whether an individual might be an alcohol abuser by any of the commonly used criteria.

It has been established in surveys of youth (Rachal, Guess, Hubbard, Maisto, Cavanaugh, Waddell, and Benrud, 1980) that there is a substantial overlap between heavier drinkers and marijuana users. Up to half of the heavier drinkers also use marijuana at least once a week, and a third of the youth who use marijuana more than once a month also are classed as heavier drinkers. Data from the 1982 National Household Survey on Drug Abuse (Miller et al., 1983) indicate that up to 50 percent of young adults that are heavier users of marijuana are heavier drinkers.

In the face of such wide overlaps between young alcohol and drug abuse populations, it is essential to study the incidence, prevalence, and consequences of both disorders in the same populations, and for the same individuals.

There are likely to be equally significant overlaps between other mental illnesses and alcohol and drug abuse although the nature of the overlap is not well understood. The Treatment Outcome Prospective Survey (Rachal et al., 1981) found a high prevalence of symptoms of depression among drug abuse treatment populations. Similarly, Collins and Schlenger (1983) indicated that there is significant overlap between the addictive disorders and other mental disorders in prison populations.

Probably the best hope for identifying and potentially disentangling the overlap between alcohol abuse, drug abuse, and other mental disorders is the epidemiologic catchment area program being sponsored by NIMH (Eaton et al., 1981). Preliminary analysis by Myers et al. (1983) suggests that the presence of multiple ADM disorders is a possibility, since their findings

show that the sum of the prevalence rates for a number of distinct mental disorders (including alcohol and drug abuse) is greater than the rate for the presence of any mental disorder. That research has not yet addressed the overlap issue, although it will be possible to indicate the magnitude of the overlap between alcohol and drug abuse, and other mental disorders in the future.

Given the strong indications of overlap between the young alcohol abusing and drug abusing populations, it would also be a significant advance if the national surveys of each of the disorders would collect some baseline information on the other disorders. Ideally, information would also be collected about mental disorders.

B. The Effect of ADM in the Workplace

The largest cost component for each of the separate disorders was lost employment and reduced productivity. From an economic perspective, these are the most significant cost components and, in fact, estimation of this cost component for alcohol and drug abuse was a major effort in this study. Within this general topic there are areas demanding further investigation. The most important of these is reduced productivity due to mental illness.

State-of-the-art econometric estimates of the impact of alcohol and drug abuse on productivity were made in the present study, but only partial estimates could be made for the impact of mental illness in the workforce. The part that could be estimated was for individuals who were institutionalized and for noninstitutionalized persons who indicated that they suffered a complete or partial work disability due to severe emotional disorders or chronic nervous disorders. These cost impacts totaled $22 billion for 1980. These estimates represented only a fraction of the adult population who have been estimated to experience mental disorders during the course of a year. The ECA studies (Myers et al., 1983) found that 12 to 18 percent of the adult population experienced symptoms of a mental disorder over a six-month period (this includes alcohol and drug abuse, which were not estimated separately). The estimates in this study of productivity losses due to mental illness include less then 1 percent of the adult population, a very small proportion of the total who are believed to experience mental disorders.

It is hypothesized that mental illness significantly affects the productivity of its victims, even though they may not seek clinical assist-

ance or acknowledge that they have a problem. This problem can be addressed in the near future as the data sets from the epidemiologic catchment area studies become available for public analysis.

State-of-the-art econometric estimates of the impact of alcohol and drug abuse on worker productivity have been produced as part of the current effort. The research represents the most comprehensive examination made to date. It has been found that particular patterns of alcohol abuse and drug abuse significantly affect the household incomes of ADM victims. This is true even after controlling for other factors known to be significantly related to labor market success.

These state-of-the-art estimates can be improved in several ways. First, slightly different information on labor market participation, earnings, and income should be obtained in future cycles of the NIAAA and NIDA household surveys. Since both Institutes plan to perform future national surveys, this change could be implemented with negligible effort and cost.

Another issue is the difference in the nature and amount of diagnostic information obtained by the respective national surveys. As noted previously, neither survey obtains detailed information about the other addictive disorder. Both surveys obtain relatively complete information about patterns of use and abuse of the respective substances, including current use, and lifetime patterns.

A significant strength of the NIAAA survey is that it collects a great deal of detailed information about many symptoms and potential consequences of alcohol abuse: symptomatic drinking, interpersonal problems, drinking and driving, belligerence, family disputes, and impacts on work.

The survey sponsored by NIDA obtains much less information of this nature about the impacts and consequences of an individual's drug abuse problem on herself/himself, family, friends, and society at large. The 1979 and 1982 national surveys began to investigate some consequences, such as driving and drug abuse and the amotivational syndrome, but there is still a large gap between the quantity and quality of information on tangible impacts obtained by the two national surveys.

For both alcohol and drug abuse, there is a remaining question of whether other factors such as personal values, personality traits, attitudes, and risk-taking behaviors underlie both the substance abuse itself and the tangible consequences such as productivity losses. Factors like

these may have preceded substance abuse problems and, in fact, contributed to them. They are probably also determinants of labor market success. Furthermore, attitudes, values, and other behaviors may not change when an individual modifies his or her substance abuse problem. If factors such as these are underlying causes of both substance abuse and level of success in the labor market, then a rigorous study of the impact of substance abuse on labor market success must control for these items to give unbiased estimates of the impact of substance abuse.

These issues will have to be addressed in future studies, since the large scale surveys performed to date have not collected information on substance abuse, employment and income, attitudes, personality, and behaviors which are necessary to make a full study of these relationships.

C. ADM Overlaps in Specialty Treatment Settings

The overlap of alcohol abuse, drug abuse, and mental illness constitutes a problem for estimating the direct treatment costs associated with each disorder. Extensive data are collected and maintained about the utilization of health care treatment in the United States. A major focus of these efforts has been to identify the total magnitude of services provided in the United States and to estimate the distribution of these services among different health care problems. These national data bases have been the foundation for the estimates developed and presented in this study.

Utilization data are usually presented by the health problem and by the initial primary diagnosis made by the health care professional. This practice is not readily compatible with the problem of multiple disorders. Typically, a health care professional makes a primary diagnosis and lists secondary problems as well. Alternatively, professionals may list multiple diagnoses. In practice, when multiple diagnoses are given, the first listed diagnosis becomes the primary diagnosis for reporting and analysis purposes.

While ADM specialty settings may have a particular orientation, specializing in alcohol abuse, drug abuse, or other mental disorders, because of the overlap problem they are likely to be treating people with any or all of the ADM disorders. The convention of using and analyzing data based on primary diagnosis or a first listed diagnosis will not accurately reflect the nature of a patient's problems nor the level of resources required to treat them.

The cost implications of treating multiple ADM disorders should be studied in the future. Improved cost estimates can be produced by identifying services provided to persons with multiple ADM disorders. In addition to analyzing treatment utilization by "primary" and "first-listed" diagnosis, data could be generated showing service delivery to persons with single disorders (with no overlaps) and those with various combinations of disorders (any two of the three ADM disorders, or all at the same time). Making these improvements requires that treatment facilities and clinicians maintain and be able to report data on multiple disorders. In effect, "primary" or "first-listed" diagnoses would have to include "combined" categories.

Dividing the costs for overlapping diagnoses would be a challenge for further analysis. It may be more meaningful to report overlapping costs separately and not artificially assign costs to a single disorder.

D. ADM and Other Health Problems

The overlap problem in general health care settings is identical to that in the ADM speciality sector. An additional factor in the general health care sector is that alcohol and drug abuse are each related to other health care problems. The relationship of alcohol abuse to other health care problems receives intense scrutiny in the medical profession, and results are regularly summarized in the NIAAA reports on alcohol and health. Alcohol has been indicated as an underlying cause of a number of health problems that also have other causes. Ongoing epidemiological research includes a thorough analysis of these data to discover the proportions of other illness that might be attributable to alcohol abuse. Cost attributions for these other illnesses can be made to alcohol abuse using those established relationships. Alcohol abuse also has cost implications when it exacerbates health problems that it does not necessarily cause. Some preliminary studies on this problem using data maintained by health care insurance companies have compared health care utilization in households where some member has received treatment for alcohol abuse with other households. Further insights into the problems associated with alcohol abuse will be gained from this avenue of research.

Important research into the relationship between alcohol abuse as a complicating factor in other illnesses is being performed by NIAAA. Initial findings indicate that alcohol-specific illnesses such as liver cirrhosis,

alcoholic psychosis, and alcoholism are secondary causes of death for about two-thirds again as many mortalities as they are primary causes. Some proportion of these mortalities should be attributable to alcohol abuse. ... Analogously, where alcohol abuse complicates health care treatment for other illnesses, some proportion of those costs should be identified and included in future cost studies.

Knowledge about drug abuse and health problems is not as advanced as that for alcohol abuse. Drug overdoses are a well-known consequence of drug abuse. Further health problems involved with abusing various drugs are hypothesized but require further research, documentation, and summarization.

The health effects of the most widely abused illicit substance--marijuana--were recently reviewed by a committee of the Institute of Medicine (Institute of Medicine, 1982). Conclusions reached in that study were that, while there are "a broad range of psychological and biological effects," it is not known how extensive the health problems is or "how serious this risk may be." The state of knowledge regarding biological effects of other illicit substances is comparable. While effects of various types have been observed, there is a lack of epidemiological evidence about their extent and severity.

Overlaps of mental illness with substance abuse should be dealt with in the future. It is not known in which direction overlaps may have biased the current cost estimates for mental illness.

E. Crime and ADM

The strong relationship between ADM and crime has received intense study over the last ten years and is a continuing topic of debate. Significant improvements have been made in the course of this study in estimating the economic costs associated with ADM. Despite the improvements in data and methodology, important issues remain open for continued analysis.

Mental illness has been linked to violent crime. A study of a prison population by Collins and Schlenger (1983) indicated that nearly 70 percent of the inmates exhibited some disorder, ranging from alcohol and drug abuse, to antisocial behavior disorder or other mental disorders. Nonetheless, the difficult question remaining to be answered is what proportion of various types of crimes is attributable to mental illness? Only when this question is answered can costs be assigned to mental illness and crime.

The drug abuse/crime relationship has been analyzed by interviewing prison inmates, studying the drug usage patterns of arrestees, analyzing the behavior of drug abuse treatment populations, and conducting intense ethnographic studies of small groups of drug addicts on the streets. All of these studies indicate a high involvement of drug abusers with criminal activities. However, most of these studies have focused on a limited and not necessarily representative segments of either the drug abuse population or the criminal population. Both of these populations are extremely difficult to identify, and members have little incentive to give reliable data on their antisocial patterns of behavior. Studies of drug abuse should carefully examine the implications of their findings for crime and vice-versa, and the results should be compared with other sources of data such as the victimization surveys performed by the Bureau of Justice Statistics and the regularly compiled data from the Uniform Crime Reports. To establish reliability and validity of the microlevel studies of select populations, the implications from the study groups must be extrapolated to a regional or national level and compared for consistency with aggregate information on the value and number of crimes committed.

F. Fetal Alcohol Syndrome in Adult Cohorts

Economic implications of the fetal alcohol syndrome have been explored for the first time in this study, building on and modifying the cost information collected by Russell (1980). The estimated costs for FAS are over 2 percent of the total value for all of alcohol abuse. Although all of the estimates for FAS are state-of-the-art and subject to revision given further study, there are several aspects of FAS that are most critical for these types of cost of illness studies.

The subject of increasing concern since the early 1970s, research on incidence and prevalence of the fetal alcohol syndrome has focused primarily on new birth cohorts. FAS, however, effects symptomatic individuals throughout life, imposing costs on them, their families, and on society. We must ask whether it is possible to identify FAS victims in older birth cohorts, including juveniles, teens, and adults. Since FAS is identified by a set of permanent defects and deformities, it is hypothesized that prevalence estimates can be made for these older cohorts.

The single aspect of the syndrome that is most economically significant is mental deficiency. Research indicates that all FAS victims experi-

ence some kind of mental deficiency, ranging from minimal brain dysfunction to severe/profound mental retardation. To make more precise estimates of FAS costs, more reliable estimates must be made of the prevalence of various degrees of mental deficiency. Moreover, reliable information is needed about the level of functionality that FAS victims may achieve in society. The severely and profoundly retarded victims are likely to have a minimal capability to function in society and would, therefore, be institutionalized. Lower levels of mental deficiency should involve greater capability to function in society. It must be ascertained whether FAS victims can do skilled or unskilled work, and whether they must work in a sheltered workshop environment.

G. Conclusions

The research needs identified in this section have strong implications for cost studies of alcohol and drug abuse and mental illness. Rigorous analysis of these issues could yield higher or lower new estimates. The overlap problem may require costs assigned to one disorder to be split with or attributed to another disorder. Changes may occur as knowledge about the very complicated ADM disorders expands.

The issues identified here represent a short but important list of research needs for improving future cost of ADM studies:

- Overlaps in the ADM populations
- ADM in the workplace
- ADM overlaps in specialty treatment settings
- ADM and other health problems
- Crime
- Fetal alcohol syndrome in adult cohorts.

Major advances have been made in the present study on some of these topics. Yet, this work has served more to define how much more must be done than to yield definitive results.

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# Appendix

## A. THE IMPACT OF ALCOHOL AND DRUG ABUSE ON PRODUCTIVITY IN THE WORKFORCE

## A. THE IMPACT OF ALCOHOL AND DRUG ABUSE ON PRODUCTIVITY IN THE WORKFORCE

### A. Introduction

Although alcohol and drug abuse in the workplace have been topics of great concern, they have received surprisingly little study. Some limited studies have examined the extent of problem drinking in the workplace, and others have made rough estimates of the costs to a company of having an alcoholic employee. The major cost-of-illness studies are reviewed here for their treatment of lost productivity. This is followed by a discussion of some recent work that has examined how health affects labor market success of individuals.

This section examines the impact of alcohol and drug abuse on the labor market success of individuals. Individuals with a substance abuse problem, it is contended, are less productive than other people with the same characteristics because of impaired social, mental, and physical functioning. Alcohol or drug abuse may cause problems outside the workplace that, nonetheless, affect functioning on the job. The cause and effect relationships among alcohol and drug abuse, the work environment, and other social factors are not clear. Stress and depression can affect an individual's productivity and may also contribute to a substance abuse problem. Too, the attitudes, values, and personality traits which underlie substance abuse behaviors as well as all others should be incorporated in future analysis; however, it was not possible with the data sets presently available.

### B. Cost of Illness Studies and Productivity

In studies of ADM, the largest cost has been losses of productivity in the workforce. In the 1981 study, over 50 percent of the economic cost of alcohol abuse was due to reduced productivity and lost employment; for mental illness, these components made up nearly 35 percent of the total cost, while for drug abuse they made up about 18 percent.

Other studies (Rice, 1966) have found that fully 25 percent of the economic costs for all illnesses was due to persons who were completely unable to work for all or any portion of the year. A more recent report by Cooper and Rice (1976) estimated that in 1972 lost work time due to illness made up 22 percent of the total economic costs for all illnesses. The most

recent study of all illnesses (Paringer and Berk, 1977) also estimated that lost work time due to illness was 24 percent of the total economic costs of all illnesses.

Each of these studies also examined mental disorders--psychoses, neuroses, alcohol psychoses and dependence, drug dependence, and mental retardation. The three studies estimated that 64 percent, 45 percent, and 46 percent, respectively, of total costs were due to the lost work production of those experiencing mental disorders.

The indirect morbidity costs estimated in each of those studies only included lost productive time during which the individual could not perform his or her primary activity due to confinement in the home, in a short-term health facility such as a general hospital, or in a long-term residential facility such as a psychiatric hospital or nursing home.

More recent work by health and labor economists has expanded the concept of economic productivity losses. Studies of employment and labor market success have used measures of health status as an important determinant of factors such as labor force participation, hours and weeks worked per year, and wage and salary rates. Examining all of these facets, Luft (1975) compared persons reporting long-term disability to the non-disabled and estimated that the long-term disabled lost $23 billion in aggregate earnings in 1966. This estimate included components for nonparticipation in the labor force, limitations in the weeks and hours worked, and impacts on wage rates. Luft concluded that long-term disability affected all aspects of labor market success.

Luft's study was similar to that of prior cost-of-illness studies in that it included the value of time when individuals could not work due to confinement at home and in hospitals. The unique contribution of this study was an analysis of earnings lost due to the reduced productivity of disabled individuals. Luft concluded that productivity losses due to long-term disability were 6.2 percent of total adult earnings in 1966. Comparing the disabled to the nondisabled, he found that white males had a reduction in annual earnings of 21 percent, black males a reduction of 24 percent, white females a reduction of 36 percent, and black females a reduction of 25 percent (see table A-1).

Table A-1

Impact of Health on Labor Market Success in Select Studies

| Study Population | Health Problem | Impact of Health (Proportional Change) Annual Earnings | Wage Rate | Unemployment Rate | Labor Force Participation |
|---|---|---|---|---|---|
| Luft (1975) | | | | | |
| Black Males | Long-term Disability | -24.3 | -10.3 | +50.2 | -28.8 |
| Black Females | " | -25.1 | +3.8 | +34.3 | -30.7 |
| White Males | " | -21.3 | -11.6 | +69.9 | -18.6 |
| White Females | " | -35.8 | -9.8 | +31.7 | -30.2 |
| Bartel and Taubman (1979) | | | | | |
| White Males Age (46-56) | First Diagnosed Mental Disorder | | | | |
| | 1967-1973 | -23.9 | N.A. | N.A. | N.A. |
| | 1962-1967 | -22.0 | -16.4 | +1.3% | -5.0% |
| | 1955-1961 | -13.3 | N.A. | N.A. | N.A. |
| | 1948-1957 | 0.0 | N.A. | N.A. | N.A. |
| McManus (1978) | | | | | |
| White Male Workers | Disabled 1 Year | N.A. | -5.2 | N.A. | N.A. |
| | Disabled 2 Years | N.A. | -9.2 | N.A. | N.A. |
| | Disabled 3 Years | N.A. | -12.2 | N.A. | N.A. |
| | Disabled 4 Years | N.A. | -14.1 | N.A. | N.A. |
| | Disabled 5 Years | N.A. | -15.1 | N.A. | N.A. |
| Berry and Boland (1977) | | | | | |
| Households with an Adult Male | Problem Drinker | -18.4[1] | N.A. | N.A. | N.A. |

[1]Household income. No other aspects were examined.

A study by McManus (1978) examined the impact of long-term disability on earnings. His primary focus was the impact of disability on the wage rates of those who remained in the workforce. The results indicate that a person disabled for five years but still in the workforce has a wage rate 17 percent below that which he would have received otherwise.

A more recent report by Bartel and Taubman (1979) made a significant advance over prior studies by using incidence data for specific diseases as diagnosed by health providers. Although the study had excellent data both on employment and health, it was somewhat limited by being drawn from the National Academy of Science twin panel data set. Because the study population was only white veteran male twins born in the continental United States between 1917 and 1927, limited generalizations can be made from the study findings.

Nonetheless, Bartel and Taubman made some important findings with respect to the impact of mental illness on earnings. They found that individuals who had a diagnosis of a psychosis or neurosis (excluding alcoholism and drug dependence) experienced significant negative impacts on their earnings, wage rate, the amount of time worked per week, and their probability of being in the labor force. An initial diagnosis of mental illness five years prior to the survey reduced earnings by 24 percent. A first diagnosis five to ten years prior to the survey affected earnings negatively by 22 percent, while a diagnosis ten to fifteen years previously reduced earnings by 12 percent. Diagnoses more than fifteen years prior to the date of survey had no significant impact on earnings in the survey year. This finding, as in the studies by Luft and McManus, controlled for a number of sociodemographic factors which are known to be important determinants of labor market success. These included education, age, marital status, and occupation or socioeconomic status.

Bartel and Taubman (1979) estimated that $1.7 billion in earnings were lost due to psychoses/neuroses in 1972. They cautioned that their specific results had limitations in their generalizability due to the nature of the sample. Nonetheless, the robustness of their results indicates that mental illness affects individuals' wage rates as well as their presence in the workforce or on the job at a particular time. Furthermore, it suggests that the impact may be very long lasting.

The first study to include estimates of the value of reduced productivity attributable to an ADM illness was Berry and Boland (1977). Using a 1968 national household survey on alcohol abuse, they compared the income of households with noninstitutionalized males, aged 21 to 59. The income of households with a male problem drinker (defined by having a large number of alcohol-related consequences) was 18.4 percent lower than the income of households without a problem drinker. When the problem drinker was 21-29 years old, the difference was 18 percent; 30-39, the difference was 17 percent; 40-49, the difference was 19 percent; and 50-59, the difference was 10 percent.

In comparing households with and without male alcohol abusers, the Berry and Boland analysis was not able to control for factors such as education, family structure, occupation or socioeconomic status, and age within the ten-year brackets. Consequently, they chose to adjust the 18.4 percent difference down to 14 percent based on a finding in Luft (1975) that 23.9 percent of the difference in annual earnings between disabled white males and healthy white males was due to factors such as age, education, marital status, and a few other factors.

C. Approach of this Study

This study has developed estimates of the economic impact of alcohol abuse and drug abuse on the productivity of the workforce. Analyses in this study were performed in a manner analogous to those by Luft (1975), Bartel and Taubman (1979), McMannus (1978) and Berry and Boland (1977) and make a significant improvement over the results found by Berry and Boland. In this study it has been possible to control for a number of factors that are known to affect labor market success, while examining the impact of problem drinking and drug abuse.

The approach taken for both alcohol abuse and drug abuse was to compare the income for households with a substance abuser present with that of households with no abuser present. This comparison was performed while controlling for characteristics of the respondent in the household, including age, education, sex, marital status, and occupation and for the presence of children in the household. This comparison was performed by using multivariate regression analysis. For alcohol abuse, this analysis was performed using data from the 1979 national household survey on alcohol abuse sponsored by NIAAA (Clark and Midanik, 1982). The analysis of drug

abuse was performed using data from the 1982 national household survey sponsored by NIDA (Miller et al., 1983). Both data sets were used because neither had information about respondents' use of both alcohol and illegal drugs. The 1982 national drug abuse survey asked a few questions about current alcohol consumption but none about lifetime patterns and consequences of drinking. Similarly, the 1979 national alcohol abuse survey obtained no information at all about abuse (past or present) of illegal drugs but had very detailed information about alcohol use and consequences of drinking.

The design of both national surveys presented specific limitations on this analysis. First of all, only one adult was interviewed per household. All information obtained through the questionnaire is specific to that individual. The 1979 survey asks about patterns of alcohol consumption, life events, and impacts of alcoholic beverages on the respondent's functioning at home, in public, and on the job. Given this, annual earnings or wage rate should also be specific for the individual, but both surveys asked for only the annual household income with source of income unspecified.

Household income frequently includes the earnings of more than one individual and can include benefits received from social welfare programs (such as unemployment insurance, aid to families with dependent children, disability payments) as well as income from savings accounts, stocks, bonds, or trust funds (i.e., unearned income).

Berry and Boland were also forced to use household income. Their estimates are comparable to and limited in the same way as the estimates developed for this study. Thus, analysis of the impact of income on alcohol abuse must proceed very carefully.

In this study it has not been possible to control for unearned income, but it has been possible to control at least partially for the earnings of other individuals within the household. The two surveys do obtain information about the marital status of the respondent and the presence of children under 12 within the household. Some assumptions can be made about income based on the presence of a spouse and young children.

1. Productivity Losses and Alcohol Abuse

The first task in the analysis was to identify the sociodemographic characteristics that are known to affect labor market success.

These included education, age (coded as number of years since final year in school), race, sex, marital status, presence of children under the age of 12 in the household and, if the survey respondent was in the labor force, occupation (see table A-2 for variable definitions). Using the 1979 survey, a regression of these variables on household income found the relationship to be very significant, with an F value of 36.6, and an $R^2$ of .392. This basic set of sociodemographic factors was able to explain 39.2 percent of the variance in household income.

The second task in the analysis was to examine the impact of drinking patterns and problem drinking on income after controlling for all previous factors. The simplest approach for this analysis would be a simple comparison of sociodemographically similar households with and without alcoholics or problem drinkers. Berry and Boland used this approach by applying a problem drinking index which Cahalan (1970) had developed for the specific survey that they used. That particular index aggregated a number of different kinds of problems which obscures numerous facets of problem drinking. The procedure in this study was to examine the impact of specific problem drinking symptoms on household income while controlling for the sociodemographic variables specified above. From the many problem drinking symptoms obtained in the survey, only those on which ten or more of the 1,772 survey respondents answered affirmatively were used. It was judged that any item with ten or fewer positive responses, no matter how important an indicator, would most likely fail to be significant in statistical testing. Therefore, only a subset of all symptoms was examined.

Extensive testing was performed on many different kinds of problem drinking symptoms (see table A-3 for a partial list of variables tested). Symptoms were included in the regression model along with the controlling sociodemographic factors to indicate whether or not they were significantly related to household income. Although virtually all of the indicators tested had a negative relationship with household income, the vast majority did not have a statistically significant relationship to household income when sociodemographic factors were controlled. However, four specific problem symptoms were identified as having the hypothesized negative affect on household earnings and being statistically significant. However, these four symptoms--binge drinking, tardiness or absence from work because of a hangover, marital problems attributed to drinking, and arrests for driving

Table A-2

Base Variable Definitions for Final Regressions on Alcohol Abuse

| | |
|---|---|
| ED1-ED6: | Dummy variables (0/1) indicating education level attained |
| ED1: | Less than 7 years |
| ED2: | Some junior high school |
| ED3: | Some high school |
| ED4: | High school graduate |
| ED5: | Some college or university |
| ED6: | College graduate or beyond |
| POTEXP: | Computed as (Age minus Number of years of Education minus 5) |
| POTEXP2: | Square term of POTEXP |
| NRACE: | Race: White defined as zero, other defined as one |
| PROF-LABORER: | Dummy variables (0/1) indicating type of employment |
| PROF: | Business executive or professional |
| MAD: | Manager and administrator |
| SALES: | Retail or office worker |
| CLER: | Clerical |
| CRAFT: | Craftsman (includes men enlisted in armed forces) |
| LABFM: | Laborers and farmers |
| OPER: | Operators |
| SERV: | Service |
| KIDS: | Dummy variable (0/1) indicating presence of children under the age of 12 in the household |
| D0-D3: | Variables created to represent the sex and marital status of individuals in the labor force |
| D0: | Single males |
| D1: | Married males |
| D2: | Single females |
| D3: | Married females |
| QF: | Quantity/frequency variable measuring average daily alcohol consumption |
| QFSQ: | Square term of QF |
| PD: | Dummy variable (0/1) created for persons with positive responses to one or more of the following components of problem drinking |
| HANGOVER: | Ever late to or miss work because of a hangover? |
| MARPROBS: | Have problems with spouse or ex-spouse in the past year because of drinking? |
| DRIVE: | Ever arrested for driving while under the influence of alcohol? |
| BINGEYR: | Have you gone on a drinking binge in the last 12 months? |

Source: Research Triangle Institute.

Table A-3

Variables Tested to Create a Measure of Drinking Problems

| | |
|---|---|
| Hangover: | Ever missed or been late to work because of a hangover? |
| MarProbs: | Had problems with spouse or ex-spouse because of drinking? |
| Drive: | Ever arrested for driving while under the influence of alcohol? |
| Bingeyr: | Have you gone on a drinking binge in the last 12 months? |
| Symptoms: | Aggregate of number of drinking symptoms in the past year |
| Freqhigh: | Frequency variable created measuring how often drunk in the past year |
| Forget: | Query of why drink: to forget everything? |
| Worries: | Query of why drink: to forget worries? |
| Cheerup: | Query of why drink: because helps to cheer you up? |
| Tense: | Query of why drink: when tense and nervous? |
| Accident: | Ever been involved in an accident after drinking? |
| Arrest: | Ever been arrested in connection with drinking? |
| Drkdrive: | Ever been a passenger while driver was drunk? |
| Healthprob: | Aggregate tested, along with each individual problem |

Source: Clark and Midanik, 1982.

while under the influence of alcohol--are strong indicators of problem drinking. The four significant symptoms were then combined into a single indicator of the presence of one or more of the four symptoms.

The survey included extensive information of drinking patterns as well as drinking impacts. Drinking patterns were examined for their relationship to household income. Tests were run on number of times drunk, the number of times high but not drunk in the last year, a quantity-frequency measure representing average daily consumption of absolute alcohol over the past year, and a quantity-frequency measure representing absolute daily consumption of alcohol during the past month. The first three pattern variables were not found to be significant. The last variable, representing the current level of consumption of alcohol, had a very strong relationship to household income, even when controlling for the sociodemographic characteristics.

Fully 10 percent of labor force participants in the 1979 national survey had one or more of the four problem drinking symptoms (table A-4). This prevalence rate compares very closely to prior estimates of problem drinking and alcohol abuse. In 1979, young males had the highest prevalence of drinking problem symptoms. In general, males had higher rates than females. Females in the 20-24 year age group had the highest rate among women.

Recall that in the report by Clark and Midanik (1982) on the 1979 national survey, 10 percent of the adult population showed some symptom of loss of control which indicated alcohol dependence. The rate for males was 15 percent, and for females it was 6 percent (see table III-13). Similarly, 5 percent of the adult population (7 percent of males and 3 percent of females) experienced one or more social consequences that they directly attributed to alcohol abuse. There is some overlap between the estimates for loss of control or dependence and that for social consequences.

From Clark and Midanik's data it is clear that problem drinking symptoms are highest between ages 18 and 30. The lowest rates for both males and females are for those aged 60 and above. This age distribution of problem drinking symptoms means that the prevalence would be even higher for adults between ages 30 and 60, the years in which they are most likely to be in the labor force. The study by Berry and Boland (1977) found 17.5 percent of households with a male aged 21-59 had a problem drinker

Table A-4

Prevalence in the Workforce of Problem Drinking Symptoms and Daily Use (Ever) of Marijuana by Age and Sex (in Percentages)

| Age | Problem Drinking Indicator† | | Daily Use (Ever) of Marijuana | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 18-19 | 16.4 | 5.7 | 18.9 | 14.3 |
| 20-24 | 21.0 | 15.4 | 21.8 | 11.0 |
| 25-34 | 18.5 | 4.5 | 12.5 | 4.5 |
| 35-44 | 11.9 | 8.2 | 0.0 | 0.0 |
| 45-54 | 13.3 | 5.6 | 0.0 | 0.0 |
| 55-64 | 6.0 | 0.8 | 0.0 | 0.0 |

Sources: Calculations from the 1979 Household Survey on alcohol abuse funded by NIAAA, and the 1982 Household Survey on drug abuse funded by NIDA.

†See PD variable definition, table A-2, for the definition of "Problem Drinking Symptoms."

present (see table A-5). Assorted other studies have indicated 5 percent of those in the workforce were alcoholics and, perhaps, another 5 percent were problem drinkers. Table A-5 shows that many of these same studies also estimated the impact of alcoholism or problem drinking on worker productivity as being between 20 and 30 percent. The exception to this was an analysis of Berry and Boland, whose initial estimate was an impairment level of 18.4 percent. However, they made another adjustment based on completely unrelated data which dropped their estimate of impairment to 14.0 percent. As stated previously, the estimates by Berry and Boland did not take into account important determinants of the labor market success which this analysis has been able to utilize.

The regression analysis of the impact of problem drinking on household income is summarized in table A-6. Only the results for drinking-related variables are presented there. The dependent variable in the relationship was the natural logarithm of household income. The independent variables were the items specified in table A-2 (referred to as the "base" variables) and the drinking related variables. In a regression using a logged dependent variable, coefficients of unlogged independent variables may be interpreted as the proportional impact of a 1 unit increase in that variable when the coefficients are relatively small (between +.10 and -.10). At values beyond that, the proportional impact is obtained by taking the antilog of the coefficient and then subtracting "1." Positive coefficients represent an increase, and negative coefficients reflect a negative effect.

The analysis was performed on three somewhat different groups. The first was individuals in the labor market (table A-6, lines 1, 2, and 5), those employed as well as those unemployed at the time of the survey. The second group was the total population (line 3). The third group was respondents that were employed (line 4). The first group is generally considered to be the best for addressing the current question because an individual must be working or looking for a job in order for substance abuse to affect his or her earnings. Included in this group are those who, though currently not working, have held a job recently and can reasonably be considered part of the labor force. Looking at the problem of lost earnings more comprehensively, consideration should be given to those who have disabling ADM problems which have either caused them to be frequently terminated from jobs and, therefore, to be unemployed for various periods or caused them to

Table A-5

Prevalence and/or Reduced Productivity of Alcohol Abusers and Alcoholics as Estimated by Various Studies

| Study | Estimated Prevalence | Defined Population | Reduced Productivity | Defined Population |
|---|---|---|---|---|
| Vischi et al. (1980) | 10 million | Adult problem drinkers | not estimated | n/a |
| Cahalan et al. (1969, 1970, and unpublished data) | 9 percent<br>16 percent | Adult problem drinkers<br>Male adult problem drinkers | 18.4 percent | Reduced income of households with male adult problem drinkers present (unadjusted for age, education, and family structure). |
| Keller (1971) | 5 percent<br>5 percent | Labor force alcoholics<br>Labor force other problem drinkers | not estimated | n/a |
| National Council on Alcoholism (1971) | 4.6 percent | 3.6 million untreated alcoholic employees out of 79 million persons employed. Secondary data. | 25 percent | Alcoholic employees - losses to company due to lost production and other costs. Secondary data. |
| Winslow et al. (1966) | not estimated | n/a | 23 percent | Suspected problem drinkers compared to problem-free employees. Primary data with matched samples. |
| Swint and Nelson (1977) | 5 percent | Alcoholics in work force. Secondary sources. | 20-30 percent | Alcoholic employees. Secondary sources. |
| Schramm (1974) | 5 percent | Alcoholics in work force. Assumption based on secondary sorces. | 25-50 percent | Alcoholic employees. Assumed level of reduced productivity. |

(continued)

| Study | Estimated Prevalence | Defined Population | Reduced Productivity | Defined Population |
|---|---|---|---|---|
| Berry et al. (1977) | 17.5 percent of households with a male aged 21 to 59 | Male adult problem drinkers Based on Social Research Group's national probability sample of households (Cahalan, unpublished data) | 14.0 percent | Reduced income of households with male adult problem drinkers present (adjusted for age, education, and family structure). |
| Mannello and Seaman (1979) | 19 percent | Problem drinking railway workers (using Cahalan et al. 1970) | 29 percent | By evaluation of supervisors: problem drinkers versus average employees. |
| | 12 percent | (using independent methodology) | | Supervisors diagnosed likely problem drinkers. |
| | 15 percent | (by Program Directors standards) | | Not related to prevalence estimates. |
| | 21 percent | (combination 1 and 3) | | |
| | 9.3 percent | (workers' self-evaluations) | | |
| VonWiegand (1976) | 6 percent | Alcoholic employees. Secondary sources. | 27.7 percent | Alcoholic employees. Cost due to lower productivity, absenteeism, accidents, etc. Secondary sources. |
| Swint and Nelson (1977) | 5 percent | Alcoholics in work force Secondary sources. | 20-30 percent | Lower productivity of alcoholics (absenteeism and work output). Secondary sources. |

Source: Cruze et al., 1981.

Table A-6

Regression Results for Analysis of Household Income[1] and Problem Drinking (By Percentage)

| Dependent Variable | Problem Drinking Indicator | Quantity/ Frequency | Quantity/ Frequency Squared | F | $R^2$ |
|---|---|---|---|---|---|
| 1. Household Income of Labor Force Participants | -.138 (-2.33)** | - | - | 35.1 | .396 |
| 2. Household Income of Labor Force Participants | -.2357 (-3.65)† | .229 (3.66)† | -.0479 (-2.74)† | 32.2 | .402 |
| 3. Household Income of Total Population | -.2367 (-3.82)† | .261 (5.59)† | -.051 (-4.71)† | 67.0 | .484 |
| 4. Household Income of Employed Persons | -.282 (-4.26)† | .230 (3.12)† | -.0429 (-1.77)* | 27.1 | .38 |
| 5. Household Income of Labor Force Participants | -- | .169 (2.78)† | -.041 (-2.36)* | 32.7 | .394 |

[1]This dependent variable is entered in natural log form.

†Significant at the .01 level.

**Significant at the .05 level.

*Significant at the .10 level.

permanently leave the labor force. Data sets to answer these last questions are not available.

Table A-6 is read from left to right. Lines 1 through 5 each summarize a regression. The title next to the number defines the dependent variable for the regression and the population included in the regression. In the table column entitled "Problem Drinking Indicator" is the coefficient in that regression. Under Quantity/Frequency and Quantity/Frequency Squared are coefficients in those regressions. The "F" and "$R^2$" values indicate the overall strength of the relationship between the dependent variable, and the "base" and drinking variables. The base variables and their coefficients are not shown here in order to focus on the most important relationships between income and the drinking variables.

The results in table A-6 indicate that problem drinkers identified through our analysis were consistently less successful in the labor market than non-problem drinkers with the same characteristics. The initial comparison of household income between the two groups (on line 1) indicates that the presence of one of the four problem drinking symptoms reduced household income by about 13 percent. This result was statistically significant. When variables representing current consumption of alcohol were included (line 2), the impact of problem drinking was found to be much greater: a 21 percent decrement was experienced by the problem drinking households. Furthermore, the (line 2) relationship including current drinking variables indicated that where an individual consumed more than an average of 2.4 absolute ounces of alcohol daily, income was negatively affected whether or not they had any problem drinking symptoms.

When the impact of level of current drinking was assessed without the problem drinking indicator in the regression (line 5), the negative effect of high levels of drinking was still found. At consumption levels beyond approximately 2 absolute ounces of alcohol daily, income fell as consumption rose.

The third and fourth lines have results for the total population and employed persons, respectively. Their results are similar to the relationship for labor force participants. In fact, it was found that problem drinking had an even larger impact on employed persons than it did for the total labor force. This suggests that problem drinkers were less likely to

be unemployed than others, but that the hourly wage decrement was greater than expected.

These findings are consistent with previous studies of the impact of alcoholism and problem drinking in the workplace. The prevalence rate, based on the four significant problem drinking symptoms, and the level of reduced productivity are also similar to those estimated in prior studies (table A-5). Moreover, the estimates of the size of the impact of problem drinking are comparable to those cited earlier for long-term disability (Luft, 1975) and for psychoses and neuroses (Bartel and Taubman, 1979). The fact that the current estimates are the same order of magnitude as prior similar estimates adds credibility to the current results.

Productivity losses attributable to problem drinking in 1980 are presented in chapter III. The computations were made by multiplying the number of individuals in the labor force for each age and sex group by the prevalence rate for our problem drinking indicator. This product was multiplied by the expected productivity (labor market plus household) of that group and, finally, by the impairment rate of 21 percent. Separate computations were made for men and women in the labor force, and for those whose primary occupation was homemaking. Summing the losses across all groups indicated reduced productivity attributable to alcohol abuse of $57.7 billion in 1980. Of this total, $44 billion was due to problem drinking by males, and $13.7 billion was due to problem drinking by females.

These estimates are adjusted downward to $49.8 billion in the final report because many young problem drinkers are also drug abusers--that is, because of double counting. This issue is addressed at the end of this section.

2. Productivity Losses Due to Drug Abuse

A similar analysis has been performed to examine the impact of abuse of marijuana on the workforce. The 1982 national household survey on drug abuse focused on patterns of use and abuse of psychoactive substances including marijuana, cocaine, heroin, hallucinogens, and a variety of stimulants, sedatives, and analgesics. Questions on income and sociodemographic factors, however, were almost identical to those in the 1979 alcohol abuse survey.

Like the study on alcohol abuse, the drug abuse study examined patterns of current and lifetime consumption, and patterns of use for a number of

different psychoactive substances. The drug abuse study, unlike the study on alcohol abuse, obtained no information about untoward events they might have been due to abuse of drugs. Questions were not asked about areas in which abuse of alcohol is known to have an impact such as symptomatic drug consumption, interpersonal problems, difficulties in the household, legal entanglements, or problems on the job. By analogy, it would be predicted that drug abuse has impacts in the same areas as alcohol abuse, but this has not been examined by any of the national surveys on drug abuse.

Although the national surveys on alcohol abuse and drug abuse had similar sociodemographic information, in fact, the income information in the drug abuse survey was of poor quality for analysis such as this. In both surveys, the income data were obtained in ranges. The alcohol abuse survey had ranges with $5,000 intervals with a total of 11 categories. In the drug abuse survey, income data were in 7 categories, with some intervals as broad as $10,000. Grouping the income data makes it more difficult to obtain precise and statistically significant estimates for relationships.

The prevalence rates of ever using marijuana daily by labor force participants are presented in table A-4. For males age 18-24, this prevalence was about 20 percent. Males aged 25-34 had a lower rate, 12.5 percent. Older males had an effective rate of "0". Rates for females were somewhat lower, although they were greater than 10 percent for women aged 18-24.

Multivariate regression analyses were completed for single males in the labor force, married males in the labor force, all males grouped together, single females in the labor force, married females in the labor force, all females together, and all labor force participants. The sociodemographic control variables (listed in table A-7) were similar to those used for the analysis of alcohol abuse.

The statistical analysis of the impact of consumption of drugs other than marijuana yielded no significant results relating abuse of the drugs to household income. Perhaps this should have been anticipated. First of all, heavy drug users may have life styles that make them unlikely to be captured in household surveys. Second, prevalence of drug use other than marijuana is much lower than that for marijuana. The failure to find relationships was true for variables reflecting recency and frequency of

Table A-7

Base Variable Definitions
Final Regressions on Marijuana Use

| | |
|---|---|
| ED1-ED6: | Dummy variables (0/1) indicating education level attained |
| ED1: | No schooling |
| ED2: | Elementary school--8th grade or less |
| ED3: | Some high school |
| ED4: | High school graduate |
| ED5: | Vocational/technical school beyond high school |
| ED6: | Some college |
| ED7: | College graduate or beyond |
| POTEXP: | Computed as (Age minus Number of years of Education minus 5) |
| POTEXP2: | Square term of POTEXP |
| NRACE: | Race: White defined as zero, others defined as one |
| PROF-LABORER: | Dummy variables (0/1) indicating type of employment |
| PROF: | Business executive or professional |
| MAD: | Manager and similar |
| SALES: | Retail or office worker |
| CRAFT: | Craftsman, foreman, skilled worker |
| SERVICE: | Service workers |
| LABORER: | Laborer |
| KIDS: | Dummy variable (0/1) indicating presence of children under the age of 12 in the household |
| D0-D3: | Variables created to represent the sex and marital status of individuals in the labor force |
| D0: | Single males |
| D1: | Married males |
| D2: | Single females |
| D3: | Married females |
| DAILYMJ: | Dummy variable (0/1) created for persons who had ever smoked marijuana daily for a month |
| MONTHMJ: | Frequency variable calculated as the number of marijuana cigarettes smoked per day times the number of different days during the past 30 having smoked marijuana |
| MONTHMJ2: | Square term of MONTHMJ |

Source: Research Triangle Institute.

current consumption, lifetime consumption of the substances, and abuse of substances in combination with alcohol or other drugs. Unfortunately, this was the extent of information obtained about consumption of each of the substances.

Table A-8 is constructed and reads identically to table A-6. Again, all appropriate "base" variables were used in the regression analyses reported in each line. (The variables and their coefficients are not printed here only to keep the presentation clear.) Analysis revealed a large and significant impact on current household income if an individual ever smoked marijuana daily for a period of at least one month. Other variables reflecting current use patterns and lifetime use were not statistically significant. Some variables measuring use had the predicted negative, although insignificant, impacts on household income; some did not; and others indicated positive, though still insignificant, impacts.

The multiple regression results for labor force participants and the total population and employed persons are summarized in table A-8. The predicted impacts of ever using marijuana daily were substantial. In the analysis of household income of labor force participants (line 1), ever using marijuana daily had a highly significant coefficient of -.3276. This translated into a negative impact of 27.9 percent. Examining two alternative specifications, even larger impacts of ever using marijuana daily were indicated. The coefficient in the regression of household income of the total population (line 3) was -.397, a statistically significant 33 percent deficit. The impact is even greater when examining the household income of employed persons (line 4): the coefficient of -.516 translates into a reduction of income of 40 percent.

These results have been used to calculate the reduced productivity due to daily marijuana use. Once again, the prevalence rates of ever using marijuana daily in the labor force by age and sex groups (see table A-4) were applied to the number of persons in the labor force from those groups that experienced reduced productivity. This number was multiplied by the expected productivity (in the workplace and in the household) and then by the impairment rate (27.9 percent) to produce the final value. The loss due to marijuana abuse was estimated as $34.2 billion for 1980.

Table A-8

Regression Results for Analysis of Labor Market Behavior and Marijuana Abuse (by Percentages)

| Dependent Variable | Daily Use Ever | Current Use | Current Use | F | $R^2$ |
|---|---|---|---|---|---|
| 1. Household Income of Labor Force Participants[1] | -.3276 (-2.83)† | - | - | 9.6 | .066 |
| 2. Household Income of Labor Force Participants[1] | -.401 (-3.13)† | .0047 (1.13) | -.00001 (-.70) | 8.8 | .067 |
| 3. Household Income of Total Population | -.397 (-2.61)† | .005 (1.10) | -.00001 (0.53) | 11.0 | .061 |
| 4. Household Income of Employed Persons[1] | -.516 (-4.55)† | .0085 (2.09)* | -.000027 (1.61) | 8.5 | .07 |

[1]This dependent variable is entered in natural log form.

†Significant at the .01 level.

*Significant at the .05 level.

As discussed below, these estimates will be adjusted down by 25 percent to compensate for double counting of young drug abusers and young problem drinkers.

D. Discussion

Both alcohol abuse and marijuana abuse have significant negative impacts on household income and productivity. Sociodemographic factors which themselves have a strong relationship to labor market success and productivity were carefully controlled in the analyses presented here. The estimated impacts of alcohol abuse and drug abuse are considered to be marginal; that is, they are correlated with the symptoms of alcohol abuse and drug abuse even when other factors hypothesized to be related to alcohol and drug abuse are held constant.

It would be too simplistic to suggest that the impact reflected in the above regression analysis could only be due to alcohol abuse or to drug abuse. Plausible alternative explanations can be offered. One alternative may be that alcohol abuse and drug abuse (either or both) may be symptomatic of other personal problems such as stress or depression. Alcohol and drug abusers may be self-destructive or have other personality disorders, low orientation toward achievement or low motivation. Attitude alone may limit an individual's success in the labor market, regardless of any complications or problems experienced with substance abuse. Extensive research has documented that marijuana use, like alcohol use or abuse of other drugs, is predictable based on social, psychological, and behavioral characteristics observed before the onset of use (Jessor, 1979).

The finding that current marijuana use has little impact on income and that past intensive use has a major impact also merits further discussion. To explain this pattern of results we clearly need a complex causal model that is beyond the scope of this report. It may be that early marijuana use directly causes some reduction in motivation, capacity, or level of performance that cannot be compensated by later achievement. Or, the relationship may be a result of other unmeasured factors. Former intensive marijuana users may maintain counter-cultural values and not seek jobs with high income as the primary reward. They may also have personality characteristics that are not compatible with many jobs.

Jessor (1979) concluded that marijuana use was associated with unconventional and more experimental behavior. Users also place a lower value

on achievement and have lower expectations of success. Jessor also cited involvement in other types of problem behaviors though these appear to be part of a constellation of other resultant factors. Behavioral patterns could stigmatize problem individuals and reduce their opportunities to be selected for better jobs.

The analysis has revealed that lifetime, as well as current, problem drinking and marijuana abuse are significant predictors of reduced household income. Use of lifetime indicators is somewhat at odds with current practices of focusing on current or most recent behavior and impacts. The prevailing theory in the analysis of labor market success in this report is that although current earnings are the result of current behavior, they are strongly affected by antecedent life events. These would obviously include variables such as years of formal education, quality and type of education, experience in the work force (analogous to age), lapses in labor force participation, tenure in present job and occupation, and current and past health problems that might impair productivity as well as factors like aptitude and motivation. The study by Bartel and Taubman (1979), discussed earlier) demonstrated that health problems ten or even fifteen years in the past can have significant impacts on current earnings, just as education has a lifelong effect.

The results presented here for both marijuana and alcohol abuse are strongly suggestive of long-lasting impacts of substance abuse on labor market success of individuals and their families. Intoxication can impair the ability to function in school, on the job, or in society. Poor school or job performance can limit future advancement, even if an individual stops abusing alcohol and/or drugs. The initial poor performance can have a permanent affect unless extraordinary measures are taken to counteract the problem (such as remedial or extra education or training). These lifetime impacts of ADM were briefly addressed in the 1981 study on ADM costs to society.

Finally, the social costs of both alcohol and drug abuse have been estimated separately. However, as many recent studies have shown, individuals with problems with alcohol or marijuana also tend to use other substances. For example, in a study of adolescents in 1978 (Rachal et al., 1980), about half of the heavier drinkers also used marijuana at least once a week. Of the youth who used marijuana more than once a month, a third

also were classed as heavier drinkers. Of those who reported they had alcohol-related problems, half also reported current marijuana use. These data indicate that there is considerable overlap in the kinds of problems that can affect productivity.

Half or more of young problem drinkers may also have a marijuana problem. Similarly, half of the young marijuana abusers are likely to be alcohol abusers. Thus, the cost estimates for alcohol and drug abuse count many people twice. Assuming this is correct, we reduced each estimate for the age groups between 18 and 34 by 25 percent.

Unfortunately, national surveys of alcohol abuse (Clark and Midanik, 1982) and drug abuse (Miller et al., 1983) included adequate measures for either alcohol or marijuana use, but not both. In order to better gauge the independent and combined effects of alcohol and marijuana, a study must include measures of use and associated problems for both substances.

Referring back to table A-4, for an example, note that 21 percent of males aged 20-24 were estimated to be problem drinkers, and 21.8 percent were estimated to be problem marijuana users. With no overlap, 42.8 percent of this group would be in one or the other of our problem groups. However, with half of each group also in the other group, 10.5 percent are only problem drinkers, 10.7 percent are problem drinkers-users of marijuana, and 10.9 percent are only problem drug abusers, for a total impairment rate in the age/sex group of 32.1 percent, or only three quarters of the duplicated total.

It remains a challenge to future researchers to discover the nature of the relationships among alcohol and drug abuse, attitudes, values, personality, basic socioeconomic and sociodemographic characteristics, and success in the labor market.

# B. FETAL ALCOHOL SYNDROME

## SECTION B: FETAL ALCOHOL SYNDROME

The risk of alcohol-related birth defects is causing increasing concern in the field of substance abuse. Although only identified in the early 1970s, research over the last 10 years has conclusively established the fetal alcohol syndrome (FAS) as one of the most serious sets of birth defects and one with a relatively high incidence rate for its degree of severity.

A. Incidence of FAS

Varying estimates on the incidence rate of fetal alcohol syndrome exist. Clarren and Smith (1978) estimate the number of children with FAS in the United States at between 1 and 2 live births per 1,000, with partial expressions at between 3 to 5 live births per 1,000. In a Seattle sample, Hanson, Streissguth, and Smith (1978) reported a rate of 1 in 750 live births. A study in Sweden detected 1 FAS infant per 600 live births (Olegard et al., 1979), and in Northern France, FAS was exhibited in 1 per 1,000 births (Dehaene et al., 1977).

1. Numerous studies have explored the relationship between alcohol consumption and birth defects.
2. Studies have also indicated that risks to the developing fetus are further complicated by mothers' smoking in addition to consuming alcohol (Landesman-Dwyer and Emanuel, 1979).
3. Consistent findings of decreased birth weight, length of torso, head circumference, significantly lower I.Q.'s, cardiac effects, etc. have been documented. Table B-1 indicates the most consistent features of FAS (Clarren and Smith, 1978; Jones and Smith, 1975; Kaminski et al., 1978; Loser and Majewski, 1977).

The risks of stillbirth and spontaneous abortion have also been studied, although limited data are available. Kaminski et al. (1978) has reported that the risks of stillbirth are increased more than 2½ times for women who reported drinking an average of 3 or more drinks per day, smoked, came from lower socio-economic classes, had more prior pregnancies, or were older. A California study detected a significant increase in spontaneous abortions which increased with the amount of reported maternal drinking even after adjusting for variables correlated with drinking (Harlap, Shinono, and Ramcharan, 1979). In a study of 3 New York hospitals, Kline et al. (1980)

Table B-1

## Most Consistent Features of the Fetal Alcohol Syndrome

### Growth and Performance

- Prenatal onset growth deficiency, more pronounced in length than in weight
- Concomitant microcephaly (small head circumference) even when corrected for small body weight and length
- Postnatal growth deficiency in weight and length, usually below 3rd percentile
- Delay of intellectual development and/or mental deficiency (mean IQ from Seattle study = 64, range 16-92)
- Fine motor dysfunction (poor coordination)

### Head and Face

- Microcephaly
- Short palpebral fissures (narrow eye slits)
- Midfacial (maxillary) hypoplasia (underdevelopment of midfacial region)
- Flattened, elongated philtrum (middle of upper lip) associated with thin, narrow vermilion lip borders (highly specific to FAS)
- Minor ear anomalies including low set ears

### Limbs

- Abnormal creases in the palm of the hand
- Minor joint anomalies
  - syndactyly (fingers or toes joined together)
  - clinodactyly (abnormal bending of fingers or toes)
  - camptodactyly (one or more fingers constantly flexed at one or more phalangeal joints)

### Heart

- Ventricular and atrial septal defect (valve defects)

### Brain

- Absence of corpus callosum
- Hydrocephalus (excess fluid in cranium)
- Brain cell migratory abnormalities

### Other

- Minor genital anomalies
- Hemangiomas (benign tumors made up of blood vessels) in infancy

SOURCE: Data from Kenneth L. Jones and David W. Smith, The fetal alcohol syndrome. *Teratology*, 12(1):1-10, 1975.

reported five times the risk of spontaneous abortions when 1 ounce of absolute alcohol was consumed twice a week. Harlap et al. also reported a significant increase for second trimester abortions when 1 to 2 drinks were consumed per day. Both of these studies had controlled for confounding variables such as smoking.

Several studies have reported increased risks of physical malformations while indicating that FAS children with the most severe physical signs typically show the greatest degree of mental impairment (Hanson et al., 1978; Majewski et al., 1976). Although few FAS children have been studied as they grew older, Seidenberg and Majewski (1978) have reported that most continue to function at the same mental level even when good foster care and special school programs are provided.

Overall estimates for the risks of drinking during pregnancy are also limited. Oulette et al. (1977) has reported a 37 percent rate of major and minor birth defects for heavy drinkers as compared to 14 percent for moderate drinkers and 9 percent for light drinkers.

Recent discussions with staff of NIAAA and physicians researching FAS suggest that a 1 in 1,000 rate of incidence is a conservative figure. In fact, it has been suggested that a mid-range estimate for the incidence rate is 1 in 500 to 600 births, and that when children having only some, but not all, of the FAS symptoms are included, the upper limit on the incidence rate may be one-half of 1 percent. This 1 in 200 rate is extremely high, and it should be noted that no researchers have suggested that the full fetal alcohol syndrome appears at this rate.

B. Economic Implications of FAS

Marsha Russell (1980) of the New York State Division of Alcoholism and Alcohol Abuse has analyzed the impact of alcohol-related birth defects on New York State. Russell's article carefully reviewed the state of knowledge about alcohol-related birth defects and identified limitations in knowledge about fetal alcohol syndrome. On the basis of that work, a more recent review of the literature on FAS and contacts with leading researchers, this study offers order of magnitude estimates of the national cost of FAS, although a precise incidence rate has not yet been proposed.

Specific birth defects that occur as part of the fetal alcohol syndrome have been identified, along with the type of health treatment that would be required in order to meet the needs of the FAS child, the length of the

treatment period, and the age at which the treatments are likely to be necessary. Estimated costs of particular treatments are also presented. These values are presented in table B-2. The specific defects have been numbered from 1 through 10, and treatment regimens are summarized in columns B, C, and D.

Since elements of the treatment and the age at which they would occur are specified along with the treatment costs and the probability of occurrence in a specific FAS case, it is possible to construct the cycle of treatments that a person with FAS would receive at different periods in his/her life. It is also possible to prepare an expected value of treatment received during specific age periods. This was calculated by identifying the treatments that a person would receive at each age and multiplying the cost of these treatments by the probability of occurrence.

It is expected that 80 percent of FAS children have prenatal and postnatal growth retardation that requires neonatal intensive care and a hospital evaluation (Russell, 1980). All infants should also be screened for potential audiological defects while in the intensive care unit (personal communication, Michael Church).

Auditory problems have been associated with fetal alcohol syndrome. Studies have shown that 56 percent of FAS diagnosed children will require a series of audiological evaluations in the first year of life with annual checkups through adolescence, and corrective surgery. Thirty-three percent of FAS diagnosed children may also need hearing aids to correct for mild hearing loss (Gerkin et al., 1984) (personal communication, Michael Church).

FAS children are expected to have some degree of mental impairment, ranging from minimal brain dysfunction (MBD) to severe/profound mental retardation. Fifty-two and one-half percent of FAS children are expected to have learning difficulties related to deficiencies in attention, concentration, and memory, plus a history of hyperactivity and impulsivity. Problems in attention, behavior, and learning have been designated as minimal brain dysfunction (Russell, 1980; personal communication). It is expected that MBD children would require some form of remedial education such as special education in a "resource room" environment in the public schools at an annual cost of $7,400 (Kahalik et al., 1981). It is also expected that these children would require services throughout their years of school attendance (personal communication, Anne Hocutt of the Research Triangle Institute).

Table B-2

Lifetime Cost Estimates of Specific Birth Defects
Associated with the Fetal Alcohol Syndrome

| (A) Specific Birth Defect | (B) Annual Cost of Treatment | (C) Length of Treatment Period | (D) Lifetime Cost | Estimation of Prevalence in FAS (percent) |
|---|---|---|---|---|
| 1. Prenatal growth retardation | Neonatal intensive care: 7 days at $500 per day[a] | Once | $ 3,500 | 80 |
| 2. Postnatal growth retardation | Hospital evaluation $750 | Once | 750 | 80 |
| 3. Audiological deficits[b] | A. Neonatal intensive care: auditory screening at $105/ procedure | Once | 105 | 100 |
| | B. Series of audiological evaluations: 1st evaluation at $45/visit, subsequent evaluations at $25/visit | | | |
| | | Every 3 months for 1st year of life | 120 | 56 |
| | | Semi-annually through adolescence | 600 | 56 |
| Serious otitis media | C. Surgery (myringotomies) at $400/physicians fee[c] | Once | 400 | 56 |
| Mild sensori-neural hearing loss | D. Hearing aids at $500/aid including office visits | Through ages 10-12 | 500 | 33 |

(continued)

| (A) Specific Birth Defect | | (B) Annual Cost of Treatment | (C) Length of Treatment Period | (D) Lifetime Cost | Estimation of Prevalence in FAS (percent) |
|---|---|---|---|---|---|
| Mental impairment: | | | | | |
| 4. Minimal brain dysfunction | | Special education: "Resource room" at $7,400/year[a] | Ages 5-18 | 103,600 | 52.5 |
| 5. Mild-moderate mental retardation | A. | Ambulatory care with special education at $15,000/year | Ages 3 to 21 | 270,000 | 45 |
| | B. | Home care with day services at $6,200/year[e] | Ages 22-65 | 272,800 | 36 |
| | C. | Residential care with day services at $18,500/year[f] | Ages 22-65 | 814,000 | 9 |
| 6. Severe mental retardation | | Institutionalization at $25,000/year[g] | Ages 5-65 | 1,500,000 | 2.5 |
| 7. Heart defects requiring surgery | | $17,500 + $750 annual checkup | 5 years | 21,250 | 5[h] |
| 8. Cleft palate | | Series of operations plus speech therapy | 10-15 years | 45,000 | 12.5 |
| 9. Kidney defects | | Treatment required not yet known | | N.A. | N.A. |
| 10. Neurotube | | $35,000 per year | 5-10 years | $ 262,500 | 0.5 |

[a]This is a very conservative estimate; the average length of stay at Columbia Presbyterian Hospital in New York is 19 days (Cheryl Rice, personal communication).

[b]Source: Gerkin, K.P., Church, M.W., and Murrans, L.E., 1984; (personal communication, Michael Church).

(continued)

[c]Cost estimate does not include hospital costs (e.g., per diem rates, operating room charges.)

[d]Source: Kahalik, J.S., Furry, W.S., Thomas, M.A. and Carney, M.F., 1981; (personal communication, Anne Hocutt).

[e]The cost estimate is for day services only. It is based on an average daily rate of $17 per day per client for day services. Individual estimates are not currently available for costs of home care; (personal communication, Charles Lakin).

[f]The type of services provided vary widely. Cost estimates are based on an average daily rate of $51.05 for residential care and day services. Source: 1977 and 1982 National Survey of Residential Facilities for Mentally Retarded People; (Charles Lakin, personal communication).

[g]Actual costs for institutionalization have been estimated as high as $40,000 per individual per year with an average cost of $30,000 in 1984. (North Carolina Department of Human Resources, Division of Mental Health, Mental Health and Substance Abuse Services, personal communication).

[h]This estimate has been revised from a 10% estimate reported by Marcia Russell. Although 10% of heart problems may be associated with FAS, it has been suggested that a more conservative estimate (5%) be utilized to reflect cases actually requiring surgery (Dr. Sterling Clarren, personal communication).

Source: Research Triangle Institute; Russell, 1980.

Forty-five percent of FAS children are expected to have mild to moderate mental retardation which would require provision of ambulatory and residential care with special education between the ages of 3 and 21 years. This has an expected value of $6,750 per FAS child per year (Russell, 1980).

The type of services provided to mentally retarded adults varies widely. Studies have shown that nearly 80 percent of mild to moderately retarded individuals live in the home. Unfortunately, costs of home care are not currently available. However, these individuals would require day services outside the home. These services may include sheltered workshops, adult developmental activity programs, vocational rehabilitation training programs and others with an average daily rate of $17 per client (personal communication, the North Carolina Division of Mental Health and Charles Lakin).

Persons not in the home may receive a wide range of services from several sources. Residential services may include state public residential facilities, group homes, nursing homes, foster homes, "Board and Room," semi-independent accomodations, as well as personal care with an average daily cost of $51.05 for residential care and day services (Bruininks, 1982) (Charles Lakin, personal communication). For the severely/profoundly mentally retarded (2.5 percent of FAS children), lifetime institutionalization may be necessary at an annual cost of $25,000 per FAS child (Russell, 1980).

Neurotube defects and cleft palate have also been associated with fetal alcohol syndrome. Treatment for these defects would begin in the first year of life. One of eight FAS children are expected to have a cleft palate which would require a series of corrective operations and speech therapy with costs estimated at $45,000 over a 15-year period. One-half of one percent of FAS children are expected to have neurotube defects that would require five to ten years of treatment at $35,000 per year. Treatment costs for heart defects are also extensive, with 5 percent of FAS children expected to need corrective surgery and annual examinations for a five-year period (Russell, 1980) (personal communication, Dr. Sterling Clarren).

The expected cost of treatment at a particular age is computed as the probability of each birth defect requiring treatment multiplied by the cost

of the treatment. The resulting products are then summed across all defects and treatments. The expected cost of treatment peaks at age 5 at $12,713 per year. Costs remain elevated while children are of school age and begin declining at age 18. Beyond this point, costs are composed of treatment for the mentally retarded: lifetime institutionalization for the severely mentally retarded, and residential care and day services for the mild to moderately retarded.

With the values just described, it is possible to establish some order of magnitude of current costs of FAS in the United States. Again, because there is great uncertainty about the incidence of FAS, results are presented for 3 rates: 1 in 1,000, 1 in 600, and 1 in 200. The 1 in 200 value is much higher than has been suggested by anyone for the incidence of the full fetal alcohol syndrome. Recent findings indicate that an incidence of 1 in 1,000 is probably conservative at this point in time. A mid-range incidence rate for FAS is 1 in 600.

It is assumed in this analysis that the 3 incidence rates selected can be applied to all birth cohorts in the United States. Although this is a strong assumption, it is a useful hypothesis for this exploratory analysis. Future studies must establish the true prevalence of FAS in age cohorts.

Results of the analysis are presented in table B-3. The table reflects the total direct costs of treatment for services delivered whether from the health sector or other sectors, e.g., day services and special education. Assuming a 1 in 1,000 incidence rate, there were approximately 3,600 neonates with FAS in 1980, accounting for health treatment costs of $14.8 million. Across all cohorts, there were 68,000 FAS children aged 18 or under with total treatment costs of $670 million in 1980 ($75 million in health care costs and $590 million in educational services), and 160,000 FAS adults with treatment costs of $760 million ($416 million in health services and $344 million in nonmedical services). The 1 in 600 incidence rate implies that there were 380,000 FAS individuals in 1980 with direct services costs of $2.4 billion: 114,000 FAS children with health treatment costs of $125 million, and educational service costs of $990 million; and 267,000 FAS adults with health treatment costs of $574 million, and other service costs of $694 million. At a rate of 1 in 200, there were 340,000 FAS victims between the ages of 0 and 18, requiring $376 million in medical services and $3 billion in educational services. FAS adults numbered nearly 800,000

Table B-3

Expected Cost of Health Treatment in 1980 Due to Fetal Alcohol Syndrome
Using Regimen Proposed in Table B-2
($ in millions)

| Age | Persons (thousands) | Annual Expected Cost of Treatment (dollars) | Likely Treatments at Age | Total Cost at Prevalence Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Conservative 1/1,000 | | Mid-Range 1/600 | | High 1/200 | |
| | | | | Persons | Cost | Persons | Cost | Persons | Cost |
| 0 | 3,598 | $ 4,122 | 1,2,3A,3B,8,10 | 3,598 | $ 14.8 | 6,009 | $ 24.8 | 17,990 | $ 74.2 |
| 1 | 3,212 | 578 | 3B,8,10 | 3,212 | 1.9 | 5,364 | 3.1 | 16,060 | 9.3 |
| 2 | 3,212 | 967 | 3B,3C,3D,8,10 | 3,212 | 3.2 | 5,364 | 5.2 | 16,060 | 15.5 |
| 3-4 | 6,425 | 7,328 | 3B,5A,8,10 | 6,425 | 47.1 | 10,730 | 78.6 | 32,125 | 235.4 |
| 5 | 3,453 | 12,713 | 3B,4,5A,6,7, 8,10 | 3,453 | 43.9 | 5,767 | 73.3 | 17,265 | 219.5 |
| 6-7 | 6,906 | 11,876 | 3B,4,5A,6,7, 8,10 | 6,906 | 82.0 | 11,533 | 137.0 | 34,530 | 410.1 |
| 8-9 | 6,906 | 11,701 | 3B,4,5A,6,7,8 | 6,906 | 80.8 | 11,533 | 135.0 | 34,530 | 404.0 |
| 10-14 | 17,846 | 11,663 | 3B,4,5A,6,8 | 17,846 | 208.1 | 29,803 | 347.6 | 89,230 | 1,040.7 |
| 15-18 | 16,483 | 11,260 | 4,5A,6 | 16,483 | 185.6 | 27,527 | 310.0 | 82,415 | 928.0 |
| 19-21 | 13,143 | 7,375 | 5A,6 | 13,143 | 96.9 | 21,949 | 161.9 | 65,715 | 484.7 |
| 22-64 | 120,765 | 4,522 | 5B,5C,6 | 120,765 | 546.1 | 201,678 | 912.0 | 603,825 | 2,730.5 |
| 65+ | 25,708 | 4,522 | 5B,5C,6 | 25,708 | 116.3 | 42,932 | 194.1 | 128,540 | 581.3 |
| TOTAL | 227,657 | $404,638 | - | 227,657 | $1,426.6 | 380,187 | $2,382.4 | 1,138,285 | $7,133.1 |

Source: Treatment regimen and costs proposed in table B-2; alternative prevalence rates suggested in discussions with Dr. Robert Sokol; computations by Research Triangle Institute; U.S. DOC, U.S. Bureau of the Census: Statistical Abstract of the United States, 1982-1983.

with health care costs of $1.7 billion and nonmedical services of $2 billion. Costs are quite significant by these calculations.

The potential indirect costs from fetal alcohol syndrome are not quite as large as our estimates of the direct health treatment expenditures. The mental retardation associated with FAS means that these individuals are unlikely to achieve a level of productivity comparable to the general population. The 2.5 percent of FAS victims that are severely mentally retarded and, consequently, institutionalized, will certainly never be full participants in the work force. The 45 percent that experience mild to moderate mental retardation not requiring institutionalization will, nonetheless, be much more limited than others in their age cohorts. They are likely to be partially disabled and may, at best, be able to function in a sheltered work environment. The 52.5 percent of FAS victims characterized as having MBD are also expected to have reduced levels of productivity.

Each level of mental impairment has been assigned an expected level of productivity reduction. The severe to profoundly mentally retarded are expected to be completely disabled (i.e., with a 100 percent reduction in productivity). The moderately retarded are considered to be 50 percent impaired, and the mildly retarded are assigned an impairment of 25 percent. (These rates are based on government classifications of moderately retarded individuals as "trainable" and the mildly retarded as "educable;" North Carolina Division of Mental Health, personal communication.) A productivity reduction of 10 percent is assumed for those with minimal brain dysfunction.

The worst case scenario for productivity losses by FAS victims occurs when we apply the high incidence rate of 1 in 200 births to the population aged 18 to 64. This computation suggests that 671,000 adults would have impaired productivity in 1980. Using appropriate values for market and household productivity, and labor force participation, the indirect costs would be $2.6 billion. In comparison, this study has estimated other current productivity losses (excluding mortality) due to alcohol abuse at $55 billion, those due to drug abuse at $30 billion, and those due to other mental illnesses at just over $20 billion.

Applying the 1 in 1,000 incidence rate to the adult population provides an alternate estimate of the indirect costs of fetal alcohol syndrome. This rate suggests that there would be 133,000 FAS adults. Using the same impairment rates, the indirect productivity losses would be $510.5 million.

The mid-range losses are estimated at $853 million, with 225,000 FAS victims of working age (18 to 64 years).

Of particular relevance in the estimation of lost productivity due to mental impairment is the proportion of mental retardation in the general population that is actually attributable to fetal alcohol syndrome. A 3 percent incidence rate is often cited as a reasonable estimate of the proportion of mentally retarded individuals in the adult population of the United States (N.C. Division of Mental Health, personal communication). However, some researchers have suggested that this figure represents an overestimate and that a 1 or 2 percent rate is more representative. On the basis of previously cited information that approximately 360,000 individuals or 20 percent of the mentally retarded are in residential care, a total estimate of 1.8 billion mentally retarded individuals in the United States can be calculated. U.S. Census Department figures estimate that there are 163 million adults over the age of 18 in the United States, allowing the calculation of a 1.1 percent incidence rate of mental retardation in the adult population (U.S. DOC, BOC, 1982). Using a mid-range estimate of 1 in 600, table 8-4 illustrates that there are 107,000 mentally retarded adults (profound/severe, moderate or mild) whose mental impairment is directly attributable to fetal alcohol syndrome. This represents 5.6 percent of all mental retardation in the United States (utilizing the conservative estimate of 1.8 million mentally retarded adults). Alternatively, a 3 percent prevalence rate of mental retardation due to FAS can be calculated using the 3 percent (4.9 million adults) prevalence rate of mental retardation in the adult population.

At the present time, it does not seem possible to create better estimates of the indirect productivity losses due to fetal alcohol syndrome. It is believed that use of the high FAS incidence rate of 1 in 200 births establishes an absolute upper bound on these costs. Without information on the prevalence of FAS in adult cohorts and the degree of impairment actually experienced by these individuals, it is extremely difficult to determine how much lower these costs might be. The 1 in 600 FAS incidence rate is a current estimate. On the basis of the 1 in 600 rate, the fetal alcohol syndrome appears with Down's syndrome and spina bifida as a leading cause of birth defects.

The range of cost estimates presented above has been developed in order to illustrate the costs to society due to fetal alcohol syndrome.

Table B-4

Lost Employment and Reduced Productivity in 1980:
Adult FAS Victims, Number of Persons, and Value of Lost Employment
(Number in thousands, $ in millions)

| Mental Impairment | Total Lost Productivity at Prevalence Rate | | | | | |
|---|---|---|---|---|---|---|
| | Conservative 1/1000 | | Mid-Range 1/600 | | High 1/200 | |
| | Persons | Value | Persons | Value | Persons | Value |
| Minimal brain disfunction | 70 | $130.3 | 118 | $217.7 | 352 | $ 651.5 |
| Mild mental retardation | 52 | 240.7 | 87 | 402.2 | 260 | 1,203.5 |
| Moderate mental retardation | 8 | 77.2 | 14 | 129.1 | 42 | 386.3 |
| Severe/profound mental retardation | 3 | 62.3 | 6 | 104.3 | 17 | 312.1 |
| All FAS | 133 | 510.5 | 225 | 853.3 | 671 | 2,553.4 |

Source: Research Triangle Institute.

The model has been constructed in such a way that it can be readily modified to improve the precision of estimates when more and better information on the incidence of FAS in specific birth cohorts, the prevalence of particular birth cohorts within the fetal alcohol syndrome, the treatment regimen appropriate for these defects, and the cost of these treatments is available.

# C. RESEARCH DEVELOPMENTS ON THE RELATIONSHIPS AMONG MENTAL ILLNESS, DRUG ABUSE, AND CRIME

## SECTION C: RESEARCH DEVELOPMENTS ON CRIME AND MENTAL ILLNESS AND DRUG ABUSE

### A. Introduction

This section offers some new research findings about crime and mental illness and drug abuse. The new contributions have led to improved estimates of the economic impact of these disorders on society. The findings were incorporated in the cost estimation of chapter III. This discussion is intended to offer further insights to the rationale behind the cost estimation.

### B. Mental Illness and Crime

The approach to estimating costs of crime associated with mental illness is outlined in two sections below. In section one, the rationale and approach for estimating criminal justice system costs associated with mental illness and public order crime are presented. In section two, the reasons for not attributing costs associated with violent and property crime to mental illness are discussed.

#### 1. Mental Illness and Public Order Offenses

Two recent developments have changed the way we deal with the mentally ill in U.S. society. Deinstitutionalization and stringent civil rights statutes limiting the involuntary commitment of those thought to be mentally ill have meant fewer individuals are hospitalized in mental health facilities (McGarry et al. 1981; Roth, 1980; Shah, 1981). One result of deinstitutionalization and limited civil commitment has been that more individuals who exhibit mental disorder symptoms are dealt with by the criminal justice system.

Eaton (1980) uses the term "bizarre behavior" to refer to human activities that are odd, incongruous, unexpected, or culturally deviant. Bizarre behavior, often taken to be an indication of mental illness, is also likely to attract the attention of the police or private citizens who are concerned, frightened, or disturbed by the behavior and notify the police. Those who act in a disruptive or troublesome manner have always been subject to detainment and arrest. Since deinstitutionalization and tightened requirements for involuntary commitment, more of the mentally ill are in the community and subject to arrest. Adler (1981) discusses this "hospital to jail" phenomenon.

In a study of mentally ill offenders in Lucas County, Ohio, the authors argued that "Potential, past and current mental health patients are often converted to the status of criminal offenders on the basis of minor misconduct" (Ventura and Jacoby, 1983:1). Legislation in Ohio and other states was designed to minimize institutionalization and protect patients' rights had reduced mentally ill inpatient populations. Then, however, voluntary and involuntary commitments often could not be made because the number of treatment slots had been reduced and because the potential patient could not be shown to be a danger to himself or others. Ventura and Jacoby proposed that the police be allowed to hold the apparently mentally ill in the local jail to gain time to find a suitable alternative or until a crisis has passed.

There is considerable variation across the United States in legislation and policies toward institutional treatment and involuntary commitment of the mentally ill. The scenario described above for Lucas County, Ohio may not be exactly replicated in other jurisdictions. It seems clear, however, that, in the face of mental hospital deinstitutionalization and limits on involuntary civil commitment, the mentally ill have often come to the attention of the police in a situation requiring intervention by the criminal justice system.

The manner and conditions under which the deinstitutionalized mentally ill encounter the criminal justice system suggest how the costs might be estimated. The scenarios described above indicate that the mentally ill are most likely to be arrested for offenses of disorderly conduct, vagrancy, and the set of public order offenses recorded in the Uniform Crime Reports as "other offenses." Arrests for those categories totalled 2.575 million in 1980, or 24.7 percent of all arrests. Implications of the citations above are that an appreciable although relatively low proportion of arrests for public order offenses was due to the exhibited behavior of the deinstitutionalized mentally ill persons.

This study makes the conservative assumption that 10 percent of arrests for these public order offenses represents the number of mentally ill who are processed by the criminal justice system.

2. Mental Illness and Violent and Property Offenses

Collins and Schlenger (1983), Hare (1983), and James et al. (1980), using systematic diagnostic methodologies, found high rates of psychiatric disorder among prison inmates. The Collins and Schlenger

findings, for example, showed that 77.5 percent of 1,149 male felons entering North Carolina prisons between March and May, 1983 had, in their lifetimes, received at least one psychiatric disorder diagnosis. This rate was twice as high as that for males in the Baltimore, New Haven, and St. Louis communities. In spite of this evidence that the prevalence of mental disorder is higher among criminal offenders than in the general population, no violent or property crime costs are assigned to mental illness.

There are two reasons for not assigning a crime causation factor to mental illness in spite of evidence that offenders are more likely to be diagnosed as having a psychiatric disorder than the general population. The first reason has to do with double counting. Substantial percentages of the psychiatric disorder diagnoses found among offenders are for alcohol abuse/dependence and drug abuse/dependence. Lifetime prevalence disorder rates for these categories were 49.5 percent and 18.8 percent in the North Carolina inmate sample. Alcohol abusers and drug abusers are not distinct from each other or all the mentally ill. Ascribing a criminogenic effect to mental illness would result in double counting because alcohol and drug abuse categories are confounded with other psychiatric disorder categories. Costs of crime associated with alcohol and drug abuse have already been estimated in conjunction with those problems.

The second reason for not ascribing crime costs to mental illness is the absence of any systematic explanation of how mental illness, other than that connected with alcohol or drug abuse, is responsible for involvement in criminal behavior. Schizophrenia, major depressive episodes, and obsessive compulsive disorders are not viewed as criminogenic. One disorder category that is associated with involvement in crime is antisocial personality. This disorder, however, is very often accompanied by an alcohol and/or drug abuse problem (American Psychiatric Association, 1980; Hare, 1983); therefore, the double counting of criminogenic effects is again an issue for this disorder type.

C. Drug Abuse and Violent Crime

In the 1981 report on the economic costs of ADM (Cruze et al., 1981), robbery was the only violent crime associated with drug abuse. Studies performed prior to 1981 indicating a causal connection between drug abuse and nonacquisitive violent crime were not convincing. It was and is clear that daily users of heroin engage in a great deal of property crime to help

finance expensive drug habits, but it was not clear that drug abuse explained significant numbers of nonacquisitive violent crimes such as homicide and assault.

Recent evidence suggests that significant numbers of homicides and assaults are caused by drug abuse. The drug abuse-violence connection is seen to occur in two ways: (1) between participants in the illegal drug distribution system to control or expand market share or to retaliate for being "ripped off" in a drug transaction, and (2) as a pharmacologic effect of the abuse of certain single nonnarcotic drugs and polydrug use.

Violence in illegal drug distribution appears to be a serious problem in certain cities. Swersey (1981) examined the increase in homicides in Harlem from 1968 to 1973. He found that the increase was largely a function of an increase in deliberate killings--many of them drug-related. McGuire (1983) reports an analysis of the circumstances of 1,656 homicides that occurred in New York City in 1981. Interviews with investigating police officers resulted in 23.7 percent being classified as drug-related homicides. Zahn and Bencivengo (1974) found that, between 1969 and 1972 in Philadelphia, homicide between drug users increased appreciably and in 1972 represented 30.8 percent of all homicides occurring in the city. Wish et al. (1981) analyzed data on arrestees in Washington, DC and found that, contrary to beliefs that drug users tend not to be involved in assaultive crimes, drug positive arrestees were arrested for homicide and assault at about the same rate as nonusers. Monforte and Spitz (1975) found that 43 percent of 753 homicide victims in Detroit in 1973 were narcotics users and that the percentage of homicides connected with narcotics traffic is very high. Ongoing work by McBride (1983) using data for Miami, Florida shows that drug distribution system violence is a very serious problem.

It is clear from the evidence that drug distribution system violence varies across locations and across time periods. Riedel and Zahn (1983) studied homicide in eight American cities for 1978. They found considerable variation in the percentages of homicide victims found to have narcotics in their systems at medical examiner testing. The 1978 results for Philadelphia, one of the eight cities, showed the presence of narcotics in homicide victims was less than it had been in the earlier Zahn and Bencivengo (1974) study. Swersey's (1981) study of Harlem homicide also indicated a decrease in homicides from 1973 to 1974 after several years of

increase. This over-time and over-location variation for drug distribution system violence makes the choice of a single causal estimate difficult.

There is evidence that the pharmacologic action of some drugs or drug combinations, in conjunction with other factors, is related to violent behavior. Although the evidence of an amphetamine relationship to violent behavior is not consistent, Ellinwood (1971) and Asnis and Smith (1978) found a direct relationship between amphetamine use and assaultive behavior. Tinklenberg (1973) found a clear association between barbiturate use and assaultive behavior. Chaiken and Chaiken (1981) also found a barbiturate use-assaultive crime relationship in a sample of prison inmates. Collins (1982) found that in a drug abuse treatment population, those whose primary drug problems were identified as amphetamines or barbiturates were significantly more likely to report assaultive behavior than were those with other types of drug problems.

The 1979 Survey of Inmates of State Correctional Facilities (U.S. DOJ, BJS, 1983c) found that 30 percent of persons incarcerated for violent offenses had been under the influence of some drug at the time of the crime.

The use of multiple psychoactive substances has become very common in recent years (Bray et al., 1982; Fishburne et al., 1980; Johnston et al., 1981). Drug abusers mix different drug types on the same drug use occasions and switch from one drug to another in serial fashion. This polydrug use pattern increases the potential for unpredictable behavior as a result of drug interaction effects. Very little information exists about the behavioral effects of polydrug use, so it is somewhat speculative to attribute violent behavior to the use of multiple drugs. However, in combination with the evidence already cited, the potential for drug interaction effects that produce violent behavior is an additional reason for changing the position in the 1981 report that attributed no drug abuse-violent crime effect.

It is the position of the present report that 10 percent of homicides and serious assaults are caused by drug abuse. The relationship is ascribed to drug distribution system violence and pharmacologic effects of barbiturate, amphetamine, and polydrug use with drug distribution system violence deemed most important. This 10 percent attribution is considered a conservative assumption made in the absence of appropriate data. The studies cited above offer strong evidence about the involvement of drug abuse in violence; however, the extent of the relationship is not well determined.

# D. ADMINISTRATIVE COSTS OF PUBLIC SOCIAL WELFARE PROGRAMS

## SECTION D: ADMINISTRATIVE COSTS OF PUBLIC SOCIAL WELFARE PROGRAMS

Just as various levels of government assist ADM victims in paying for their health care treatment, public social welfare programs are available to supplement the income of ADM victims that are disabled for some period of time. The major programs that provide assistance are listed in table D-1 and include unemployment insurance, disability payments, veterans pensions and compensation, workers compensation, and supplemental security income, among others. These programs accounted for cumulative expenditures of $65 billion in 1980. This is slightly more than half the contribution of governments to payments for personal health care expenditures.

The purpose of these social welfare programs is to assist individuals who suffer from both long- and short-term problems and have low earnings and/or income. In determining whether needy individuals are eligible for particular programs, information is filed on the nature of problems experienced by individuals. This information makes it possible to identify program expenditures that are due to ADM problems of beneficiaries.

Within these social welfare programs, a distinction must be made between two functions. First of all, the programs transfer income to needy individuals to make up for earnings or income that the individuals cannot provide for themselves. This component of program expenditures constitutes a transfer of income from the government (and taxpayers) to program-eligible individuals. This issue is discussed further in section E of this appendix. Secondly, there are real costs (administrative expenses) in effecting the transfer of income.

Total ADM-related administrative costs for these programs was $241 million in 1980 (Social Security Office, personal communication) (table D-1). Of this value, $201 million was associated with mental illness, $2 million with drug abuse, and $38 million with alcohol abuse. This constitutes approximately 6.6 percent of the total cost to administer public social welfare programs to all recipients. Excluding unemployment insurance and workers compensation, total administrative costs were $1.4 billion. Mental illness accounted for almost 15 percent of all affected program administration costs. Alcohol abuse represented about 2.5 percent of these costs. The impact of drug abuse was negligible.

Table D-1
Public Program Social Welfare Administrative Expenditures and Costs Due to ADM Problems, 1980
($ in millions)

| Program | Total Expenditures[a] | Percent Administrative Costs | Total Administrative Costs | Costs Alcohol Abuse | | Costs Drug Abuse | | Costs Mental Illness | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Percent | Amount | Percent | Amount | Percent | Amount |
| OASDHI-disability payments | $15,437 | 2.4 | $ 370 | 3.4 | $12 | c | $b | 8.9 | $ 33 |
| Unemployment insurance | 16,503 | 11.0 | 1,815 | - | - | - | - | - | - |
| Railroad temporary disability insurance | 64 | 7.8 | 5 | 3.4 | b | c | b | 8.9 | b |
| State temporary disability insurance[d] | 1,330 | 3.2[f] | 43 | 3.4 | 1 | c | b | 8.9 | 4 |
| Workers compensation[d] | 9,588 | 4.4[f] | 422 | - | - | - | - | - | - |
| Public assistance[e] | 1,219 | 15.3 | 186 | 4.8 | 9 | 0.5 | 1 | 4.7 | 9 |
| Supplemental Security Income | 7,446 | 8.8 | 655 | 0.8 | 5 | c | b | 18.8 | 123 |
| Food stamps | 644 | 4.4 | 28 | 4.8 | 1 | 0.5 | b | 4.7 | 1 |
| Veteran's pensions and compensation | 11,306 | 0.8 | 90 | 9.7 | 9 | 0.9 | 1 | 23.6 | 21 |
| Vocational rehabilitation[d] | 976 | 4.7[f] | 46 | - | - | - | - | 19.3 | 9 |
| Total | $64,513 | | $3,661 | | $38 | | $2 | | $201 |

[a]Source: Social Security Administration, Office of Retirement and Survivors Insurance, personal communication.

[b]Less than $.5 million.

[c]Less than .0005.

[d]Excludes hospital and medical benefits.

[e]Excludes vendor medical payments and social services.

[f]Percent does not exclude hospital and medical program administrative costs.

(-) No causal relationship is assumed, or no beneficiaries reported ADM as primary cause of eligibility.

Totals may not add due to rounding.

Source: Research Yriangle Institute.

# E. OTHER IMPACTS OF ADM ON THE ECONOMY

## SECTION E. OTHER IMPACTS OF ADM ON THE ECONOMY

### A. Introduction

Consumers spend billions of dollars on alcoholic beverages and illicit drugs; a substantial proportion of property crime is committed by drug addicts; and ADM victims receive benefits from social welfare programs such as health treatment through Medicare. These expenditures might be considered to have impacts on the economy though they are intrinsically different from the costs measured in this report because they are indirect or are transferred resources rather than lost resources. The discussion in the following sections is presented to allow the public and policymakers to more completely assess the role of ADM in the economy although the costs discussed are not included in the framework established in this report to calculate the social cost of ADM.

### B. Expenditures on Alcoholic Beverages and Illicit Drugs

Total legal alcoholic beverage production and sales in 1979 were $45.0 billion (U.S. DOC, Bureau of the Census, 1982); approximately 50 percent of the consumption was beer, 39 percent was distilled spirits, and 11 percent was wine (DeLuca, 1981). Illegitimate production of alcohol is believed to be negligible, but illicit consumption of alcohol merits attention. It is illegal for those underage to consume alcoholic beverages, and it is illegal to sell them alcoholic beverages. Among high school students in 1978, 31.2 percent were misusers of alcohol, 51.7 percent drank but did not misuse, and 17.2 percent abstained. Male misusers reported consumption of 3.56 gallons of ethanol annually (1.25 ounces of ethanol, or approximately 2.5 "drinks" per day); female misusers reported consumption of 2.59 gallons annually. Male and female drinkers who did not misuse consumed .74 and .48 gallons annually, respectively (Rachal, Maisto, Guess, and Hubbard, 1982). The U.S. Department of Commerce (1982) reports 13 million 15- to 17-year olds in 1978. These figures indicate total annual consumption of 16.5 million gallons (about 2 billion ounces) of ethanol.

Total U.S. sales in 1978 was 2.73 gallons of ethanol for each of the 174 million persons aged 14 or over. When comparing the self-reported consumption of 10th to 12th grade students (excluding 18-year olds) with reported sales of ethanol in the U.S. (DeLuca, 1981), it appears that youth aged 14 to 17 years consumed 3.5 percent of all ethanol in the United States in 1978.

The value of purchases by underage youth is likely to be a smaller proportion of total expenditures than their share of volume of consumption. The contexts for drinking most often mentioned by youth were teenage parties, "hangouts," at home on special occasions, school activities, and in cars at night - all with peers only except at home. These contexts would involve lower prices than locations more typical of adult consumption such as restaurants and cocktail lounges. Furthermore, youth consume a larger proportion of beer, which is a relatively inexpensive source of ethanol.

Surveys of adult populations (age 18 and above) indicate very different drinking patterns than those of teenagers. Between 1971 and 1976 the average reported consumption (using quantity and frequency measures similar to those used to study youth) of all adults ranged from .40 to .50 ounces of alcohol per day (Noble, 1978). At 128 ounces per gallon, this represents approximately 1.3 gallons per year. The reported consumption accounted for only half of what is manufactured and sold. The same results are found for the reported consumption of adults and youth (age 15 to 17).

Lower reports of consumption than sales have been replicated in all of the national surveys, with the under-report ranging from 40 to 60 percent. Because youth aged 15 to 17 reported consuming 3.5 percent of all alcohol sold, this value was adjusted to nearly 7 percent of all alcohol sold.

Estimates of illicit drug use have been made by two government agencies: an interagency task force entitled the National Narcotics Intelligence Consumers Committee (NNICC); and the Internal Revenue Service. Both estimates used similar estimation methodologies and the same data sources.

NNICC estimated that the retail value of illicit drug consumption in 1979 ranged from $56 to $74 billion (see table E-1). Consumer expenditures for cocaine were $21.7 billion; for marijuana, $18.7 billion; for heroin, $8.5 billion; for other drugs, $16 billion. Volume of consumption was also estimated. The NNICC values represented the value of drugs consumed at "street" prices by retail customers and at "wholesale" prices by the dealers themselves.

The Internal Revenue Service estimated the value of marijuana, cocaine, and heroin only. These values were $8.6 billion, $5.7 billion, and $7.2 billion, respectively (see table E-1). Again, this represents the value of drugs consumed at "street" prices and value of drugs consumed by dealers. These values are somewhat lower than the corresponding NNICC estimates for

Table E-1

Consumption of Illicit Drugs in 1979 as Estimated by NNICC and the IRS

| Type of Drug | NNICC | | IRS | |
|---|---|---|---|---|
| | Quantity (metric tons) | Retail Value ($ in millions) | Quantity (metric tons) | Retail Value ($ in millions) |
| Heroin | 3.4-4.0 | $7,790-9,160 | 1.9-4.5 | $1,160-13,260 |
| Cocaine | 25-31 | 19,500-24,180 | 5.2-12.8 | 3,280-8,080 |
| Marijuana | 10,000-13,600 | 15,480-21,930 | 6,647 | 4,490-12,650 |
| Hashish | 200 | 1,480 | N.E. | N.E. |
| Dangerous Drugs | - | 12,000-17,000 | N.E. | N.E. |
| Total | | $56,250-73,750 | | $8,930-33,990 |

N.E.: Not Estimated.

Sources: NNICC (National Narcotics Intelligence Consumers Committee) and Internal Revenue Service, Department of the Treasury, 1983.

marijuana (by 54 percent), cocaine (by 74 percent) and heroin (by 15 percent). Differences between NNICC and the IRS are due primarily to differences in estimating the consumption of marijuana (the IRS is lower by 44 percent), cocaine (by 68 percent), and heroin (by 14 percent). The balance of the differences in total values is due to differences in the calculation of price.

While the differences between the illicit drug consumption estimates of the NNICC and IRS are appreciable, both estimates are enormous. Both indicate the order of magnitude of the true values and establish a framework for improved estimates in the future.

C. Property Crime Transfers Associated with Drug Addiction

Property crime is one of the leading problems attributable to drug abuse and is of concern to society, the criminal justice system, the drug abuse treatment system, and policy makers. This report has estimated that nearly 35 percent of the costs to society of drug abuse are crime related. The value of property stolen due to drug addiction is relevant to understanding the impact on the economy of drug abuse; but because this value is a transfer payment, it is not directly estimated in this report.

Criminal career costs have been included as a cost to society. This component reflects the value of time diverted from legitimate (market and household) activities and used to pursue income through criminal activities including property crime, drug trafficking, and victimless crimes such as gambling and prostitution. Estimates in chapter III indicate that nearly 1.1 million addicts participated in a criminal career with a corresponding loss to society of $8.7 billion of productive effort.

Evidence on property crime and drug abuse has been collected from several sources. The National Crime Survey included a household component that gathered information on personal victimization by violent and property crimes and established an overall estimate of the value of property stolen in 1980. The survey asked detailed questions on the type of victimization, the time and place of occurrence, the injury suffered, loss of valuables, damage to property, and whether the offense(s) was reported to the police. A series of reports has assessed the extent of personal victimization in the United States on the basis of these data.

The nationally representative survey provides comprehensive estimates of the number and value of crimes for the type of offenses often associated

with drug abusers and addicts. Data on robbery, personal larceny, burglary, household larceny, and motor vehicle theft are also available.

There were 32.8 million victimizations in 1980 (see table E-2). The most frequent type of crime was personal larceny, with 14 million occurrences, one per every 16 persons in the U.S. The average value of property and cash stolen was $116 with a total value of $1.6 billion. Burglary resulted in the largest total transfer of $3.2 billion from 6.5 million victimizations. The 1.3 million motor vehicle thefts in 1980 had the largest average loss at $938 per incident. The total value of theft from all types of personal offenses was $7.3 billion. These BJS estimates represent the most comprehensive data to date on the extent and value of personal crime.

The 1981 RTI study reviewed evidence on the drug abuse-property crime link and concluded that one of five property crimes was attributable to drug addiction. Studies of arrestees, prison populations, drug abusers, and treatment populations were reviewed. Attributions to drug abuse were made for 26.8 percent of robberies, 22.4 percent of burglaries and 18.6 percent of larcenies and motor vehicle thefts (see table E-2). Application of these rates to the nationwide value of personal property crime in 1980 yields an estimate of $1.5 billion attributable to drug addiction. This estimate is partial. It does not measure the dollars lost by crime victims to drug abusers, does not include offenses like forgery, fraud and other types of crime, and does not represent income from the illegal drug distribution system or from victimless crimes such as prostitution. These estimates are relatively consistent with other recent research findings on the economic behavior of heroin addicts.

Johnson and Goldstein (1984) estimated that daily heroin users spend $13,189 on the drug per year, with those using heroin three to five days a week spending $6,431 per year on the drug. With an estimate of $10,000 a year as the average annual cost of heroin for addicts, 500,000 addicts spend $5 billion a year for the drug.

Recent findings from the Treatment Outcome Prospective Study (TOPS) indicate that daily heroin users have $8,426 more in illegal income per year than nonusers or nondaily users of heroin (Collins, Hubbard, and Rachal, 1984). Based on an assumption that two-thirds of heroin users are daily users (500,000 X .667 = 333,500), this group has a total of $2.8 bil-

Table E-2

Value of Property Transferred by Personal Crime in 1980;
Total and Proportion Attributable to Drug Abuse

| Type | Number of Crimes (thousand) | Average Value | Total Value ($ in millions) | Attributed to Drug Abuse | |
|---|---|---|---|---|---|
| | | | | Percent | Value ($ in millions) |
| Robbery | 1,138 | $ 138 | $ 157 | 26.8 | $ 42 |
| Personal Larceny | 14,023 | 116 | 1,621 | 18.6 | 302 |
| Burglary | 6,522 | 490 | 3,193 | 22.4 | 715 |
| Household Larceny | 9,787 | 116 | 1,138 | 18.6 | 212 |
| Motor Vehicle Theft | 1,290 | 938 | 1,210 | 18.6 | 225 |
| Total | 32,760 | N.A. | $7,319 | N.A. | $1,496 |

Source: U.S. DOJ, BJS, unpublished data, and U.S. DOJ, BJS, NCJISS, 1983 and causal factors from Cruze et al., 1981.

lion in illegal income. For many heroin addicts, this illegal income comes primarily from victimless crime and does not involve the direct victimization of others.

In comparison to extrapolations from Johnson and Goldstein (1984) and Collins et al. (1984), the $1.5 billion loss suffered by victims shown in table E-2 seems small. It should be remembered, however, that the $1.5 billion estimate is for a limited number of offenses and does not include illegal income earned from drug distribution, often a major income source for drug addicts.

D. Public Transfer Payments to ADM Victims

Another impact of ADM on the economy is the social welfare program transfer payments received by ADM victims. Victims are eligible to receive benefits under some social welfare programs. These values are not costs to society using the conceptual framework developed by the Public Health Service (Hodgson and Meiners, 1979). Clients usually qualify for transfer payments because of a consequence of ADM which is considered and totalled as a cost in this report. Adding the value of transfer payments to the cost estimates would result in "double counting" of the problem.

For example, OASDHI-disability payments are made to compensate persons who are unable to work for their loss in earnings. The "lost employment" estimates included in the PHS framework represents the value of productivity that is lost because persons cannot function in the workplace and at home. The value of these transfers can be estimated using information on administrative expenses in public social welfare programs (see section D of this appendix).

Social welfare program transfers excluding unemployment insurance and workers compensation totaled $37 billion in 1980. ADM disorders accounted for $7.5 billion, or 20 percent (table E-3). Mental illness represented $5.6 billion in transfers, just over 15 percent; alcohol represented 5 percent; the impact of drug abuse was negligible.

The administrative costs and the value of transfers from these programs were distributed among alcohol abuse, drug abuse, and mental illness based on varying factors. For programs involving disability payments, the distributional factors were equal to the proportion of patient days attributable to the disorder spent in general hospitals and VA hospitals. More specific data were available for programs related to vocational rehabilitation (U.S.

Table E-3

Public Program Social Welfare Transfer Payment Expenditures and Costs Due to ADM Problems, 1980
($ in millions)

| Program | Total Expenditures[a] | Percent Transfer Costs | Total Transfer Costs | Costs Alcohol Abuse | | Costs Drug Abuse | | Costs Mental Illness | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Percent | Amount | Percent | Amount | Percent | Amount |
| OASDHI-disability payments | $15,437 | 97.6 | $15,067 | 3.4 | $ 507 | c | $ 2 | 8.9 | $1,341 |
| Unemployment insurance | 16,503 | 89.0 | 14,688 | - | - | - | - | - | - |
| Railroad temporary disability insurance | 64 | 92.2 | 59 | 3.4 | 2 | c | b | 8.9 | 5 |
| State temporary disability insurance[d] | 1,330 | 96.8[f] | 1,287 | 3.4 | 43 | c | b | 8.9 | 115 |
| Workers compensation[d] | 9,588 | 95.6[f] | 9,167 | - | - | - | - | - | - |
| Public assistance[e] | 1,219 | 84.7 | 1,032 | 4.8 | 49 | 0.5 | 5 | 4.7 | 49 |
| Supplemental security income | 7,446 | 91.2 | 6,791 | 0.8 | 53 | c | 2 | 18.8 | 1,279 |
| Food stamps | 644 | 95.6 | 616 | 4.8 | 29 | 0.5 | 3 | 4.7 | 29 |
| Veteran's pensions and compensation | 11,306 | 99.2[f] | 11,216 | 9.7 | 1,088 | 0.9 | 102 | 23.6 | 2,651 |
| Vocational rehabilitation[d] | 976 | 95.3 | 930 | - | - | - | - | 19.3 | 179 |
| Total | $64,513 | | $60,851 | | $1,771 | | $115 | | $5,648 |

[a]Source: Social Security Administration, Office of Retirement and Survivors Insurance, personal communication.

[b]Less than $.5 million.

[c]Less than .0005.

[d]Excludes hospital and medical benefits.

[e]Excludes vendor medical payments and social services.

[f]Percent does not exclude hospital and medical program transfer costs.

(-) No causal relationship is assumed, or no beneficiaries reported ADM as primary cause of eligibility.

Totals may not add due to rounding.

Source: Research Triangle Institute.

DOC, BOC, 1982) and social security income (U.S. DHHS, SSA, personal communication). These proportions are based on information collected on persons likely to receive assistance from these programs.

E. Sources of Payments for Health Care Expenditures

In the main body of the report, values were assigned to the health treatment services received by ADM victims, regardless of the source of payment. The data on source of payment describe how the cost burden is borne.

How much the government pays for the treatment of ADM victims is a relevant topic for policymaking. The size of the ADM treatment bill will be pertinent to the Federal government and private third-party insurers in deciding whether or not to provide coverage for these disorders.

This question has been addressed in the same fashion as in the 1981 study. The first step was to obtain financial data on health settings specializing in ADM treatment. The NDATUS survey obtains financial information from specialty units which treat alcohol and drug abusers.

The data for alcohol and drug abuse treatment specialty units are presented in table E-4. For units primarily providing alcohol abuse services, the largest single source of payments was private health insurance, at 26 percent of $1.1 billion in 1980. State, Federal, and local governments paid an additional 45 percent, with state government paying 21 percent. Client fees were the next largest source, at approximately 10 percent or $110 million.

Settings offering primarily drug abuse treatment are somewhat different (table E-4). Of funds totaling $534 million in 1980, 7 percent were client fees, 8 percent came from private health insurance, and the remaining 81 percent was from a variety of government sources.

Community mental health centers primarily serve individuals with other mental disorders, although some alcohol and drug abusers are clients. The National Institute of Mental Health has collected information on funding for CMHCs. Their findings are presented in table E-5. Government funds, including grants for various purposes, provided 64 percent of the CMHC resources. Twenty-one percent were Federally funded with 34 percent from the state, and 9 percent from other governmental units. Direct services provided by CMHCs generated 32 percent of revenues (3.7 from patient fees and 7.3 percent from private insurance). The remaining 21 percent was from sources such as Medicare, Medicaid, schools, and other grants.

Table E-4

Funding for All Alcoholism and Drug Abuse Treatment Units
by Source of Funds in 1980
($ in thousands)

| Funding Source | Alcohol Abuse | | Drug Abuse | |
|---|---|---|---|---|
| | Amount | Percent | Amount | Percent |
| ADAMHA block grant | $ 50,910 | 4.5 | $ 67,804 | 12.7 |
| Other ADAMHA program support | 12,133 | 1.1 | 11,572 | 2.2 |
| Other Federal funds | 112,456 | 10.0 | 46,070 | 8.6 |
| State government | 235,751 | 21.1 | 165,412 | 31.0 |
| Local government | 108,254 | 9.6 | 41,423 | 7.8 |
| State/local government | 45,413 | 4.0 | 16,612 | 3.1 |
| Social services block grant | 13,959 | 1.2 | 5,174 | 1.0 |
| Public welfare | 18,257 | 1.6 | 17,226 | 3.2 |
| Public health insurance | 77,922 | 6.9 | 62,229 | 11.7 |
| Private health insurance | 296,419 | 26.4 | 43,513 | 8.2 |
| Private donations | 28,754 | 2.6 | 17,358 | 3.3 |
| Client fees | 110,272 | 9.8 | 35,588 | 6.7 |
| Other | 12,677 | 1.1 | 3,651 | 0.7 |
| Total | $1,123,175 | 100.0 | $533,631 | 100.0 |

Totals may not add due to rounding.

Source: U.S. DHHS, NIAAA (1983); U.S. DHHS, NIDA (1983).

Table E-5

Source of Operating Funds
Federally Funded Community Health Centers
in 1980

| Source of Funds | Percent |
|---|---|
| Government funds | 64.2 |
| Federal funds | 21.2 |
| Staffing grants | 15.2 |
| Construction grants | 0.8 |
| Children's grants | 1.4 |
| Research and training | 0.4 |
| Other Federal funds | 3.5 |
| State funds | 33.9 |
| Local government funds | 8.8 |
| Other government funds | 0.2 |
| Receipts from direct services | 31.8 |
| Patient fees | 3.7 |
| Insurance (priv. & voluntary) | 7.3 |
| Medicare | 2.9 |
| Medicaid | 10.9 |
| Schools | 1.0 |
| Title XX | 3.7 |
| Other receipts from services | 2.2 |
| Receipts from indirect services | 0.6 |
| Schools | 0.2 |
| Other receipts | 0.4 |
| Philanthropy | 0.5 |
| Other fund raising | 0.8 |
| Other receipts | 2.2 |
| Total | 100.0 |

Totals may not add due to rounding.

Source: U.S. DHHS, NIMH (1981).

The types of health treatment settings discussed above represent a small proportion of all treatment services used by ADM victims. Data on the other settings, including general hospitals, physicians' offices, nursing homes, and other health providers and sundries, are maintained for all illnesses on an annual basis. This study has distributed the aggregate expenditures of alcohol abuse, drug abuse, and mental illness for each setting estimated above by the percentage distribution of national funding sources. The costs for alcohol abuse exclude fetal alcohol syndrome because costs were not estimated by setting for this disorder. Tables E-6 through E-8 report the expenditure for each setting and its distribution across out-of-pocket and various third party funds including Federal, state and local, and private. These funds are reported according to the distribution of illnesses being treated in that setting.

For alcohol abuse, of the $8 billion spent in settings for which we have data, the two largest payment sources are Federal funds and private third party funds, each contributing approximately 31 percent. This is followed by individuals, and State and local third party funds which together provide approximately 12.5 percent of all resources.

Drug abuse treatment expenditure patterns are similar. Twenty percent of all payments are from out-of-pocket sources and more than 20 percent from state and local governments. Federal funds and private third party funds each contribute slightly more than 30 percent of the total budget. For mental health treatment, the largest payment source was from Federal funds, with approximately 33 percent. Out-of-pocket sources and private third party funds covered approximately 25 percent each, while state and local governments paid under 20 percent of all costs.

It has also been possible to obtain more specific information on payments from Medicare for ADM disorders. These data overlap with values discussed immediately above and represent the proportion of federal payments for Medicare services in general hospitals.

Unpublished 1980 data on inpatient hospital discharges by Medicare eligible individuals indicate that ADM disorders accounted for 3.8 percent of all discharges (table E-9). Of 10.3 million total Medicare discharges, 129,000 or 1.3 percent were related to alcohol abuse as defined by diagnostic codes. Thirty-seven thousand discharges (0.4 percent) were associated with drug abuse, and 214,000 discharges (2.1 percent) were associated with other

Table E-6

Estimates of Funds for Alcohol Abuse by Setting and Source, 1980
($ in millions)

| Setting | Expenditures for Alcohol Abuse Treatment | Out of Pocket | Third Party Funds | | |
|---|---|---|---|---|---|
| | | | Federal | State & Local | Private |
| ADM specialty hospitals[a] | - | - | - | - | - |
| General hospitals | $4,800 | $ 437 | $1,982 | $ 624 | 1,747 |
| Other specialty facilities | | | | | |
| CMHCs | 181 | 7 | 38 | 81 | 55 |
| Alcohol abuse facilities | 385 | 38 | 60 | 118 | 169 |
| Other facilities[a] | - | - | - | - | - |
| Other general services | | | | | |
| Nursing homes | 167 | 70 | 52 | 43 | 2 |
| Physician services | 726 | 271 | 147 | 45 | 264 |
| Dentist services | 621 | 271 | 13 | 10 | 130 |
| Other health professionals | 171 | 101 | 33 | 13 | 24 |
| Drug and drug sundries | 750 | 620 | 31 | 30 | 69 |
| Other health services | 359 | - | 185 | 80 | 94 |
| Volunteer services | - | - | - | - | |
| Total | $8,160 | $2,012 | $2,541 | $1,044 | $2,554 |

Totals may not add due to rounding.

[a]Data not available. Expenditures in ADM specialty hospitals and other facilities were over $6 billion.

Source: U.S. DHHS, NIAAA (1983); U.S. DHHS, NIMH (1981); Gibson and Waldo (1981).

Table E-7

Estimates of Funds for Drug Abuse by Setting and Source, 1980
($ in millions)

| Setting | Expenditures for Drug Abuse Treatment | Out of Pocket | Third Party Funds | | |
|---|---|---|---|---|---|
| | | | Federal | State & Local | Private |
| ADM specialty hospitals[a] | - | - | - | - | - |
| General hospitals | $ 527 | $248 | $218 | $ 69 | 192 |
| Other specialty facilities | | | | | |
| CMHCs | 50 | 2 | 11 | 22 | 15 |
| Drug abuse facilities | 295 | 20 | 69 | 114 | 92 |
| Other facilities[a] | - | - | - | - | - |
| Other general services | | | | | |
| Physician services | 28 | 10 | 6 | 2 | 11 |
| Dentist services | 59 | 45 | 1 | 1 | 12 |
| Other health professionals | 16 | 10 | 3 | 1 | 2 |
| Drug and drug sundries | 71 | 58 | 3 | 3 | 7 |
| Other health services | 34 | - | 17 | 8 | 9 |
| Volunteer services | - | - | - | - | |
| Total | $1,080 | $193 | $328 | $220 | $338 |

Totals may not add due to rounding.

[a]Data not available. Expenditures in ADM specialty hospitals and other facilities were over $6 billion.

Source: U.S. DHHS, NIDA (1983); U.S. DHHS, NIMH (1981); Gibson and Waldo (1981).

Table E-8

Estimates of Funds for Mental Illness by Setting and Source, 1980
($ in millions)

| Setting | Expenditures for Mental Illness Treatment | Out of Pocket | Third Party Funds | | |
|---|---|---|---|---|---|
| | | | Federal | State & Local | Private |
| ADM specialty hospitals[a] | - | - | - | - | - |
| General hospitals | $5,088 | $ 463 | $2,101 | $ 661 | 1,862 |
| Other specialty facilities | | | | | |
| CMHCs | 997 | 37 | 211 | 446 | 303 |
| Other facilities[a] | - | - | - | - | - |
| Other general services | | | | | |
| Nursing homes | 2,783 | 1,166 | 863 | 718 | 46 |
| Physician services | 870 | 315 | 176 | 54 | 326 |
| Other health professionals | 184 | 109 | 36 | 14 | 26 |
| Drug and drug sundries | 810 | 670 | 33 | 32 | 74 |
| Other health services | 388 | - | 199 | 87 | 102 |
| Volunteer services | - | - | - | - | - |
| Total | $11,120 | $2,760 | $3,619 | $2,012 | $2,729 |

Totals may not add due to rounding.

[a]Data not available. Expenditures in ADM specialty hospitals and other facilities were over $6 billion.

Source: U.S. DHHS, NIMH (1981); Gibson and Waldo (1981).

mental disorders. Applying these proportions to the $26.3 billion distributed by Medicare to pay for inpatient hospital stays, $332 million were attributable to alcohol abuse, $95 million due to drug abuse, and $552 million due to mental illness.

These estimates suggest that Medicare payments for alcohol abuse accounted for $342 million out of the federal government total of $1,982 million (17 percent). For drug abuse, the Medicare value of $95 million was 44 percent of federal payments for hospital services. Medicare paid $989 million, or 47 percent of the federal share for mental illness of $2.1 billion.

Table E-9

ADM Related Hospital Loss Reimbursed by Medicare, 1980
(Number in thousands, $ in millions)[a]

| | Discharges | | |
|---|---|---|---|
| | Number | Percent | Payments |
| Alcohol Abuse | 129 | 1.3 | $ 342 |
| Drug Abuse | 37 | .4 | 105 |
| Mental Illness | 214 | 2.1 | 552 |
| Total ADM | 381 | 3.8 | 999 |
| All Illnesses | 10,334 | 100.0 | $26,300 |

[a]Costs included are based on hospital discharges.

Source: U.S. DHHS, HCFA, personal communication.

# F. ALCOHOL ABUSE RELATED GASTROINTESTINAL TRACT CANCERS

better understood to disentangle the combined effects of both of these substances.

Malnutrition and anemia have also been associated with increased risk of oral, hypopharyngeal, and esophageal cancers. Nutritional defects, especially of vitamin-B complex and iron, have been associated with heavy alcohol intake (Wynder and Shigomatsu, 1967). Studies have reported that alcohol impairs the absorption of thiamine in the intestines, and that several intestinal enzymes that aid in the movement of nutritional factors into the blood streams are affected by alcohol (Mezey et al., 1970; Mott et al., 1972; Roggen et al., 1972).

In studies of alcohol related cancer risks, authors have emphasized the need to clearly distinguish among the specific forms, amounts, and duration of drinking involved. Increasing knowledge about how cancer is caused and how it is related to alcohol abuse has not yet produced a consensus on which cancers are caused by alcohol and what proportion of new cancers and of mortalities are related to alcohol abuse.

C. Potential Costs

Nonetheless, it is possible to examine the potential implications for the economic cost of alcohol abuse if alternative causal factors between alcohol and GI tract neoplasms are hypothesized.

A list of GI tract neoplasms that have been related to alcohol abuse is presented in table F-1. The number of mortalities by type of cancer, and the estimated total cost in 1980 for each type of cancer are also presented. These neoplasms caused more than 60,000 premature deaths in that year. Table F-2 presents estimates of the direct treatment costs in specific settings for 1980-1982 for the alcohol abuse-associated cancers of the GI tract. Another major cost which is associated with mortality is lost productivity.

The analyses indicate that if 100 percent of the specified cancers could be attributed to alcohol abuse, then the economic cost to society for alcohol abuse would be close to $900 million for direct treatment costs in 1980 and $4.9 billion for lost lifetime productivity. Should the estimates of the cost of treatment and mortality due to alcohol abuse-related gastrointestinal tract cancers be added to the already-calculated estimates of alcohol-related costs, the new total would be noticeably, but not overwhelmingly, larger.

## SECTION F: ALCOHOL ABUSE RELATED GASTROINTESTINAL TRACT CANCERS

### A. Introduction

Controversy exists on whether alcohol abuse is causally related to cancers of the gastrointestinal tract. While there is strong evidence that malignancies of the liver can be caused by alcohol abuse, research findings on other neoplasms are mixed. Costs of liver malignancies are represented in the main body of the report. In lieu of more definitive findings about alcohol abuse and other cancers, these costs were not included. This section outlines the potential magnitude of costs of other cancers of the gastrointestinal tract.

### B. Evidence on the Link

Several studies have been performed in the last 20 years which indicate that alcohol abuse is related to cancer of the gastrointestinal tract. These studies have found a significant increase in risk associated with high levels of alcohol abuse, leading to malignancies of the GI tract. In Alcohol and Health III (Noble, 1978), it was estimated that over 50 percent of primary malignant liver cancers were due to alcohol abuse. However, studies have indicated both higher and lower levels of association. A wide variation has been found in the association of other GI tract cancers to alcohol abuse.

A factor significantly aggravating the relationship of alcohol abuse to cancer is consumption of tobacco. Epidemiological studies indicate that consumption of alcohol and tobacco increases the risk of contracting cancer over that of consumption of only one or the other product.

After studying the smoking and drinking habits of 483 people with cancer of the mouth and pharynx and 447 controls, Rothman and Keller (1972) reported that risks accelerated with increased exposure to each factor. They calculated that 76 percent of the disease in males might be eliminated if exposure to both alcohol and tobacco were avoided. Another study reported that women who drink and smoke heavily may develop cancers of the buccal cavity and tongue 15 years earlier than women who abstain from both (JAMA, 1976).

The means by which alcohol acts on body tissues is still unclear. There are theories that specific ingredients in different types of alcohol are carcinogens. Similarly, the effect of tobacco on body tissues must be

Table F-1

Numbers and Economic Cost of Premature Mortality Due to Malignant Neoplasms Related to Alcohol Abuse, 1980
($ in millions)

| Type | Mortalities | | | |
|---|---|---|---|---|
| | Number | Discounted Value (100 percent) | (10 percent) | (56 percent) |
| Tongue, malignant | 1,874 | $ 145 | $ 15 | $ 81 |
| Mouth, floor malignant | 509 | 39 | 4 | 22 |
| Mouth, other, malignant | 1,399 | 108 | 11 | 61 |
| Pharynx, malignant, oro | 1,127 | 87 | 9 | 49 |
| Pharynx, malignant, naso | 585 | 45 | 5 | 25 |
| Pharynx, malignant, hypo | 634 | 49 | 5 | 28 |
| Pharynx, malignant, unspecified | 1,501 | 116 | 12 | 65 |
| Esophagus, malignant | 7,985 | 619 | 61 | 347 |
| Stomach, malignant | 14,372 | 1,115 | 111 | 624 |
| Rectum, malignant | 7,435 | 577 | 58 | 323 |
| Liver, malignant, primary | 2,395 | 186 | 19 | 104 |
| Liver, bile duct type[b] | 455 | 35 | 4 | 20 |
| Pancreas, malignant | 19,640 | 1,523 | 152 | 853 |
| Larynx, malignant | 3,412 | 264 | 26 | 148 |
| Total | 63,323 | 4,911 | 491 | 2,750 |

Source: Unpublished mortality statistics from the Vital Statistics files provided by NCHS, present discounted values provided by NCHS.

Table F-2

Direct Treatment Costs for Alcohol-Abuse Related Neoplasms
($ in millions)

| General Health Facilities | Year 1980 | 1981 | 1982 |
|---|---|---|---|
| Hospital-based | | | |
| Non-Federal community hospitals (excluding psychiatric units) | $548 | $588 | $671 |
| VA general hospitals and other facilities | 24 | 24 | 26 |
| Other Federal facilities | 19 | 19 | 21 |
| Other general health facilities and services | | | |
| Nursing homes | 92 | 98 | 109 |
| Private practice physicians | 29 | 35 | 32 |
| Other health professionals | 19 | 21 | 23 |
| Drugs and drug sundries | 85 | 87 | 89 |
| Other health services | 44 | 46 | 51 |
| Volunteer services | 15 | 16 | 17 |
| Total | $874 | $934 | $1,039 |

Totals may not add due to rounding.

Source: Research Triangle Institute.

The $874 million of treatment costs for the selected GI cancers in 1980 is somewhat more than 10 percent of total health treatment costs due to other alcohol abuse related illnesses. These cancers represent a more significant although, again, not overwhelming impact on total mortality costs. The additional 63,000 mortalities attributable to alcohol abuse would almost double the number of deaths attributable to alcohol abuse. At 100 percent discount, however, there would be a $4.9 billion increase in mortality costs, already estimated at $13.9 billion. This would be a 35 percent increase in the mortality costs at the 6 percent discount rate.

The combined increase in treatment cost and mortality cost with a 100 percent attribution would be $5.8 billion. This is 6.7 percent of the total value already attributed to alcohol abuse.

At the other extreme, should only 10 percent of these GI neoplasms be attributable to alcohol abuse, then treatment cost would have been $87 million higher in 1980, and mortality cost would have been $491 million higher. The combined increase would be .7 percent of the cost estimated in this study.

Another interesting comparison is made by taking the 56 percent causal factor currently assigned to malignant primary liver neoplasms. Should the 56 percent rate be appropriate for other GI tract neoplasms, then health treatment costs would be $490 million higher, and mortality costs would be $2.8 billion higher. The total increase would be just under 4 percent of the current estimate for alcohol abuse.

# G. PROTOCOL FOR UPDATING COST ESTIMATES

## SECTION G. PROTOCOL FOR UPDATING COST ESTIMATES

### A. Introduction

Having current data about the economic costs of ADM is essential. Because the function of these values indicates the relative impact of the disorders on economic well-being, it is necessary to have relatively current estimates. Only by maintaining current estimates will it be possible to compare the costs of alcohol and drug abuse, and mental illness to updated estimates of the costs of major disease categories produced by NCHS, and new estimates produced for narrowly defined disorders, such as particular infectious diseases.

The cost estimates presented in this volume have been constructed using a methodology that makes it possible to compare the ADM cost estimates with those for other disorders. The concepts and methodology are consistent with those recommended by the Public Health Service (Hodgson and Meiners, 1979) and with the tradition of previous cost of illness studies.

The best way to maintain current estimates of the economic burden of alcohol abuse, drug abuse, and mental illness is to completely reestimate the costs for each year, utilizing the same methodology from year to year, and inserting the most current values from appropriate statistical series. Completely reestimating costs has essentially been the task of the present effort. This is both time consuming and relatively expensive if the sole function is to provide more recent estimates than the last comprehensive study.

A less expensive and less time intensive technique for maintaining current cost estimates is to make year-to-year adjustments in the values based on a small number of factors that have known relationships to the cost estimates. This is both possible and reasonable where there are a relatively small number of factors that could affect the cost estimates significantly. A specific cost estimate will have some imprecision because adjustments will be made for only some of the most important change factors.

In this section, some of the factors that contribute to changes in estimates of the economic costs of ADM are identified, and then a small number of adjustment factors are selected and their application for use in maintaining current cost estimates is specified.

Finally, the economic costs to society of ADM in 1981, 1982, and 1983 are estimated using the protocol developed in this study.

B. Sources of Changes in the ADM Cost Estimates Over Time

The 1981 RTI study developed formulas for estimating the costs of ADM. The elements of those formulas delineate the variety of factors that are significant in making cost estimates. A short list of these includes:

- o inflation in wages and prices;
- o growth in the population at risk;
- o sociodemographic distribution;
- o change in the prevalence or incidence rate;
- o causal factors; and
- o social responses to ADM.

Changes in any and all of these elements are incorporated when completely new cost estimates are made.

Inflation is the most obvious and inevitable source of change in economic cost estimates. Market prices in our society continually change, sometimes rapidly (at over 10 percent per year) and sometimes more slowly (potentially down to no change, or even a negative change). Moreover, wages and different prices may change at different rates in the same period of time. Health prices increased more rapidly than prices of other consumer goods during the last 20 years. Wages and salaries have grown at a rate faster than consumer prices because productivity of the workforce has improved. Although a single inflation rate may be calculated for the gross national product, different sections of the economy have different rates of inflation. Any methodology proposed to adjust for inflation should allow for differences in rates.

As the total population grows, the number of people potentially affected by ADM also increases. However, some sections of the population may be at higher risk than others. The growth in the total population may not reflect change in the numbers in those subpopulations at risk. For instance, total population grew 3.2 percent between 1977 and 1980, while the labor force increased by nearly 8 percent. Thus, the potential for losses from reduced productivity grew by more during that period than did total population. Conversely, a population at very high risk of motor vehicle crashes--18 to 20 year olds--grew by only 3.7 percent over the 3-year period.

The sociodemographic characteristics of the population at risk can be another source of variation in cost, although such distributions may not change substantially over short periods of time. For instance, in calculating indirect losses, there are substantial differences between productivity values for older and younger workers, and males and females. Should the age/sex distribution of ADM change, while the total population prevalence rate remains the same, the cost to society would change.

Potentially, the true incidence and/or prevalence rates for ADM disorders could change from one year to the next. Completely apart from population growth, the proportion of the population at risk that experiences problems due to ADM may increase or decrease. The costs would change accordingly, even if there were no change in the population at risk, because a different share is affected.

A further complicating factor is that the causal relationship between ADM and costly consequences may change. Apparent causal relationships might change either because there are new data or analyses. Improved study techniques may simply yield more reliable estimates of causal factors. Additionally, ADM might actually have a change in causal relationship with consequences.

Finally, society's response to ADM may impact on any of these items. Social responses may serve to increase some cost components (where these costs reflect intervention efforts) and reduce other cost components (the result of successful interventions being to reduce certain undesirable impacts of ADM). There are many other ways in which the economic cost to society of ADM might be affected by public interventions. A much debated example of this is the current proposal to make 21 the legal drinking age in all states. Such a change could have immediate cost impacts. The criminal justice system may bear higher costs in enforcing the laws, while there may be lower indirect costs due to reduced alcohol abuse-related trauma.

In updating cost estimates, it is recommended that only two of the six factors be adjusted--wage and price inflation and change in the population at risk.

Prices and population changes can be routinely adjusted because quality data are available on a very timely basis for these continuously changing factors.

The other four factors--incidence and prevalence rates, causal factors, sociodemographic distributions, and social responses--are less likely to change significantly in a short time period than prices, wages, and population. Incidence and prevalence rates for the ADM disorders are not reestimated on an annual basis. It is recommended that detailed cost computations be made when the data from the periodic studies of alcohol and drug abuse become available. The causal relationships of ADM to their consequences are the subject of much scholarly study. New studies on causal relationships will tend to use different data sets, different time periods, and different analysis techniques. These factors make routine adjustments to causal factors unadvisable to undertake.

The impact of new interventions vis-à-vis the economic cost estimates is seldom well monitored, and it is very difficult to integrate the impact of changing social responses to ADM into the cost estimation framework.

C. A Simplified Cost Update Protocol

A two-factor update protocol is recommended. The first factor is an adjustment for inflation, and the second is an adjustment for population growth or real change.

There are somewhat different sets of factors for the various types of cost components. The basic premise of this methodology is that proportional changes (over a period of time) in the adjustment factors are related to proportional changes in the values of the cost components. The period of time is the time between the base year (year with the most recent estimate for the cost component, referred to as "b.year") and the update year (year for which updated estimates for the cost component are desired, referred to as "u.year").

The general update formula is

$$CC_{u.year} = CC_{b.year} \times (AFI_{u.year} \div AFI_{b.year}) \times (AFRC_{u.year} \div AFRC_{b.year})$$

where

$CC_{u.year}$ = value of cost component (CC) in update year (u.year)

$CC_{b.year}$ = value of cost component (CC) in base year (b.year)

$AFI_{u.year}$ = value of adjustment factor for inflation (AFI) in update year (u.year)

$AFI_{b.year}$ = value of adjustment factor for inflation (AFI) in base year (b.year)

$AFRC_{u.year}$ = value of adjustment factor for real change (AFRC) in update year (u.year)

$AFRC_{b.year}$ = value of adjustment factor for real change (AFRC) in base year (b.year).

This formula applies proportional change adjustments for inflation ($AFI_{u.year} \div AFI_{b.year}$) and real change ($AFRC_{u.year} \div AFRC_{b.year}$) to the value of the cost component in the base year to produce a value for the update year.

Table G-1 lists the cost components for ADM and specifies an adjustment factor to reflect change in inflation and a factor to reflect real change. The adjustment factors are in each case a data series that is routinely maintained and published by a government agency. Values for these data series are readily available from publications of these agencies (listed in the table) or by personal communication. The complete references for the publications and identification of the responsible agencies are on the bottom of the table.

Separate adjustment factors are specified for the major components of the costs of ADM. Different factors allow the various cost components to change at somewhat different rates, as dictated by the factors "more" appropriate for each component.

For a given cost component, the same factors are suggested for adjusting estimates for each of the three ADM disorders. The two factors for each cost component reflect general influences that are likely to affect costs of the ADM disorders in similar, if not identical, ways. As stated above, there are many other factors likely to be relevant to cost changes; however, incorporating many or all of those changes in updated estimates would require recalculating the costs from the start. This update protocol is only intended to reflect major, relatively unambiguous, changes that occur over a period of several years. Beyond three to four years, the full cost estimates should be performed again, with an assessment made of new findings and data about ADM.

To facilitate implementation of the update protocol, historical values are presented for the recommended adjustment factors (see table G-2). Data

Table G-1

Adjustment Factors for Updating ADM Economic Costs to Society Estimates

| Cost Component | Adjustment Factor | Data Series | Source |
|---|---|---|---|
| Treatment and Support | Inflation & Real Change | Total National Health Expenditures | Health Care Financing Review |
| Mortality | Inflation | Compensation per hour in the business sector | Monthly Labor Review |
| | Real Change | Total deaths | |
| Morbidity-Reduced Productivity and Lost Employment | Inflation | Compensation per hour in the business sector | Monthly Labor Review |
| | Real Change | U.S. Civilian Labor Force | Monthly Labor Review |
| Motor Vehicle Crashes -Direct Costs | Inflation | Implicit price deflator for gross national product | Survey of Current Business |
| | Real Change | Motor vehicle accidents (on the road) | Accident Facts |
| Crime | Inflation | Implicit price deflators for gross national product: Government purchases of goods and services (state and local) | Survey of Current Business |
| | Real Change | Crime Index: Number of known offenses | Crime in the United States; Uniform Crime Reports |

| Cost Component | Adjustment Factor | Data Series | Source |
|---|---|---|---|
| Social Welfare Programs | Inflation | Implicit priced deflators for gross national product: Government purchases of goods and services (state and local) | Monthly Labor Review |
| | Real Change | Adult population (18-64 years) (as of July 1, each year) | Current Population Reports, Series P-25 |
| Other Direct Costs | Inflation | Implicit price deflators for gross national product | Survey of Current Business |
| | Real Change | Adult population (18-64 years) (as of July 1, each year) | Current Population Reports, Series P-25 |
| Victims of Crime | Inflation | Compensation per hour in the business sector | Monthly Labor Review |
| | Real Change | Crime Index: Number of known offenses | Crime in the United States: Uniform Crime Reports |
| Crime Careers (Drug Abuse only) | Inflation | Compensation per hour in the business section | Monthly Labor Review |
| | Real Change | Heroin addicts in the United States | National Institute on Drug Abuse |
| Incarceration | Inflation | Compensation per hour in the business sector | Monthly Labor Review |
| | Real Change | Total population in state and federal prisons | National Prisoner Statistics: Bureau of Justice Statistics Bulletin |
| Motor Vehicle Crashes -Indirect Costs | Inflation | Compensation per hour in the business sector | Monthly Labor Review |
| | Real Change | Motor vehicle accidents (on the road) | Accident Facts |

## Data Sources for Updating Costs

Accident Facts, National Safety Council, Chicago, Ill., annual.

Current Population Reports, Series P-25, Bureau of the Census, U.S. Department of Census.

Federal Bureau of Investigation, Crime in the United States: Uniform Crime Reports, U.S. Department of Justice, annual.

Health Care Financing Review, Health Care Financing Administration, U.S. Department of Health and Human Services, periodical.

Monthly Labor Review, Bureau of Labor Statistics, U.S. Department of Labor, monthly.

National Narcotics Information Consumers Committee Report, Drug Enforcement Administration, U.S. Department of Justice, annual.

National Prisoner Statistics, Bureau of Justice Statistics Bulletin, Bureau of Justice Statistics, U.S. Department of Justice, periodical.

Survey of Current Business, Bureau of Economic Analysis, U.S. Department of Commerce, monthly.

Vital Statistics of the United States, National Center for Health Statistics, U.S. Department of Health and Human Services, annual.

are reported for 1975 through 1983 (several values are not available from agencies at this time). The historical data will make it easier to acquire the correct values of new factors.

D. An Example of Using the Protocol

The simplified procedure described above has been implemented to estimate values for 1981, 1982, and 1983 based on the detailed 1980 computations. First, a sample computation for a single cost component--Reduced Productivity costs for alcohol abuse -- is worked out.

Recall that the adjustment formula is

$$CC_{u.year} = CC_{b.year} \times (AFI_{u.year} \div AFI_{b.year}) \times (AFRC_{u.year} \div AFRC_{b.year}).$$

The base (1980) value for the Reduced Productivity component was $50,575 million. The adjustment factor for inflation for this component is "compensation per hour in the business sector." The value of this index was 131.2 in 1980, 143.9 in 1981, 155.1 in 1982 and 163.1 in 1983. The adjustment factor for real change for this component is "civilian labor force" in the United States. The value was 106,940,000 in 1980, and the other values are in table G-2.

The update values for 1981-1983 come directly from application of the formula

$$CC_{1981} = \$50,575 \text{ million} \times (143.9 \div 131.2) \times (108,670,000 \div 106,940,000)$$
$$= \$56,367 \text{ million}$$

$$CC_{1982} = \$50,575 \text{ million} \times (155.1 \div 131.2) \times (110,204,000 \div 106,940,000)$$
$$= \$61,612 \text{ million}$$

$$CC_{1983} = \$50,575 \text{ million} \times (163.1 \div 131.2) \times (111,550,000 \div 106,940,000)$$
$$= \$65,582 \text{ million}$$

The updated cost values increased 11.5 percent between 1980 and 1981, 9.3 percent between 1981 and 1982, and 6.4 percent between 1982 and 1983 as a result of both wage inflation and labor force growth in each year. The proportional increase in each factor over one year equals the value of the adjustment factor in the update year divided by the value of the adjustment factor in the prior year minus one. Thus, the increase in wages between 1980 and 1981 was 0.097 = (143.9 ÷ 131.2) - 1 or 9.7 percent.

Similar update computations have been performed for all cost components for 1981, 1982, and 1983 using the base values for 1980 (see table I-1 or

Table G-2

Historical Data Series of Adjustment Factors for Update Protocol

| Year | Total National Health Expenditures ($ in billions) | Compensation per Hour in the the Business Sector (index) | Implicit Price Deflator for State & Local Government Purchases of Goods and Services (index) | Implicit Price Deflator for for Gross National Product (index) | Adult Population (18-64 years) (as of July 1) (thousand) | Total Deaths (thousand) | U.S. Civilian Labor Force (thousand) | Crime Index Number of Known Offenses (thousand) | Motor Vehicle Accidents (millions) | Heroin Addicts (thousand) | Population in State and Federal Prisons |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1975 | $132.7 | 85.5 | 129.4 | 125.8 | 125,604 | 1,893 | 93,775 | 11,257 | 16.5 | 550 | N.A. |
| 1976 | 149.7 | 92.9 | 138.3 | 132.3 | 128,034 | 1,909 | 96,158 | 11,305 | 16.8 | 500 | N.A. |
| 1977 | 169.2 | 100.0 | 148.4 | 140.1 | 130,407 | 1,900 | 99,009 | 10,936 | 17.6 | 495 | 300,024 |
| 1978 | 189.3 | 108.6 | 159.7 | 150.4 | 132,820 | 1,928 | 102,251 | 11,141 | 18.3 | 470 | 307,276 |
| 1979 | 215.0 | 118.7 | 173.7 | 163.4 | 135,329 | 1,914 | 104,962 | 12,153 | 18.1 | 420 | 314,457 |
| 1980 | 249.0 | 131.2 | 191.6 | 178.6 | 137,842 | 1,990 | 106,940 | 13,295 | 17.9 | 492 | 329,821 |
| 1981 | 286.6 | 143.9 | 208.1 | 195.5 | 140,054 | 1,987[a] | 108,670 | 13,290 | 18.0 | 492[b] | 369,930 |
| 1982 | $322.4 | 155.1 | 222.9 | 206.9 | 142,149 | 1,986[a] | 110,204 | 12,857 | 18.1 | 492[b] | 414,362 |
| 1983 | $333.5[c] | 163.1 | 236.6 | 215.6 | 144,022 | 2,010[a] | 111,550 | (11,960)[d] | N.A. | 492[b] | 438,830 |

[a]Preliminary.

[b]1980 is the most recent year for this estimate from NNICC.

[c]This value has been estimated by RTI based on inflation in personal health care prices and growth in total population. The 1983 value will be available in August, 1984.

[d]Preliminary tabulations as of April, 1984 indicated a 7 percent drop between 1982 and 1983. This translates into a Crime Index of about 11,960,000 known offenses.

N.A.: not available.

III-1), and the available data on adjustment factors. The results appear in tables G-3, G-4, and G-5.

Using this procedure, the economic costs to society of ADM are estimated to increase from $190 billion in 1980 to $213 billion in 1981, $234 billion in 1982, and $249 billion in 1983. The estimates for alcohol abuse, drug abuse, and mental illness do not increase proportionally with the total over the three years of updating because growth in components is different.

The growth in estimated total costs of ADM was greater than the overall rate of inflation in the economy. These estimates indicate growth of 12.1 percent between 1980 and 1981, 9.9 percent between 1981 and 1982, and 6.4 percent between 1982 and 1983. In contrast, inflation as measured by the "implicit price deflator for gross national product" was 9.5 percent, 5.8 percent, and 4.2 percent respectively. The difference between overall inflation and the increase in cost estimated is due to population growth, other real changes, and increased productivity of the work force as reflected by the "compensation" adjustment.

E. A Final Cautionary Note

Updated cost estimates allow the impact of ADM to be roughly assessed in more current dollars and units. The protocol uses the readily made adjustments for the most fundamental changes. While these estimates will be used in place of current cost estimates (or because data for current estimates are unavailable), they are only a substitute for current data. It is recommended that updated values only be used for, at most, three to four years, until it becomes propitious to make completely new estimates due to an accumulation of more recent data, and findings about the incidence, prevalence, and consequences of ADM in our society.

Table G-3

Updated Costs to Society of Alcohol Abuse, Drug Abuse, and Mental Illness, 1981
(dollars in millions)

| | Alcohol Abuse | Drug Abuse | Mental Illness | Total |
|---|---|---|---|---|
| Core Costs | | | | |
| Direct | | | | |
| Treatment and Support | $12,052 | $1,661 | $27,115 | $ 40,828 |
| Indirect | | | | |
| Mortality[a] | 15,832 | 2,168 | 7,881 | 25,880 |
| Reduced Productivity | 56,367 | 28,661 | 3,480 | 88,508 |
| Lost Employment | 4,575 | 348 | 20,666 | 25,589 |
| Other Related Costs | | | | |
| Direct | | | | |
| Motor Vehicle Crashes | 2,405 | [c] | - | 2,405 |
| Crime | 2,548 | 6,417 | 945 | 9,909 |
| Social Welfare Programs | 42 | 2 | 222 | 266 |
| Other | 3,239 | 597 | 733 | 4,569 |
| Indirect | | | | |
| Victims of Crime | 189 | 926 | - | 1,115 |
| Crime Careers | - | 9,570 | - | 9,570 |
| Incarceration | 2,216 | 1,803 | 108 | 4,127 |
| Motor Vehicle Crash (time loss) | 512 | [c] | - | 512 |
| Total | $99,976[b] | $52,154[b] | $61,149[b] | $213,279 |

Totals may not add due to rounding.

[a]At 6 percent discount rate.

[b]The total costs to society for each of the three ADM disorders are not comparable, since the completeness of data available for each cost category varied significantly. For example, the estimate of reduced productivity is relatively complete for alcohol abuse, only partially complete for drug abuse, and incomplete for mental illness.

[c]Although costs are hypothesized to occur in this category, sufficient data are not available to develop a reliable estimate.

Source: Research Triangle Institute.