The Cost of Substance Abuse in Wyoming 2010

WYSAC Technical Report No. DER-1250

November 2012

Wyoming Survey & Analysis Center • (307) 766-2189 • wysac@uwyo.edu • http://wysac.uwyo.edu

The Cost of Substance Abuse in Wyoming 2010

By

Nanette M. Nelson, M.S., Associate Research Scientist
Muneyuki Kato, M.A., Assistant Research Scientist
Humphrey Costello, M.A., Assistant Research Scientist

With the assistance of

Laura Vanatta, Research Aide

Wyoming Survey & Analysis Center
University of Wyoming • Dept. 3925
1000 East University Avenue • Laramie, WY 82071
wysac@uwyo.edu • http://wysac.uwyo.edu
(307) 766-2189 • Fax: (307) 766-2759

Under contract to
Wyoming Department of Health, Public Health Division
6101 Yellowstone Road, Suite 420
Cheyenne, WY 82002
(307) 777-6340

Citation for this document: WYSAC. (2012). *Cost of Substance Abuse in Wyoming 2010,* by N. M. Nelson, M. Kato, & H. Costello. (WYSAC Technical Report No. DER-1250). Laramie, WY: Wyoming Survey & Analysis Center, University of Wyoming.

Short reference: WYSAC (2012), *Cost of Substance Abuse in Wyoming 2010*

Table of Contents

1. Executive Summary....6
2. Acronyms....8
3. Introduction....10
   3.1. Background....10
   3.2. Organization of this Report....10
4. General Methodological Approach....10
   4.1. Scope of the Project....10
   4.2. Comparability to Other Research....11
   4.3. COI Study Guidelines....11
      4.3.1. Adverse Outcomes Associated with Substance Abuse....11
      4.3.2. Causality....11
      4.3.3. Assigning Costs....12
   4.4. Attributable Fractions (AFs) and Health Conditions....12
5. Direct Costs of Substance Abuse to Wyoming's Health Care System....12
   5.1. Cost of Specialty Treatments....13
   5.2. Medical Care Costs for Primary Diagnoses....15
      5.2.1. Inpatient Hospital Care Costs....15
      5.2.2. Other Medical Care Costs....17
6. Productivity Losses Resulting from Substance Abuse....20
   6.1. Impaired Productivity....21
      6.1.1. Alcohol....21
      6.1.2. Tobacco....22
      6.1.3. Drugs....23
   6.2. Losses While Institutionalized/Hospitalized....25
      6.2.1. Specialty Treatment....25
      6.2.2. Hospitalization....25
   6.3. Mortality....26
   6.4. Crime-related Losses....27
      6.4.1. Crime Victim Productivity Losses....27
      6.4.2. Losses Related to Incarceration....28
7. Crime Costs from Substance Abuse....29
   7.1. Victims' Costs of Crime (Excluding Medical and Productivity Costs)....29
   7.2. Criminal Justice System Costs....30
      7.2.1. Policing Costs....30
      7.2.2. Legal and Adjudication Costs....31
      7.2.3. Corrections Costs....32
8. Other Costs from Substance Abuse....33
   8.1. Motor Vehicle Crashes (Excluding Medical and Productivity Costs)....33
   8.2. Fire Damage....35
9. Summary of the Costs of Substance Abuse in Wyoming....36
   9.1. Wyoming State Government's Share of the Costs....37
   9.2. Limitations of the Study and Data Gaps Analysis....38
      9.2.1. Health Care....38
      9.2.2. Productivity....38
      9.2.3. Crime....39
      9.2.4. Other Costs....39

10. References 41
11. Appendices 45
Appendix A. Health Conditions and Attributable Fractions 45
Appendix B. Estimated Inpatient Hospital Care Costs by Substance 57
Appendix C. Economic Productivity, 2010 Estimates for Wyoming 68
Appendix D. Alcohol- and Drug-Attributable Motor-Vehicle Crashes 73

List of Tables

Table 1-1. Percentage of Total Economic Costs by Cost Category, 2010 7
Table 1-2. State Government's Proportion of Total Economic Costs, 2010 7
Table 5-1. Total Health Care Cost, Wyoming, 2010 13
Table 5-2. Substance Abuse Treatment Costs by Primary Substances of Abuse, 2010. 15
Table 5-3. Ratios of Other Medical Care Costs to Hospital Inpatient Care Costs for Alcohol and Drug Abuse 18
Table 5-4. Ratio of Other Medical Care Costs to Hospital Inpatient Care Cost for Tobacco Use 18
Table 5-5. Costs of Other Medical Care Services by Type of Substance, 2010 19
Table 6-1. Total Productivity Losses, Wyoming, 2010 20
Table 6-2. Estimates of Prevalence and Number of Wyoming Individuals with Past Year Alcohol Dependence, 2009-2010 22
Table 6-3. Productivity Losses for Men with Past Year Alcohol Dependence, 2010 22
Table 6-4. Productivity Losses for Current and Former Smokers, 2010 23
Table 6-5. Estimates of Prevalence and Number of Individuals with Past Year Drug Abuse or Dependence, 2009-2010 24
Table 6-6. Productivity Losses Attributable to Past Year Drug Abuse or Dependence, 2010 24
Table 6-7. Productivity Losses Attributable to Specialty Treatment for Substance Abuse, 2010 25
Table 6-8. Productivity Losses Attributable to Hospitalization for Substance Abuse-Related Diseases, 2010 26
Table 6-9. Productivity Losses for Substance Abuse- or Use-Attributable Mortality, by Age and Gender, 2010 26
Table 6-10. Productivity Losses for Victims of Crime, 2010 28
Table 6-11. Productivity Losses for Incarcerations Attributable to Substance Abuse, 2010 28
Table 7-1. Total Crime Costs, Wyoming, 2010 29
Table 7-2. Victims' Costs of Crime (Excluding Medical and Productivity Costs), 2010 30
Table 7-3. Policing Costs, 2010 31
Table 7-4. Legal and Adjudication Costs, 2010 32
Table 7-5. Corrections Costs, 2010 33
Table 8-1. Total Other Losses, Wyoming, 2010 33
Table 8-2. Substance-Related Motor Vehicle Crash Costs (Excluding Medical Care and Productivity Costs), 2010 35
Table 8-3. Alcohol-Attributable Fire Losses, 2010 36
Table 9-1. Total Economic Costs of Substance Abuse, Wyoming, 2010 37
Table 9-2. Percentage of Total Economic Costs by Cost Category, 2010 37
Table 9-3. Wyoming Government's Proportion of Total Economic Costs, 2010 38
Table A-1. Alcohol-Related Health Conditions and Alcohol-Attributable Fractions 45
Table A-2. Tobacco-attributable Fractions 48

Table A-3. Drug-attributable Fractions (ICD-9) 50
Table A-4. Drug-attributable Fractions (ICD-10) 53
Table A-5. List of Mental Disorders 55
Table B-1. Alcohol-Related Hospital Inpatient Care Costs, Wyoming, 2010 57
Table B-2. Tobacco-Related Hospital Inpatient Care Costs, Wyoming, 2010 60
Table B-3. Illicit Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010 62
Table B-4. Prescription Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010 63
Table B-5. Unspecified Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010 66
Table C-1. Annual Productivity, Wyoming, 2010 71
Table C-2. Present Value of Lifetime Productivity, Wyoming (2010 Dollars) 72
Table D-1. Crashes by Crash Severity and Alcohol and/or Drug Involvement, Wyoming, 2010 73
Table D-2. KABCO-to-MAIS Conversion Table 73
Table D-3. Estimated Number of Crashes by MAIS, Wyoming, 2010 74
Table D-4. Alcohol-Involved and Alcohol-Caused Vehicle Crash Costs, Wyoming, 2010 75
Table D-5. Drug-Involved and Drug-Caused Vehicle Crash Costs, Wyoming, 2010 76
Table D-6. Alcohol and Drug Involved and Alcohol and Drug Caused Vehicle Crash Costs, Wyoming, 2010 77

List of Figures

Figure 1-1. Total Economic Costs of Substance Abuse, Wyoming, 2010 6

Cost of Substance Abuse & Mental Health in Wyoming 2010

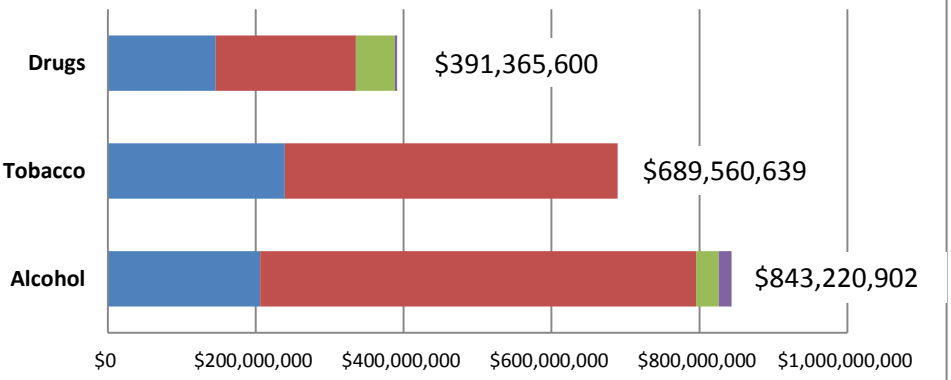
1. Executive Summary

The Wyoming Department of Health, Public Health Division (PHD) contracted with the Wyoming Survey & Analysis Center (WYSAC) at the University of Wyoming to conduct a cost of illness (COI) analysis of alcohol, tobacco, illicit drug abuse, prescription drug abuse, and mental health in the state. WYSAC received methodological guidance on the project from the Wyoming State Epidemiological Outcomes Workgroup (SEOW). In this report, WYSAC presents estimates of the economic impacts of substance abuse.

In COI studies, estimated costs represent opportunity costs (WYSAC, 2011). Opportunity costs in COI studies are the economic values of opportunities or resources that could have otherwise been used for an alternative purpose instead of those opportunities or resources being used because of adverse health conditions or other outcomes. In this study WYSAC researchers estimated economic costs that would not have been incurred if the Wyoming population was not exposed to the risk factor (i.e., substance abuse) at some point during 2010.

Costs attributable to substance abuse including health care costs, productivity losses, crime-related costs, and costs associated with motor vehicle crashes and fire were assessed by WYSAC researchers. Figure 1-1 shows the total economic cost by major cost category for each substance.

Figure 1-1. Total Economic Costs of Substance Abuse, Wyoming, 2010



	Alcohol	Tobacco	Drugs
Health Care Costs	$206,297,631	$239,631,163	$146,155,714
Total Productivity Losses	$589,194,744	$449,929,476	$189,104,591
Crime Costs	$30,370,956		$53,118,881
Other Costs	$17,357,571		$2,986,414

Alcohol abuse constituted the greatest costs, at $843,220,902 in total. Total tobacco use costs were $689,560,639. Drug costs summed to $391,365,600.

Table 1-1 shows the percentage of total economic costs for each substance broken down by cost category. Productivity losses constituted the largest share of losses for all substances, followed by health care costs.

Table 1-1. Percentage of Total Economic Costs by Cost Category, 2010

Cost Category	Alcohol	Tobacco	Drug
Health Care Costs	24%	35%	37%
Productivity Losses	70%	65%	48%
Crime-related Costs	4%	--	14%
Other Costs	2%	--	1%

Table 1-2 shows the costs to the state government as a result of substance abuse. WYSAC only included the costs associated with policing, legal, adjudication, corrections, and Wyoming's tobacco cessation program in the estimation of the state's proportion of total costs. The state's share of total economic costs of substance abuse was limited to these categories by WYSAC because the researchers were certain that the state paid 100% of the costs for these categories. WYSAC did not include the cost of Medicaid or Medicare in the state's proportion of the total economic costs because the relevant data set (i.e., hospital inpatient discharge data) did not include information on payer origin. The result of this approach was an underestimation of the cost of substance abuse to the state's budget by WYSAC.

Table 1-2. State Government's Proportion of Total Economic Costs, 2010

Substance	Total Economic Cost	Wyoming	
		Cost	Percentage
Alcohol	$843,220,902	$27,658,488	3.3%
Tobacco	$689,560,639	$1,218,500	0.2%
Drugs	$391,365,600	$48,897,539	12.5%

Note: The state's proportion of total economic costs was limited to costs associated with policing, legal, adjudication, corrections, and Wyoming's tobacco cessation program costs. The state's proportion did not include Medicaid or Medicare costs because the hospital inpatient discharge data did not include information on payer origin.

2. Acronyms

ACS	American Community Survey
ADSS	Alcohol and Drug Service Study
AF	Attributable Fraction
AIDS	Acquired Immune Deficiency Syndrome
ARDI	Alcohol-Related Disease Impact
ATUS	American Time Use Survey
BHD	Behavioral Health Division
BJS	Bureau of Justice Statistics
BRFSS	Behavioral Risk Factor Surveillance System
BLS	Bureau of Labor Statistics
CCRs	Cost-to-Charge Ratios
CDC	U.S. Centers for Disease Control and Prevention
COI	Cost of Illness
CPI	Consumer Price Index
CPS	Community Population Survey
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders Fourth Edition
ECEC	Employer Costs for Employee Compensation
FAS	Fetal Alcohol Syndrome
HBV	Hepatitis B Virus
HCA	Human Capital Approach
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
ICD-9	International Classification of Diseases-Ninth Revision
ICD-10	International Classification of Diseases-Tenth Revision
IDU	Injection Drug Use
IS	Illness-Specific
ISU	Injury Severity Unknown
KABCO	K=killed, A=incapacitating injury, B=non-incapacitating, C=possible injury, O=no apparent injury
LAUS	Local Area Unemployment Statistics
MAIS	Maximum Abbreviated Injury Scale
MSAs	Metropolitan Statistical Areas
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
N-SSATS	National Survey of Substance Abuse Treatment Services
NASS	National Automotive Sampling System
NCHS	National Center of Health Statistics
NCVS	National Crime Victimization Survey
NDIC	National Drug Intelligence Center
NFPA	National Fire Protection Association
NHTSA	National Highway Traffic Safety Administration
NSDUH	National Survey on Drug Use and Health
ONDCP	Office of National Drug Control Policy
PAF	Population Attributable Fraction
PHD	Public Health Division
PRAMS	Pregnancy Risk Assessment Monitoring System
PUMS	American Community Survey's Public Use Microdata Sample
PVLP	Present Value of Lifetime Production
PWGTP	American Community Survey's Public Use Microdata Sample Population Weight
SAEs	Smoking-Attributable Expenditures
SAMHSA	Substance Abuse and Mental Health Services Administration

SAMMEC	Smoking-Attributable Mortality, Morbidity, and Economic Costs
SATCAAT	Substance Abuse Treatment Cost Allocation and Analysis Template
SDUs	Service Delivery Units
SEOW	State Epidemiological Outcomes Workgroup
TEDS	Treatment Episode Data Set
TEDS-A	Treatment Episode Data Set-Admissions
TEDS-D	Treatment Episode Data Set-Discharge
VSS	Vital Statistics Services
WDOC	Wyoming Department of Corrections
WDH	Wyoming Department of Health
WHA	Wyoming Hospital Association
WHO	World Health Organization
WQTP	Wyoming Quit Tobacco Program
WYDOT	Wyoming Department of Transportation
WYSAC	Wyoming Survey & Analysis Center

3. Introduction

3.1. Background

The WDH-PHD contracted with WYSAC at the University of Wyoming to conduct a COI analysis of alcohol, tobacco, illicit drug abuse, prescription drug abuse, and mental illness in the state. To make informed decisions concerning the allocation of limited funding, the WDH-PHD will need to know the economic burden imposed by substance abuse and mental illness. COI studies estimate the economic impact of an illness on society. More specifically, COI studies estimate the *potential* amount of money saved if the illness under consideration were eliminated (Schori, 2011; Tarricone, 2006). COI studies highlight the comparative economic impact of abused substances and/or mental health on society (Segel, 2006) and government agencies routinely use them to justify and prioritize prevention, intervention, and research programs (Rice, 2000).

In preparation for this analysis, PHD contracted with WYSAC to undertake a review of methods used in the economic analysis of health and public health programs. This undertaking resulted in a report (WYSAC, 2011) reviewing this methodology. PHD subsequently recommended that the Wyoming SEOW act as an advisory body on analytic methods for the COI analysis discussed here. The SEOW formed a sub-group specifically to provide guidance on this project. WYSAC researchers consulted with the SEOW and its subgroup and incorporated their guidance in the COI analysis.

Because of a paucity of data on mental illness in Wyoming, this component of the study will be presented in a separate report.

3.2. Organization of this Report

This document contains 11 sections. Sections 1, 2, and 3 provide an executive summary, a table of acronyms used throughout the report, and an introduction, respectively. Section 4 describes, in general, the methods used in conducting the COI analysis. Section 5 presents estimates of the direct costs of substance abuse to Wyoming's health care system. Section 6 covers productivity losses resulting from substance abuse. Section 7 addresses crime costs from substance abuse. Section 8 addresses other costs from substance abuse, including motor vehicle crashes and fire damage. Section 9 summarizes the total costs of substance abuse.

Section 10 contains citations for reference material used in this report. Section 11 consists of appendices that contain additional detailed information associated with this analysis. Appendices A and B present detailed tables regarding health conditions, attributable fractions, and inpatient hospital care costs. Appendix C covers the methodology and data sources used to estimate productivity losses. Appendix D presents data on motor-vehicle crashes.

4. General Methodological Approach

4.1. Scope of the Project

The scope of this COI analysis was to assess the economic costs of alcohol, illicit drug, and prescription drug abuse; and tobacco use in Wyoming in 2010. Although the PHD requested separate economic costs estimates for illicit drugs and prescription drugs, the available data did not always distinguish between the two. Therefore, WYSAC estimated the costs of illicit drug abuse and prescription drug abuse when the data were available, and when the data were not available WYSAC combined the cost estimates, reporting them as either unspecified drugs or drugs. This COI study

took into account health care costs, losses in productivity (foregone earnings), and other costs associated with substance abuse such as criminal justice system costs, victims' costs, and property loss to estimate total economic costs for 2010. However, intangible costs, for example, reduced pain and suffering associated with health improvements, were not included in the estimate.

4.2. Comparability to Other Research

For the purposes of this study, WYSAC focused their efforts on producing substance abuse cost estimates that were not only comparable to other studies, but more importantly, that were comparable to one another. To develop comparable estimates, the COI study guidelines established in the literature were followed (for example, Harwood, Fountain, & Livermore, 1988; Hodgson & Meiners, 1982).

4.3. COI Study Guidelines

In the late 1970's, the U.S. Public Health Service codified the general approach to conducting a COI study (Harwood et al., 1988). A COI study can be broken down into the following three steps:

- Step 1: Identify the adverse **outcomes** associated with substance abuse;
- Step 2: Determine the degree of **causality** between substance abuse and the associated adverse outcomes; and
- Step 3: Assign **economic values** to these adverse outcomes.

4.3.1. Adverse Outcomes Associated with Substance Abuse

The framework for a COI study is structured around the identification and definition of the negative outcomes associated with substance abuse. The outcomes of concern should be quantifiable both in their incidence and in their use of resources (Harwood et al., 1998). WYSAC used the following major cost categories of negative outcomes in this COI analysis:

- **Health care costs.** These include the costs of treating substance abuse as well as the illnesses or injuries resulting from substance abuse (comorbidity and trauma).
- **Productivity losses.** These include foregone earnings during 2010 for the abuser and victims of crime related to substance abuse. Productivity losses also include the foregone lifetime earnings of individuals who die prematurely from substance abuse.
- **Other effects on society.** These include the costs of crime and criminal justice, road accidents, and fires.

4.3.2. Causality

An essential task in any COI study is estimating the role of substance abuse as a causal factor for various adverse outcomes. Causality is fundamental in determining estimates of morbidity and mortality attributable to substance abuse. These estimates in turn are required for estimating productivity costs and costs to the health care system. WYSAC looked to the literature to attribute causality. Previous studies (for example, the U.S. Centers for Disease Control and Prevention [CDC], 2007, 2008) quantify causality in the form of attributable fractions, which is discussed in Section 4.4.

4.3.3. Assigning Costs

Where available, WYSAC used Wyoming-specific cost data, for instance, inpatient health care costs and wages of employed workers. Otherwise, cost estimates from national studies were used. The details on the source of economic cost data are addressed subsequently, in pertinent sections of the report. Further, WYSAC adjusted costs to 2010 dollars when cost estimates obtained were for years other than 2010.

4.4. Attributable Fractions (AFs) and Health Conditions

An AF is the proportion of a health condition (for example, lung cancer) that a given risk factor (for example, smoking) is known to cause. It estimates the risk factor's impact on a health condition (morbidity and/or mortality) for a given population (for example, males between 35 and 64). AFs do not determine which substances cause health conditions. The World Health Organization (WHO) provides a concise description of AF on their website.

> The contribution of a risk factor to a disease or a death is quantified using the [Population Attributable Fraction] PAF. The PAF is the proportional reduction in population disease or mortality that would occur if exposure to a risk factor were reduced to an alternative ideal exposure scenario (for example, no tobacco use). Many diseases are caused by multiple risk factors, and individual risk factors may interact in their impact on overall risk of disease. As a result, PAFs for individual risk factors often overlap and add up to more than 100%. (WHO, 2012)

To determine health conditions effected by substance abuse and the associated AFs, WYSAC used the lists of substance-related health conditions from the CDC's Alcohol-Related Disease Impact (ARDI) application (2008), the CDC's Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) application (2007), government reports, national cost-of-illness studies, journal articles, and other public health reports (see Appendix A for the lists of substance-related health conditions and AFs).

There were no Wyoming-specific estimates of the fraction of violent crimes or property crimes attributable to alcohol or drugs found. Instead, WYSAC relied on estimates derived from national studies. WYSAC used estimates of AFs for alcohol-induced crimes from Bouchery, Simon, and Harwood (2010) and for illicit drug-induced crimes from the National Drug Intelligence Center (NDIC) (2011). Both studies relied on the National Crime Victimization Survey (NCVS) statistical tables to construct their estimates.

5. Direct Costs of Substance Abuse to Wyoming's Health Care System

WYSAC estimated direct costs incurred by use of the state's health care resources (health care goods or services) for specialty treatment and medical care of conditions that are attributable to the use or abuse of alcohol, tobacco, and drugs.

Table 5-1 presents the 2010 total health care costs for Wyoming by cost category for alcohol, tobacco, and drugs (illicit, prescription, and unspecified).

Table 5-1. Total Health Care Cost, Wyoming, 2010

Cost Category	Alcohol	Tobacco	Drug		
			Illicit	Prescription	Unspecified
Specialty Treatment totals	$17,977,522	$1,218,500	$9,075,321	$1,659,046	--
Detoxification	$418,402	--	$147,494	$20,318	--
Outpatient	$10,436,480	--	$4,898,223	$631,326	--
Residential	$7,122,641	--	$4,029,604	$1,007,401	--
WQTP cessation services	--	$1,218,500	--	--	--
Medical care totals	$188,320,109	$238,412,663	$20,484,454	$81,058,272	$33,878,621
Hospital inpatient care	$89,718,966	$131,206,969	$9,759,149	$38,617,566	$16,140,363
Outpatient medical care	$35,259,553	$33,601,785	$3,835,346	$15,176,704	$6,343,162
Nursing home care	$12,560,655	$17,600,935	$1,366,281	$5,406,459	$2,259,651
Prescription drugs	$31,939,952	$35,201,870	$3,474,257	$13,747,854	$5,745,969
Other health professionals' services	$18,840,983	$20,801,105	$2,049,421	$8,109,689	$3,389,476
Drug totals	--	--	**$29,559,776**	**$82,717,317**	**$33,878,621**
Health care totals	**$206,297,631**	**$239,631,163**			**$146,155,714**

Note: Totals may not always add up due to rounding.

For Wyoming, WYSAC estimated the total health care costs attributable to alcohol in 2010 at $206,297,631. Similar costs for tobacco were $239,631,163, and for drugs, they were $146,155,714. The largest total health care cost came from tobacco use (and most of this cost came from cigarette smoking).

In Sections 5.1 and 5.2, the cost estimation methods for each cost category and the results are discussed.

5.1. Cost of Specialty Treatments

Detoxification, residential treatment, and outpatient treatment are services available to treat people with alcohol and/or drug abuse problems. WYSAC estimated the costs of these treatment services provided in Wyoming in 2010 for alcohol abuse, illicit drug abuse, and prescription drug abuse. Because the treatment of tobacco use did not follow the same pattern as the treatment for other substances, WYSAC estimated treatment costs for tobacco use by applying the 2010 budget for the Wyoming Quit Tobacco Program (WQTP).

WYSAC used four data sources to develop the estimates of substance abuse treatment costs. Cost data were drawn from two studies: a substance abuse treatment cost analysis study by Harwood, Kallinis, & Liu (2001) and the Alcohol and Drug Services Study (ADSS) report by Substance Abuse and Mental Health Services Administration (SAMHSA, 2003). Data on service utilization were obtained from the 2010 National Survey of Substance Abuse Treatment Services (N-SSATS) report (SAMHSA, 2011) and the 2010 Treatment Episodes Data-Admissions (TEDS-A) public-use data file (SAMHSA, 2012a).

Harwood et al. (2001) estimated the unit costs of substance abuse treatment using the Substance Abuse Treatment Cost Allocation and Analysis Template (SATCAAT). The SATCAAT, developed in collaboration with SAMHSA, provides a standardized method and tool to collect data on unit costs of substance abuse treatment by service type. The SATCAAT follows generally accepted accounting principles in measuring treatment costs. Harwood et al. (2001) used 1997 treatment cost data from 37 community-based Service Delivery Units (SDUs) to conduct their analysis. WYSAC

adopted the unit cost of detoxification service from Harwood et al. and adjusted it from 1997 dollars to 2010 dollars, using the medical Consumer Price Index (CPI) (U.S. Department of Labor, n.d.).

In the ADSS report, SAMHSA (2003) developed unit cost estimates for substance abuse treatment using a nationally-representative sample of substance abuse treatment facilities and clients. WYSAC adopted these national estimates of unit costs for residential and outpatient treatment services and adjusted them from 1997 dollars to 2010 dollars, using the medical CPI (U.S. Department of Labor, n.d.).

The Treatment Episodes Data Set (TEDS) is a data system that collects data from annual administrative records on clients admitted to state-licensed substance abuse treatment programs receiving public funds, which include state alcohol and/or drug funds and Federal Block Grant funds (SAMHSA, 2012a).[1] TEDS-A is a subset of the TEDS system and collects data on treatment admissions. WYSAC used the 2010 TEDS-A data file for Wyoming (SAMHSA, 2012a) to estimate the proportions of admissions for non-hospital residential detoxification, non-hospital residential, and regular or intensive outpatient treatment of alcohol abuse, illicit drug abuse, and prescription abuse.[2] These proportions were based on the primary substance of abuse recorded in TEDS-A. Illicit drugs were defined as all Schedule 1 drugs plus some Schedule II and III drugs (i.e., cocaine, amphetamines, inhalants, non-prescription methadone, ketamine). Prescription drug abuse encompassed all non-medical use of Schedule II-IV drugs including prescription pain relievers, tranquilizers, stimulants, and sedatives.

N-SSATS is a survey conducted annually by SAMHSA, gathering data on substance abuse treatment facilities (or programs) and clients on a typical day (SAMHSA, 2011). In 2010, in Wyoming, that day was March 31, 2010. N-SSATS surveys all facilities or programs operated by both public and private entities in each state.[3] The unit of analysis is facility or program. To estimate the size of the population in treatment for non-hospital residential detoxification, non-hospital residential, and regular or intensive outpatient services, WYSAC used the one-day census counts of clients in treatment on March 31, 2010, collected by the 2010 N-SSATS for Wyoming.

Whereas N-SSATS surveys all public and private substance abuse treatment facilities, TEDS-A generally collects data only from publicly-funded programs. Because of this inconsistency in data collection, WYSAC assumed that the proportions of admissions for the programs that were not publicly-funded were the same as for the programs that were publicly-funded.

In addition, to avoid potential double-counting of costs included in medical care, WYSAC did not include clients receiving treatment in hospital settings (i.e., inpatient treatment and detoxification), through outpatient day treatment or partial hospitalization. The client counts in outpatient detoxification and methadone maintenance programs were also excluded because the 2010 TEDS-A

[1] SAMHSA generally does not collect TEDS data on facilities operated by federal agencies, including the Bureau of Prisons, the Department of Defense, and the Department of Veterans Affairs with the exception of some facilities operated by the Indian Health Service (SAMHSA, 2012a). In addition, substance abuse treatment programs that do not receive any public funds are not required to report TEDS data, although some state programs voluntarily report TEDS data (SAMHSA, 2012b). In Wyoming, only programs that receive public funds report TEDS data.

[2] This file included only initial admissions and excluded transfer admissions, which occur with either a change of service or provider within a treatment episode. Also, because of confidentiality protection, clients who are 11 years old and younger or whose age is unknown were not included.

[3] N-SSATS generally excludes facilities such as prisons/jails, solo practitioners, group practices, and halfway houses that also provide substance abuse treatment (SAMHSA, 2011).

(SAMHSA, 2012a) did not have any admission data for these treatment programs. These clients, who have been excluded from the analysis, accounted for 1.2% of all clients in treatment for Wyoming based on the 2010 N-SSATS (SAMHSA, 2011).

Table 5-2 presents the estimation and findings on the costs of specialty treatment for the abuse of alcohol and drugs. To obtain these estimates WYSAC took a similar approach used by the NDIC (2011) which proceeds as follows. First, WYSAC annualized the one-day census counts of clients in treatment and then multiplied by the proportion of admissions by substance. This calculation produced the number of client days for each treatment type by substance. Then, WYSAC multiplied the number of client days by the treatment cost per day to derive the total treatment costs for each treatment type by substance.

Table 5-2. Substance Abuse Treatment Costs by Primary Substances of Abuse, 2010

Type of Treatment	Clients in Treatment on March 31, 2010[a]	Proportion of Admissions by Substance[b]	Average Number of Client Days	Treatment Cost per Day[c,d]	Total Treatment Cost
	(1)	(2)	(1)×(2)×365=(3)	(4)	(3)×(4)
Alcohol Abuse					
Detoxification	5	0.714	1,303	$321.21	$418,402
Residential	324	0.586	69,272	$102.82	$7,122,641
Outpatient	2,881	0.654	687,374	$15.18	$10,436,480
Total					**$17,977,522**
Illicit Drug Abuse					
Detoxification	5	0.252	459	$321.21	$147,494
Residential	324	0.331	39,190	$102.82	$4,029,604
Outpatient	2,881	0.307	322,610	$15.18	$4,898,223
Total					**$9,075,321**
Prescription Drug Abuse					
Detoxification	5	0.035	63	$321.21	$20,318
Residential	324	0.083	9,798	$102.82	$1,007,401
Outpatient	2,881	0.040	41,581	$15.18	$631,326
Total					**$1,659,046**

Source: [a] SAMHSA, 2011; [b] SAMHSA, 2012a; [c] Harwood et al., 2001; [d] SAMHSA, 2003.
Note: The totals may not add up due to rounding.

5.2. Medical Care Costs for Primary Diagnoses

The estimated medical care costs for inpatient hospital care and other medical care services for primary diagnosis are presented in this section. Inpatient hospital care costs are presented first, followed by the estimated costs of other medical care, which includes outpatient care, nursing home care, prescribed medications, and other health professionals' services.

5.2.1. Inpatient Hospital Care Costs

WYSAC took the Illness-Specific (IS) approach used by previous national-level (for example, Harwood et al., 1998) as well as state-level (for example, Wickizer, 2007) COI studies to estimate inpatient hospital care costs. The IS approach counts hospitalizations with primary diagnosis associated with substance use or abuse. As Harwood et al. (1998) explained,

> The illness-specific (IS) approach is predicated on the evidence that certain health conditions (for example, forms of cirrhosis) are caused by alcohol and drug abuse, and accordingly, some proportion of the total hospitalizations for conditions that are partially caused by alcohol and drug abuse ought to be attributed to alcohol and drug abuse problems (pp. 4-14).

The estimation of inpatient hospital care followed the basic three-step procedure first used by Harwood et al. in 1998. The three steps included 1) identifying adverse consequences (for example, diseases) related to substance use or abuse, 2) determining the degree of causality between adverse health consequences and risk factors (for example, substance abuse problems), and 3) assigning economic or monetary values to the adverse consequences. WYSAC estimated substance-related inpatient hospital care costs by multiplying three main components: 1) the number of substance-related health conditions or injuries, 2) the attributable fractions, and 3) the average (mean) costs estimated for each condition. Below, WYSAC describes how these steps were applied in the analysis.

Step 1: Based on primary diagnosis, identify inpatient hospital discharges with substance-related adverse health conditions. WYSAC used the International Classification of Diseases-Ninth Revision (ICD-9) codes to identify the number of inpatient hospital discharges with primary diagnoses partially or fully attributable to the abuse or use of alcohol, tobacco, or other drugs. The International Classification of Diseases (ICD) codes are used internationally as a system of disease classification.

Step 2: Estimate substance-attributable hospital discharges by applying attributable fractions. For each health condition, WYSAC multiplied the number of discharges identified in Step 1 by the corresponding attributable fractions. This calculation estimates the proportion of discharges that can be attributed to the substance abuse or use.

Steps 3: Estimate total costs by assigning economic (monetary) values to substance-attributable discharges. WYSAC calculated average charges per discharge for a given condition. Average charges were then multiplied by the number of substance-attributable discharges to derive the total charges of inpatient hospital care attributable to substance abuse or use. Finally, WYSAC multiplied the total substance-related charges by Cost-to-Charge Ratios (CCRs) to reflect actual use of health care resources.[4]

The primary data source for estimating inpatient hospital care costs for Wyoming was inpatient hospital discharge data, provided by the WDH-PHD.[5] The data represent inpatient hospital discharges from all 26 non-federal acute-care hospitals in Wyoming. The data did not include inpatient discharges from federal hospitals (for example, Veterans Affairs hospitals) and specialized hospitals (for example, rehabilitation and psychiatric hospitals). The unit of analysis was discharge from hospital inpatient care. WYSAC identified hospital discharges and the corresponding charges for substance-related conditions or injuries based on primary diagnosis or an external cause of injury. The hospital discharge data were used to calculate the average charge for each condition. The

[4] The CCRs are available separately for rural hospitals and urban hospitals using definitions from the 2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas (2010). According to these definitions, two Wyoming counties, Laramie and Natrona, are considered urban, and the rest are rural (OMB, 2009). Since October 1, 2009, the CCRs for acute care hospitals in Wyoming in 2010 are 0.394 for urban hospitals and 0.539 for rural hospitals (Medicare Program, 2009). These ratios are applied to hospital inpatient care charges to reflect the hospital inpatient care costs of real health care resource utilization.

[5] The WDH has an agreement with the Wyoming Hospital Association (WHA), who compiles the hospital discharge data, to have access to these data (J. Grandpre, personal communication, June 18, 2012). The WDH extracted the data files in a non-personally identifiable format and provided them to WYSAC to conduct this study.

total cost for each condition was estimated by applying CCRs to reflect actual resource utilization (see Table 5-1 for the cost of inpatient hospital care).

Appendix A shows the list of health conditions, ICD-9 codes, ICD-10 codes, age cutoffs, and attributable fractions for alcohol, tobacco, and drugs. Appendix B presents the estimates of hospital discharges and inpatient care costs attributable to substance abuse or use, by health condition, for alcohol, tobacco, and drugs.

Alcohol. Following the approach taken by Bouchery et al. (2010), WYSAC included discharges of patients who were 20 years of age or older with alcohol-related chronic conditions and discharges of patients who were 15 years of age or older with alcohol-related acute conditions. Exceptions to these age cutoffs were Fetal Alcohol Syndrome (FAS) (age>0), fetus and newborn affected by maternal use of alcohol (age>0), low birth weight, prematurity, intrauterine growth retardation or death (age>0), child maltreatment (age≤14), and motor-vehicle traffic crashes (age>0).

The findings indicated that Wyoming had approximately 1,837 hospital discharges as a result of health conditions or injuries that were attributable to alcohol abuse in 2010. These discharges amounted to the total alcohol-related inpatient hospital care cost of $89,718,966.

Tobacco. To develop the cost estimate for smoking-related conditions, for adults WYSAC used discharges of individuals who were 35 years of age or older and for perinatal conditions, WYSAC used newborn discharge data. For conditions related to smokeless tobacco use, discharges of patients of all ages were included.

WYSAC estimated that Wyoming had approximately 2,032 hospital discharges as a result of health conditions or injuries that were attributable to tobacco use in 2010. The total cost of these tobacco-related hospitalizations was estimated to be $131,206,969.

Drugs. Discharges of patients of all ages were included for the estimation of inpatient hospital care costs of conditions attributable to drug abuse.

According to WYSAC's estimates, Wyoming had 971 hospital discharges due to drug-attributable conditions in 2010. The total cost of these hospitalizations was $64,517,078.

5.2.2. Other Medical Care Costs

In addition to inpatient hospital care costs, WYSAC estimated the costs of outpatient medical care, nursing home care, prescription drugs, and other health professionals' services (i.e., other medical care services). Data sources for directly estimating the costs of these services for Wyoming were not available. Instead, WYSAC followed an indirect estimation method employed by previous state-level COI studies (see, for example, Max, Wittman, Stark, & West, 2004; Wickizer, 2007). Using this method, a ratio of other medical care cost to hospital inpatient care cost was calculated for each of the itemized other medical care services. The hospital inpatient care costs were then multiplied by those ratios to derive the costs of other medical care services. WYSAC used multiple sources to obtain either ratios or cost estimates to calculate ratios. Max, Wittman et al. (2004) provided ratios for alcohol-related and drug-related other medical care services based on the 1992 national cost estimates calculated by Harwood et al. (1998). Following Wickizer (2007), WYSAC assumed that the distribution of medical care costs was identical between alcohol-related and drug-related conditions. Table 5-3 shows the ratios calculated by Max, Wittman et al. (2004).

Table 5-3. Ratios of Other Medical Care Costs to Hospital Inpatient Care Costs for Alcohol and Drug Abuse

Provider and Service Type	Ratio to Hospital Inpatient Care Cost, per dollar spent
Hospital inpatient care	1.000
Outpatient medical care	0.393
Nursing home care	0.140
Prescription drugs	0.356
Other health professionals' services	0.210

Source: Max, Wittman et al., 2004.

For every dollar spent in hospital inpatient care at non-federal short-stay hospitals, the cost of outpatient medical care was 39.3 cents, the cost of nursing home care was 14.0 cents, the cost of prescription drugs was 35.6 cents, and the cost of services from other health professionals was 21.0 cents. WYSAC used these ratios to compute the other medical care costs related to alcohol abuse and drug abuse.

For tobacco, WYSAC estimated hospital inpatient care cost to other medical care cost ratios based on SAMMEC estimates of the adult smoking-attributable expenditures (SAEs) for Wyoming in 2004 (CDC, 2007). Table 5-4 shows the SAEs and the estimated ratios.

Table 5-4. Ratio of Other Medical Care Costs to Hospital Inpatient Care Cost for Tobacco Use

Provider and Service Type	Smoking-attributable Expenditures, 2004 (in millions)[1]	Ratio to Hospital Inpatient Care Cost, per dollar spent
Hospital inpatient care	$82	1.000
Outpatient medical care	$21	0.256
Nursing home care	$11	0.134
Prescription drugs	$22	0.268
Other health professionals' services	$13	0.159

Source: CDC, 2007.
[1] Among adults 18 years and older.

For every dollar spent in hospital inpatient care, the cost of outpatient medical care was 25.6 cents, the cost of prescription drugs was 26.8 cents, the cost of nursing home care was 13.4 cents, and the cost of service from other health professionals was 15.9 cents. WYSAC used these ratios to derive the other medical care costs for illness related to tobacco use.

Following the approach developed by Max, Wittman et al. (2004) as discussed above, WYSAC applied these ratios to the CCR-adjusted costs of hospital inpatient care to estimate the costs of other medical care service as shown in Table 5-5.

Table 5-5. Costs of Other Medical Care Services by Type of Substance, 2010

Provider and Service Type	Fraction of Hospital Inpatient Care Cost[a]	Other Medical Care Costs
Hospital Inpatient Care Costs for Alcohol = $89,718,966		
Outpatient medical care	0.393	$35,259,553
Nursing home care	0.140	$12,560,655
Prescription drugs	0.356	$31,939,952
Other health professionals' services	0.210	$18,840,983
Other medical care total		**$98,601,143**
Hospital Inpatient Care Costs for Tobacco = $131,206,969		
Outpatient medical care	0.256	$33,601,785
Nursing home care	0.134	$17,600,935
Prescription drugs	0.268	$35,201,870
Other health professionals' services	0.159	$20,801,105
Other medical care total		**$107,205,694**
Hospital Inpatient Care Costs for Illicit Drugs = $9,759,149		
Outpatient medical care	0.393	$3,835,346
Nursing home care	0.140	$1,366,281
Prescription drugs	0.356	$3,474,257
Other health professionals' services	0.210	$2,049,421
Other medical care total		**$10,725,305**
Hospital Inpatient Care Costs for Prescription Drugs = $38,617,566		
Outpatient medical care	0.393	$15,176,704
Nursing home care	0.140	$5,406,459
Prescription drugs	0.356	$13,747,854
Other health professionals' services	0.210	$8,109,689
Other medical care total		**$42,440,705**
Hospital Inpatient Care Costs for Unspecified Drugs = $16,140,363		
Outpatient medical care	0.393	$6,343,162
Nursing home care	0.140	$2,259,651
Prescription drugs	0.356	$5,745,969
Other health professionals' services	0.210	$3,389,476
Other medical care total		**$17,738,258**
Hospital Inpatient Care Costs for All Drugs = $64,517,078		
Outpatient medical care	0.393	$25,355,212
Nursing home care	0.140	$9,032,391
Prescription drugs	0.356	$22,968,080
Other health professionals' services	0.210	$13,548,586
Other medical care total		**$70,904,269**

Source: [a] Max, Wittman et al., 2004

6. Productivity Losses Resulting from Substance Abuse

A COI study views sickness, impaired function, hospitalization, incarceration, or death resulting from the abuse or use of alcohol, tobacco, illicit drugs and/or prescription drugs as a loss of potential productivity. For this study WYSAC valued losses in productivity using the human capital approach (HCA). HCA assumes an individual's expected future earnings reflect that individual's potential contribution to the economy (Tarricone, 2006). In other words, the value of lost productive time is equivalent to what that individual would be expected to earn in the market plus the value of running a household. Although dollars are not exchanged in a household, when individuals perform household work, their activities result in economic benefits. If that individual should no longer be able to perform their household work because of substance abuse, then someone else will have perform those household duties, either another member of the household or a person hired to complete those tasks.

In this analysis total productivity value included market productivity plus household productivity. Market productivity included cash wage/salary earnings and employer provided fringe benefits (i.e., insurance, retirement) and legally required employer costs (i.e., Social Security, Medicare, unemployment insurance, and workers' compensation). WYSAC relied on 2006 through 2010 data, adjusted to 2010 dollars, from the American Community Survey (ACS) to produce wage/salary estimates for Wyoming workers. Compensation in the form of employer-provided fringe benefits and legally-required employer costs were estimated using data on employer costs for employee compensation from the Bureau of Labor Statistics (BLS) (U.S. Department of Labor, 2011). Estimates of household productivity value were taken from the Dollar Value of a Day, a report that uses data from the American Time Use Survey (ATUS) to estimate the value of household productivity (Expectancy Data, 2011). See Appendix C for a detailed discussion of the methods WYSAC used in developing the productivity estimates for this analysis. Table 6-1 presents a summary of the estimated decrease in total productivity value or total productivity losses by substance.

The human capital approach for assessing productivity losses associated with substance abuse is not all-inclusive (Haddix, Corso, and Gorsky, 2003). The human capital approach excludes the costs associated with pain and suffering, the value of leisure time, and it may undervalue the productivity of groups whose productivity value is not reflected in earnings (for example, volunteers). Therefore, the human capital estimation of mortality and morbidity costs associated with a health problem should be considered an extremely conservative (or lower-bound) estimate of the economic cost of mortality.

Table 6-1. Total Productivity Losses, Wyoming, 2010

	Total Productivity Losses		
Cost Category	**Alcohol**	**Tobacco**	**Drugs**
Impaired Productivity	$358,004,140	$234,572,938	$68,813,575
Specialty Treatment	$27,632,546	--	$19,091,601
Hospitalization	$765,037	$913,090	$383,048
Mortality	$188,691,055	$214,443,448	$78,809,066
Crime Victim	$1,732,270	--	$277,539
Incarceration	$12,369,696	--	$21,729,762
Total, Productivity Losses	**$589,194,744**	**$449,929,476**	**$189,104,591**

6.1. Impaired Productivity

The estimates of impaired productivity loss are total productivity values – the combined value of market labor and household productivity estimates. To date, researchers have not directly measured the reduction in household productivity associated with alcohol or drug abuse/dependence or tobacco use. Therefore, WYSAC assumed that the observed reduction in market labor income from substance use, abuse and/or dependence would be equally present in the household.

6.1.1. Alcohol

WYSAC used estimates of impaired productivity from Bouchery et al. (2010). The researchers used a two-stage model to estimate changes in productivity resulting from excessive alcohol consumption. Stage one estimated the probability of labor force participation and stage two estimated earnings from participation in the labor force. The authors used data from the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a survey administered to a random sample of non-institutionalized, U.S. adults, 18 years of age and older. The questionnaire was designed using the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) clinical standards for alcohol dependence and collected the necessary data to evaluate the extent of alcohol use disorders and their associated disabilities (Bouchery et al., 2010).

The variables included in the two-stage model were lifetime alcohol dependence, lifetime drug dependence, lifetime severe mental disorder, labor force participation, income, age, race, educational attainment, gender, and number of children under 18 years of age. The model showed a significant reduction in labor force participation and earnings for men but showed no effect on workplace productivity for women. Averaging across all age groups, the authors estimated a 2.5% reduction in labor force participation and a 5.0% reduction in earnings among those who were employed and alcohol dependent.

Bouchery et al. (2010) also estimated productivity losses from increased absenteeism resulting from binge drinking, which they defined identically for both sexes: consuming five or more drinks in a single occasion. The authors also controlled for the presence of alcohol dependence in the model. They found a positive and significant increase in absenteeism for both men and women as a result of both binge drinking and alcohol dependence. To avoid double counting the productivity losses already estimated for individuals with alcohol dependence, Bouchery et al. only included losses for increased absenteeism associated with binge drinking in their total estimate of productivity losses. Because prevalence estimates of binge drinking for Wyoming included alcohol dependent individuals and non-alcohol dependent individuals, to avoid any overlap in the productivity loss estimates, WYSAC followed the conservative approach used by Bouchery et al. and did not include losses in productivity as a result of binge drinking.

For Wyoming, WYSAC obtained prevalence estimates of alcohol dependence for the past year from the 2009-2010 National Survey on Drug Use and Health (NSDUH) for males (SAMHSA, 2012; Table 6-2).[6] Because income was found to be a function of age, WYSAC also narrowed the range of age categories (i.e., 26-34, 35-49, 50-64) by using the U.S. estimates of past year alcohol dependence to calculate the alcohol-dependent proportion of the population by sex and age. WYSAC multiplied the total number of Wyoming individuals with past year alcohol dependence by the proportions estimated in Table 6-2 to obtain estimates of alcohol dependence by sex and age for Wyoming.

[6] WYSAC was not interested in prevalence estimates for females because a reduction in workplace productivity or labor force participation was shown to be gender specific.

Table 6-2. Estimates of Prevalence and Number of Wyoming Individuals with Past Year Alcohol Dependence, 2009-2010

Age Category	Wyoming Population[a]	NSDUH 2009-2010 Prevalence[a]	Estimated Individuals with Alcohol Dependence[a]
18-25	62,918	7.96%	5,008
26+	273,182	2.95%	8,059

Source: [a] SAMHSA, 2012c.

To calculate total productivity losses WYSAC took the approach used by the NDIC (2011) whereby estimates of productivity were assumed to include individuals who were alcohol dependent. Bouchery et al. (2010) showed that males with alcohol dependence earned on average 5% less than males without an alcohol dependence; therefore, WYSAC adjusted the estimates of income by multiplying the income estimates for each age category by the factor 1/ (1-*ab*), where *a* is the alcohol dependent proportion of the male population in a given age category, and *b* is the reduction in income (i.e., 5%). In addition, WYSAC estimated a 2.5% reduction in labor force participation among males (based on Bouchery et al.) to estimate the number of men in each age category who would have participated in the market labor force, if they were not alcohol dependent. The results of these calculations and the total estimate of productivity loss associated with past year alcohol dependence are presented in Table 6-3.

Table 6-3. Productivity Losses for Men with Past Year Alcohol Dependence, 2010

Age Category	Wyoming Population Males[a]	Estimated Individuals[b]	Estimated Prevalence	Per Person Annual Total Productivity[c]	Adjusted Per Person Annual Total Productivity	Total Productivity Losses
(1)	(2)	(3)	(3)÷(2)	(4)	(5)	(3)x(5)
Reduction in income (5%)						
18-25	32,717	2,994	9.2%	$35,917	$36,082	$5,401,034
26-34	37,061	1,839	5.0%	$68,013	$68,182	$6,268,557
35-49	49,073	1,878	3.8%	$92,737	$92,915	$8,725,657
50-64	54,703	1,321	2.4%	$91,221	$91,331	$6,031,790
Reduction in labor force participation (2.5%)						
18-25	32,717	818	2.5%	--	$36,082	$29,512,983
26-34	37,061	927	2.5%	--	$68,182	$63,173,172
35-49	49,073	1,227	2.5%	--	$92,915	$113,988,968
50-64	54,703	1,368	2.5%	--	$91,331	$124,901,979
Total						**$358,004,140**

Source: [a] SAMHSA, 2012c & U.S. Census Bureau (2011); [b] SAMHSA, 2012; [c] U.S. Department of Labor;

6.1.2. Tobacco

Bunn, Stave, Downs, Alvir, and Dirani (2006) estimated productivity losses due to health-related absenteeism and presenteeism among nonsmokers, former smokers, and current smokers.[7] The authors analyzed data from a large, cross-sectional database of U.S. employees who voluntarily completed the Wellness Inventory (Bunn et al., 2006). The authors found, after controlling for age and sex, that nonsmokers and former smokers missed significantly fewer days compared with current smokers. Using an average hourly rate of $34.25, Bunn et al. calculated the average annual

[7] Presenteeism is defined as lost productivity from individuals who report to work but who underperform because of illness.

productivity costs related to illness per employee per year as $2,623 for nonsmokers, $3,246 for former smokers, and $4,430 for current smokers.[8] WYSAC adjusted these amounts to 2010 dollars using the CPI for all goods and services resulting in productivity losses of $2,837 for nonsmokers, $3,511 for former smokers, and $4,792 for current smokers (U.S. Department of Labor, 2012)

To estimate the productivity losses associated with smoking, WYSAC used the health-related productivity costs for nonsmokers as the baseline. The productivity losses associated with cigarette smoking would then be the amount of the health-related productivity costs that exceeded the baseline cost. Next, WYSAC estimated the number of current and former smokers in Wyoming using prevalence estimates from the 2010 Wyoming Behavioral Risk Factor Surveillance System (BRFSS). Finally, WYSAC estimated total productivity losses from smoking by multiplying the estimated number of current and former smokers by their associated per person annual productivity loss (see Table 6-4).

Table 6-4. Productivity Losses for Current and Former Smokers, 2010

Age Category	Wyoming Population[a]	WY BRFSS 2010 Prevalence[b]	Estimated Individuals	Per Person Annual Productivity Loss[c]	Total Productivity Losses
(1)	(2)	(3)	(2)x(3)	(4)	(2)x(3)x(4)
Current smokers					
18+	428,918	19.5%	83,639	$1,954.50	$163,472,445
Former smokers					
18+	428,918	24.6%	105,514	$673.85	$71,100,493
Total					**$234,572,938**

Source: [a] US Census, 2011; [b] Wyoming 2010 BRFSS; [c] Bunn et al., 2006

6.1.3. Drugs

WYSAC followed the NDIC (2011) approach for conducting a COI analysis on the impact of illicit drug use. The NDIC estimated the decrease in productivity as a result of past year abuse of or dependence upon illicit drugs (2011). For the NDIC study the authors defined illicit drugs as all Schedule 1 drugs (mostly marijuana and heroin) and non-medical use of Schedule II-IV drugs (cocaine, and methamphetamine as well as prescription pain relievers, tranquilizers, stimulants, and sedatives). Relying on data from the 2007 NSDUH to provide prevalence estimates of drug abuse and dependence, the authors produced estimates of reduced productivity attributable to illicit drug use. Among respondents aged 15 and older, the authors found a 17% and 18% reduction in productivity attributable to drug abuse or dependence for males and females, respectively.

Table 6-5 provides prevalence estimates from the 2009-2010 NSDUH of past year drug abuse and/or dependence for Wyoming.

[8] The hourly rate of $34.25 used by Bunn et al. (2006) was based on a benchmarking study peformed by the MEDSTAT Group. This estimate for hourly cost to employers is higher than the national average published by the U.S. BLS. In 2001, this figure was $23.15 per hour. Both hourly rates included average hourly wages and benefits.

Table 6-5. Estimates of Prevalence and Number of Individuals with Past Year Drug Abuse or Dependence, 2009-2010

Age Category	Wyoming Population	NSDUH 2009-2010 Prevalence	Estimated Individuals with Drug Abuse or Dependence
15-17	22,013	4.99%	1,098
18-25	62,918	6.02%	3,788
26+	273,182	1.30%	3,551

Source: SAMHSA, 2012c.

Similar to the calculations for productivity losses attributable to alcohol, WYSAC needed drug prevalence estimates by gender and narrower age categories. Again WYSAC made use of the U.S. estimates of illicit drug prevalence, which were available by gender and the desired age categories, to inform the estimates of drug prevalence for a given sex and age category for Wyoming. Table 6-6 shows the resulting number of males and females by age category and the recalculated prevalence estimates.

Following the same approach WYSAC used in calculating alcohol-related productivity loss, and put forth by the NDIC (2011), WYSAC assumed estimates of productivity included individuals who were drug dependent. To adjust the estimates of total productivity to reflect this finding WYSAC multiplied the productivity estimates for each age category by the factor $1/(1-ab)$, where a is the drug dependent proportion of the population in a given age category, and b is the reduction in income (i.e., 17% for males and 18% for females). The results of these calculations and the total estimate of productivity loss associated with past year alcohol dependence are presented in Table 6-6.

Table 6-6. Productivity Losses Attributable to Past Year Drug Abuse or Dependence, 2010

Age Category	Wyoming Population[a]	Estimated Individuals[b]	Estimated Prevalence	Per Person Annual Total Productivity[c]	Adjusted Per Person Annual Total Productivity	Total Productivity Losses
(1)	(2)	(3)	(3)÷(2)	(4)	(5)	(3)x(5)
Males with a 17% reduction						
15-17	11,381	548	4.8%	$12,522	$12,625	$1,176,505
18-25	32,717	2,346	7.2%	$35,917	$36,360	$14,500,507
26-34	37,061	1,187	3.2%	$68,013	$68,385	$13,796,185
35-49	49,073	776	1.6%	$92,737	$92,987	$12,262,062
50-64	54,703	389	0.7%	$91,221	$91,331	$6,033,842
Females with an 18% reduction						
15-17	11,381	550	5.2%	$12,622	$12,741	$1,262,027
18-25	32,717	1,442	4.8%	$29,883	$30,142	$7,822,494
26-34	37,061	495	1.5%	$49,271	$49,401	$4,405,239
35-49	49,073	531	1.1%	$59,431	$59,554	$5,692,108
50-64	54,703	174	0.3%	$59,460	$59,496	$1,862,605
Total						**$68,813,575**

Source: [a] SAMHSA, 2012; U.S. Census Bureau, 2011; [b] SAMHSA, 2012; [c] U.S. Department of Labor.

6.2. Losses While Institutionalized/Hospitalized

6.2.1. Specialty Treatment

Individuals who enter residential treatment centers for substance abuse are unable to work or participate in the functioning of their household. Thus these individuals are not able to realize their potential productivity while receiving care. WYSAC calculated the productivity losses associated with specialty treatment using discharge data from Treatment Episodes Data Set-Discharge (TEDS-D). TEDS-D provides information on individuals seeking treatment from state-licensed treatment programs. WYSAC used the 2009 discharge data set (the most recently available data) to calculate the total number of days patients spent in detoxification, residential, and outpatient programs in Wyoming. Following the approach used by Bouchery et al. (2010) WYSAC multiplied the total number of days by the mean total productivity value per day to obtain total productivity losses associated with specialty treatment. Table 6-7 presents estimates of total productivity losses due to specialty treatment by substance.

Table 6-7. Productivity Losses Attributable to Specialty Treatment for Substance Abuse, 2010

Substance Category	Specialty Treatment Days Attributable to Substance	Mean Per Day Total Productivity Value[1]	Total Productivity Losses
(1)	(2)	(3)	(2)x(3)
Alcohol	275,857	$100.17	$27,632,546
Drugs	190,592	$100.17	$19,091,601
Illicit	179,001	$100.17	$17,930,530
Prescription	11,591	$100.17	$1,161,070

[1] Mean per day total productivity value is a weighted average of annual total productivity. Annual values are divided by 365 to estimate the per day value. See Appendix C for a discussion of the methods used to estimate annual total productivity.

6.2.2. Hospitalization

Similar to productivity losses resulting from days spent in a specialty treatment program, individuals who were treated at a hospital for health conditions associated with substance abuse or use will also not realize their productivity potential during their hospital stay. WYSAC used primary diagnoses as well as cause of injury codes to estimate the number of inpatient days attributable to substance abuse or use. The hospital inpatient discharge data were the same used in Section 5.2.1 to estimate medical care costs. Table 6-8 presents estimates of total productivity losses from hospitalizations associated with substance abuse or use.

Table 6-8. Productivity Losses Attributable to Hospitalization for Substance Abuse-Related Diseases, 2010

Substance	Hospital Days Attributable to Substance	Mean Per Day Total Productivity Value[1]	Total Productivity Losses
(1)	(2)	(3)	(2)x(3)
Alcohol	7,637	$100.17	$765,037
Tobacco	9,115	$100.17	$913,090
Drugs	3,824	$100.17	$383,048
Illicit	1,583	$100.17	$158,569
Prescription	1,149	$100.17	$115,095
Unspecified	1,092	$100.17	$109,383

[1] Mean per day total productivity value is a weighted average of annual total productivity. Annual values are divided by 365 to estimate the per day value. See Appendix C for a discussion of the methods used to estimate annual total productivity.

6.3. Mortality

Mortality data attributable to alcohol, tobacco, and drug use came from the WDH Vital Statistics Services (VSS). The data were categorized by underlying cause of death, age, and gender. WYSAC applied the estimates of present value of lifetime production using a 3% discount rate by age and gender to obtain total productivity losses due to substance abuse-related mortality (see Table 6-9).

Table 6-9. Productivity Losses for Substance Abuse- or Use-Attributable Mortality, by Age and Gender, 2010

Age/ Gender Group	Present Value of Lifetime Production 3% Discount Rate[1]	Alcohol				Tobacco		Drugs	
		Number of Alcohol-Attributable Deaths		Total Loss		Number of Tobacco-Attributable Deaths	Total Loss	Number of Drug-Attributable Deaths	Total Loss
		Chronic	Acute	Chronic	Acute				
(1)	(2)	(3)	(4)	(2)x(3)	(2)x(4)	(5)	(2)x(5)	(6)	(2)x(6)
Males									
<1	$1,282,844	--	--	--	--	1.28	$1,642,041	--	--
1-15	$1,519,489	0.04	0.91	$60,780	$1,382,735	0	$0	0	$0
16-19	$1,812,172	0	2.64	$0	$4,784,133	0	$0	2	$3,624,343
20-24	$1,900,118	0	10.73	$0	$20,388,268	0	$0	0	$0
25-29	$1,895,801	0.15	6.29	$284,370	$11,924,587	0	$0	1.16	$2,195,337
30-34	$1,806,109	0.31	9.56	$559,894	$17,266,399	0	$0	7.16	$12,928,126
35-39	$1,638,708	2.10	5.83	$3,441,286	$9,553,665	3.31	$5,424,122	4	$6,554,830
40-44	$1,415,366	4.21	5.24	$5,958,691	$7,416,518	3.31	$4,684,862	2.68	$3,790,350
45-49	$1,173,462	4.51	8.64	$5,292,313	$10,138,710	9.86	$11,570,333	3.2	$3,755,078
50-54	$918,979	10.45	13.63	$9,603,332	$12,525,686	23.96	$22,018,740	5.88	$5,401,759
55-59	$670,466	6.62	7.44	$4,438,482	$4,988,264	37.94	$25,437,466	3.92	$2,628,225
60-64	$425,329	6.23	5.33	$2,649,801	$2,267,004	46.45	$19,756,540	2.4	$1,020,790
65-69	$278,684	1.37	1.77	$381,797	$493,271	52.34	$14,586,330	0	$0
70-74	$209,926	4.31	2.64	$904,781	$554,205	57.75	$12,123,229	0	$0
75-79	$154,142	1.27	2.97	$195,760	$457,801	48.00	$7,398,800	0	$0
80-84	$112,164	3.70	2.1	$415,008	$235,545	69.94	$7,844,780	0	$0
85+	$55,499	1.32	2.55	$73,259	$141,524	80.09	$4,444,950	0	$0
Females									
<1	$889,536	--	--	--	--	1.66	$1,476,630	--	--
1-15	$1,051,781	0.06	0.89	$63,107	$936,085	0	$0	0.5	$498,544
16-19	$1,239,470	0	1.71	$0	$2,119,493	0	$0	0	$0
20-24	$1,275,954	0	1.83	$0	$2,334,996	0	$0	2	$2,551,908

Age/ Gender Group	Present Value of Lifetime Production 3% Discount Rate[1]	Alcohol				Tobacco		Drugs	
		Number of Alcohol-Attributable Deaths		Total Loss		Number of Tobacco-Attributable Deaths	Total Loss	Number of Drug-Attributable Deaths	Total Loss
		Chronic	Acute	Chronic	Acute				
Females									
25-29	$1,256,501	1	3.64	$1,256,501	$4,573,662	0	$0	7	$8,795,504
30-34	$1,198,591	2	2.68	$2,397,181	$3,212,223	0	$0	3.32	$3,979,321
35-39	$1,104,101	3.46	2.21	$3,820,188	$2,440,062	2.05	$2,263,406	5	$5,520,503
40-44	$975,139	2.01	1.8	$1,960,030	$1,755,251	2.63	$2,564,617	3.64	$3,545,607
45-49	$841,318	4.34	3.83	$3,651,319	$3,222,247	7.84	$6,595,931	4.2	$3,533,534
50-54	$697,497	4.4	3.3	$3,068,987	$2,301,741	14.74	$10,281,108	7	$4,882,480
55-59	$545,482	3.97	3.23	$2,165,565	$1,761,908	18.86	$10,287,799	4	$2,181,930
60-64	$396,062	5.18	2.34	$2,051,602	$926,786	24.87	$9,850,067	2.2	$871,337
65-69	$296,799	2.12	0.86	$629,213	$255,247	28.45	$8,443,921	1	$296,799
70-74	$233,691	1.36	1.22	$317,820	$285,104	29.48	$6,889,224	0.2	$46,738
75-79	$180,055	0.67	1.27	$120,637	$228,670	46.04	$8,289,744	0.2	$36,011
80-84	$134,998	0.89	1.44	$120,148	$194,397	40.32	$5,443,116	0.32	$43,199
85+	$63,405	23.92	3.57	$1,516,657	$226,357	80.84	$5,125,691	2	$126,811
Total				**$57,398,511**	**$131,292,544**		**$214,443,448**		**$78,809,066**

[1] See Appendix C for a description of the methodology used in the calculation of present value of lifetime production estimates.

6.4. Crime-related Losses

6.4.1. Crime Victim Productivity Losses

Lacking data on the number of victims in 2010, WYSAC used the number of offenses as a proxy – assuming every offense has at least one victim. Estimates of the number of offenses in 2010 came from the State of Wyoming, Office of the Attorney General (2010). Therefore, the estimates of crime victim productivity costs should be regarded as conservative. WYSAC used estimates of attributable fractions and mean number of work days lost from Bouchery et al. (2010) for alcohol-induced crimes, and from NDIC (2011) for illicit drug-induced crimes. Both studies relied on the NCVS statistical tables to construct their estimates. The estimated value of each work day lost was based on a weighted average of the annual total productivity estimates divided by 52 weeks and 5 work days per week. Table 6-10 presents the estimates of total productivity losses for victims of crime in Wyoming.

Table 6-10. Productivity Losses for Victims of Crime, 2010

Type of Crime	Number of Offenses[a]	Cost per Day	Alcohol			Drugs		
			AF[b]	Mean # of Work Days Lost	Total Productivity Loss	AF[c]	Mean # of Work Days Lost	Total Productivity Loss
(1)	(2)	(3)	(4)	(5)	(2)x(3)x(4)x(5)	(6)	(7)	(2)x(3)x(6)x(7)
Violent Crime								
Forcible Rape	160	$140.62	31.1%	3.05	$21,342	12%	1.19	$3,206
Other Sex Offenses	0	$140.62	18.8%	0.6	$0	12%	1.19	$0
Aggravated Assault	810	$140.62	22.6%	6.25	$160,887	12%	1.19	$16,233
Other Assault	5,879	$140.62	13.8%	6.32	$721,019	12%	1.19	$117,818
Property Crime								
Robbery	76	$140.62	18.7%	4.33	$8,653	31%	0.23	$778
Burglary	2,122	$140.62	21.9%	1.79	$116,974	31%	0.23	$21,711
Larceny	10,962	$140.62	16.1%	2.69	$667,598	31%	0.23	$112,156
Motor Vehicle Theft	551	$140.62	23.1%	2	$35,797	31%	0.23	$5,637
Total	20,560				$1,732,270			$277,539

Source: [a] State of Wyoming, Office of Attorney General, 2010; [b] Bouchery et al., 2010; [c] NDIC, 2011.
Note: AF – Attributable Fraction

6.4.2. Losses Related to Incarceration

Using national data sets, Bouchery et al. (2010) and the NDIC (2011) developed crime-specific attributable fractions to estimate the number of alcohol- and illicit drug-induced crimes committed. However, WYSAC did not have data on the crimes that inmates were serving time for in Wyoming's penal institutions. These data were compiled by the WDOC but were not available for 2010. WYSAC did have the number of arrests by crime type for Wyoming and WYSAC used these data to calculate a weighted average of attributable fractions for alcohol and illicit drugs. Next WYSAC applied the resulting average attributable fractions to the total number of inmates in Wyoming in 2010 to obtain an estimate of the number of inmates serving time for drug- and alcohol-induced crimes (WDOC, 2010). Finally WYSAC multiplied by the adjusted annual total productivity to obtain the total productivity losses resulting from incarceration (see Table 6-11).

Table 6-11. Productivity Losses for Incarcerations Attributable to Substance Abuse, 2010

Substance	Number of Wyoming Inmates[a]	AF[b]	Adjusted Mean Annual Total Productivity	Total Productivity Losses
(1)	(2)	(3)	(4)	(2)x(3)x(4)
Alcohol	2,122	0.16	$36,605	$12,369,696
Drugs	2,122	0.28	$36,745	$21,729,762

Source: [a] U.S. Department of Justice (2012); [b] Bouchery et al. (2010); NDIC (2011).
Note: AF – Attributable Fraction

7. Crime Costs from Substance Abuse

Costs of crime from substance abuse were attributed to both alcohol and drug abuse. WYSAC did not estimate crime costs attributable to tobacco. Costs include victims' costs of crime (e.g., property loss or damage), excluding medical and productivity costs (addressed above) and criminal justice system costs. Criminal justice system costs were comprised of policing costs, legal and adjudication costs, and corrections costs. In total, WYSAC estimated costs of crime attributable to alcohol to be $30,189,344 and costs of crime attributable to drugs to be $53,118,881. Table 7-1 shows the total crime costs by substance.

Table 7-1. Total Crime Costs, Wyoming, 2010

	Total Crime Cost	
Cost Category	**Alcohol**	**Drugs**
Victims' Cost	$2,712,468	$4,221,342
Policing Cost	$6,393,225	$12,485,437
Legal and Adjudication Cost	$5,820,694	$9,701,928
Corrections Cost	$15,262,957	$26,710,174
Total, Crime	$30,189,344	$53,118,881

A discussion of attributable fractions for drug- and alcohol-related crimes used in this section can be found in Section 6.4.2., Losses Related to Incarceration.

7.1. Victims' Costs of Crime (Excluding Medical and Productivity Costs)

Victims of property crimes suffer damage or loss of their property, as might victims of violent crime. Unfortunately, crime statistics generally do not disaggregate costs attributable to prescription drug abuse from costs attributable to illicit drug use; thus, WYSAC did not estimate separate victims' costs of crime attributable to prescription drug abuse and illicit drug use. Cost estimates of vehicle damage due to driving under the influence are covered separately in Section 8.1.

WYSAC estimated victims' costs (excluding medical and productivity costs) by multiplying the number of offenses resulting in property losses first by the value of losses and damages, and then by the alcohol- and drug-attributable fractions. WYSAC obtained the number of offenses in major categories of crimes from the State of Wyoming, Office of the Attorney General (2010). WYSAC estimated losses and damages differently for property crimes and violent crimes. For property crimes, WYSAC used cost estimates provided by the State of Wyoming, Office of Attorney General (2010). Unfortunately, however, the Wyoming Attorney General's report did not provide estimates of property losses and damages for victims of violent crime. For violent crimes, WYSAC relied on estimates developed by Bouchery et al. (2010) from the 2006 NCVS, adjusted by the CPI for all goods and services (U.S. Department of Labor, 2012). WYSAC used estimates of attributable fractions from Bouchery et al. (2010) and the NDIC (2011) for alcohol- and drug-related crimes. Table 7-2 shows victims' costs of crimes attributable to alcohol and drugs.

Table 7-2. Victims' Costs of Crime (Excluding Medical and Productivity Costs), 2010

Type of Crime	Number of Offenses[a]	Loss per Victim[b,c,d]	Alcohol		Drugs	
			AF[e]	Total Victims' Costs	AF[f]	Total Victims' Costs
(1)	(2)	(3)	(4)	(2)x(3)x(4)	(5)	(2)x(3)x(5)
Violent Crime						
Forcible Rape	160	$148	31%	$7,383	12%	$2,849
Other Sex Offenses	*		19%		12%	
Aggravated Assault	810	$51	23%	$9,255	12%	$4,914
Other Assault	5,879	$75	14%	$60,517	12%	$52,624
Property Crime						
Robbery	76	$926	19%	$13,160	31%	$21,817
Burglary	2,122	$1,757	22%	$816,510	31%	$1,155,790
Larceny	10,962	$544	16%	$960,096	31%	$1,848,632
Motor Vehicle Theft	551	$6,643	23%	$845,548	31%	$1,134,718
Total	20,560			$2,712,468		$4,221,342

Source: [a] State of Wyoming, Office of Attorney General, 2010; [b] Loss per victim for violent crime from Bouchery et al., 2010; [c] Loss per victim for property crime from State of Wyoming, Office of Attorney General, 2010;[e] CPI adjustment from U.S. Department of Labor, 2012; [e] Bouchery et al., 2010; [f] NDIC, 2011.

Note: AF – Attributable Fraction

7.2. Criminal Justice System Costs

Among criminal justice system costs WYSAC included policing, the legal and adjudication costs, and costs for incarceration.

7.2.1. Policing Costs

Following Wickizer (2007), WYSAC restricted the analysis of policing costs to the set of crimes believed to be most closely linked to substance abuse. WYSAC started with the number of offenses, where available, and the number of arrests, where available. WYSAC multiplied these by estimates of attributable fractions from Bouchery et al. (2010) and the NDIC (2011) for alcohol- and drug-related crimes. This product was further multiplied by the average cost per offense provided by Wickizer (Wickizer's average cost per offense was based on Rice, Kelman, Miller, & Dunmeyer, 1990) and adjusted to 2010 values using the CPI. Table 7-3 shows the results.

Table 7-3. Policing Costs, 2010

Type of Crime	Number of Offenses[a]	Average Cost per Offense[b, c]	Alcohol		Drugs	
			AF[d, e]	Total Policing Cost	AF[f]	Total Policing Cost
(1)	(2)	(3)	(4)	(2)x(3)x(4)	(5	(2)x(3)x(5)
Violent Crime						
Homicide	10	$2,067	47%	$9,713	12%	$2,480
Aggravated Assault	810	$2,040	23%	$373,419	12%	$198,275
Other Assault	5,879	$2,040	14%	$1,654,951	12%	$1,439,088
Property Crime						
Robbery	76	$1,410	19%	$20,041	31%	$33,223
Burglary	2,122	$2,040	22%	$947,965	31%	$1,341,868
Larceny	10,962	$1,379	16%	$2,433,586	31%	$4,685,787
Motor Vehicle Theft	551	$2,040	23%	$259,637	31%	$348,430
Alcohol-Related Arrests*						
Driving Under the Influence	5,770	$61	100%	$354,326		
Public Drunkenness	2,347	$61	100%	$144,125		
Liquor Laws	3,183	$61	100%	$195,462		
Drug Abuse Violation Arrests*						
Drug Abuse Violations	2063	$2,150			100%	$4,436,286
Total				**$6,393,225**		**$12,485,437**

Source: [a] State of Wyoming, Office of Attorney General, 2010; [b] Average cost per offense from Wickizer (2007); [c] CPI adjustment from U.S. Department of Labor, 2012; [d] Bouchery et al., 2010; e Alcohol-related arrests are, by definition, all attributable to alcohol, and drug abuse violation arrests are all attributable to drugs; [f] NDIC, 2011.

7.2.2. Legal and Adjudication Costs

As with policing costs, WYSAC followed Wickizer's (2007) model for estimating legal and adjudication costs. WYSAC multiplied the number of arrests reported by the State of Wyoming, Office of Attorney General (2010) by cost estimates from the U.S. Bureau of Justice Statistics (BJS) (1996) adjusted to reflect 2010 prices. These, in turn, were multiplied by estimates of attributable fractions from Bouchery et al. (2010) and the NDIC (2011) for alcohol- and drug-related crimes. Table 7-4 shows the results.

Table 7-4. Legal and Adjudication Costs, 2010

Type of Crime	Number of Offenses[a]	Average Cost per Offense for Alcohol[b,c]	Average Cost per Offense for Drugs[d,e]	Alcohol		Drugs	
				AF[f]	Total Legal & Adjudication Costs	AF[g]	Total Legal & Adjudication Costs
(1)	(2)	(3)	(4)	(5)	(2)x(3)x(5)	(6)	(2)x(4)x(6)
Violent Crime							
Homicide	10	$1,587	$1,602	47%	$7,460	12%	$1,923
Aggravated Assault	810	$1,581	$1,580	23%	$289,403	12%	$153,557
Other Assault	5,879	$1,581	$1,580	14%	$1,282,604	12%	$1,114,523
Property Crime							
Robbery	76	$1,578	$1,580	19%	$22,432	31%	$37,236
Burglary	2,122	$1,582	$1,580	22%	$735,029	31%	$1,039,520
Larceny	10,962	$1,580	$1,580	16%	$2,788,675	31%	$5,370,723
Motor Vehicle Theft	551		$1,581	23%	$0	31%	$270,069
Alcohol-Related Arrests*							
Driving Under the Influence	5,770	$62		100%	$355,163		
Public Drunkenness	2347	$62		100%	$144,466		
Liquor Laws	3183	$61		100%	$195,462		
Drug Abuse Violation Arrests*							
Drug Abuse Violations	2063		$831.0			100%	$1,714,377
Total					**$5,820,694**		**$9,701,928**

Source: [a] State of Wyoming, Office of Attorney General, 2010; [b] Average cost per offense from U.S. BJS (1996); [c] CPI adjustment from U.S. Department of Labor, 2012; ; [d] Average cost per offense from U.S. BJS (1996); [e] CPI adjustment from U.S. Department of Labor, 2012; [f] Bouchery et al., 2010; [g] NDIC, 2011.

*State of Wyoming, Office of Attorney General (2010) reports arrests but not total offenses for these alcohol-related and drug abuse violation crime categories.

7.2.3. Corrections Costs

For this analysis, corrections costs included costs for inmates in state correctional facilities, community correction centers, county jails, and the state's secure treatment facility. In addition, corrections costs included costs for offenders under probation and parole. The FY10 total budget for these expenditures in Wyoming was $95,393,489 (WDOC, 2010).

Because people under incarceration, probation, and parole often serve different sentence terms for multiple offenses (Barkey, 2009), WYSAC could not, from incarceration data alone, determine the proportion of inmates, probationers, and parolees who were serving time for alcohol- and drug-related crimes. Instead, to estimate the proportion of corrections costs attributable to alcohol and drug abuse, WYSAC applied attributable fractions of the numbers of crimes to the average daily population of Wyoming inmates, probationers, and parolees under the assumption that corrections costs were proportional to offenses. WYSAC's approach was consistent with Bouchery et al. (2010).

Using national data sets, Bouchery et al. (2010) and the NDIC (2011) developed crime-specific attributable fractions allowing for the estimation of the number of alcohol- and drug-induced crimes committed. Because WYSAC lacked data on the crimes that inmates, probationers, and parolees were serving time for at any given time in Wyoming, WYSAC calculated a weighted average of attributable fractions to produce estimates of the fraction of all crimes that were the result of alcohol or drugs. Next, WYSAC applied both the alcohol- and drug-attributable fractions to the total number of inmates, probationers, and parolees in Wyoming in 2010 (WDOC, 2010) to obtain an estimate of the number of people serving. WYSAC multiplied this estimate by the mean annual total corrections costs to calculate corrections costs attributable to drugs and alcohol, as shown in Table 7-5.

Table 7-5. Corrections Costs, 2010

Substance	Average Daily Population of Wyoming Inmates, Probationers, and Parolees[a]	AF[b,c]	Adjusted Mean Annual Total Corrections Costs[d]	Total Corrections Costs
(1)	(2)	(3)	(4)	(2)x(3)x(4)
Alcohol	8,380	0.16	$11,383	$15,262,957
Drugs	8,380	0.28	$11,383	$26,710,174

Source: [a] WDOC, 2010; [b] Attributable fraction for alcohol from Bouchery et al., 2010; [c] Attributable fraction for drugs from NDIC, 2011; [d] WDOC, 2010.

8. Other Costs from Substance Abuse

This section presents other costs associated with substance abuse including property loss resulting from motor vehicle crashes and fire. Table 8-1 summarizes the total other costs WYSAC estimated in this study.

Table 8-1. Total Other Losses, Wyoming, 2010

Cost Category	Total Productivity Losses		
	Alcohol	Tobacco	Drugs
Motor Vehicle Crashes	$11,551,514	--	$2,986,414
Fire Losses	$5,806,057	--	--
Total, Other Losses	**$17,357,571**	**$0**	**$2,986,414**

8.1. Motor Vehicle Crashes (Excluding Medical and Productivity Costs)

WYSAC estimated the costs of motor vehicle crashes that involved alcohol, drugs, or both alcohol and drugs in Wyoming in 2010. The types of costs estimated include insurance administration costs associated with motor vehicle crashes, legal costs, travel delay, and property damage. Health care and productivity costs related to motor vehicle crashes are presented in Sections 5 and 6, respectively.

WYSAC used the economic costs and attributable fractions for substance-related motor vehicle crashes from a U.S. National Highway Traffic Safety Administration (NHTSA) report by Blincoe, Seay, Zaloshnja, Miller, Romano, Luchter, & Spicer (2002). The NHTSA report provided the unit costs by injury severity for each type of cost in 2000 dollars. The level of injury severity was classified using the Maximum Abbreviated Injury Scale (MAIS) score ranging from 0 to 5, plus

property damage only or fatality.[9] The alcohol-attributable fractions in the NHTSA report represented the proportion of alcohol-involved crashes that were caused by alcohol and not by other factors such as bad weather.

The Wyoming Department of Transportation (WYDOT) crash data provided the number of motor vehicle crashes by type of substance involved (alcohol, drugs, or both) and by crash severity. In Wyoming, the investigating officer selects the crash severity from the following choices: no injury, unknown, possible injury, non-incapacitating, incapacitating, and fatal. The officer records the crash severity for the worst injury suffered in a given crash, regardless of whether any lesser injuries occurred in the same crash (T. Carpenter, personal communication, October 3, 2012).

There are two crash-related injury severity scales – the MAIS score and the KABCO injury scale. The MIAS score measures the potential threat to life, and thus requires medical judgment. The KABCO scale is an injury designation and was developed for police officers investigating motor vehicle crashes. The KABCO scale is used in almost every state, Wyoming being one of the exceptions (Eigen & Najm, 2009). Although WYDOT does not use the MAIS score nor the KABCO scale (T. Carpenter, personal communication, October 3, 2012), Wyoming's crash severity data corresponded to the KABCO scale.

To match the unit cost data provided in the NHTSA report, which used the MAIS score, to the WYDOT crash data, which corresponded to the KABCO scale, WYSAC first converted the WYDOT crash data to the MAIS score using a KABCO-MAIS conversion table. The KABCO-MAIS conversion table was developed by Willke, Summers, Wang, Lee, Partyka, & Duffy (1999) using 1982-1986 NASS data. Appendix D Tables presents the conversion procedure.

WYSAC multiplied the number of alcohol-involved crashes in Wyoming by the alcohol-attributable fractions to estimate the number of alcohol-caused crashes. Next, WYSAC multiplied the number of alcohol-caused crashes by the unit cost after adjusting from 2000 dollars to 2010 dollars, using the CPI for all goods and services (U.S. Department of Labor, 2012). To estimate the costs of drug-related crashes and alcohol and drug combined-related crashes, WYSAC assumed that the degree of causality and their economic costs were the same as alcohol-involved crashes.

WYSAC's method may significantly underestimate the substance-related motor vehicle crash costs because the WYDOT data only reported data for one injured person per crash. The degree of the underestimation was unknown. Table 8-2 presents the results.

Alcohol-related crashes. Of 826 alcohol-involved crashes in Wyoming in 2010, WYSAC estimated that 582 crashes were caused by alcohol intoxication or impairment. The cost of these alcohol-caused crashes, excluding medical care and productivity costs, was estimated to total $10,275,141.

Drug-related crashes. Of 80 drug-involved crashes, WYSAC estimated that 57 crashes were caused by drug intoxication or impairment. The cost of these drug-caused crashes, excluding medical care and productivity costs, was estimated to total $1,710,041.

Crashes related to both alcohol and drugs. Of 175 crashes that involved both alcohol and drugs, 124 crashes were estimated to be caused by alcohol and drug intoxication or impairment. The cost of these alcohol and drug-caused crashes, excluding medical care and productivity costs, was

[9] MAIS is a classification scale for coding impact injury severity.

estimated to total $2,552,744. WYSAC divided this cost equally and added an additional $1,276,372 to the total costs of alcohol- and drug-induced crashes.

Table 8-2. Substance-Related Motor Vehicle Crash Costs (Excluding Medical Care and Productivity Costs), 2010

	Alcohol-Related Crashes[a]	Drug-Related Crashes	Crashes Related to Both Alcohol and Drugs
Number of crashes			
Number of Substance-Involved Crashes	826	80	175
Number of Substance-Caused Crashes	582	57	124
Type of cost			
Insurance Administration	$2,548,459	$417,318	$662,322
Legal Costs	$4,742,521	$924,376	$1,196,083
Travel Delay	$906,673	$126,342	$204,473
Property Damage	$2,077,488	$242,006	$489,866
Subtotal[1]	$10,275,141	$1,710,041	$2,552,744
Total	**$11,551,514**	**$2,986,414**	--

Source: [a] Blincoe et al., 2002; Willke et al., 1999; WYDOT.
Notes:
[1] The total cost of crashes associated with both alcohol and drugs is apportioned equally to the total costs of alcohol- and drug-related crashes.
Figures may not add up due rounding.

8.2. Fire Damage

A National Fire Protection Association (NFPA) report by Karter (2011) estimated that, nationwide, the U.S. had 1,331,500 fires in 2010, which included fires in structures, outside (outside storage, crops, timber, etc.), vehicles, vegetation (brush, grass, wild land with no value), and other things (rubbish with no value and all other things with some value). The total property loss of these fires was estimated to be $11,593,000,000 nationally. Based on these figures, the mean property loss was $8,707 per fire.

The U.S. Census Bureau (2012) estimated that local governments in Wyoming spent approximately $90,297,000 for fire protection services in 2010.[10]

The 2010 Wyoming Fire Report by Mead, Applegate, and Skoranski (n.d.) reported a total of 2,966 fires, including structural, outside, vehicle, vegetation and other things, in Wyoming in 2010. Using the national estimate for property loss of $8,707 per fire, WYSAC estimated that the property loss due to fire was $25,824,137 ($8,707×2,966) for Wyoming in 2010.

[10] WYSAC assumed that the Wyoming state government did not have any expenditure for fire protection services.

Another NFPA report (as cited in Bouchery et al., 2010) estimated that alcohol intoxication or impairment caused 5% of property damage losses due to fire. Following Bouchery et al., WYSAC applied the alcohol-attributable fraction of 5% to the total costs of fire property loss and fire protection services. Table 8-3 presents the results.

Table 8-3. Alcohol-Attributable Fire Losses, 2010

Type of cost	Total cost[a, b]	Alcohol-attributable fraction[c]	Alcohol-related cost
Fire property loss	$25,824,137	5.0%	$1,291,207
Fire protection services	$90,297,000	5.0%	$4,514,850
Total	$116,121,137	5.0%	$5,806,057

Source: [a] Karter, 2011; Mead, Applegate & Skoranski, (n.d.); [b] U.S. Census Bureau, 2012; [c] Bouchery et al., 2010.

9. Summary of the Costs of Substance Abuse in Wyoming

Table 9-1 presents the total estimated costs of substance abuse for Wyoming in 2010. Costs associated with past year alcohol dependence represented the highest total cost at $843,220,902. Costs associated with tobacco use were second at $689,560,639, and past-year drug abuse and/or dependence was third, at $391,365,600. Table 9-2 presents the percentages of total cost by substance and cost category. Costs associated with productivity losses made up the largest proportion of total costs for all three substance abuse/use categories, followed by health care costs.

The purpose of this COI study was to provide the WDH-PHD with estimates of the magnitude of alcohol and drug abuse and tobacco use in Wyoming. These estimates can be used to justify prevention and intervention programs and to assist in the allocation of funding for these programs. Further, these estimates can provide a basis for determining the efficacy of policies and programs that target substance abuse.

The cost estimates presented in this report should be interpreted with caution because they do not include all possible direct costs (i.e., out-of-pocket payments for hospitals and pharmaceuticals, transportation costs of the patient and family, costs for taking care of dependents). In addition, WYSAC has not included intangible costs, such as pain and suffering, in this analysis. The results of this analysis do provide a clear indication of the relative magnitude of the costs to Wyoming for the three substances studied– alcohol, tobacco and drugs.

WYSAC strongly advises against summing the total costs for alcohol, tobacco, and drugs together to present a grand total of substance abuse in Wyoming. Presenting a summation of the totals would overestimate the true cost of substance abuse because of the high probability that individuals were abusing multiple substances at the same time (i.e., comorbidity of substance abuse). In other words, an individual that abused alcohol may have also abused drugs and/or use tobacco. Summing the costs across substances would result in double-counting of expenditures for those individuals with multiple substance abuse disorders.

Table 9-1. Total Economic Costs of Substance Abuse, Wyoming, 2010

Cost Category	Alcohol	Tobacco	Drug
Health Care Costs			
Specialty Treatment	$17,977,522	$1,218,500	$10,734,367
Detoxification	$418,402	--	$167,812
Outpatient	$10,436,480	--	$5,529,549
Residential	$7,122,641	--	$5,037,006
Medical Care	$188,320,109	$238,412,663	$135,421,347
Hospital Inpatient Care	$89,718,966	$131,206,969	$64,517,078
Outpatient Medical Care	$35,259,553	$33,601,785	$25,355,212
Nursing Home Care	$12,560,655	$17,600,935	$9,032,391
Prescription drugs	$31,939,952	$35,201,870	$22,968,080
Other Health Professionals' Services	$18,840,983	$20,801,105	$13,548,586
Total Health Care Costs	**$206,297,631**	**$239,631,163**	**$146,155,714**
Productivity Losses			
Impaired Productivity	$358,004,140	$234,572,938	$68,813,575
Specialty Treatment	$27,632,546	--	$19,091,601
Hospitalization	$765,037	$913,090	$383,048
Mortality	$188,691,055	$214,443,448	$21,729,762
Crime Victim	$12,369,696	--	$277,539
Incarceration	$1,732,270	--	$68,813,575
Total Productivity Losses	**$589,194,744**	**$449,929,476**	**$189,104,591**
Crime-related Costs			
Victim	$2,712,468	--	$4,221,342
Policing	$6,393,225	--	$12,485,437
Legal & Adjudication	$6,002,306	--	$9,701,928
Corrections	$15,262,957	--	$26,710,174
Total Crime Costs	**$30,370,956**	--	**$53,118,881**
Other Costs			
Motor Vehicle Crashes	$11,551,514	--	$2,986,414
Fire Losses	$5,806,057	--	--
Total Other Costs	**$17,357,571**	--	**$2,986,414**
TOTAL	**$843,220,902**	**$689,560,639**	**$391,365,600**

Table 9-2. Percentage of Total Economic Costs by Cost Category, 2010

Cost Category	Alcohol	Tobacco	Drug
Health Care Costs	24%	35%	37%
Productivity Losses	70%	65%	48%
Crime-related Costs	4%	--	14%
Other Costs	2%	--	1%

9.1. Wyoming State Government's Share of the Costs

As requested by the WDH-PHD, WYSAC estimated Wyoming's share of the total economic costs of substance abuse and use in Wyoming. These estimates are presented in Table 9-3. WYSAC only accounted for the share of Wyoming's costs associated with policing, legal, adjudication, corrections, and Wyoming's tobacco cessation program. WYSAC limited the state's proportion of total economic costs of substance abuse to these categories because WYSAC was certain that the state paid 100% of the costs for these categories. This approach means WYSAC most certainly underestimated the cost of substance abuse to the state's budget. For instance, WYSAC has not included the cost of Medicaid or Medicare in the state's portion of the total economic costs of substance abuse because the relevant data set (i.e., hospital inpatient discharge data) did not include information on payer origin.

Table 9-3. Wyoming Government's Proportion of Total Economic Costs, 2010

Substance	Total Economic Cost	Wyoming	
		Cost	Percentage
Alcohol	$843,220,902	$27,658,488	3.3%
Tobacco	$689,560,639	$1,218,500	0.2%
Drugs	$391,365,600	$48,897,539	12.5%

9.2. Limitations of the Study and Data Gaps Analysis

Primarily, the limits of the study resulted from the lack of Wyoming-specific data. In many estimates of the economic costs of substance abuse, WYSAC relied on national studies for the necessary data. For instance, the estimates of impaired productivity while on the job or property losses because of violent crime were based on national, not Wyoming, data. In other instances, WYSAC uncovered data gaps such as having no estimates of the prevalence of a particular disease or estimates of the number inmates serving time for a particular crime.

9.2.1. Health Care

Similar to other COI studies, WYSAC's estimates of medical care costs were based on applying proportions based on national estimates to inpatient hospital care costs to obtain costs estimates for Wyoming on outpatient medical care, nursing home care, prescription drugs, and other health professionals' services. Because these proportions were based on national estimates, they could introduce bias should the costs in the Wyoming health care system differ from the national picture.

Some previous studies (for example, Harwood et al., 1998) found that individuals with co-occurring alcohol or drug disorders experience longer lengths of hospital stays for the treatment of an illness than those individuals with the same illness but no substance abuse comorbidity. WYSAC did not calculate separate estimates of the potential costs of the extended length of hospital stays due to substance-related complications or comorbidity. The estimation of hospital inpatient costs was based upon data from the WHA. The hospital discharge records tracked costs by incidence and not diagnosis. Therefore, WYSAC was unable to estimate the costs of substance-related complications/comorbidity.

Further, WYSAC did not estimate crime victims' treatment costs separately from the other health care costs. These potential costs may be represented in the overall health care costs in some unknown magnitude across the different substances.

The following costs typically included in previous COI studies to determine the total economic costs of substance abuse were not included in WYSAC's cost estimates for Wyoming because WYSAC did not have access to the data or the available data were limited:

- Federal and specialized hospitals (for example, the state's Veteran Affairs Medical Hospitals)
- Prevention and research
- Health insurance administration
- Training

9.2.2. Productivity

The estimates of impaired productivity losses associated with substance abuse or use relied on estimates of reduced productivity from national studies (i.e., Boucher et al., 2010; Bunn et al., 2006,

NDIC, 2011). In addition, because Wyoming-specific estimates for past year alcohol dependence and drug abuse or dependence were not gender specific and covered only three broad age categories, WYSAC used U.S. estimates of alcohol and drug prevalence, which were available by gender and narrower age categories. Using national studies for estimates of reduced productivity and prevalence rates by gender and age category may be biased if patterns of substance abuse or use and the associated negative outcomes in Wyoming differ from the national pattern.

Crime-related productivity loss estimates, comprised of the average number of work days lost for victims of crime and the attributable fractions for alcohol- and drug-induced crimes, came from studies using national data sets. Lacking Wyoming-specific data for these data inputs represents a data gap.

9.2.3. Crime

While Wyoming-specific data for property crimes exists, there were no Wyoming-specific data for property losses incurred by victims of violent crime. Further, there was a lack of Wyoming-specific estimates for the fraction of violent crimes or property crimes attributable to alcohol or drugs, and policing and legal and adjudication costs per offense. Therefore, WYSAC relied on estimates derived from national studies to estimate the costs associated with substance abuse. To the extent that crime-related costs in Wyoming differ substantially from national averages, WYSAC could not capture the impact of those differences on the costs of crime in Wyoming.

9.2.4. Other Costs

In the review of the methodologies used in COI studies, WYSAC found that COI studies typically included treatment costs and productivity losses associated with a group of illnesses – FAS, HIV, hepatitis, and tuberculosis – in the economic costs of substance abuse and their associated negative outcomes. However, for this study WYSAC was unable to estimate specific illness-related costs because of the lack of necessary data to estimate the prevalence of these illnesses in Wyoming in 2010. Below WYSAC discusses what is known about each of these illnesses and their relationship to substance abuse and the limited data available for Wyoming.

Fetal Alcohol Syndrome

Maternal alcohol consumption during pregnancy can cause FAS, a permanent birth defect that is characterized by growth, mental and physical disabilities that may occur in a baby (Astley, 2004). According to Wyoming Vital Records (as cited in Sherard, n.d.), the FAS rate as reported on birth certificates was 0.2 cases per 1,000 births from 2001 to 2003. For 2010, the hospital discharge data contained no information for FAS as a primary diagnosis. Although the FAS prevalence in Wyoming was relatively low, compared to the national rate of 0.8 per 1,000 births, maternal alcohol consumption may be underreported on birth certificates. In addition, the PRAMS showed that for Wyoming in 2010, 1% of mothers engaged in binge drinking (defined by PRAMS as having more than four drinks in one occasion) and 5% consumed alcohol during the last three months of their pregnancy (WYSAC, 2012). Despite the low FAS prevalence, FAS is a lifelong disability, and represents a reduction in economic productivity in Wyoming. Nonetheless, because of the limited availability of data on adult FAS and its relatively low FAS prevalence in newborns, WYSAC did not estimate the potential health care and productivity costs of FAS in this analysis.

HIV

Previous COI studies (for example, NDIC, 2011; ONDCP, 2004; Wickizer, 2007) estimated the national or state costs of HIV and/or AIDS attributable to injection drug use. HIV can be

transmitted through contact with the virus via sexual contact and blood. Intravenous drug users who share needles are among those who are at highest risk of HIV infection and the development of AIDS, which is the final stage of HIV disease. In Wyoming, 197 people were known to be living with a diagnosis of HIV and/or AIDS as of December 31, 2010 although the actual number of HIV/AIDS cases may be higher than what was reported due to underreporting by individuals who do not have or recognize symptoms and therefore do not seek testing (WDH, 2012). Of 84 newly-diagnosed cases of HIV/AIDS in Wyoming between 2006 and 2010, injection drug use (IDU) only accounted for 14% and men who have sex with men and engage in IDU accounted for 10%.[11] WYSAC did not estimate these costs for Wyoming in 2010 because no discharge data indicated a primary diagnosis of HIV and the available data did not allow WYSAC to estimate other costs of HIV (for example, costs of living with HIV disease and lost productivity).

Hepatitis B and C

HBV and HCV are known to be transmitted through sharing needles with injection drug users who are infected with HBV and HCV. The costs of acute viral hepatitis B and C attributable to injection drug use were estimated in other national and state COI studies (for example, ONDCP, 2004; Wickizer, 2007). However, WYSAC reported no costs related to these conditions because no discharge with the primary diagnosis of viral hepatitis B or C was recorded and the available data also did not allow WYSAC to estimate other costs of hepatitis B or C. Instead, WYSAC reported published statistics for hepatitis B and C to provide a glance of the potential burden of the diseases in Wyoming.

Wyoming had three confirmed cases of acute hepatitis B in 2010 (WDH, 2012). The CDC (2012) estimated that 15.8% of the reported cases of acute hepatitis B were associated with the use of IDU in the United States in 2010. No data were available for reporting acute hepatitis C (WDH, 2012). The CDC estimated that nationally 53% of the reported cases of acute hepatitis C were associated with the use of IDU in 2010.

In addition, alcohol is an accepted risk factor for hepatitis C. However, no costs related to hepatitis C are attributed to alcohol because there is no attributable fraction for this condition in ARDI – CDC's Alcohol-Related Disease Impact application – due to the lack of suitable risk estimates to calculate the alcohol-attributable fraction (CDC, 2008).

Tuberculosis

Although alcohol is believed to be a risk factor for contracting tuberculosis, WYSAC did not include cost estimates for this disease because ARDI does not include an alcohol-attributable fraction for tuberculosis (CDC, 2008). For drug-attributable tuberculosis, WYSAC included no costs because Wyoming hospital discharge data reported no cases in 2010 and the available data did not allow WYSAC to estimate other drug-related tuberculosis costs.

Between 2006 and 2010, Wyoming had 20 confirmed cases of reported active tuberculosis (WDH, 2012). Of these cases, 7 cases were reported in 2010.

[11] A new HIV diagnosis may not represent a new infection.

10. References

2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas, 75 Fed. Reg. 37,251 (announced June 28, 2010).

Arias, E. (2011). United States Life Tables, 2007. *National Vital Statistics Reports,* 59(9), 1-60.

Astley, S.J. (2004). Fetal alcohol syndrome prevention in Washington State: Evidence of success. *Pediatric and Perinatal Epidemiology*, 18, 344-351.

Barkey, P. M. (2009). *The economic cost of alcohol abuse in Montana*. Missoula, MT: University of Montana.

Behavioral Risk Factor Surveillance System : 2010 [Data File]. Laramie, WY: Wyoming Survey & Analysis Center, University of Wyoming.

Blincoe, L.J., Seay, A.G., Zaloshnja, E., Miller, T.R., Romano, E.O., Luchter, S., & Spicer, R.S. (2002). The economic impact of motor vehicle crashes, 2000. Washington, D.C.: National Highway Traffic Safety Administration. Retrieved July 30, 2012 from http://www.nhtsa.gov/DOT/NHTSA/Communication%20&%20Consumer%20Information/Articles/Associated%20Files/EconomicImpact2000.pdf

Boffetta, P., & Straif, K. (2009). Use of smokeless tobacco and risk of myocardial infarction and stroke: systematic review with meta-analysis. *BMJ*, 339, b3060. doi:10.1136/bmj.b3060

Boffetta, P., Hecht, S., Gray, N., Gupta, P., & Straif, K. (2008). Smokeless tobacco and cancer. *Lancet Oncology*, 9, 667-675.

Bouchery, E., Simon, C., & Harwood, H. (2010). *Economic costs of excessive alcohol consumption in the united states, 2006: Final report*. Retrieved October 9, 2012 from http://www.lewin.com/~/media/Lewin/Site_Sections/Publications/Economic%20Cost%20of%20Excessive%20Alcohol%20Consumption.pdf

Bunn, W. B., Stave, G. M., Downs, K. E., Alvir, J. & Dirani, R. (2006). Effect of smoking status on productivity loss. *Journal of Occupational & Environmental Medicine*, 48, 1099- 1108.

Centers for Disease Control and Prevention (CDC). (2012). *Viral hepatitis surveillance—United States, 2010*. Retrieved October 31, 2012 from http://www.cdc.gov/hepatitis/Statistics/2010Surveillance/PDFs/2010HepSurveillanceRpt.pdf

Centers for Disease Control and Prevention (CDC). (2011). Vital signs: overdoses of prescription opioid pain relievers --- United States, 1999--2008. *Morbidity and Mortality Weekly Report (MMWR)*, 60(43), 1487-1492.

Centers for Disease Control and Prevention (CDC). (2008). Alcohol Related Disease Impact (ARDI) application, 2008. Retrieved June 21, 2012, from http://apps.nccd.cdc.gov/DACH_ARDI/Default.aspx

Centers for Disease Control and Prevention (CDC). (2007). Smoking-attributable mortality, morbidity, and economic costs (SAMMEC): Adult SAMMEC and maternal and child health (MCH) SAMMEC software, 2007. Retrieved June 21, 2012 from http://apps.nccd.cdc.gov/sammec/

Centers for Disease Control and Prevention (CDC). (2004). The health consequences of smoking: a report of the surgeon general. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Retrieved June 21, 2012 from http://www.cdc.gov/tobacco/data_statistics/sgr/2004/index.htm

Eigen, A. M. & Najm, W. G. (2009). Problem definition for pre-crash sensing advanced restraints. Washington D.C.: National Highway Traffic Safety Administration. Retrieved October 17, 2012 from http://www.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/Crashworthiness/811114.pdf

Expectancy Data. (2011). *The Dollar Value of a Day: 2010 Dollar Valuation*. Shawnee Mission, Kansas: Expectancy Data.

Harwood, H., Fountain, D., & Livermore, G. (1998). *The economic costs of alcohol and drug abuse in the United States 1992* (NIH Publication Number 98-4327). Prepared for National Institute on Drug Abuse (NIDA) & National Institute on Alcohol Abuse and Alcoholism (NIAAA). Washington, DC: U.S. Government Printing Office. Retrieved May 2, 2012 from http://archives.drugabuse.gov/EconomicCosts/Index.html

Harwood, H. J., Kallinis, S., & Liu, C. (2001). The cost and components of substance abuse treatment. Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved October 2, 2012 from http://www.lewin.com/~/media/lewin/site_sections/publications/1562.pdf

Hodgson, T. A. & Meiners, M. R. (1982). Cost of Illness Methodology: A Guide to Current Practices and Procedures. *Milbank Memorial Fund Quarterly*, 60(3): 429-462.

Karter, M.J. (2011). *Fire loss in the United States during 2010*. Quincy, MA: National Fire Protection Association. Retrieved July 30, 2012 from http://www.nfpa.org/assets/files//PDF/OS.fireloss2010.pdf

Max, W., Rice, D. P., Sung, H., & Michel, M. (2004). Valuing human life: estimating the present value of lifetime earnings, 2000.

Max, W., Wittman, F., Stark, B., & West A. (2004). *The cost of alcohol abuse in California: A briefing paper*. Berkeley, CA: Institute for the Study of Social Change. Retrieved August 31, 2012 from http://socrates.berkeley.edu/~pbd/pdfs/AlcoholCostStudy.pdf

Mead, M.H., Applegate, L., & Skoranski, S. (n.d.). 2010 Wyoming fire report. Cheyenne, WY: The Wyoming Department of Fire Prevention & Electrical Safety. Retrieved October 17, 2012 from http://wyofire.state.wy.us/pdf/WFIRSreport.pdf

Medicare Program; Changes to the Hospital Inpatient Prospective Payment Systems for Acute Care Hospitals and Fiscal Year 2010 Rates; and Changes to the Long-Term Care Hospital Prospective Payment System and Rate Years 2010 and 2009 Rates, 74 Fed. Reg. 44,159 (2009).

National Drug Intelligence Center (NDIC). (2011). The economic impact of illicit drug use on American society. Washington D.C.: United Sates Department of Justice. Retrieved October 2, 2012 from http://www.justice.gov/archive/ndic/pubs44/44731/44731p.pdf

Office of Management and Budget (ONB). (2009). *Update of statistical area definitions and guidance on their uses* (OMB Bulletin No. 10-02). Retrieved July 30, 2012 from http://www.whitehouse.gov/sites/default/files/omb/assets/bulletins/b10-02.pdf

Office of National Drug Control Policy (ONDCP). (2004). *The economic costs of drug abuse in the United States, 1992-2002* (Publication No. 207303). Washington, DC: Executive Office of the President. Retrieved April 11, 2012 from https://www.ncjrs.gov/ondcppubs/publications/pdf/economic_costs.pdf

Rice, D. P. (2000). Cost of illness studies: what is good about them? *Injury Prevention*, 6: 177-179.

Rice, D. P., Kelman, S., Miller, L. S., & Dunmeyer, S. (1990). The economic costs of alcohol and drug abuse and mental illness: 1985. No.:(ADM) 90-1694, 307.

Segel, J. E. (2006). Cost-of-Illness Studies – A Primer. TRI-UNC Center of Excellence in Health Promotion Economics Working Paper. Research Triangle, NC: TRI International.

Sherard, B. (n.d.). *Comprehensive assessment of maternal and child health needs, 2006-2010*. Cheyenne, WY: Community and Family Health Division, Wyoming Department of Health. Retrieved October 5, 2012 from http://www.health.wyo.gov/familyhealth/mch/index.html

State of Wyoming, Office of Attorney General (2010). Crime in Wyoming Annual Report: Crime in Wyoming January through December 2010. Retrieved August 31, 2012 from http://attorneygeneral.state.wy.us/dci/pdf/2010_Annual_Report.pdf

Substance Abuse and Mental Health Services Administration (SAMHSA). (2012a). Treatment Episode Data Set -- Admissions (TEDS-A) -- Concatenated, 1992 to 2010 (ICPSR25221-v5) [Data file and codebook]. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. Retrieved July 30, 2012 from http://www.icpsr.umich.edu/icpsrweb/SAMHDA/studies/25221?utm_source=webann&utm_medium=web&utm_campaign=2010TEDS-A_concat. doi:10.3886/ICPSR25221.v5

Substance Abuse and Mental Health Services Administration (SAMHSA). (2012b). *Treatment Episode Data Set (TEDS): 2000-2010: National admissions to substance abuse treatment services* (DASIS Series S-61, HHS Publication No. (SMA) 12-4671). Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved July 30, 2012 from http://www.samhsa.gov/data/2k12/TEDS2010N/TEDS2010NWeb.pdf

Substance Abuse and Mental Health Services Administration (SAMHSA). (2012c). Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2009 and 2010 (Revised March 2012).

Substance Abuse and Mental Health Services Administration (SAMHSA). (2011). *National Survey of Substance Abuse Treatment Services (N-SSATS): 2010: Data on substance abuse treatment facilities* (DASIS Series S-59, HHS Publication No. (SMA) 11-4665). Rockville, MD: Substance Abuse and Mental Health Services Administration. Retrieved July 31, 2012 from http://www.samhsa.gov/data/DASIS/2k10nssats/NSSATS2010Web.pdf

Substance Abuse and Mental Health Services Administration (SAMHSA). (2003). The ADSS cost study: Costs of substance abuse treatment in the specialty sector (DHHS Publication No. SMA 03-3762, Analytic Series A-20). Rockville, MD: Author. Retrieved October 2, 2012 from http://www.oas.samhsa.gov/adss/ADSSCostStudy.pdf

Synectics for Management Decisions. (2010). *Treatment Episode Data Set (TEDS) state instruction manual: Admission data with National Outcomes Measures (NOMS)*. Rockville, MD: Office of Applied Studies, Substance Abuse and Mental Health Services Administration (SAMHSA). Retrieved July 31, 2012 from http://wwwdasis.samhsa.gov/dasis2/manuals/teds_adm_manual.pdf

U.S. Bureau of Justice Statistics (1996). Justice Expenditures and Employment Extracts, 1996, U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics.

U.S. Census Bureau. (2012). Table 1. State and local government finances by level of government and by state: 2009-10-con. Retrieved October 3, 2012 from http://www2.census.gov/govs/estimate/10slsstab1b.xls

U.S. Census Bureau. (2011). Table 2. Intercensal estimates of the resident population by sex and age for Wyoming: April 1, 2000 to July 1, 2010 (ST-EST00INT-02-56). Retrieved August 1, 2012 from http://www.census.gov/popest/data/intercensal/state/ST-EST00INT-02.html

U.S. Department of Justice. (2012). Prisoners in 2010 (Bulletin NCJ 236096). Washington, DC: Bureau of Justice Statistics. Retrieved October 5, 2012 from http://bjs.ojp.usdoj.gov/content/pub/pdf/p10.pdf

U.S. Department of Labor. (2012). Consumer price index—all urban consumers, U.S. city average: All items, not seasonally adjusted, annual & monthly (CUUR0000SA0,CUUS0000SA0). Retrieved October 23 2012, from ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt

U.S. Department of Labor. (2011). Employment status of the civilian noninstitutional population by sex, race, Hispanic or Latino ethnicity, marital status, and detailed age, 2010 annual average. Retrieved August 5, 2013, from http://www.bls.gov/lau/table14full10.pdf

U.S. Department of Labor. (2011). Employer Costs for Employee Compensation – December 2010. Bureau of Labor Statistics. Retrieved September 25, 2012 from http://www.bls.gov/schedule/archives/ecec_nr.htm#2010

U.S. Department of Labor. (n.d.). Consumer price index—all urban consumers, U.S. city average: Medical care items, not seasonally adjusted, annual & monthly (CUUR0000SAM, CUUS0000SAM). Retrieved October 26 2012, from http://data.bls.gov/pdq/querytool.jsp?survey=cu

Wickizer, T.M. (2007). *The economic costs of drug and alcohol abuse in Washington State, 2005*. Olympia, WA: Division of Alcohol and Substance Abuse, Department of Social and Health Services. Retrieved June 12, 2012 from http://www.dshs.wa.gov/pdf/dbhr/EconCosts2005_0607.pdf

Willke, D., Summers, S., Wang, J., Lee, J., Partyka, S, & Duffy, S. (1999). Ejection mitigation using advanced glazing: Status report II. Transportation Research Center. Washington, DC: National Highway Traffic Safety Administration. Retrieved October 17, 2012 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.124.6531&rep=rep1&type=pdf

World Health Organization (WHO). (2012). Metrics: Population attributable fraction (PAF): Quantifying the contribution of risk factors to the burden of disease. Retrieved October 2, 2012 from http://www.who.int/healthinfo/global_burden_disease/metrics_paf/en/index.html

Wyoming Department of Corrections (2010). Wyoming Department of Corrections Annual Report, FY2010. Retrieved September 20, 2012 from http://corrections.wy.gov/Media.aspx?mediaId=287

Wyoming Department of Health. (2012). *2011 comprehensive HIV/STD/TB/viral hepatitis epidemiologic profile*. Cheyenne, WY: Author. Retrieved October 30, 2012 from http://www.health.wyo.gov/phsd/std/graphs.html

WYSAC. (2012). *Wyoming State Epidemiological Outcomes Workgroup: 2012 State Epidemiological Profile*, by E. L. Canen, C. M. Cooper, D. M. Shields, & R. A. Wambeam. (WYSAC Technical Report No. DER-1210). Laramie, WY: Wyoming Survey & Analysis Center, University of Wyoming.

WYSAC. (2011). *The Cost of Substance Abuse & Mental Health in Wyoming: Methodology Review*, by H. Costello, N.M. Nelson, and K.S. Freedman. (WYSAC Technical Report No. CHES-1118). Laramie, WY: Wyoming Survey & Analysis Center, University of Wyoming.

11. Appendices

Appendix A. Health Conditions and Attributable Fractions

Table A-1. Alcohol-Related Health Conditions and Alcohol-Attributable Fractions

Diagnosis	ICD-9	ICD-10	Age	Alcohol-attributable fraction	
				Male	Female
Chronic conditions					
Alcoholic psychosis	291	F10.3-F10.9	≥20	1.000	1.000
Alcohol abuse	305.0, 303.0	F10.0, F10.1	≥20	1.000	1.000
Alcohol dependence syndrome	303.9	F10.2	≥20	1.000	1.000
Alcohol polyneuropathy	357.5	G62.1	≥20	1.000	1.000
Degeneration of nervous system due to alcohol	*	G31.2	≥20	1.000	1.000
Alcoholic myopathy	*	G72.1	≥20	1.000	1.000
Alcohol cardiomyopathy	425.5	I42.6	≥20	1.000	1.000
Alcoholic gastritis	535.3	K29.2	≥20	1.000	1.000
Alcoholic liver disease	571.0-571.3	K70-K70.4, K70.9	≥20	1.000	1.000
FAS	655.4, 760.71	Q86.0	>0	1.000	1.000
Fetus and newborn affected by maternal use of alcohol	*	P04.3, O35.4	>0	1.000	1.000
Alcohol-induced chronic pancreatitis	*	K86.0	≥20	1.000	1.000
Acute pancreatitis	577.0	K85	≥20	0.240	0.240
Chronic pancreatitis	577.1	K86.1	≥20	0.840	0.840
Epilepsy	345	G40, G41	≥20	0.150	0.150
Esophageal varices	456.0-456.2	I85, I98.20, I98.21	≥20	0.400	0.400
Gastroesophageal hemorrhage	530.7	K22.6	≥20	0.470	0.470
Liver cirrhosis, unspecified	571.5-571.9	K74.3-K74.6, K76.0, K76.9	≥20	0.400	0.400
Portal hypertension	572.3	K76.6	≥20	0.400	0.400
Spontaneous abortion	634	O03	≥20	0.000	0.040
Breast cancer, females	174	C50	≥20	0.000	0.010
Cholelithiases	574	K80	≥20	-0.020	-0.010
Chronic hepatitis	571.4	K73	≥20	0.020	0.020
Esophageal cancer	150	C15	≥20	0.050	0.020
Hypertension	401-405	I10-I15	≥20	0.040	0.020
Ischemic heart disease	410-414	I20-I25	≥20	0.000	0.000
Laryngeal cancer	161	C32	≥20	0.080	0.040
Liver cancer	155	C22	≥20	0.070	0.040
Low birth weight, prematurity, intrauterine growth retardation or death	656.5, 764, 765	O36.5, O36.4, P05, P07	>0	0.040	0.030

Table A-1 (con't). Alcohol-attributable fractions

Diagnosis	ICD-9	ICD-10	Age	Alcohol-attributable fraction	
				Male	Female
Oropharyngeal cancer	141, 143-146, 148, 149	C01-C06, C09-C10, C12-C14	≥20	0.080	0.030
Psoriasis	696.1	L40.0-L40.4, L40.8, L40.9	≥20	0.010	0.000
Superventricular cardiac dysrhythmia	427.0, 427.2, 427.3	I47.1, I47.9, I48	≥20	0.020	0.010
Stroke, ischemic	433-435, 437, 362.34	G45, I63, I65-I67, I69.3	≥20	0.070	0.010
Stroke, hemorrhagic	430-432	I60-I62, I69.0-I69.2	≥20	0.100	0.020
Prostate cancer	185	C61	≥20	0.010	0.000
Acute conditions					
Alcohol poisoning	980.0, 980.1, E860.0, E860.1, E860.2, E860.9	X45, Y15, T51.0, T51.1, T51.9	≥15	1.000	1.000
Suicide by and exposure to alcohol	*	X65	≥15	1.000	1.000
Excessive blood level of alcohol	790.3	R78.0	≥15	1.000	1.000
Air-space transport	E840-E845	V95-V97	≥15	0.180	0.180
Aspiration	E911	W78-W79	≥15	0.180	0.180
Child maltreatment	E960-E968	T74.02, T74.12, T74.22, T74.32, T74.4, T74.92	≤14	0.160	0.160
Drowning injuries	E910	W65-W74	≥15	0.340	0.340
Fall injuries	E880-E888, E848	W00-W19	≥15	0.320	0.320
Fire injuries	E890-E899	X00-X09	≥15	0.420	0.420
Firearms	E922	W32-W34	≥15	0.180	0.180
Homicide	E960-E969	X85-Y09, Y87.1	≥15	0.470	0.470
Hypothermia	E901	X31	≥15	0.420	0.420
Motor-vehicle non-traffic crashes	E820-E825	V02.0, V03.0, V04.0, V09.0, V12-V14(.0-.2), V19.0-V19.3, V20-V28(.0-.2), V29.0-V29.3, V30-V39(.0-.3),V40-V49(.0-.3), V50-V59(.0-.3), V60-V69(.0-.3), V70-V79(.0-.3), V81.0, V82.0, V83-V86(.4-.9), V88.0-V88.8, V89.0	≥15	0.180	0.180

Table A-1 (con't). Alcohol-attributable fractions

Diagnosis	ICD-9	ICD-10	Age	Alcohol-attributable fraction	
				Male	Female
Motor-vehicle traffic crashes	E810-E819	V02(.1, .9), V03(.1, .9), V04(.1, .9), V09.2, V12-V14(.3-.9), V19.4-V19.6, V20-V28(.3-.9), V29.4-V29.9, V30-V39(.4-.9), V40-V49(.4-.9), V50-V59(.4-.9), V60-V69(.4-.9), V70-V79(.4-.9), V80.3-V80.5, V81.1, V82.1, V83-V86(.0-.3), V87.0-V87.8, V89.2	0-14	0.160	0.150
Motor-vehicle traffic crashes			15-19	0.270	0.190
Motor-vehicle traffic crashes			20-24	0.470	0.330
Motor-vehicle traffic crashes			25-34	0.490	0.330
Motor-vehicle traffic crashes			35-44	0.470	0.350
Motor-vehicle traffic crashes			45-54	0.400	0.250
Motor-vehicle traffic crashes			55-64	0.280	0.150
Motor-vehicle traffic crashes			65+	0.130	0.080
Occupational and machine injuries	E917-E920	W24-W31, W45	≥15	0.180	0.180
Other road vehicle crashes	E800-E807, E826-E829	V01, V05-V06, V09.1, V09.3, V09.9, V10-V11, V15-V18, V19.3, V19.8-V19.9, V80.0-V80.2, V80.6-V80.9, V81.2-V81.9, V82.2-V82.9, V87.9, V88.9, V89.1, V89.3, V89.9	≥15	0.180	0.180
Poisoning (not alcohol)	E850-E869, E924.1	X40-X49 (except X45)	≥15	0.290	0.290
Suicide	E950-E959	X60-X84, (except X65) Y87.0	≥15	0.230	0.230
Water transport	E830-E838	V90-V94	≥15	0.180	0.180

Source: CDC, 2008.

*No ICD-9 code is available and the condition is new to ICD-10.

Table A-2. Tobacco-attributable Fractions

Diagnosis	ICD-9	ICD-10	Age	Smoking-attributable fraction		Smokeless tobacco-attributable fraction
				Male	Female	Male [1]
Smoking						
Neoplasms (cancer)						
Lip, oral cavity, pharynx	140–149	C00–C14	35–64	0.7300	0.5500	NA
Lip, oral cavity, pharynx	140–149	C00–C14	65+	0.7200	0.4200	NA
Esophagus	150	C15	35–64	0.6800	0.6600	NA
Esophagus	150	C15	65+	0.7300	0.5200	NA
Stomach	151	C16	35–64	0.2500	0.1300	NA
Stomach	151	C16	65+	0.2800	0.1100	NA
Pancreas	157	C25	35–64	0.2300	0.2900	NA
Pancreas	157	C25	65+	0.1900	0.2100	NA
Larynx	161	C32	35–64	0.8100	0.7900	NA
Larynx	161	C32	65+	0.8300	0.6900	NA
Trachea, bronchus, lung	162	C33–C34	35–64	0.8700	0.7800	NA
Trachea, bronchus, lung	162	C33–C34	65+	0.8800	0.6700	NA
Cervix uteri	180	C53	35–64	0.0000	0.1400	NA
Cervix uteri	180	C53	65+	0.0000	0.0800	NA
Kidney, other urinary	189	C64–C66, C68	35–64	0.3600	0.0700	NA
Kidney, other urinary	189	C64–C66, C68	65+	0.3900	0.0400	NA
Urinary bladder	188	C67	35–64	0.4300	0.3200	NA
Urinary bladder	188	C67	65+	0.4800	0.2600	NA
Acute myeloid leukemia	204–208	C91–C95	35–64	0.2100	0.1000	NA
Acute myeloid leukemia	204–208	C91–C95	65+	0.2300	0.1100	NA
Cardiovascular diseases						
Rheumatic heart disease (other heart disease)	390–398	I00–I09	35–64	0.1800	0.1300	NA
Rheumatic heart disease (other heart disease)	390–398	I00–I09	65+	0.1800	0.0800	NA
Ischemic heart disease	410–414	I20–I25	35–64	0.3500	0.3500	NA
Ischemic heart disease	410–414	I20–I25	65+	0.1500	0.1000	NA
Pulmonary heart disease (other heart disease)	415–417	I26–I28	35–64	0.1800	0.1300	NA
Pulmonary heart disease (other heart disease)	415–417	I26–I28	65+	0.1800	0.0800	NA
Other heart disease (other heat disease)	420–429	I29–I51	35–64	0.1800	0.1300	NA
Other heart disease (other heat disease)	420–429	I29–I51	65+	0.1800	0.0800	NA
Cerebrovascular Disease	430–438	I60–I69	35–64	0.3200	0.4300	NA
Cerebrovascular Disease	430–438	I60–I69	65+	0.0900	0.0500	NA
Atherosclerosis	440	I70	35–64	0.2800	0.1600	NA

Table A-2 (con't). Tobacco-attributable fractions

Diagnosis	ICD-9	ICD-10	Age	Smoking-attributable fraction		Smokeless tobacco-attributable fraction
				Male	Female	Male [1]
Atherosclerosis	440	I70	65+	0.2600	0.0700	NA
Aortic Aneurysm	441	I71	35–64	0.6200	0.6200	NA
Aortic Aneurysm	441	I71	65+	0.6500	0.4500	NA
Other Arterial Disease	442–448	I72–I78	35–64	0.1800	0.2300	NA
Other Arterial Disease	442–448	I72–I78	65+	0.1100	0.1200	NA
Respiratory diseases						
Pneumonia, influenza	480–487	J10–J18	35–64	0.2000	0.2200	NA
Pneumonia, influenza	480–487	J10–J18	65+	0.2300	0.1100	NA
Bronchitis, emphysema	490–492	J40–J43	35–64	0.8800	0.8300	NA
Bronchitis, emphysema	490–492	J40–J43	65+	0.9100	0.8000	NA
Chronic airways obstruction	496	J44	35–64	0.7800	0.8000	NA
Chronic airways obstruction	496	J44	65+	0.8200	0.7300	NA
Perinatal conditions						
Short gestation/low birth weight	765	P07	Newborn	0.1399	0.1399	NA
Respiratory distress syndrome	769	P22	Newborn	0.0555	0.0555	NA
Other respiratory conditions in newborns	770	P23–P28	Newborn	0.0744	0.0744	NA
Sudden infant death syndrome	798.0	R95	Newborn	0.2018	0.2018	NA
Smokeless tobacco use						
Neoplasms (cancer)						
Lip, oral cavity, pharynx	140–149	C00–C14	All	NA	NA	0.0660
Cardiovascular diseases						
Acute myocardial infarction	410	I21-I22	All	NA	NA	0.0050
Cerebrovascular disease	430–438	I60–I69	All	NA	NA	0.0170

Source: Boffetta, Hecht, Gray, Gupta, & Straif, 2008; Boffetta and Straif, 2009; CDC, 2004; CDC, 2007.

[1] Smokeless tobacco-attributable fractions were found only for males.

Table A-3. Drug-attributable Fractions (ICD-9)

Diagnoses	ICD-9	Age	Drug-attributable fraction
Illicit drug-related diagnosis			
Cocaine dependence	304.2	All	1.000
Cannabis dependence	304.3	All	1.000
Hallucinogen dependence	304.5	All	1.000
Nondependent cannabis abuse	305.2	All	1.000
Nondependent hallucinogen abuse	305.3	All	1.000
Nondependent cocaine abuse	305.6	All	1.000
Poisoning by heroin	965.01	All	1.000
Poisoning by psychodysleptics (hallucinogens)	969.6	All	1.000
Poisoning by cocaine	970.81	All	1.000
Opiates and related narcotics (accidental poisoning by heroin)	E850.0	All	1.000
Accidental poisoning by psychodysleptics [hallucinogens]	E854.1	All	1.000
Heroin, methadone, other opiates and related narcotics, and other drugs causing adverse effects in therapeutic use.	E935.0-E935.2, E937-940	All	1.000
Prescription drug-related diagnosis			
Sedative, hypnotic or anxiolytic dependence	304.1	All	1.000
Nondependent sedative, hypnotic or anxiolytic abuse	305.4	All	1.000
Nondependent antidepressant type abuse	305.8	All	1.000
Poisoning by antibiotics	960	All	1.000
Poisoning by other anti-infectives	961	All	1.000
Poisoning by hormones and synthetic substitutes	962	All	1.000
Poisoning by primarily systemic agents	963	All	1.000
Poisoning by agents primarily affecting blood constituents	964	All	1.000
Poisoning by analgesics, antipyretics, and antirheumatics (Except 965.01 - heroin)	965 (Except 965.01 - heroin)	All	1.000
Poisoning by anticonvulsants and anti-Parkinsonism drugs	966	All	1.000
Poisoning by sedatives and hypnotics	967	All	1.000
Poisoning by other central nervous system depressants and anesthetics	968	All	1.000

Table A-3 (con't). Drug-attributable Fractions (ICD-9)

Diagnoses	ICD-9	Age	Drug-attributable fraction
Poisoning by psychotropic agents (Except for 969.6 - hallucinogens (for example, LSD)	969 (Except for 969.6 - hallucinogens (for example, LSD))	All	1.000
Aromatic analgesics, not elsewhere classified	E850.2	All	1.000
Other non-narcotic analgesics	E850.7	All	1.000
Unspecified analgesics and antipyretics	E850.9	All	1.000
Barbiturates	E851	All	1.000
Tranquilizers	E853	All	1.000
Other psychotropic agents (i.e., antidepressants) (Except E854.1 - Hallucinogens)	E854 (Except E854.1 - Hallucinogens)	All	1.000
Agricultural and horticultural chemical pharmaceutical preparations other than plan foods and fertilizers	E863	All	1.000
Salicylates	E850.1	All	1.000
Pyrazole derivatives	E850.3	All	1.000
Antirheumatics	E850.4	All	1.000
Other non-narcotic analygesics	E850.5	All	1.000
Accidental poisoning by antibiotics	E856	All	1.000
Accidental poisoning by other anti-infectives	E857	All	1.000
Agents primarily affecting blood constituents	E858.2	All	1.000
Agents primarily affecting cardiovascular system	E858.3	All	1.000
Agents primarily affecting gastrointestinal system	E858.4	All	1.000
Water mineral and uric acid metabolism drugs	E858.5	All	1.000
Agents primarily acting on the smooth and skeletal muscles and respiratory system	E858.6	All	1.000
Agents primarily affecting skin and mucous membrane, opthalmological, otorhinolaryngological, dental drugs	E858.7	All	1.000
Analgesics, antipyretics, and antirheumatics	E980.0	All	1.000
Barbiturates	E980.1	All	1.000
Other sedatives and hypnotic	E980.2	All	1.000

Table A-3 (con't). Drug-attributable Fractions (ICD-9)

Diagnoses	ICD-9	Age	Drug-attributable fraction
Tranquilizers and other psychotropic agents	E980.3	All	1.000
Unspecified drug-related diagnosis			
Drug psychosis	292	All	1.000
Opioid type dependence	304.0	All	1.000
Amphetamine and other psychostimulant dependence	304.4	All	1.000
Other specified drug dependence	304.6	All	1.000
Combinations of opioid type drug with any other drug dependence	304.7	All	1.000
Combinations of drug dependence excluding opioid type drug	304.8	All	1.000
Unspecified drug dependence	304.9	All	1.000
Nondependent opioid abuse	305.5	All	1.000
Nondependent amphetamine or related acting sympathomimetic abuse	305.7	All	1.000
Nondependent other mixed or unspecified drug abuse	305.9	All	1.000
Drug withdrawl syndrome in newborn	779.5	All	1.000
Other	E850.8	All	1.000
Other sedatives and narcotics	E852	All	1.000
Other drugs acting on the central and autonomic nervous system	E855	All	1.000
Hormones and synthetic substitutes	E858.0	All	1.000
Primarily systemic agents	E858.1	All	1.000
Other specified drugs	E858.8	All	1.000
Unspecified drug	E858.9	All	1.000
Other unspecified drugs and medicinal substances	E980.4	All	1.000
Unspecified drug or medicinal substance	E980.5	All	1.000
Other and unspecified solid or liquid substance	E980.9	All	1.000
Homicide and injury inflicted purposely by other persons	E960-E969	All	0.158
Tuberculosis	010-018	All	0.045
Hepatitis C	070.41, 070.44, 070.51, 070.54, 070.7	All	0.200
Hepatitis B	070.2-070.3	All	0.300
AIDS	042	All	0.320

Source: ONDCP, 2004; WYSAC, 2012.

Table A-4. Drug-attributable Fractions (ICD-10)

Diagnoses	ICD-10	Age	Drug-attributable fraction
Illicit drug-related diagnosis			
Cannabinoids (abuse, dependence, unspecified use)	F12	All	1.000
Cocaine (abuse, dependence, unspecified use)	F14	All	1.000
Hallucinogens (abuse, dependence, unspecified use)	F16	All	1.000
Volatile solvents (abuse, dependence, unspecified use)	F18	All	1.000
Drug overdose by heroin (illicit drug)	T40.1	All	1.000
Drug overdose by cocaine (illicit drug)	T40.5	All	1.000
Drug overdose by hallucinogens (illicit drug)	T40.7-T40.9	All	1.000
Drug overdose by stimulants	T43.6	All	1.000
Prescription drug-related diagnosis			
Sedatives or hypnotics (abuse, dependence, unspecified use)	F13	All	1.000
Other stimulants, including caffeine (abuse, dependence, unspecified use)	F15	All	1.000
Drug overdose by prescription drugs	T36-T39, T40.2-T40.4, T41-T43.5, T43.7-T50.8	All	1.000
Nonopioid analgesics, antipyretics and antirheumatics	X40	All	1.000
Antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	X41	All	1.000
Organic solvents and halogenated hydrocarbons and their vapours	X46	All	1.000
Nonopioid analgesics, antipyretics and antirheumatics	Y10	All	1.000
Antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified	Y11	All	1.000
Organic solvents and halogenated hydrocarbons and their vapours	Y16	All	1.000
Unspecified drug-related diagnosis			
Opioids (abuse, dependence, unspecified use)	F11	All	1.000

Table A-4 (con't). Drug-attributable Fractions (ICD-10)

Diagnoses	ICD-10	Age	Drug-attributable fraction
Multiple drug use and use of other psychoactive substances (abuse, dependence, unspecified use)	F19	All	1.000
Drug overdose by only unspecified drugs	T50.9	All	1.000
Narcotics and psychodysleptics [hallucinogens], not elsewhere classified	X42	All	1.000
Other drugs acting on the autonomic nervous system	X43	All	1.000
Other and unspecified drugs, medicaments and biological substances	X44	All	1.000
Narcotics and psychodysleptics [hallucinogens], not elsewhere classified	Y12	All	1.000
Other drugs acting on the autonomic nervous system	Y13	All	1.000
Other and unspecified drugs, medicaments and biological substances	Y14	All	1.000
Homicide or injury inflicted by another person with intent to injure or kill, by any means	X85-Y09	All	0.158
Tuberculosis	A15-A19	All	0.045
Hepatitis C	B17.1, B18.2	All	0.200
Hepatitis B	B16, B18.0-B18.1	All	0.300
HIV	B20-B24	All	0.320

Source: CDC, 2011; ONDCP, 2004.

Table A-5. List of Mental Disorders

Diagnoses	ICD-9
Severe and persistent mental illnesses	
Schizophrenic disorders	295
Affective psychoses	296
Paranoid states	297
Other nonorganic psychoses	298
Psychoses with Origin Specific to Childhood (Autism)	299
Panic Disorders	300.01, 300.21
Obsessive Compulsive disorder	300.3
Suicide (72%)	E950-959
Homicide (10%)	E960-978
Mental illnesses, not elsewhere specified	
Neurotic disorders (except Panic)	300 (except 300.01, 300.21)
Personality disorders	301
Sexual deviations and disorders	302
Special symptoms or syndromes, NEC	307
Acute reaction to stress	308
Adjustment reaction	309
Specific nonpsychotic mental disorders due to organic brain damage	310
Depressive Disorder, NEC	311
Disturbance of Conduct, NEC	312
Disturbance of emotions specific to childhood and adolescence	313
Hyperkinetic syndrome of childhood	314
Sleep disorders	780.5
Child maltreatment syndrome	995.5
Mental/Behavioral problem	V402-V409
Other family circumstances	V61
Other psychosocial circumstances	V62
Mental disorder convalescence	V663
Psychiatric follow-up	V673
Psychiatric exam criminal justice requested	V701
General psychiatric exam, NEC	V702
Observation for Mental Conditions	V710
Mental retardation and developmental disabilities	
Mild Mental Retardation	317
Other Specified Mental Retardation	318
Unspecified Mental Retardation	319
Specific Delays in Development	315

Table A-5 (con't). List of Mental Disorders

Diagnoses	ICD-9
Dementia, delirium, senility, amnesia, etc.	
Senile and Presenile Organic Psychotic Conditions	290
Transient organic mental disease	293
Other Organic Psychotic Conditions (chronic)	294
Alzheimer's Disease	331.0
Senility without Psychosis	797
Other	
Physiological Malfunction from Mental Factors	306
Psychic Factors Associated with Diseases Classified Elsewhere	316

Source: Harwood et al., 2000.

Note: Substance-induced mental disorders are removed from this list and are included in substance-specific health conditions.

Appendix B. Estimated Inpatient Hospital Care Costs by Substance

Table B-1. Alcohol-Related Hospital Inpatient Care Costs, Wyoming, 2010

Alcohol-related diagnosis	Alcohol-attributable fraction		Alcohol-related hospital discharges		CCR adjusted costs
	Male	Female	Male	Female	
Primary diagnosis					
100% alcohol-attributable condition					
Alcoholic psychosis	1.000	1.000	235	61	$9,811,939
Alcohol abuse	1.000	1.000	182	81	$17,607,805
Alcohol dependence syndrome	1.000	1.000	56	36	$5,231,540
Alcohol polyneuropathy	1.000	1.000	2	0	$21,310
Degeneration of nervous system due to alcohol	1.000	1.000	0	0	$0
Alcoholic myopathy	1.000	1.000	0	0	$0
Alcohol cardiomyopathy	1.000	1.000	3	0	$37,507
Alcoholic gastritis	1.000	1.000	18	5	$131,004
Alcoholic liver disease	1.000	1.000	55	36	$2,702,483
FAS	1.000	1.000	0	0	$0
Fetus and newborn affected by maternal use of alcohol	1.000	1.000	0	0	$0
Alcohol-induced chronic pancreatitis	1.000	1.000	0	0	$0
Other alcohol-attributable condition					
Acute pancreatitis	0.240	0.240	58	48	$7,152,162
Chronic pancreatitis	0.840	0.840	8	10	$102,904
Epilepsy	0.150	0.150	4	3	$74,018
Esophageal varices	0.400	0.400	3	2	$30,661
Gastroesophageal hemorrhage	0.470	0.470	8	3	$107,463
Liver cirrhosis, unspecified	0.400	0.400	4	5	$575,753
Portal hypertension	0.400	0.400	1	0	$10,682
Spontaneous abortion	0.000	0.040	0	1	$199,585
Breast cancer, females	0.000	0.010	0	1	$23,744

Table B-1 (con't). Alcohol-Related Hospital Inpatient Care Costs, Wyoming in 2010

Alcohol-related diagnosis	Alcohol-attributable fraction		Alcohol-related hospital discharges		Cost-to-charge ratio adjusted costs
	Male	Female	Male	Female	
Cholelithiases	-0.020	-0.010	-4	-3	-$566,866
Chronic hepatitis	0.020	0.020	0	0	$217
Esophageal cancer	0.050	0.020	1	0	$15,998
Hypertension	0.040	0.020	4	3	$314,512
Ischemic heart disease	0.000	0.000	0	0	$0
Laryngeal cancer	0.080	0.040	0	0	$7,932
Liver cancer	0.070	0.040	1	0	$10,119
Low birth weight, prematurity, intrauterine growth retardation or death	0.040	0.030	0	2	$8,806
Oropharyngeal cancer	0.080	0.030	1	0	$12,445
Psoriasis	0.010	0.000	0	0	$75
Superventricular cardiac dysrhythmia	0.020	0.010	5	3	$763,972
Stroke, ischemic	0.070	0.010	24	4	$1,196,359
Stroke, hemorrhagic	0.100	0.020	6	1	$286,006
Prostate cancer	0.010	0.000	1	0	$18,747
Alcohol poisoning	1.000	1.000	5	3	$80,692
Suicide by and exposure to alcohol	1.000	1.000	0	0	$0
Excessive blood level of alcohol	1.000	1.000	0	0	$0
Non-primary diagnosis coded with ICD-9 E-codes					
100% alcohol-attributable condition					
Alcohol poisoning	1.000	1.000	0	1	$2,649
Other alcohol-attributable condition					
Air-space transport	0.180	0.180	0	0	$2,354
Aspiration	0.180	0.180	0	0	$16,824
Child maltreatment	0.160	0.160	0	0	$1,765

Table B-1 (con't). Alcohol-Related Hospital Inpatient Care Costs, Wyoming in 2010

Alcohol-related diagnosis	Alcohol-attributable fraction		Alcohol-related hospital discharges		CCR adjusted costs
	Male	Female	Male	Female	
Drowning injuries	0.340	0.340	1	0	$785,289
Fall injuries	0.320	0.320	182	283	$17,993,499
Fire injuries	0.420	0.420	2	1	$165,715
Firearms	0.180	0.180	1	1	$326,742
Homicide	0.470	0.470	30	13	$1,027,989
Hypothermia	0.420	0.420	8	1	$1,268,881
Motor-vehicle non-traffic crashes	0.180	0.180	14	4	$1,610,322
Motor-vehicle traffic crashes (ages 0-14)	0.160	0.150	1	1	$23,789
Motor-vehicle traffic crashes (ages 15-19)	0.270	0.190	6	3	$586,969
Motor-vehicle traffic crashes (ages 20-24)	0.470	0.330	15	6	$2,159,224
Motor-vehicle traffic crashes (ages 25-34)	0.490	0.330	21	6	$840,121
Motor-vehicle traffic crashes (ages 35-44)	0.470	0.350	17	6	$1,847,829
Motor-vehicle traffic crashes (ages 45-54)	0.400	0.250	15	9	$1,393,100
Motor-vehicle traffic crashes (ages 55-64)	0.280	0.150	6	2	$241,497
Motor-vehicle traffic crashes (ages 65+)	0.130	0.080	3	2	$511,241
Occupational and machine injuries	0.180	0.180	17	7	$810,242
Other road vehicle crashes	0.180	0.180	13	8	$724,714
Poisoning (not alcohol)	0.290	0.290	18	35	$4,126,324
Suicide	0.230	0.230	34	54	$7,280,737
Water transport	0.180	0.180	0	0	$1,572
Total			**1087**	**750**	**$89,718,966**

Source: Hospital inpatient discharge data for Wyoming in 2010.
Note: Totals and percentages may not always add up due to rounding.

Table B-2. Tobacco-Related Hospital Inpatient Care Costs, Wyoming, 2010

	Smoking-attributable fraction						Smokeless tobacco-attributable fraction	Tobacco-related hospital discharges		
	Male			Female			Male	Male	Female	
Tobacco-related primary diagnosis	**Newborn**	**35-64**	**65+**	**Newborn**	**35-64**	**65+**	**All ages**	**All ages**	**All ages**	**CCR adjusted costs**
Smoking-related primary diagnosis										
Neoplasms (cancer)										
Lip, oral cavity, pharynx cancer	NA	0.730	0.720	NA	0.550	0.420	NA	5	1	$108,631
Esophagus cancer	NA	0.680	0.730	NA	0.660	0.520	NA	7	1	$237,967
Stomach cancer	NA	0.250	0.280	NA	0.130	0.110	NA	2	1	$54,507
Pancreas cancer	NA	0.230	0.190	NA	0.290	0.210	NA	4	4	$92,743
Larynx cancer	NA	0.810	0.830	NA	0.790	0.690	NA	2	2	$100,709
Trachea, bronchus, lung cancer	NA	0.870	0.880	NA	0.780	0.670	NA	61	29	$4,070,771
Cervix uteri cancer	NA	0.000	0.000	NA	0.140	0.080	NA	0	1	$9,598
Kidney, other urinary cancer	NA	0.360	0.390	NA	0.070	0.040	NA	10	1	$177,457
Urinary bladder cancer	NA	0.430	0.480	NA	0.320	0.260	NA	8	2	$143,753
Acute myeloid leukemia cancer	NA	0.210	0.230	NA	0.100	0.110	NA	3	1	$91,854
Cardiovascular diseases										
Rheumatic heart disease (other heart disease)	NA	0.180	0.180	NA	0.130	0.080	NA	1	1	$85,778
Ischemic heart disease	NA	0.350	0.150	NA	0.350	0.100	NA	222	95	$9,566,463
Pulmonary heart disease (other heart disease)	NA	0.180	0.180	NA	0.130	0.080	NA	37	20	$4,568,682
Other heart disease (other heat disease)	NA	0.180	0.180	NA	0.130	0.080	NA	178	101	$15,333,019
Cerebrovascular Disease	NA	0.320	0.090	NA	0.430	0.050	NA	66	57	$5,242,188
Atherosclerosis	NA	0.280	0.260	NA	0.160	0.070	NA	15	4	$322,897
Aortic Aneurysm	NA	0.620	0.650	NA	0.620	0.450	NA	0	0	$0
Other Arterial Disease	NA	0.180	0.110	NA	0.230	0.120	NA	6	4	$209,051
Respiratory diseases										
Pneumonia, influenza	NA	0.200	0.230	NA	0.220	0.110	NA	174	140	$23,321,850
Bronchitis, emphysema	NA	0.880	0.910	NA	0.830	0.800	NA	347	404	$67,095,798
Chronic airways obstruction	NA	0.780	0.820	NA	0.800	0.730	NA	0	0	$0

Table B-2 (con't). Tobacco-Related Hospital Inpatient Care Costs, Wyoming in 2010

	Smoking-attributable fraction						Smokeless tobacco-attributable fraction	Tobacco-related hospital discharges		
	Male			Female			Male	Male	Female	
Tobacco-related primary diagnosis	**Newborn**	**35-64**	**65+**	**Newborn**	**35-64**	**65+**	**All ages**	**All ages**	**All ages**	**CCR adjusted costs**
Perinatal conditions										
Short gestation/low birth weight	0.140	NA	NA	0.140	NA	NA	NA	2	0	$14,356
Respiratory distress syndrome	0.056	NA	NA	0.056	NA	NA	NA	0	0	$0
Other respiratory conditions in newborns	0.074	NA	NA	0.074	NA	NA	NA	0	1	$3,476
Sudden infant death syndrome	0.202	NA	NA	0.202	NA	NA	NA	0	0	$0
Smokeless tobacco-related primary diagnosis										
Neoplasms (cancer)										
Lip, oral cavity, pharynx cancer	NA	NA	NA	NA	NA	NA	0.066	1	0	$8,879
Cardiovascular diseases										
Acute myocardial infarction	NA	NA	NA	NA	NA	NA	0.005	2	0	$58,761
Cerebrovascular disease	NA	NA	NA	NA	NA	NA	0.017	7	0	$287,780
Total								**1160**	**872**	**$131,206,969**

Source: Hospital inpatient discharge data for Wyoming in 2010.

Note: Totals and percentages may not always add up due to rounding.

Table B-3. Illicit Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010

Illicit drug-related diagnosis	Drug-attributable fraction	Drug-related hospital discharges		CCR adjusted costs
		Male	Female	
Primary diagnosis				
100% drug-attributable condition				
Cocaine dependence	1.000	0	1	$2,501
Cannabis dependence	1.000	3	4	$75,399
Hallucinogen dependence	1.000	0	0	$0
Nondependent cannabis abuse	1.000	0	0	$0
Nondependent hallucinogen abuse	1.000	1	0	$7,814
Nondependent cocaine abuse	1.000	0	0	$0
Poisoning by heroin	1.000	0	0	$0
Poisoning by psychodysleptics (hallucinogens)	1.000	0	0	$0
Poisoning by cocaine	1.000	0	0	$0
Non-primary diagnosis coded with ICD-9 E-codes				
100% drug-attributable condition				
Opiates and related narcotics (accidental poisoning by heroin)	1.000	0	0	$0
Accidental poisoning by psychodysleptics (hallucinogens)	1.000	0	0	$0
Heroin, methadone, other opiates and related narcotics, and other drugs causing adverse effects in therapeutic use.	1.000	118	197	$9,673,436
Total		**122**	**202**	**$9,759,149**

Source: Hospital inpatient discharge data for Wyoming in 2010.
Note: Totals and percentages may not always add up due to rounding.

Table B-4. Prescription Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010

Prescription drug-related diagnosis	Drug-attributable fraction	Drug-related hospital discharges		CCR adjusted costs
		Male	Female	
Primary diagnosis				
100% drug-attributable condition				
Sedative, hypnotic or anxiolytic dependence	1.000	0	0	$0
Nondependent sedative, hypnotic or anxiolytic abuse	1.000	0	3	$12,269
Nondependent antidepressant type abuse	1.000	0	1	$2,946
Poisoning by antibiotics	1.000	0	0	$0
Poisoning by other anti-infectives	1.000	0	1	$8,591
Poisoning by hormones and synthetic substitutes	1.000	4	9	$6,412,004
Poisoning by primarily systemic agents	1.000	12	10	$135,445
Poisoning by agents primarily affecting blood constituents	1.000	2	2	$21,492
Poisoning by analgesics, antipyretics, and antirheumatics (except 965.01 - heroin)	1.000	50	105	$7,419,628
Poisoning by anticonvulsants and anti-Parkinsonism drugs	1.000	6	11	$65,929
Poisoning by sedatives and hypnotics	1.000	8	26	$2,955,801
Poisoning by other central nervous system depressants and anesthetics	1.000	0	5	$5,003,286
Poisoning by psychotropic agents (except for 969.6 - hallucinogens (for example, LSD)	1.000	44	97	$7,284,293

Table B-4 (con't). Prescription Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010

Prescription drug-related diagnosis	Drug-attributable fraction	Drug-related hospital discharges		CCR adjusted costs
		Male	Female	
Non-primary diagnosis coded with ICD-9 E-codes				
100% drug-attributable condition				
Aromatic analgesics, not elsewhere classified	1.000	4	12	$125,691
Other non-narcotic analgesics	1.000	0	0	$0
Unspecified analgesics and antipyretics	1.000	0	2	$9,486
Barbiturates	1.000	0	0	$0
Tranquilizers	1.000	2	6	$101,194
Other psychotropic agents (i.e., antidepressants) (except E854.1 - Hallucinogens)	1.000	5	2	$53,043
Agricultural and horticultural chemical pharmaceutical preparations other than plan foods and fertilizers	1.000	0	0	$0
Salicylates	1.000	2	0	$8,776
Pyrazole derivatives	1.000	0	0	$0
Antirheumatics	1.000	1	5	$46,994
Other non-narcotic analgesics	1.000	0	0	$0
Accidental poisoning by antibiotics	1.000	0	0	$0
Accidental poisoning by other anti-infectives	1.000	0	0	$0
Agents primarily affecting blood constituents	1.000	3	1	$25,577
Agents primarily affecting cardiovascular system	1.000	2	7	$3,600,587
Agents primarily affecting gastrointestinal system	1.000	0	0	$0
Water mineral and uric acid metabolism drugs	1.000	0	0	$0

Table B-4 (con't). Prescription Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010

Prescription drug-related diagnosis	Drug-attributable fraction	Drug-related hospital discharges		CCR adjusted costs
		Male	Female	
Agents primarily acting on the smooth and skeletal muscles and respiratory system	1.000	0	3	$18,101
Agents primarily affecting skin and mucous membrane, opthalmological, otorhinolaryngological, dental drugs	1.000	1	0	$5,060
Analgesics, antipyretics, and antirheumatics	1.000	0	4	$49,115
Barbiturates	1.000	0	0	$0
Other sedatives and hypnotic	1.000	1	2	$2,386,745
Tranquilizers and other psychotropic agents	1.000	1	3	$2,865,513
Total		**148**	**317**	**$38,617,566**

Source: Hospital inpatient discharge data for Wyoming in 2010.
Note: Totals and percentages may not always add up due to rounding.

Table B-5. Unspecified Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010

Unspecified drug-related diagnosis	Drug-attributable fraction	Drug-related hospital discharges		CCR adjusted costs
		Male	Female	
Primary diagnosis				
100% drug-attributable condition				
Drug psychosis	1.000	31	43	$6,291,594
Drug withdrawal syndrome in newborn	1.000	0	0	$0
Opioid type dependence	1.000	0	8	$41,051
Amphetamine and other psychostimulant dependence	1.000	4	3	$46,441
Other specified drug dependence	1.000	0	0	$0
Combinations of opioid type drug with any other drug dependence	1.000	4	9	$104,374
Combinations of drug dependence excluding opioid type drug	1.000	6	4	$86,849
Unspecified drug dependence	1.000	0	0	$0
Nondependent opioid abuse	1.000	0	0	$0
Nondependent amphetamine or related acting sympathomimetic abuse	1.000	1	4	$22,418
Nondependent other mixed or unspecified drug abuse	1.000	1	2	$19,090
Tuberculosis	0.045	0	0	$0
Hepatitis C	0.200	0	0	$0
Hepatitis B	0.300	0	0	$0
AIDS	0.320	0	0	$0
Non-primary diagnosis coded with ICD-9 E-codes				
100% drug-attributable condition				
Other	1.000	0	1	$4,518
Other sedatives and narcotics	1.000	3	3	$38,406
Other drugs acting on the central and autonomic nervous system	1.000	2	5	$35,880
Hormones and synthetic substitutes	1.000	1	3	$66,555

Table B-5 (con't). Unspecified Drug-Related Hospital Inpatient Care Costs, Wyoming, 2010

Unspecified drug-related diagnosis	Drug-attributable fraction	Drug-related hospital discharges		CCR adjusted costs
		Male	Female	
Primarily systemic agents	1.000	1	1	$17,624
Other specified drugs	1.000	3	5	$17,059
Unspecified drug	1.000	2	5	$1,670,011
Other unspecified drugs and medicinal substances	1.000	1	4	$4,647,719
Unspecified drug or medicinal substance	1.000	3	2	$2,659,868
Other and unspecified solid or liquid substance	1.000	1	0	$19,417
Other drug-attributable condition				
Homicide and injury inflicted purposely by other persons	0.158	11	4	$351,489
Total		**75**	**106**	**$16,140,363**

Source: Hospital inpatient discharge data for Wyoming in 2010.
Note: Totals and percentages may not always add up due to rounding.

Appendix C. Economic Productivity, 2010 Estimates for Wyoming

In this cost-of-illness study, WYSAC used the human capital approach (HCA) to value losses in productivity resulting from the negative outcomes associated with substance abuse and use. The HCA is based on two assumptions: 1) the value of an individual is what he or she produces; and 2) productivity is accurately measured by earnings (Cropper and Freeman, 1991). In this section WYSAC describes the methodology used to estimate the present value of lifetime productivity and total productivity values, economic values that are used in Section 4 to estimate total productivity losses.

Present Value of Lifetime Production (PVLP)
To calculate PVLP, WYSAC used the methodology developed by Max, Rice, Sung, and Michel (2004). The authors approach tool into account life expectancy, the percent of individuals participating in the labor force and keeping house, expected annual increase in productivity, and the discount rate. Lifetime present values were calculated as follows:

$$PVLP_{y,g} = \sum_{n=y}^{100} P_{y,g}(n)[Y_g(n)E_g(n) + Y_g^h(n)E_g^h(n)] \times \frac{(1+p)^{n-y}}{(1+r)^{n-y}}$$

Where $PVLP_{y,g}$ is the present discounted value of lifetime production for a person of age *y* and gender *g*

$P_{y,g}(n)$ is the probability that a person of age *y* and gender *g* will survive to age *n*

y is the age of the person at present

g is the gender of the person

n is the age the person will be in the future

$Y_g(n)$ is the mean annual market productivity value of an employed person of gender *g* and age *n*

$E_g(n)$ is the proportion of the population of gender *g* and age *n* that are employed in the labor market

$Y_g^h(n)$ is the mean annual household productivity value of a person of gender *g* and age *n*

$E_g^h(n)$ is the proportion of the population of gender *g* and age *n* that are participating in household production activities

p is the rate of increase of labor productivity

r is the real discount rate

WYSAC describes each variable below including data sources and any assumptions made.

Life Expectancy
The NCHS develops complete period life tables for the United States based on age-specific death rates. WYSAC used the U.S. life tables from 2007, the most recent life tables available, for use in WYSAC's PVLP calculations (Arias, 2011). WYSAC followed the methodology in Max, Rice et al. (2004) and used the number of person-years lived within an age interval – x to x+1 – from an original synthetic cohort of 100,000 live births to obtain life expectancy for age group x. WYSAC assumed in the PVLP calculation that each cohort will follow the same pattern of life expectancy at successive ages as the synthetic cohort reported in the life tables.

Market Productivity
WYSAC calculated 2010 dollar based estimates of market productivity using the 2006 through 2010 American Communities Survey's Public Use Microdata Sample (PUMS) for Wyoming. WYSAC applied the adjustment variable (ADJINC) provided in the PUMS data file to adjust reported incomes into 2010 dollars and annualize the different rolling reference periods for reported income.

All analyses were conducted using weighted statewide data. Population weights were provided in the PUMS data file and were applied to age, sex, educational attainment, and total individual income. The population weight (PWGTP) generates statistics about individuals as opposed to households. It also accounts for how representative that person is of the total population and weights the observation according to their percentage of representation for the total population.

WYSAC adjusted the mean market productivity values upward to account for employer provided fringe benefits (i.e., insurance, retirement) and legally required benefits. The BLS produces quarterly reports on the ECEC. The average ECEC for 2010 was $9.02, which represents a 30.3% increase in the average market wage for the civilian workforce.

Labor Force Participation
WYSAC used the U.S. Department of Labor's BLS estimates of labor force participation for the civilian, non-institutionalized population (U.S. Department of Labor, 2011). These estimates were derived from the CPS and the Local Area Unemployment Statistics (LAUS) program.

Household Productivity
WYSAC used data from the Dollar Value of a Day, a report compiled by Expectancy Data (2011) to estimate household productivity values. Expectancy Data assembled data from the ATUS, a national study that collects diary entries from individuals on how much time they spend on household production, work, and leisure on a given day (over a 24 hour period). The ATUS is conducted by the U.S. Census Bureau for the BLS. The sample is a subset of individuals from the CPS.

Household production activities included inside work, food cooking and clean-up, pet care, home and vehicle care, household management, shopping, obtaining services, and travel for household activities. An additional subcategory, caring and helping services, included caring for household children and adults, as well as non-household members, and related travel. The household productivity estimates did not include activities for personal time or leisure time since these activities did not contribute to the wealth building of the household. The value of time spent at household production activities was determined using the replacement value method. Expectancy Data (2011) uses wage data from May 2010 from the U.S. Department of Labor's BLS in their calculations.

Participation in Keeping House
WYSAC used the percentage of time engaging in household production activities from the Dollar Value of a Day report by Expectancy Data (2011).

Discount Rate
The discount rate is a quantitative measure of time preference. In other words, the discount rate reflects the premium that society places on benefits received today versus the future (Haddix, Corso, and Gorsky, 2003). Studies of health-care interventions have consistently used a lower discount rate on the general premise that societal preferences for health improvement differ from consumer goods (Haddix, Corso, and Gorsky, 2003). The U.S. Panel on Cost-Effectiveness in Health and Medicine recommends using a 3% discount rate for evaluations of health care programs and a 5% rate is recommended to allow for comparability to older studies. WYSAC followed the above recommendation and used both a 3% and a 5% discount rate in the analyses.

Increase in Labor Productivity
In a COI study it is customary to increase a person's productivity to reflect the likely gains the individuals would maker over his or her's lifetime. Max, Rice et al. (2004) assumed a 1% annual increase in productivity. Grosse et al. (2009) also used 1% in their calculations of expected lifetime present values noting that this increase was consistent with the increase in real compensation paid per hour in the nonfarm business sector over the last 35 years. WYSAC followed the customary practice of increasing productivity by 1% per year.

Results
The average value of annual compensation, household productivity, and total productivity by age and gender are reported in Table C.1. The present values of total production for individuals over their remaining expected lifetimes are presented in Table C.2 for 3% and 5% discount rates.

Table C-1. Annual Productivity, Wyoming, 2010

Gender	Per Person Annual Market Productivity Value[1]	Per Person Annual Household Productivity Value	Per Person Annual Total Productivity Value
(1)	(2)	(3)	(2)+(3)
Males			
15-19	$7,131	$6,928	$14,059
20-24	$30,371	$8,464	$38,835
25-29	$50,314	$11,658	$61,972
30-34	$60,050	$11,658	$71,708
35-39	$72,670	$13,545	$86,215
40-44	$76,239	$13,545	$89,784
45-49	$80,634	$12,676	$93,310
50-54	$78,173	$12,676	$90,850
55-59	$80,866	$13,476	$94,342
60-64	$75,119	$13,476	$88,595
65-69	$67,143	$15,217	$82,360
70-74	$53,324	$15,217	$68,541
75-79	$47,049	$13,625	$60,674
80-84	$37,580	$13,625	$51,206
85+	$36,515	$13,625	$50,141
Females			
15-19	$4,614	$11,098	$15,712
20-24	$16,470	$14,188	$30,657
25-29	$26,935	$21,239	$48,174
30-34	$28,908	$21,239	$50,148
35-39	$36,722	$22,466	$59,188
40-44	$39,602	$22,466	$62,068
45-49	$38,165	$18,874	$57,039
50-54	$40,718	$18,874	$59,592
55-59	$42,598	$19,371	$61,968
60-64	$37,450	$19,371	$56,821
65-69	$35,335	$19,852	$55,188
70-74	$27,760	$19,852	$47,613
75-79	$27,920	$17,064	$44,983
80-84	$27,858	$17,064	$44,922
85+	$26,361	$17,064	$43,424

Notes:
[1] Market productivity includes employer provided benefits and legally required employer costs.

Table C-2. Present Value of Lifetime Productivity, Wyoming (2010 Dollars)

	Total Production	
Gender	**3%**	**5%**
Males		
<1	$1,282,844	$586,929
1-4	$1,357,979	$652,373
5-9	$1,485,346	$778,385
10-14	$1,639,426	$945,842
15-19	$1,797,047	$1,135,733
20-24	$1,900,118	$1,290,945
25-29	$1,895,801	$1,356,153
30-34	$1,806,109	$1,346,965
35-39	$1,638,708	$1,265,147
40-44	$1,415,366	$1,124,826
45-49	$1,173,462	$958,390
50-54	$918,979	$768,667
55-59	$670,466	$571,515
60-64	$425,329	$362,831
65-69	$278,684	$236,961
70-74	$209,926	$182,254
75-79	$154,142	$136,615
80-84	$112,164	$101,522
85+	$55,499	$52,057
Females		
<1	$889,536	$405,724
1-4	$940,394	$450,368
5-9	$1,028,335	$537,225
10-14	$1,134,914	$652,747
15-19	$1,231,356	$771,232
20-24	$1,275,954	$850,494
25-29	$1,256,501	$875,344
30-34	$1,198,591	$866,969
35-39	$1,104,101	$825,115
40-44	$975,139	$747,947
45-49	$841,318	$662,347
50-54	$697,497	$562,228
55-59	$545,482	$447,177
60-64	$396,062	$326,315
65-69	$296,799	$246,861
70-74	$233,691	$199,074
75-79	$180,055	$157,278
80-84	$134,998	$120,995
85+	$63,405	$59,130

Appendix D. Alcohol- and Drug-Attributable Motor-Vehicle Crashes

Table D-1. Crashes by Crash Severity and Alcohol and/or Drug Involvement, Wyoming, 2010

Substance Involved	Crash Severity						
	No Injury	Unknown	Possible Injury	Non-incapacitating	Incapacitating	Fatal	Total
Alcohol-Involved Crashes	432	34	115	139	69	37	826
Drug-Involved Crashes	38	1	12	13	8	8	80
Both Alcohol & Drugs Involved Crashes	76	3	30	32	25	9	175

Source: Wyoming Department of Transportation (WYDOT).

Table D-2. KABCO-to-MAIS Conversion Table

MAIS	Police-Reported KABCO Injury Severity Scale					
	No injury	Injured, but severity unknown	Possible injury	Non-incapacitating	Incapacitating	Killed
MAIS 0	0.92423	0.07523	0.19919	0.04938	0.01516	0.00000
MAIS 1	0.07342	0.70581	0.71729	0.79229	0.49183	0.00000
MAIS 2	0.00206	0.15708	0.06761	0.12487	0.27920	0.00000
MAIS 3	0.00029	0.04343	0.01509	0.03009	0.16713	0.00000
MAIS 4	0.00001	0.01712	0.00064	0.00267	0.02907	0.00000
MAIS 5	0.00000	0.00134	0.00018	0.00069	0.01762	0.00000
Fatal	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
Total	1.00001	1.00001	1.00000	0.99999	1.00001	1.00000

Source: Willke et al., 1999.

[1]KABCO: K=Killed, A=Incapacitating injury, B=Non-incapacitating injury, C=Possible injury, and O=No injury; MAIS=Maximum Abbreviated Injury Scale.

Table D-3. Estimated Number of Crashes by MAIS, Wyoming, 2010

MAIS	Police-Reported KABCO Injury Severity Scale						Total
	No Injury	Unknown	Possible Injury	Non-incapacitating	Incapacitating	Fatal	
Estimated Number of Alcohol-Involved Crashes by MAIS							
MAIS 0	399	3	23	7	1	0	**433**
MAIS 1	32	24	82	110	34	0	**282**
MAIS 2	1	5	8	17	19	0	**51**
MAIS 3	0	1	2	4	12	0	**19**
MAIS 4	0	1	0	0	2	0	**3**
MAIS 5	0	0	0	0	1	0	**1**
Fatal	0	0	0	0	0	37	**37**
Total	432	34	115	139	69	37	**826**
Estimated Number of Drug-Involved Crashes by MAIS							
MAIS 0	35	0	2	1	0	0	**38**
MAIS 1	3	1	9	10	4	0	**26**
MAIS 2	0	0	1	2	2	0	**5**
MAIS 3	0	0	0	0	1	0	**2**
MAIS 4	0	0	0	0	0	0	**0**
MAIS 5	0	0	0	0	0	0	**0**
Fatal	0	0	0	0	0	8	**8**
Total	38	1	12	13	8	8	**80**
Estimated Number of Both Alcohol and Drugs Involved Crashes by MAIS							
MAIS 0	70	0	6	2	0	0	**78**
MAIS 1	6	2	22	25	12	0	**67**
MAIS 2	0	0	2	4	7	0	**14**
MAIS 3	0	0	0	1	4	0	**6**
MAIS 4	0	0	0	0	1	0	**1**
MAIS 5	0	0	0	0	0	0	**0**
Fatal	0	0	0	0	0	9	**9**
Total	76	3	30	32	25	9	**175**

Table D-4. Alcohol-Involved and Alcohol-Caused Vehicle Crash Costs, Wyoming, 2010

	PDO	MAIS 0	MAIS 1	MAIS 2	MAIS 3	MAIS 4	MAIS 5	Fatal	Total
Alcohol-Related Crashes									
Number of Alcohol-Involved Crashes	--	433	282	51	19	3	1	37	826
Alcohol-Attributable Fraction of Alcohol-Involved Crashes	85.3%	69.8%	68.5%	78.6%	71.1%	75.8%	80.8%	80.8%	81.6%
Number of Alcohol-Caused Crashes	--	302	193	40	14	2	1	30	582
Unit Costs for Alcohol-Involved Crashes									
Insurance Administration	$147	$101	$905	$9,709	$25,206	$45,083	$95,122	$47,005	N/A
Legal Costs	$0	$0	$218	$7,627	$21,809	$47,440	$112,387	$129,337	N/A
Travel Delay	$1,017	$979	$984	$1,071	$1,190	$1,265	$11,584	$11,584	N/A
Property Damage	$1,879	$1,290	$4,868	$5,007	$8,610	$12,451	$11,961	$13,009	N/A
Total	$3,043	$2,371	$6,975	$23,414	$56,815	$106,240	$231,055	$200,934	N/A
Total Costs for Alcohol-Caused Crashes									
Insurance Administration	--	$30,583	$175,062.32	$386,312.00	$341,343.63	$103,779	$105,908	$1,405,471	$2,548,459
Legal Costs	--	$0	$42,113	$303,477	$295,351	$109,206.64	$125,132	$3,867,242	$4,742,521
Travel Delay	--	$295,505	$190,243	$42,627	$16,120	$2,912	$12,897.65	$346,369.94	$906,673
Property Damage	--	$389,546	$941,174	$199,228	$116,594	$28,663	$13,318	$388,965.72	$2,077,488
Total	--	$715,633	$1,348,592	$931,643	$769,408	$244,561	$257,255	$6,008,049	$10,275,141

Source: Blincoe et al., 2002; U.S. Department of Labor, 2012.
Note: Figures may not add up due rounding.

Table D-5. Drug-Involved and Drug-Caused Vehicle Crash Costs, Wyoming, 2010

	PDO	MAIS 0	MAIS 1	MAIS 2	MAIS 3	MAIS 4	MAIS 5	Fatal	Total
Drug-Related Crashes									
Number of Drug-Involved Crashes	--	38	26	5	2	0	0	8	80
Drug-Attributable Fraction of Drug-Involved Crashes	85.3%	69.8%	68.5%	78.6%	71.1%	75.8%	80.8%	80.8%	81.6%
Number of Drug-Caused Crashes	--	27	18	4	1	0	0	6	57
Unit Costs for Drug-Involved Crashes									
Insurance Administration	$147	$101	$905	$9,709	$25,206	$45,083	$95,122	$47,005	N/A
Legal Costs	$0	$0	$218	$7,627	$21,809	$47,440	$112,387	$129,337	N/A
Travel Delay	$1,017	$979	$984	$1,071	$1,190	$1,265	$11,584	$11,584	N/A
Property Damage	$1,879	$1,290	$4,868	$5,007	$8,610	$12,451	$11,961	$13,009	N/A
Total	$3,043	$2,371	$6,975	$23,414	$56,815	$106,240	$231,055	$200,934	N/A
Total Costs for Drug-Caused Crashes									
Insurance Administration	--	$2,711	$16,335	$37,417	$35,184	$9,994	$11,792	$303,886	$417,318
Legal Costs	--	$0	$3,929	$29,394	$30,443	$10,516	$13,933	$836,161	$924,376
Travel Delay	--	$26,194	$17,751	$4,129	$1,662	$280	$1,436	$74,891	$126,342
Property Damage	--	$34,529	$87,818	$19,296	$12,018	$2,760	$1,483	$84,101	$242,006
Total	--	$63,434	$125,833	$90,235	$79,306	$23,550	$28,644	$1,299,038	$1,710,041

Source: Blincoe et al., 2002; U.S. Department of Labor, 2012.
Note: Figures may not add up due rounding.

Table D-6. Alcohol and Drug Involved and Alcohol and Drug Caused Vehicle Crash Costs, Wyoming, 2010

	PDO	MAIS 0	MAIS 1	MAIS 2	MAIS 3	MAIS 4	MAIS 5	Fatal	Total
Both Alcohol and Drug Related Crashes									
Number of Alcohol & Drug-Involved Crashes	--	78	67	14	6	1	0	9	175
Alcohol and Drug-Attributable Fraction of Alcohol and Drug-Involved Crashes	85.3%	69.8%	68.5%	78.6%	71.1%	75.8%	80.8%	80.8%	81.6%
Number of Alcohol and Drug-Caused Crashes	--	55	46	11	4	1	0	7	124
Unit Costs for Both Alcohol and Drug Involved Crashes									
Insurance Administration	$147	$101	$905	$9,709	$25,206	$45,083	$95,122	$47,005	N/A
Legal Costs	$0	$0	$218	$7,627	$21,809	$47,440	$112,387	$129,337	N/A
Travel Delay	$1,017	$979	$984	$1,071	$1,190	$1,265	$11,584	$11,584	N/A
Property Damage	$1,879	$1,290	$4,868	$5,007	$8,610	$12,451	$11,961	$13,009	N/A
Total	$3,043	$2,371	$6,975	$23,414	$56,815	$106,240	$231,055	$200,934	N/A
Total Costs for Both Alcohol and Drug Caused Crashes									
Insurance Administration	--	$5,542	$41,470	$104,018	$102,952	$30,191	$36,277	$341,871	$662,322
Legal Costs	--	$0	$9,976	$81,714	$89,080	$31,770	$42,862	$940,681	$1,196,083
Travel Delay	--	$53,550	$45,066	$11,478	$4,862	$847	$4,418	$84,252	$204,473
Property Damage	--	$70,592	$222,950	$53,644	$35,166	$8,339	$4,562	$94,613	$489,866
Total	--	$129,685	$319,461	$250,854	$232,060	$71,147	$88,120	$1,461,417	$2,552,744

Source: Blincoe et al., 2002; U.S. Department of Labor, 2012.
Note: Figures may not add up due rounding.