Economic Costs of Alcohol and Drug Abuse in Texas – 2000

by
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Chapter I – Summary

1.1 Introduction

The consequences of alcohol and drug abuse show significant costs to the state in medical resources used for treatment and care, in reduced and lost productivity, in law enforcement, in destruction of property, in motor vehicle accidents, and in social welfare administration. The total economic costs of alcohol and drug abuse in Texas were estimated at $25.9 billion for 2000. Alcohol abuse cost an estimated $16.4 billion (63 percent), while drug abuse or dependency accounted for $9.5 billion (37 percent). On a per capita basis, the 2000 amount translates to $1,244 per man, woman, and child in the state.

This report is an update and extension of a similar study that thoroughly documented the costs of substance abuse in Texas for 1989 (Liu 1992). Each study utilized the most up-to-date and reliable data possible, as well as the most refined methodology available at the time of cost estimations. The 2000 Texas study, for example, included estimates of the cost for hospital treatment of alcohol and drug abuse-caused illness using the Texas inpatient hospital discharge data, which were not included in the 1989 Texas estimates. The costs for drug prevention programs, based on the recently available Survey of Statewide Chemical Dependency Resource and Service Distribution (Texas Commission on Alcohol and Drug Abuse [TCADA] 2002), were identified in a different cost category in 1989. Also, the methodology in estimating substance-related deaths was expanded to cover both underlying and contributing (or multiple) causes of death for the current analysis.

Since variations in data sources, underlying assumptions, and methods have occurred between the current and previous studies, one cannot conclude that the differences in these estimates reflect changes in actual costs. Rather than trying to pinpoint trends in substance abuse costs over the years, it would be more important to recognize the vastness of the costs in any given year, to understand those institutions and activities contribute to the overall burden, and to value the dramatic effect that substance abuse has on the life of every Texan.

The methodology for this study has been adapted in part from several national studies: Rice et al. (1990), Harwood et al. (1998), Harwood (2000), and the Office of National Drug Control Policy (2001). The estimates have followed cost-of-illness assessment methods, which primarily employ the prevalence-based approach to measure the value of resources used or lost during a certain

period of time, regardless of the onset of disease. The human capital approach is also used for valuing an individual's expected course of life or loss of productivity, reflected in market earnings. It could be argued that the approach undervalues life for children, retired elderly, women, and minorities, and omits the indirect cost computation of pain and suffering from health problems. Despite its limitations, the human capital approach still remains widely used and provides a useful method to quantify the cost of disease.

A complex set of variables was gathered and analyzed for this study. Although previous research has identified the major contexts of substance abuse that incur "opportunity costs" to society (i.e., the value of the foregone benefits because the resource is not available for its best alternative use), assigning specific dollar amounts for Texas estimates can be difficult due to a lack of certain state-level data. In addition, it is critical to establish cause and effect for some factors, such as in the relationship between substance abuse and criminal behavior. When possible, the last available published data were used or projected if some component estimates were not accessible for 2000. These limitations of the study should be kept in mind when considering the implications of cost findings.

1.2 General Results

Costs and general results of this study are summarized in Table 1.1.

- Total economic cost of alcohol and drug abuse in Texas was approximately $25.9 billion in 2000.

- Of the total costs, alcohol abuse accounted for 63 percent ($16.4 billion) and drug abuse accounted for the remaining 37 percent ($9.5 billion).

- Morbidity costs (the value of reduction in productivity of alcohol and drug abusers) accounted for the largest amount of $11.2 billion, followed by other related costs ($7.8 billion), consisting primarily of crime expenditures, motor vehicle crashes, social welfare administrative costs, fire destruction, lost productivity for victims of crime, productivity losses due to incarceration, and opportunity costs for drug users engaged in crime as a career rather than legal employment.

Table 1.1
Economic Costs of Alcohol and Drug Abuse in Texas, 2000

	Amount ($ in millions)		
Type of Cost	Total	Alcohol Abuse	Drug Abuse
Total	$25,946	$16,415	$9,530
Treatment Services	$679	$286	$393
Prevention Services	$127	$54	$74
Medical Care	$791	$779	$12
Hospitalization, non-Federal	$325	$314	$12
Outpatient Medical Services	$204	$204	--
Nursing Home Care	$46	$46	--
Prescription Drugs and Medical NonDurables	$216	$216	--
Morbidity (lost productivity)	$11,180	$8,805	$2,375
Mortality (premature death)*	$4,813	$3,364	$1,450
Other Related Costs	$7,761	$2,823	$4,939
Direct Costs (crime, MV crashes, social welfare administration, fire destruction)	$4,464	$2,054	$2,410
Indirect Costs (victims of crime, incarceration, crime careers)	$3,298	$769	$2,529
Special Disease Groups	$593	$305	$288
Fetal Alcohol Syndrome	$305	$305	--
Drug-Exposed Infants	$100	--	$100
AIDS	$182	--	$182
Hepatitis B/C	$4	--	$4
Tuberculosis	$2	--	$2

* at a 4 percent discount rate.

■ Premature mortality amounted to $4.8 billion of the total costs. Mortality costs represent the present value of lifetime earnings lost for individuals who died from alcohol- and drug-related causes.

■ Medical care related to alcohol and drug abuse cost Texans $791 million. Four types of costs on health care utilization are presented: hospital costs, outpatient medical costs, nursing home costs, and prescription drugs and nondurable medical supplies.

■ Costs for specialty treatment services were about $679 million, which included detoxification, rehabilitation, counseling, and other types of services to individuals with substance abuse problems and their families. Another $127 million from state and federal funding

sources was spent on prevention services.

■ It cost an estimated $593 million to care for infants, children, or surviving adults with fetal alcohol syndrome (FAS), perinatal drug exposure, and intravenous drug use (IVDU)-related AIDS, hepatitis, and tuberculosis. Productivity losses resulting from developmental disabilities among FAS survivors were also included.

■ In relative terms, as shown in Figure 1.1, morbidity accounted for 43 percent of the costs, followed by

other related costs for 30 percent and mortality for 19 percent. About 2 to 3 percent was for treatment and prevention services, medical care, and special disease groups, respectively.

Treatment Services

■ Of the total treatment costs, two-fifths ($286 million) were spent on alcohol addiction and three-fifths ($393 million) were spent on drug addiction.

■ Primary data about specialty treatment services and utilization were based on the 2000 National

Figure 1.1 Alcohol and Drug Abuse Costs by Cost Category in Texas, 2000 (Total: $25.9 Billion)

Legend:
- Treatment & Prevention Services
- Medical Care
- Morbidity
- Mortality
- Other Related Costs
- Special Disease Groups

2.3%, 3.1%, 3.0%, 29.9%, 43.1%, 18.6%
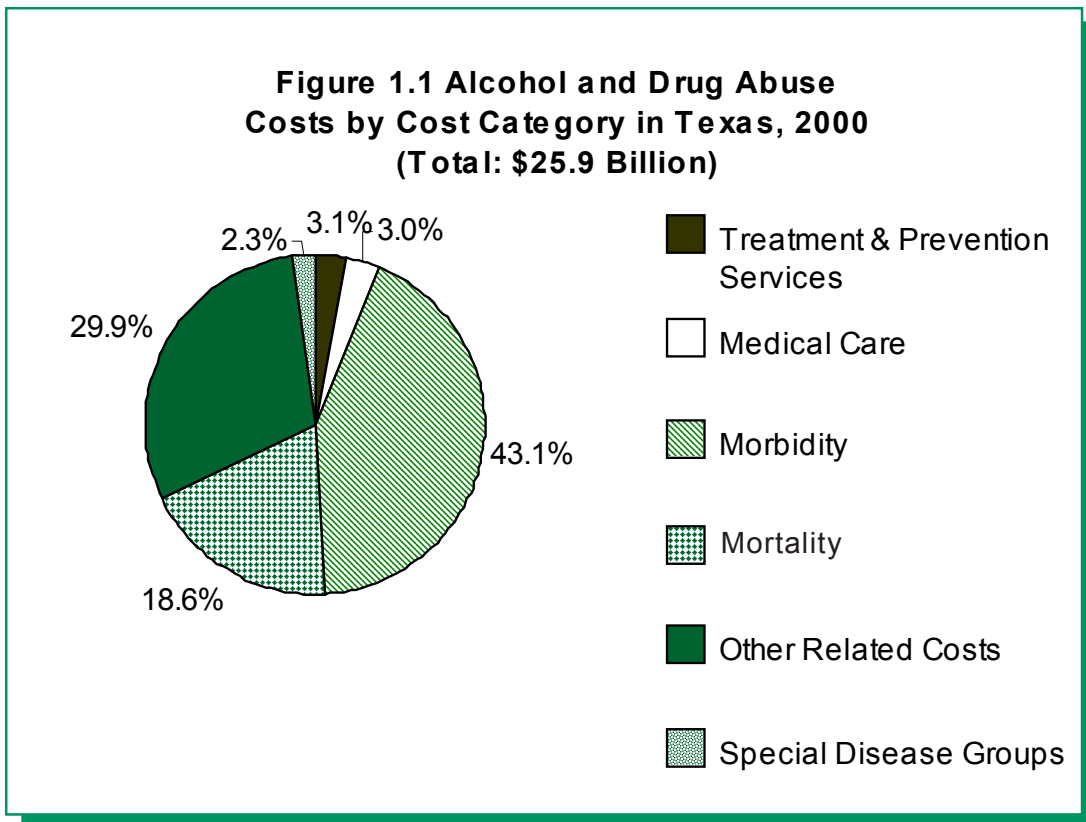
Survey of Substance Abuse Treatment Services (Substance Abuse and Mental Health Services Administration [SAMHSA] 2001), where a total of 747 treatment facilities in Texas participated in the survey, representing a 90 percent response rate.

- By facility ownership, 54 percent of the total treatment units were private non-profit, 37 percent private for-profit, and 8 percent state and local government institutions.

- Analysis of the client utilization data indicated that 13 percent of current clients were treated for alcohol problems only, 29 percent were treated for drug problems only, and 58 percent received treatment for dual abuse problems.

- About 11 percent of current clients treated were under 18 years of age. By modality, youth clients (22 percent) tended to receive inpatient or residential treatment less frequently than adult clients (25 percent).

- After adjustments for program and survey item non-responses, the estimate of annual admissions in

Texas specialized alcohol and drug abuse treatment units was more than 222,000 (55 percent of which were in outpatient treatment).

- Lengths of stay varied across different types of treatment. For example, based on the TCADA client data system, the average length of stay was about 6-7 days for detoxification services, 27 days for adult residential, 51 days for youth residential, and 9 weeks for outpatient programs.

- The weekly cost estimates for outpatient services in private non-profit institutions ranged from $100 to $150 per client, which were less than half of those in private for-profit institutions.

Prevention Services

- Of the $127 million in state and federal prevention expenditures in Texas, the majority (97 percent) went to direct services and 3 percent was for administrative costs.

- Due to a lack of representative data of prevention programs in Texas, the allocations to alcohol abuse versus drug abuse were based on those for treatment admissions.

That is, 42 percent ($54 million) was spent on alcohol abuse prevention and 58 percent ($74 million) on drug abuse prevention.

Medical Care

- Total costs of substance abuse-caused illness treated in hospitals were estimated at $325 million, of which 97 percent was for alcohol abuse-caused care.

- According to the Texas Hospital Inpatient Discharge Public Use Data File (Texas Health Care Information Council [THCIC] 2001), it is estimated that there were 5,556 discharges in 2000 for illnesses specifically caused by alcohol or drug abuse, resulting in about 34,300 days of care.

- Of 5,556 discharges, the vast majority (91 percent) were allocated to the disease of alcoholic fatty liver.

- An additional 221,000 hospitalization days were for treatment of illness partially caused by substance abuse or for longer lengths of stay associated with co-occurring substance abuse disorders.

- Lengths of stay in hospitals were longer for patients with co-occurring alcohol or drug abuse disorders (6.6 days) compared to stays for other patients with no secondary substance abuse diagnosis (4.8 days).

- The adjusted cost per inpatient day was about $1,274 for care provided in non-federal, short-term general and other special hospitals in Texas.

- Outpatient medical services for alcohol-specific and alcohol-related disorders cost about $204 million.

- Expenditures on nursing home care and on prescription drugs and medical nondurables related to alcohol abuse were $46 million and $216 million, respectively.

Morbidity

- Of the total $11.2 billion in morbidity costs, 79 percent ($8.8 billion) resulted from alcohol abuse.

- Over 73 percent ($8.2 billion) of morbidity losses were attributed to males; and 60 percent ($6.7 billion) occurred in the 25-44 age group.

- Individuals affected by alcohol and drug abuse or dependency lowered their work productivity as well as the ability to perform in usual activities, such as household services or childcare duties.

- The prevalence of problem substance users was based on the TCADA household survey of alcohol and drug use among Texas adults. About 22 percent of males and 10 percent of females were problem drinkers, and 7 percent of males and 4 percent of females were problem drug users.

- All of the percentages of problem users decreased substantially with age. The youngest age 18-24 group for both male and female adults had the highest percentage of alcohol- or drug-related problems.

- Regression analyses for impairment rates indicated that individuals were, on average, 12.1 percent less productive as a result of alcohol abuse and 11.9 percent less productive as a result of drug dependence.

- Among the noninstitutional population, average income (earnings plus imputed value of housekeeping services) losses per male were about $5,000 versus $3,500 income losses per female due to substance abuse.

Mortality

- About 13,518 Texans in 2000 died from alcohol- and drug-related causes, which translated to 378,047 years of potential life lost (27.97 years per death) and the equivalent of $4.81 billion in lost future earnings ($356,077 per death) at a 4 percent discount rate.

- 10,913 alcohol-attributable deaths cost an estimated $3.36 billion and 2,605 drug-attributable deaths cost an estimated $1.45 billion to the economy.

- Both person-years and productivity lost per drug death were higher than those per alcohol death (37.3 years vs. 25.7 years and $556,491 vs. $308,236), because on average the drug-related decedents were younger than the alcohol-related decedents.

- Male deaths attributable to substance abuse represented a loss of $3.97 billion (82 percent) and female deaths accounted for $845 million (18 percent).

- Years of potential life lost per substance-related death was 28.9 years for men, compared to 26.3 years for women; mortality losses were $455,962 per male death, compared to $175,536 per female death.

- Deaths related to alcohol or drug abuse comprised 9 percent of total deaths in Texas for 2000. In terms of age distribution, substance-related deaths accounted for more than one-third (38 percent) of all deaths among 15- to 24-year-olds.

- 45 percent of the deaths from fires, 42 percent of motor vehicle traffic accidents, 38 percent of drownings, and 28 percent of suicides involve alcohol abuse.

Other Related Costs

- Other related direct and indirect costs were estimated at $7.76 billion for 2000. Of the total, direct costs accounted for 58 percent ($4.46 billion); indirect costs, the remaining 42 percent ($3.30 billion).

- Drug abuse costs comprised almost two-thirds ($4.94 billion) of the total other related costs.

- Of the other related direct costs, 87 percent ($3.87 billion) were associated with crime. The remaining 13 percent included the value of losses due to motor vehicle crashes ($424 million), social welfare administration ($61 million), and fire destruction ($110 million) related to substance abuse.

- Of the other related indirect costs, 57 percent ($1.88 billion) were for productivity losses of incarcerated populations, 35 percent ($1.15 billion) for foregone value in crime careers, and 8 percent ($265 million) for lost work time by victims of crime due to alcohol or drug abuse.

- The largest component of crime-related costs is the criminal justice system (police protection, legal and adjudication, state corrections, and local corrections), which amounted to $3.62 billion.

- There were 1,056,988 total reported arrests in Texas in 2000. Of this total, 14.5 percent were from public drunkenness, 10.0 percent from drug abuse violations, 9.2 percent from driving under the influence, and 2.9 percent from liquor law violations.

■ Substance-related motor vehicle crashes killed 1,160 Texans and injured an additional 27,298 for the year 1999, the most recent annual data available. It is also estimated that 74,637 property damage only vehicles were related to alcohol abuse.

■ Some 6.1 percent of structural fire losses and 11.2 percent of fire protection service costs were attributed to alcohol.

■ An estimated 41,326 drug abusers in Texas engaged in income-generating crimes to finance their drug addiction during 2000. Of this total, 53 percent were from the 18 to 24 age group.

■ Incarceration associated with drug abuse translated to 57,658 person years in lost productivity, and an additional 29,201 person years were lost due to incarceration related to alcohol abuse.

■ About 22 to 23 percent of state prisoners and local jail inmates in Texas were incarcerated for drug law violations, the most committed type of offense.

■ Larceny theft accounted for the largest part (45 percent) of the total substance-related productivity

losses resulting from the victims of crime.

■ Drug law violations represented the largest component of incarceration losses due to substance abuse, equaling $851 million.

Special Disease Groups

■ Unlike many other alcohol- and drug-related illnesses, the diseases of perinatal alcohol or drug exposure, AIDS, hepatitis B/C, and tuberculosis result in long-term medical and social costs.

■ Fetal alcohol syndrome (FAS) accounted for $305 million, drug-exposed infants for $100 million, AIDS associated with injection drug use for $182 million, and drug-related hepatitis B/C and tuberculosis for $6 million.

■ Using the incidence rate of 2.0 per 1,000 live births, an estimated 727 infants were born with FAS in Texas. An additional 10,796 children up to age 21 and 11,737 surviving adults aged 22 to 65 had FAS.

■ Adjusted from national figures (Harwood et al. 1998), a newborn with exposure to cocaine and other drugs had medical costs $9,620

higher than those of unexposed infants, and cocaine-only exposure was $1,522 in additional costs.

■ Of the 2,790 newly reported AIDS cases in 2000, about 21 percent (578 cases) were drug related; 415 cases were IVDUs and 163 cases were homosexual IVDUs.

■ About 5,700 Texans living with AIDS through the end of 2000 were intravenous drug users.

■ Approximately 13 percent (137 cases) of hepatitis B and 26 percent (95 cases) of hepatitis C cases were related to intravenous drug abuse.

■ An estimated 146 tuberculosis cases were attributable to injecting or non-injecting drug use for Texas in 2000.

Chapter II – Treatment and Prevention Costs

2.1 Alcohol and Drug Abuse Treatment

About $679 million was spent on specialty treatment services for alcohol and other drugs in Texas for 2000. An estimated $286 million was spent to treat clients primarily for alcohol abuse and $393 million primarily for drug dependence.

Estimates of Service Use

The treatment service and utilization information was mainly based on the 2000 National Survey of Substance Abuse Treatment Services (N-SSATS), which replaced the Uniform Facility Data Set (UFDS) and the National Drug and Alcoholism Treatment Unit Survey (NDATUS) in the previous years. The survey, conducted by SAMHSA (2001), is the only comprehensive survey of all private and public facilities in the nation that provide substance abuse treatment services, including inpatient or residential rehabilitation, outpatient services, detoxification, methadone programs, DWI programs, halfway houses, case management, and counseling. The survey form collects information on the operations and clients in treatment on a particular day (usually around October 1), including the number of 12-month admissions, capacity

of the program, licensure of facility/staff, ownership, and types of payment accepted.

A total of 747 treatment facilities in Texas participated in the 2000 N-SSATS, representing a 90.3 percent response rate. About 54 percent of the total facilities were private non-profit, 37 percent private for-profit, and 9 percent publicly owned (state, local, tribal, or federal government). Sixty-one facilities were operated by a hospital.

There were 42,616 clients reported in Texas treatment units on October 1, 2000. Some 74 percent of current clients were in outpatient services and 26 percent in detoxification or residential care. Eleven percent of the total clients treated were under 18 years of age. Youth clients (22 percent) tended to receive residential or inpatient treatment less frequently than adult clients (25 percent). While more than 53 percent of hospital inpatients received detoxification services, only 3 percent of non-hospital residential clients received detoxification.

According to the N-SSATS for Texas, 13 percent of current clients were treated for alcohol abuse only, 29 percent were treated for drug abuse only, and 58 percent

received treatment for both alcohol and drug abuse problems. Dividing the number of comorbid clients in half and adding them to the alcohol- and drug-only numbers would produce 42 percent of alcohol treatment and 58 percent of drug treatment.

To obtain the number of annual treatment admissions, two kinds of adjustments for survey item non-response and program non-response were made. To adjust for item non-response, the imputed values were developed by regressing the 12-month total admissions on current clients. Then, the estimate of annual admissions was adjusted up by 10.7 percent (computed as 100/90.3 percent, where 90.3 percent was the overall response rate in Texas) for program non-response. The 2000 data reported having 168,416 annual admissions in Texas treatment facilities. Imputations with missing estimates of annual admissions added 32,417 admissions, for a 19 percent increase. The second adjustment for program non-response increased the total annual treatment admissions to 222,406.

Length of Stay and Per Client Costs

Table 2.1 presents the number of current clients by type of treatment care as reported in the N-SSATS and the number of annual admissions after adjustments for item and program non-response. Since various types of treatment have different lengths of stay,

the distribution of current clients across modalities is different from that of annual admissions. Outpatients, for example, tend to stay in treatment for longer periods of time than inpatients. Based on the TCADA client data system, outpatients on average stay for 9 weeks, compared to adult inpatients for 27 days, youth inpatients for 51 days, and detoxification clients for 6-7 days. As shown in Table 2.1, about 74 percent of current clients were enrolled in outpatient programs. Yet, over the course of a year, only 55 percent of clients were in outpatient treatment.

The weekly costs for outpatient services in private non-profit institutions were estimated at $104 per adult client and $148 per youth client, generated from analyses of TCADA client and billing data. Adult residential services ranged from $32 to $158 and adolescent residential services ranged from $90 to $168 per client day in private non-profit treatment units. Also, adult detoxification charged $123 per client day, and adolescent detoxification was $132.

In comparison, the weekly outpatient fees per client were about $230 for adults and $330 for youths treated in private for-profit facilities, updated from TCADA telephone contacts for client fees in 1991 (Liu 1992). These weekly costs were also close to the estimates in French's study (1997). An estimate of $360 to $550 was used for

Table 2.1
Alcohol and Drug Abuse Treatment Services in Treatment Units, Texas, 2000

Modalities	Current Clients	Annual Admissions
Total	42,616	222,406
Detoxification	591	20,829
Hospital Inpatient (Youth)	199	801
Hospital Inpatient (Adult)	70	618
Non-Hospital Residential (Youth)	887	4,383
Non-Hospital Residential (Adult)	9,325	73,371
Outpatient	31,544	122,404

Sources: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 2000 National Survey of Substance Abuse Treatment Services (N-SSATS) for Texas

inpatient daily costs per client in private for-profit treatment units, adjusted for private spending changes on substance clients studied by Dayhoff and associates (2000).

Total Treatment Costs

Calculations of total treatment costs for private non-profit and private for-profit facilities were derived from the number of annual admissions, length of stay, and per client costs by both modality and setting (except for hospital inpatients, where the costs will be measured separately). It is estimated that $165 million was spent on private non-profit treatment services for alcohol and drug abuse in Texas. And, $364 million was spent on private for-profit treatment services (Table 2.2).

For publicly owned facilities, the total amount of funding sources provided in the 1998 UFDS was used to represent the total treatment costs, adjusted for inflation to 2000. The 1998 UFDS, instead of the 2000 N-SSATS, was the most recent available census that collected the information of sources and amounts of treatment revenues. An estimated $60 million in Texas was spent to treat substance abuse in state and local government institutions. Another $29 million was used for treatment services in federal institutions.

In addition, total treatment costs for specialty alcohol and drug services in hospital settings were estimated separately at $61 million. The utilization data were

Table 2.2
Treatment Costs in Alcohol and Drug Abuse Specialty Institutions, Texas, 2000

Type of Institution	Amount ($ in millions)		
	Total	Alcohol Abuse	Drug Abuse
Total	$679.1	$285.9	$393.2
Private Non-Profit	$165.4	$69.5	$95.9
Private For-Profit	$363.5	$152.7	$210.8
State and Local Government	$60.2	$25.3	$34.9
Federal and Tribal Governmen	$29.0	$12.2	$16.8
Hospitals, Non-Federal	$61.0	$26.3	$34.7

based on Texas Hospital Inpatient Discharge Public Use Data File, which will be discussed in Chapter III. In 2000, there were 25,633 discharges where the treatment provided in non-federal hospitals was primarily for an alcohol or drug abuse diagnosis (Appendix A, Table A.1). More than 127,000 hospital days of care were delivered, of which 43 percent were for alcohol abuse and 57 percent for drug abuse disorders. Most of the hospital-based treatment may be short-term detoxification episodes, with an average episode of 4.96 days for substance abuse-specific treatment. Hospital costs per day primarily for substance abuse disorders were comparable to those in private for-profit institutions.

2.2 Alcohol and Drug Abuse Prevention

The costs for programs to prevent alcohol and drug abuse were directly based on the Survey of Statewide Chemical Dependency Resource and Service Distribution conducted by TCADA (2002). The survey had been distributed to several state agencies whose budget was dedicated to substance abuse services including prevention, treatment, and enforcement activities. Different funding sources and types were collected as well.

An estimated $127 million in state and federal expenditures in Texas was spent on the prevention process that uses multiple strategies to preclude the illegal use of alcohol, tobacco, and other drugs to foster healthy, safe, and drug-free environments.

Of the total amount, 97 percent went to direct services and 3 percent was for administrative costs.

Since there are no statewide representative data of substance abuse prevention service providers, as there are for treatment services, the allocations to alcohol abuse (42 percent) versus drug abuse (58 percent) are based on the estimated figures from treatment admissions discussed earlier. An estimated $54 million was for alcohol abuse prevention and $74 million for drug abuse prevention.

Chapter III – Medical Care Costs

Alcohol or drug abuse problems may increase the risk of illness that requires the use of medical care services. The effects of substance abuse on other illnesses or injuries may be direct or more complicated, resulting in longer lengths of stay in the hospital. The total estimated medical care costs related to substance abuse for Texas were $791 million in 2000. Four types of costs are included: hospitalization ($325 million), outpatient medical services ($204 million), nursing home care ($46 million), and prescription drugs and nondurable medical supplies ($216 million). The coverage of these costs was not presented in the earlier Texas cost report (Liu 1992).

3.1 Hospital Costs

The estimation of hospital inpatient care was based on the 2000 Texas Hospital Inpatient Discharge Public Use Data File (THCIC 2001). The data file collects discharge information from more than 400 state licensed hospitals on a quarterly basis. Federal hospitals are exempted from reporting to THCIC by state law. Exempt hospitals also consist of those located in a county with a population less than 35,000, those with fewer than 100 licensed hospital beds, or those not seeking insurance payment or government reimbursement. The data, including length of stay in days,

ICD (International Classification of Disease) coded discharge diagnosis and procedure, source of payment, ZIP code, and gender/age/race, are validated through a process of automated auditing and verification.

Discharges Specifically Caused by Alcohol or Drug Abuse

Some illnesses are distinctively and specifically caused by alcohol or drug abuse, such as alcoholic or drug polyneuropathy, alcoholic cardiomyopathy, alcoholic gastritis, and alcoholic cirrhosis. Medical care for fetal alcohol syndrome and other effects of drug exposure on the fetus or newborns are not included here and will be discussed later in Chapter VII on specific disease groups.

It is estimated that there were 5,556 discharges in Texas hospitals for illnesses specifically caused by alcohol or drug abuse during 2000 (Appendix A, Table A.2). These discharges resulted in 34,325 days of care, with an average length of stay of 6.18 days. Only 13 discharges (147 days of care) were explicitly caused by drug abuse disorders. The vast majority (91 percent) of 5,556 discharges were allocated to the diagnosis of alcoholic fatty liver.

Discharges Partially Caused by Alcohol or Drug Abuse

Some hospitalizations of given illnesses or injuries are partially caused by substance abuse. The illness-specific (IS) approach is used for the estimate (Harwood et al. 1998). For example, 75 percent of malignant neoplasm of esophagus, 42 percent of acute pancreatitis, and 10 percent of fractures are caused by alcohol abuse (Appendix A, Table A.3). However, not much evidence is available for the role of drug abuse in causing various illnesses.

An estimated 30,249 hospital discharges in Texas for 2000 were for illnesses or injuries partially caused by alcohol abuse, which resulted in 194,879 days of hospital care. Some diagnoses caused in part by alcohol use, such as chronic hepatitis and portal hypertension, had relatively few discharges. Yet, hospitalizations for fractures accounted for 18 percent of the alcohol-related discharges and 19 percent of alcohol-related days of care. The average length of stay ranged from 2.6 days to 31.4 days for various illnesses partly caused by alcohol.

Discharges and Additional Days from Alcohol or Drug Abuse Co-occurrence

It is expected that lengths of stay in hospitals are longer for patients with co-occurring alcohol and drug abuse problems compared to stays for other patients. The diagnosed-population (DP) approach is used to estimate the additional hospital days resulting from co-occurring alcohol or drug abuse disorders (Harwood et al. 1998). First, the discharges for primary diagnoses of alcohol and drug abuse disorders were excluded. Then, the remaining discharges were divided into three groups: patients with no secondary alcohol or drug abuse comorbidity, patients with secondary alcohol abuse comorbidity, and patients with secondary drug abuse comorbidity.

The lengths of stay for patients with no alcohol or drug abuse comorbidity were subtracted from the lengths of stay for those with alcohol or drug disorders coded as a secondary diagnosis. The subtraction was then multiplied by the number of discharges for each diagnostic category with a co-occurring alcohol or drug disorder to get the total additional days of care. Table 3.1 shows the number of discharges, days of care, and average length of stay by major diagnostic categories for those three groups of patients mentioned earlier. Most (98 percent) of the discharges did not have any secondary alcohol or drug abuse comorbidity. About 35,400 discharges had a secondary (but no primary) diagnosis of alcohol abuse, and 19,600 had a secondary drug abuse diagnosis.

Table 3.1

Additional Days of Hospital Care From Alcohol or Drug Abuse Co-occurrence

Texas, 2000

Diagnositc Category	No. Secondary A&D Comorbidity			W/ Secondary Alcohol Abuse Comorbidity				W/ Secondary Drug Abuse Comorbidity			
	Discharges	Days	LOS*	Discharges	Days	LOS*	Add. Days	Discharges	Days	LOS*	Add. Days
Infectious/Parasitic	46,291	333,712	7.21	1,090	11,993	11.00	4,135	894	7,934	8.87	1,489
Neoplasms	107,702	663,634	6.16	1,186	11,530	9.72	4,222	553	5,441	9.84	2,034
Endocrine/Nutritional	78,187	389,820	4.99	1,872	9,728	5.20	395	1,102	5,848	5.31	354
Blood	22,145	109,292	4.94	461	2,260	4.90	(15)	209	1,693	8.10	662
Nervous	26,742	157,838	5.90	495	4,531	9.15	1,609	445	3,823	8.59	1,196
Circulatory System	353,780	1,934,601	5.47	5,977	38,663	6.47	5,979	2,633	18,629	7.08	4,231
Respiratory System	194,941	1,199,949	6.16	3,425	27,300	7.97	6,218	1,749	13,920	7.96	3,154
Digestive System	181,094	880,389	4.86	8,770	50,060	5.71	7,425	1,545	10,183	6.59	2,672
Genitourinary	116,248	442,638	3.81	842	5,548	6.59	2,342	634	3,413	5.38	999
Pregnancy	370,220	912,891	2.47	239	762	3.19	173	2,472	7,090	2.87	995
Skin	34,744	277,252	7.98	921	6,274	6.81	(1,075)	992	5,928	5.98	(1,988)
Musculoskeletal Sys.	99,704	473,897	4.75	791	6,272	7.93	2,512	877	6,562	7.48	2,394
Injury/Poison	143,612	890,232	6.20	5,908	40,050	6.78	3,427	3,141	17,823	5.67	(1,648)
Supplemental	413,846	1,968,571	4.76	957	12,351	12.91	7,799	795	10,476	13.18	6,694
Others	118,498	488,409	4.12	2,488	8,495	3.41	(1,760)	1,580	6,261	3.96	(251)
TOTAL	**2,307,754**	**11,123,125**	**4.82**	**35,422**	**235,817**	**6.66**	**43,385**	**19,621**	**125,024**	**6.37**	**22,986**

* LOS = length of stay (average) in days.

Source: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 2000 Texas Hospital Inpatient Discharge Public Use Data File (THCIC 2001).

The average length of stay for patients with secondary alcohol (6.66 days) or drug (6.37 days) abuse comorbidity was, as expected, longer than that among noncomorbid patients (4.82 days). Total additional days for patients with a secondary alcohol abuse diagnosis were estimated at 43,385 days, where supplemental disorders and digestive system problems accounted for more additional days than other disease categories. Also, there were 22,986 additional days from secondary drug abuse comorbidity, with supplemental disorders and circulatory system problems having more additional days than other diagnostic categories.

Estimating Hospital Costs

The IS approach counts all days for illnesses partially caused by alcohol or drug abuse, but misses additional days for other disorders. On the other hand, the DP approach counts extra days from co-occurring alcohol or drug disorders, but misses the days for disorders caused by alcohol or drug abuse. These two approaches are not mutually exclusive. To avoid double counting, parts of the additional days resulting from alcohol or drug abuse comorbidity under the DP approach (that is, the days of care for alcohol- or drug-related illnesses) have to be removed.

About 26,206 days included in the IS alcohol-caused estimates were taken out of the total additional days with co-occurring

alcohol disorders as shown in Table 3.1. The remaining 17,179 additional days can be directly added to the alcohol-specific and alcohol-related illness days for cost estimation (Table 3.2). For drug abuse, the proportion of discharges for which the additional days were estimated was assumed to be the same as for alcohol abuse. It shows that 9,102 additional days from drug abuse comorbidity remained for further cost measurement.

In sum, about 255,480 days were the hospitalizations of illnesses resulting from alcohol and drug problems or for longer lengths of stay associated with co-occurring substance abuse disorders. Applying the adjusted cost of $1,273.82 per inpatient day from non-federal, short-term general and other special hospitals in Texas (American Hospital Association [AHA] 2002) to the number of hospital days resulted in an estimated $325 million in hospital costs related to alcohol and drug abuse. Of the total, $314 million was for alcohol abuse problems and $12 million was for drug abuse problems.

3.2 Outpatient Medical Services

Due to a lack of statewide data sources for outpatient medical services, cost data from the National Ambulatory Medical Care Survey of 1992, adjusted upward to reflect 2000 prices, were used to derive the outpatient medical care estimates. As reported in the national study (Harwood et al. 1998), total costs of outpatient medical

Table 3.2

Non-Federal Hospital Days and Costs Resulting From Alcohol and Drug Abuse-Caused Illness, Texas, 2000

	Days of Care	Costs ($ in millions)
Total, Alcohol and Drug Abuse-Caused Illness	255,484	$325.4
Alcohol Abuse	246,236	$313.7
Alcohol-specific illness	34,178	$43.5
Alcohol-related illness	194,879	$248.2
Additional days from co-occuring alcohol disorders	17,179	$21.9
Drug Abuse	9,249	$11.8
Drug abuse-specific illness	147	$0.2
Drug abuse-related illness	--	--
Additional days from co-occuring drug disorders	9,102	$11.6

Source: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 2000 Texas Hospital Inpatient Discharge Public Use Data File (THCIC 2001) and the 2002 AHA Hospital Statistics for Texas.

care for alcohol abuse-specific and alcohol abuse-related conditions were about $1.75 billion nationwide. This figure was first inflated by national health expenditures to 2000, and then extrapolated to Texas based on the state's proportional population. It is, thus, estimated that $204 million was for outpatient medical care related to alcohol abuse in Texas.

3.3 Nursing Home Care

Cost estimates for nursing home care were based on the State Health Care Expenditures of 1998 (Health Care Financing Administration [HCFA] 2000). The data measure spending for personal health care services and products by state of provider and by two sources of funding, Medicare and Medicaid.

For Texas, a total of $4.35 billion was spent on nursing home care in 1998, which was adjusted upward by 5 percent to $4.56 billion in 2000. The percentage adjustment was derived from the change of national expenditures on nursing homes between 1998 and 2000. According to Harwood's study (1998), 1.0 percent was applied to the total Texas expenditures on nursing home care to obtain $45.6 million related to alcohol abuse. No estimates were allocated to drug abuse.

3.4 Prescription Drugs and Medical Nondurables

The same data sources (HCFA 2000) as mentioned in Section 3.3 were used to derive the costs of prescription drugs and nondurable medical items related to substance abuse. In 1998, total Texas expenditures on drugs and medical nondurables were about $8.67 billion. The figure was adjusted by the same increase of 25.5 percent in national expenditures on drugs and medical nondurables to reflect 2000 prices, which resulted in $10.9 billion.

It is assumed that the proportion of these expenditures related to or caused by alcohol abuse was comparable to the proportion of inpatient hospital days for illnesses caused in whole or partly by alcohol abuse. Hence, 1.99 percent[1] of the Texas expenditures on prescription drugs and medical nondurables, or $216.4 million, was attributed to alcohol abuse. Again, there was no equivalent estimate made for drug abuse.

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[1] Based on Section 3.1, the total days for alcohol-caused illnesses (34,178+194,879) divided by total days of care (34,178+11,123,125+235,817+125,024) in hospitals yield 1.99 percent.

Chapter IV – Morbidity Costs: Lost Productivity

Morbidity costs reflect the reduction in work productivity as well as the ability to perform usual activities by individuals with alcohol or drug abuse problems. Earnings from work and outputs in other non-work roles, such as performing household or childcare duties, are adversely affected among alcohol and drug abusers.

The morbidity costs were estimated at $11.2 billion in 2000 and comprised 43 percent of total substance abuse costs in Texas. About 79 percent ($8.8 billion) of total morbidity costs were from alcohol abuse, and 21 percent ($2.4 billion) from drug abuse. Over 73 percent ($8.2 billion) of morbidity losses were attributed to males. In terms of age group, 32 percent of the costs occurred in the 25-34 age group; 28 percent, in the 35-44 age group; and 16 to 17 percent, in the 18-24 or 45-54 age group.

To estimate morbidity costs, the numbers of noninstitutionalized persons who had alcohol or drug problems (abuse or dependence) were calculated based on the prevalence data of the substance abuse adult survey. Next, per capita income losses were measured by multiplying the total income per person by the relevant impairment rate due to alcohol or drug abuse. The total income includes the mean annual earnings in the labor market and the imputed value of housekeeping services. The impairment rates were estimated by regressing the income on various sociodemographic characteristics of labor force participants and information regarding substance abuse. Finally, the income losses per person with a substance problem were multiplied by the numbers of such persons within age-gender groups to derive the total morbidity cost estimates.

4.1 Alcohol and Drug Problem Users

About 2,186,000 individuals aged 18 and over in Texas had alcohol problems in 2000, and an additional 716,000 persons had drug problems (Table 4.1). Males (1,979,000) were two times more likely than females (923,000) to be problem users. Nearly 84 percent of total substance abusers were between 18 and 44 years of age.

The size of the civilian noninstitutionalized population for Texas by age group and gender was based on the local area labor force statistics from the Current Population Survey (U.S. Department of Labor 2001a) and the 2000 population census for Texas (U.S. Census Bureau 2001). About 3

percent of the total adult population was either institutionalized, homeless, or in military services, and was excluded from the estimation. The economic losses of substance use for the incarcerated population will be discussed in Chapter VI.

The prevalence of substance problems was derived from data collected for the 2000 Texas Survey of Substance Use Among Adults (Wallisch 2001). The telephone household survey, conducted by TCADA, generated a sample size of 10,227 adult Texans aged 18 and over. Texas households with no telephones were not sampled, nor

were homeless and institutional populations. Alcohol and drug problems were assessed using questions based on the symptoms of substance abuse and dependence defined in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition-Revised (DSM-III-R). Persons who reported at least one of the nine symptoms queried (such as undesired excessive use, development of tolerance and withdrawal symptoms, and problems in a person's life and functioning due to excessive substance use) in the past 12 months were considered as problem substance users for the study.

Table 4.1

Noninstitutionalized Population, Prevalence, and Problem Users by Age and Gender, Texas, 2000

	Civilian Noninstitutionalized Population	Prevalence of Alcohol Problems (%)	Prevalence of Drug Problems (%)	Problem Alcohol Users	Problem Drug Users
Total	14,474,000			2,185,586	716,127
Male	7,048,000			1,506,789	472,184
18-24	1,107,000	39.76	21.48	440,159	237,792
25-34	1,459,000	28.82	7.05	420,484	102,860
35-44	1,656,000	19.04	5.88	315,302	97,373
45-54	1,258,000	16.48	1.83	207,318	23,021
55-64	714,000	9.55	0.95	68,187	6,783
65+	854,000	6.48	0.51	55,339	4,355
Female	7,426,000			678,796	243,943
18-24	1,033,000	19.74	11.77	203,810	121,522
25-34	1,523,000	14.83	5.84	225,861	88,943
35-44	1,632,000	8.94	1.53	145,901	24,970
45-54	1,286,000	5.58	0.63	71,759	8,102
55-64	812,000	2.78	0.05	22,574	406
65+	1,140,000	0.78	--	8,892	--

Sources: Population: U.S. Department of Labor (2001a) and U.S. Census Bureau (2001); Prevalence: Texas Survey of Substance Use Among Adults (Wallisch 2001).

Table 4.1 shows that the youngest age group for both male and female adults had the highest percentage of substance-related problems. About 40 percent of males and 20 percent of females aged 18-24 were problem drinkers, and 21 percent of males and 12 percent of females in the 18-24 age group were problem drug users. All of the percentages of substance abuse decrease substantially with age.

The estimated number of people with an alcohol or drug problem was then summarized in the last two columns of Table 4.1. Of the total problem users, 75 percent were related to alcohol abuse or dependence.

4.2 Impairment Rates and Per Capita Income Losses

Total income levels per noninstitutional person are obtained within each age and gender group by combining civilian average annual earnings in the labor market and the imputed value of household services (Table 4.2). The mean annual earnings per person were based on national employment earning statistics (U.S. Department of Labor 2001b), and adjusted downward by 10.5 percent to reflect lower Texas average weekly earnings in manufacturing industry (U.S. Department of Labor 2001c). The earned income is the sum of wage or salary income and net income from farm and nonfarm self-

Table 4.2

Per Capita Income in 2000 of Persons 18 Years and Over by Age and Gender, Texas

Age and Gender	Total	Earned Income	Imputed Value of Housekeeping Services
Male	$41,906	$38,479	$3,428
18-24	$15,685	$13,480	$2,205
25-34	$37,674	$33,981	$3,693
35-44	$48,222	$44,262	$3,960
45-54	$53,213	$49,253	$3,960
55-64	$50,996	$47,834	$3,162
65+	$31,066	$29,391	$1,675
Female	$29,777	$22,443	$7,333
18-24	$16,614	$10,893	$5,721
25-34	$31,062	$22,598	$8,463
35-44	$34,289	$25,916	$8,373
45-54	$35,262	$26,889	$8,373
55-64	$28,150	$23,336	$4,814
65+	$15,840	$13,361	$2,479

Sources: U.S. Department of Labor (2001b, 2001c); Rice et al. (1990); Liu (1992).

employment. The 2000 average earnings were estimated at $38,479 per male and $22,443 per female in Texas. For each age group, male earnings are substantially higher than female earnings. The highest amount of annual earnings for both males and females is in the 45-54 age group.

The imputed market value of housekeeping services has to be added to the earnings because many people keep house and do not work in the labor market. The productivity losses due to substance abuse would be underestimated if the value of household work was not included in total personal income. The imputation of housekeeping services was directly adapted from Rice et al. (1990), who measured the time spent on housekeeping by men and women and valued the contributions with the prevailing wage rate for similar tasks in corresponding occupations. The value was then updated by earning statistics to reproduce 2000 prices for Texas. Housekeeping values, as shown in Table 4.2, are significantly higher for females than males, reflecting the relative amount of time spent in this activity.

Impairment Factors

The estimated impairment rates were 12.08 percent and 11.91 percent for alcohol and drug problem users, respectively. These impairment factors are computed by regressing family income on various individual sociodemographic characteristics (including age, gender, ethnicity, number of children, employment status, residential area) and information regarding alcohol and drug problems. The data used in the regression analysis were from the TCADA adult survey.

An indicator model for the regression analysis was applied in the current study. The model refers to the estimates based on dichotomous indicator (dummy variable) measures of individual substance abuse. For instance, if the respondent is considered an alcohol abuser, the dichotomous indicator of problem drinking takes on a value of one (versus the value of zero assigned to a non-abusing person). The impairment rates, defined as the percentages of income losses due to alcohol or drug abuse, are adjusted and transformed from the estimated regression coefficients.[1]

Per Capita Income Losses

Multiplying the impairment rates by the per capita total income in Table 4.2 yields the estimates of income losses per person with substance-related problems. Since total

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[1] Impairment rates are regression coefficients adjusted by the transformation; that is, [antiln(reg. coeff.) – 1].

income levels are higher for males than for females (except for the 18-24 age group), males have much higher income losses per person with substance problems. The estimated average income loss per male was about $5,000 versus $3,500 loss per female.

4.3 Total Alcohol and Drug Abuse Morbidity Losses

The aggregate morbidity losses shown in Table 4.3 are obtained by multiplying the number of alcohol and drug problem users in Table 4.1 by the corresponding per capita income losses with substance abuse. Within the noninstitutionalized adult population in Texas, alcohol and drug abuse accounted for aggregate productivity losses of $11.2 billion. Nearly three

quarters of the total losses were attributable to men, and over one quarter were attributable to women. Almost 60 percent of the losses were incurred by the 25-44 age group.

Because the 2000 statewide adult survey indicated no prevalence of drug abuse among females aged 65 and over (Table 4.1), the number of drug abusers in this group was not available. A female-specific imputed loss for this group was calculated by multiplying the ratio of the 65+ to the 55-64 age group alcohol abuse morbidity loss by the 55-64 age group drug abuse morbidity loss. A small amount of imputed losses ($0.3 million) for female drug abusers aged 65 and over was added to the total morbidity losses.

Table 4.3
Alcohol and Drug Abuse Morbidity Losses by Age, Gender and Disorder, Texas, 2000 ($ in millions)

	Total	Male	Female
Total	$11,180	$8,213	$2,967
Alcohol Abuse	$8,805	$6,545	$2,260
18-24	$1,243	$834	$409
25-34	$2,761	$1,914	$847
35-44	$2,441	$1,837	$604
45-54	$1,638	$1,333	$306
55-64	$497	$420	$77
65+	$225	$208	$17
Drug Abuse	$2,375	$1,668	$707
18-24	$684	$444	$240
25-34	$790	$461	$329
35-44	$661	$559	$102
45-54	$180	$146	$34
55-64	$43	$41	$1
65+	$16	$16	$0.3

Chapter V – Mortality Costs: Premature Death

Mortality costs represent the discounted present value of future lifetime earnings that are lost because people die prematurely from alcohol and drug abuse. In other words, if the individuals had not died prematurely due to substance abuse, they would have continued production for a number of years. The economic losses due to premature deaths account for a substantial percentage of total costs.

About 13,518 Texans in 2000 died from alcohol- and drug-related causes, resulting in 378,047 years of potential life lost and an economic cost of $4.81 billion. Of the total mortality amount, $3.36 billion (70 percent) was ascribable to alcohol-related deaths and $1.45 billion (30 percent) to drug-related deaths. Male deaths represented a major loss of $3.97 billion (82 percent) and female deaths accounted for $845 million (18 percent). The single greatest number of mortality losses was males aged 35-44 dying of alcohol-related diagnoses.

The estimated cost was derived by multiplying the number of substance-related deaths by the present value of an individual's expected lifetime earnings.

The method of estimation considers life expectancy for different age and gender groups, various labor force participation rates, patterns of earnings and imputed value of household work, and the appropriate discount rates to transform a stream of costs into its present price. The formula for calculating the lifetime earnings is presented in Appendix E.

5.1 Alcohol- and Drug-Related Deaths

There were 13,518 residential deaths caused by alcohol or drug abuse in 2000. Included were 10,913 alcohol-related deaths and 2,605 drug-related deaths. The number of substance-related deaths was based on the vital statistics death records provided by the Texas Department of Health (TDH).

The methodology in estimating the substance-related deaths for Texas has been revised since 1989 (Liu 1998; TCADA 1996). The mortality study was expanded in 1994 to include both underlying and contributing (or multiple) causes of death for analyses. Additional diagnoses such as AIDS-related diseases, viral hepatitis B and non-A/non-B, and infective endocarditis

were also included. The elderly who died at age 65 years and over were excluded from the estimation of drug-caused mortality.[1] In 1999, Texas death records started using the 10th revision of the International Classification of Diseases (ICD-10) codes, instead of the 9th revision (ICD-9-CM) codes. Differences between these coding systems may affect some mortality rates and make comparisons difficult. Certain reports showing the conversion and level of agreement between the two systems have provided helpful information (Centers for Disease Control and Prevention [CDC] 2000; World Health Organization [WHO] 1999).

The ICD provides a system by which descriptions of diseases and causes of death on death certificates are transformed to numerical codes for general statistical use (Practice Management Information Corporation 1989; WHO 1992). The numbers of deaths based on appropriate ICD codes are multiplied by the proportion of deaths attributable entirely or partially to alcohol or drug abuse for each code within the corresponding age ranges.

The alcohol-attributable fractions (AAF) and drug-attributable fractions (DAF), shown in Table B.1 and Table B.2 of Appendix B, are estimates of the

proportion of deaths from a specific disease or injury that are causally linked to alcohol and drug abuse, respectively. For direct causes, the AAF or DAF is always set to 100 percent; that is, all of the deaths in these diagnoses are attributed to alcohol or drug abuse. For indirect causes, the fractions show a wide range. For example, 60 percent of the deaths from chronic pancreatitis, 42 percent of motor vehicle traffic fatalities, and 5 percent of diabetes mellitus deaths involve alcohol abuse. Some 13 to 14 percent of people who died from viral hepatitis B or infective endocarditis are associated with drug abuse.

The total number of alcohol-related deaths in Texas in 2000 was estimated at 10,913, which accounted for 7.3 percent of deaths from all causes. About 2,100 of those deaths were directly related to the use or abuse of alcohol, and 8,813 more deaths were indirectly related. When indirect effects of alcohol abuse are counted, alcoholism becomes an even more significant mortality factor. Table 5.1 also shows that alcohol-related deaths among males totaled 6,926 (63 percent) and among females totaled 3,987 (37 percent).

The total estimated number of deaths caused by drug abuse was 2,605, which

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[1] Many elderly deaths coded as drug overdoses were not a result of these drugs that are commonly abused, but because their legally prescribed drugs were involved in deaths that were primarily due to advancing age. To avoid providing misleading information, numbers on drug-related deaths in Texas do not include those aged 65 and older since 1994.

Table 5.1

Alcohol and Drug Abuse Mortality: Number of Deaths and Years of Potential Life Lost by Age and Gender, Texas, 2000

	Number of Deaths			Years of Potential Life Lost		
	Total	Male	Female	Total	Male	Female
Alcohol Abuse	10,913	6,926	3,987	280,890	186,817	94,073
<15	186	106	80	13,443	7,363	6,080
15-24	789	606	183	45,979	34,468	11,511
25-34	697	540	157	34,281	25,977	8,304
35-44	1,099	827	272	43,233	31,541	11,692
45-54	1,515	1,153	362	46,627	34,236	12,391
55-64	1,446	1,050	396	32,457	22,478	9,979
65+	5,181	2,644	2,537	64,869	30,754	34,116
Drug Abuse	2,605	1,777	828	97,157	64,674	32,483
<15	1	0	1	70	0	70
15-24	257	197	60	14,840	11,120	3,720
25-34	402	285	117	19,799	13,621	6,178
35-44	727	503	224	28,961	19,233	9,727
45-54	681	449	232	21,296	13,378	7,918
55-64	537	343	194	12,192	7,323	4,870
65+	--	--	--	--	--	--

Sources: Analysis of the 2000 Texas vital statistics death data by Texas Commission on Alcohol and Drug Abuse; Texas Department of Health (2001a).

accounted for 1.7 percent of deaths from all causes. About 1,978 deaths were directly related to drug abuse, and 627 additional deaths were indirectly related. More than twice the number of males (1,777) died from drug-related causes as compared to females (828). About 54 percent of drug-related deaths occurred in the 35-54 age group.

5.2 Years of Potential Life Lost (YPLL)

The age- and gender-specific life expectancy data were used to estimate the number of YPLL due to premature deaths

(TDH 2001a). Life expectancy is the average number of years that a person can expect to live after a given age. As shown in Table B.3 of Appendix B, females have a higher life expectancy than males for each five-year age group. The number of YPLL was measured by multiplying the number of deaths by the life expectancy in years per age and gender category.

Table 5.1 shows that 378,047 years of potential life were lost due to alcohol- and drug-related deaths in Texas in 2000. An estimated 280,889 YPLL were from alcohol abuse, and 97,157 YPLL from drug

abuse. Though females have a longer life expectancy than males, fewer females died from substance-related causes, resulting in a smaller proportion of substance-related YPLL for females.

5.3 Present Value of Lifetime Earnings

The present value calculation rests on the notion that income which will be earned in the future has to be discounted back to the present by using a discount rate. The methodological problems, economic variables, and assumptions in estimating the costs of premature deaths are briefly summarized below.

Methodology

The human capital (HC) approach is used to evaluate the costs of premature death and to calculate the present value of future earnings and household services (Rice et al. 1990). The HC method measures the value of the individual's life in terms of the foregone earnings or labor contribution to the economy over his remaining lifetime. The method ignores non-market activities such as pain and suffering, loss of leisure, and aversion to risk that may be more important to an individual than economic loss. Yet, the imputation of the value for housekeeping activities is the only adjustment for non-market activities in HC estimates. The discount rate used to calculate the present value of future earnings represents the opportunity cost of

society investing in life-saving programs. Choice of a discount rate would affect the relative valuations of human life.

The mathematical expression to characterize the human capital method is shown in Appendix E.

Economic Variables and Assumptions

The *mean annual earnings* for year-round full-time (35 or more hours per week) workers, including salary income and net income from farm and nonfarm self-employment, were used to estimate the discounted lifetime earnings. The national figures of age- and gender-specific earnings were adjusted downward by 10.5 percent to reflect Texas prices (U.S. Department of Labor 2001b, 2001c). In applying these data, it is assumed that the future pattern of earnings for an individual within a sex group would follow the pattern during a base year. A one percent annual growth rate of productivity throughout an individual's working span is also assumed. The higher earnings for males, as shown in Table B.4 of Appendix B, will create a significant gender difference in the present value of future lifetime benefits.

The *labor force participation rate* is defined as the proportion of labor force participants in the total population. Labor force participants are those individuals who perform some market work in the economy

or who are actively seeking work. The labor force statistics for Texas (U.S. Department of Labor 2001a) show that a much higher proportion of males than of females were employed for each age group. The highest labor force participation rate was 94.8 percent for males in the 35-44 age group.

The *value of housekeeping services* was added to labor force earnings by using an age- and gender-specific imputed value of household work for those in the labor force and those not in the labor force (Table B.4, Appendix B). As described in Chapter IV, the imputation was adapted from Rice et al. (1990) and then updated to 2000 prices for Texas. The values of housekeeping services are higher for those not in the labor force since this population would likely spend more non-working time on household work than would those in the labor force.

The *housekeeping participation rates* by gender and age group were derived from the TCADA adult survey (Wallisch 2001). About 7.3 percent of total respondents in the 2000 survey said they currently were "full-time homemaker," and this population represented the housekeeping participation rate of those not in the labor force. In calculating the housekeeping participation rates of those in the labor force, it was assumed that their rates are 50 percent of those not in the labor force.

The present value calculations are quite sensitive to the *discount rate* used in human capital estimates; the higher the discount rate, the lower the present value of expected earnings. A four percent discount rate was applied for the Texas mortality cost estimation to convert future earnings into 2000 dollars. For comparison, a six percent discount rate in estimating the present value of lifetime earnings was also shown.

Estimated Results of Present Value

Table 5.2 shows the estimated present value of future lifetime earnings by age, gender, and discount rate. It is assumed that the individual's working span is from age 16 to age 75 and the maximum life span is 85 years.

The 4 percent discounted present value for a male under age 15 is $663,098. The male present-value amount reaches a peak of $929,664 for the 25-34 age group, and declines to $55,395 for ages 65 and over. The "hump-shaped" pattern is similar for females. Yet, the present value of lifetime earnings for females are much lower than those for males, and the peak point is in the 15-24 age group at $568,486 (or about 60 percent of the peak male value).

Table 5.2
Present Value of Expected Future Lifetime Earnings by Age, Gender and Discount Rate, Texas, 2000

Age	Males		Females	
	4 percent	6 percent	4 percent	6 percent
<15	$663,098	$377,901	$432,750	$255,938
15-24	$895,750	$627,528	$568,486	$410,457
25-34	$929,664	$716,842	$552,027	$434,029
35-44	$789,739	$651,889	$435,642	$363,708
45-54	$542,500	$476,325	$272,596	$240,242
55-64	$248,234	$231,312	$115,064	$105,950
65+	$55,395	$52,932	$29,510	$27,504

Note: See Appendix E for the formula of calculations.

5.4 Mortality Costs of Alcohol and Drug Abuse

Productivity losses due to premature death were estimated by multiplying the number of deaths by the 4 percent discounted present value of an individual's future earnings within the gender and age group. As indicated in Table 5.3, a total of 10,913 alcohol-related deaths resulted in 280,889 years of potential life lost (25.74 years per death), which translated to the equivalent of a loss of $3.36 billion in future earnings in 2000 dollars ($308,236 per death). The large differences between male and female losses are due to fewer substance-related deaths and lower earned income for females. A total of 2,605 Texans who died from drug-related causes in 2000 represented 97,157 years of potential life lost (37.30 years per death) and $1.45 billion productivity losses ($556,491 per death). Although the number of drug-related person years lost per death was slightly higher for females (39.23 years) than for males (36.40 years), the average dollar losses per death were about two times higher for males ($656,940) than for females ($340,915).

In sum, the 13,518 total deaths due to alcohol and drug abuse resulted in 378,047 person years lost and a loss of $4.81 billion to the Texas economy in 2000 (at a 4 percent discount rate). Males accounted for 64.4 percent of total alcohol- and drug-related deaths, 66.5 percent of the total years of potential life lost, and 82.4 percent of the total productivity losses. Many persons who died from substance abuse were young. About 45.6 percent of the total 13,518 deaths were in the 15-54 age group, and this age group accounted for 84.6 percent of the total dollar losses.

Table 5.3

Alcohol and Drug Abuse Mortality: Number of Deaths, Years of Potential Life Lost, and Productivity Losses by Disorder and Gender, Texas, 2000

	Number of Deaths	Years of Potential Life Lost		Productivity Losses *	
		Total Person Years Lost	Years Per Death	Amount ($ thousands)	Amount Per Death
Total	13,518	378,047	27.97	$4,813,444	$356,077
Alcohol Abuse	10,913	280,890	25.74	$3,363,784	$308,236
Drug Abuse	2,605	97,157	37.30	$1,449,660	$556,491
Male	8,703	251,491	28.90	$3,968,239	$455,962
Alcohol Abuse	6,926	186,817	26.97	$2,800,857	$404,397
Drug Abuse	1,777	64,674	36.40	$1,167,382	$656,940
Female	4,815	126,556	26.28	$845,205	$175,536
Alcohol Abuse	3,987	94,073	23.59	$562,927	$141,191
Drug Abuse	828	32,483	39.23	$282,278	$340,915

* at a 4 percent discount rate.

5.5 Deaths From All Causes vs. Substance Abuse Deaths

Based on 2000 vital statistics data (TDH 2001a), a total of 149,763 Texans died from all causes (74,533 males and 75,230 females). The number of deaths related to alcohol and drug abuse comprised 9.0 percent of total deaths from all causes. The age distribution of substance-related deaths is quite different from that of total deaths. Forty-six percent of the total substance-related decedents were aged 15-54, while only 16 percent of deaths from all causes were aged 15-54.

Alcohol and drug abuse take their toll most heavily among young adults. Substance-related deaths accounted for 38.2 percent of all deaths among those aged 15-24, and 32.9 percent of all deaths among those aged 25-34 (Figure 5.1). Substance-related deaths accounted for 11.7 percent of all male deaths, and 6.4 percent of all female deaths.

Figure 5.1 Substance-Related Deaths as Percent of All Causes of Death by Age, Texas, 2000

Legend: Substance-Related Deaths, "Other Causes" Deaths

Age	Substance-Related Deaths	"Other Causes" Deaths
<15	6%	94%
15-24	38%	62%
25-34	33%	67%
35-44	28%	72%
45-54	19%	81%
55-64	12%	88%
65+	5%	95%
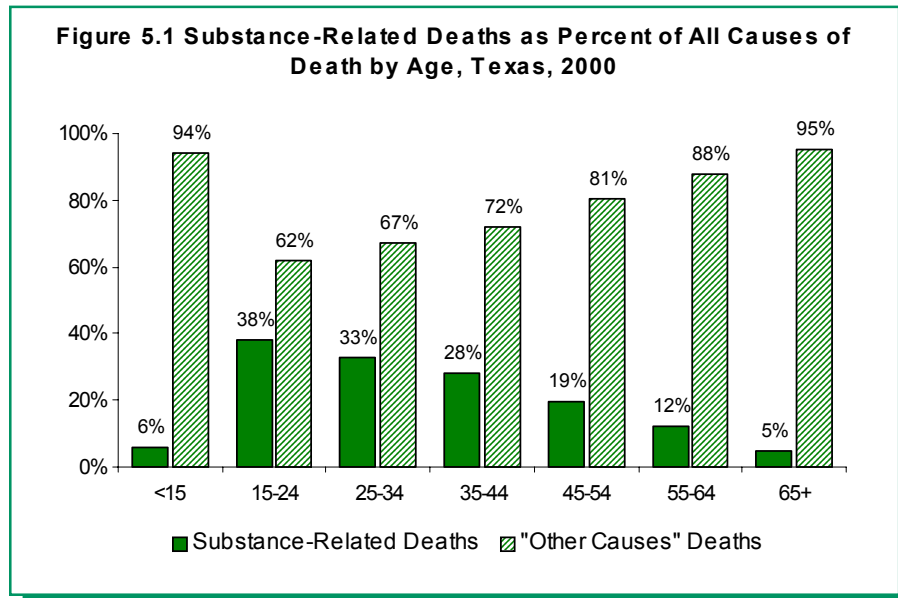
Chapter VI – Other Related Costs

Other related direct costs of alcohol and drug abuse include public and private expenditures for crime, motor vehicle crash losses, social welfare administrative costs, and fire destruction losses. Indirect costs include the value of productivity losses due to criminal victimization, individuals' incarceration as a result of criminal offenses, and time spent by individuals who are engaged in drug-related crime careers rather than legal employment.

The estimates of direct and indirect costs related to substance abuse for Texas in 2000 are summarized in Table 6.1. These "other related costs" of alcohol and drug abuse amounted to $7.76 billion ($2.82 billion for alcohol abuse and $4.94 billion for drug abuse). The direct costs totaled $4.46 billion; of this amount, criminal expenditures accounted for 86.7 percent ($3.87 billion). The indirect costs totaled $3.30 billion; of this amount, incarceration losses accounted for 57.0 percent ($1.88 billion).

Direct Costs
6.1 Crime and the Criminal Justice System
According to the Texas Crime Report (Texas Department of Public Safety [TDPS] 2001), a total of 1,032,670 known criminal offenses occurred in 2000. About 11 percent were violent crimes (murder, rape, robbery, and aggravated assault) and 89 percent were property crimes (burglary, theft, and motor vehicle theft). The crime volume by offense is shown in column <1> of Appendix Table C.1. Law enforcement officers cleared 19 percent of all known offenses reported to them by arrest. Of the violent crimes, 46 percent were cleared while 15 percent of all property crimes were cleared.

During 2000, Texas law enforcement officers made 1,056,988 criminal arrests. Among those arrested, 14 percent were juveniles and 86 percent were adults. About 105,657 arrests (10.0 percent) were for drug abuse offense, 97,019 (9.2 percent) for driving under the influence, 30,204 (2.9 percent) for liquor laws, and 152,698 (14.5 percent) for public drunkenness. The number of known arrests by type of offense is shown in column <1> of Appendix Table C.4.

To estimate the offense-specific criminal justice costs associated with alcohol and drug abuse, the "causal factors" for all offenses shown in columns <3> and <4> of Appendix Tables C.1 through C.4 are determined. The causal factors represent the percentage of known offenses or arrests that are attributable to alcohol and drug

Table 6.1

Other Related Direct and Indirect Costs by Type of Cost and Disorder - Texas, 2000

| Type of Cost | Amount ($ in millions) | | |
	Total	Alcohol Abuse	Drug Abuse
Total	$7,761	$2,823	$4,939
Direct Costs	$4,464	$2,054	$2,410
Crime	$3,869	$1,509	$2,360
Public Expenditures	$3,701	$1,455	$2,245
Criminal Justice System	$3,624	$1,455	$2,169
Police Protection	$1,607	$561	$1,047
Legal and Adjudication	$344	$117	$227
State Correction	$1,111	$405	$705
Local Correction	$562	$372	$189
Drug Law Enforcement	$77	–	$77
Private Legal Defense	$83	$29	$54
Property Destruction	$85	$25	$60
Motor Vehicle Crashes	$424	$394	$30
Social Welfare Administration	$61	$41	$20
Fire Destruction	$110	$110	–
Indirect Costs	$3,298	$769	$2,529
Victims of Crime	$265	$131	$134
Incarceration	$1,880	$638	$1,242
Crime Careers	$1,153	–	$1,153

abuse. Those alcohol- and drug-related causal factors were derived from the integrated data of TCADA 1998-2000 surveys for male and female inmates, state jail offenders, and substance abuse offenders. For example, 25.7 percent and 8.2 percent of aggravated assault offenders were involved in drinking and drugs, respectively, at the time of their crime. Also, 12.4 percent and 21.2 percent of robbery/burglary/larceny theft offenders were under the influence of alcohol and drugs, respectively, at the time of their arrest.

The drug-related causal factors for stolen property and prostitution could not be estimated from the surveys and were directly adapted from the national study of Harwood and associates (1998).

The total expenditures for the criminal justice system in Texas (U.S. Department of Justice 2001) were inflated to $7.52 billion for 2000 using consumer price index (all-items index). There are four major components included in the public criminal justice system: police protection, legal and adjudication, state corrections, and local corrections. Data for lock-ups or "tanks" holding prisoners less than 48 hours are included in the category of "police protection." Data for institutions with authority to hold prisoners beyond arraignment (usually 48 hours or more) are included in the category of "corrections."

Table 6.2 shows the distribution of criminal justice expenditures and the amount and percentage due to substance abuse. About 48 percent ($3.62 billion) of the total expenditures of the criminal justice system in Texas were associated with alcohol and drug abuse. Police protection costs accounted for the largest amount of $1.61 billion, followed by $1.11 billion for state corrections, $562 million for local corrections, and $344 million for legal and judicial services. Tables C.1 through C.4 in Appendix C present a more detailed itemization and estimation of these costs.

6.2 Drug Law Enforcement

A small portion (2.1 percent) of the public expenditures for crime in Texas was attributable to drug law enforcement. The costs of drug law enforcement were directly based on the Survey of Statewide Chemical Dependency Resource and Service Distribution conducted by TCADA (2002). An estimated $76.7 million in state and federal expenditures in Texas was spent on the law enforcement to reduce the supply of drugs.

6.3 Private Legal Defense

Not only public expenditures but also private legal defense costs are included in the substance-related criminal costs. Based on the 1997 Economic Census (U.S. Census Bureau 1997), the total annual receipts for legal services in Texas were $9.24 billion. This amount was updated by

Table 6.2
Criminal Justice System Expenditures by Type of Activity, Texas, 2000

Type of Activity	Total Amount (millions)	Total % Distribution	Alcohol & Drug Abuse Amount (millions)	Alcohol & Drug Abuse % Distribution	% Alcohol & Drug Abuse of Total
Total	$7,516	100.0	$3,624	100.0	48.2
Police Protection	$2,962	39.4	$1,607	44.4	54.3
Legal Adjudication	$1,212	16.1	$344	9.5	28.4
State Corrections	$2,323	30.9	$1,111	30.6	47.8
Local Corrections	$1,019	13.6	$562	15.5	55.1

Sources: See Appendix Tables C.1–C.4.

consumer price index (other goods and services index) to $11.14 billion for 2000. Yet, only 2.6 percent of lawyers practiced criminal law (Office of National Drug Control Policy [ONDCP] 2001), which resulted in the total of $290 million expended for private legal defense services for those accused of crimes.

According to Texas known arrests by type of offense and the corresponding causal factors of substance abuse, it is estimated that about 10.1 percent and 18.6 percent of total arrests were allocated to alcohol and drug abuse, respectively. Applying these proportions to the amount of $290 million yielded the private legal defense costs attributable to alcohol and drug abuse at $83 million in 2000 ($29 million for alcohol abuse and $54 million for drug abuse).

6.4 Property Destruction in Crime

The values of property destroyed by crime attributable to substance abuse are shown in Appendix Table C.5. Since Texas uniform crime records only report the value of property stolen, the ratios of victimizations resulting in damage losses (property damage) and theft losses (property stolen) in the nation are used to calculate the value of property damage in Texas by crime category. Those ratios were based on the National Crime Victimization Survey (U.S. Department of Justice 2001d).

The total values of damaged property due to murder, assault, robbery, burglary, larceny theft, and motor vehicle theft were estimated at $290 million in Texas for 2000. About 29 percent ($84.9 million) of

Table 6.3

Motor Vehicle Crash Costs due to Alcohol and Drug Abuse, Texas, 2000 ($ in thousands)

Disorder & Cost Category	Total	Fatalities	Non-fatal Injuries	Property Damage Only
Total	$424,050	$132,831	$167,810	$123,408
Alcohol Abuse	$394,054	$113,765	$156,880	$123,408
Legal/Court Costs	$89,391	$70,148	$19,243	$0
Insurance Administration	$79,610	$33,069	$37,609	$8,933
Vehicle Damage	$225,053	$10,549	$100,028	$114,476
Drug Abuse	$29,996	$19,066	$10,930	--
Legal/Court Costs	$13,097	$11,756	$1,341	--
Insurance Administration	$8,162	$5,542	$2,620	--
Vehicle Damage	$8,737	$1,768	$6,969	--

Sources: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 1999 Motor Vehicle Traffic Accident Data File (TDPS 2000); Blincoe (1996).

the total costs were associated with substance abuse ($24.6 million for alcohol abuse and $60.3 million for drug abuse).

6.5 Motor Vehicle Crashes

Motor vehicle crashes associated with alcohol and drug abuse cost Texas $424 million in 2000, representing almost 10 percent of total "other related direct costs." Motor vehicle crashes fall into three accident categories, including those with fatalities, with non-fatal injuries, and with property damage only. For each category, only data on direct-cost elements are included; that is, legal/court costs, insurance administration, and vehicle damage (Table 6.3).

Based on the most recent 1999 Texas Motor Vehicle Traffic Accident File (TDPS 2000), there were 994 and 167 motor vehicle crash fatalities due to alcohol and drug abuse, respectively. The non-fatal injuries were 25,520 and 1,778, respectively. About 308,595 accidents were for property damage only (PDO), including those involved in injury crashes. It is estimated that 1.74 times of PDO accidents were PDO vehicles (Blincoe 1996). And 13.9 percent of PDO vehicles were alcohol-abuse related; yet there is no evidence of a causal relationship for other drugs (Harwood et al. 1998). Therefore, a total of 74,637 vehicles that incurred PDO were alcohol-related in Texas.

Blincoe (1996) developed quite detailed estimates of motor vehicle crash costs for 1994, including a number of different injury and non-injury components. Accidents with personal injury were presented by severity level, using the Maximum Abbreviated Injury Scale (MAIS), with minor/moderate injuries represented by categories MAIS 1 and MAIS 2 and severe and critical injuries by categories MAIS 3 through MAIS 5. The weighted average of the five MAIS costs was used as the cost value per non-fatal injury in this current study.

Estimates from Blincoe for 1994 unit costs were inflated to 2000 dollars using the consumer price index (all-items index). The total accident-specific costs for motor vehicle crashes in Table 6.3 were computed by multiplying the number of substance-related fatalities, injuries, or PDO by the corresponding unit costs per accident category. About 93 percent ($394 million) of the total substance-related motor vehicle crash costs were attributed to alcohol abuse, and 7 percent ($30 million) attributed to drug abuse. The costs from non-fatal injury crashes accounted for the largest component ($168 million), followed by fatality costs ($133 million).

6.6 Social Welfare Administration

Alcohol and drug addiction contributes to income losses for the abusers and their families. To compensate for reduced income, cash payments are often made to these individuals through welfare, unemployment, social security, or public assistance programs. Because cash transfer payments do not represent an economic cost to society per se, but rather a redistribution of resources, only the administrative expenses of social welfare programs are included in these cost estimates.

The amount of social welfare administration costs attributable to alcohol and drug abuse was estimated at $60.8 million in 2000, or 2.8 percent of the total $2.16 billion in annual administrative expenditures. Accordingly, $40.7 million in costs were attributed to alcohol abuse, and $20.1 million were attributed to drug abuse.

Methodology

Three major components included to derive the cost estimates were the total expenditures of relevant social welfare programs, the proportion of expenditures devoted to administrative costs, and the proportion of social welfare services attributable to alcohol or drug abuse. Appendix Table C.6 shows the detailed estimation of components by type of social

welfare program. The current study includes 15 social welfare programs in Texas, such as OASDI (old age, survivors, and disability insurance), SSI (supplemental security income), TANF (temporary assistance for needy families), unemployment insurance, workers' compensation, public assistance, food stamps, and the Head Start program.

The most recent Texas-specific expenditures were obtained for the majority of social welfare programs, except for a few programs where state-level data were not available and a proper fraction of the national expenses was used for Texas-specific amount. The social welfare expenditures shown in column <1> of Appendix Table C.6 were based on various sources, including the Statistical Abstract of the United States (U.S. Census Bureau 2002), Social Security Bulletin, and Head Start statistics (U.S. Department of Health and Human Services 2001a, 2001b). The OASDI program affects a large element of the public and accounts for the largest share of the total social welfare expenditures.

The percentages of the social welfare expenses devoted to administration were directly adapted from Harwood et al. (1998). Administrative costs shown in column <3> of Appendix Table C.6 accounted for about 7 percent of the total program expenditures. To establish the

social welfare administrative costs due to alcohol and drug abuse, the causal proportions were also adapted from the national study (Harwood et al. 1998). For example, 1.7 percent of OASDI, 3.0 percent of SSI, and 5.2 percent of TANF cases were attributable to alcohol or drug abuse. The cost estimates for substance abuse were then measured by multiplying the total administrative costs by the proper causal proportion per program.

6.7 Fire Destruction

Although alcohol is involved in 45 percent of fire-related deaths mentioned in the previous chapter of mortality costs, alcohol is much less frequently implicated with fire-related destruction losses. About 6.1 percent of structural fire losses and 11.2 percent of fire protection services are attributed to alcohol (Cruze et al. 1981; Rice et al. 1990).

Based on Texas fire incident statistics (Texas Department of Insurance 2002), there were 20,279 structure fires reported during 2000 resulting in $290 million property losses. Of this amount, $17.7 million was alcohol related. Also, the total fire protection service costs were estimated at $825 million from local/city government expenditures (U.S. Census Bureau 1996, 2000) with $92.4 million related to alcohol. Altogether, the fire destruction losses attributed to alcohol cost Texas about $110 million.

Table 6.4

Productivity Losses for Victims of Crime by Type of Crime, Texas, 2000

($ in thousands)

Type of Crime	Number of Victims	Average Workdays Lost per Victim	% Attributable to Alcohol Abuse	% Attributable to Drug Abuse	Productivity Losses Alcohol Abuse	Productivity Losses Drug Abuse	Total
Rape	22,721	6.59	23.7	4.0	$5,101	$866	$5,967
Assault	434,760	3.84	25.7	8.2	$61,667	$19,653	$81,320
Robbery	54,257	3.60	12.4	21.2	$3,477	$5,953	$9,430
Burglary	317,549	2.67	12.4	21.2	$15,093	$25,841	$40,934
Larceny Theft	1,363,865	1.81	12.4	21.2	$43,945	$75,237	$119,182
Motor Vehicle Theft	74,853	2.97	4.1	20.4	$1,299	$6,495	$7,794
Total	2,268,004				$130,582	$134,045	$264,627

Sources: U.S. Department of Justice (2001b, 2001c, 2001d); Texas Department of Public Safety (2001).

Indirect Costs
6.8 Victims of Crime

Productivity losses or the value of lost work time by victims of crime are shown in Table 6.4. A total of 2,268,004 Texans were criminally victimized in 2000, with the average number of workdays lost per criminal offense ranging from 1.81 to 6.59 days (excluding homicides, which were accounted for in the previous chapter on mortality). The number of victims per crime in Texas was derived from the national ratios of the victimizations to the known offenses (U.S. Department of Justice 2001b, 2001c).

The average workdays lost for victims of crime were based on the percent distribution of victimizations resulting in

loss of time from work and the number of days lost by type of crime (U.S. Department of Justice 2001d). For example, 60 percent of the victimizations of robbery offense lost 1-5 days, 26 percent lost less than 1 day, and 13 percent lost 6 or more days from work. To develop the total productivity losses per victim of crime, the average number of work-loss days per victim was multiplied by the estimated loss of productivity (market plus non-market) of $143.56 per workday. The productivity loss per workday was based on the national figure adjusted by the Texas manufacturing hourly earnings in 2000 dollars.

The total number of victims was multiplied by the value of lost productivity per victim of crime. To estimate the value of losses

caused by substance abuse, the attribution factors by each type of crime were applied for alcohol and drug abuse, respectively (which were discussed in the previous section on criminal justice system). This yielded a total substance-related loss of $265 million for victims of crime, where larceny theft accounted for 45 percent of the total.

6.9 Incarceration

Criminals who are incarcerated contribute to the losses of potential productivity. Estimates of lost productivity due to incarceration are based on the number of persons incarcerated because of alcohol- or drug-related offenses, the person years served in incarceration, and the average annual earnings for male and female inmates.

The value of reduced productivity for those incarcerated individuals was estimated using the approach developed by Cruze et al. (1981), with the application of Texas updated criminal statistics and attribution factors discussed earlier. The detailed calculations are presented in Appendix Table C.7 and Table C.8.

Number of Inmates

Based on Texas state prisoner and county jail population reports (Texas Department of Criminal Justice [TDCJ] 2001; Texas Commission on Jail Standards [TCJS] 2001), there were 151,092 state inmates (including prison offenders, state jail

offenders, and substance abuse offenders) and 47,876 local inmates in county jails during 2000. Male inmates accounted for the majority (92 percent) of either state inmates or local jail inmates. About 22 to 23 percent of state and local jail offenders were for drug law violations, the most committed type of offense.

To show the gender-specific local jail inmates by type of criminal offense, the offense distributions by gender under the national profile of jail inmates (U.S. Department of Justice 1998) were applied to the total number of male and female inmates in Texas local jails, respectively. Similar to the state offender population, male inmates were nearly twice as likely as female inmates to be in local jails for a violent offense. On the other hand, female inmates (27 percent) were more likely than male inmates (21 percent) to be in local jails for drug offenses (this pattern held for state offenders as well: 38 percent females vs. 22 percent males).

The attribution factors for alcohol- and drug-related crimes, as shown in Appendix Table C.7, were used to determine the number of incarcerations associated with alcohol or drug abuse.

Time Served by Inmates

People incarcerated in state prisons are more serious criminal offenders and therefore serve longer sentences than those in local jails. The TDCJ estimated that state

prison offenders confined on August 31, 2000, had an average sentence length of 20.1 years, and state jail offenders had an average sentence length of 1.2 years. Local jails, unlike state prisons, typically hold inmates with sentences of a year or less.

Based on the 1996 national profile of jail inmates, the estimated time that local jail inmates were expected to serve was 5.7 months (a median value). Among inmates sentenced to serve their time in jails, violent offenders expected to serve the longest with a median of 8.2 months. For driving under the influence, one common offense type for which persons are sentenced to local jails, inmates were expected to serve a median of 4.1 months.

Person years served in incarceration were derived by multiplying the number of inmates associated with substance abuse by the time served in years. During the whole year of 2000, the time served for all state offender populations was one year and the median time served by local jail inmates was 0.475 year (that is, 5.7 months). As shown in Appendix Table C.7, there were in total 29,201 years of lost productivity due to incarceration associated with alcohol abuse (27,599 years for male inmates and 1,602 years for female inmates). Another 57,658 years served were for drug-related incarceration, with 51,426 years for male inmates and 6,232 years for female inmates.

Value of Productivity Losses

Incarceration prevents individuals from performing their normal work and household responsibilities, which results in productivity losses to society. The average annual income of legal productivity (market plus nonmaket) for each gender group is used to calculate the value of lost productivity of incarcerated person years.

Derived from the integrated data of TCADA inmate surveys, the average legal income adjusted for year-round, full- and part-time personal earnings was $18,739 for male offenders and $9,009 for female offenders in Texas. The average imputed value of household services, adapted from the previous chapter on morbidity, was $3,428 for males and $7,333 for females. Therefore, the average annual income of $22,167 per male inmate and $16,342 per female inmate was applied.

Total productivity losses of incarceration due to alcohol and drug abuse, as shown in Appendix Table C.8, were about $1.88 billion in Texas for 2000. Productivity losses from drug-related incarceration ($1.24 billion) were nearly two times of those from alcohol-related incarceration ($638 million). Male incarceration losses were estimated at $1.75 billion, of which 44 percent for drug law violations and 27 percent for violent offenses (Figure 6.1). In comparison, drug law violations accounted for almost two-thirds of the total $128

Figure 6.1 Male and Female Incarceraton Losses Due to Substance Abuse by Type of Offense: Texas, 2000
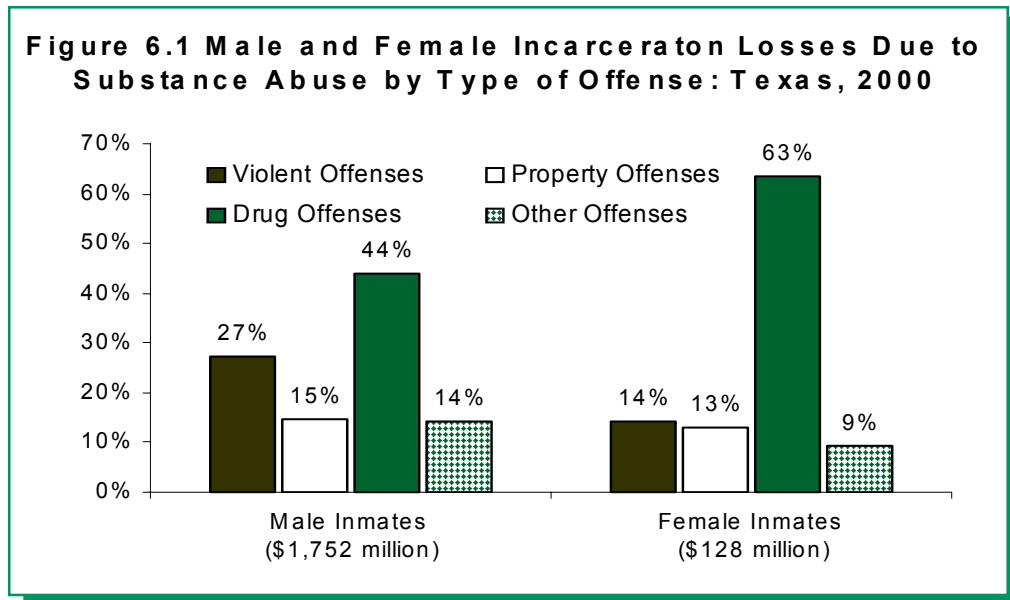
million female incarceration losses. Overall, drug law violations represented the largest component, equaling $851 million.

6.10 Crime Careers

A primary source of other related indirect costs is the lost productivity of individuals who engage in drug-related crime as a career rather than legitimate employment. Serious drug abuse can cause an individual to forego regular productive efforts and become involved in selling drugs and committing criminal activities to obtain income. It was assumed that 50 percent of drug abusers who are not incarcerated for drug-related crime perform criminal activities to support their drug habit (Rice et al. 1990).

Heroin and cocaine, which are highly addictive as well as expensive, are the two major drugs that cause individuals to forego legal employment. This lost productivity was determined by first estimating the prevalence of heroin and cocaine addiction by gender and age group. Next, an estimate was made of the proportion of this population who engaged in criminal activities as a result of drug addiction (that is, 50 percent of non-inmates). The value of productivity losses was then measured by applying the appropriate average annual earnings in each gender and age group. The detailed estimation is presented in Appendix Table C.9.

Prevalence of Substance-related Crime

The prevalence of past-month heroin and cocaine abuse, based on the 2000 TCADA adult survey (Wallisch 2001), was used to calculate the numbers of heroin and cocaine addicts. There were about 129,100 cocaine abusers in Texas and 11,200 heroin abusers. More than 73 percent were male addicts. In terms of age group, about 53,500 were 18-24 years old, 44,600 were 25-34 years old, and 42,200 were 35 and over.

The total drug-related incarceration population of 57,658 (both state and local jail inmates) was deducted from the total prevalence of cocaine and heroin addicts, leaving 82,652 drug abusers in the "free world." One-half of the drug abusers not in incarceration (41,326 people) were estimated to be career criminals who finance their drug addiction. The first three columns of Appendix Table C.9 present the gender and age distribution of the 41,326 career criminals.

Lost Productivity due to Substance-related Crime

The productivity loss figures were derived by multiplying the number of people foregoing legal activities by the appropriate mean annual earnings, which were based on salary income and net income from self-employment for year-round, full time workers (U.S. Department of Labor 2001c) adjusted by Texas manufacturing earnings.

The total value of lost productivity due to drug-related crime careers equaled $1.15 billion in Texas, of which 67 percent represented losses for males and 33 percent for females. By age group, $447 million (39 percent) was attributable to people aged 18-24, $428 million (37 percent) to those aged 25-34, and $280 million (24 percent) to those 35 and over.

Chapter VII – Costs for Specific Disease Groups

Costs related to certain types of specific disease groups associated with substance abuse are presented in this chapter. Unlike many other alcohol- and drug-related illnesses discussed in the medical cost chapter, these specific diseases result in long-term medical and social costs, including fetal alcohol syndrome (FAS), drug-exposed infants, acquired immunodeficiency syndrome (AIDS), hepatitis B/C, and tuberculosis.

These disease groups cost Texans $593 million in 2000. Of the total amount, $305 million was for FAS, $100 million for drug-exposed babies, $182 million for AIDS through intravenous drug use (IVDU), and $6 million for IVDU-related hepatitis B/C and tuberculosis.

7.1 Fetal Alcohol Syndrome

One extreme result of perinatal alcohol exposure is FAS, which occurs in children born to women who drink excessively during pregnancy. The common signs of FAS are prenatal and postnatal growth deficiency, developmental delay or mental retardation, fine motor dysfunction, and a characteristic facial dysmorphology.

Not all women who drink alcohol heavily during pregnancy deliver babies with FAS.

Early reports suggested incidence rates of FAS in the range of 1 to 3 cases per 1,000 live births. Adapted from the Harwood et al. (1998) and Abel and Sokol (1987), this current study assumes that 2.0 per 1,000 live births had FAS, 2.0 per 1,000 persons up to age 20 were born with FAS, and 1.0 per 1,000 persons over the age of 20 had FAS. It is estimated that 727 infants were born in Texas in 2000 with FAS. About 10,796 Texans from ages 5 to 21 had FAS. In addition, there were an estimated 11,737 adult survivors of FAS (ages 22 to 65).

To estimate the health care costs of FAS, factors such as the cost of specific types of treatment, the proportion of FAS cases receiving needed services, and the duration of services were taken into account. The detailed estimation of FAS health services for Texas, as shown in Appendix Table D.1, was based on the cost components captured in the national study (Harwood et al. 1998). The cost amount was updated by consumer price index (medical care index) and adjusted downward by 9.3 percent to reflect 2000 health care value in Texas. The total direct costs of FAS health services were estimated to be $208.5 million.

Additional costs for those FAS adult survivors who were assumed to experience

minimal or mild mental retardation with less productivity versus non-FAS persons amounted to $96.7 million through lost earnings. Adjusting for wage inflation from the national study, the average FAS survivor earned about $8,200 less than non-FAS persons in 2000.

In sum, it cost Texas an estimated $305 million to treat infants, children, and surviving adults with FAS and its sequelae.

7.2 Drug-Exposed Infants

Maternal use of drugs during pregnancy is related to intrauterine growth retardation, the consequences of which can incur significant economic costs. Cocaine use, for example, can constrict placental blood flow and cause poor fetal growth and development, resulting in decreased birth weight, length, and head circumference compared to the infants of drug-free mothers.

Based on the Texas postpartum survey (TCADA 1991), an estimated 15,690 infants (or 4.3 percent of total live births) were born in 2000 to mothers who used illicit drugs during pregnancy. To measure the economic effects of perinatal drug exposure, only the marginal costs are counted (that is, the additional costs required to care for drug-exposed infants above those costs associated with non-exposed infants).

On average, infants born exposed to cocaine and other drugs had hospital medical costs that were $7,731 higher than those of unexposed infants, and infants born exposed to cocaine only had increased hospital costs of $1,223 (Harwood et al. 1998). Adjusting these figures to the Texas level yielded a cost of $9,620 and $1,522, respectively, in 2000 dollars. Adapting from the findings by Joyce et al. (1994) that 36 percent of the exposed infants were with cocaine-plus-other-drug exposure and 24 percent with cocaine-only exposure, this study estimated that drug-exposed infants cost Texas an additional $100 million in hospital care.

7.3 IVDU-Related AIDS

The AIDS epidemic has imposed significant economic stress on both individual patients and on the health care system because AIDS is an expensive illness with complex treatment demands. The study from Hellinger (1993) estimated that the lifetime cost of treating a person with human immunodeficiency virus (HIV) from the onset of infection until death was about $119,000 ($50,000 from HIV infection until the development of AIDS and $69,000 from AIDS development until death). These costs may have decreased during recent years, as new treatments have been successful in transforming HIV from an acute illness involving frequent hospitalizations to an illness with long

periods of low-intensity care and fewer inpatient hospital services.

Based on the Texas HIV/STD surveillance report (TDH 2000), there were 2,790 newly reported AIDS cases during 2000. Of these, 578 cases (20.7 percent) were drug related: 415 cases were IVDUs and 163 cases were homosexual IVDUs. Also, an estimated 5,688 Texans living with AIDS through the end of 2000 were intravenous drug users.

The estimate for AIDS costs in this study includes costs for treating all persons living with AIDS during a given year. The average cost of treating a person with AIDS was about $30,930 in 1996 (ONDCP 2001). After adjusting the cost for Texas health care expenses accordingly, the total medical costs among those individuals living with AIDS exposed through IVDU were estimated at $182 million in 2000.

7.4 IVDU-Related Hepatitis B and Hepatitis C

Blood-borne infections such as hepatitis B and hepatitis C can be spread by needle-sharing among intravenous drug users. A total of 1,059 hepatitis B cases and 359 hepatitis C cases were reported to the TDH in 2000 and in 1999, respectively. The epidemiological patterns between hepatitis B and hepatitis C are different; about 12.9 percent of hepatitis B infections and 26.4 percent of hepatitis C infections were attributed to persons who use intravenous

drugs (ONDCP 2001). Applying the percentages to Texas figures translates to an estimate of 137 IVDU-related hepatitis B cases and 95 IVDU-related hepatitis C cases.

Due to the unavailability of the average cost for treating hepatitis C, the 1989 hepatitis B cost estimates from the Texas Medical Foundation (Liu 1992) were applied to hepatitis C cases. The average length of hospital stay for patients with hepatitis B in Texas was about 10.4 days, and the average charge per patient day was $961 in 1989 prices. Since the acute cases of hepatitis C are more serious than hepatitis B, the application of the hepatitis B costs to hepatitis C may underestimate the actual treatment value for hepatitis C victims.

Adjusting by the consumer price index (medical care index), the annual direct hospital cost was about $17,460 per hepatitis case in 2000 dollars. Thus, the costs of drug abuse reflected by hepatitis B and hepatitis C treatment were $2.4 million and $1.6 million respectively, for a total of $4.0 million in Texas.

7.5 Drug-Related Tuberculosis

During 2000, Texas had a total of 1,506 cases of tuberculosis reported, for an incidence rate of 7.2 cases per 100,000 (TDH 2001b). To capture the link between drug use and tuberculosis, the Centers for

Disease Control and Prevention in 1993 amended its tuberculosis surveillance data system to require information on injecting and non-injecting drug use for confirmable cases of tuberculosis. The percentages of tuberculosis cases attributable to injecting or non-injecting drug use was 7.1 percent and 2.6 percent, respectively (ONCDP 2001).

The cost for treating tuberculosis from the 1992 national study was inflated and adjusted accordingly to yield an estimate of $12,250 per case for Texas in 2000. Thus, the total direct medication costs of treating drug abuse-related tuberculosis cases accounted for $1.8 million.

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Appendix A. Supplemental Tables for Medical Care Costs

Table A.1
Hospital Discharges and Days of Care Primarily for Alcohol and Drug Abuse Disorders, Texas, 2000

Diagnosis (ICD-9-CM code)	Discharges	Days of Care	Average LOS* in Days
Total	**25,633**	**127,039**	**4.96**
Primarily Alcohol Abuse Episodes	**10,620**	**54,730**	**5.15**
Alcohol psychoses (291)	3,096	16,076	5.19
Alcohol dependence syndrome (303)	6,382	34,446	5.40
Nondependent abuse of alcohol (305.0)	971	3,899	4.02
Toxic effects of ethyl alcohol (980.0)	171	309	1.81
Primarily Drug Abuse Episodes	**15,013**	**72,309**	**4.82**
Drug psychoses (292)	2,987	18,660	6.25
Drug dependence (304)	4,500	32,085	7.13
Nondependent abuse of drugs (305.2-305.9)	1,121	5,313	4.74
Poisoning by opiates and related narcotics (965.0)	799	2,528	3.16
Poisoning by sedatives and hypnotics (967)	530	1,370	2.58
Poisoning by central nervous system muscle tone depressants (968)	918	2,514	2.74
Poisoning by psychotropic agents (969)	4,104	9,630	2.35
Poisoning by central nervous system stimulants (970)	54	209	3.87

* LOS = length of stay.

Source: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 2000 Texas Hospital Inpatient Discharge Public Use Data File (THCIC 2001).

Table A.2

Hospital Discharges and Days of Care Specifically Caused by Alcohol and Drug Abuse Texas, 2000

Diagnosis (ICD-9-CM code)	Discharges	Days of Care	Average LOS* in Days
Total	**5,556**	**34,325**	**6.18**
Alcohol Abuse Specific (without FAS)	**5,543**	**34,178**	**6.17**
Alcoholic polyneuropathy (357.5)	31	220	7.10
Alcoholic cardiomyopathy (425.5)	70	413	5.90
Alcoholic gastritis (535.3)	377	1,192	3.16
Alcoholic cirrhosis (571.0-571.3)	5,065	32,353	6.39
Drug Abuse Specific **(without effects on the fetus/newborns)**	**13**	**147**	**11.31**
Polyneuropathy due to drugs (357.6)	13	147	11.31

* LOS = length of stay.

Source: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 2000 Texas Hospital Inpatient Discharge Public Use Data File (THCIC 2001).

Table A.3

Hospitalizations for Illnesses and Injuries Partially Caused by Alcohol, Texas, 2000

Diagnosis (ICD-9-CM code)	Attributable Fraction	Attributable Discharges	Attributable Days of Care	Average LOS* in Days
Total, Alcohol-Related		**30,249**	**194,879**	**6.44**
Respiratory tuberculosis (011-012)	25%	176.5	5,534.8	31.36
Malignant neoplasm of lip, oral cavity, and pharynx (140-149)	50% (men) 40%(women)	437.1	3,260.4	7.46
Malignant neoplasm of esophagus (150)	75%	450.0	4,470.8	9.94
Malignant neoplasm of stomach (151)	20%	303.4	3,283.6	10.82
Malignant neoplasm of liver and interhepatic bile ducts (155)	15%	142.7	1,044.8	7.32
Malignant neoplasm of larynx (161)	50% (men) 40%(women)	220.3	2,230.9	10.13
Diabetes mellitus (250)	5%	1,367.7	9,010.7	6.59
Essential hypertension (401)	8%	500.6	1,603.2	3.20
Cerebrovascular disease (430-438)	7%	4,228.1	26,284.4	6.22
Pneumonia and influenza (480-487)	5%	2,997.3	20,521.0	6.85
Diseases of esophagus, stomach, duod. (530-537	10%	3,087.9	14,228.0	4.61
Chronic hepatitis (571.4)	50%	48.0	327.0	6.81
Cirrhosis of liver, alcohol not mentioned (571.5)	50%	1,418.0	9,034.5	6.37
Other chronic nonalcohol Liver damage (571.8)	50%	47.5	238.0	5.01
Unspec. Chronic liver disease, no mention of alcohol (571.9)	50%	15.0	72.0	4.80
Portal hypertension (572.3)	50%	116.5	584.5	5.02
Acute pancreatitis (577.0)	42%	4,853.5	31,897.3	6.57
Chronic pancreatitis (577.1)	60%	681.0	4,452.0	6.54
Fractures (800-829)	10%	5,499.0	36,839.8	6.70
Dislocations (830-839)	10%	116.9	476.9	4.08
Sprains and strains (840-848)	10%	311.9	804.4	2.58
Intracranial (850-854)	10%	590.7	5,305.5	8.98
Thorax, abdomen, pelvis (860-869)	10%	491.2	3,700.4	7.53
Open wound -- head, neck, trunk (870-879)	10%	225.8	897.2	3.97
Open wound -- upper limb (880-887)	10%	217.7	703.8	3.23
Open wound -- lower limb (890-897)	10%	146.7	1,130.0	7.70
Injury to blood vessels (900-904)	10%	42.7	255.9	5.99
Late effects (905-909)	10%	9.6	158.1	16.47
Superficial (910-919)	10%	33.9	125.0	3.69
Contusions (920-924)	10%	202.8	810.8	4.00
Crushing (925-929)	10%	20.8	108.6	5.22
Foreign bodies (930-939)	10%	70.0	256.4	3.66
Burns (940-949)	10%	162.0	1,551.3	9.58
Nerves and spinal (950-957)	10%	56.4	519.6	9.21
Trauma, comp. (958-959)	10%	154.2	787.0	5.10
Poisoning (960-968, 971-979)	10%	480.7	1,267.9	2.64
Toxic effects (980-989)	10%	126.2	417.1	3.31
Other external (990-995)	10%	198.6	685.8	3.45

* LOS = length of stay.

Source: Analysis by Texas Commission on Alcohol and Drug Abuse, using the 2000 Texas Hospital Inpatient Discharge Public Use Data File (THCIC 2001).

Appendix B. Supplemental Tables for Mortality Costs

Table B.1
Direct and Indirect Causes of Alcohol Mortality and Alcohol-Attributable Fractions (AAF)
Texas, 2000

Diagnosis	ICD-10 Diagnostic Code	AAF	Age [1] (in years)
Direct Causes			
Alcoholic psychoses/mental disorders	F10.07, F10.3-F10.9	100%	>=10
Alcohol dependence syndrome	F10.2	100%	>=10
Alcohol abuse	F10.0-F10.1 (excl F10.07)	100%	>=10
Alcoholic polyneuropathy	G62.1	100%	>=15
Alcoholic cardiomyopathy	I42.6	100%	>=15
Alcoholic gastritis	K29.2	100%	>=15
Alcoholic fatty liver	K70.0	100%	>=15
Acute alcoholic hepatitis	K70.1, K70.4	100%	>=15
Alcoholic cirrhosis of the liver	K70.3	100%	>=15
Alcoholic liver damage, unspecified	K70.2, K70.9	100%	>=15
Fetal alcohol syndrome (dysmorphic)	Q86.0	100%	>=0
Abnormal finding of alcohol in blood	R78.0	100%	>=15
Alcohol poisonings, accidental	X45	100%	>=15
Alcohol intentional self-poisoning	X65	100%	>=15
Alcohol poisonings, undetermined intent	Y15	100%	>=15
Indirect Causes			
Cancer of the lip, tongue, oral cavity, pharynx	C00.0-C14.8	50% [2]	>=35
Cancer of the esophagus	C15.0-C15.9	75%	>=35
Cancer of the stomach	C16.0-C16.9	20%	>=35
Cancer of the liver and intrahepatic bile ducts	C22.0-C22.9	15%	>=35
Cancer of the larynx	C32.0-C32.9	50% [2]	>=35
Respiratory tuberculosis	A15.0 -A16.9	25%	>=35
Diabetes mellitus	E10.0-E14.9	5%	>=35
Pneumonia and influenza	J10.0-J18.9	5%	>=35
Diseases of esophagus, stomach and duodenum	K20.0-K31.9 (excl K29.2)	10%	>=35
Other and unspecified cirrhosis of the liver	K74.3-K74.6	50%	>=35
Acute pancreatitis	K 85	42%	>=35
Chronic pancreatitis	K86.0-K86.1	60%	>=35
Essential hypertension	I10	8%	>=35
Cerebrovascular disease	I60.0-I69.9	7%	>=35
Motor vehicle traffic/nontraffic accidents	V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1, V83-V86, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2	42%	>=0

Table B.1 (continued)

Diagnosis	ICD-10 Diagnostic Code	AAF	Age (in years)
Other road vehicle accidents	V01, V06, V09.1, V09.3, V09.9, V10-V11, V16-V18, V19.3, V19.8-V19.9, V80.0-V80.2, V80.7-V80.9, V82.2-V82.9, V89.1, V89.3, V89.9	20%	>=0
Water transport accidents	V90-V94	20%	>=0
Air and space transport accidents	V95-V97	16%	>=0
Accidental falls	W00-W19	35%	>=15
Accidents caused by fires	X00-X09	45%	>=0
Accidental drownings	W65-W74	38%	>=0
All other accidents	X46-X47, W20-W64, W75-W99, X10-X39, X50-X59, Y86	25%	>=15
Suicides	X61, X64, X66-X84, Y87.0	28%	>=15
Homicides	X86-Y09, Y87.1	46%	>=15

Notes: [1] Deaths occurring before this age are not included in the calculations
          [2] The AAF for females is 40%.

Sources: Centers of Disease Control and Prevention (2000); World Health Organization (1992, 1999); Rice et al. (1990).

Table B.2
Direct and Indirect Causes of Drug Mortality and Drug-Attributable Fractions (DAF)
Texas, 2000

Diagnosis	ICD-10 Diagnostic Code	DAF	Age [1] (in years)
Direct Causes			
Drug psychoses/mental disorders	F1x.3-F1x.9 (excl F10.3-F10.9)	100%	>=10,<=64
Drug dependence	F1x.2 (excl F10.2)	100%	>=10,<=64
Nondependent abuse of drugs	F1x.0-F1x.1 (excl F10.0-F10.1), F55.0-F55.6, F55.8-F55.9	100%	>=10,<=64
Drug-induced toxic liver disease	K71.0-K71.9	100%	>=10,<=64
Drug withdrawal syndrome in newborn	P96.1	100%	>= 0,<=64
Abnormal findings of drugs in blood	R78.1-R78.6	100%	>=10,<=64
Accidental poisoning by drugs, medicaments, and biologicals	X40-X44	100%	>=10,<=64
Heroin, methadone, other opiates and related narcotics, and other drugs causing adverse effects in therapeutic use	Y45.0, Y45.8-Y45.9, Y47, Y48, Y49.6-Y49.9, Y50.0-Y50.1, Y50.8-Y50.9	100%	>=10,<=64
Suicide and self-inflicted poisoning by drugs and medicinal substances	X60, X62, X63	100%	>=10,<=64
Homicidal poisoning by drugs and medicinal substances	X85	100%	>=10,<=64
Injury undetermined whether accidentally or purposely inflicted from poisoning by drugs, medicaments, and other	Y10-Y14, Y19	100%	>=10,<=64
Indirect Causes			
Human immunodeficiency virus infection	B20-B24	19% [2]	>=10,<=64
Viral hepatitis B	B16.0-B16.9, B18.0-B18.1	13%	>=10,<=64
Other Specified viral hepatitis non-A, non-B	B17.0-B17.8, B18.2-B18.8	21%	>=10,<=64
Acute and subacute infective endocarditis	I33.0-I33.9	14%	>=10,<=64
Homicides	X86-Y09, Y87.1	28%	>=15,<=64

Notes: [1] Deaths occurring outside the age range are not included in the calculations
          [2] The DAF for females is 32%.

Sources: Centers of Disease Control and Prevention (2000); World Health Organization (1992, 1999); Rice et al. (1990).

T a b l e B.3
Life Expectancy in Years by Age and Gender
T e x a s, 2000

Age	Total	Male	Female
<1	76.67 *	73.81 *	79.52 *
1--4	76.11	73.28	78.93
5--9	72.22	69.39	75.04
10--14	67.28	64.45	70.10
15--19	62.35	59.54	65.15
20--24	57.59	54.85	60.31
25--29	52.88	50.25	55.45
30--34	48.13	45.58	50.61
35--39	43.40	40.91	45.81
40--44	38.71	36.29	41.04
45--49	34.15	31.82	36.37
50--54	29.73	27.51	31.81
55--59	25.44	23.34	27.38
60--64	21.41	19.46	23.17
65--69	17.68	15.89	19.24
70--74	14.27	12.66	15.60
75+	11.20	9.80	12.30

* Life expectancy at birth.
Source: Texas Department of Health (2001a).

Table B.4

Economic Variables for Estimating Present Value of Lifetime Earnings, Texas, 2000

Earned Income and Imputed Value of Housekeeping

| | Mean Annual Earnings [1] | | Mean Annual Value of Housekeeping Services | | | |
| | | | In Labor Force | | Not in Labor Force | |
Age	Male	Female	Male	Female	Male	Female
15-24	$21,484	$18,027	$2,778	$8,060	$5,697	$14,415
25-34	$37,744	$28,082	$3,750	$11,201	$7,136	$17,484
35-44	$47,888	$31,625	$4,075	$11,776	$7,481	$18,131
45-54	$52,338	$31,629	$4,094	$10,232	$7,501	$16,588
55-64	$54,662	$29,283	$4,378	$10,052	$7,785	$16,479
65+	$50,601	$26,511	$2,309	$5,169	$4,127	$8,520

Labor Force and Housekeeping Participation Rates

| | Percent of Population With Earnings | | Housekeeping Participation Rates | | | |
| | | | In Labor Force [2] | | Not in Labor Force [3] | |
Age	Male	Female	Male	Female	Male	Female
15-24	68.04%	59.47%	0.07%	4.09%	0.14%	8.17%
25-34	93.80%	73.20%	0.19%	9.40%	0.38%	18.79%
35-44	94.80%	74.50%	0.33%	8.68%	0.66%	17.36%
45-54	88.60%	74.80%	0.21%	5.84%	0.42%	11.67%
55-64	72.50%	49.60%	0.35%	5.82%	0.69%	11.63%
65+	19.60%	9.10%	0.03%	5.34%	0.06%	10.67%

Notes: [1] Mean annual earnings are for year-round full-time workers, including salary income and net income
         from farm and nonfarm self-employment.
         [2] The figures are 50 percent of those not in labor force.
         [3] Based on the survey data of Texas Adult Survey (Wallisch, 2001).

Sources: Labor market earnings and participation rates: U.S. Department of Labor (2001a, 2001b, 2001c);
         Housekeeping value: Rice et al. (1990); Liu (1992).

Appendix C. Supplemental Tables for Other Related Costs

Table C.1
Publicly-Financed Criminal Justice System, Police Protection Costs by Type of Offense in Texas, 2000
($ in thousands)

Offense	Known Offenses [1]		Causal Factors (%)		Police Protection Costs (PPC) [2]		
	Number <1>	Percent of Total <2>	Alcohol Abuse <3>	Drug Abuse <4>	Alcohol (<2>x<3>x total PPC) <5>	Drug (<2>x<4>x total PPC) <6>	Total (<5>+<6>) <7>
Homicide	1,236	0.1	23.7 [6]	4.0 [6]	$841	$143	$984
Rape	7,851	0.8	23.7 [6]	4.0 [6]	$5,344	$908	$6,252
Aggravated/Other Assault	74,288	7.2	25.7 [6]	8.2 [6]	$54,829	$17,474	$72,302
Robbery	30,230	2.9	12.4 [6]	21.2 [6]	$10,753	$18,409	$29,162
Burglary	189,012	18.3	12.4 [6]	21.2 [6]	$67,230	$115,104	$182,333
Larceny Theft	636,942	61.7	12.4 [6]	21.2 [6]	$226,554	$387,882	$614,436
Motor Vehicle Theft	93,111	9.0	4.1 [6]	20.4 [6]	$10,870	$54,352	$65,222
Driving Under Influence	97,019 [3]	--	100.0	--	$4,712 [8]	--	$4,712
Liquor Laws Violations	30,204 [3]	--	100.0	--	$1,467 [8]	--	$1,467
Public Drunkenness	152,698 [3]	--	100.0	--	$7,417 [8]	--	$7,417
Stolen Property	635 [3]	0.1 [4]	--	15.1 [7]	--	$299	$299
Prostitution	6,329 [3]	0.7 [4]	--	12.8 [7]	--	$2,522	$2,522
Drug Laws Violations	105,657 [3]	10.0 [5]	--	100.0	--	$296,101	$296,101
Other Offenses	422,681 [3]	40.0 [5]	14.4 [6]	13.0 [6]	$170,576	$153,636	$324,212
Total					$560,592	$1,046,830	$1,607,422

Notes:
[1] Total reported known offenses is 1,032,670.
[2] Total PPC is $ 2,962,181,000.
[3] Total number of arrests for every offense.
[4] Based on percent of the total number of arrests for non-drug offenses: 951,331.
[5] Based on percent of total arrests: 1,056,988.
[6] Analyzed from the integrated data of TCADA 1998-2000 Male and Female State Prison, State Jail, and SAFP Surveys.
[7] Based on Harwood et al. (1998).
[8] The cost of alcohol offense is estimated at $48.57 per offense times the number of arrests in column <1> (updated from $39.57 in Harwood et al., 1998).

Sources: Texas Department of Public Safety (2001); U.S. Department of Justice (2001a).

Table C.2
Publicly-Financed Criminal Justice System, Legal and Adjudication Costs by Type of Offense in Texas, 2000
($ in thousands)

| Offense | Known Offenses [1] | | Causal Factors (%) | | Legal and Adjudication Costs (LAC) [2] | | |
	No. Cleared by Arrest <1>	Percent of Total <2>	Alcohol Abuse <3>	Drug Abuse <4>	Alcohol (<2>x<3>x total LAC) <5>	Drug (<2>x<4>x total LAC) <6>	Total (<5>+<6>) <7>
Homicide	853	0.1	23.7 [6]	4.0 [6]	$237	$40	$278
Rape	3,611	0.3	23.7 [6]	4.0 [6]	$1,006	$171	$1,176
Aggravated/Other Assault	39,373	3.8	25.7 [6]	8.2 [6]	$11,887	$3,788	$15,676
Robbery	7,860	0.8	12.4 [6]	21.2 [6]	$1,144	$1,958	$3,102
Burglary	22,681	2.2	12.4 [6]	21.2 [6]	$3,300	$5,650	$8,950
Larceny Theft	108,280	10.5	12.4 [6]	21.2 [6]	$15,755	$26,974	$42,729
Motor Vehicle Theft	13,967	1.4	4.1 [6]	20.4 [6]	$667	$3,335	$4,002
Driving Under Influence	97,019 [3]	--	100.0	--	$4,712 [8]	--	$4,712
Liquor Laws Violations	30,204 [3]	--	100.0	--	$1,467 [8]	--	$1,467
Public Drunkenness	152,698 [3]	--	100.0	--	$7,417 [8]	--	$7,417
Stolen Property	635 [3]	0.1 [4]	--	15.1 [7]	--	$122	$122
Prostitution	6,329 [3]	0.7 [4]	--	12.8 [7]	--	$1,032	$1,032
Drug Laws Violations	105,657 [3]	10.0 [5]	--	100.0	--	$121,125	$121,125
Other Offenses	422,681 [3]	40.0 [5]	14.4 [6]	13.0 [6]	$69,777	$62,848	$132,624
Total					$117,368	$227,043	$344,411

Notes: [1] Total reported known offenses is 1,032,670.
[2] Total LAC is $ 1,211,729,000.
[3] Total number of arrests for every offense.
[4] Based on percent of the total number of arrests for non-drug offenses: 951,331.
[5] Based on percent of total arrests: 1,056,988.
[6] Analyzed from the integrated data of TCADA 1998-2000 Male and Female State Prison, State Jail, and SAFP Surveys.
[7] Based on Harwood et al. (1998).
[8] The cost of alcohol offense is estimated at $48.57 per offense times the number of arrests in column <1> (updated from $39.57 in Harwood et al., 1998).

Sources: Texas Department of Public Safety (2001); U.S. Department of Justice (2001a).

Table C.3
Publicly-Financed Criminal Justice System, State Correction Costs by Type of Offense in Texas, 2000
($ in thousands)

Offense	State Prisoners [1]		Causal Factors (%)		State Correction Costs (SCC) [2]		
	Number <1>	Percent of Total <2>	Alcohol Abuse <3>	Drug Abuse <4>	Alcohol (<2>x<3>x total SCC) <5>	Drug (<2>x<4>x total SCC) <6>	Total (<5>+<6>) <7>
Homicide	13,928	10.4	23.7 [4]	4.0 [4]	$57,439	$9,755	$67,194
Rape	14,934	11.2	23.7 [4]	4.0 [4]	$61,588	$10,459	$72,047
Aggravated/Other Assault	14,118	10.6	25.7 [4]	8.2 [4]	$63,130	$20,119	$83,249
Robbery	22,504	16.8	12.4 [4]	21.2 [4]	$48,496	$83,029	$131,525
Burglary	19,358	14.5	12.4 [4]	21.2 [4]	$41,716	$71,422	$113,138
Larceny Theft	3,619	2.7	12.4 [4]	21.2 [4]	$7,799	$13,352	$21,151
Arson	668	0.5	4.1 [4]	20.4 [4]	$472	$2,362	$2,835
Forgery/Fraud	2,185	1.6	4.1 [4]	20.4 [4]	$1,545	$7,727	$9,273
Motor Vehicle Theft	2,164	1.6	4.1 [4]	20.4 [4]	$1,531	$7,653	$9,184
Driving Under Influence [3]	5,871	4.4	100.0	--	$102,031	--	$102,031
Stolen Property	0	0.0	--	15.1 [5]	--	$0	$0
Prostitution	0	0.0	--	12.8 [5]	--	$0	$0
Drug Laws Violations	26,589	19.9	--	100.0	--	$462,085	$462,085
Other Offenses	7,742	5.8	14.4 [4]	13.0 [4]	$19,375	$17,451	$36,825
Total	133,680	100.0			$405,121	$705,415	$1,110,536

Notes: [1] Total state prison offenders is 133,680.
[2] Total SCC is $ 2,323,200,000.
[3] Driving under influence is the only alcohol-related offense for state prisoners.
[4] Analyzed from the integrated data of TCADA 1998-2000 Male and Female State Prison, State Jail, and SAFP Surveys.
[5] Based on Harwood et al. (1998).

Sources: Texas Department of Criminal Justice (2001); U.S. Department of Justice (2001a).

Table C.4
Publicly-Financed Criminal Justice System, Local Correction Costs by Type of Offense in Texas, 2000
($ in thousands)

Offense	Known Arrests [1]		Causal Factors (%)		Local Correction Costs (LCC) [2]		
	Number <1>	Percent of Total <2>	Alcohol Abuse <3>	Drug Abuse <4>	Alcohol (<2>x<3>x total LCC) <5>	Drug (<2>x<4>x total LCC) <6>	Total (<5>+<6>) <7>
Homicide	973	0.1	23.7 [3]	4.0 [3]	$222	$38	$260
Rape	2,228	0.2	23.7 [3]	4.0 [3]	$509	$87	$596
Aggravated/Other Assault	119,350	11.3	25.7 [3]	8.2 [3]	$29,592	$9,431	$39,023
Robbery	6,136	0.6	12.4 [3]	21.2 [3]	$733	$1,255	$1,988
Burglary	17,327	1.6	12.4 [3]	21.2 [3]	$2,070	$3,545	$5,615
Larceny Theft	86,744	8.2	12.4 [3]	21.2 [3]	$10,365	$17,746	$28,111
Motor Vehicle Theft	9,007	0.9	4.1 [3]	20.4 [3]	$353	$1,766	$2,120
Driving Under Influence	97,019	9.2	100.0	--	$93,490	--	$93,490
Liquor Laws Violations	30,204	2.9	100.0	--	$29,105	--	$29,105
Public Drunkenness	152,698	14.4	100.0	--	$147,144	--	$147,144
Stolen Property	635	0.1	--	15.1 [4]	--	$92	$92
Prostitution	6,329	0.6	--	12.8 [4]	--	$781	$781
Drug Laws Violations	105,657	10.0	--	100.0	--	$101,814	$101,814
Other Offenses	422,681	40.0	14.4 [3]	13.0 [3]	$58,652	$52,828	$111,480
Total	1,056,988	100.0			$372,238	$189,382	$561,621

Notes: [1] Total known arrests is 1,056,988.
         [2] Total LCC is $ 1,018,545,000.
         [3] Analyzed from the integrated data of TCADA 1998-2000 Male and Female State Prison, State Jail, and SAFP Surveys.
         [4] Based on Harwood et al. (1998).

Sources: Texas Department of Public Safety (2001); U.S. Department of Justice (2001a).

Table C.5
Property Destruction in Crime by Type of Crime, Texas, 2000
($ in thousands)

Type of Crime	Value of Total Damages [1]	Causal Factors (%) [2]		Property Damage Associated With:	
		Alcohol Abuse	Drug Abuse	Alcohol Abuse	Drug Abuse
Murder	$203	23.7	4.0	$48	$8
Assault/Rape	$271	25.7	8.2	$70	$22
Robbery	$5,662	12.4	21.2	$702	$1,202
Burglary	$94,063	12.4	21.2	$11,664	$19,970
Larceny Theft	$53,098	12.4	21.2	$6,584	$11,273
Motor Vehicle Theft	$136,697	4.1	20.4	$5,564	$27,818
Total	$289,995			$24,632	$60,293

Notes: [1] Derived from the values of property stolen and the ratios of victimizations resulting in damage losses (property damage) and theft losses (property stolen) by type of crime.
[2] Analyzed from the integrated data of TCADA 1998-2000 Male and Female State Prison, State Jail, and SAFP Surveys.

Sources: Texas Department of Pubilc Safety (2001); U.S. Department of Justice (2001d).

Table C.6
Social Welfare Expenditures Under Public Programs and Administrative Costs due to Alcohol and Drug Abuse
Texas, 2000   ($ in thousands)

Program	Total (Texas) Expenditures <1>	Administrative Costs Percent [4] <2>	Administrative Costs Amount (<1>x<2>) <3>	% Attributed to Alcohol Abuse [4] <4>	% Attributed to Drug Abuse [4] <5>	Costs for Alcohol and Drug Abuse Alcohol Abuse <3>x<4>	Costs for Alcohol and Drug Abuse Drug Abuse <3>x<5>	Total
OASDI Payments	$22,883,000	2.6	$594,958	1.14	0.56	$6,777	$3,338	$10,114
Railroad Temporary Disability Insurance	$967	35.0	$338	1.14	0.56	$4	$2	$6
State Temporary Disability Insurance	$213,660	4.3	$9,187	1.14	0.56	$105	$52	$156
Workers' Compensation [1]	$1,033,648	5.3	$54,783	1.14	0.56	$624	$307	$931
Unemployment Insurance	$1,189,000	8.9	$105,821	1.14	0.56	$1,205	$594	$1,799
Veterans Pensions and Rehabilitation	$1,210,690	5.3	$64,167	1.14	0.56	$731	$360	$1,091
Supplemental Security Income	$1,556,804	6.9	$107,419	2.01	0.99	$2,159	$1,063	$3,223
TANF/AFDC	$591,000	6.2	$36,642	3.48	1.72	$1,277	$629	$1,905
Public Assistance [2]	$2,185,600	6.5	$142,064	2.75	1.35	$3,902	$1,922	$5,825
Low Income Heat and Energy Ass. Prog.	$24,243	6.5	$1,576	2.75	1.35	$43	$21	$65
Food Stamps	$1,215,000	5.9	$71,685	3.48	1.72	$2,498	$1,230	$3,728
Foster Care (Title IV-E)	$86,960	51.0	$44,350	2.21	1.09	$981	$483	$1,464
Vocational Rehabilitation [3]	$152,761	100.0	$152,761	2.21	1.09	$3,378	$1,664	$5,041
Special Education	$410,500	100.0	$410,500	2.21	1.09	$9,076	$4,470	$13,547
Head Start	$361,846	100.0	$361,846	2.21	1.09	$8,000	$3,941	$11,941
Total	$33,115,679		$2,158,098			$40,759	$20,075	$60,834

Notes: [1] Excludes hospital and medical benefits.
          [2] Excludes vendor payments and social services.
          [3] Excludes medical services and research.
          [4] Based on Harwood et al. (1998), pp. D-4 & D-5.

Sources: U.S. Department of Commerce (2002); U.S. Department of Health and Human Services (2000, 2001a, 2001b); U.S. Department of Education (2001).

Table C.7
Incarcerations and Person Years Served Associated With Alcohol and Drug Abuse by Type of Offense and Gender, Texas, 2000

| Offense | Number of Incarcerations in: | | | | % Associated With: [3] | | Person Years Served Associated With: [4] | | | |
| | State Prison [1] | | Local Jails [2] | | Alcohol Abuse | Drug Abuse | Alcohol Abuse | | Drug Abuse | |
	Male	Female	Male	Female			Male	Female	Male	Female
Homicide	13,180	791	1,495	55	23.7	4.0	3,296	194	560	33
Rape	14,777	165	1,539	4	23.7	4.0	3,680	40	625	7
Aggravated/Other Assau	13,473	1,277	6,067	391	25.7	8.2	4,208	376	1,341	120
Robbery	21,762	962	3,034	133	12.4	21.2	2,877	127	4,926	218
Burglary	19,886	616	3,561	145	12.4	21.2	2,676	85	4,581	145
Larceny Theft	4,861	940	3,253	512	12.4	21.2	794	147	1,360	251
Forgery/Fraud	2,671	1,139	1,671	434	4.1	20.4	141	55	705	274
Motor Vehicle Theft	3,009	149	1,187	55	4.1	20.4	145	7	727	36
Other Property	616	55	1,890	98	4.1	20.4	62	4	308	21
Driving Under Influence	6,392	293	3,341	203	100.0	--	7,979	390	--	--
Drug Laws Violations	30,257	4,460	9,409	1,072	--	100.0	--	--	34,726	4,969
Other Offenses	8,514	845	7,518	810	14.4	13.0	1,740	177	1,567	160
Total	139,398	11,694	43,965	3,911			27,599	1,602	51,426	6,232

Notes: [1] TDCJ prison population includes prison offenders, state jail offenders, and substance abuse offenders.
[2] The percentages of male and female incarcerations by offenses in Texas county jails were based on the profile of national jail inmates.
[3] Analyzed from the integrated data of TCADA 1998-2000 Male and Female State Prison, State Jail, and SAFP Surveys.
[4] Product of the number of incarcerations associated with alcohol/ drug abuse and the time served in years. The calendar time served is 1 year for state prisoners and 0.475 year (5.7 months) for local jail inmates.

Sources: Texas Department of Criminal Justice (2001); Texas Commission on Jail Standards (2001); U.S. Department of Justice (1998).

Table C.8
Productivity Losses Due to Incarceration by Type of Offense, Substance Abuse and Gender, Texas, 2000
($ in thousands)

Offense	Alcohol Abuse			Drug Abuse			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Homicide	$73,066	$3,167	$76,233	$12,409	$538	$12,946	$85,475	$3,705	$89,180
Rape	$81,575	$648	$82,223	$13,854	$110	$13,964	$95,429	$758	$96,187
Aggravated/ Other Assault	$93,279	$6,151	$99,430	$29,728	$1,960	$31,688	$123,007	$8,111	$131,118
Robbery	$63,778	$2,078	$65,857	$109,194	$3,558	$112,753	$172,973	$5,637	$178,609
Burglary	$59,311	$1,389	$60,700	$101,547	$2,377	$103,924	$160,858	$3,766	$164,624
Larceny Theft	$17,610	$2,399	$20,009	$30,150	$4,107	$34,258	$47,761	$6,506	$54,267
Forgery/ Fraud	$3,126	$895	$4,020	$15,629	$4,474	$20,102	$18,754	$5,368	$24,123
Motor Vehicle Theft	$3,223	$116	$3,340	$16,117	$582	$16,699	$19,340	$698	$20,039
Other Property	$1,366	$68	$1,434	$6,830	$338	$7,168	$8,195	$406	$8,602
Driving Under Influence	$176,873	$6,372	$183,246	–	–	–	$176,873	$6,372	$183,246
Drug Laws Violations	–	–	–	$769,761	$81,195	$850,957	$769,761	$81,195	$850,957
Other Offenses	$38,576	$2,894	$41,470	$34,745	$2,607	$37,352	$73,321	$5,501	$78,822
Total	$611,785	$26,177	$637,962	$1,139,963	$101,847	$1,241,810	$1,751,747	$128,025	$1,879,772

Notes: 1. The productivity losses were based on the average annual income (market earnings plus nonmarket imputed value) of $22,167 for male inmates and
$16,342 for female inmates.
2. Numbers may not add to totals due to rounding.

Sources: see Table C.7.

Table C.9
Productivity Losses for Drug Abuse Related Crime Careers by Age and Gender, Texas, 2000

Age	Number of Persons Forgoing Legitimate Productive Pursuits [1]			Mean Annual Earnings [2]		Productivity Losses ($ in thousands)		
	Male	Female	Total	Male	Female	Male	Female	Total
18-24	14,854	7,030	21,884	$21,533	$18,075	$319,848	$127,067	$446,915
25-34	7,499	5,117	12,616	$37,744	$28,082	$283,032	$143,700	$426,732
35 and over	3,436	3,390	6,826	$50,657	$31,131	$174,069	$105,523	$279,592
Total	25,789	15,537	41,326			$776,950	$376,289	$1,153,239

Notes: [1] The number is 50 percent of the difference between the total cocaine/heroin abusers and the persons incarcerated in state prison and local jails for drug abuse.

[2] Based on salary income and net income from farm and nonfarm self-employment for year-round, full-time workers.

Sources: Texas Department of Criminal Justice (2001); U.S. Department of Commerce (2001); U.S. Department of Labor (2001b); Wallisch (2001).

Appendix D. Supplemental Tables for FAS Costs

Table D.1
Health Care Services and Costs for Fetal Alcohol Syndrome, Texas, 2000

Specific Birth Defect	Annual Cost of Treatment	Length of Treatment Period	Percent in FAS	Population Served	Total Costs (in dollars)
Prenatal growth retardation: neonatal intensive care	$17,421	once, 1st yr.	80.0%	581	$10,126,889
Postnatal growth retardation: hospital evaluation	$2,933	once, 1st yr.	80.0%	581	$1,704,934
Audiological defects					
Neonatal screening	$121	once, 1st yr.	100.0%	727	$87,706
AVR test	$327	once, 1st yr.	56.0%	407	$133,169
Acoustic impedance test	$63	once, 1st yr.	56.0%	407	$25,824
Serous otitis media: surgery, including recovery	$1,636	once, 1st yr.	81.0%	589	$963,094
Midsensorineural hearing loss					
Hearing aid evaluation	$154	once by 12yrs	27.0%	196	$30,272
Hearing aids	$933	once by 12yrs	27.0%	196	$183,098
Hearing aid check	$286	once by 12yrs	27.0%	196	$56,150
Hearing aid orientation	$101	once by 12yrs	27.0%	196	$19,775
Minimal brain dysfunction: special education	$7,030	Age 5-18	53.0%	4,866	$34,212,507
Mid-moderate mental retardation					
Special education	$9,693	Age 5-21	18.0%	1,943	$18,836,374
Home care	$40,876	Age 22-65	14.4%	1,690	$69,088,568
Residential care	$45,418	Age 22-65	3.6%	423	$19,191,269
Severe mental retardation: residential care	$45,418	Age 5-65	5.0%	1,127	$51,170,574
Cleft palate					
Series of operations plus followups for hearing/speec	$24,886	once by 15yrs	12.5%	91	$2,260,466
Speech therapy	$2,265	once btw 5-15	12.5%	91	$205,702
Neurotube: surgery	$12,831	once by 10yrs	1.8%	13	$167,831
Total					**$208,464,203**

Sources: Abel and Sokol (1987); Harwood et al. (1998); U.S. Census Bureau (2001); Texas Department of Health (2001a).

Appendix E:
Formula for Calculating the Present Value of Lifetime Earnings

The formula for the present value of future lifetime earnings is presented below:

$$PV = \sum_{i=a}^{85} \frac{(X_i W_i P_a^{\ i} + H_i K_i P_a^{\ i})}{(1+r)^{\ i-a}} \, ,$$

where
PV : the present value,
i : the specific single age under consideration,
a : the midyear age for the given cohort of persons,
r : the discount rate,
X_i : the annual mean earnings for persons in the age group with the midpoint age i,
W_i : the average labor force participation rate in the age group with the midpoint age i,
$P_a^{\ i}$: the probability that an individual aged a survives to i,
H_i : the annual mean imputed value of housekeeping services for persons in the age group with the midpoint age i,
K_i : the average housekeeping participation rate in the age group with the midpoint age i.

The product of $W_i P_a^{\ i}$ is determined as follows:

$$W_i P_a^{\ i} = \frac{\sum_{j=t}^{s} L_j W_j}{L_a} \, ,$$

where
j : the specific single age under consideration,
t : the beginning year of the age group,
s : the ending year of the age group,
L_j : the number of persons surviving to j out of a cohort of 100,000 live births,
W_j : the labor force participation rate at single age j,
L_a : the number of persons living at the midpoint age a for the given age group out of a cohort of 100,000 live births.

The product of $K_i P_a^{\ i}$ is determined in the similar formation as $W_i P_a^{\ i}$.