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References - Chapter 2

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CHAPTER 3

Summary of Review and Comparison of Previous Studies

I. INTRODUCTION AND SCOPE

Over the past decade, a number of studies of the costs of ADM disorders have been completed. The methodologies used to develop these cost estimates differ in certain respects across the three major problem areas, but are relatively consistent in cases of multiple studies of the costs of individual problem areas. For this reason, it was decided to focus this review on a single primary study within each of the problem areas. These primary studies are as follows: alcohol abuse -- Berry, and Boland; drug abuse -- the RTI report; and mental illness -- Levine and Levine. Although this review focused on these three primary ADM cost studies, materials from other ADM studies were also reviewed and are included in this report as appropriate.

In addition to the ADM cost studies cited above, a recently completed study of the cost of all illnesses has also been included within the scope of this review. This study, authored by Paringer and Berk (1977)¹ provides useful insights into the development of an appropriate methodology for estimating costs of illness.

Finally, the recently issued Public Health Service (PHS) Guidelines for cost-of-illness studies has also been included within the scope of this review. These guidelines were reviewed in terms of the overall conceptual framework presented for cost-of-illness studies rather than from the perspective of specific techniques or data sources for estimating ADM costs. The inclusion of the Guidelines document in the scope of this review assures us that the ADM cost estimating methodology developed during this study is consistent with the overall PHS framework for cost-of-illness studies.

This chapter presents a summary of the review and comparison of previous studies that was conducted as an early task of the RTI STUDY. Results are presented in terms of the major cost categories for cost-of-illness studies. In addition a brief summary of the overall review is provided.

II. REVIEW CRITERIA

Three principal criteria were developed to guide the review of previous studies. These included the approach or methodology that was developed to generate the estimates, the sources of data that were used in the actual calculations, and the sensitivity of the cost estimates to various assumptions. A brief description of these criteria follows:

¹ Hereinafter the Paringer and Berk (1977) report will be referred to in the text as Paringer and Berk

In reviewing the approach to developing the ADM cost estimates, three principal issues were examined. These include the definitions of the particular problem under consideration and the associated cost categories, details of the methodology used to develop the resulting cost estimates, and the scope of costs included, represented primarily in terms of the various settings in which treatment for the appropriate problem is provided.

In addition to reviewing the overall approach for developing ADM cost estimates, the specific data sources used were also reviewed. The criteria that were used in reviewing these data sources included representativeness, bias, and reliability.

The final criterion that was used during the literature review was the sensitivity of the resulting cost estimate to underlying assumptions and the sensitivity of the estimate of total costs to the cost of individual components. To the extent possible the sensitivity of an estimate for an individual component was assessed by recalculating the estimate under a range or alternative assumptions. Appropriate values for these alternative assumptions were determined from the review of each of the primary sources (e.g., in some cases, reasonable alternative assumptions for estimating the cost of drug abuse may be determined from the report on the cost of alcohol abuse) and from a review of selected secondary documents.

III. DIRECT CORE COSTS

A. Guidelines

The Guidelines document clearly defines a framework for analysis of direct core health cost which are costs incurred explicitly by the victim of illness or trauma through the provision of goods or services or diagnosis, treatment, continuing care, rehabilitation, or terminal care. As a practical guide to calculating direct core costs, the Guidelines lists the primary types of expenditures which constitute these costs. These are:

- Hospitalization
- Outpatient clinic care
- Nursing home care
- Home health care
- Service of primary physicians and specialists
- Other professional services
- Drugs and drug sundries
- Rehabilitation counseling
- Rehabilitation aids, and
- Supportive activities

These goods and services are provided to the ill person directly and are not provided to another person or the household of the victim. As an example, prostheses, eyeglasses or hearing aids for an ill person are direct core costs, while alterations to a house or special rehabilitation equipment are considered other related direct costs.

The costs of the health services listed above are accompanied by a variety of overhead costs (e.g., administration, planning, prevention, and research activities in the health sector). The classification of these overhead costs is not addressed explicitly in the Guidelines document, but they clearly should be included in the direct core cost category, since they are incurred only to support the expenditures for medical care.

B. Alcohol Abuse

In 1975 alcohol abuse health care costs for an estimated 10 million U.S. problem drinkers constituted \$12.8 billion, or 30 percent of the total costs associated with alcohol abuse, as reported by Berry and Boland. These costs are the second largest component of the cost to society of alcohol abuse.

The Berry and Boland report estimated the excess use of health care services by alcohol abusers. This process involved comparing the level of utilization of health care services by alcohol abusers with those of the general public and assigning the cost of excess annual per capita utilization by alcohol abusers as an economic cost of alcohol abuse. This methodology is direct, straightforward, easily applied, but does not completely address the question of causality.

In addition, the Berry and Boland report does not appear to have used consistent definitions of problem drinker, alcohol abuser, or alcoholic. It used these classifications virtually interchangeably in discussing special reports and key parameters of the studies, an inconsistency that makes the estimates of direct core costs subject to wide variation.

A summary of the \$12.8 billion direct core costs of alcohol abuse is presented in table 3-1. As shown in the table, these costs may be divided into two major categories: costs of health services to treat alcoholism and related disorders, accounting for \$11.0 billion; and overhead and supporting costs, accounting for \$1.8 billion.

C. Drug Abuse

According to the RTI report, the direct core costs of drug abuse totaled \$1.5 billion in 1975 (see table 3-2). Treatment costs were estimated at \$1.08 billion in 1975. This total included \$585 million in drug treatment and rehabilitation facilities and \$494 million in medical services. Direct core costs for supporting services were \$410 million in 1975.

The RTI report defined drug abuse as the nonmedical use of drugs. In calculating the health care costs of drug abuse, the authors used a variety of statistics from the Drug Abuse Warning Network (DAWN), which defines drug abuse as follows:

The non-medical use of a substance for any of the following reasons: psychic effect, dependence, or self-destruction (attempt or gesture). For the purpose of this definition, non-medical use means the use of prescription drugs in a manner which is inconsistent with accepted medical practice; the use of over-the-counter drugs contrary to approved labeling; or the use of any other drug or substance (heroin), marijuana, peyote, glue, aerosols, etc.) for the reasons cited above (U.S. O.O.J., DEA 1974).

The primary approach to estimating the direct core costs of drug abuse was to identify types of providers of health care and drug abuse treatment services and estimate the proportion of these services that were utilized due to drug abuse. This approach incorporates a more direct measurement of the causal relationship between drug abuse and a subsequent health problem than the Berry and Boland approach. The RTI report also reported emergency room or inpatient episodes which were drug-abuse related. However, there was no measurement of excess health care costs incurred by persons who were drug abusers. It should be noted that the RTI report approach yields conservative estimates of direct costs in that it omits health care costs incurred as a result of drug abuse but not immediately perceived as such.

Federal, state, and local drug treatment and rehabilitation costs totaled \$686 million in 1975. Support costs for administration, planning, research, and education were estimated at \$410 million. In contrast to the Berry and Boland study, these estimates were largely obtained from NIDA budget documents.

There may be some limitations on the scope of the service providers included in these costs. Estimates of utilization of four types of health care services were made, including the largest two categories of health care--inpatient and physician care. However, costs in even these two categories may be downwardly biased, particularly since no estimates of the excess use of health care services by drug abusers for related illnesses were developed.

D. Mental Illness

According to the Levine and Levine study, direct mental health care valued at \$9.5 billion was provided to the mentally ill in 1971. During 1971 direct core costs were estimated for 13 separate categories of expenditures (see table 3-3), ranging from \$2.7 billion on nursing home care to a low of \$80 million on private practice psychologists.

Table 3-1

Direct Core Costs of Alcohol Abuse, 1975
(\$ in millions)

Category	Costs
Treatment	<u>\$11,021</u>
Hospital care	8,400
Physician services	1,300
Nursing home care	194
Other professionals	124
Public health activity	393
Other health services	328
Drugs and drug sundries	282
Support	<u>1,798</u>
Administration, prepayment of health system	776
Research, construction	779
Training, education	168
Administration of alcohol programs	75
Total	<u>\$12,819</u>

SOURCE: Berry et al. (1977)

Table 3-2

Direct Core Costs of Drug Abuse, 1975
(\$ in millions)

Category	Costs
Treatment	<u>\$ 1,079</u>
Emergency room visits	12
Inpatient care	314
Mental hospital inpatient care	35
Physician care expenditures	133
Treatment/rehabilitation	585
Support	<u>410</u>
Planning, direction, research education, prevention and training	410
Total	<u>\$ 1,489</u>

SOURCE: Rufener et al. (1977)

The approach to estimating the direct costs of mental illness was to identify all possible sources which provided goods and services to the mentally ill, and then to estimate the total expenditures on these goods and services. This approach was feasible due to the high degree of specialization of most of the mental health settings.

The estimates of direct cost do not seem to be strongly affected by the definition of mental illness which is used. For most of the providers of health the costs were drawn from secondary sources with standard definitions and data collection procedures for mental illness.

The primary exception to having accepted definitions of the category of care was in nursing homes. The authors have attributed care to clients with primary diagnoses of (1) mental illness or senile dementia (43 percent) or (2) a mental disorder plus an ambulatory mobility status (44.5 percent) to mental illness. Since there is little difference in these values, the authors chose the lower figure in order to be conservative.

A potential for double counting costs should be noted here. Since alcoholism and drug dependence are mental illness diagnoses, the cost of treating these disorders in mental health facilities was legitimately included in the Levine and Levine study. However, many of these same costs were also included in Berry and Boland and the RTI reports. Thus, there is a definite overlap of health care costs between mental illness and alcohol and drug abuse which should be identified and adjusted for in any study on the combined costs of alcohol, drug and mental disorders.

The Levine and Levine study did not estimate excess use of health care by the mentally ill. However, it did attribute 10 percent of visits to private nonpsychiatric physicians to mental illness. Health care costs for other illnesses, accidents, poisonings or violence associated with mental illness were not included in the direct costs of mental illnesses, an approach that is similar to that reported by the RTI report but which is in contrast with the Berry and Boland results.

Only \$1.6 billion of support costs were estimated for mental illness in 1971 (see table 3-3). These were for expenditures ancillary to the provision of direct health care to the mentally ill and included research (\$399 million), training (\$187 million), construction (\$253 million), management expenses (\$767 million) and NIMH unallocated expenses (\$15 million).

E. All Illness

Paringer and Berk estimated total direct costs of health care to be \$118.5 billion in 1975. Table 3-4 represents the breakdown of these expenditures across the different kinds of health goods and services. The four largest categories were hospital care (\$46.6 billion), physician services (\$22 billion), drugs and drug sundries (\$10.6 billion), and nursing home (\$9 billion). These categories have also been the largest cost categories for the direct core costs of ADM problems.

Table 3-3

Direct Core Costs of Mental Illness, 1971
(\$ in millions)

Category	Costs
Treatment	\$ 9,526
State and county mental hospitals	2,164
Other public mental hospitals	412
Private mental hospitals	281
General hospitals	928
Community mental health centers	285
Freestanding outpatient centers	481
General medical services	358
Nursing homes	2,666
Rehabilitation facilities and halfway houses	195
Children's programs	304
Private practice psychiatrists	833
Private practice psychologists	79
Psychoactive drugs	538
Support	1,621
Research	399
Training	137
Construction	253
Management	767
NIMH unallocated	15
Total	\$11,147

SOURCE: Levine and Levine (1975)

The allocation of costs to illness categories by Paringer and Berk is based on association and not on causality. The data available on utilization of health care are based on a patient's primary diagnosis, and not on the cause of the illness. This allocation procedure may yield underestimates of the costs of problems such as alcoholism, which may lead to subsequent diagnoses of diseases such as diabetes and other digestive disorders. However, more detailed analyses of the extent to which a subsequent diagnosis is due to prior problems of alcohol or drug abuse require data in more rich detail than was available to Paringer and Berk.

Data used in this analysis were complete and detailed. It was possible to allocate virtually all health care services to some disease class

Table 3-4

Direct Core Costs of All Illnesses, 1975
(\$ in millions)

Category	Costs
Treatment	\$100,200
Hospital care	46,600
Physician services	22,100
Dentist services	7,500
Other professional services	2,100
Nurses	256
Chiropractors	503
Optometrists	500
Visiting nurses	194
Other	644
Drugs and drug sundries	10,600
Eyeglasses and appliances	2,300
Nursing home care	9,000
Support	18,300
Expenses for prepayment and administration	4,593
Government public health activities	3,457
Other health services	3,000
Research	2,750
Construction	4,500
Public	1,266
Private	3,234
Total	\$ 1,489

SOURCE: Paringer and Berk (1977)

due to the detailed statistics maintained on health care utilization by the National Center for Health Statistics. Utilization is reported by the eighth revision of the International Classification of Diseases-Adapted (ICDA) (U.S. DHEW, NCHS 1968), except for expenditures on physician care, which still used the seventh revision. Reclassification of data from the seventh to the eighth revision was possible so that diagnostic categories were consistent. Data are presented in the final report by 7 major disease classifications, although cost information is available in greater detail.

IV. INDIRECT CORE COSTS

A. Guidelines

The Guidelines document states that the human capital approach should be used to estimate indirect costs of illnesses. This approach is an established procedure with a clear conceptual basis by which the value of the output which is lost due to an illness or disease is estimated. In principle these indirect costs are capable of being measured with readily available data.

Lost output can be either in the market place or at home. Time which is lost in work should be valued at the worker's wage rate, which is assumed to reflect the worker's marginal productivity. Time lost keeping the home should be valued at the opportunity cost of the household services - that is, the cost of hiring someone to perform the work. In this way output losses in the market place and in the household are measured in consistent units.

Both current year morbidity losses and permanent future losses (mortality) should be included. Morbidity includes time away from a productive activity. Future morbidity losses can also result from a current year's illness or disease and should be estimated in analyzing life cycle costs of illnesses or diseases. However, in most studies only current year morbidity losses are estimated or included. Mortality losses involve the permanent loss to society of a person's productive abilities due to death. These losses should include the present discounted value of productive time for the expected balance of an individual's life, including allowances for withdrawal from the labor force, unemployment, growth in productivity, etc. The present discounted value may be calculated for several different discount rates in order to demonstrate the sensitivity of indirect costs to variations in this assumption. The recommended rates in the Guidelines document are 2, 5, 6, and 10 percent.

B. Alcohol Abuse

The Berry and Boland report attributed \$19.64 billion in indirect core costs to alcohol abuse and alcoholism for 1975 (see table 3-5). This was 46 percent of the total economic costs attributed to alcohol abuse.

The largest element of the indirect costs was reduced earnings of alcohol abusers, estimated at \$15.5 billion in 1975. This figure was based on a three-stage process. First, lower earnings of alcohol abusers compared to non-alcohol abusers were estimated, then a 23.9 percent adjustment was made for non-alcohol called differences, and finally estimates of the prevalence of alcohol abuse were used to calculate the total cost for the U.S. population.

One problem in using these income data is that the study may not have analyzed with sufficient precision the income difference between households with abusing and non-abusing adult males. The study did make an initial adjustment for age differences and then a further adjustment

for factors such as education and experience. The total adjustments for age, education, and other factors reduced the income gap between abusing and non-abusing males by 23.9 percent. However, this adjustment may not have been fully appropriate for this purpose since it was developed from

Table 3-5

Indirect Core Costs of Alcohol Abuse, 1975
(\$ in millions)

Cost Category	Costs
Lost production	<u>\$19,637</u>
Market production, 1975	15,458
Military production	411
Present value in 1975 of lost future production due to excess mortality in 1975	3,768
Total	<u>\$ 1,489</u>

SOURCE: Berry et al. (1977)

an analysis of persons with severe health problems in general rather than with specific alcohol abuse problems. However, given the data that were available, this may have been the most precise adjustment that was possible in attempting to eliminate extraneous differences between the groups studied. In any case, the 23.9 percent downward adjustment does represent at least a partial attempt by Berry and Boland to go beyond the mere association between alcohol abuse and reduced income.

Although the Berry and Boland study failed to distinguish between reduced earnings caused by alcohol abuse and associated with alcohol abuse, the 23.9 percent downward adjustment discussed in the preceding paragraph was made to eliminate several noncausal factors. In addition their estimate was incomplete in that it did not include reduced productivity for females, either working or in the household, or for males under age 21 or over age 59.

The Berry and Boland report used two different sources of data to estimate the costs of mortality. One report was used to estimate the relative mortality rate of alcohol abusers and alcoholics and another was used to generate estimates of prevalence. This raises the potential for using data which are inconsistent with each other due to differences in the operational definitions of the populations at risk (alcohol abusers and alcoholics).

A second potential problem with the Berry and Boland estimates of excess mortality is that they appear to be based on association rather than causality. Frequent heavy drinkers do have higher relative mortality rates, but many of the reasons for excess death among this group are not necessarily causally related to alcohol abuse itself. Instead, they may be causally related to factors frequently associated with alcohol abuse such as smoking or poor personal hygiene and health habits. A more conservative approach would have been to have used the number of mortalities with diagnoses believed to have been caused by alcohol abuse.

C. Drug Abuse

The indirect core costs of drug abuse were estimated at 54.2 billion for 1975 in the RTI report (see table 3-5). The largest components were unemployability (\$2.5 billion) and absenteeism (\$1.6 billion). Depending on the assumed number of heroin abusers, the costs of unemployability may have been as high as \$3.7 billion - over 30 percent of total estimated economic costs of drug abuse.

The central concept behind the RTI report's measurement of the indirect core costs of drug abuse was the value of goods and services that would have been produced if there were no abuse of drugs. This value was analyzed by estimating the foregone earnings of the drug abusers in their most likely primary occupation. The RTI report was explicit in adjusting its estimates of earnings and labor force participation for age, race, and sex.

The costs for unemployability and absenteeism are included in indirect core costs as estimates of drug abuse-caused disability or illness. It is hypothesized that the excess unemployment and absenteeism are experienced by persons whose drug abuse problem prevents their working during that lost time. These estimates appear to have been based more on association than on strict causality. However, costs for unemployability were hypothesized to result only from heroin abuse. The costs estimated were dependent on estimates of the prevalence of heroin abuse in the United States. The study found no single estimate of the prevalence of heroin abuse; estimates ranged from 250,000 to 750,000. Therefore, the authors of the RTI report used three separate estimates on which separate cost calculations were based. These prevalence estimates caused cost estimates for unemployability to range from \$1.2 to \$3.7 billion, a variation by a factor of three.

Mortality costs were underestimated in this study as these costs were only estimated for lost productivity in 1975, omitting lost future productivity. The RTI report did not adjust for expected mortality from other causes for the drug abusers who died in 1975. This is inconsistent with the alcohol abuse and mental illness studies as well as the Guidelines document, which included the present discounted value of future earnings for mortalities. The basic data for the 1975 estimate on mortality were from the Drug Abuse Warning Network (DAWN), which is a generally comprehensive source of this type of data (U.S. DHEW, NIDA 1976).

D. Mental Illness

Indirect core costs constituted the largest component of the economic cost of mental illness in 1971. Total indirect costs were \$14.2 billion (see table 3-7), of which disability cost \$7.4 billion, mortality \$3.5 billion and patient care morbidity \$3.2 billion. As is the case with alcohol and drug abuse, these indirect costs were at least 50 percent (\$4.2 billion) of total costs to society of mental illness (\$25.3 billion).

Table 3-6

Indirect Core Costs of Drug Abuse, 1975
(\$ in millions)

Cost Category	Costs
Unemployability	\$ 2,478
Emergency room treatment	0.4
Inpatient treatment	20
Mental hospitalization	8
Drug-related deaths	12.5
Absenteeism	1,594
Treatment costs	88
Total	\$ 4,201

SOURCE: Rufener et al (1977)

Table 3-7

Indirect Core Costs of Mental Illness, 1971
(\$ in millions)

Cost Category	Costs
Death	\$ 3,537
Disability	7,404
Patient Care	3,238
Total	\$14,179

SOURCE: Levine and Levine (1975).

The authors conducted a rigorous analysis of indirect costs, making the necessary adjustments in wage rates for labor force factors such as unemployment and labor force participation. This allowed data on incidence and prevalence to be directly multiplied with the adjusted wage rates to calculate costs. In addition to estimates of mortality, estimates of disability and time lost for treatment were made from the same adjusted wage data.

The Levine and Levine study is explicit in its calculations of wages to make as many adjustments for labor force phenomena as possible. These included adjustments for the age and sex characteristics of the mentally ill, their labor force participation, and the value of wage supplements (reflecting social security, vacation and other fringe benefits). An adjustment for the average value of housewives' services was added to this figure for women.

The study proceeded to estimate the incidence and prevalence of mortality, complete disability and time lost for inpatient and outpatient treatment. Estimates of excess mortality were based on age-sex specific mortality rates and an estimate of the population at risk. Excess mortality was defined as the difference between the mortality of the age-sex mentally ill cohort and that of a mentally healthy cohort.

A possible upward bias in this procedure was made by summing the number of admissions to treatment in each health care setting. The potential for multiple admissions to inpatient or outpatient care was ignored.

The prevalence of total disability was based on National Center for Health Statistics (NCHS) data, with corrections for underreporting of mental illness.

The last category of indirect core costs was for time used in receiving inpatient and outpatient care for those patients who were neither totally disabled nor institutionalized. These calculations also used the adjusted wage rates already discussed. Prevalence data for these calculations were based on utilization data discussed under direct costs. The data contained age- and sex-specific information on days of utilization of inpatient and day care and numbers of visits to providers of outpatient care.

This study did not explore all sources of indirect core costs. The exclusions noted by the study were: (1) crime committed by the mentally ill; (2) loss of leisure time by the totally disabled; (3) lost productivity by the partially disabled; and (4) the indirect costs of homicides due to mental illness.

E. All Illness

The indirect core costs of all illnesses were estimated at \$120 billion in 1975. This estimate was developed using a 10 percent rate of discount for mortality losses. Using a 2.5 percent discount rate results in a revised estimate of \$204 billion. Each of these totals includes morbidity costs of \$58 billion in addition to mortality losses. These costs are summarized in Table 3-8.

The Paringer and Berk study used the human capital approach to valuing morbidity and mortality and attempted to place a value on the productive time lost during 1975 due to morbidity and mortality. In addition, the authors estimated the value of lost future productivity due to mortality. The time lost was valued at age- and sex-specific wage rates which were hypothesized to reflect differentials in productivity.

Table 3-8

Direct Core Costs of All Illnesses, 1975 (\$ in millions)

Category	Costs
Morbidity	\$ 57,846
Mortality	
2.5% discount rate	146,226
10 % discount rate	62,409
Total	
2.5% discount rate	\$ 204,072
10 % discount rate	\$ 120,255
Total	\$ 1,489

SOURCE: Paringer and Berk (1977)

Morbidity costs totaled \$58 billion in 1975, as estimated by this study. Four classes of primary activities were used to estimate these costs: (1) employed (\$21 billion); (2) keeping house (\$4 billion); (3) unable to work (\$24 billion); and (4) institutionalized (\$8 billion). The study obtained estimates of persons of restricted primary activity for each of these categories, adjusted for labor force participation and unemployment, assigned appropriate values to the lost time and distributed the costs across the 17 primary illnesses and diseases.

Mortality costs for all illnesses were established to be \$62 billion with a 10 percent rate of discount. A 2.5 percent discount rate resulted in an estimate of \$146 billion. Data on mortality and cause of death were obtained from NCHS. In calculating these costs it was assumed that no deaths occurred in 1975, and that standard life expectancies were experienced by each age and sex cohort from 1976 on. Survivors of 1975 were assigned average age- and sex-specific mortality risks for 1976 until their cohort passes away. Survival was based on a Social Security Administration 1973 Life Table and projected survival factors (Foster n.d.).

The survival data for each age and sex cohort were adjusted with work experience and housekeeping figures to yield person years to productive time over each cohort's expected productive lifetime. This procedure adjusted for average labor force participation and unemployment rates. Person years of productive effort were multiplied by average annual earning with the wage supplement and/or imputed value of household services to develop cost estimates. This analysis of mortality costs was highly detailed and included all of the adjustments which have been identified in the other studies.

V. OTHER RELATED COSTS

A. Guidelines

All non-health sector costs, whether direct or indirect, are included in other related costs. These may be costs borne by the patient or other individuals. They may be real goods and services (direct costs) or lost productivity (indirect costs). The important distinction is that these are non-health factor goods and services or lost productivity by family or friends of the patient.

The Guidelines mentions a number of examples of other related direct costs. These costs included:

- Transportation;
- Household expenditures and help for the household;
- Special equipment or alteration of property for rehabilitation or comfort;
- Counseling, retraining, and re-education;

Property losses (destruction, for instance from vehicular accidents or criminal activity);
Criminal justice system; and
Welfare system administration (not the transfers themselves).

This is not a comprehensive list of other related direct costs, but was intended to be generally suggestive of these types of costs.

Other related indirect costs can include any lost productivity not directly related to ADM morbidity or mortality. For example, lost productivity due to criminal activity and incarceration (related to ADM) are examples of other related indirect costs. Costs to society from ADM related problems such as motor vehicle crashes and fires are also included as other related costs and broken out into their direct and indirect cost components.

B. Alcohol Abuse

Alcohol abuse entails substantial costs to society over and above direct and indirect core costs. According to the authors of the Berry and Boland report, these other related costs were conservatively estimated at \$10.3 billion in 1975, accounting for approximately one-quarter of the estimated total cost to society due to alcohol abuse.

The various components of these costs are presented in Table 3-9. The largest two items were motor vehicle crash losses (\$5.1 billion) and the cost of providing and administering social welfare programs (\$1.3 billion). No other item in this category was significantly greater than \$400 million (about one percent of the cost to society of alcohol abuse).

Both motor vehicle crash losses and fire losses have components of core costs related to treatment and lost productivity. Law enforcement, judicial, and corrections costs are other related direct costs. Lost productivity due to incarceration of persons for alcohol-related crimes was not estimated, but it is another related indirect cost if causality is established.

Motor vehicle crashes constituted the single largest component of the other related costs of alcohol abuse, with a total of \$5.2 billion in 1975.

Table 3-9

Other Related Costs of Alcohol Abuse, 1975
(\$ in millions)

Category	Costs
Social costs	<u>\$ 7,442</u>
Motor vehicle crash losses	5,143
Fire losses	434
Social welfare system	1,274
Highway safety	29
Fire protection	392
Criminal justice system (nonviolent crime)	170
Costs associated with violent crime	<u>\$ 2,858</u>
Criminal justice system (violent crime)	760
Homicide	106
Forcible rape	19
Other sex offenses	55
Aggravated assault	213
Other assaults	367
Lost productivity and health care	2,098
Homicide	2,072
Forcible rape	2
Other sex offenses	-
Aggravated assault	24
Other assaults	-
Total	<u>\$10,300</u>

SOURCE: Berry et al. (1977).

These estimates were based on prior analyses of the cost to society of motor vehicle crashes and the relationship of alcohol abuse to motor vehicle crashes. Distribution of these costs was based on a detailed analysis of a number of small special surveys of vehicle crashes and alcohol abuse. A multivariate analysis of causal factors led the analysts to attribute \$5.2 billion out of the total cost of \$28.7 billion to alcohol abuse.

Fire losses due to alcohol abuse were estimated at \$434 million in 1975. These were due primarily to mortality losses (\$150 million), property losses (\$210 billion), and treatment costs (\$70 million). Causality for these costs was attributed to inebriated smokers and the impaired ability of alcohol abusers to react to a fire.

Costs to administer and provide social welfare services to alcohol abuse-impacted families were estimated at \$1.3 billion. Five categories of social welfare programs were identified that are likely to provide a significant response to alcohol-caused problems. These programs cost \$53.5 billion in 1975, transferring \$47.6 billion with administration and operation expenses of \$5.9 billion. Transfers are not an economic cost and were therefore excluded. The \$5.9 billion is the real economic cost of these \$48 billion in transfers provided by the five social welfare system programs. To assign a proportion of these costs to alcohol abuse, Berry and Boland estimated the prevalence of alcohol abusers in the client populations of these programs.

Three additional other related cost categories were attributed to alcohol abuse. These were highway safety (\$29 million), fire protection (\$392 million), and the criminal justice system (\$170 million). Criminal justice costs were for alcohol-related offenses such as public inebriation and driving under the influence of alcohol. Highway safety and fire protection expenses were allocated to alcohol abuse on the same basis as productivity and health costs.

The Berry and Boland study also estimated the cost to society of violent crime associated with alcohol abuse. This was estimated to be \$2.9 billion in 1975. Since the authors hesitated to specify any specific proportion of this cost as caused by alcohol abuse or alcoholism, this \$2.9 billion estimate constitutes an upper bound on the cost of crime due to alcohol abuse.

C. Drug Abuse

Drug Abuse cost estimates in the RTE report included a substantial amount of other related costs - \$4.6 billion in 1975 (see Table 3-10). This included direct costs of expenditures on law enforcement (\$1.3 billion), the judicial system (\$300 million), corrections (\$300 million), drug traffic control (\$90 million) and housing stock Loss (\$80 million) as well as indirect costs for non-drug crime (\$1.3 billion) and incarceration (\$1.2 billion).

Table 3-10

Other Related Costs of Drug Abuse, 1975
(\$ in millions)

Cost Category	Costs
Direct	\$ 2,109
Law enforcement	1,342
Judicial system use	296
Corrections	294
Drug traffic control	93
Housing stock loss	84
Indirect	2,539
Non-drug crime	1,334
Incarceration	1,205
Total	\$ 4,648

SOURCE: Rufener et al. (1977)

A common methodology was used to estimate the costs associated with the criminal justice system. Expenditures on law enforcement, judicial system use and corrections were broken down for violations of drug laws and non-drug laws, reflecting the working hypothesis that heroin abuse specifically causes income-generating crime in addition to drug trafficking crimes.

For drug-related expenditures on the criminal justice system, the total expenditures were broken out by the percent of services rendered for drug law violations. Allocation of criminal justice expenditures for non-drug law violations was based on the working hypothesis that heroin abusers committed income-generating crimes because of their drug abuse. The study specified a list of income-generating crimes broken out of the Uniform Crime Reports (U.S. DOJ, FBI 1975) and obtained the proportion of all arrests, persons charged, and convictions accounted for by these crimes. Only a fraction of income-generating crime was committed by drug abusers, and only a fraction of that was caused by their drug abuse.

Classification of the costs of non-drug criminal activity depends on what it is believed to represent. If it is thought that this figure is a proxy for the value of property losses (damaged, or destroyed, not just stolen), then this is an other related direct cost, using the Guidelines classification system. If this cost represents the value of labor

devoted to illegitimate activity instead of work because of drug abuse, then this is an other related indirect cost. This latter approach was used to classify these costs in the RTI study. The estimate of the value of this cost component was based on assumptions about the percent of time spent in criminal activities and the opportunity cost of this time, measured in terms of earnings levels of those involved in criminal activity.

The second other related indirect cost component was earnings losses due to incarceration of drug abusers. This component was estimated from data on person years of incarceration and an assumption about the opportunity earnings of those incarcerated.

D. Mental Illness

The Levine and Levine study did not estimate any expenses which could be considered other related costs. All costs estimated were related to health care and lost productivity.

There are other related costs of mental illness which should be included in any further studies. There should include the categories for other related costs of alcohol and drug abuse as well as other categories of costs to society caused by the mentally ill with no alcohol or drug abuse problem. These will include crime, a variety of accidents, any disruption of family employment caused by the mentally ill, and the costs of administering non-health social welfare program serving the mentally ill.

E. All Illness

The Paringer and Berk study did not estimate other related costs associated with illness. All estimates were for core direct and indirect costs.

VI. SUMMARY

The previous section has reviewed estimates of the costs to society from the three ADM problems as well as the costs of all illnesses. A summary of the resulting cost estimates is presented in Table 3-11.

An important criterion for comparing and summarizing the costs to society of these problems is to identify the specific cost components or elements that are included in each study. These components are summarized in exhibit 3-1, which presents a direct cost typology for the primary studies reviewed in this report, and exhibit 3-2, which presents an indirect cost typology.

The left hand column in exhibit 3-1 identifies the eight major components of direct costs (designated by the letters A through H) that were specified in the Guidelines document as appropriate for estimating the costs to society of illness. The remaining columns for each of the four studies reviewed indicate which of these eight components were included and which were excluded in developing the respective cost estimates.

Three of the studies loosely classified certain cost components as "direct costs" which the Guidelines document classified as other than direct core costs. Exhibit 3-1 also highlights these cost components and indicates their classification as supporting core costs (SCC) within the direct core cost category, indirect core costs (ICC), or other related costs (ORC).

Exhibit 3-2 summarizes the indirect cost components that were included in each of the four studies reviewed in this study. Similar to the format of exhibit 3-1, the left hand column identifies the three major components of indirect costs that were specified in the Guidelines document as appropriate for estimating the costs to society of illness. As indicated in exhibit 3-2, none of the studies reviewed included an explicit recognition of the costs of reduced productivity in developing their indirect cost estimates.

Table 3-11

Summary of the Costs to Society of Alcohol Abuse
Drug Abuse, Mental Illness, and All Illness
(\$ in millions)

Illness Category	Total Costs	Core Costs		Other Related Costs
		Direct	Indirect	
Alcohol Abuse	\$ 42,756	\$ 12,819	\$ 19,637	\$10,300
Drug Abuse	10,338	1,489	4,201	4,648
Mental Illness	25,326	11,147	14,179	a/
All Illness	238,755	118,600	120,255	a/

a/ Not estimated

SOURCE: RTI analyses, Berry et al. (1977); Rufener et al. (1977); Levine and Levine (1975); Paringer and Berk (1977).

EXHIBIT 3-1

Direct Cost Typology of Primary Studies

Guidelines (1979)	Alcohol Abuse Berry and Boland 1977	Drug Abuse RTI Report 1977	Mental Illness Levine and Levine 1975	All Illness Paringer and Berk 1977
A Hospitalization	A Hospital Care	Medical Expenses	AB State & Co. M. Hospitals	AB Hospital Care
B Outpatient Clinic Care	E Physician Services	B Emerg. Rm. Visits	AB Other Public M. Hospitals	E Physician Services
C Nursing Home Care (long term care)	E Dentist Services	A Inpatient Care	AB Private M. Hospitals	E Dentist Services
D Home Health Care	E Other Professional Services	A M.H. Inpat. Care	AB General Hospitals	E Other Prof. Services
E Services of Primary Physicians, Specialists and other Professionals	F Drugs & Drug Sundries	E Priv. Physician	AB CMHC	Nurses
F Drugs & Drug Sundries	H Eyeglasses and Appliances	ORC Law Enforcement	B Freestanding Outp. Clinics	Chiropractors
G Rehabilitation Counseling	C Nursing Home Care	ORC Drug Laws	B General Medical Services	Optometrists
H Rehabilitation Aids	SCC Expenses for Prepay & Administration	ORC Judicial System	C Nursing Homes	Visiting Nurses
SCC Supporting Costs	SCC Gov't Public Health Activities	ORC Drug Laws	BCC Rehab Fac's & H-Way Houses	Other
ICC Indirect Costs	SCC Other Health Svcs.	ORC Corrections Costs	ABE Children's Programs	F Drugs & Drug Sundries
ORC Other Related Costs	SCC Research & Med. Fac's Construction	ICC Non-Drug Criminal Activity	E Priv. Prac. Psychiatrists	F Eye glasses and Appliances
	SCC Training & Educ.	ORC Drug Traffic Control Costs	E Priv. Prac. Psychologists	C Nursing Home Care
	Exclusions:	SCC Drug Abuse Prev.	F Psychoactive Drugs	SCC Expenses for Prepayment and Administration
	B Outpatient Clinic Care	ORC Housing Stock Loss	Exclusions:	SCC Gov. Publ. Health Activities
	D Home Health Care	Exclusions:	D Home Health Care	SCC Other Health Services
	G Rehabilitation Counseling	C Nursing Home Care	C Rehabilitation Counseling	SCC Research
	H Rehabilitation Aids	D Home Health Care	H Rehabilitation Aids	SCC Construction
		E Other Professionals		Exclusions:
		F Drugs and Drug Sundries		D Home Health Care (except Nurses)
		H Rehab. Aids		G Rehabilitation Counseling
				H Rehabilitation Aids

Exhibit 3-2

Indirect Cost Typology of Primary Studies

Guidelines	Alcohol Abuse	Drug Abuse	Mental Illness	All Illness
Morbidity	Morbidity Reduced income Lost military productivity	Morbidity Unemployability Absenteeism Emergency room Inpatient hospitalization	Morbidity Disability Inpatient psychiatric Outpatient psychiatric	Morbidity Lost market work Household Disabled totally Institutionalized
Mortality	Mortality Excess death of alcohol abusers due to any cause Lifetime costs	Mortality Only related to episode of drug abuse Single year costs	Mortality Mental illness Suicide Excess death of mentally ill due to other causes Lifetime costs	Mortality All deaths Single year costs Lifetime costs
Reduced productivity				

A final method of summarizing the results of our literature review is to highlight major differences in the methodologies that were developed and implemented by the authors of each of the studies. These major differences, summarized by major cost category, are as follows:

Direct Core Costs. The direct core costs of alcohol abuse included estimates of the costs of excess utilization of the health care system by alcohol abusers, while these costs were not included in the direct core costs of drug abuse and mental illness.

Indirect Core Costs. The lost production of females was not included in the indirect core costs of alcohol abuse, while the indirect core costs of males was based on estimates of total income rather than the more appropriate earnings figure. The future value of foregone production were excluded from the estimates of the indirect core costs of drug abuse, as was the value of foregone household production. The indirect core costs of mental illness excluded the costs of partial disability and contained potential over-estimates of mortality due to the possibility of duplication in estimating the population at risk (those persons with episodes in 1971 of either hospital or physician visits).

Other Related Costs. All studies appeared to contain potential under-estimates of this cost category. None of the studies included the value of lost production of family members and friends associated with ADM problems. In addition, the study on the costs of drug abuse attributed a significant portion of other related costs to heroin abuse and ignored the value of these costs that could occur from the abuse of other types of drugs.

In conclusion, this chapter has reviewed and summarized differences in methodologies and resulting cost estimates for the three types of ADM problems and for all illnesses. Inappropriate methodologies and deficiencies of data used to generate the cost estimates have been pointed out. The results of this review together with a review of currently available data have been used to develop a consistent, methodologically appropriate approach to estimating the costs to society of alcohol and drug abuse and mental illness.

References - Chapter 3

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Chapter 4

Methodological Approach

I. INTRODUCTION

A. Alternatives

Chapter 2 of this report provided a description of the applicability of the alternative ADM population-specific and ADM illness-specific methodologies to estimating each of the major components of the costs to society of alcohol and drug abuse and mental illness, while Chapter 3 summarized the results of previous studies of these costs using these methodologies. As outlined in Chapter 1, the major objective of this study is to produce use of a uniform and comprehensive methodology for each of the three ADM problem areas. In order to determine the specific approach that should be followed in developing these estimates, a series of criteria for comparing the two alternative methodologies was developed in the RTI study. These criteria were organized into three major categories: definitional/conceptual, data availability, and utilization of results. A brief comparison of the two proposed methodologies according to specific criteria within each of these categories is as follows:

B. Selection Criteria

1. Definitional/Conceptual

One of the issues raised in Chapter 2 of this report is that, to the extent possible, estimates of the costs to society of ADM problems should be based on a measure of causality between the ADM problem in question and subsequent behaviors rather than on a more general measure of association between these activities. Although it may be difficult to quantify the extent of causality, nevertheless the ADM illness-specific methodology focuses more specifically on this causal relationship, as it includes a specific factor for the proportion of costs caused by an ADM disorder. On the other hand, the ADM population-specific methodology addresses more general, associative relationships, as it compares the cost experiences of an imperfectly matched group of individuals with and without an ADM disorder.

As indicated throughout this report, the overall objective of the RTI study was to estimate the costs to society of the dysfunctional effects of ADM disorders rather than the costs of all consumption of alcohol and drugs or the general prevalence of alcohol and drug abuse and mental illness. The ADM illness-specific methodology is oriented more toward this dysfunctional behavior than is the ADM population-specific approach in that it focuses on specific types of dysfunctional behavior that are thought to result from alcohol or drug abuse or mental illness.

As discussed in Chapter 2, the ADM population-specific methodology is implemented by estimating the differences in resource utilization and costs between the ADM prevalence population and the non-ADM population. Differences in these costs are then attributed to the specific ADM problem in question. In order to develop valid cost estimates using this methodology, it is essential that members of the ADM and non-ADM groups have similar characteristics except for their ADM problem. In other words, it is necessary to define an appropriate comparison group for the ADM prevalence population, a task that may prove difficult to accomplish. Since a generally poor health status may tend to be correlated with ADM problems, use of an inappropriately defined comparison group may tend to produce upwardly biased estimates of ADM costs to society, as differences between the two groups may be improperly attributed to the ADM problem in question.

In a similar vein, in order to develop appropriate estimates with the ADM illness-specific methodology, it is necessary to identify each specific illness or event that is caused by the ADM problem in question. To the extent that the entire set of illnesses and/or events is not appropriately identified, the ADM illness-specific methodology will yield downwardly biased cost estimates. However, this direction of bias is consistent with that reported in previous ADM costs studies. The authors of these studies have stated that whenever there was a choice, they selected assumptions or data sources that provided conservative estimates of costs to society in order to avoid overstating the problem in the case of uncertainty.

2. Data Availability

As outlined in the materials presented in the remainder of this chapter, appropriate and reliable data are more readily available for developing cost estimates using the ADM illness-specific methodology than with the ADM population-specific methodology. Of particular note is the fact that estimates of actual prevalence of the three ADM problems are critical inputs to using the population-specific methodology. As indicated, for some ADM problems reliable prevalence estimates are not readily available. This is of particular importance since we must distinguish between acute and chronic use of alcohol and drugs in order to develop an operational definition of alcohol and drug abuse.

In a related issue, the data requirements of the ADM population specific methodology are such that it is pretty much of an all or nothing proposition to develop estimates for an individual cost component. In other words, if appropriate data are not available, it is difficult to develop any estimate of the cost of that particular component. On the other hand, this restriction may not necessarily be present in implementing the ADM illness-specific methodology. For example, although

information on treatment resource utilization for ADM problems may not be available for the entire range of treatment settings, sufficiently liable data are available to estimate these costs in major settings such as the ADM specialty treatment facilities. Thus, appropriate information will be available to estimate at least a portion of this cost component with the ADM illness-specific methodology, whereas it may not be possible to develop any reliable estimate with the ADM population-specific methodology.

Finally, the ADM illness-specific methodology appears to be less sensitive to errors in data than the ADM population-specific approach. Implementation of the ADM population-specific approach requires a division of the resource utilization by the ADM population by estimates of the prevalence of the ADM problem in question and a subsequent multiplication of differences in per capita resource utilization costs by this same prevalence estimate. To the extent that there are uncertainties in these prevalence estimates, the resulting cost estimates may be subject to a greater degree of error using the ADM population-specific methodology than the ADM illness-specific methodology.

3. Utilization

The subsequent use of estimates of costs to society of ADM problems is an important criteria in the selection of a methodology, as was affirmed at the March 1980 ADAMHA-sponsored panel on cost-of-illness studies that was conducted as part of the RTI study. Issues of utilization of the cost estimates also have implications for the choice of methodology for their development. Because of its inherent "building block" approach, estimates of costs to society developed by the ADM illness-specific methodology are more amenable to sensitivity analysis than are estimates developed with the ADM population-specific methodology. This results from the fact that assumptions used to develop estimates of costs of individual subelements can be varied in order to test the sensitivity of the cost estimates to these assumptions. These types of sensitivity analyses would be difficult to undertake with results developed through use of the more global ADM population-specific approach.

Similarly, estimates developed through the ADM illness-specific methodology can be more readily used in analyses of various policy options that may be proposed to reduce the ADM problem in question. In particular, estimates for individual cost elements (e.g., treatment costs in ADM specialty settings) can be incorporated into a benefit/cost framework to examine the potential effects of policies to improve treatment effectiveness.

C. Recommendations

Although in some sense the ADM population-specific methodology provides a better conceptual framework through which to approach the development of ADM cost estimates, the issues discussed in the preceding section led the RTI study team to recommend that the ADM illness-specific methodology be used to develop cost estimates for its study. This recommendation was accepted by the ADAMHA review panel for the study, with the stipulation that the population-specific methodology be used to estimate the cost of selected elements if lack of data precluded implementation of the preferred illness-specific methodology.

A summary of the ADM illness-specific methodology as it was implemented for this study is contained in the remainder of this chapter. The resulting estimates are presented in Chapter 5.

II. OVERVIEW

As indicated in Chapter 2 of this report, the basic approach used in the RTI study organizes resulting cost estimates into two major categories: (1) core costs and (2) other related costs. Within each of these major categories, a number of specific direct and indirect cost elements have been estimated. As also pointed out in earlier sections of this report, we have followed a generally conservative approach in estimating these costs. For example, in many cases there are a variety of data sources and/or expert opinion related to a number of assumptions that are necessary to develop the resulting cost estimates. In these cases we have generally selected the assumption and/or data source that yields the lowest or most conservative cost estimate. In other cases, there are no reliable data or assumptions on which to base the cost estimates. In these cases we have generally selected the assumption and/or data source that yields the lowest or most conservative cost estimate. In other cases, there are no reliable data or assumptions on which to base the cost estimates. In these latter situations, estimates of the individual cost elements are not included in our totals. The net result of this approach is that the true cost to society of ADM problems exceeds the estimates presented in this report. However, the portion of the costs developed and presented in the RTI study are based on available data and on research findings and conclusions from a number of studies.

A summary of the completeness of the ADM cost estimates by category is presented in Exhibit 4-1. The row headings in this exhibit present the major categories of cost elements that are discussed in more detail in the remainder of this chapter. As shown in the exhibit, cost estimates are relatively more complete for core direct costs and other related direct costs than they are for other cost categories. However, in reviewing the cost estimates presented in this report, it should be noted that indirect costs can constitute a significant portion of the total cost estimate. Therefore, there is a possibility for a downward bias in the estimates due to incompleteness in these indirect cost estimates, particularly in the case of drug abuse and mental illness.

III. CORE DIRECT COSTS - TREATMENT

Personal health care treatment expenditures are among the most obvious costs to society of illness. The health care treatment sector

of the national economy produced about \$146 billion worth of goods and services in 1977. This is probably the most visible impact of illness on our nation's economy and also the most easily understood since it involves the flow of real goods and services through a market in which they can be readily valued.

The approach used in the RTI study to estimate the core direct treatment costs of ADM disorders involved a number of operations. First, the study identified the various types of settings in which health care goods and services are provided. Health care settings were first organized into two major categories: (1) alcohol abuse, drug abuse, and mental illness (ADM) treatment facilities, and (2) general health facilities. Within each of these major categories, specific treatment facilities were classified as either hospital-based or other facilities and services. Within each of these four classes, more specific types of settings were next identified. The categories and types of health care treatment settings used in this study are based on those used by the National Center for Health Statistics (NCHS) and the National Institute of Mental Health (NIMH), both of which regularly publish utilization data for a wide spectrum of health care treatment settings.

The second step in developing these estimates involved obtaining expenditure data for each of the selected settings. National expenditure data for a variety of categories and settings are annually collected and published by NCHS. Expenditure data on specialty mental health settings (including alcohol abuse and drug abuse treatment) are collected each year by NIMH, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and the National Institute on Drug Abuse (NIDA). Data on expenditures for each of the other settings are also readily available.

The third step in developing estimates of treatment costs was to develop a list of illnesses or diagnostic categories which are caused by an ADM problem and the extent of the causal relationship for each. As shown in exhibit 4-1, these categories may be conveniently organized into four groups: (1) ADM treatment in ADM facilities, (2) ADM treatment in general health facilities, (3) other illnesses caused by ADM, and (4) injury caused by ADM.

A variety of sources was used to estimate the extent of the causal relationship between the ADM problem and specific illnesses. In the case of treatment for the specific ADM problem (i.e., alcoholism, drug abuse, or mental illness), 100 percent of the treatment costs were, of course, allocated to the costs of ADM. For other illnesses related to the ADM disorders, the magnitude and direction of the causal effect is often unknown or poorly established. Of the three ADM components the best information on related illness exists for alcohol abuse and alcoholism. The Third Special Report to the U.S. Congress on Alcohol and Health (Noble 1978) provides a summary of the biomedical consequences of alcohol use and abuse, effects of alcohol on the fetus, and alcohol-

Exhibit 4-1

Completeness of ADM Cost Estimates by Category

Category	Alcohol Abuse	Drug Abuse	Mental Illness
Core Costs			
Direct			
Treatment			
ADM treatment in ADM facilities	C	C	C
ADM treatment in general health facilities	C	C	C
Other illness caused by ADM	I	N	N
Injury caused by ADM	I	N	N
Support			
ADM treatment	C	C	C
Other illness/injury	I	N	N
Indirect			
Mortality			
Death due to ADM disorder	I	I	I
Death due to ADM-caused illness	I	N	N
Death due to ADM-caused injury			
Morbidity			
Reduced productivity			
Current employment	C	I	I
Future employment	N	N	N
Lost employment			
Disability due to ADM disorder	I	I	C
Disability due to ADM-caused illness	I	N	N
Disability due to ADM-caused injury	I	N	N
Other Related Costs			
Direct			
Social welfare administration	C	C	C
Criminal justice system	C	C	N
Motor vehicle crashes	C	N	-
Other property damage	C	C	N
Other	C	C	N
Indirect			
Noninjury time loss	I	N	-
Incarceration	C	C	N
Crime career	-	C	-

Legend: C = relatively complete estimate
 I = incomplete estimate
 N = not estimated due to data unavailability
 - = not relevant

related accidents. Although this report summarizes the information on the effects of alcohol on the physiologic and biochemical system and the increased risk of illness and death, little quantitative information is provided. The exception is for accidents, where the results of a number of studies were summarized by Aarens et al. (1977) and the ranges of the involvement of alcohol in various types of accidents were presented (in percentages).

Information on illnesses caused by drug abuse is limited. Apparently, the only known related illnesses are trauma and side effects and adverse reaction to drugs. However, no reliable data on the extent of this relationship were located during this study. Therefore, these categories were dropped from further consideration.

Eastwood and Trevelyan (1972) found evidence that there is a positive association between physical and psychiatric disorders. However, they suggested the appropriate model may be of many having a generalized psychophysical propensity to disease rather than one which seeks a cause and effect relationship. If this psychophysical propensity model is valid, then it is inappropriate to attribute other illnesses to mental disorders. More information is needed to establish causal relationships if, in fact, there is a causal relationship. For these reasons, the costs of treatment for mental illness-related illnesses and trauma were excluded from further consideration in this study.

The final step involved estimating the utilization of health care services and goods to treat ADM disorders, a task that is more difficult than simply estimating the total value of goods and services provided in each setting. To accomplish this final task, it was necessary to estimate the proportions of goods and services within each health care treatment setting which are used to treat specific ADM disorders. The health care treatment sector generally maintains detailed data on the utilization of goods and services by diagnosis or type of treatment episode. Typical unit of treatment measures include days of care in inpatient settings and the number of visits or periods of treatment for outpatient care facilities. The key to allocating these goods and services to the ADM disorders lies in the diagnosis of illness which is attributed to each episode of health care treatment. This was generally done by using the International Classification of Diseases Adapted (ICDA) system (U.S. DHEW, NCHS 1968). The proportionate utilization of health care goods and services to treat ADM disorders has been used to allocate expenditures within specific treatment settings to these ADM disorders. In addition, expenditures for non-ADM disorders have been included to the extent that these disorders can be shown to be caused by ADM problems.

While total expenditure data are available for each of this study's settings, utilization data by diagnosis are not always readily available. Where this happens, this study has allocated expenditures between

diseases based on the utilization factor found in similar health care treatment settings.

The strengths of the approach outlined above are: (1) it is consistent with the approach used in studies on the cost of all illness, and (2) it is the approach recommended in the recently published Guidelines document. This approach also uses sources of data for expenditures and utilization which have been used in cost-of-illness studies by Rice (1966), Cooper and Rice (1976), and Paringer and Berk (1977). In each of these studies, total treatment expenditures were estimated by setting and then allocated across illnesses within each setting. However, these prior studies did not present their utilization data by diagnosis in sufficient detail to allow estimates for the various ADM disorders to be broken out. This study of the costs of ADM has taken the prior work as its basis in each sector and developed estimates for the specific ADM disorders. Thus, these estimates are comparable with prior estimates made for the costs of all illness.

IV. CORE DIRECT COSTS - SUPPORT

There are expenditures for health care goods and services which are not provided directly to ill persons. These goods and services do, however, facilitate the further provision of treatment services to ill persons and may be termed expenditures for the support of treatment. The types of expenditures which play this support role include research, education and training, construction of health care facilities, and administration of insurance plans.

National expenditures for research, construction, and administration of insurance plans are collected and published along with data on health care treatment expenditures by the Health Care Financing Administration (Gibson 1979). Education and training expenditures have also been obtained from a study performed for the National Academy of Sciences (1974).

The nature of many of these support services is such that they form part of the infrastructure for the entire health care treatment sector of the economy. As infrastructure expenditures, support services may ultimately be used to provide treatment for any one of many different illnesses. A hospital or clinic may be used for general treatment or as a specialty facility. Furthermore, it may change its orientation at any time. Similarly, health personnel may provide treatment to persons with many different illnesses even if they develop specialized skills or work in a specialty facility. In addition, health research may be focused on a specific illness or illness in general ("basic" research).

Such conceptual difficulties led Paringer and Berk (1977) to not allocate support costs to disease categories. However, because this study has a greater focus on disease categories, it has allocated support costs among the different ADM disorders. It has done so by assuming that the proportion of these support expenditures attributable to an ADM disorder is the same as the proportion of total treatment goods and services attributable to that ADM disorder.

V. CORE INDIRECT COSTS - MORTALITY

In addition to consuming health care resources, the ADM disorders exact a cost in terms of morbidity and mortality. Thousands of persons die and millions are incapacitated either temporarily or permanently each year because of studies by Rice (1966), Cooper and Rice (1976) and Paringer and Berk (1977) for all illness and are featured prominently in the cost-of-illness framework outlined in the Guidelines document.

While it is one thing to assert that ADM disorders cause a great deal of death and disability, it is quite another to measure that death and disability and to express those losses in terms that can be compared with the level of resources consumed for health care treatment for ADM disorders. Yet this is precisely what must be done in preparing estimates of the economic costs of ADM disorders. The challenge is to express the ADM-caused death and disability as a dollar value so that the costs of these disorders may be compared with each other, with the value of the treatment services provided, and with these costs for other illnesses.

This section describes how a value has been estimated for the deaths caused by ADM disorders in 1977. The approach used is similar to the approaches used in the earlier studies mentioned above. It first estimates the number of lives lost due to ADM problems in a particular year. The human capital approach is then used to place a dollar value on lost future productivity due to ADM - caused death. The underlying assumption of the human capital approach is that present and future productive time losses by a person due to an ADM-related illness should be valued at a rate commensurate with how the national economy would value the individual's probable productive activity. Market work and housekeeping are both productive activities. Thus, the death of an individual who could have been expected to perform any market work or housekeeping constitutes an economic loss.

Although the human capital approach has been criticized on various conceptual grounds, the primary alternative, the willingness-to-pay approach, has not yet been able to be effectively implemented in cost-of-illness studies. The human capital approach to valuing human life is well defined, generally understood, and in widespread use. It has been used in most of the major cost-of-illness studies, including Rice (1966), Cooper and Rice (1976), and Paringer and Berk (1977).

Accordingly, the Guidelines document recommends that the human capital be used in cost-of-illness studies to estimate the value of mortality losses.

The economic cost of mortality attributed to ADM disorders is calculated by estimating the number of deaths due to ADM disorders in a particular year and assigning a value to each death. The basic data to carry out this procedure have been obtained from the NCHS (U.S. DHEW, NCHS no date). Its Vital Statistics series on mortality lists all deaths recorded in the nation during a calendar year by age and sex of the victim as well as by the primary reason for death as coded by ICDA classification. This study has also obtained estimates from the NCHS on the estimated present discounted value of lifetime productivity of persons by age and sex, using the human capital approach. These values are combined with the mortality data to estimate the economic costs of deaths caused by ADM disorders.

Computationally, the methodology involves determining a priori the diagnostic reasons for death which are causally related to ADM disorders. Appendix A contains a list of these reasons by ICDA diagnostic code. This list does not include all illness for which ADM causality has been demonstrated to date, merely those for which it has been possible to obtain some estimate of the proportion of deaths which can be attributed to ADM. For some illnesses such as trauma and gastrointestinal cancer which may have multiple causes it is difficult to determine what portion of cases are actually due to ADM disorders. Therefore, whenever the proportionate size of the causal relationship between illness and ADM disorder is unknown, this study follows the very conservative approach of assuming no causal relationship.

As indicated above, this study uses the human capital approach once the number of mortalities attributable to ADM disorders has been identified. This approach calculates the present discounted value of expected lifetime productivity for individuals of specific age and sex groups. For each age and sex group a number of factors are calculated: average full-time equivalent earnings, value of average full-time equivalent housekeeping services, value of housekeeping services if employed, labor force participation rates, average supplemental wages, and age/sex cohort survival rates. These factors are all estimated at a point in time, and the calculations assume that individuals will experience these rates over the remainder of their expected lifetime. Productivity rates are assumed to increase at an annual rate of 2 percent throughout the remainder of their expected life. The results are presented in real terms, with the effects of future inflationary increases in wage rates excluded from the present discounted value calculations.

As indicated in earlier sections of this report, a general consensus on the appropriate discount rate to be used in estimating these present values has not been developed.

Therefore, as is recommended in the Guidelines document, our estimates are presented for three separate discount rates--21, 6 and 10 percent. The 6 percent rate represents what many individuals think is the real long-term social discount rate in the U.S., and is consistent with the assumption used in several prior cost-of-illness studies. The choice of the 21 and 10 percent rates was made to provide a reasonable range of alternative estimates of these indirect costs. As shown in the results presented in the following chapter, the estimates of indirect costs are fairly sensitive to the assumed value of the discount rate. Therefore, care must be taken to specify the assumed value of the discount rate in interpreting the resulting indirect cost estimates.

VI. CORE INDIRECT COSTS - MORBIDITY

Losses to society of potential productivity occur because ADM disorders can be highly disruptive of normal life patterns. Cost-of-illness studies traditionally estimate the morbidity which is associated with an illness or disease. These studies estimate the number of hours, days, weeks, and years that individuals are prevented from participating in productive activities because of the illness. The time lost from productive activities is then valued at the potential productive level of the individual. This approach is almost universally used and has been recommended in the Guidelines document.

The most straightforward methodology for calculating these costs is to estimate the amount of time lost from market and household activities and to attribute a value to that time. This procedure has been used in this study. However, the estimates are more difficult to make for ADM disorders than for other illnesses because ADM disorders can cause other illnesses and problems and because the social and legal stigmas attached to ADM disorders discourage full acknowledgement of the true impact of ADM disorders on these other illnesses. These difficulties require that the estimation of productivity losses be conducted through a series of indirect procedures. As a result, estimates of lost productivity due to morbidity tend to be less precise than those for other categories of economic costs to society.

Morbidity resulting from ADM problems causes persons to lose productive time from their endeavors. Any time which is taken away from market or household responsibilities (which these individuals would ordinarily carry out) because of an ADM problem is a loss to society. There are several different avenues through which it is believed that ADM problems cause lost productivity. These avenues include health problems, absenteeism and tardiness, time spent in ADM treatment facilities, lowered quantity or quality of output, incarceration and crim careers.

Health problems from ADM can be manifest in total (chronic) work and withdrawal from the workforce (institutionalized or not), in short-term (acute) illness and disability, or in excessive work loss due to ADM-caused illness (absenteeism and tardiness). In addition to lost time, ADM problems may reduce the productivity of the ADM population which is engaged in market or household activities. This is reflected in lower productivity for this group on the average than for the general population with similar sociodemographic characteristics. In our cost framework, the time an individual is incarcerated and the time spent in crime careers and thus lost from productive activities is designated as an other related indirect cost; procedures for estimating this component are detailed in the concluding section of this chapter.

The key to operationalizing this approach is to identify persons who experience lowered productivity due to ADM-related reasons. These reasons have been specified above, although they can involve greater detail in such areas as health-related problems. In theory the productivity losses can be calculated and summarized for reduced on-the-job productivity, lost productive time, and lost employment opportunities. However, data limitations precluded us from developing separate estimates of productivity losses for reduced on-the-job productivity and lost productive time. As shown in exhibit 4-1, these morbidity losses are estimated as a single category--reduced productivity. Therefore, our estimates are presented for two major categories: (1) reduced productivity and (2) lost employment.

In developing the estimates it is first necessary to estimate the number of persons with a given ADM problem who have a specific reason for losing productivity. To facilitate use of productivity data, these estimates are made separately for a series of age/sex cohorts. Then, the average annual loss of time per person must be obtained. Multiplication of these two numbers defines the total lost productive time in a year for this group of people. This lost productive time is valued at the wage rate of the general population in the given age/sex cohort, with the results summed across age/sex cohorts.

Next, it is necessary to estimate the proportion of the lost productivity that is caused by the ADM problem. In some cases (e.g., reductions in on-the-job productivity), available data and information are not as clear cut. As discussed in detail in appendix A, in these cases we have based our estimates on the best available information from prior studies. Furthermore, we have consistently selected conservative assumptions, with the result that the cost estimates presented in this report underestimate the true economic cost to society of these ADM problems.

As outlined in exhibit 4-1, costs of reduced productivity on the job may occur for both current (1977) employment and future employment. As discussed in more detail in chapter 7 of this report, these future productivity losses may occur because of events such as time lost from

schooling or premature infant deaths due to an ADM problem. However, there are no data available for developing reliable estimates of these productivity losses for future employment and they have therefore been excluded from our study.

The first step in estimating the costs of productivity losses due to alcohol abuse for currently employed individuals was to determine the number of individuals suffering these losses. Previous studies have used a variety of definitions and concepts to estimate this number. In many cases, it is difficult to develop precise estimates of the number of individuals who suffer productivity losses. Based on a review of a number of previous studies, we decided to use the term "problem drinkers" in defining this set of individuals, with the term referring to alcohol abusers who are either alcoholics or persons with drinking problems. A prevalence estimate that 10 percent of the labor force can be classified as problem drinkers has been widely quoted in several official NIAA documents and in other literature on alcohol abuse problems in the labor force. Applying Cahalan's (1970) data on the prevalence of drinking problems across several age and sex categories in the general population, we have estimated that there were about 7.8 million male (14 percent prevalence) and 1.2 million female (3.2 percent prevalence) problem drinkers employed in 1977. This amounts to a total of 9.0 problem drinkers or 9.7 percent of the employed population. In addition, these prevalence rates suggest that .07 percent of housewives were problem drinkers in 1977.

Similarly, reliable data on the extent of reduction in productivity experienced by these problem drinkers was difficult to obtain. After reviewing a number of sources, it was decided that Berry and Boland's estimate of a 14.0 percent reduction was the best available. This value was used to estimate the value of reduced productivity for individuals currently engaged in productive activities. Further detail on the development of these estimates is provided in Appendix A.

Our attempts to estimate the value of reduced productivity due to drug abuse were characterized by a paucity of available, reliable data. Although several excellent studies of the prevalence of drug abuse in the general population are available, we were unable to find any reliable information on the effects of this drug abuse on the work performance of the employed population.

However, we were able to estimate the value of reduced productivity for one population segment--young males--using data from a worldwide survey of alcohol and drug abuse in the U.S. military (Burt and Biegel 1980). Using the results of this study and other information on the prevalence of drug abuse in the general population, we estimated that about 17 percent of employed young males experience drug-related work impairment. In the absence of specific information, we estimated that the degree of work impairment was identical to that for problem drinkers - a 14.0 percent reduction in productivity. However, lack of adequate

data prevented us from estimating the value of reduced productivity due to drug abuse among other population segments.

Individuals who experience a partial work disability due to a mental disorder were identified as a source of reduced productivity for mental illness. Using information from the Survey of Income and Education (U.S. DOC, BOC 1978) we estimated the magnitude of these costs for individuals with chronic nervous disorders and severe emotional disorders. As in the case of productivity losses due to drug abuse, we believe that these estimates are incomplete, due in large part to the social stigma associated with mental illness and the probable under-reporting of the prevalence of these problems in general population surveys such as the Survey of Income and Education.

As indicated in exhibit 4-1, the costs of lost employment can occur from a disability due to an ADM disorder or from an ADM-caused illness or injury. Our estimates of the value of lost employment from the ADM disorders are relatively complete in the case of mental illness, but are somewhat incomplete for alcohol abuse and drug abuse. In the case of ADM-caused illness or injury, we were able to obtain sufficient data with which to estimate some of these costs for alcohol abuse. As indicated in this exhibit, insufficient data were available for estimating this cost component for drug and mental illness.

Data were available to estimate three major sources of costs of lost employment caused by alcohol abuse: (1) residential treatment, (2) trauma (accidents and violence), and (3) long-term disability. In terms of the typology of costs presented in exhibit 4-1, the indirect costs of residential treatment are classified as the costs of lost employment due to alcohol abuse, while the indirect costs of trauma and long-term disability are classified as costs of lost employment due to alcohol abuse-caused illness or injury.

The only problem for which data were available to estimate the costs of lost employment caused by drug abuse was time spent in residential treatment. Two major sources of lost employment were included in the morbidity costs of mental illness: (1) complete work disability, and (2) institutionalization. We were able to estimate costs of lost employment for separate reasons for each of these categories. In the case of complete work disability costs were estimated for chronic nervous disorders and severe emotional disorders. Costs for two separate types of institutionalization were incorporated into our estimates: nursing homes and psychiatric hospitals.

The basic approach used to estimate these costs was to estimate the amount of lost employment, measured in units such as person-days, and then to estimate the value of this lost employment with the market and nonmarket productivity data used to develop estimates of other indirect cost elements.

In some cases (e.g., time spent in residential treatment), 100 percent of the costs of employment losses were attributed to the appropriate ADM problem. In others (e.g., complete or partial work disability), estimates of the portion of the lost employment due to the relevant ADM problem were made using data from a variety of sources. In particular, it should be noted that this approach provides estimates of the costs of lost employment due to ADM treatment that are consistent with the direct core treatment costs and with standard information included in NIAAA, NIDA, and NIMH treatment utilization reporting systems.

VII. OTHER RELATED COSTS - DIRECT

A. Introduction

As indicated in chapter 2 of this report, a number of specific cost elements are included within the general category of other related direct costs within the overall cost framework employed for this study. Examples of these cost elements are provided in exhibit 2-1 of this report.

Previous studies of the costs to society of ADM problems have incorporated a number of specific cost elements in this category. As presented in the previous chapter, the most relevant cost elements for each of the three ADM problems have been:

<u>Alcohol Abuse</u>	<u>Drug Abuse</u>	<u>Mental Illness</u>
Criminal justice system	Criminal justice system	Social welfare system
Social welfare system	Social welfare system	
Motor vehicle crash losses	Drug traffic control	
Fire losses		
Fire protection		
Highway safety		

A brief summary of the procedures used to estimate each of these components is as follows

B. Criminal Justice System

In estimating criminal justice system costs associated with alcohol and drug abuse, we have developed estimates for each of the three major components of the criminal justice system--law enforcement, the judicial process, and corrections. Using the general taxonomy of the Uniform Crime Reports (U.S. DOJ, FBI 1978), we first developed a list of the major crime categories that previous studies indicated could be caused by or associated with alcohol or drug abuse. A listing of these crimes is provided in exhibit 4-2.

We next distributed the costs of the three major components of the criminal justice system to each of these crime categories, using appropriate measures of criminal justice system activity. For example, law enforcement costs were distributed in proportion to the number of arrests for each offense; and judicial costs were distributed in proportion to the number of cases charged for each offense. Corrections costs were separated into state, Federal, and local components and distributed according to the number of incarcerations in state and Federal prisons and according to the number of persons charged in the case of local jail costs.

This procedure suffers from the implicit assumption that the average cost per unit activity (e.g., arrest, trial) is the same for each of the crime categories. However, in the absence of more detailed data on resource utilization, this approach is necessary and appropriate. The approach does take into account the varying levels of intensity of resource utilization that are experienced as the set of cases moves through the criminal justice system. This occurs because the different factors (e.g., arrests, cases tried, incarceration rates) are used to allocate costs of the three components of the system.

Once the portion of criminal justice system costs required to process individuals committing each type of crime has been determined, the next step is to estimate the portion of these costs that are caused by alcohol or drug abuse.

There are several sources of available data for estimating these causal factors. In the case of alcohol abuse, Berry and Boland reviewed a number of studies of these causal factors and devise a series of single estimates based on these studies. In addition, data useful for this purpose are available from a national survey of approximately 10,000 inmates in state correctional institutions (U.S. DOJ, LEAA 1976). During this survey, inmates were asked about their use of alcohol at the time of the offense that resulted in their incarceration. Both published and unpublished data from this survey have been used to estimate the magnitude of these causal relationships.

Each of the above sources provides information on the number of crimes "associated with" alcohol use or abuse; none provides definitive information on the proportion of crimes "caused by" alcohol abuse. In addition, a recently completed National Institute of Justice (NIJ)-sponsored project conducted by the Research Triangle Institute indicated that definitive information on the percentage of various types of crimes caused by alcohol abuse simply does not exist (Collins forthcoming). Therefore, our approach to implementing the event-specific methodology here has been to confer with both the NIJ-sponsored project's advisory panel of nationally recognized experts and RTI staff participating in the project to develop

Exhibit 4-2

Crimes Associated With Alcohol Abuse and Drug Abuse

<u>Crime Category</u>	<u>Alcohol Abuse</u>	<u>Drug Abuse</u>
<u>Violent Crimes</u>		
Homicide	X	
Forcible rape*	X	
Aggravated assault	X	
<u>Property Crimes</u>		
Robbery	X	X
Burglary	X	X
Larceny	X	X
Auto Theft	X	X
Receiving or selling stolen goods		X
<u>Other</u>		
Prostitution		X
Drug abuse violations		X
Driving under influence	X	
Liquor law violations	X	
Public drunkenness	X	

* Forcible rape and aggravated assault are combined under felonious assault in later analyses.

reasonable estimates of the portion of crimes caused by alcohol abuse. Although this procedure does not provide us with an empirically developed estimate, it does provide us with current state-of-the-art knowledge with respect to "expert opinion" of this causality factor.

A similar approach was used to estimate the causal factors for crimes associated with drug abuse. The principal empirical data source for drug related crime was information from LEAA's survey of inmates (U.S. DOJ, LEAA 1976). This survey includes tabulations of the proportions of inmates who were regular drug users at the time they committed the crime for which they were incarcerated. In addition, the survey provides information on the distribution of incarcerations in state prisons for all types of offenses, information which can be readily used to estimate corrections costs.

A supplemental source of information for these factors is data from the Treatment Outcome Prospective Study (TOPS) currently being conducted by NIDA by the Research Triangle Institute (Rachal et al. 1981). The project collects detailed information on drug use, employment experiences, criminal behavior, and other factors from a sample of about 3500 clients in drug treatment programs in six cities around the nation. The information on criminal activity includes types and frequencies of crimes committed during various time periods prior to entering treatment.

Preliminary analyses of the TOPS data have enabled us to assess the relationships between use of various licit and illicit drugs and different types of criminal activities. The major drug categories used have been opiates and nonopiates. As in the case of alcohol abuse, the TOPS staff have been asked to indicate their best estimates of the causal relationship between drug abuse and crime. These, together with estimates from previous studies, have been used to develop current state-of-the-art estimates of the magnitude of this causal factor.

Social Welfare System

Many individuals who abuse alcohol or drugs or who suffer from mental illness also receive cash transfer payments from various programs in the nation's social welfare system. As indicated in chapter 2 of this report, these payments do not represent costs to society in our framework since they are merely transfers from one group in society to another. However, the management and administration activities of these programs do consume resources and are properly included as costs to society within our framework.

Our approach to estimating these costs was to first identify the relevant social welfare programs in which individuals with ADM problems participate. Based on previous ADM cost-of-illness studies and an analysis of income data from studies of individuals with these problems (e.g., unpublished data from the TOPS study), the following were identified as the pertinent programs: Age, Survivors, Disability and Health Insurance (OASDHI) Program administered by the Social Security Administration; unemployment insurance; railroad temporary disability insurance; state temporary disability insurance; worker's compensation; public assistance, primarily Aid to Families with Dependent Children; Supplemental Security Income; Food Stamps; Veteran's compensation and benefits; and vocational rehabilitation. The next step was to identify the amount of management and administrative costs for each program and the proportions of client caseloads due to each of the three ADM disorders. Finally, the ADM cost to society for each of these programs was calculated by determining the proportions of administrative and management expenses required to provide services to clients with ADM disorders.

Motor Vehicle Crash Losses

As discussed in the Berry and Boland report, there are a number of specific elements present in estimating the costs to society of motor vehicle accidents. According to Faigin (1976) these include: lost production/consumption and medical, funeral, legal and court, insurance administration, accident investigation, second party, vehicle damage, and traffic delay costs.

Of these elements, production/consumption losses are considered indirect core costs within our framework and a summary of procedures for their estimation has been included in an earlier section of this chapter. Similarly, procedures for estimating medical (direct core costs) and losses to others (other related indirect costs) are discussed in the appropriate sections of this chapter.

The event-specific methodology was appropriate for estimating the magnitudes of the remaining cost elements. Barry and Boland and Jones and Joscelyn (1978) reviewed an extensive literature to determine the portions of these costs that were caused by alcohol abuse, using as their causal factor the percent of drivers with different levels (0.05 and 0.10 percent) of blood alcohol concentration (BAC) at the time of the accident. During this study, conversations with the staff of the Office of Program Evaluation of the National Highway Traffic Safety Administration (NHTSA) indicated that no additional studies of these costs had been undertaken since the Faigin study. Therefore, the basic approach used by Berry and Boland and Faigin for estimating the costs to society of motor vehicle crashes is still appropriate for the event-specific methodology and was thus used in this study.

Additional data requirements to estimate the costs to society of motor vehicle accidents in 1977 include the number of fatalities, injuries (reported by severity level), and vehicle accidents involving property damage only. These data are available from the National Crash Severity Study (Ricci 1980) in current operation by NHTSS and from the National Safety Council (1979). Values of these data for 1977 were used with the other relevant data from the Faigin report (1976) to develop estimates of these cost components.

Although it is hypothesized that drug abuse also may lead to an increased number of motor vehicle accidents, reliable data with which to estimate the value of this cost element do not yet exist. Therefore, these costs were excluded from our study.

E Other

The remaining cost elements for alcohol abuse-fire losses, fire protection, and highway safety-represent relatively small portions of the total costs to society of alcohol abuse. For this reason and because the Berry and Boland estimates were developed using the event-specific methodology, we have applied their estimated causal factors to the relevant expenditure data for 1977 in order to develop our estimates of these cost elements.

In the case of drug abuse, expenditures for law enforcement expenditures for drug traffic control have not been included in the earlier studies of criminal justice system expenditures. However, this study was able to obtain data from appropriate documents to estimate these cost elements for 1977.

VIII. OTHER RELATED COSTS - INDIRECT

Estimates of three major categories of other related indirect costs have been developed for the study. These are: (1) the costs of lost work time experienced by individuals other than the victims in alcohol-caused accidents and by other persons delayed in traffic because of alcohol-caused accidents, (2) the lost productivity from incarceration brought on by either alcohol or drug abuse, and (3) the costs of crime careers caused by drug abuse. Consistent with our estimates of the other costs of motor vehicle crashes, the Faigin (1976) methodology was used to estimate costs in the first category. Incarceration costs were estimated by first calculating the number of persons incarcerated due to alcohol- and drug-related offenses, estimating the amount of time of incarceration for the crime, and attaching an estimate of the value of this time spent incarcerated. The data and assumptions used for these calculations were consistent with those used to develop estimates of other cost components (e.g., criminal justice system costs) for this study.

One of the major sources of other related indirect costs of ADM problems is the opportunity costs of the time of individuals who are engaged in crime careers as a result of drug abuse. We have developed estimates of these losses based on the hypothesis that serious drug abuse can cause a person to forego normal productive activities in favor of selling drugs, committing income-generating crimes, or engaging in other illicit activities. These costs were estimated in a relatively straightforward fashion. First, the prevalence of heroin abuse, heroin addiction, and dysfunctional abuse of other drugs was estimated. Second, estimates were made of the socioeconomic and demographic characteristics of these populations. Third, the portions of these populations which have been caused to move into illicit activities because of their drug abuse problem were specified. Finally, this lost productive time was assigned a potential market value.

Previous studies of the costs to society of drug abuse have resulted in a wide range of estimates of this cost component. This variation is due primarily to uncertainty in estimates of both the prevalence of drug abuse, particularly for opiate abuse, and the portions of illicit activities that are caused by drug abuse. For our estimates, we used data in official NIDA and ADAMHA publications as our source of prevalence estimates. Estimates of the causal relationships between drug abuse and illicit activities were obtained from special analyses of data on the drug treatment population who are participating in the NIDA-sponsored Treatment Outcome Prospective Study (Rachal et al. 1981). This study, which is currently in progress, provided detailed information on the treatment population's employment history and illicit activities for one year prior to admission and during treatment. Further data on socioeconomic characteristics of these individuals and drug of choice are also available.

Among the individuals admitted to treatment in the TOPS study in 1979, illicit activities were the major occupation for 54 percent of the male opiate abusers, 39 percent of the female opiate abusers, 46 percent of the male nonopiate abusers, and 29 percent of the female nonopiate abusers. These percentages were applied to the appropriate general prevalence populations to estimate the total numbers of drug abuser engaged in illicit activities. Details are provided in appendix A.

References - Chapter 4

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Chapter 5

Results

I. OVERVIEW

Application of the ADM illness-specific methodology summarized in chapter 4 produced an estimated economic cost to society of ADM problems of approximately \$106 billion in 1977. The estimated for each ADM disorder ranged from a high of \$49.4 billion for alcohol abuse to \$16.4 billion for drug abuse. The cost to society of mental illness in 1977 was \$40.3 billion. A summary of these costs is presented in table 5-1. Details of each of the major cost components are presented in the remaining sections of this chapter.

As was mentioned in chapter 4, this study could identify either no data or only incomplete data for many categories of cost. In these instances, either no cost estimates or only partial cost estimates were developed. Thus, the estimated economic costs to society presented here tend to be very conservative. On the other hand, there were instances where the association between ADM disorders and various economic costs could not be fully adjusted to reflect causality. To the extent that this occurred, the estimates may be liberal. However, it is the authors' belief that, overall, the estimates lean strongly in the conservative direction.

In addition, data availability was uneven across the three ADM problems, with the greatest amount of available data pertaining to alcohol abuse. Thus, although particular types of costs can be compared where adequate data are available, it would not be valid to compare this study's estimates of the total economic costs to society of each of the three ADM disorders.

II. CORE DIRECT COSTS - TREATMENT

As indicated in chapter 4, treatment for ADM problems can occur in a variety of settings. The categories of settings for which treatment costs are estimated for this effort include ADM facilities, both hospital-based and other and general health facilities, both hospital-based and other. A summary of the treatment costs in various settings within each of these major categories is presented in table 5-2.

As shown in the table, direct treatment costs range from \$1.1 billion for drug abuse to \$15.8 billion for mental illness. Treatment costs for alcohol abuse were estimated at \$5.6 billion in 1977. The distribution of treatment costs across the categories of settings was different for each of the three ADM problems. For alcohol and drug abuse, the higher treatment costs were found in general health facilities, primarily non-Federal community hospitals.

However, for mental illness the highest treatment costs were found in ADM specialty facilities, primarily state and county psychiatric hospitals.

In the case of treatment for alcohol abuse, were able to estimate costs for various types of illnesses. As shown in table 5-2, \$2.7 billion, or 48.0 percent of the treatment costs, were used to treat alcohol abuse-specific illness (e.g.: alcoholism, alcohol psychosis, alcoholic cirrhosis). Treatment for alcohol abuse-related trauma constituted \$1.2 billion, or 21.5 percent of the total, while the remaining \$1.7 billion or 30.4 percent (con't on page 5-2)

Table 5-1

Costs to Society of Alcohol Abuse, Drug Abuse and Mental Illness, 1977				
	(\$ in millions)	Drug Abuse	Mental Illness	Total
Core Costs	<u>\$43,161</u>	<u>\$5,174</u>	<u>\$39,739</u>	<u>\$ 88,074</u>
Direct.....	<u>6,372</u>	<u>1,290</u>	<u>18,197</u>	<u>25,859</u>
Treatment.....	<u>5,637</u>	<u>1,078</u>	<u>15,761</u>	<u>22,476</u>
Support.....	<u>735</u>	<u>212</u>	<u>2,436</u>	<u>3,383</u>
Indirect.....	<u>36,789</u>	<u>3,884</u>	<u>21,542</u>	<u>62,215</u>
Morbidity ^{a/}	<u>10,715</u>	<u>831</u>	<u>5,926</u>	<u>17,472</u>
Morbidity.....	<u>26,074</u>	<u>3,053</u>	<u>15,616</u>	<u>44,743</u>
Reduced productivity..	<u>23,593</u>	<u>2,330</u>	<u>1,646</u>	<u>28,069</u>
Lost employment.....	<u>2,481</u>	<u>223</u>	<u>13,970</u>	<u>16,674</u>
Other Related Costs.....	<u>6,213</u>	<u>11,213</u>	<u>548</u>	<u>17,974</u>
Direct.....	<u>4,441</u>	<u>4,776</u>	<u>548</u>	<u>9,765</u>
Motor vehicles crashes	<u>1,782</u>	<u>*</u>	<u>-</u>	<u>1,782</u>
Crime.....	<u>1,685</u>	<u>4,453</u>	<u>*</u>	<u>6,138</u>
Public	<u>1,479</u>	<u>3,347</u>	<u>*</u>	<u>4,826</u>
Private	<u>191</u>	<u>1,033</u>	<u>*</u>	<u>1,224</u>
Property loss/damage	<u>15</u>	<u>73</u>	<u>*</u>	<u>88</u>
Social Welfare program	<u>142</u>	<u>12</u>	<u>548</u>	<u>702</u>
Other.....	<u>832</u>	<u>311</u>	<u>*</u>	<u>1,143</u>
Indirect.....	<u>1,772</u>	<u>6,437</u>	<u>*</u>	<u>8,209</u>
Crime careers.....	<u>-</u>	<u>5,143</u>	<u>-</u>	<u>5,143</u>
Incarceration.....	<u>1,418</u>	<u>1,294</u>	<u>*</u>	<u>2,712</u>
Motor vehicle crashes....	<u>354</u>	<u>*</u>	<u>-</u>	<u>354</u>
Total.....	<u>\$49,374^{b/}</u>	<u>\$16,387^{b/}</u>	<u>\$40,287^{b/}</u>	<u>\$106,048</u>

Totals may not add due to rounding.

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

^{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 2½ percent. The use

(continuation of Table 5-1)

of a 10 percent rate decreases indirect costs by the following amounts: alcohol abuse--\$3,634 million; drug abuse--\$304 million; and mental illness \$2,022 million. The use of a 2½ percent rate increases indirect costs by the following amounts: alcohol abuse--\$7,164 million; drug abuse--\$602 million; and mental illness--\$3,820 million.

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. Table 4-1 can be used to identify those categories of cost which are comparable across the three ADM disorders.

SOURCE: Research Triangle Institute.

of the treatment costs were used to treat various alcohol abuse-related illnesses. As shown in table 5-3, approximately \$608 million or 35 percent of the costs of treating alcohol abuse-related illnesses were used to treat illnesses of the endocrine system. Evidence on the relationship between specific physical diseases and drug abuse and mental disorders is not yet sufficiently developed to justify including an estimate here. However, it should be noted that many studies have found that those in treatment for mental disorders also use a disproportionately high level of medical care services.

III. CORE DIRECT COSTS - SUPPORT

The support costs of providing ADM health care treatment in 1977 were approximately \$3.4 billion. These expenditures are for the infrastructure of the health care treatment sector. Activities financed by these expenditures do not include direct health care services. However, they do make treatment services possible. These expenditures include research, training and education, construction, and expenses for administration of health care insurance programs. (see table 5-4)

Expenditures for alcohol abuse support services were estimated at \$7735 million in 1977. The largest component of this was for administration of insurance programs--\$289 million. The second largest component was for training and education of health care personnel, estimated at \$225 million. Finally, \$193 million was expended for construction and \$28 million for research.

5-3
Table 5-2

ADM Expenditures by Setting, 1977
(\$ in millions)

Settings	Expenditures							All ADM	All Illnesses
	All Alcohol Abuse Illnesses	Alcohol Abuse Specific Illnesses	Alcohol Abuse Related Trauma	Alcohol Abuse Related Illness	Drug Abuse	Mental Illness			
ADM Facilities	707	707	-	-	364	7,624	8,695	8,695	
Hospital-based	306	306	-	-	51	4,747	5,104	5,104	
State and county psychiatric hospitals	200	200	-	-	33	3,097	3,330	3,330	
Private psychiatric hospitals	34	14	-	-	6	524	563	563	
VA neuropsychiatric hospitals	29	29	-	-	5	454	488	488	
Non-federal general hospitals with separate psychiatric hospitals	43	43	-	-	7	672	723	723	
Other ADM facilities and services	401	401	-	-	313	2,877	3,591	3,591	
Federally funded CMHCs	129	129	-	-	39	822	990	990	
Residential treatment centers for children	-	-	-	-	-	359	359	359	
Halfway houses	37	37	-	-	12	42	91	91	
Multiservice mental health facilities	8	8	-	-	1	127	136	136	
Other freestanding facilities	198	199	-	-	195	434	827	827	
ADM units in correctional facilities	3	3	-	-	20	-	23	23	
Private practice psychiatrists	18	13	-	-	32	763	813	813	
Private Practice psychologists	8	5	-	-	14	330	352	352	
General health facilities	4,930	2,001	1,217	1,711	714	8,137	13,781	139,010	
Hospital-based	2,848	1,285	628	935	432	2,655	5,935	57,864	
Non-federal community hospitals (excluding psychiatric units)	2,274	880	586	808	363	1,557	4,194	52,230	
VA general hospitals and other facilities	425	321	19	85	37	940	1,402	3,362	
Other federal facilities	149	84	23	42	32	158	330	2,272	
Other general health facilities and services	2,082	716	589	776	282	5,482	7,846	81,146	
Nursing homes	108	63	40	-	-	2,225	2,333	13,364	
Private practice physicians	548	16	250	281	31	487	1,066	30,429	
Dentists	443	195	93	155	82	-	525	11,650	
Other health professionals	133	62	27	44	12	111	250	3,345	
Drugs and drug sundries	525	232	110	183	97	1,643	2,265	13,810	
Other health services	222	98	47	77	41	695	958	5,844	
Volunteer services	103	45	22	36	19	321	443	2,700	
TOTAL	5,627	2,703	1,217	1,711	7,078	15,761	22,476	147,705	

5-3
Table 5-2

ADM Expenditures by Setting, 1977
(\$ in millions)

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ADM Facilities	707	707	-	-	364	7,624	8,695	8,695
Hospital-based	306	306	-	-	51	4,747	5,104	5,104
State and county psychiatric hospitals	200	200	-	-	33	3,097	3,330	3,330
Private psychiatric hospitals	34	14	-	-	6	524	563	563
VA neuropsychiatric hospitals	29	29	-	-	5	454	488	488
Non-federal general hospitals with separate psychiatric hospitals	43	43	-	-	7	672	723	723
Other ADM facilities and services	401	401	-	-	313	2,877	3,591	3,591
Federally funded CMHCs	129	129	-	-	39	822	990	990
Residential treatment centers for children	-	-	-	-	-	359	359	359
Halfway houses	37	37	-	-	12	42	91	91
Multiservice mental health facilities	8	8	-	-	1	127	136	136
Other freestanding facilities	198	199	-	-	195	434	827	827
ADM units in correctional facilities	3	3	-	-	20	-	23	23
Private practice psychiatrists	18	13	-	-	32	763	813	813
Private Practice psychologists	8	5	-	-	14	330	352	352
General health facilities	4,930	2,001	1,217	1,711	714	8,137	13,781	139,010
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Other health services	222	98	47	77	41	695	958	5,844
Volunteer services	103	45	22	36	19	321	443	2,700
TOTAL	5,627	2,703	1,217	1,711	7,078	15,761	22,476	147,705

Table 5-3

Estimated Direct Treatment Costs for Alcohol
Abuse by Type of Illness - 1977
(\$ in millions)

Type of Illness	Costs
Alcohol abuse-specific illness - specialty setting	<u>\$ 707</u>
Alcohol abuse-specific illness - general setting	<u>\$2,001</u>
Alcohol abuse-related illness - categories	<u>\$1,711</u>
Gastrointestinal tract	220
Liver disease	181
Nervous system	6
Heart	17
Endocrine system	608
Nutritional deficiency	108
Cancer	171
Mental disorder	293
Infectious disease	107
Alcohol abuse-related trauma	<u>1,217</u>
Total	<u>\$5,637</u>

Totals may not add due to rounding.

SOURCE: Research Triangle Institute.

Table 5-4

Support Costs for ADM Health Care Provision, 1977
(\$ 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*	\$ 3,684	0.77	2.08	6.33	\$ 28.2	\$ 76.6	\$ 233.2	\$ 338.0
Training & education**	5,882	3.82	0.73	11.90	224.7	42.9	700.0	967.6
Construction**	5,055	3.82	0.73	11.90	193.1	36.9	601.5	831.5
Health insurance administration**	7,572	3.82	0.73	11.90	289.3	55.3	901.1	1,245.7
TOTAL	\$22,193	3.21	0.95	10.98	\$735.3	\$211.7	\$2,435.8	\$3,382.8

*From the Report by President's Commission on Mental Health (1978).

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

SOURCE: Research Triangle Institute.

Drug abuse support expenditures were \$212 million in 1977. The largest component was research, estimated at \$77 million. Other expenditures included health insurance administration--\$55 million, training and education \$43 million, and construction--\$37 million.

Support expenditures for mental illness were much greater than those for either alcohol abuse or drug abuse--\$2.4 billion in 1977. The largest component was for health insurance administration at \$901 million, followed by training and education with \$700 million, construction at \$602 million, and research with \$233 million.

IV. CORE INDIRECT COSTS - MORTALITIES

As shown in table 5-5, mortalities due to alcohol abuse that occurred in 1977 resulted in \$10.7 billion worth of lost future productivity, assuming a 6 percent discount rate. This estimate is based on the estimate that approximately 65,300 deaths that occurred in 1977 were due to alcohol abuse. Alternative estimates for discount rates of 2½ and 10 percent are also shown in table 5-5. These range from \$7.1 billion for a 10 percent discount rate to \$17.9 billion for a 2.5 percent discount rate. These three discount rates were used, as is recommended in the PHS Guidelines document. For the sake of simplicity, the estimates shown in summary tables are those derived by using the 6 percent or middle rate.

Alcohol-related premature mortality may be broken down into three major groups. The first of these is termed direct primary causes. This group includes alcohol psychoses, alcoholism, alcoholic cirrhosis of the liver, and alcohol poisoning. All deaths in this are attributed to alcohol abuse. In 1977, there were a total of 18,800 deaths due to these causes, accounting for a cost of \$2.6 billion in foregone productivity at a 6 percent discount rate.

The second group of mortalities is termed direct secondary causes, and includes diseases such as other cirrhosis of the liver, various neoplasms, pancreatitis, and respiratory tuberculosis. In 1977, there were a total of 10,800 deaths in this group attributed to alcohol abuse, resulting in a cost of \$1.1 billion at a 6 percent discount rate. As shown in table 5-5, the percentages of these deaths attributed to alcohol abuse varies according to the specific disease. In addition, no reliable data were available to estimate either the percentage of other malignant neoplasms of the gastrointestinal tract or the percentage of other associated diseases due to alcohol abuse. Since 1977 deaths in these categories constituted approximately 75 percent of the total deaths in this group, the unavailability of reliable data with which to establish this causal factor may result in an underestimate of mortality costs in this category.

Table 5-5
Economic Cost of 1977 Mortalities Due to Alcohol Abuse - for Various Discount Rates
(\$ in millions)

Cause of Death - Primary diagnosis	Mortalities in 1977			Discount Rates		
	Total	Attributed to Alcohol Abuse Percent	Number	10%	6%	2½%
<u>Direct Primary Causes</u>	18,784	100	18,784	\$1,953	\$1,953	\$3,608
Alcohol Psychosis	318	100	318	33	43	59
Alcoholism	5,100	100	5,100	569	775	1,097
Alcoholic cirrhosis of liver	13,029	100	13,029	1,307	1,738	2,365
Alcoholic poisoning	337	100	337	43	59	86
<u>Direct Secondary Causes</u>	97,108		10,767	803	1,063	1,448
Cirrhosis of liver--other	17,819	44.6	7,948	640	847	1,152
Malignant primary liver neoplasms.	2,409	56	1,349	59	75	97
Other malignant neoplasms of gas- trointestinal tract.....	63,084	*	0	-	-	-
Pancreatitis	2,550	35.5	905	73	100	142
Respiratory tuberculosis	2,259	25	565	31	41	57
Other associated diseases	8,987	*				
<u>Indirect Causes</u>	151,579		35,774	4,325	7,035	12,823
Motor vehicle crashes	49,513	37	18,320	2,532	4,210	7,838
Falls	13,946	44.4	6,192	280	401	634
Fires	6,361	25.9	1,647	146	243	476
Other **	33,379	11.1	3,705	432	712	1,337
Homicide	19,699	30	5,910	935	1,469	2,538
Suicide	28,681	0	0	0	0	0
<u>TOTAL.....</u>	267,471		65,325	\$7,081	\$10,715	\$17,879

*

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

**

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

SOURCE: Research Triangle Institute, unpublished mortality data from the Vital Statistics files provided by NCHS.

The balance of the mortalities attributed to alcohol abuse were due to trauma--accidents and violence. These include motor vehicle crashes, falls, fires, other accidents, and homicides. These reasons accounted for 35,800 mortalities attributed to alcohol abuse and \$7.0 billion worth of lost future productivity. The single largest component of alcohol abuse mortality losses in this group was motor vehicle crashes, which was estimated at \$4.2 billion in 1977, using a 6 percent discount rate. Thus, approximately 40 percent of the total value of mortality losses due to alcohol abuse was due to driving while intoxicated.

Drug abuse is implicated in a more limited number of mortalities than is alcohol abuse. The U.S. Vital and Health Statistics series (U.S. DHEW, NCHS no date) indicates that 3590 persons died due to drug abuse in 1977. This suggests an estimated lost future production of \$831 million at a 5 percent discount rate (table 5-6). The reasons for death included drug dependence, accidental overdose of psychoactive drugs, accidental overdose of other drugs and medicaments, and overdose of drugs and medicaments for undetermined reasons. Suicides by use of drug overdose have been included in the costs of mental illness.

Table 5-6 presents estimates for the three alternative discount rates used in this study. These estimates are \$831 million at a 5 percent discount rate and range from \$527 million at a 10 percent discount rate to \$1,433 million at a 2.5 percent discount rate.

There are three possible categories of mortality that might be due to mental illness: (1) psychoses and neuroses, (2) suicide, and (3) homicide. As discussed in greater detail in appendix A, there are no reliable data available with which to measure the extent of causality between mental illness and homicide. Therefore, it has been assumed that none of the homicides reported in 1977 were caused by mental illness. On the other hand, it is assumed that all of the deaths in the first two categories above were due to mental illness. However, the number of deaths due to psychoses and neuroses were first adjusted for deaths due to alcoholic psychoses and alcoholism and drug dependence to eliminate potential duplications in the estimates of the costs of mortalities from these three problems. Suicidal overdoses of drugs and medicaments are attributed to mental illness. They are presented separately in the other suicide category for expository purposes.

In all, 32,398 premature deaths were estimated to have been due to mental disorders in 1977 at a cost in lost future production of over \$5.9 billion, calculated at a 6 percent discount rate (table 5-7). The estimates are \$3.9 billion and \$9.7 billion for the 10 and 2.5 percent discount rates, respectively.

Table 5-6

**Economic Cost of 1977 Mortalities Due to Drug Abuse - for Various Discount Rates
(in millions)**

Cause of Death - Primary diagnosis	Mortalities in 1977			Discount Rates		
	Total	Attributed to Drug Abuse		. 10%	6%	2½%
		Percent	Number			
Drug dependence.....	551	100	551	\$ 99	\$157	\$ 271
Accidental overdose of psycho- active drugs.....	1,045	100	1,045	164	260	449
Accidental overdose of other drugs and medicaments	1,203	100	1,203	149	236	412
Suicidal overdose of drugs and medicaments.....	3,125	0	0	0	0	0
Overdose of drugs and medicaments, reason undetermined.....	791	100	791	115	178	301
TOTAL.....	6,715		3,550	\$527	\$831	\$1,433

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

Table 5-7

**Economic Cost of 1977 Mortalities Due to Mental Illness -
for Various Discount Rates
(\$ in millions)**

Cause of Death - Primary Diagnosis	Mortalities in 1977			Discount Rates		
	Attributed to Mental Illness					
	Total	Percent	Number	10%	6%	2½%
Psychoses and neuroses*	3,715	100	3,715	\$ 105	\$ 147	\$ 233
Alcoholic psychoses and alcoholism•	5,418	0	0	0	0	0
Drug dependence	551	0	0	0	0	0
Suicide (excluding overdose)•••••	25,556	100	25,556	3,412	5,188	8,543
Suicidal overdose of drugs or medicaments	3,125	100	3,125	390	591	965
Homicide	19,699	0	0	0	0	0
Total•••••	58,064		32,396	\$3,907	\$5,926	\$9,741

*Excluding alcohol and drug abuse-related deaths.

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

V. CORE INDIRECT COSTS - MORBIDITY

As indicated in chapter 4, our core indirect costs are divided into two major categories--reduced productivity and lost employment. A summary of estimated costs in each of these categories for the three ADM disorders is provided in table 5-8. A brief discussion of these costs follows.

Table 5-8

Core Indirect Costs--Morbidity Due to
ADM Disorders--1977
(\$ in millions)

Cost Category	Alcohol Abuse	Drug Abuse	Mental Illness	Total
Reduced productivity	\$23,593	\$2,830	\$ 1,646	\$28,069
Males	20,178	2,830	932	23,940
Females	3,415	-	714	4,129
Lost employment	<u>2,481</u>	<u>223</u>	<u>13,970</u>	<u>16,674</u>
Trauma	545	-	12,665	13,210
Residential treatment	328	223	1,305	1,856
Long-term disability	1,608	-	-	1,608
TOTAL	\$26,074	\$3,053	\$16,616	\$44,743

SOURCE: Research Triangle Institute.

A. Alcohol Abuse

As shown in table 5-8, morbidity caused by alcohol abuse is estimated to have resulted in morbidity losses of approximately \$26.1 billion in 1977. This total includes estimated productivity losses of \$23.6 billion for the problem drinking population and lost employment valued at \$2.5 billion. This latter category includes losses to individuals who are injured in accidents or violent crime caused by alcohol abuse, those who suffer a long-term disability due to alcohol abuse and who were unable to work in 1977, and individuals who were in residential treatment facilities in 1977.

The majority of the productivity losses are incurred by male problem drinkers. In 1977, there were an estimated 7.8 million employed male problem drinkers in the U.S., accounting for a total of \$20.2 billion in productivity losses (absenteeism and lower on-the-job productivity). In contrast, there were an estimated 1.9 million female problem drinkers, with a total of \$3.4 billion in productivity losses. Of the estimated 1.9 million female problem drinkers, approximately 1.2 million were employed in 1977, while 0.7 million were housewives.

Some perspective on these figures is gained when they are compared to prevalence estimates for alcohol abuse. The Third Special Report to the U.S. Congress on Alcohol and Health (Noble 1978) estimates that "almost 10 million American adults" were either problem drinkers or alcoholics in 1975. This was about 7 percent of the adult population. In The ADM National Data Book (Vischi et al. 1980), alcoholism and alcohol problems were estimated to have a point prevalence of 2.5 to 8 percent in the adult (18-65) population, representing between 3.2 and 10.3 million persons in 1977. The lower figure appears to be an estimate of the minimal number of alcoholics and the higher one an estimate of alcoholics plus other problem drinkers based on general population studies by Cahalan et al. (1969; 1974). The estimate used in this study (9.7 million persons) is for alcoholics plus other problem drinkers. Thus, it is roughly comparable to the higher ADAMHA estimate and the NIAAA figure. For these 9.7 million problem drinkers, this study used Berry and Boland's 14.0 percent estimate of reduced productivity. As is evident from the discussion in appendix A, this yields a conservative estimate of these productivity losses consistent with our overall approach in this study.

Turning to estimates of costs of trauma, alcohol abuse--related accidents were fairly evenly distributed between motor vehicles, the workplace, home, and other kinds of accidents. Males lost 20,000 person-years of productive time due to these accidents, compared to 18,000 person-years of time lost by females. Male productivity losses are estimated at \$282 million, compared to \$245 million of losses for females. In addition, there is an estimated \$18 million in lost employment to individuals injured in violent crimes which could not be readily allocated to the sex of the victim.

A total of 274,000 individuals experienced some alcohol abuse-caused physical impairment in 1977, resulting in lost employment valued at \$1.6 billion. A variety of impairments were estimated to have been caused by alcohol abuse, with the largest portion, approximately 40 percent, classified as orthopedic impairments other than paralysis of the back or spine.

Finally, a total of \$328 million in lost employment in 1977 occurred while individuals were in residential treatment facilities for alcohol abuse. An average census of 18,800 individuals were in these facilities--15,800 males and 3,000 females. Males in residential treatment accounted for \$291 million

in lost employment, while females accounted for a total of \$37 million.

B. Drug Abuse

Due to the unavailability of reliable data, estimates of productivity losses caused by drug abuse could only be made for young males. An estimated 1,784,000 employed young males aged 18-24 experienced absenteeism or a reduction in their on-the-job productivity in 1977 due to their drug abuse. As indicated in table 5-8, the total productivity losses are estimated at \$2.8 billion, or approximately \$1,590 per employed individual.

It was possible to obtain some details by sex for the value of lost employment due to time spent in residential treatment for drug abuse. In 1977, there were an estimated average census of 11,900 males and 4,600 females in residential treatment facilities for drug abuse. The value of lost employment is estimated at \$171 million for males, or \$14,400 per individual, and \$52 million for females, or \$11,300 per individual.

C. Mental Illness

The value of reduced productivity in 1977 due to mental illness is estimated for partial work disability due to either chronic nervous disorders or severe emotional disorders. A total of 616,000 individuals--287,000 males and 329,000 females--were estimated to have experienced a 25 percent loss in productivity due to these mental illnesses in 1977. Chronic nervous disorders accounted for \$1,328 million, or approximately 81 percent of the total estimated employment loss. Severe emotional disorders accounted for \$318 million or 19 percent of the total.

As shown in table 5-8, lost employment due to mental illness may be classified into two major categories--long-term disability or complete work disability and residential treatment or institutionalization. A total of 871,000 individuals--372,000 males and 499,000 females--were estimated to have a long-term disability due to mental illness in 1977. As in the case of partial work disability, chronic nervous disorders were the larger category of complete work disability--with a total of \$9.0 billion or 71 percent of the total. Severe emotional disorders again accounted for approximately \$3.6 billion or 29 percent of the total.

In 1977, a total of 223,900 individuals were estimated to have been institutionalized for mental illnesses in nursing homes and psychiatric hospitals. Approximately 167,000, or 75 percent of the total, were in nursing homes. While about 57,000 individuals, or 25 percent of the total, were in psychiatric hospitals. Because of the differing age characteristics of these populations, the distribution of the value of lost employment across these two settings is not proportional to the distribution of individuals in the settings.

Costs of lost employment for individuals in psychiatric hospitals were estimated at \$844 million in 1977, or approximately 65 percent of the total, while nursing home lost employment costs were \$461 million, or 35 percent of the total.

Conservative point prevalence estimates for mental illness (including alcohol and drug abuse) range between 10 and 15 percent for the adult population (Vischi et al. 1980). Excluding the estimates for alcohol and drug dependence results in a mental disorder point prevalence of between 7 and 12 percent or between 9.0 and 15.4 million Americans. The data sources used in this study have estimated productivity losses of \$15.6 billion for 1.7 million persons (between 11 to 19 percent of estimated the actual extent of these morbidity losses.

VI. OTHER RELATED COSTS - DIRECT

A number of specific cost elements are included in the general cost category of other related direct costs of alcohol and drug abuse and mental illness. These include: motor vehicle damage, criminal justice system, social welfare system, fire losses, fire protection, highway safety, and drug traffic control. A summary of these costs is provided in table 5-9.

As shown in the table, other related direct costs are highest for drug abuse (\$4.8 billion, or 93 percent of the drug abuse costs, arise from the direct costs of the criminal justice system and private security activities. The only other related direct costs that can be currently estimated for mental illness are social welfare administrative costs (welfare benefits are not counted since they are economic transfer costs). Finally, as shown in the table, other related direct costs for alcohol abuse can be estimated for most of the same categories as for drug abuse plus several additional categories, the largest of which is motor vehicle damage. The total estimate for other related direct costs due to alcohol abuse is \$4.4 billion.

VII. OTHER RELATED COSTS - INDIRECT

Within this study, three sources of other related indirect costs were identified: (1) the opportunity costs of time for individuals who pursue a career in crime as a result of drug abuse, (2) the opportunity costs of time spent in prison as a result of alcohol or drug abuse-related crime, and (3) the value of time lost by individuals other than

Table 5-9

Other Related Direct Costs of Alcohol Abuse,
Drug Abuse, and Mental Illness, 1977
(\$ in millions)

Cost Category	Alcohol Abuse	Drug Abuse	Mental Illness	Total
Motor vehicle crashes	\$1,782	*	*	\$1,782
Crime	1,685	\$4,453	*	6,138
Public criminal justice System	1,479	3,347	*	4,826
Law enforcement	313	1,787	*	2,100
Legal and adjudication	139	604	*	743
Corrections	1,027	966	*	1,983
Private criminal justice System	191	1,033	*	1,224
Law enforcement	184	1,005	*	1,189
Legal and adjudication	7	28	*	35
Corrections	*	*	*	*
Property loss/damage	15	73	*	88
Social welfare programs	142	12	\$548	702
Fire losses	319	*	*	319
Fire protection	482	*	*	482
Highway safety	31	*	*	31
Drug traffic control	*	311	*	311
Total	\$4,441	\$4,776	\$548	\$9,765

Totals may not add due to rounding.

*

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

SOURCE: Research Triangle Institute.

crash victims and by individuals delayed in traffic as a result of motor vehicle accidents caused by alcohol abuse. Another type of costs in this category is the productivity losses of persons who care for individuals with ADM problems. However, it has not been possible to estimate this last type of cost with the data available. Thus, it has been omitted from our estimates. A summary of these costs is presented in table 5-10.

One of the major sources of other related indirect costs of ADM problems is the opportunity cost of time of individuals who are engaged in crime careers as a result of drug abuse. This study has developed estimates of these losses based on the hypothesis that serious drug abuse can cause a person to forego normal productive activities in favor of selling drugs, committing income-generating crimes, or engaging in other illicit activities. In 1977, it is estimated that a total of 350,100 persons--223,400 opiate abusers and 126,700 nonopiate abusers--experienced such losses in normal productivity due to their drug abuse. These figures are consistent with NIDA and ADAMHA drug abuse prevalence estimates published by Vischi et al. (1980) in The ADM National Data Book and with information on the major activities of clients admitted to treatment in the Treatment Outcome Prospective Study (Rachal et al. 1981). As shown in table 5-10, losses due to opiate abuse are estimated at \$3.5 billion, while nonopiate abuse was estimated to have caused \$1.6 billion in productivity losses in 1977.

Estimates of the productivity losses due to incarcerations were developed by first identifying the person years of incarceration due to either alcohol or drug abuse and then assigning a value of lost productivity to that time spent in prison. In 1977, it is estimated that a total of 83,700 person years were spent in prisons by individuals convicted of crimes caused by alcohol abuse. The comparable figure for drug abuse-caused incarcerations is 76,400 person-years. As shown in table 5-10, this time spent in prison generated the following indirect costs: alcohol abuse--\$1.4 billion, and drug abuse -- \$1.3 billion. The largest portions of this loss due to alcohol abuse was incurred for public drunkenness (\$461 million or approximately 33 percent of the total) and driving under the influence (\$287 million or approximately 20 percent of the total); the largest portions for drug abuse were for drug law violations (\$640 million or approximately 50 percent of the total) and robbery (\$316 million or approximately 25 percent of the total).

Finally, a total of \$354 million in other related indirect costs was caused by motor vehicle crashes. This total included losses to individuals other than the victim of a traffic accident (\$180 million) and traffic delay costs (\$174 million).

Table 5-10

Other Related Indirect Costs of
Alcohol Abuse and Drug Abuse, 1977
(\$ in millions)

Cost Category	Alcohol Abuse	Drug Abuse
Crime careers.....	-	\$5,143
Opiates.....		3,530
Nonopiates.....		1,613
Incarceration.....	<u>\$1,418</u>	<u>1,294</u>
Homicide.....	276	-
Felony assault.....	120	0
Robbery.....	46	316
Burglary.....	49	234
Drug laws.....	0	640
Driving under the influence...	287	0
Liquor laws.....	158	0
Public drunkenness.....	461	0
Other.....	21	104
Motor vehicle crashes.....	354	-
Total.....	\$1,772	\$6,437

SOURCE: Research Triangle Institute.

VIII. SPECIAL ISSUES - COSTS OF CRIME

As indicated throughout this report, the costs to society of ADM problems have been developed and presented in the cost framework contained in the Guidelines document. This framework organizes costs into two principal categories--core costs and other related costs--and includes subcategories of direct and indirect costs within each. Although this framework is a useful approach for developing these estimates, it does not enable one to readily identify costs related to a specific type of behavior

caused by the ADM problem. An important example of this type of behavior, and one for which cost estimates are frequently requested, is crime.

Estimates of the costs of crime due to alcohol abuse and drug abuse are presented in table 5-11. As shown in the table, crimes due to alcohol abuse and drug abuse resulted in costs to society of \$15.8 billion in 1977. Drug abuse accounted for approximately 70 percent of these costs--\$4.6 billion. Unfortunately, a current lack of data prevents us from making a reliable estimate of crime-related costs due to mental illness.

The development of the cost estimates presented in table 5-11 was a relatively straightforward procedure. All of the drug abuse-caused crime costs fall in the other related cost category and were taken directly from the appropriate totals presented in table 5-1. Similarly, the other related costs of alcohol abuse associated with crime were taken directly from the appropriate entries in table 5-1.

In the case of mortality and morbidity, the appropriate subtotals of the costs of trauma due to homicide were obtained from tables A-12 and A-20, respectively. A portion of the treatment costs for alcohol-abuse related trauma was estimated as the treatment costs for victims of crime. This portion was obtained from the data in table A-20 and was assumed to be the ratio of the number of person/years of lost employment due to violent crimes (1,100) to the total person years of lost employment for all types of trauma (39,700). Using data presented in table A-10, support costs for treatment were estimated as 3.21 percent of the treatment costs resulting from crime.

Additional details of these costs, particularly the other related direct costs of crime, are presented in the appropriate sections of appendix A.

5-19
Table 5-11

Crime-Related Costs of Alcohol and
Drug Abuse, 1977
(\$ in millions)

Cost Category	Alcohol Abuse	Drug Abuse	Total
Core costs	<u>\$1,522</u>	-	<u>\$1,522</u>
Direct	<u>35</u>		<u>35</u>
Treatment	34		34
Support	1		1
Indirect	<u>1,487</u>		<u>1,487</u>
Mortality ^{a/}	1,469		1,469
Morbidity	18		18
Reduced productivity.	-		-
Lost employment	18		18
Other related costs	<u>3,103</u>	<u>\$11,201</u>	<u>14,304</u>
Direct	<u>1,685</u>	<u>4,764</u>	<u>6,449</u>
Motor vehicle crashes..	-	-	-
Crime	1,685	4,453	6,138
Public criminal justice			
system	1,479	3,347	4,825
Private criminal justice			
system	191	1,033	1,224
Property loss/damage...	15	73	88
Social welfare programs..	-	-	-
Drug traffic control	-	311	311
Indirect	<u>1,418</u>	<u>6,437</u>	<u>7,855</u>
Crime careers	-	6,143	6,143
Incarceration	1,418	1,294	2,712
Motor vehicle crashes...	-	-	-
Total	<u>\$4,625</u>	<u>\$11,201</u>	<u>\$15,826</u>

^{a/} At 6 percent discount rate.

SOURCE: Research Triangle Institute.

- Cahalan, D.; Cisin, I.; and Crossley, H. American Drinking Practices. New Brunswick, N.J.: Rutgers University, Rutgers Center on Alcohol Studies, 1969.
- Cahalan, D., and Room, R. Problem Drinking Among American Men. New Brunswick, N.J.: Rutgers University, Rutgers Center of Alcohol Studies, 1974.
- Nonle, E., ed. Third Special Report to the U.S. Congress on Alcohol and Health. DHEW Pub. No. (ADM) 78-569. Rockville, Md.: U.S. Department of Health, Education, and Welfare, Alcohol, Drug Abuse, and Mental Health Administration, 1978.
- The President's Commission on Mental Health. Report to the President from the President's Commission on Mental Health. Vol. I. Washington, D.C.: Supt. of Docs., U.S. Govt. Print Off., 1979.
- Rachal, J.; Hubbard, R.; Cavanaugh, E.; Bray, R.; Collins, J.; Allison, M.; and Craddock, G. Annual Report - Characteristics, Behaviors and Intreatment Outcomes of Clients in TOPS - 1979 Admission Cohort. Research Triangle Park, N.C.: Research Triangle Institute, 1981.
- U.S. Department of Health, Education, and Welfare, National Center for Health Statistics. Unpublished mortality data. Hyattsville, Md.: the Center, no date.
- Vischi, T.; Jones, K.; and Lima, L. The Alcohol, Drug Abuse, and Mental Health National Data Book. Rockville, Md.: U.S. Department of Health Education, and Welfare, Alcohol, Drug Abuse, and Mental Health Administration, 1980.

Chapter 6

Differences from Earlier Studies

I. INTRODUCTION

Chapter 3 summarizes the RTI review of the key previous studies of the economic costs to society of each of the three ADM problems. Fairly substantial differences exist between the estimates in these studies and the current study. Since these studies were completed for different time periods, part of the differences between our results and those estimated by previous authors are due to inflation. However, as summarized in chapter 4 of this report and detailed in appendix A, the cost estimates of this study are based on a consistent methodology applied to each of the three ADM problems. For some of the cost components, the use of our illness-specific methodology results in significant differences in cost estimates from those obtained in prior studies.

This chapter presents a brief summary of the differences between the cost estimates developed for this study and those estimated in previous studies and the major reasons for these differences. These comparisons are presented in three major sections--one each for alcohol abuse, drug abuse, and mental illness.

II. ALCOHOL ABUSE

The NRTI study made significant changes in the methodology used to estimate the economic costs to society of alcohol abuse. The results obtained in the study are compared in table 6-1 with those in the prior study by Berry and Boland.

The first and most obvious difference is the increase in total costs due to alcohol abuse. Berry and Boland estimated the total cost to be \$42.8 billion in 1975. The NRTI study estimated a total cost of \$49.4 billion for 1977, representing an increase of approximately 15 percent over the 1975 estimate. If the two methodologies were similar, most of this difference would be due to inflation experienced between 1975 and 1977. However, as stated previously, there are strong methodological differences between the two studies which affect each of the major cost categories.

The NRTI study has estimated that treatment costs due to alcohol abuse were \$5.6 billion in 1977. Berry and Boland estimated these costs to be \$11.0 billion in 1975. The reason for this difference lies in the methodologies used. The prior study used a population-specific approach,

- Cahalan, D.; Cisin, I.; and Crossley, H. American Drinking Practices. New Brunswick, N.J.: Rutgers University, Rutgers Center on Alcohol Studies, 1969.
- Cahalan, D., and Room, R. Problem Drinking Among American Men. New Brunswick, N.J.: Rutgers University, Rutgers Center of Alcohol Studies, 1974.
- Nonle, E., ed. Third Special Report to the U.S. Congress on Alcohol and Health. DHEW Pub. No. (ADM) 78-569. Rockville, Md.: U.S. Department of Health, Education, and Welfare, Alcohol, Drug Abuse, and Mental Health Administration, 1978.
- The President's Commission on Mental Health. Report to the President from the President's Commission on Mental Health. Vol. I. Washington, D.C.: Supt. of Docs., U.S. Govt. Print Off., 1979.
- Rachal, J.; Hubbard, R.; Cavanaugh, E.; Bray, R.; Collins, J.; Allison, M.; and Craddock, G. Annual Report - Characteristics, Behaviors and Intreatment Outcomes of Clients in TOPS - 1979 Admission Cohort. Research Triangle Park, N.C. : Research Triangle Institute, 1981.
- U.S. Department of Health, Education, and Welfare, National Center for Health Statistics. Unpublished mortality data. Hyattsville, Md.; the Center, no date.
- Vischi, T. ; Jones, K.; and Lima, L. The Alcohol, Drug Abuse, and Mental Health National Data Book. Rockville, Md.: U.S. Department of Health Education, and Welfare, Alcohol, Drug Abuse, and Mental Health Administration, 1980.

Table 6-1

Comparison of Results of Present Study with
the Prior Major Study - Alcohol Abuse
(\$ in billions)

Cost Category	Research Triangle Institute (1977)	Berry and Boland (1975)
Core costs	<u>\$43.2</u>	<u>\$38.7</u>
Direct	<u>6.4</u>	<u>12.3</u>
Treatment	5.6	11.0
Support	0.7	1.8
Indirect	<u>36.8</u>	<u>25.8</u>
Mortality	10.7 ^{a/}	9.7
Morbidity	26.1	16.1
Other related costs	<u>6.2</u>	<u>4.1</u>
Direct	4.4	4.1
Indirect	1.8	-
Total	\$49.4	\$42.8

^{a/}
At 6 percent discount rate.

Individual items may not add to totals due to rounding.

Source: Research Triangle Institute.

while the present study uses an illness-specific methodology. In the Berry and Boland study, all health care costs experienced by persons with a history of alcohol abuse were calculated. That is, a per capita rate of health care utilization for this population was calculated and compared to a per capita rate for the nonalcohol abusing population. The difference between these two rates was attributed to alcohol abuse. This difference was multiplied by the estimated prevalence of alcohol abuse to produce an estimate of total health care costs due to alcohol abuse.

In the NRTI study, an illness-specific methodology has identified those illness which are clearly related to a history of alcohol abuse or which result from incidents of alcohol abuse. In the case of illnesses that result solely from alcohol abuse, all expenditures in the appropriate treatment settings have been allocated to alcohol abuse. In the cases of illnesses that can be caused by alcohol abuse or by something else, a further analysis was undertaken to allocate only a portion of the expenditures for that diagnosis to alcohol abuse.

These two methodologies yield significantly different estimates because persons with a history of alcohol abuse may have other problems or attributes which require further health care treatment. This additional health care treatment may not necessarily be causally related to the alcohol abuse problem and hence use of the population-specific methodology tends to overestimate treatment costs. On the other hand, our estimates are probably conservative, because there are a number of illness which have been related to alcohol abuse, but the degree to which they are caused by alcohol abuse is currently unknown. For example, more than two dozen cancers of the gastrointestinal system have been strongly linked to high consumption of alcoholic beverages, but the portion of such cancers caused by alcohol abuse is not yet known with certainty. In these situations we have attributed a portion of the costs of treatment to alcohol abuse, but the resulting total may be an underestimate of the actual total. In addition, alcohol abuse may result in a generally poorer state of health and result in a greater incidence of many diseases not currently related to alcohol abuse.

Estimates of support costs differ in the same degree as treatment costs because each study estimated support costs in a fashion analogous to that for treatment costs.

Estimates of mortality costs are remarkably similar for the two studies. However, they were estimated by different approaches. The Berry and Boland study used several steps to estimate the total number of mortalities as well as the total value of losses due to mortality. First of all, epidemiological surveys on alcohol abusing populations were used to estimate excess mortality rates for these populations. Similar to the case of treatment costs, this approach tends to overestimate the costs of mortalities, since differences in mortality experience between

alcohol abusing and non-alcohol abusing populations may be due to factors other than alcohol abuse. Next, mortalities due to various traumatic causes were estimated. These causes included motor vehicle accidents, fires, and homicides. For each of these other causes only a portion of the deaths was attributed to alcohol abuse and the values of these deaths were estimated accordingly.

The NRTI used an illness-specific approach in estimating the cost of mortalities due to alcohol abuse. First of all, causes of death related to alcohol abuse were identified; and the degree to which these causes were the result of alcohol abuse was estimated. Then, once the number of deaths due to alcohol abuse was estimated, the present discounted value of lost future productivity due to these deaths was estimated. This methodology is similar to that used by Berry and Boland in making estimates of the value of mortalities due to motor vehicle crashes, fires, and homicides. As in the case of direct treatment costs, use of the illness-specific methodology here tends to underestimate the value of this cost component. This is due to the fact that we have not included any costs of mortalities for illnesses that are associated with alcohol abuse but for which we were not yet able to clearly establish a reliable causal factor.

Costs of reduced productivity due to alcohol abuse have increased significantly from the prior study to the present study. This has occurred even though the two studies have used similar methodologies in making the estimates. Both estimates are based on results of the same studies that estimated the extent to which productivity is impaired by alcohol abuse. However, the Berry and Boland study estimated the economic costs of alcohol abuse only in lost market productivity and excluded the costs of reduced productivity in the household by both males and females. Furthermore, Berry and Boland made no estimates of lost productivity by females in the work force. This latter omission is particularly critical in view of the increasing labor force participation by women. Finally, Berry and Boland also omitted the value of wage supplements and benefits in estimating the value of lost production. These supplements and benefits are worth about 15 percent of total wages.

In the other related cost category, direct costs were estimated in a similar fashion with similar results. However, only the NRTI study included other related indirect costs. These were of two types: lost productivity due to incarceration and lost productivity by persons indirectly affected by alcohol caused traffic accidents.

III. DRUG ABUSE

Cost estimates for drug abuse are also greater in the current study than in the previous RTI study. These increases result primarily

from changes that have been made in the methodology used in the current study in order to be consistent with estimates prepared for alcohol abuse and mental illness. The cost estimates for the two studies are summarized in table 6-2.

Health care treatment costs due to drug abuse are estimated to have been virtually the same in 1975 as in 1977. The methodologies use were very similar, both of them using an illness--specific approach. Support costs for drug abuse treatment services are somewhat different in the two studies. This difference can be attributed to the fact that the current study has estimated support costs for a variety of activities, while the prior study used an estimate obtained from a single secondary data source. That source included some duplications and is incompatible with the more detailed methodology used in the current study.

Mortality costs were estimated at \$831 million in the RTI study. This is an estimate of the present discounted value of lost future productivity due to drug abuse deaths in 1977. The previous RTI study estimated lost productivity due to drug abuse deaths only for the year 1975 and omitted the present value of lost productivity for future years. The appropriate inclusion of lost future productivity results in a significant increase in this cost component. On the other hand, while the prior study allocated suicides by use of psychoactive drugs to drug abuse, the current study has assumed that the costs of all suicides belong in the mental illness category.

The estimates of the costs of morbidity are somewhat lower in the recent RTI study. However, there are a number of factors contributing to this decrease, some of which produce a higher value and others which produce a lower value.

Turning to the factors which produce higher estimates, the current RTI study included estimates of the value of reduced productivity of non-opiate abusers, while the previous RTI study included only opiate abusers in this cost component. In addition, the current RTI study includes the value of household production and has adjusted earnings levels for the value of wage supplements and benefits, both of which were excluded in the previous study.

On the other hand, the methodology used in the current RTI study has reduced or eliminated some of the cost elements contained in the previous RTI study. First, the previous RTI study included some doublecounting of individuals in their estimates of the costs of unemployability and productivity losses due to non-drug crime by drug abusers. Secondly, the previous study estimated absenteeism costs to the economy for employed drug abusers. The information on drug-abuse-related absenteeism used in the previous study was judged to be of insufficient reliability for the 1977 estimates due to the fact that it is several years out of date, concentrated on a heavy

Table 6-2

Comparison of Results of Present Study with
the Prior Major Study - Drug Abuse
(\$ in billions)

Cost Category	Research Triangle Institute (1977)	RTI Study (1975)
Core costs	<u>\$ 5.1</u>	<u>\$ 5.7</u>
Direct.....	<u>1.3</u>	<u>1.5</u>
Treatment	1.1	1.1
Support	0.2	0.4
Indirect	<u>3.9</u>	<u>4.2</u>
Mortality ^{a/}	0.8	<u>b/</u>
Morbidity	3.0	4.2
Other related costs	<u>11.2</u>	<u>4.6</u>
Direct	4.8	2.1
Indirect	6.4	2.5
Total	\$16.4	\$10.3

^{a/} At 6 percent discount rate.

^{b/} Less than \$60 million.

Individual items may not add to totals due to rounding.

SOURCE: Research Triangle Institute.

manufacturing industry with a high number of blue collar workers, and is developed from a relatively small sample of persons. Instead, the only data source on lost employee productivity that was found to be sufficiently reliable for the current study covered only young males, 18 to 25 years of age. Although this is the key population segment for drug abuse, the exclusion of other population groups does considerably lower this study's estimate of indirect costs due to drug abuse induced morbidity.

Other related direct costs were calculated by RTI using similar methods in the two studies. The increase in the current RTI study occurs in the category of the direct costs of the criminal justice system. This increase is due primarily to the fact that the current study includes not just the costs of property crime but also of violent crimes and not just crime committed by opiate abusers but also by some non-opiate abusers. In addition, the current study includes estimates of the costs of replacing property that was damaged or destroyed during property crimes, a cost element that was omitted from the previous RTI study.

Turning to other related indirect costs, the most recent RTI study contains a significantly greater estimate of the costs of crime careers (\$5.1 billion) than the previous RTI study (\$1.3 billion). This increase is due to several factors. First, estimates in the previous RTI study were developed only for crimes committed by heroin abusers, while the current study includes estimates of the costs of crime caused by opiate as well as non-opiate abusers. Second, the estimates of foregone productivity incorporated in the current study include the value of fringe benefits and wage supplements, a factor that was omitted in the previous study. Finally, using information from more current research, the portions of criminal activities caused by drug abuse are assumed to be higher in the current study than they were in the previous RTI study.

The second component of other related indirect costs, lost productivity due to incarceration, is similar in the two studies. The 1977 estimate is that \$1.3 billion was lost due to incarceration stemming from drug abuse, compared with \$1.2 billion in 1975. The previous estimate was developed by first estimating the number of incarcerations for drug law violations and then the number of incarcerations due to income-generating crime by heroin users. These numbers were multiplied by the average sentence served for these violations and then adjusted for unemployment and nonlabor force participation by the drug abusing population. Finally, a value was assigned using a weighted estimate of earnings for drug abusers.

In contrast, this study reduced the number of person years served during 1977 for non-drug offenses related to drug abuse by counting only a portion of these crimes as being actually caused by drug abuse. However, this reduction was largely offset by including in lost productivity the value of nonmarket production as well as wage benefits and supplements, none of which were included in the previous RTI study.

IV. MENTAL ILLNESS

The RTI estimates of the costs to society of mental illness in 1977 can be compared with those of two prior studies. The first estimates were developed for 1971 and are presented in the Levine and Levine report. The second estimates were developed for 1974 by Levine and Willner (1976). The latter estimates were based on the original Levine and Levine methodology and were developed primarily by adjusting the 1971 estimates for inflation. Only minor methodological changes were made. Therefore, although table 6-3 lists the results of all three studies the following discussion of differences will focus primarily on the current RTI study and the Levine study.

Estimates of core direct treatment costs are most comparable among the three studies, with the most recent estimate of \$15.8 billion representing approximately a 9 percent annual increase over the estimate by Levine and Levine of \$9.5 billion for 1971. The difference between the two estimates can be explained primarily by inflation and moderate population growth. However, it should be noted that current estimates exclude the expenses of services provided to alcohol and drug abusers, as these costs are reported under the appropriate ADM problem in this study. The extent that these alcohol and drug abuse related mental health expenditures were subtracted from the Levine and Levine estimates, growth in treatment expenditures would be greater over the six year period.

Support costs for this study have been estimated in a manner similar to that used in Levine and Levine. Total costs of the various support services were first identified, and then the portion of those costs due to mental illness were estimated on the basis of the portion of total health treatment services used by the mentally ill. The estimated increase in support expenditures is about 6.6 percent annually. Although this is somewhat less than inflation plus population growth over the six year period, once again expenditures due to alcohol and drug abuse have been allocated to those respective cost categories in this study.

Mortality costs have been estimated in somewhat different ways in the two studies. Levine and Levine used the methodology employed by Berry and Boland in estimating the mortality costs due to alcohol abuse. First, epidemiological data on excess mortality of mentally ill populations were used to estimate excess mortality of the mentally ill. Next, this estimate of mortality was adjusted by including additional deaths due to mental

These causes included any suicides or mental disorders in excess of those estimated in the first step. In contrast, our estimates of the costs of mortalities are based upon the illness-specific approach, in which only deaths attributable to a specific list of mental illness-related diagnostic codes have been attributed to mental illness.

Both studies used the human capital approach to valuing the lost future productivity. Comparable adjustments were made in the two studies for wage supplements and benefits and for the value of household productivity.

Turning to morbidity costs, Levine and Levine used data from the Health Information Survey administered by the National Center for Health Statistics to estimate the number of persons with total work disabilities due to mental and nervous disorders. This number of persons was inflated by a factor of four to adjust for what the authors expected would be significant underreporting of mental conditions. Then, estimates were made of time lost because of treatment by individuals. To the extent that persons disabled with mental illness also received treatment in inpatient and outpatient settings for their disorders, there was probably some double counting.

The estimates have also been made using data from a general population survey on the disability status of the noninstitutional population in the U.S. The 1976 Survey of Income and Education by the Department of Commerce obtained data on disability due to mental and nervous disorders. These two categories of disorders are analogous to those used by Levine and Levine. A further expansion on the prior estimates was made by attributing some productivity loss to persons who experienced partial disabilities. Losses in productivity due to partial disabilities are experienced when persons are limited in either the kind or amount of productive activity that they can undertake. This component probably captures a large part of productivity losses estimated by Levine and Levine as being due to patient care. Unlike Levine and Levine, the current study does not make any adjustments for potential underreporting of mental disorders. Lastly, the current estimates include productivity losses due to institutionalization of individuals. These persons experienced complete work disabilities over the year in question, and would not have been included in the general population surveys of the noninstitutional population.

Finally, the current RTI includes estimates of other related direct costs, specifically the costs of the social welfare system; as shown in table 6-3, this cost category was omitted in the Levine and Levine study.

Table 6-3

Comparison of Results of Present Study with
the Prior Major Study - Mental Illness
(\$ in billions)

Cost Category	Research Triangle Institute (1977)	Levine & Levine (1971)	Levine & Willner (1974)
Core costs	<u>\$39.7</u>	<u>\$25.3</u>	<u>\$36.8</u>
Direct	<u>18.2</u>	<u>11.1</u>	<u>16.9</u>
Treatment.....	15.8	9.5	14.5
Support.....	2.4	1.6	2.4
Indirect	<u>21.5</u>	<u>14.2</u>	<u>19.8</u>
Mortality ^{a/}	5.9	3.5	4.9
Morbidity.....	15.6	10.6	14.9
Other related costs.....	<u>0.5</u>	-	-
Direct.....	0.5	-	-
Indirect.....	-	-	-
Total	\$40.3	\$25.3	\$36.8

^{a/}

At 6 percent discount rate.

Individual items may not add to totals due to rounding.

SOURCE: Research Triangle Institute.