



Recovery Centers *of* America

**Economic Cost of Substance Abuse Disorder
in the United States, 2019**

April 2020

Analysis provided by Marwood Group



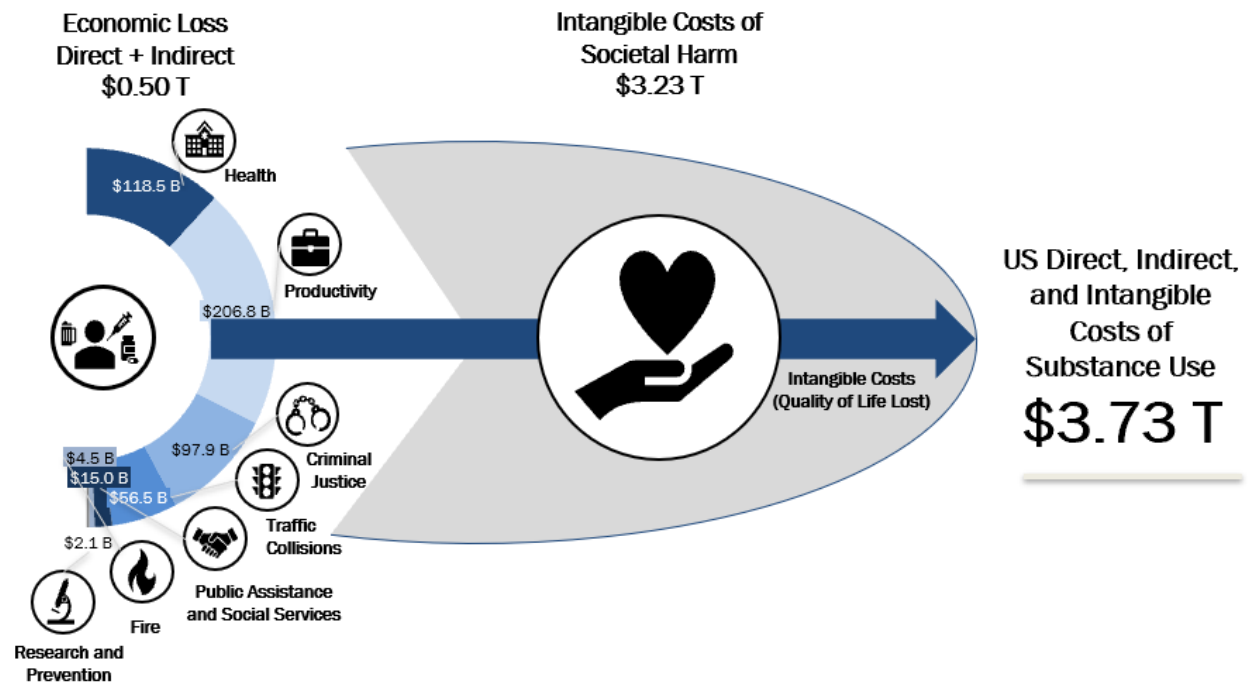
Executive Summary

The current estimated economic cost of substance abuse disorder in the United States is approximately **\$3.73 T annually**, including \$0.50 T in tangible measured costs and \$3.23 T in intangible costs, a figure that consumes the equivalent of the combined GDP of 45 of the 50 US States and is larger than the combined GDP of California, Texas, New York, Florida, Illinois, Pennsylvania, and Ohio.¹ In this work, we identify and quantify the varied ways in which substance abuse disorder imposes direct and indirect costs on communities in the United States so that policymakers can have an updated and clear vision of how their investment in solutions to substance abuse disorder issues can deliver massive quantifiable economic benefits that coincide with their priceless impacts on human life.

Our analysis divides the costs of substance abuse disorder into three main categories – tangible direct costs, tangible indirect costs, and intangible costs. **Tangible costs** (\$0.50 T, 13.4%) are those that can be measured directly and/or estimated based on economic activity, including, for example, **direct** healthcare expenditures for substance abuse disorder treatment and the treatment of health conditions exacerbated or caused by substance abuse, and **indirect** costs including, for example, productivity loss due to premature mortality or absenteeism due to morbidity, criminal justice activity, public assistance expenditures, and expenses associated with substance abuse-related traffic collisions and fires.

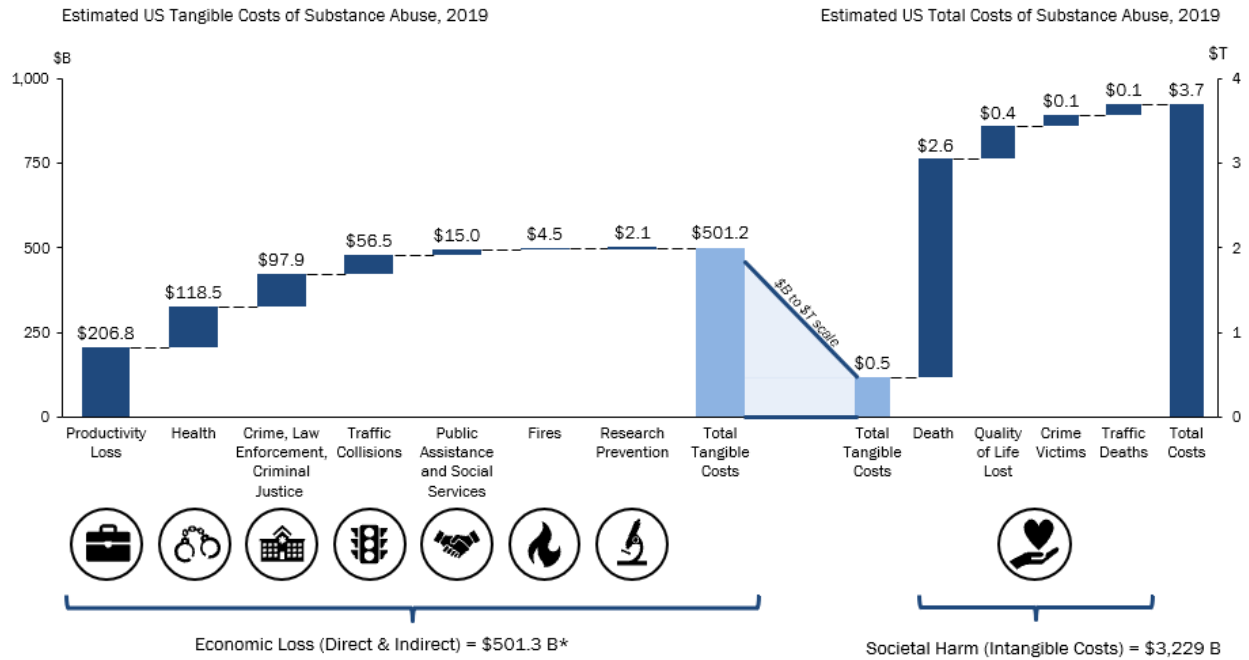
The **intangible costs** of substance abuse disorder (\$3.23 T, 86.6%) include losses that are not frequently quantified outside of actuarial analysis, social science research, or personal injury torts, such as the economic value assigned to loss of life, injury, and reduced quality of life. Among these, the most significant examples of the intangible costs of substance abuse disorder are those associated with the loss in quality of life of those with substance abuse disorders who do not receive treatment (\$0.39 T) and the pain and suffering of deaths, traffic deaths, and victims of violent crime associated with substance abuse disorder (\$2.84 T).

Economic Cost of Substance Abuse Disorder in the United States (2019), Summary View



¹ <https://apps.bea.gov/regional/histdata/releases/0519gdpstate/index.cfm>

Summary of Key Findings



*Values reflect rounding

Categories	Cost (\$M)	Adj. for Double Counting ²	%
Health	\$135,457	\$118,535	3.2%
Productivity Loss	\$236,268	\$206,753	5.5%
Crime, Law Enforcement, Criminal Justice	\$111,855	\$97,882	2.6%
Traffic Collisions	\$64,599	\$56,529	1.5%
Public Assistance and Social Services	\$17,155	\$15,012	0.4%
Fires	\$5,106	\$4,468	0.1%
Research Prevention	\$2,398	\$2,098	0.1%
Tangible (Direct and Indirect) Costs	\$572,838	\$501,277	13.4%
Death	\$2,943,951	\$2,576,182	69.1%
Crime Victims	\$158,190	\$138,428	3.7%
Quality of Life Lost	\$441,078	\$385,977	10.3%
Traffic Deaths	\$147,181	\$128,795	3.5%
Intangible Costs	\$3,690,400	\$3,229,382	86.6%
Total Costs	\$4,263,237	\$3,730,658	100.0%

- **Health**
 - The direct healthcare costs associated with substance abuse disorders total \$118.5 B annually, mainly driven by hospital inpatient and outpatient spending (36%), followed by the costs of treatment programs (34%)
- **Productivity Loss**
 - The indirect productivity loss costs associated with substance abuse disorders total ~\$207 B annually, mainly driven by health-related categories (89%) such as premature death

² SAMHSA's NSDUH 2018 Survey indicated that 12.5% of substance abusers abuse both alcohol and drugs so an adjustment was applied to avoid double counting of those using both alcohol and drugs

- Productivity loss due to crime (11%) such as incarceration and absenteeism, and diminished productivity and victims of crime, are also contributing factors
- **Crime, Law Enforcement, Criminal Justice**
 - The indirect and direct costs due to crime, law enforcement, and criminal justice total ~\$98B annually, driven by law enforcement costs (76%)
 - The costs of private lawyers and security (23%) due to substance abuse disorder were also considered
- **Traffic Collisions**
 - The total cost of direct tangible traffic collisions related to substance abuse is ~\$57B, with productivity (32%) and property damage (31%) as categories with the highest costs
- **Public Assistance and Social Services**
 - The total cost of public assistance and social service costs related to substance abuse is ~\$15B, with Federal (42%) and State (35%) program expenditures making up the largest costs
 - Federal and State programs include OASDI, SSI, TANF, SNAP, VA, and Child Welfare
 - Donations to charity related to substance abuse (14%) were also considered
- **Fires**
 - The cost of fire due to substance abuse is \$4-5B, composed of two main costs:
 - Fire Protection – costs of fire protection service workers (86%)
 - Property Damage due to fires (14%)
- **Research Prevention**
 - The total Federal (95%) and State (5%) expenditure on substance abuse research and prevention is ~\$2B
- **Intangible Costs**
 - The intangible cost of substance abuse (\$3.2T) measures the non-financial welfare losses such as reduced quality of life, death, and injury
 - The highest intangible cost was death from substance abuse (80%), which was based on the value of a statistical life or the willingness for a person to pay to avoid death
 - The second highest intangible cost was quality of life lost (12%), which was based on the loss of productivity of substance abuse users who needed treatment, but did not receive it
- **Cost vs. No Cost Treatment**
 - The total benefit to society of treatment for substance abuse disorder versus no treatment is \$534.6 B.
- **Opioids**
 - The cost of non- medical opioid use to society is \$188.4 B. This includes healthcare, mortality, criminal justice, child and family assistance, education, and productivity loss.

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A. Introduction

Substance abuse disorder and its related public health issues are an endemic problem in the United States. According to the National Survey on Drug Use and Health (NSDUH), an annual survey on the use of illicit drugs and alcohol, substance abuse disorders, and mental health issues among the civilian and noninstitutionalized United States population, stated an estimated 20 million people aged 12 and above were battling a substance abuse disorder in 2017.³ Among adults struggling with substance abuse disorder that year, 74% were also contending with an alcohol use disorder.⁴

The direct health impact of substance abuse disorder alone is staggering as it is associated with a number of adverse health conditions and public health concerns, such as cardiovascular disease and pregnancy complications; abundant research documents the linkage of drug misuse with abnormal cardiovascular functioning, including abnormal heart rate and heart attacks,⁵ and prenatal drug use is known to result in miscarriage, premature birth, low birth weight, and fetal drug dependency.⁶ These direct, tangible and measurable health costs are further increased by the enormous intangible social and economic costs related to the social impact of substance abuse, including domestic violence, child abuse, and motor vehicle accidents. Finally, substance abuse disorder contributes to a host of other social problems with serious economic effects, including lost labor productivity, decreased quality of life, and premature death.

While some progress has been made to address substance abuse disorder in the United States, including increased prevention, treatment, and research efforts, substance abuse disorder continues to play a large role in the burden of disease in the United States and continues to have a severe impact on the economy. As decisionmakers work to address the complex economic, health, and social issues associated with substance abuse disorder, information on the scope of the issues and objective measures of their impacts are crucial to drive thoughtful decisions about the value of investing in solutions.

In the following sections, we offer a detailed analysis of the economic impact of substance abuse disorder in the United States, estimating the costs in terms of health spending, productivity loss, crime, law enforcement and criminal justice spending, and the contributions of traffic collisions, public assistance and social services activities, fires, research on prevention, and other intangible costs, and analyze the economic yield of the cost of treatment versus no treatment. Due to the recent and ongoing major public focus on the opioid use crisis in the United States, we specifically analyzed this issue in an additional section.

B. Detailed Approach

To conduct this analysis, we reviewed a comprehensive set of existing source materials including independent private and public sector research on the costs of substance abuse disorders in a variety of sectors, including those in the healthcare, legal, social science, and public policy spheres. We incorporated our previous framework on this subject (RCA's September 2017 Report on the Economic Cost of Substance Abuse) in approaching the problem, further enhancing this perspective with additional spending categories and updated analysis using current primary source data and updated methodologies. A list of major primary and secondary sources can be found in the appended material.

³ <https://www.samhsa.gov/data/report/2017-nsduh-annual-national-report>

⁴ <https://americanaddictioncenters.org/rehab-guide/addiction-statistics>

⁵ <https://www.drugabuse.gov/publications/health-consequences-drug-misuse/cardiovascular-effects>

⁶ <https://www.drugabuse.gov/publications/health-consequences-drug-misuse/prenatal-effects>

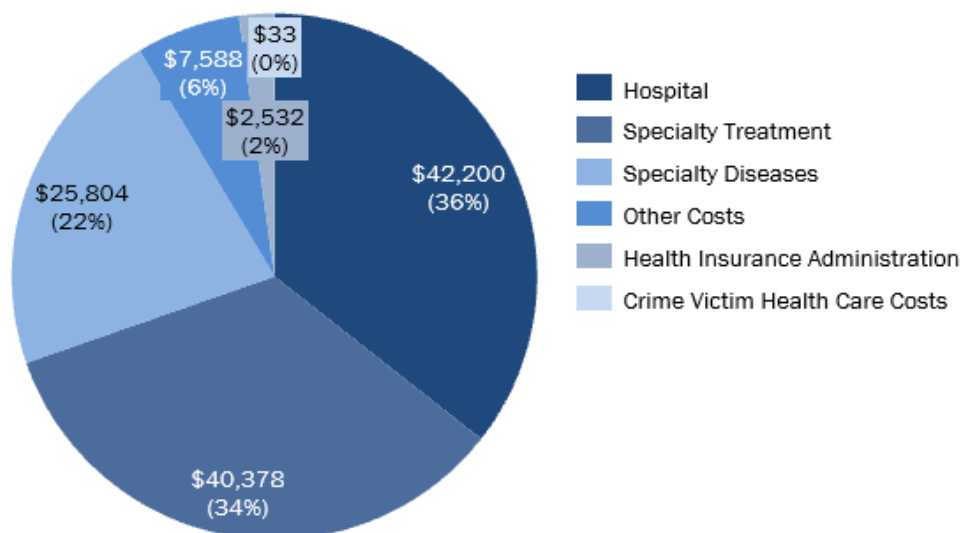
C. DIRECT TANGIBLE COSTS



I. Health

Summary

The direct healthcare costs associated with substance abuse disorders total \$118.5 B annually, mainly driven by hospital inpatient and outpatient spending, followed by the costs of treatment programs and treatment for specialty diseases.



Categories	Cost (\$M)	Adjusted for Double Counting	% of Category
Hospital	\$48,224	\$42,200	35.6%
Inpatient	\$29,972	\$26,228	22.1%
Outpatient (Emergency Visits)	\$18,252	\$15,972	13.5%
Other Costs	\$8,671	\$7,588	6.4%
Ambulance	\$3,580	\$3,133	2.6%
Prescription Drugs	\$1,097	\$960	0.8%
Nursing Homes	\$1,680	\$1,470	1.2%
PCP	\$1,616	\$1,414	1.2%
Other Health Professional, Durable Goods	\$698	\$611	0.5%
Specialty Diseases	\$29,488	\$25,804	21.8%
Hepatitis C Treatment	\$1,224	\$1,071	0.9%
AIDS ART Treatment	\$1,733	\$1,517	1.3%
Mental Health Treatment	\$19,519	\$17,081	14.4%
Hypertension Treatment	\$7,011	\$6,135	5.2%
Specialty SUD Treatment	\$46,142	\$40,378	34.1%
Community Based Specialty Treatment	\$38,975	\$34,106	28.8%
Federal -Provided Specialty Treatment	\$7,167	\$6,272	5.3%
Health Insurance Administration	\$2,893	\$2,532	2.1%
Crime Victim Health Care Costs	\$37	\$33	<0.1%
Total	\$135,457	\$118,535	100.0%

Methodology and Analysis

Hospital

For the inpatient and outpatient/emergency visit costs due to substance abuse disorder, we used the 2017 National Inpatient Sample (NIS) and Nationwide Emergency Department Sample (NEDS) datasets from the Healthcare Cost and Utilization Project (HCUP) and adjusted the identified costs to project 2019 values using the CPI for Medical Services.

The NIS data set includes all payers and a sample size of more than 7 million annual hospital stays; HCUP applies a weighting factor to each recorded discharge to represent more than 35 million hospitalizations nationally in community hospitals in the US. A cost-to-charge ratio based on Center for Medicare and Medicaid Services (CMS) data enables inference of the associated estimated costs.

In our analysis we compiled the weighted cost-to-charge ratio and the weighted inpatient visit counts associated with 10th Revision International Statistical Classification of Diseases and Related Health Problems (ICD-10) codes indicating alcohol and substance abuse disorders or fetal alcohol syndrome were recorded as the primary through quinary diagnoses. We filtered duplicate events to prevent double counting and excluded ICD-10 codes that could be tangential to substance abuse disorder (*i.e.*, Hepatitis C, tuberculosis, and others) from the analysis due to the likelihood that medical events driven by those conditions in the setting of substance abuse disorder would be captured in the visits where substance abuse disorders were noted to be in the first through fifth ICD-10 classifications.

Table 1.1: Inpatient Total Charge - Cost-to-charge Ratio Adjusted (Weighted), (\$ M, 2017)

Description	ICD-10	DX 1	DX 2	DX 3	DX 4	DX 5
Alcohol related disorders	F10	\$2,930	\$5,822	\$6,239	\$6,800	\$6,793
Opioid Related Disorders	F11	\$2,157	\$1,226	\$1,298	\$1,379	\$1,324
Cannabis Related Disorders	F12	\$385	\$1,003	\$790	\$787	\$702
Sedative, Hypnotic, or Anxiolytic Related Disorders	F13	\$41	\$458	\$461	\$419	\$365
Cocaine Related Disorders	F14	\$72	\$69	\$58	\$54	\$45
Other Stimulant Related Disorders	F15	\$69	\$190	\$183	\$166	\$147
Hallucinogen Related Disorders	F16	\$97	\$212	\$211	\$181	\$180
Nicotine Dependence	F17	\$7	\$10	\$8	\$7	\$3
Inhalant Related Disorders	F18	\$5	\$2,542	\$3,104	\$3,681	\$3,914
Other Psychoactive Substance Related Disorders	F19	\$1	\$1	\$1	\$2	\$1
Fetal Alcohol Syndrome (Dysmorphic)	Q860	⁷	\$1	\$8	\$4	\$5

Note: Duplicates have been removed

The total derived medical spending cost was \$28.6B, which was adjusted to a 2019 value of \$30.0B accounting for inflation. A similar broader approach in which the top ten ICD-10 designations for a visit were scanned for substance abuse disorders brought the total adjusted estimated cost to \$56.1B (\$58.8 for 2019).

Outpatient Emergency Visits

Table 1.2: Emergency Visits Total Charge - Cost-to-Charge Ratio Adjusted (Weighted), in \$ M (2017)

ICD-10	Total	CCR Adjustment	DX 1	DX 2	DX 3	DX 4	DX 5
F1X	Medicare	26%	\$236	\$629	\$654	\$606	\$533
	Medicaid	28%	\$670	\$1,890	\$1,434	\$1,040	\$742
	Private Insurance	26%	\$383	\$1,438	\$1,150	\$852	\$593
	Self-Pay	23%	\$421	\$1,210	\$947	\$627	\$394
	No Charge	22%	\$26	\$71	\$61	\$41	\$27
	Other	25%	\$66	\$209	\$170	\$129	\$96
	(blank)	26%	\$5	\$11	\$9	\$8	\$6

*Excluded fetal alcohol syndrome due to small sample size

The NEDS data does not come with a cost-to-charge ratio file. Instead, we calculated the charge-to-charge ratio for substance abuse disorders and fetal alcohol syndrome, by payer, based on the NIS sample and applied it to

⁷ Sample size too small

the total weighted Emergency Department (ED) charges. The total cost of ED visits with substance abuse disorders as one of the first five listed diagnoses was \$17.4 B in 2017, adjusted to \$18.3 B for 2019.

The NEDS data also breaks out the inpatient charges due to ED admissions. We found that the inpatient cost for patients admitted from the ED due to substance abuse disorder was \$23.3 B (78% of total inpatient costs due to substance abuse disorder).

There are drawbacks to using the cost-to-charge ratio and a weighted sample to represent a nationwide view of payment totals for substance abuse disorders, however, using unadjusted total charges would substantially overestimate actual payments, due to the gap between published prices and realized payments; furthermore, an unweighted sample would underrepresent the total across the United States.

Other Costs

Ambulance

Using the Health Care Cost Institute's 2017 Health Care Cost and Utilization Report we were able to estimate the total volume of ambulance rides in 2019.

Table 1.3: Estimated Number of Ambulance Rides

Annual Utilization per 1000 People Adjusted for Service-Mix Intensity (2017)	2019 BLS Annual Estimate of US Resident Population (2019)	Implied Number of US Ambulance Rides, 2019
49.9	328,239,523	16,379,152

A Marwood Group market study on Ground Ambulance services indicated that Medicare is about 37% of the payer mix and Commercial is 17%. We applied this ratio to the US resident population to calculate the weighted cost of an ambulance ride based on the CMS Medicare average payment for 2019 and the Health Care Cost Institute's average payment for an ambulance ride adjusted to 2019.

Table 1.4: Total Spend on Ambulance Rides

	Medicare (CMS)	Commercial (Health Care Cost Institute)	Weighted Average	Total Spend 2019 (\$M)
Average Payment Per Ride	\$445	\$767	\$546	\$8,950
Ratio of Rides	69%	31%		

After reviewing multiple studies, we applied the low end 40% attribution rate from Johns Hopkins University⁸ to drugs or alcohol yielding an estimated cost of substance abuse disorders associated ambulance rides to be \$3.6B; including government and commercial payers. Other studies indicated a wide range of attribution rates:

Source	% EMS calls
Brown University (2005) ⁹	23% due to alcohol and substance abuse
South Korea, Van Dillen, Kim (2017) ¹⁰	43% intoxicated
State of CT Dept of Public Health (2016) ¹¹	7% one or more indicators of possible toxicity
UK Institute of Alcohol Studies (2015) ¹²	35% alcohol-related ambulance journeys
Denver Health Paramedic Division (2012-2014) ¹³	30% alcohol consumption, 29% alcohol as a contributing factor
North East Ambulance Service, England (2003-2010) ¹⁴	10% calls were alcohol related
Zurich, Switzerland (2012, 10 year) ¹⁵	73% alcohol use present
England and Scotland (2014-2015) ¹⁶	20.15% alcohol related, 1.04% drug related

⁸ <https://hub.jhu.edu/gazette/2014/september-october/focus-baltimore-city-ems/>

⁹ <https://www.browndailyherald.com/2005/02/24/23-of-ems-calls-alcoholrelated/>

¹⁰ <https://doi.org/10.1177/0300060517718116>

¹¹ <https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/ems/pdf/CEMSTARS/2016EMSAAnnualDataReportpublic.pdf?la=en>

¹² http://www.ias.org.uk/uploads/Alcohols_impact_on_emergency_services_full_report.pdf

¹³ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6360267/>

¹⁴ <https://www.ncbi.nlm.nih.gov/pubmed/22262506/>

¹⁵ <https://www.ncbi.nlm.nih.gov/pubmed/22838502/>

¹⁶ <https://sjtrem.biomedcentral.com/articles/10.1186/s13049-019-0611-9/tables/1>

Prescription Drugs

The US Substance Abuse and Mental Health Services Administration (SAMHSA)'s *Projections Of National Expenditures For Treatment Of Mental And Substance Abuse Disorders, 2010-2020* predicted SUD spending would grow to \$42.1B in 2020, increasing at an average of 5.8% percent annually for all-health spending and 5.1% for SUD treatment spending; one reason for the slower M/SUD treatment cost growth is the large number of prescription drugs lost their patent protections in that period of time.

Table 1.5: Distribution of Substance Abuse Disorder Spending by Provider Type

Provider Type	Projected 2020	Calculated Spend (\$M)
Insurance Administration	7%	\$2,940
Retail Prescription Drugs	4%	\$1,680
Specialty SA Centers	33%	\$13,860
Specialty MH Centers	4%	\$1,680
Long Term Care	<3%	
Office Based Professionals	19%	\$7,980
Hospitals	30%	\$12,600
Total SUD Spending	\$42 B	

The total projected spend on retail prescription drugs is \$1.68 B. Since this report was published in October 2014 the projections may be outdated. Another study from August 2014 estimated that the amount of retail prescription drugs treatment spending for substance abuse disorders would reach \$1.8 B in 2020.¹⁷

Nursing Homes

Table 1.6: Total Spend on Nursing Homes due to Substance Abuse Disorder

CMS Projected 2019 Spend (\$M)	Attribution %	Total Spend (\$M)
\$175,100	0.92%	\$1,616

We used the projected total national expenditure on Nursing Care Facilities and Continuing Care Retirement Communities from CMS' National Healthcare Expenditure Projections data. The attribution rate due to substance abuse disorder was calculated from the NIS 2017 dataset. We divided the weighted number of visits that had substance abuse disorder as a primary diagnosis and were discharged to a nursing facility by the weighted number of visits that were discharged to a nursing facility to obtain a 0.92% attribution rate. This is conservative given that as many as 49% of patients in nursing homes may have a history of an alcohol abuse problem.^{18,19}

Primary Care Spending

We applied the annual utilization per people for outpatient visits from the Health Care Cost Institute to the US Census estimate of the US adult population to get the estimated number of outpatient visits in the US. Using the 2016 National Ambulatory Medical Care Survey from the CDC, we calculated that 54.5% of all US physician office visits were primary care visits.

Table 1.7: Estimated Number of PCP Visits

Annual Utilization per 1000 People Adjusted for Service-Mix Intensity (2017)	2019 US Census Annual Estimate of Resident Population 18 years + (2019)	Estimated Number of Adult Outpatient Visits in the US in 2019	Estimated Number of Primary Care Visits in the US in 2019
362.86	254,713,870	92,425,475	27,452,677

We then obtained the average of the highest and lowest paying primary care visits from CMS and the Health Care Cost Institute and applied that to the total number of visits in the US to estimate primary care spending. A 2017 study indicated that 36.0% met criteria for any 12-month SUD (14.2% mild disorder, 21.8%

¹⁷ <https://www.healthaffairs.org/doi/pdf/10.1377/hlthaff.2014.0163>

¹⁸ https://www.tandfonline.com/doi/abs/10.1300/J020v25n03_07

¹⁹ <https://www.aging.com/alcohol-abuse-amongst-the-elderly-a-complete-guide/>

moderate/severe disorder) and 13.9% was due to alcohol and 14.0% was due to “any drug use,”²⁰ therefore we applied those as our attribution rates for substance abuse disorder. The study included 2,000 adults from primary care practices between 2014-2015. Their study defined SUD as meeting ≥ 2 DSM criteria for a given substance; mild SUD was defined as meeting 2–3 criteria; and moderate/severe SUD was defined as meeting ≥ 4 criteria.

Table 1.8: Total Spend on PCP Visits due to Substance Abuse Disorder

Type of Primary Care Visit	Medicare (CMS)	Commercial (HCCI)	Average Payment per Visit	Total Spend on Primary Care Visits (\$M)	Attribution Rate due to Drug or Alcohol Abuse	Total Cost of PCP Visits Due to SUD (\$M)
Office Visit Primary Doctor New Patient High Complexity	\$211	\$232	\$143	\$3,933	27.9%	\$1,097
Office Visit Primary Care Doctor Established Patient Low Complexity	\$90	\$49				
Medicare/Commercial Weighted	29%	71%				

Other Non-Durable Goods

Table 1.9: Total Spend on Non-Durable Goods due to Substance Abuse Disorder

CMS Projected 2019 Spend (\$M)	Attribution %	Total Spend (\$M)
\$69,500	1%	\$698

We used the projected total national expenditure on Non-Durable Goods from CMS’ National Healthcare Expenditure Projections data. We used Lewin’s (2006) methodology and estimated the share of all ambulatory visits attributed to alcohol and applied it to the total projected spend to get the cost due to substance abuse disorder. To calculate the proportion of substance abuse disorder related visits, we used SAMSHA’s Projections for Office Based Professionals and divided by the CMS’ National Projected Health Expenditure for 2020 on Physician and Clinician Services, finding an attribution rate of 1.0%.

Other Health Professionals

Using the May 2018 BLS data for substance abuse disorder related jobs (for non-nurses and physicians), we multiplied the number of substance abuse and mental health counselors and social workers by their annual wage to obtain total cost and then adjusted the number for inflation to arrive at a 2019 estimate.

Table 1.10: Total Cost of Other Health Professionals Related to Substance Abuse Disorder

Substance Abuse Disorder Related Occupations	# Employed	Annual wage	Total Cost, Inflated to 2019 (\$M)	% Attributed to SUD	Total Cost Related to SUD (\$M)
Substance Abuse, Behavioral Disorder, and Mental Health Counselors	267,730	\$47,920	\$13,192	20.1%	\$2,656
Mental Health and Substance Abuse Social Workers	116,750	\$49,630	\$5,958		\$1,199
Total					\$3,855

We calculated the attribution percentage of exclusive substance abuse disorder services using SAMSHA’s National Survey on Drug Use and Health (2018) by summing the number of people that received “mental health services, but not [related to] substance abuse” at a specialty facility to the number of people that received “both substance abuse and mental health services” and then divided by the total number of people that received substance abuse treatment or mental health services.

Specialty Diseases

²⁰ <https://www.sciencedirect.com/science/article/pii/S0376871617303277#bib0105>

Hepatitis C Treatment

Using the number of estimated acute Hepatitis C cases from previous years, we applied 2016-17 growth rate to estimate the 2019 number of Hepatitis C cases.

We multiplied by the average treatment cost for HCV and divided the number of reported cases to the CDC (2017) that had the potential risk behavior of injection drug use to obtain an attribution for intravenous drug use.

Table 1.11: Total Cost of HCV treatment due to Drug Use

Number of Acute HCV	Estimated Total HCV treatment cost	Attribution due to Injection Drugs	Total Cost due to Drugs (\$M)
54,891	\$95,000	33.2%	\$1,733

Antiretroviral Treatment (ART) for HIV

According to the CDC there were ~1.1M HIV-positive people in the US, of whom 14% do not know they are positive. Approximately thirty-nine thousand were newly diagnosed with HIV in 2017, and ~38k in 2018. We applied a decreasing volume to estimate the number that may receive a diagnosis in 2019.

Table 1.12: Total Number of People with a HIV diagnosis

Number of HIV Positive in the US (2016, CDC)	# that knows HIV Positive	# of People Receiving New Diagnosis (2017)	# of People Receiving New Diagnosis (2018)	Calculated # of People Receiving New Diagnosis (2019)	Total Number of People with Diagnosis (2019)
1,100,000	946,000	38,739	37,832	36,946	1,059,517

We applied the percentage of those using ART to calculate the number of US ART treatments and multiplied by an average of the whole sale acquisition cost per month and applied the proportion of new HIV diagnoses due to injection drug abuse.²¹

Table 1.13: Total Cost of Antiretroviral Treatment due to Drug Use

% of People in North America and Western Europe Accessing ART ²²	Number Antiretroviral Treatment (ART) in the US	Wholesale Acquisition Cost (monthly) (2019) ²³	Attribution due to Injecting Drugs (2018) ²⁴	Annual Cost due to Drugs (\$M)
79.0%	837,019	\$20,898	7%	\$1,224

Mental Health Treatment for Major Depressive Disorder, Generalized Anxiety Disorder, Post Traumatic Stress Disorder, and Insomnia

Major depressive disorder (MDD), generalized anxiety disorder (GAD), post traumatic stress disorder (PTSD), and chronic insomnia have high rates of comorbidities with each other and substance abuse disorder.

To calculate the MDD costs due to substance abuse we started by using 2019 Census data to get the total US population that is over the age of 18. According to SAMSHA's 2018 National Survey on Drug Use and Health (NSDUH) 7.2% of adults aged 18 or older had at least one major depressive episode (MDE) in the past year and 64.8% of adults who had a past year MDE received treatment for depression. According to the Anxiety and Depression Association of America, the median age at onset is 32.5 years old. In addition, 177,000 out of 379,000 survey respondents (46.7%) had an MDE and substance use disorder (using illicit drugs or alcohol) resulting in 5.6 M people that had an MDE and substance use disorder and received treatment in the past year.

²¹ <https://www.cdc.gov/hiv/basics/statistics.html>

²² https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf

²³ <https://aidsinfo.nih.gov/guidelines/html/1/adult-and-adolescent-arv/459/cost-considerations-and-antiretroviral-therapy>

²⁴ <https://www.cdc.gov/hiv/statistics/overview/ataglance.html>

Using the same NSDUH data set, we subtracted the number of people that received treatment for mental health and substance abuse disorder at a specialty facility or inpatient setting after allocating the number attributable to MDD, GAD, and PTSD by the percent receiving treatment and percent attributable to substance abuse so that we would not double count with the specialty treatment or inpatient cost calculations from the other sections.

Table 1.14: Number Received Services in a Substance Abuse Treatment Specialty Facility or Inpatient Setting

Number Received Services in a Substance Abuse Specialty Facility or Inpatient Setting	
Received substance abuse treatment at a specialty facility and mental health services	645,000
Received mental health services in an inpatient setting	1,580,000
Major Depressive Disorder (MDD)	673,347
Generalized Anxiety Disorder (GAD)	192,240
Post Traumatic Stress Disorder (PTSD)	516,200

A study in the Journal of Clinical Psychiatry (2018) using data from OptumHealth Care solutions (July 2009-March 2015), estimated that 16% of those with major depression had a treatment resistant form of the disorder and do not respond to two or more antidepressants. They estimated that the cost of mental health related care to be \$5,325 for treatment resistant depression per person per year and \$2,019 for non treatment resistant depression per person per year. Inflating that to 2019 dollars, we were able to calculate the direct mental health-related cost of major depressive disorder to be \$14.0 B per year.

Table 1.15: Total Cost of Treatment of Major Depressive Disorder due to Substance Abuse Disorder

Total Cost of MDD due to Substance Abuse disorder (2019)			
US population over 18 (2019)		255,405,918	
% with MDD		7.2%	
US population over 18 with MDD		18,389,226	
% received treatment		64.8%	
% attributable to substance abuse disorder		46.7%	
Population receiving treatment and attributable to substance abuse disorder		5,565,094	
Population received mental health and SUD treatment at a specialty facility or inpatient setting		673,347	
Population receiving treatment and attributable to substance abuse disorder not in a specialty facility or inpatient setting		4,891,747	
% with Treatment Resistant MDD	16%	% with non Treatment Resistant MDD	84%
Number of People with Treatment Resistant MDD	782,680	Number of People with non Treatment Resistant MDD	4,109,067
Direct Costs of Mental Health Treatment Resistant MDD Per Person Per Year	\$5,964	Direct Costs of Mental Health MDD Per Person Per Year	\$2,261
Total cost of MDD attributable to substance abuse disorder (\$M)		\$13,960	

According to the Anxiety and Depression Association of America 18.1% of adults have anxiety and only 36.9% receive treatment. Generalized Anxiety Disorder affects 3.1% of the US population and yet only 43.2% are receiving treatment. GAD often co-occurs with major depression. For patients with generalized anxiety disorder (GAD), the lifetime prevalence of comorbid alcohol abuse and dependence is 30% to 35%, and the prevalence of drug abuse and dependence is 25% to 30%.²⁵ Approximately 17.7% of respondents with a SUD in the past 12 months also met criteria for an independent (i.e., not attributed to withdrawal or intoxication) anxiety disorder, and 15% of those with any anxiety disorder in the past 12 months had at least one co-occurring SUD.²⁶ Therefore, we used 20% to approximate the cost of generalized anxiety disorder due to substance abuse disorder. We then removed the number that received mental health and substance abuse disorder treatment in a specialty facility or inpatient setting to avoid double counting. A 2005 study using data from MarketScan Databases estimated that GAD was associated with an \$2,138 increase in total medical costs

²⁵ <https://www.psychiatrytimes.com/anxiety/anxiety-disorders-comorbid-substance-abuse>

²⁶ Brady, K. T., Haynes, L. F., Hartwell, K. J., & Killeen, T. K. (2013). Substance use disorders and anxiety: a treatment challenge for social workers. *Social work in public health, 28*(3-4), 407-423. <https://doi.org/10.1080/19371918.2013.774675>

(including inpatient, outpatient, and prescription drugs).²⁷ Inflating this to 2019 dollars, we calculated that the total cost of treatment of GAD due to substance abuse disorder is \$4.6 B.

Table 1.16: Total Cost of Treatment of Generalized Anxiety Disorder due to Substance Abuse Disorder

Total Cost of Generalized Anxiety Disorder due to Substance Abuse Disorder (2019)	
US population over 18	255,405,918
% with Generalized Anxiety Disorder	3.1%
US population over 18 with GAD	7,917,583
% receive treatment	43%
% attributable to substance abuse disorder	20%
Number of adults attributable to substance abuse and received treatment	1,583,517
Received treatment in specialty facility or inpatient setting	192,240
Population receiving treatment and attributable to substance abuse disorder not in a specialty facility or inpatient setting	1,391,277
Cost of treatment	\$3,293
Total cost of GAD due to substance abuse disorder (\$M)	\$4,581

According to the Anxiety and Depression Association of America, 3.5% of the US adult population has PTSD. The VA indicated that 7-8% of the population will have PTSD at some point in their lives. Since 50% of those with PTSD will never reach out for professional help, we assume 50% will receive treatment.²⁸ A 2010 study using the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions data showed that 46.4% of full PTSD respondents also met the criteria for any alcohol or drug use disorder. In one study of veterans, 63% of those who met the diagnostic criteria for alcohol use disorders (AUDs) or drug use disorders had co-occurring PTSD, while the PTSD prevalence among those who met criteria for both AUDs and drug use disorders (e.g., alcohol dependence and cocaine abuse) was 76%. Estimates for the average cost of PTSD per patient ranged from \$4,520 (Department of Defense, 2012) to \$8,300 (Congressional Budget Office, 2009). The average cost per patient for PTSD specific care only was \$4,100 for the first year and then went down after that. We inflated the figure to 2019 numbers to get a total of \$8.0 B for the cost of PTSD treatment due to substance abuse disorder.

Table 1.17: Total Cost of Treatment of PTSD due to Substance Abuse Disorder

Total Cost of PTSD due to Substance Abuse Disorder (2019)	
US Population over 18	255,405,918
% with PTSD	3.5%
US Population over 18 with PTSD	8,939,207
% received treatment	50%
% attributable to substance abuse disorder	46%
Number of adults attributable to substance abuse and received treatment	2,073,896
Received treatment in inpatient setting or specialty treatment facility	516,200
Population receiving treatment and attributable to substance abuse disorder not in a specialty facility or inpatient setting	1,557,696
Cost of treatment	\$5,125
Total cost of PTSD treatment attributable to substance abuse disorder (\$M)	\$7,983

According to the American Academy of Sleep Medicine, about 30% of adults have symptoms of insomnia, 10% have insomnia that is severe enough to cause daytime consequences, and less than 10% of adults are likely to have chronic insomnia. Approximately 3% of the population has insomnia symptoms that are caused by a medical or psychiatric condition (including drug or substance, medical condition, or mental disorder). The Addiction Center states that according to the CDC, about half the people that suffer from sleep disorders regularly abuse alcohol and/or narcotic drugs do so in order to enhance sleep. Another study showed that 28% of insomniacs reporting using alcohol to help them sleep. There is a risk of abuse and dependence of benzodiazepines and nonbenzodiazepines especially with patients with anxiety disorder and a history of alcohol or drug abuse. Ramelteon, low-dose sinequan, and cognitive behavioral therapy (CBT-I) are alternative treatments that have minimal adverse effects and no risk of abuse.²⁹ The cost of treatment was estimated by

²⁷ Marciniak, Martin & Lage, Maureen & Dunayevich, Eduardo & Russell, James & Bowman, Lee & Landbloom, Ronald & Levine, Louise. (2005). *The cost of treating anxiety: The medical and demographic correlates that impact total medical costs. Depression and anxiety. 21. 178-84. 10.1002/da.20074.*

²⁸ <http://www.ptsdalliance.org/about-ptsd/>

²⁹ <https://www.psychiatrytimes.com/sleep-disorders/treatment-insomnia-anxiety-disorders>

using the mean of one study's estimated Medicare cost for therapy (2016) which was \$449 and the cost from a 2011 post from the American Academy of Sleep Medicine indicating that the average cost of treating insomnia ranges from about \$200 a year for a generic sleeping pill to up to \$1,200 for behavioral therapy. The total cost of treatment of insomnia due to substance abuse disorder was \$3.7 B.

Table 1.18: Total Cost of Treatment of Insomnia due to Substance Abuse Disorder

Total Cost of Insomnia due to Substance Abuse Disorder (2019)	
US Population over 18	255,405,918
% with insomnia symptoms due to medical or psychiatric condition	3%
US Population over 18 with insomnia	7,662,178
% attributable to substance abuse disorder	50%
Number of adults attributable to substance abuse and received treatment	3,831,089
Cost of treatment	\$974
Total cost of insomnia treatment attributable to substance abuse disorder (\$M)	\$3,733

As stated earlier, major depressive disorder, general anxiety disorder, PTSD, and insomnia are highly comorbid with each other and substance abuse. For example, nearly 50% of all people diagnosed with depression are also diagnosed with anxiety disorder. One more recent Medical University of Vienna study indicated a 10.8% comorbid prevalence³⁰.

Nearly 70-87% of individuals with PTSD experience insomnia. It is estimated that up to 80% of PTSD patients have a comorbid disorder, with the most common comorbidities being depression, anxiety, alcohol addiction, and substance abuse.³¹ "Difficulty sleeping" was reported by up to 90% of individuals with PTSD application of DSM-5 criteria for insomnia suggest a range of 35-61%.³²

To help adjust for double counting, we added the cost of MDD and GAD and reduced it by 20% and added the cost of PTSD and insomnia and reduced it by 60%. Therefore, the total cost of treatment of mental health due to substance abuse disorder is \$19.5 B.

Table 1.19: Total Cost of Treatment of Mental Health due to Substance Abuse Disorder

Total Cost of Treatment of Mental Health due to Substance Abuse Disorder (2019)				
	MDD	GAD	PTSD	Insomnia
Total cost (\$M)	\$13,960	\$4,581	\$7,983	\$3,733
Double counting adjustment	20%		60%	
Total cost of treatment of mental health (\$M)	\$19,519			

Hypertension

The cost for treatment of hypertension due to substance abuse disorder was calculated using the US Census population for adults over 20 years old. The CDC showed that around 30-31% percent of the US population over 20 years old has hypertension since about 2000-2016. The US Department of Health and Human Services used the National Health and Nutrition Examination Survey from 2013-2016 to show that 81% of those with hypertension were recommended to implement life style modifications plus medication and not just life style modifications. A 2004 article published in Hypertension, stated that even low estimates of 5% or 7% of HTN attributable to alcohol imply that there are more patients with HTN caused by alcohol than by conventional causes of remediable secondary HTN. Another article published in 2013 in the Journal of Clinical Hypertension, stated that 16% of hypertensive disease is attributable to alcohol consumption. The rate of hypertension due to drug abuse was not considered for this analysis since it is generally more acute episodes and likely capture in the inpatient or outpatient emergency visit calculations. The 2018 study "Trends in Healthcare Expenditures Among US Adults with Hypertension: National Estimates, 2003-2014" uses the Medical Expenditure Panel Survey, to calculate the estimated annual healthcare expenditure for patients with hypertension and to measure trends in expenditure longitudinally over a 12-year period. The incremental cost associated with hypertension was \$2,000 and remained steady from 2003-2014, therefore we just inflated the cost to 2019.

³⁰ <https://www.ecnp.eu/presentationpdfs/71/P.2.b.026.pdf>

³¹ <https://www.pharmaceutical-technology.com/comment/ptsd-and-comorbidity/>

³² Colvonen, P.J., Straus, L.D., Stepnowsky, C. et al. Recent Advancements in Treating Sleep Disorders in Co-Occurring PTSD. *Curr Psychiatry Rep* 20, 48 (2018). <https://doi.org/10.1007/s11920-018-0916-9>

Table 1.20: Total Cost of Treatment of Hypertension due to Substance Abuse Disorder

Total Cost of Hypertension due to Substance Abuse Disorder (2019)	
US Population over 20	246,749,764
% of US age 20+ with hypertension	31%
US Population over 18 with hypertension	75,266,795
Recommended intervention type: life style modification plus medication	81%
% attributable to alcohol	5%
Cost per person	\$2,300
Cost of hypertension treatment due to substance abuse (\$M)	\$7,011

Specialty SUD Treatment*Community Based Specialty Treatment***Table 1.21: Total Cost of Community Based Specialty Treatment due to Substance Abuse Disorder**

	# of Treatments by Type of Service (2018)	Average Length of Stay	Average Cost Per Day	Total Cost (\$M)
Outpatient	1,799,410	78.0	\$91	\$12,707
Intensive outpatient	622,940	42.0	\$300	\$7,849
Short-term residential	435,889	20.0	\$650	\$5,667
Long-term residential	399,636	39.0	\$650	\$10,131
Hospital residential	11,119	22.0	\$650	\$159
Outpatient med assisted therapy (outpatient and intensive outpatient medication assisted opioid therapy was planned)	405,334	90.0	\$13	\$470
Detoxification	922,672	4.1	\$667	\$295
Total	4,597,000 ³³			\$38,975

We did not use the National Survey of Substance Abuse Treatment Service (N-SSATS) to determine the number of facilities by type in the US in 2018 because it no longer provides the median population by facility type. Instead, we used the total number of people that received treatment in specialty facilities (4,597,000) in 2018 from NSUDH at each type of location because respondents could indicate multiple locations of treatment in that survey, so it was a better proxy of total number of treatments.

We applied the percent of each treatment type from the TEDS 2017 discharges distribution³⁴ to get the breakdown of the total number of treatments at specialty facilities by type of treatment service. We found the average length of stay and calculated average costs of per day using a variety of sources. We made sure to check that the value used was in within range or lower than multiple sources to make sure that we were still conservative in our estimates.

- Outpatient: *The average cost per day was from a Marwood analysis conducted in 2014 where we applied the historical 2% CAGR from the same report.*
- Intensive outpatient: *We used the average of the range provided by the American Addiction Centers.*
- Short term and long term residential: *We used the average of the range provided by the American Addiction Centers for 28 and 30 day drug and alcohol rehab and then estimated the cost per day.*
- Hospital residential: *We used the American Addiction Centers value for inpatient residential and selected the high end of the range given the higher estimates from other sources, including the 2014 Marwood analysis.*
- Outpatient med assisted therapy: *This estimate was from the Addiction Center based on a one year long methadone treatment was \$4,700.*

³³ NSDUH (2018), Table 5.27A Locations Received Substance Use Treatment in Past Year among Persons Aged 12 or Older Who Received Substance Use Treatment at a Specialty Facility in Past Year, by Age Group

³⁴ TEDS (2017), Table 5.1. Discharges aged 12 years and older, by reason for discharge and type of treatment service: Number, median length of stay (LOS)

- Detoxification: Sources did not specify the detoxification costs broken down into detoxification and medication assisted opioid detoxification (methadone, buprenorphine, naltrexone). Therefore, we used a blended rate in the range of the detoxification costs.

We then multiplied the number of people that received treatment at specialty facilities by the average length of stay and average cost per day to get the total community-based specialty treatment costs due to substance abuse disorder.

The total cost was \$39.0 B and the average cost per specialty community-based treatment was \$8,478

Federal Specialty Treatment Spending

The FY 2019 Budget and Performance Summary from the Office of National Drug Control Policy outlines the Federal Drug Control Funding by functional area. The funding for treatment allocated is \$7,167 M.

Treatment are activities conducted to assist users with their substance abuse and related health problems and include:

- Screening for controlled substances
- Interventions for drug use and SUDs
- Rehabilitation and recovery support
- Medical referral
- Drug courts and other community corrections programs that utilize drug testing and swift and certain sanctions to deter future drug use and treat chronic reoccurrence of drug use and SUDs
- Relapse prevention
- Re-entry support for ex-offenders that includes, but is not limited to housing, education, employment and substance and mental health (MH) abuse treatment
- International health care, research, rehabilitation, and interventions for SUD
- All other service programs intended to ease the health-related consequences of drug use and SUDs

Table 1.22: FY 2019 Federal Drug Control Funding for Treatment

Department	Division	2019 Spend (\$M)*
Department of Agriculture	Office of Rural Development	\$25
DC Court Services and Offender Supervision Agency	All	\$31
Department of Defense	Defense Health Program	\$101
Federal Judiciary	All	\$162
Department of Health and Human Services	Centers for Medicare & Medicaid Services ³⁵	
Department of Health and Human Services	Health Resources and Services Administration	\$553
Department of Health and Human Services	National Institute of Health	\$876
Department of Health and Human Services	Indian Health Service	\$90
Department of Health and Human Services	Substance Abuse and Mental Health Services Administration	\$3,540
Department of Housing and Urban Development	Office of Community Planning and Development	\$555
Department of Justice	Bureau of Prisons	\$118
Department of Justice	Drug Enforcement Administration	\$0
Department of Justice	Office of Justice Programs	\$313
Office of National Drug Control Policy	High Intensity Drug Trafficking Areas	\$4
Office of National Drug Control Policy	Other Federal Drug Control Programs	\$2
Office of National Drug Control Policy	Salaries and Expenses	\$3
Department of Transportation	National Highway Traffic Safety Administration	\$1
Department of Veterans Affairs	Veteran's Health Administration	\$794
Total Spend on Treatment		\$7,167

*"Research and Development: Treatment" was included, but "Research and Development: Prevention" was classified in "Prevention"

³⁵ Removed for double counting. The estimates for the Centers for Medicare & Medicaid Services reflect Medicaid and Medicare benefit outlays for substance abuse treatment; they do not reflect budget authority so removed due to double counting

Health Insurance Administration

Table 1.23: Total Cost of Health Insurance Administration due to Substance Abuse Disorder

Category	
Total Medical Services Cost (\$M)	\$53,276
Overhead premium adjustment	6%
Cost of Health Insurance (\$M)	\$3,197

Insurance administration costs are not included in the costs of care identified above, and they typically amount on average to 6% overhead on medical services, according to NDIC (2011). We applied this factor to the total cost of inpatient and ED visits due to substance abuse disorders, a conservative approach since we did not include other settings or types of medical services.

Crime Victim Health Care Costs

Table 1.24: Total Medical Costs of Crime Victims due to Substance Abuse Disorder

Category	Violent Crime	Property Crime
# of events	6,385,520	13,502,840
Medical Costs Per Event	\$48	\$0
Total Medical Costs (\$M)	\$308	\$0
Attribution	12%	31%
Total Medical Costs due to Drugs (\$M)	\$37	\$0

The number of violent crimes and property crimes were obtained from the Crime Victimization report (2018) from the US Bureau of Justice Statistics, and the estimated associated medical cost per event was adjusted from the figures in the 2011 NDIC report.

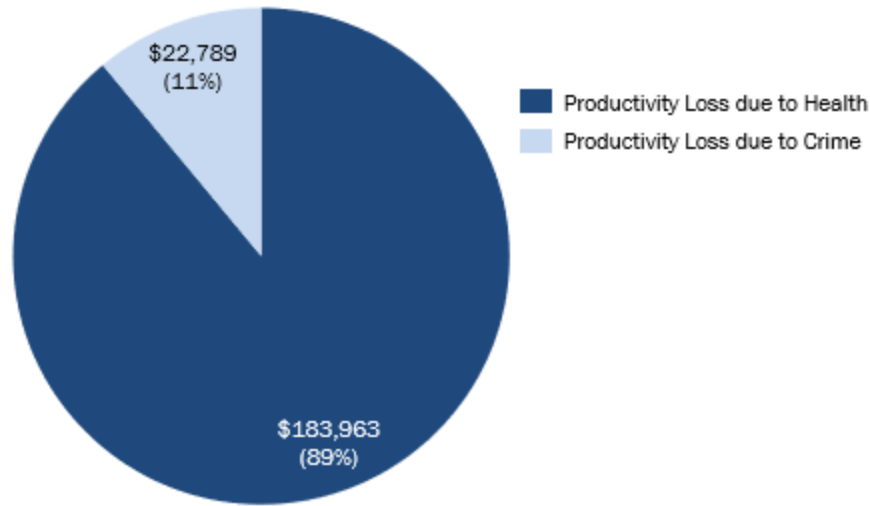
D. INDIRECT TANGIBLE COSTS

II. Productivity Loss



Summary

The indirect productivity loss costs associated with substance abuse disorders total \$206.8 B annually, mainly driven by premature death. Incarceration and absenteeism, followed by the costs of diminished productivity and victims of crime, are also contributing factors.



Categories	Cost (\$M)	Adjustment for Double Counting	%
Productivity Loss due to Health	\$210,225	\$183,963	89.0%
Premature death (Mortality)	\$179,186	\$156,801	75.8%
Morbidity - Absenteeism	\$17,124	\$14,984	7.2%
SUD treatment -Institutionalization/Hospitalization	\$16,865	\$14,758	7.1%
Medical conditions- Institutionalization/Hospitalization	\$258	\$226	0.1%
Morbidity - Diminished productivity	\$13,916	\$12,178	5.9%
Productivity Loss due to Crime	\$26,043	\$22,789	11.0%
Incarceration	\$26,042	\$22,789	11.0%
Victims of Crime	\$0.3	\$0.3	0.0%
Total	\$236,268	\$206,753	100.0%

Methodology and Analysis

We replicated Grosse's 2009 methodology to calculate market and household productivity by age and sex.³⁶

Table 2.1: Daily Production of the US Noninstitutional Population (2019)

	Average Daily Hours Working at a Job (2018) ³⁷	Usual Hourly Compensation (2019) ³⁸	Daily Market Compensation	Average Daily Hours of Household Service (2018)	Household Service Daily Value	Daily Production (hours)	Daily Production Value
<i>Males</i>							
15 to 19 years	1.24	\$16.38	\$20.31	0.73	\$11.64	1.97	\$31.96
20 to 24 years	3.75	\$20.27	\$76.02	0.69	\$11.01	4.44	\$87.02
25 to 34 years	5.88	\$29.08	\$170.98	1.07	\$17.07	6.95	\$188.05
35 to 44 years	6.05	\$37.19	\$225.00	1.28	\$20.42	7.33	\$245.42
45 to 54 years	5.67	\$37.89	\$214.85	1.34	\$21.37	7.01	\$236.22
55 to 64 years	4.18	\$37.87	\$158.31	1.78	\$28.39	5.96	\$186.70
65 to 74 years	1.29	\$34.35	\$44.31	2.03	\$32.38	3.32	\$76.70
75 years and over	0.71	\$34.35	\$24.39	1.89	\$30.15	2.60	\$54.54
<i>Females</i>							
15 to 19 years	1.2	\$13.95	\$16.74	0.94	\$14.99	2.14	\$31.74
20 to 24 years	3.29	\$18.20	\$59.87	1.56	\$24.88	4.85	\$84.76
25 to 34 years	4.16	\$25.58	\$106.43	1.99	\$31.74	6.15	\$138.17

³⁶ Med Care 2009;47: S94-S103

³⁷ <https://www.bls.gov/charts/american-time-use/activity-by-agem.htm>

³⁸ <https://www.bls.gov/bls/news-release/wkyeng.htm#2019>

35 to 44 years	4.15	\$29.79	\$123.64	2.3	\$36.69	6.45	\$160.33
45 to 54 years	4.22	\$29.29	\$123.59	2.31	\$36.85	6.53	\$160.43
55 to 64 years	3.43	\$28.58	\$98.04	2.4	\$38.28	5.83	\$136.33
65 to 74 years	0.85	\$27.19	\$23.12	2.82	\$44.98	3.67	\$68.10
75 years and over	0	\$27.19	\$0.00	2.32	\$37.01	2.32	\$37.01
All							
15 to 19 years	1.22	\$15.41	\$18.80	0.84	\$13.40	2.06	\$32.20
20 to 24 years	3.52	\$19.37	\$68.18	1.12	\$17.87	4.64	\$86.04
25 to 34 years	5.01	\$27.43	\$137.42	1.53	\$24.41	6.54	\$161.82
35 to 44 years	5.08	\$33.53	\$170.35	1.8	\$28.71	6.88	\$199.06
45 to 54 years	4.93	\$33.54	\$165.35	1.83	\$29.19	6.76	\$194.54
55 to 64 years	3.79	\$33.04	\$125.22	2.1	\$33.50	5.89	\$158.72
65 to 74 years	1.05	\$30.42	\$31.94	2.45	\$39.08	3.50	\$71.02
75 years and over	0.49	\$30.42	\$14.90	2.14	\$34.14	2.63	\$49.04

Daily Market Compensation: We used the Bureau of Labor Statistic’s American Time Use 2018 survey (BLS ATUS) to obtain the average hours per day spent on “working and work-related activities” and “household activities” for civilian noninstitutional populations by sex and age category. We obtained the compensation data from BLS’s Usual Weekly Earnings of Full-Time Wage and Salary Workers and averaged the 4 quarters from 2019 since the data was not seasonally adjusted and calculated the hourly rate. If the age categories did not match up, we rolled up the cost categories or applied the rate if it was within range of the category.

Household Service Daily Value: To calculate the household service daily value, we used the average hours per day spent on “household activities” from BLS. We calculated a mean hourly salary of \$14.81 (\$15.95 including an estimate for legally required benefits from the Employer Costs for Employee Compensation December 2019 report) to quantify the value of household activities by averaging the mean hourly wages of various paid occupations in the Occupational Employment and Wages (May 2019) database that had similar activities such as childcare worker, janitors, maids and housekeeping, passenger vehicle drivers, food preparation, landscaping, etc.

As noted in Grosse’s 2009 report, we could have added additional activities to measure economic productivity than just “working and work-related activities” and “household activities” such as “caring for and helping household and non-household members”, “purchasing goods and services”, “educational activities”, etc., but chose to take the more conservative approach given the argument that people with substance abuser disorders may be less economically productive than the average population.

Table 2.2: Daily Production of the US Total Population (2018/2019)

(Thousands)	Civilian Noninstitutional Population (2018)	Total Population (2018)	Total Group Quarters (2018)	US Military Group Quarters Population (2018)	US Nonmilitary Group Quarters Population (2018)	Per Person Annual Market Compensation of US Population	Per Person Annual Household Production Value of US Population	Per Person Annual Production Value of US Population
Males	161,118,151	160,966,380	4,927,790	303,828	3,880,091	\$7,314	\$4,117	\$11,431
15 to 24 years	22,094,421	21,247,562	2,123,877	251,569	1,534,227	\$26,294	\$3,627	\$29,922
25 to 34 years	22,980,929	22,374,327	625,829	45,270	675,496	\$60,672	\$6,053	\$66,725
35 to 44 years	20,691,045	20,442,730	473,068	5,469	533,773	\$80,068	\$7,284	\$87,352
45 to 54 years	20,520,290	20,442,730	384,368	911	358,866	\$77,073	\$7,658	\$84,731
55 to 64 years	20,395,960	20,764,663	349,873	304	237,849	\$57,117	\$10,189	\$67,305
65 to 74 years	14,277,428	14,969,873	271,028	-	153,540	\$16,003	\$11,599	\$27,602
75 years and over	9,013,470	10,784,747	650,468	-	357,359	\$8,563	\$10,263	\$18,826
Females	166,049,288	166,201,059	3,163,819	51,942	2,637,439	\$6,026	\$5,369	\$11,395
15 to 24 years	21,069,034	21,938,540	1,363,606	43,008	1,495,437	\$20,468	\$8,514	\$28,982
25 to 34 years	22,363,745	23,101,947	401,805	7,739	103,821	\$38,679	\$11,378	\$50,057
35 to 44 years	20,807,408	21,107,534	303,727	935	67,197	\$44,985	\$13,198	\$58,183
45 to 54 years	21,084,954	21,107,534	246,778	156	72,408	\$44,955	\$13,294	\$58,249
55 to 64 years	21,891,402	21,439,937	224,631	52	123,845	\$35,585	\$13,831	\$49,417
65 to 74 years	16,293,885	15,456,698	174,010	-	186,426	\$8,342	\$16,245	\$24,587

75 years and over	12,838,331	11,135,471	417,624	-	578,307	\$0	\$13,082	\$13,082
All	327,167,439	327,167,439	8,091,609	355,770		\$6,905	\$4,768	\$11,672
15 to 24 years	43,163,455	43,186,102	3,487,483	294,578		\$25,099	\$5,996	\$31,094
25 to 34 years	45,344,674	45,476,274	1,027,634	53,010		\$50,192	\$8,701	\$58,893
35 to 44 years	41,498,453	41,550,265	776,794	6,404		\$62,184	\$10,286	\$72,470
45 to 54 years	41,605,244	41,550,265	631,146	1,067		\$60,355	\$10,495	\$70,850
55 to 64 years	42,287,362	42,204,600	574,504	356		\$45,706	\$12,063	\$57,769
65 to 74 years	30,571,313	30,426,572	445,038	-		\$11,657	\$14,060	\$25,717
75 years and over	15,547,953	21,920,218	1,068,092	-		\$0	\$11,659	\$11,659

Per Person Annual Production Value of the US Population: In order to adjust for the total population, we used the US BLS American Community Survey (2018) to obtain the estimated population of noninstitutionalized civilians and the rest of the population that are in Group Quarters. Again, following the rationale in Grosse's 2009 report, we assumed that the population in juvenile facilities, adult correctional facilities, nursing facilities, and college/nursing were productive, but the costs of supervision and care may eliminate most of the benefits, so we excluded them in our productivity calculations. We also included the military population to add to the market compensation of the US population but did not add them to the household production value. Using the same ATUS and BLS data as in Table 2.2, we were able to calculate the Per Person Annual Production value of the US Population.

Table 2.3 Present Value of Lifetime Production and Market Production of the US Total Population, by Discount Rate, Gender, and Age (2018/2019)

Age Group	Market Productivity (3%)	Total Productivity (3%)
< 1 year	\$1,096,783	\$1,350,379
1-4 years	\$1,159,573	\$1,427,688
5-14 years	\$1,338,945	\$1,648,534
15-24 years	\$1,482,287	\$1,823,847
25-34 years	\$1,392,781	\$1,730,187
35-44 years	\$1,094,684	\$1,406,132
45-54 years	\$688,984	\$962,943
55-64 years	\$297,675	\$523,345
65-74 years	\$92,429	\$249,760
75-84 years	\$42,646	\$134,045
85+ years	\$20,938	\$65,811

Present Value of Lifetime Production and Market Production of the US Total Population: We utilized the Present Value of Lifetime Earnings (PVLE) formula found in the Max 2004 report.

$$PVLE_y = \sum_{n=y}^{100} P_y(n) * E(n) * (1 + p)^{n-y} / (1 + r)^{n-y}$$

PVLE_y – the present discounted value of lifetime earnings for a person of age y

y – the age of the person at present

n – the age of the person

P_y(n) – the probability that the person of age y will survive to age n

E(n) – the mean annual earnings or production value

p – the rate of increase of labor productivity

r – the discount rate

Using the annual market and total production value [E(n)] calculated in Table 2.3 and the probability of survival [P_y(n)] from CDC's Life Table (2017), we were able to estimate the present value of the lifetime production and market production. Using Grosse's (2009) guidance, we applied a 1% productivity increase assumption year over year and then applied a 3% discount to obtain the present value. To obtain the values for each age

bracket, we took the average PVLE of the endpoints and the middle age (Ex. the average PVLE for ages 5-14 was based on the PVLE of age 5, 10, and 14)

Productivity Loss due to Poor Health from Substance Abuse Disorder

Table 2.4 Premature Death (Mortality) in \$ M

	Premature death (Mortality) Year (2018)			Total Productivity	Loss to Society (using Total Value)		
	Drugs	Alcohol	Total	3%	Drugs	Alcohol	Total
< 1 year	41	2	42	\$1.4	\$54.7	\$2.0	\$56.7
1-4 years	40	-	40	\$1.4	\$56.4	\$0.0	\$56.4
5-14 years	60	3	63	\$1.6	\$98.9	\$4.9	\$103.9
15-24 years	5,011	537	5,548	\$1.8	\$9,139.3	\$979.4	\$10,118.7
25-34 years	17,995	3,293	21,287	\$1.7	\$31,133.8	\$5,696.6	\$36,830.5
35-44 years	19,427	6,333	25,760	\$1.4	\$27,316.9	\$8,904.3	\$36,221.3
45-54 years	26,237	12,744	38,981	\$1.0	\$25,264.3	\$12,271.7	\$37,536.0
55-64 years	46,820	19,193	66,013	\$0.5	\$24,503.0	\$10,044.6	\$34,547.6
65-74 years	51,239	10,257	61,495	\$0.2	\$12,797.3	\$2,561.7	\$15,359.0
75-84 years	45,634	3,060	48,694	\$0.1	\$6,116.9	\$410.2	\$6,527.1
85+ years	27,103	683	27,786	\$0.1	\$1,783.7	\$44.9	\$1,828.6
Not Stated	22	6	28	\$1.4	\$0	\$0	\$0
Total	239,626	56,109	295,735		\$138,265.3	\$40,920.4	\$179,185.7

Premature Death (Mortality): To calculate the cost of premature mortality due to substance abuse disorders, we pulled the total of deaths from the CDC Wonder data (2018) where alcohol or drugs were the underlying cause of death (UCD) or were among the multiple causes of death (MCD). We averaged the UCD and MCD total deaths due to drugs and the UCD and MCD total deaths due to alcohol and used our estimated lifetime productivity loss to calculate the loss to society due to the premature deaths. This value assumes that if the person did not die due to substance abuse disorders at that age, the individual would have lived a productive life until the average expected age.

Morbidity – Absenteeism (Institutionalization/Hospitalization)

Table 2.5: Productivity Loss Due To Substance Abuse Disorder Treatment

	% of Admissions	TEDS-A Admissions Per Day	TEDS-A LOS	Days In Care	Daily Production Value	Loss of Productivity due to Treatment (\$M)	
Male							
12-17 years	2.4%	48980	50.2	2,457,759	15 to 19 years	\$32	\$78.5
18-20 years	2.3%	45360	50.2	2,276,075	15 to 19 years	\$32	\$72.7
21 to 24 years	6.0%	120598	50.2	6,051,403	20 to 24 years	\$87	\$526.6
25 to 29 years	11.6%	233251	50.2	11,704,171	25 to 34 years	\$188	\$2,200.9
30 to 34 years	10.7%	214238	50.2	10,750,130	25 to 34 years	\$188	\$2,021.5
35 to 39 years	8.5%	171236	50.2	8,592,351	35 to 44 years	\$245	\$2,108.7
40 to 44 years	5.7%	114482	50.2	5,744,499	35 to 44 years	\$245	\$1,409.8
45 to 49 years	5.7%	114192	50.2	5,729,971	45 to 54 years	\$236	\$1,353.5
50 to 54 years	5.3%	105618	50.2	5,299,722	45 to 54 years	\$236	\$1,251.9
55 to 59 years	3.7%	75165	50.2	3,771,672	55 to 64 years	\$187	\$704.2
60 to 64 years	1.7%	34417	50.2	1,726,980	55 to 64 years	\$187	\$322.4
65 to 69 years	0.6%	11067	50.2	555,340	65 to 74 years	\$77	\$42.6
70 to 74 years	0.2%	3104	50.2	155,733	65 to 74 years	\$77	\$11.9
75 years and older	0.1%	1442	50.2	72,382	75 years and over	\$55	\$3.9

Subtotal							\$12,109.4
<i>Female</i>							
12-17 years	1.3%	26978	50.2	1,353,688	15 to 19 years	\$32	\$43.0
18-20 years	1.2%	24983	50.2	1,253,620	15 to 19 years	\$32	\$39.8
21 to 24 years	3.3%	66423	50.2	3,333,000	20 to 24 years	\$85	\$282.5
25 to 29 years	6.4%	128471	50.2	6,446,438	25 to 34 years	\$138	\$890.7
30 to 34 years	5.9%	117999	50.2	5,920,971	25 to 34 years	\$138	\$818.1
35 to 39 years	4.7%	94314	50.2	4,732,507	35 to 44 years	\$160	\$758.7
40 to 44 years	3.1%	63054	50.2	3,163,963	35 to 44 years	\$160	\$507.3
45 to 49 years	3.1%	62895	50.2	3,155,961	45 to 54 years	\$160	\$506.3
50 to 54 years	2.9%	58172	50.2	2,918,988	45 to 54 years	\$160	\$468.3
55 to 59 years	2.1%	41400	50.2	2,077,366	55 to 64 years	\$136	\$283.2
60 to 64 years	0.9%	18956	50.2	951,188	55 to 64 years	\$136	\$129.7
65 to 69 years	0.3%	6096	50.2	305,871	65 to 74 years	\$68	\$20.8
70 to 74 years	0.1%	1709	50.2	85,775	65 to 74 years	\$68	\$5.8
75 years and older	0.0%	795	50.2	39,867	75 years and over	\$37	\$1.5
Subtotal							\$4,755.7
TOTAL							\$16,865.2

Loss of Productivity due to Treatment: We used the Treatment Episode Data Set: Admissions (TEDS-A-2017) and TEDS-Discharges (2017) because they have the national annual admissions to and discharges from substance abuse disorder treatment facilities. Using the information from TEDS-A, we were able to break down the admissions by age and sex. From there, we applied the median length of stay from the TEDS-D data set to obtain the number of days per age and sex. We were then able to use the Daily Production Value from Table 2.2 to calculate the loss of productivity due to substance abuse disorder treatment.

Table 2.6: Productivity Loss Due To Hospitalization Of Substance Abuse Disorder Related Medical Conditions

Primary Diagnosis	# of Total IP Visits (2017)	Average LOS IP Visits	Days Missed	Daily Production Value (2019)	Total Productivity Lost (\$M)
Alcohol related disorders	305,585	4.6	1,400,274	\$119	\$166.7
Opioid Related Disorders	85,370	4.7	401,455	\$119	\$47.8
Cannabis Related Disorders	7,340	6.0	43,835	\$119	\$5.2
Sedative, Hypnotic, or Anxiolytic Related Disorders	11,830	4.7	55,750	\$119	\$6.6
Cocaine Related Disorders	11,740	6.1	71,970	\$119	\$8.6
Other Stimulant Related Disorders	20,580	4.6	95,425	\$119	\$11.4
Hallucinogen Related Disorders	1,370	4.7	6,455	\$119	\$0.8
Nicotine Dependence	610	3.1	1,915	\$119	\$0.2
Inhalant Related Disorders	120	6.8	820	\$119	\$0.1
Other Psychoactive Substance Related Disorders	20,605	4.5	93,080	\$119	\$11.1
Total					\$258.5

Using the National Inpatient Sample (NIS, 2017) data, we pulled the encounters that had a primary diagnosis of substance abuse disorders by ICD-10 codes and the average length of visit to calculate the number of days missed due to hospitalization. We then used the average of the overall Daily Production Value calculated in Table 2.2 to estimate the total productivity lost due to hospitalizations from substance abuse disorders.

Table 2.7 Morbidity (Diminished Productivity)

Productivity Loss due to Crime

Table 2.9: Productivity Lost Due To Incarceration

	Jails	Federal Prison	State Prison	Annual Productivity (2019)	Jails (\$M)	Federal Prison (\$M)	State Prison (\$M)	
Male								
18-19	803	200	1,497	15 to 24 years	\$29,922	\$24.0	\$0.0	
20-24	9,536	2,377	17,772	15 to 24 years	\$29,922	\$285.3	\$6.0	
25-29	15,760	3,928	29,371	25 to 34 years	\$66,725	\$1,051.6	\$158.6	
30-34	15,861	3,953	29,558	25 to 34 years	\$66,725	\$1,058.3	\$262.1	
35-39	15,459	3,853	28,809	35 to 44 years	\$87,352	\$1,350.4	\$345.3	
40-44	11,845	2,952	22,075	35 to 44 years	\$87,352	\$1,034.7	\$336.6	
45-49	10,239	2,552	19,082	45 to 54 years	\$84,731	\$867.6	\$250.2	
50-54	8,533	2,127	15,901	45 to 54 years	\$87,352	\$745.3	\$222.9	
55-59	6,023	1,501	11,224	55 to 64 years	\$67,305	\$405.4	\$143.1	
60-64	3,313	826	6,173	55 to 64 years	\$67,305	\$223.0	\$101.0	
65 or older	2,911	726	5,425	65 to 74 years	\$27,602	\$80.4	\$22.8	
Female								
18-19	157	18	134	15 to 24 years	\$28,982	\$4.6	\$0.0	
20-24	2,580	294	2,197	15 to 24 years	\$28,982	\$74.8	\$0.5	
25-29	5,599	638	4,768	25 to 34 years	\$50,057	\$280.3	\$14.7	
30-34	6,040	688	5,143	25 to 34 years	\$50,057	\$302.3	\$31.9	
35-39	5,348	609	4,554	35 to 44 years	\$58,183	\$311.1	\$40.0	
40-44	3,743	426	3,188	35 to 44 years	\$58,183	\$217.8	\$35.4	
45-49	3,177	362	2,706	45 to 54 years	\$58,249	\$185.1	\$24.8	
50-54	2,359	269	2,009	45 to 54 years	\$58,249	\$137.4	\$21.1	
55-59	1,384	158	1,179	55 to 64 years	\$49,417	\$68.4	\$13.3	
60-64	629	72	536	55 to 64 years	\$49,417	\$31.1	\$7.8	
65 or older	440	50	375	65 to 74 years	\$24,587	\$10.8	\$1.8	
Total						\$8,749.6	\$2,040.0	\$15,252.9

Productivity lost due to incarceration: Using the various 2017 datasets from the Bureau of Justice Statistics (BJS) we were able to identify the volume of inmates and prisoners and project it to 2019 by applying the annualized 2016-2017 percent change. Additional information on age and sex of inmates and prisoners and their most serious offense allowed us to segment the prisoner totals by age and sex, to apply the Annual Productivity per person (Table 2.2), and to identify those incarcerations attributed to substance abuse disorder (i.e., DUI or drug possession). In the sample, there was greater proportion of women with DUIs and drug possession sentences, but there was a higher percentage of men overall.

Victims of Crime

To calculate the total productivity loss due to victims of crime, we used the 2018 Crime Victimization report by the Bureau of Justice Statistics to obtain the updated volume of crimes. From there, we used the 2007 figures in the NDIC report to determine how to value the total productivity loss. We adjusted the mix in 2007 dollars based on the same percent change of the volume of crimes in each category (violent and property). We then adjusted it to 2019 dollars to obtain total cost of victims of crime and applied the same attribution rate for drugs (from NDIC 2004).

Table 2.10: Updated Volume of Crimes

Category	Violent Crime	Property Crime
2007 # of Crimes	5,385,240	17,955,838
2018 # of Crimes	6,385,520	13,502,840
% Change	+19%	-25%

Table 2.11: Total Productivity Lost

Category	Violent Crime	Property Crime
----------	---------------	----------------

2007 Lost Productivity	\$834,140	\$576,746
2007 Adjusted (2007 Dollars)	\$989,077	\$433,715
Inflation %	123%	123%
Inflation to 2019 Dollars	\$1,219,553	\$534,779
Attribution Rate	12%	31%
Productivity Value lost due to Crime in 2019	\$148,275	\$163,190
Total Productivity Value Lost	\$311,464	

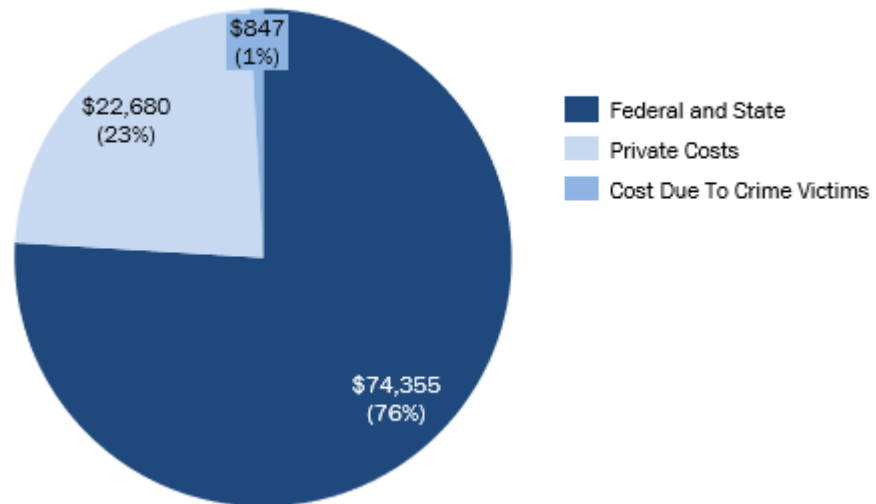
III. Crime, Law Enforcement, Criminal Justice



Summary

In order to estimate the cost due to Crime, Law Enforcement, and Criminal Justice, we broke out the categories to law enforcement (police at the State and Federal level and drug control in terms of Federal spending), judicial, correctional, private costs, and costs due to crime victims.

The indirect and direct costs due to crime, law enforcement, and criminal justice total \$9.2 B annually, driven by law enforcement then judicial and private costs.



Categories	Cost (\$ M)	Adj. for Double Counting	%
Federal and State	\$84,970	\$74,355	76%
Law Enforcement	\$47,052	\$41,174	42%
Police Protection	\$45,304	\$39,645	40.5%
State	\$36,158	\$31,641	32.3%
Federal	\$9,146	\$8,004	8.2%
Drug Control	\$1,747	\$1,529	1.6%
Supply Reduction (federal)	\$1,747	\$1,529	1.6%
Department of Agriculture	\$15	\$13	0.0%
Department of Defense	\$365	\$320	0.3%
Department of Homeland Security	\$1,084	\$948	1.0%
Department of the Interior	\$24	\$21	0.0%
Office of National Drug Control Policy	\$183	\$160	0.2%
Department of State	\$	\$	0.0%
Department of Transportation	\$16	\$14	0.0%
Department of the Treasury	\$60	\$53	0.1%
Supply Reduction (State)	\$	\$	0.0%
Judicial	\$4,715	\$4,126	4.2%
State	\$3,202	\$2,802	2.9%
Federal	\$1,512	\$1,323	1.4%
Correctional	\$33,203	\$29,055	29.7%

State	\$29,166	\$25,523	26.1%
Federal	\$4,037	\$3,533	3.6%
Private Costs	\$25,917	\$22,680	23.2%
Private Legal Defense	\$24,944	\$21,828	22.3%
Private Security Costs	\$974	\$852	0.9%
Property Destruction due to Crime	\$968	\$847	0.9%
Total	\$111,855	\$97,882	100.0%

*Other costs due to crime victims are in the intangible costs and health sections

Methodology and Analysis

Federal and State Government

Table 3.1: Federal and State Government Spend on Crime due to Substance Abuse Disorder

Level	Category	Total Spend (\$M) - 2019	Attribution Proportion	Total Costs (\$M)
State	Law Enforcement	\$117,412	31%	\$36,158
	Judicial	\$49,050	7%	\$3,202
	Correctional	\$82,445	35%	\$29,166
Federal	Law Enforcement	\$29,700	31%	\$9,146
	Judicial	\$15,395	10%	\$1,512
	Correctional	\$7,340	55%	\$4,037
Total	Law Enforcement			\$45,304
	Judicial			\$4,715
	Correctional			\$33,203

To find the total 2019 Federal and State government justice expenditure, we averaged of two closely related approaches. The first approach utilized the expenditure growth 5-year CAGR from 2011-2016 (the year of the most recent reported expenditures by the BJS) to estimate 2019 spending. For the other approach, we adjusted the 2016 expenditures for inflation to 2019 dollars. Both estimates were reasonably close to one another, so we used the average value.

For the attribution proportion for law enforcement, we used the proportion of arrests that were related to identifiers for drug abuse, driving under the influence, liquor laws, and drunkenness, and applied the same proportion to both State and Federal law enforcement values. For judicial spending, the National Center for State Courts reported that in 2016, about 22% of State court cases were criminal-related, and so we applied this to the law enforcement attribution proportion. As for the Federal judicial attribution proportion, the United States Courts reported about 10% of Federal cases were drug offenses. Though this accounts only for drugs, due to the fact that Lewis (2006) reported that the Federal corrections alcohol attribution was only 5% while the BJS (2014) stated 50% of prisoners were incarcerated for drug offenses, we felt comfortable using the drug attribution factor only for the Federal judicial category. Both the State and Federal correctional attribution proportions were obtained from the BJS 2014 report on prisoners in the US, which stated the drug attribution proportion, and the Lewis 2006 report for the alcohol attribution proportion.

Private Costs

Lawyer

Table 3.2: Cost of Private Lawyers due to Substance Abuse Disorder

GDP By Industry (2018) - Private Legal Services	Inflated to 2019 (\$M)	% of Criminal Drug Offenses Filed	Value to Due to Drugs (\$M)
\$266,300	\$271,125	9%	\$24,944

We used the Bureau of Economic Analysis' estimation of the Private Legal Services GDP from 2018 and inflated it to 2019. We then applied the percent of drug offenses filed from the US Attorneys' Annual Statistical report to calculate the estimated value of the industry due to drugs.

Security

Table 3.3: Cost of Private Security due to Substance Abuse Disorder

Number of Jobs (2017)	Number of Jobs (2018)	Update to 2019	Median Annual Wages	Percent in Relevant Locations	% of Crime Related to Drugs/Alcohol	Total Cost (\$M)
1,105,440	1,143,800	1,183,491	32,183	8.4%	31%	\$974

We estimated the proportion of the total number of security guards who work in locations where alcohol consumption is likely to be relevant to any problematic activity. For example, we included security guards at retail sales locations (including groceries, merchandise, etc.), spectator sports or promotional sports events, any other live entertainment venue, and any locations including food and drink such as restaurants, bars, clubs, etc. This came out to be around 8.4% of total security employment. We then multiplied the total number of security guards by average annual salary, percent that work in relevant areas (8.4%), and percent of arrests related to drug and alcohol (31%), to come up with an estimated annual cost of security related to substance abuse disorders.

Costs due to Crime Victims

Property Loss

Table 3.4: Adjusted Cost due to Inflation (\$M)

Category	NDIC (2011)	Inflation	2019
Property Loss Violent Crime	\$125	111%	\$139
Recovered Rate			11%
True Rate			\$15
Property Loss Property Theft	\$802	111%	\$893
Recovered Rate			26%
True Rate			\$232

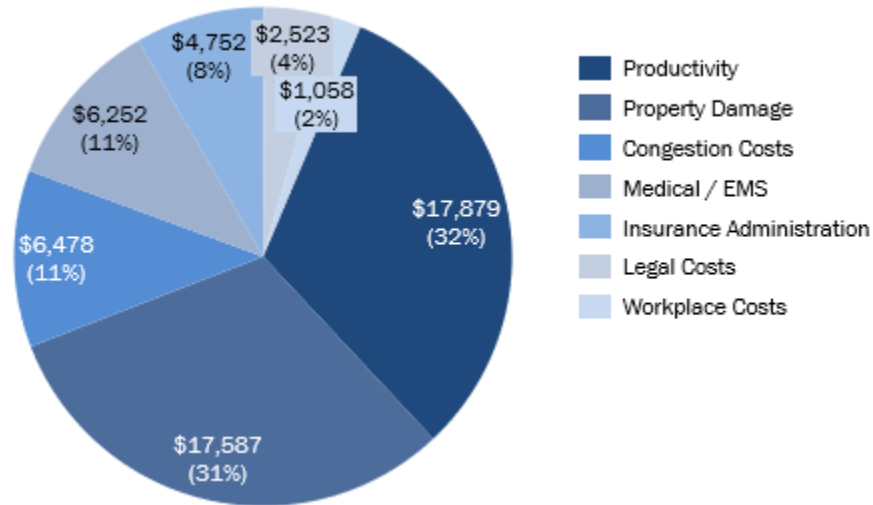
To calculate the total property loss due to substance abuse disorder related crimes, we used the 2018 Crime Victimization report by the Bureau of Justice Statistics to obtain the updated volume of crimes. From there, we used the 2011 NDIC reports estimate on the value of property loss for both violent and property related crimes. We adjusted the mix in 2007 dollars based on the same percent change of the volume of crimes in each category (violent and property), the damage rate, and then calculated the total property loss.

Table 3.5: Cost of Property Loss due to Substance Abuse Disorder

Category	Violent	Property	Total
Number of Crime Victimization (2018)	6,385,520	13,502,840	19,888,360
Number of Crimes (2018)	1,206,836	7,196,045	8,402,881
Weighted Attribution Factors	12%	31%	
Number of Drug Events	776,358	4,120,438	4,896,796
Property cost Per Event	\$139	\$893	
Damage Rate	11%	26%	
Loss Per Event	\$15	\$232	
Subtotal (\$M)	\$12	\$956	\$968

IV. Traffic Collisions

Summary



Society has long understood the connection between alcohol use and impaired driving. In 2017, 29% of all fatal traffic crashes involved alcohol-impaired driving. However, there are limited studies on the influence of drugs on traffic collisions. It is difficult to determine the proportion of crashes due to “drugged” driving because of the lack of a good roadside drug test and length of time a drug may persist in the body after use. According to the Fatality Analysis Reporting System (FARS) by the NHTSA, 42% of fatally injured drivers tested positive for drugs in 2016 (however, drug tests do not necessarily fully correlate with driver impairment due to the length of time tests may remain positive, for example).

The traffic collision costs associated with substance abuse disorders total \$20.1 B annually, mainly driven by property damage and market productivity and congestion costs and medical costs.

Categories	Costs (\$M)	Double Ct. Adj.	% of Total
Medical / EMS	\$7,145	\$6,252	11%
Medical	\$6,860	\$6,003	10.6%
Emergency Services	\$285	\$249	0.4%
Productivity	\$20,432	\$17,879	32%
Market Productivity	\$15,216	\$13,315	23.6%
Household productivity	\$5,216	\$4,564	8.1%
Insurance Administration	\$5,430	\$4,752	8.4%
Workplace Costs	\$1,209	\$1,058	1.9%
Legal Costs	\$2,884	\$2,523	4.5%
Subtotal	\$37,099	\$32,464	57.4%
Congestion Costs	\$7,402	\$6,478	11.5%
Property Damage	\$20,098	\$17,587	31.1%
Total	\$64,599	\$56,529	100.0%

Methodology and Analysis

The National Highway and Traffic Safety Administration (NHTSA) conducted an analysis on motor vehicle crashes in 2015, which reported the economic and societal costs of traffic collisions in 2010. The report

founded that the total economic cost of traffic collisions is \$242 billion dollars, with property damage and market productivity making the largest categories (Table 4.1).

However, we also accounted for the increasing number of traffic collisions that occurred since 2010 by applying the volume growth CAGR to the overall costs (Table 4.2).

The NHTSA 2015 report also indicated that 22% of the total cost were crashes where alcohol was present, but 18% of the total costs were due to crashes specifically caused by alcohol. Determining an attributional factor for drugs is more difficult due to several factors, including a lack of a good roadside test for drugs and the fact that some drugs remain in a person’s system for days or weeks, making it difficult to determine the impact of drugs on the accident. Furthermore, law enforcement officers may not typically conduct drug testing if the driver is found to have exceeded the legal BAC level as there is enough evidence for a DUI charge; in addition, since drivers can have both alcohol and drugs in their system, it is difficult to assign proportional responsibility for a particular substance in addition to alcohol. NHTSA attempted to determine the drug attribution rate by conducting a small study on the impact of drugs and alcohol on driving and found that 16% drivers involved in a traffic crash were positive for drugs and alcohol. Given the lack of studies on the impact of drugs on traffic collisions, we used the 18% as a conservative estimate for the attributable proportion of substance abuse disorder on traffic collisions. We considered the proportion of fatal crashes due to alcohol over time to account for any changes in the attributable factor. Since 2010, the proportion of fatal crashes involving alcohol-impaired driving has remained relatively constant at about 30%, and therefore we assumed a constant 18% attributable factor. In addition, though alcohol-impaired driving does not necessarily imply alcohol abuse, because we are using only the alcohol attribution factor, our overestimation in this sense may account for the underestimation due to the lack of a drug attribution factor.

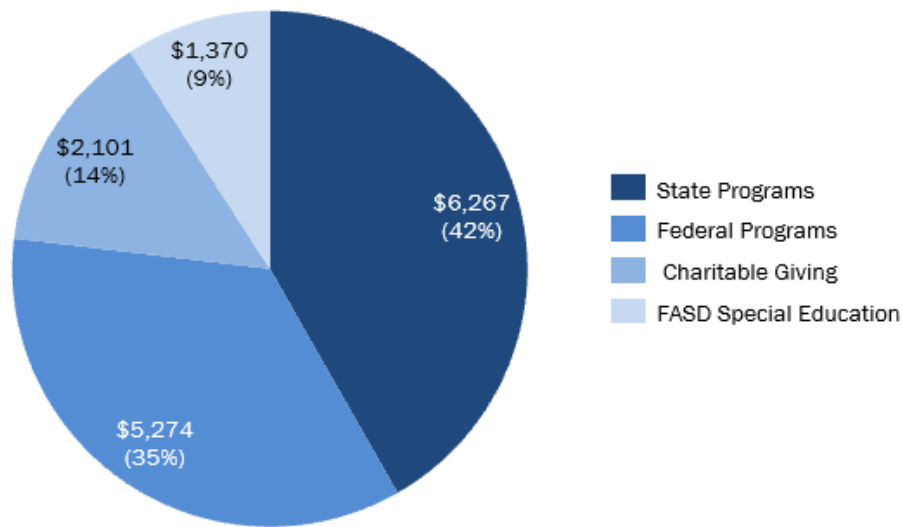
Table 4.1: Number of Traffic Crashes and Alcohol-Related Fatal Crashes

Categories	2010	2011	2012	2013	2014	2015	2016	2017	2010-17 CAGR
<i>Number of Crashes (In Thousands)</i>	5,419	5,338	5,615	5,687	6,064	6,296	6,821	6,452	2.5%
<i>Fatal Crashes (In Thousands)</i>	30.2	29.8	30.8	30.1	30.0	32.2	34.4	34.2	1.8%
<i>Alcohol-Related Fatal Crashes (In Thousands)</i>	9.3	9.0	9.4	9.2	9.1	9.3	9.5	9.9	0.9%
<i>Proportion of Alcohol-Related Fatal Crashes</i>	31%	30%	30%	30%	30%	29%	28%	29%	



V. Public Assistance and Social Services

Summary



Social welfare programs such as Old Age, Survivors, and Disabilities Insurance (OASDI) and Supplemental Nutrition Assistance Program (SNAP) can provide assistance to people with substance abuse disorders. Therefore, a proportion of these programs administrative spend is attributable to substance abuse disorder. In addition, a proportion of child welfare is attributable to substance abuse disorder as substance abuse disorder is one of the major contributing factors for child removal. According to the National Center on Substance Abuse and Child Welfare (NCSACW), about 35% of child removal is due parental alcohol or other drug use in the United States in 2016. However, child welfare is considered a direct transfer or redistribution of payments. Therefore, a proportion of the total child welfare expenditures is considered rather than utilizing an administration cost.

Fetal alcohol syndrome disorder (FASD) is a condition in a child that results from alcohol exposure while in the womb. Studies have shown 0.2 to 1.5 infants out of 1,000 live births have FASD. Though medical and productivity loss costs were measured in the previous sections, special education costs were calculated in this section.

Another source of spending is charitable giving to organizations and non-profits focused on substance abuse disorder and homelessness related to substance abuse disorder. According to Giving USA, in 2018, Americans gave \$428 billion dollars to charity, with 13% going to human services and 10% going to health organizations.

The direct and indirect public assistance and social services costs associated with substance abuse disorders total \$17.2 B annually, mainly driven by State and Federal spending and followed by charitable given and Fetal Alcohol Syndrome Disorder special education costs.

Categories	Costs (\$M)	Double Ct. Adj.	Percent of Total
Federal	\$6,027	\$5,274	35.1%
Administrative Expenses From:	\$377	\$330	2.2%
Old Age, Survivors, and Disabilities Insurance (OASDI);	\$115	\$101	0.7%
Supplemental Security Income (SSI)	\$136	\$119	0.8%
Temporary Assistance for Needy Families (TANF)	\$62	\$54	0.4%
Supplemental Nutrition Assistance Program (SNAP)	\$14	\$13	0.1%
Veteran's compensation and pension	\$49	\$43	0.3%
Child Welfare Costs	\$5,650	\$4,944	32.9%
State	\$7,161	\$6,267	41.7%
Temporary Assistance for Needy Families (TANF)	\$42	\$37	0.2%
Supplemental Nutrition Assistance Program (SNAP)	\$263	\$230	1.5%
Child Welfare Costs	\$6,856	\$6,000	40.0%
Fetal Alcohol Syndrome Disorder Costs and Care	\$1,565	\$1,370	9.1%

Charitable Giving	\$2,401	\$2,101	14.0%
Total	\$17,155	\$15,012	100.0%

Methodology and Analysis

The social welfare programs considered in this analysis were Old Age, Survivors, and Disabilities Insurance (OASDI), Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), Veterans Benefits Administration, and Child Welfare Payments in accordance to the methodology found in previous reports including the National Institute on Drug Abuse (NIDA) report “The Economic Costs of Alcohol and Drug Abuse in The United States 1992” and the State of Maine report “The Cost of Alcohol and Drug Abuse in Maine, 2015.” The most current administrative spend for each program except child welfare were considered. The spend was adjusted to 2019 dollars if necessary. The substance abuse disorder attribution proportion from the NIDA and Maine reports were utilized. For child welfare payments, we utilized the proportion of child removal due to parental alcohol or another drug use from the NCSACW, using the historical CAGR from 2010 to 2016 to approximate the 2019 value of 39%.

Table 5.1: Federal and State Social Welfare Program Administrative Expenditure

Categories	Spend (\$M)	Attribution Factor	Adj. Spend (\$M)
<i>Federal</i>			
Child Welfare	\$14,382	39%	\$5,650
Old Age, Survivors, and Disabilities Insurance (OASDI)	\$6,777	1.7%	\$115
Supplemental Security Income (SSI)	\$4,546	3.0%	\$136
Veterans Benefits Administration	\$2,869	1.7%	\$49
Temporary Assistance for Needy Families (TANF)	\$1,197	5.2%	\$62
Supplemental Nutrition Assistance Program (SNAP)	\$277	5.2%	\$14
Total		\$6,027	
<i>State</i>			
	\$17,452	39%	\$6,856
Temporary Assistance for Needy Families (TANF)	\$806	5.2%	\$42
Supplemental Nutrition Assistance Program (SNAP)	\$5,054	5.2%	\$263
Total			\$7,161

For FASD, we took the average from two studies, the Lewin Group 2006 and the Journal of Addiction Medicine 2018. The Lewin Group annual expected costs of special education were adjusted to 2019 dollars and were multiplied by the current prevalence of FASD. The Journal of Addiction Medicine paper conducted a comprehensive literature review of 20 US, 9 Canadian, and 2 other studies to determine the annual cost of FASD per person for special education, which was adjusted to 2019 dollars and multiplied by the current FASD prevalence.

Table 5.2: FASD Special Education Expenditure

Source	Age Group	Population	Annual Cost (2019)	Total Cost (\$M)
<i>Lewin Group (2006)</i>	< 18	73,783	\$8,184	\$604
	18 - 77	240,236	\$168	\$40
			Total	\$644
<i>Journal of Addiction Medicine 2018</i>	All Ages	330,269	\$7,528	\$2,486
Average				\$1,565

For charitable giving, the two main categories we focused on from the Giving USA 2019 report were human services and health organizations. We utilized the IRS Exempt Organization Business Master File Extract to find the total income and revenue of all human service charities and non-profits. We then found the total income and revenue of organizations related to homelessness and housing services, which were subsectors of human services, and determined the proportion over the entire human services. This factor was 12%. According to SAMHSA, 35% of homeless adults had a chronic substance abuse disorder issue. The combined attribution factor of health charitable giving that is homelessness related to substance abuse disorder is 4%. For health organizations, we utilized the same IRS file to determine what proportion of health organizations revenue and income were those of substance abuse disorder organizations and applied this proportion to the overall health organization charitable giving amount.

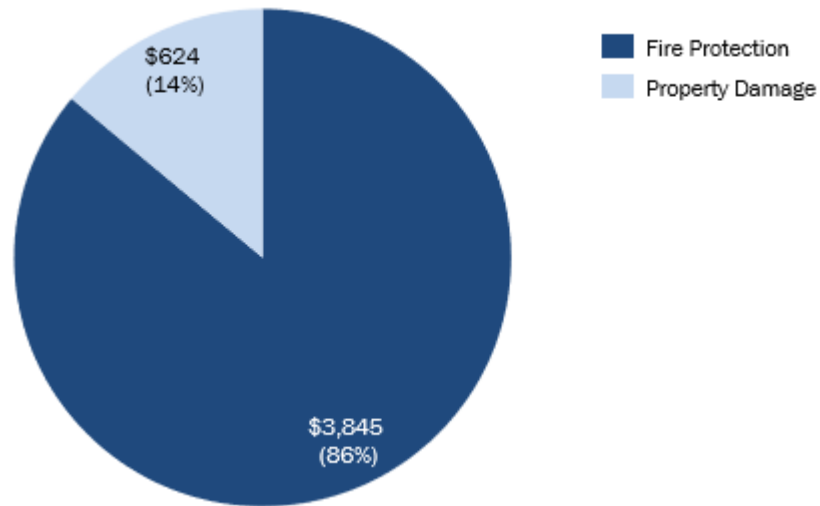
Table 5.3: Charitable Giving Related to Substance Abuse Disorder

Category	Amount (\$M)	Attribution Factor	Total Amount (\$M)
Human Services	\$52,997	4.1%	\$2,186
Health Organizations	\$41,933	0.5%	\$215
Total			\$2,401

VI. Fires



Summary



The total cost of fire in the US in 2014 was \$329 billion dollars, with \$13 billion dollars attributable to property loss. Based on the Lewin Group 2006 report, the National Fire Protection Association (NFPA) reported that 5% of overall property damage caused by fires was the result of alcohol-related ignition, showing the association of fires and substance abuse disorder. The NFPA also reported that in 2013-2017, about 15% of home fire deaths and 10% of home fire injuries were due to substance abuse disorder.

The indirect fire damage and protection costs associated with substance abuse disorders total \$5.1 B annually, mainly driven by fire protection services and then fire damages or destruction.

Categories	Costs (\$M)	Double Ct. Adj.	Percent of Total
Fire Protection Services	\$4,393	\$3,845	86%
Fire Damages/Destruction	\$713	\$624	14%
Total	\$5,106	\$4,468	100%

Methodology and Analysis

The total salary of fire protection employees (including fire fighters) were considered to determine the fire protection service costs. According to the US Census Bureau, there were 437,282 fire protection service employees with an average salary of \$65,789 in 2018. The total amount was adjusted to 2019 dollars. We

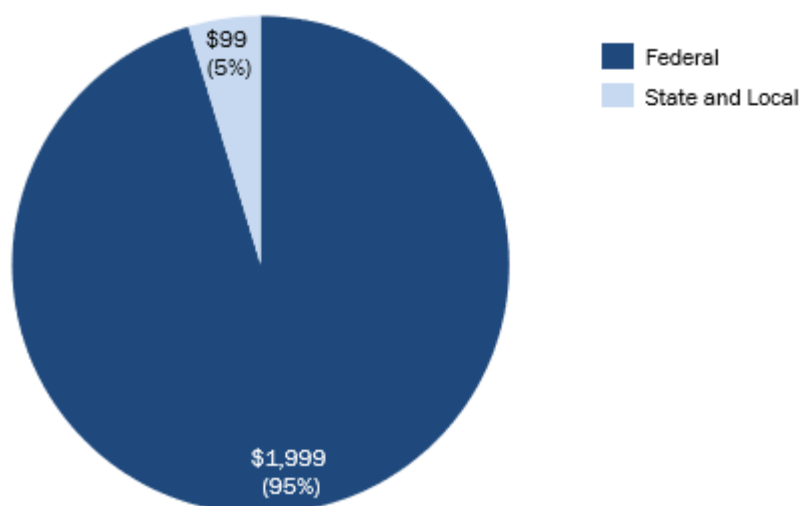
utilized the 15% attribution proportion based on home fire deaths for fire protection services, as fire service employees are responsible for both putting out fires and rescuing people from fires.

For fire damages, we utilized the NFPA 2017 report on the total cost of fires in the US in 2014. For fire damage, we utilized the 5% attribution proportion as a conservative estimate for the cost of fire damage related to substance abuse disorder. Determining fire property damage due to drugs is difficult because of the similar reasons as mentioned in the traffic collision section. We did not utilize the higher proportion of 15% because alcohol-related fire casualties are related more to people who are impaired and eventually are exposed to fire than fire property damage.



VII. Research and Prevention

Summary



The Federal and State government allocate funds for the research and prevention of substance abuse disorder in the US. The costs associated with substance abuse disorders total \$3.3 B annually by primarily federal but also state costs.

Categories	Costs (\$M)	Double Counting Adjustment	Percent of Total
<i>Federal</i>	\$2,285	\$1,999	95%
<i>State</i>	\$113	\$99	5%
Total	\$2,398	\$2,098	100%

Methodology and Analysis

Every year, the President’s National Drug Control Strategy Budget is submitted to Congress, detailing the drug control budget for each Federal department. The budget outlines the prevention and research requests for each department. We took the sum of all the departments’ research and prevention budget request, which totaled to \$2.3 billion dollars.

According to the National Association of State Alcohol and Drug Abuse Directors, the total State substance abuse disorder prevention expenditures in 2018 was \$567M, with 19% from State and local funds. The total State funds for substance abuse disorder prevention, after adjusted to 2019 dollars, is \$111 million dollars. Since this amount is only for prevention, we used the proportion of Federal research and prevention that is research to approximate total State research and prevention expenditure. Research made up only 2% of the

Federal total research and prevention budget, and therefore the total State research and prevention funds slightly increased to \$114 million dollars.

Table 7.1: 2019 Federal Prevention and Research Budget by Department

Department	Sub-department	Category	Budget (\$M)
<i>Department of Agriculture</i>	Office of Rural Development	Prevention	\$4
<i>Court Services and Offender Supervision Agency for the District of Columbia</i>	All	Prevention	\$25
<i>Department of Defense</i>	Office of the Secretary Defense	Prevention	\$121
<i>Department of Defense</i>	Defense Health Program	Research and Development	\$28
<i>Department of Education</i>	Office of Elementary and Secondary Education	Prevention	\$55
<i>Federal Judiciary</i>	All	Research and Development	\$7
<i>Department of Health and Human Services</i>	Administration for Children and Families	Prevention	\$40
	Centers for Disease Control and Prevention	Prevention	\$476
	Health Resources and Services Administration	Prevention	\$111
	Indian Health Service	Prevention	\$25
	National Institute of Health	Research and Development: Prevention	\$602
	Substance Abuse and Mental Health Services Administration	Prevention	\$600
<i>Department of Homeland Security</i>	United States Coast Guard	Research, & Development	\$2
<i>Department of the Interior</i>	Bureau of Indian Affairs	Prevention	\$1
<i>Department of Justice</i>	Drug Enforcement Administration	Prevention	\$8
	Office of Justice Programs	Prevention	\$24
<i>Department of Labor</i>	Employment and Training Administration	Prevention	\$6
	Office of Worker's Compensation Programs	Prevention	\$8
<i>Office of National Drug Control Policy</i>	High Intensity Drug Trafficking Areas	Prevention	\$3
	High Intensity Drug Trafficking Areas	Research and Development	\$3
	Other Federal Drug Control Programs	Prevention	\$102
	Other Federal Drug Control Programs	Research and Development	\$13
	Salaries and Expenses	Prevention	\$3
<i>Department of Transportation</i>	Federal Aviation Administration	Prevention	\$17
	National Highway Traffic Safety Administration	Prevention	\$2
	National Highway Traffic Safety Administration	Research and Development: Prevention	\$1
		Prevention*	\$2,232
		Research	\$52
		Total	\$2,285

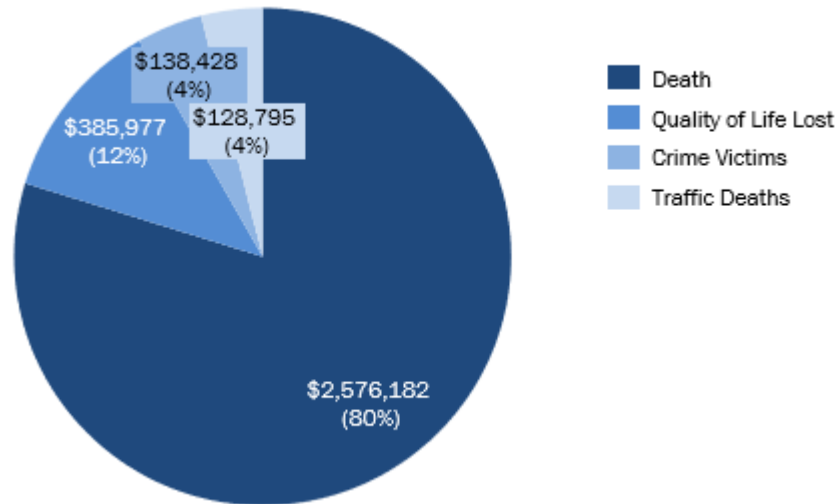
*Research and Development: Prevention was classified in "Prevention"

E. INTANGIBLE COSTS

VIII. Intangible Costs



Summary



The intangible cost of substance abuse disorder (\$3.23 T) measures the non-financial welfare losses such as reduced quality of life, death, and injury. The biggest intangible cost of substance abuse disorder is the loss in the quality of life or productivity of people with substance abuser disorders who do not receive treatment. Death is an intangible cost based on the value of a statistical life, which indicates what a person is willing to spend to avoid death. Another intangible cost is the pain and suffering and risk of death of crime victims. The final intangible costs we analyzed were the costs involving traffic injuries.

Intangible Costs Categories	Costs (\$M)	Double Ct. Adj.	Percent of Total
Death	\$2,943,951	\$2,576,182	80%
Quality of Life Lost	\$441,078	\$385,977	12%
Crime Victims	\$158,190	\$138,428	4%
Traffic Deaths	\$147,181	\$128,795	4%
Total	\$3,690,400	\$3,229,382	100%

Methodology and Analysis:

For certain sections of this analysis, we required a financial estimate for the value of a statistical life, sometimes defined as “the willingness of people to pay to avoid death.” We obtained this value from multiple sources, adjusted the values to 2019 dollars, and used the average, which was \$10.6 million dollars (Table 8.1) per life. Government departments such as the Environmental Protection Agency (EPA) and U.S. Department of Transportation (DOT) determined their VSL number by taking an average values across multiple studies. The two most common ways to determine VSL are the “revealed preference approach” and “stated preference approach.” The revealed preference approach relies mainly on labor market statistics by comparing the wages and death rates of various occupations across multiple industries. The stated preference approach is based on hypothetical decisions rather than actual behavior, usually involving asking people what they might do in certain situations that involves a monetary/ safety tradeoff. The U.S. DOT drew on labor market studies that utilized the Census of Fatal Occupational Injuries (CFOI) fatality rate data, while the EPA took a combination of both revealed preference and state preference studies. According to Kniesner et al. 2019, the basic structure for determining the VSL using labor statistics is: $VSL = (\beta' \times w) \times h \times (1/p)$

- where β' = a heterogeneity coefficient that factors both demographic (such as age and education) and other job characteristic variables (such as non-fatal injury risk, workers' compensation insurance coverage, and industry and occupation indicators)
- w = wage value
- h = total number of hours per work year
- p = is the number of deaths per worker

Table 8.1: Value of Statistical Life

Source	Value of Statistical Life (\$M)	Inflation Adjustment	Value of Statistical Life - Adjusted 2019 (\$M)
EPA (2007)	\$9.6	107%	\$10.3
NHTSA (2012)	\$7.4	142%	\$10.5
DOT (2016)	\$9.1	120%	\$10.9
Vanderbilt Law (2017)	\$10.0	105%	\$10.5
Average			\$10.6

Death

To determine the intangible cost of death, we applied the value of a statistical life. We utilized the total number of deaths from drugs and alcohol to calculate the total cost of death due to substance abuse disorder. To avoid double counting productivity loss due to premature mortality, we subtracted the total productivity loss due to premature death from the previous analysis to find the net total intangible cost of death due to substance abuse disorder (Table 8.4)

Table 8.2: Intangible Costs of Death Due to Substance Abuse Disorder

Value of Statistical Life (\$M)	Deaths from Drugs and Alcohol	Cost of Death Due to Drugs and Alcohol (\$M)	Economic Productivity Loss (\$M)	Difference- Intangible Cost (\$M)
\$10.6	295,735	\$3,130,509	\$179,186	\$2,943,951

Quality of a Life Lost

Of the 21 million people who might have benefitted from substance abuse disorder treatment in the US in 2019, only 2 to 3 million people received treatment. This leaves about 19 million people who did not receive substance abuse disorder treatment. We utilized the average value of a statistical life calculated in Table 8.1, annualized it using the average life expectancy (78.6 years) and the proportion of each life lost to productivity to find the total quality of life lost (Table 8.3).

Table 8.3: Intangible Costs Due to Quality of Life Lost of Substance Abuse Disorder

Number of People with SUD Who Don't Receive Treatment - 2018	Value of a Life (\$M)	Annualized Value of a Life	% Lost to Productivity	Quality of Life Lost (\$M)
18,715,000	\$10.6	\$134,675	18%	\$441,078

Crime Victims

For the calculation of intangible cost of crime, we utilized the Drug and Alcohol Dependence journal 2010 study on the cost of crime. According to the study, the intangible costs of crime include the pain and suffering cost and the risk-of-homicide costs. The pain and suffering costs were calculated by utilizing jury compensation for injury related to crime and the probability of injury for each type of crime. The risk-of-homicide cost factors in the risk of homicide for each type of criminal offense. We adjusted these costs to 2019 dollars. We also found the most updated number of cases for each type of criminal offense and utilized attribution factors based on the averages from the NIDA report and Bureau of Justice reports to calculate the total intangible cost per crime (Table 8.5).

Table 8.4: Intangible Costs of Crime Victims Related to Substance Abuse Disorder

Categories	# Cases 2018	Attribution Factor	Intangible Costs- 2019	Total Intangible Costs (\$M)
Violent Crime				
Murder	16,214	32%	\$11,557,297	\$60,027
Rape/Sexual Assault	734,630	27%	\$273,315	\$54,212
Aggravated Assault	1,058,040	28%	\$130,089	\$38,768
Robbery	573,100	28%	\$30,906	\$4,894

Property Crime				
Motor Vehicle Theft	748,841	18%	\$359	\$47
Arson	36,127	25%	\$7,027	\$63
Household Burglary	1,230,149	29%	\$439	\$158
Larceny/Theft	5,217,055	29%	\$14	\$20
Total				\$158,190

Traffic Injuries (Non-Fatalities)

The NHTSA reported the total intangible cost of traffic collisions due to alcohol to be \$150 million dollars in 2010. Since we had already factored the cost of fatalities into the section on deaths, here, we specially looked at the intangible costs due to non-fatal traffic injuries. Similar to the analysis in the traffic section, we adjusted the total cost by the growth in the number of traffic collisions and for inflation (Table 8.6).

Table 8.5: Intangible Costs Due to Traffic Injury Related to Alcohol

Intangible Cost Due to Alcohol – 2010 (\$M)	Intangible Cost – Fatalities (\$M)	Intangible Cost – Non-Fatalities (\$M)	Growth in Collisions	Inflation Adjustment	Intangible Costs due to Alcohol (\$M)
\$150,019.36	\$58,364.42	\$91,654.94	125%	128%	\$147,181

F. Cost of Treatment vs. No Treatment

Summary:

In evaluating the potential costs and benefits of treating 100% of the population needing assistance with substance abuse disorder, Marwood employed the methodology from the RCA September 2017 analysis, updated to reflect more current numbers and to fix inaccuracies.

Marwood concluded that if everyone in the United States that needed treatment for substance abuse disorder received it, the total cost of treatment would be \$339.1 billion. In this scenario, the estimated overall costs to society, including intangible costs, would be \$2.5 trillion. Considering the current overall cost estimate of \$3.7 trillion, universal treatment for substance abuse disorder would reduce overall societal costs by \$1.2 trillion, more than 32%.

Analysis:

We calculated the cost of treatment first, by dividing total treatment costs by the number of persons that had received treatment in the corresponding year. Our analysis estimated cost of treatment as \$15,960 per person per year.

Table F.1: Cost of Treatment Per Person in 2018

Cost of Treatment Per Person in 2018	
Cost of Specialty Treatment (\$M) ⁴¹	\$40,378
# of People with SUD that Received Treatment	2,530,000
Cost of Treatment Per Person	\$15,960

Next we calculated avoidable costs. Collins and Lapsley (2002) in “Counting the cost: estimates of the social costs of drug abuse in Australia in 1998-9” stated 47.9% of tangible costs and 63.2% of intangible costs associated with alcohol misuse disorders are avoidable. These avoidable cost estimates assume a sufficiently long time period for the effects of past abuse to be totally removed from society and for any anti-abuse policies to take full effect. The avoidable costs estimates cannot be interpreted to represent potential rapid returns to anti-abuse policies and programs. The article notes a problem in identifying the avoidable proportions of illicit drug costs generally. It is expected that appropriate policies could lead to a reduction in illicit drug costs, but it was not possible to identify any basis for estimating the appropriate proportion, so those costs are excluded

⁴¹ The total cost of treatment is from Table 1.21 (Community Based Treatment) and Table 1.22 (Federal Based Treatment)

from the analysis. The “International Guidelines for the Estimation of the Avoidable Costs of Substance Abuse” (2006) refer to the Collins and Lapsley 2002 report and states “Although few estimates have been made of avoidable costs, those that have been made indicate that avoidable costs represent in the order of fifty per cent of aggregate costs”. An article in the Journal of Occupational Environmental Medicine from 2017 (Goplerud, Hodge, Benham) notes “Employers who self-insure and provide individual coverage pay \$1,729 per employee with no SUD each year (estimates of the costs of workers’ health care use from the NSDUH are likely to be lower than actual costs because the survey does not inquire about medications or laboratory tests, and 12-month recall may be imprecise.) A worker with a SUD uses health care services that cost his/her employer \$2,197. The difference is primarily a result of greater emergency department use by the latter. Workers with a pain medication use disorder cost more than twice that much as workers with no SUD: \$5,586.” This indicates that employers pay approximately 27% more for workers with SUD. Given that the 2017 number is only considering health care services costs, we used the attribution rates from Collins and Lapsley 2002 report.

In our analysis, this suggests that \$16.0 billion in direct and indirect costs, and \$135.6 B in intangible costs of substance abuse disorders can be avoided.

Table F.2: Avoidable Costs

	Direct & Indirect	Intangible
Total Cost of Substance Abuse Disorder (\$M)	\$501,277	\$3,229,382
Avoidable (%)	47.9%	63.2%
Total Avoidable Cost (\$M)	\$240,112	\$2,040,969
Avoidable Total Cost Per Person with SUD Needing Treatment	\$11,302	\$96,068
Avoidable Cost Per Person with SUD Needing Treatment - People That Have Received Treatment and Relapsed	\$12,018	\$102,151
Relapse % Assumption	50%	50%
Cost Avoided in 2019 (\$M)	\$15,947	\$135,554

We then divided total avoidable costs by the total number of people needing substance abuse disorder treatment (~21.2 M people) to find avoidable cost per person.

Next, we calculated the new avoidable cost, by multiplying the new number of people with substance abuse disorders by avoidable cost per person to find the new total avoidable cost to society. To estimate the new number of people with substance abuse disorder, we multiplied the total number of people that needed SUD treatment by 50% to get the number of people that relapsed and added it to the total number of people that needed SUD treatment. The 50% relapse rate for substance abuse disorders is the average of the 40-60% range given by the 2000 JAMA article “Drug Dependence, a Chronic Medical Illness” that is also cited by the National Institute on Drug Abuse. We multiplied the number of people with the avoidable cost per person with SUD needing treatment. We then added the new avoidable cost to the previously calculated unavoidable cost to find the new total cost to society. We then compared our hypothetical calculations laid out in the above scenario with our real-world calculations to find the value add of comprehensive treatment for substance abuse disorder.

In our analysis, we can see that universal treatment for persons with substance abuse disorder results in a \$211.4 B reduction in Direct & Indirect societal benefits. However, this is more than offset by the significant \$746.0 B gains in intangible benefits to society to get \$534.6 B in total benefit.

Table F.3: Cost to Society

	Direct & Indirect	Intangible
Total Unavoidable (\$M)	\$261,165	\$1,188,413
# People That Relapsed That Needed But Did Not Receive SUD Treatment	9,357,500	9,357,500
New Avoidable (\$M)	\$112,455	\$955,874
New Total Cost of Substance Abuse Disorder (\$M)	\$373,620	\$2,144,287
	\$2,517,907	
Previous Total Cost of Substance Abuse Disorder (\$M)	\$501,277	\$3,229,382
Difference (Total Cost of Substance Abuse Disorder-New Total cost of Substance Abuse Disorder) (\$M)	\$127,657	\$1,085,095

Cost if Everyone Received Treatment (\$M)	\$339,063	\$339,063
Benefit (Difference - Cost if everyone Received Treatment) (\$M)	-\$211,406	\$746,032
Total Benefit (\$M)	\$534,625	
ROI (Cost to Benefits)	0.38	3.2

G. Opioids

Summary

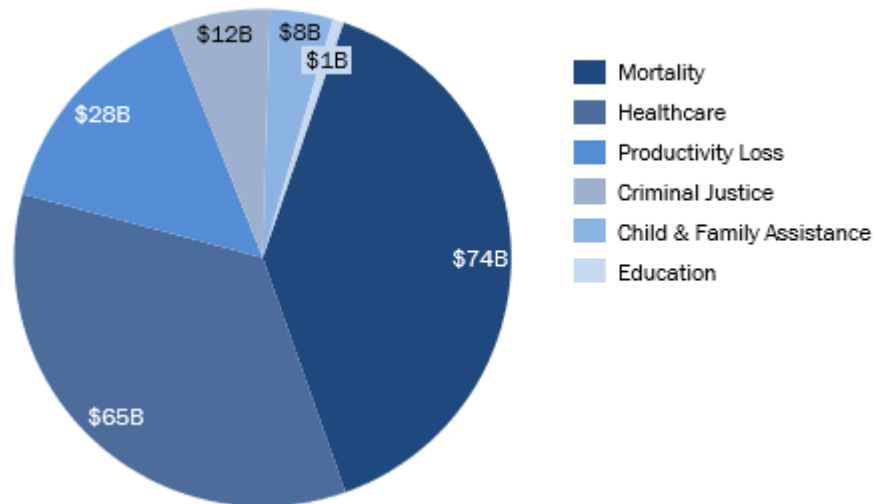


Table G.1: Estimated Cost of Non-Medical Opioid Use in the United States, \$ Cost in Billions (2015-2019)

Categories	2015	2016	2017	2018	2015-18 Total	2019 Estimate*	2015-19 Total
Healthcare Costs	\$36.7	\$51.7	\$55.8	\$60.4	\$204.6	\$65.1	\$269.7
Mortality Costs	\$47.3	\$62.2	\$71.2	\$72.6	\$253.3	\$74.1	\$327.4
Criminal Justice Costs	\$8.9	\$9.2	\$9.8	\$10.9	\$38.8	\$12.2	\$50.9
Child & Family Assistance Costs	\$9.3	\$8.5	\$7.8	\$7.8	\$33.4	\$7.8	\$41.1
Education Costs	\$1.4	\$1.3	\$1.2	\$1.2	\$5.2	\$1.3	\$6.5
Productivity Loss Costs	\$20.7	\$23.5	\$25.0	\$26.5	\$95.7	\$28.0	\$123.7
Total	\$124.3	\$156.4	\$170.9	\$179.4	\$631.0	\$188.4	\$819.3

*The Society of Actuaries provides a low, midpoint, and high estimate for 2019. For the purposes of this summary table, the midpoint estimate is shown.

Background

According to the CDC, between 1999 and 2018, an estimated 450,000 people have died from a drug overdose involving prescription or illicit opioid and approximately 130 people continue to die every day from an opioid-related overdose.⁴²

Overdose mortality is only one of the drastic consequences of the opioid epidemic. The epidemic and opioid use disorder (OUD) also adversely impact the economy and have high costs to society, including increased healthcare spending associated with treatment and services for those with OUD, losses in lifetime earnings

⁴² <https://www.cdc.gov/drugoverdose/epidemic/index.html>

due to premature mortalities, costs associated with criminal justice issues, funding for child and family assistance programs often run by the government, and productivity loss. Understanding the scope of the opioid epidemic and its economic burden is crucial for policy and decision makers to make informed choices and address the opioid crisis.

An article published by the Society of Actuaries in October 2019 estimated the total economic cost of the opioid epidemic from 2015 to 2018 to be at least \$631 billion, not including other potential costs such as losses in unpaid household productivity and reductions in quality of life for which there is insufficient data to make estimates. The bulk of the estimated economic impact (approximately 40%) is accounted for by mortality costs. Healthcare costs due to additional spending for OUD treatment and related services make up an additional 32% of the estimated costs between 2015 and 2018. The remaining costs associated with criminal justice activities, child and family assistance, education programs, and productivity loss are roughly 6%, 5%, 1%, and 15%, respectively, of the total \$631B cost. Using a midpoint estimate between the low and high cost scenarios for 2019, the economic burden of the opioid epidemic between 2015 and 2019 is estimated to be at least \$819B.

In a 2017 report by the Council of Economic Advisors (CEA), the cost of the opioid crisis was estimated by further accounting for the value of a statistical life (VSL) in addition to the cost categories described above. By considering the value of lost lives and the economic impact of lives beyond premature mortality, the CEA estimated the economic burden of the epidemic at \$2.5 trillion for the time period between 2015 and 2018.⁴³ While the use of VSLs is common for cost-benefit analyses, we have chosen to report the findings by the Society of Actuaries, which provides more recent estimates and follows a similar analytical approach to the other estimates made in this report.

Methodology and Analysis

Healthcare Costs

Table G.2: Healthcare Costs, \$ in Millions (2019 Estimates)

Cost Category	2019 Mid. Estimate	2019 Low Estimate	2019 High Estimate
<i>For individuals with OUD</i>			
Commercial	\$19,151	\$17,795	\$22,209
Medicare	\$25,355	\$23,494	\$31,357
Medicaid	\$8,770	\$8,324	\$9,731
Other Public	\$555	\$508	\$692
Uninsured	\$7,577	\$7,023	\$8,344
Subtotal	\$61,407	\$56,944	\$72,332
<i>For family members of individuals with OUD</i>			
Commercial	\$1,130	\$1,050	\$1,310
Medicare	\$690	\$639	\$853
Medicaid	\$517	\$479	\$574
Other Public	\$33	\$30	\$41
Uninsured	\$447	\$414	\$492
Subtotal	\$2,816	\$2,612	\$3,270
<i>For infants born with NAS/NOWS</i>			
Commercial	\$97	\$91	\$109
Medicare	N/A	N/A	N/A
Medicaid	\$695	\$652	\$789
Other Public	\$7	\$7	\$8
Uninsured	\$66	\$62	\$75
Subtotal	\$865	\$812	\$981
Healthcare Total	\$65,088	\$60,368	\$76,583

To estimate healthcare costs, Davenport, Weaver, and Caverly (2019) used 3 large healthcare claims datasets (IBM Watson Health MarketScan Commercial Claims and Encounters Database, Milliman Consolidated Health Cost Guidelines Sources Database, CMS 5% Sample Standard Analytical Files) to conduct a matched case-control study, comparing the healthcare costs of patients with OUD to similar patients who do not have OUD.

⁴³ <https://www.whitehouse.gov/articles/full-cost-opioid-crisis-2-5-trillion-four-years/>

The 3 datasets covered claims data for those with commercial insurance, Medicaid managed care, Medicare FFS, and Medicare Advantage. Patients with OUD were identified using OUD-related diagnosis codes and patients without OUD were identified using eligible control variables. Claims were also classified into various service categories, including Medication-Assisted Treatment, other opioids, behavioral, and physical.

In addition to performing a cost analysis for individuals with OUD, the authors also performed a similar analysis for individuals with relatives diagnosed with an OUD by examining individuals that share an insurance contract with someone diagnosed with OUD. This analysis was only applicable to the commercial insurance population. Treatment costs for infants born with neonatal abstinence syndrome (NAS) or neonatal opioid withdrawal syndrome (NOWS) were also estimated. Both analyses, involving family members and infants born with NAS/NOWS, were included as part of the estimated healthcare costs as the economic impact of non-medical opioid use also affects family members of those diagnosed with OUD.

Davenport et al. (2019) extrapolated the case-control study costs to the national population using 2015 to 2017 population estimates from the U.S. Census Bureau, and further trended forward population estimates for 2018 and 2019 using the 2015 to 2017 distributions and rates.

Mortality Costs

Table G.3: Mortality Costs, \$ in Millions (2019 Estimates)

Cost Category	2019 Mid. Estimate	2019 Low Estimate	2019 High Estimate
Medical costs	\$270	\$238	\$304
Lost lifetime earnings	\$73,817	\$65,331	\$83,322
Mortality Total	\$74,087	\$65,569	\$83,626

The CDC has published opioid overdose data via its Morbidity and Mortality Weekly Report for 2015 to 2017 and estimated opioid overdose deaths for 2018. The data is broken down into age group, sex, and state. To estimate opioid overdose deaths for 2019, Davenport et al. (2019) projected mortality rates to remain flat, to decrease, and to increase for a total of 3 possible scenarios reflecting a continuation, improvement, or worsening of the opioid epidemic.

The average cost per death involves the medical costs per death and the lost lifetime earnings per death, both of which the CDC's Web-based Injury Statistics Query and Reporting System (WISQARS) module was used for. The WISQARS module estimates medical cost per death data by cause of injury, place of death, and age. Lost lifetime earnings are estimated by the net present value of expected annual earnings based on the number of remaining working years, age, and sex, while also accounting for adjusted future earnings. Davenport et al. (2019) then indexed both of these cost estimates from the WISQARS module, which are valued at 2010 prices, through 2019 using the GDP implicit price deflator from the Federal Reserve Bank of St. Louis.

Criminal Justice Costs

Table G.4: Criminal Justice Costs, \$ in Millions (2019 Estimates)

Cost Category	2019 Mid. Estimate	2019 Low Estimate	2019 High Estimate
Police protection	\$4,761	\$4,349	\$4,920
Legal and adjudication activities	\$2,050	\$1,872	\$2,118
Correctional facilities	\$4,470	\$4,118	\$4,712
Property lost due to crime	\$894	\$846	\$1,004
Criminal Justice Total	\$12,175	\$11,185	\$12,754

The criminal justice costs in the research published by the Society of Actuaries were broken down into costs for police protecting and legal and adjudication activities, costs of correctional facilities, and costs of property loss due to crime. The cost estimates for police protecting, legal and adjudication activities, and correctional facilities were derived from the annual Justice Expenditure and Employment Extracts published by the Bureau of Justice Statistics. The annualized cost trends for each category between 2013 to 2015 were trended forward to estimate for the time period between 2015 through 2019. Cost estimates for property loss between 2015 and 2017 came from the annual “Crime in the U.S.” reports published by the Federal Bureau of Investigation (FBI). The annualized trend rate for 2015 to 2017 were then used to project estimates for 2018 and 2019.

Davenport et al. (2019) then calculated the opioid cost portion for each of these cost categories separately. The portion of police protection and legal and adjudication costs attributed to non-medical opioid use was determined by first determining the proportion of arrests in the United States that are drug-induced and then applying the proportion of overall illicit drug use that is related to non-medical opioids. A similar method was used to determine the opioid cost apportionment for correctional facilities, but the authors further analyzed by type of correctional facility, including federal, state, and local facilities. The portion of property loss costs related to opioids was estimated using a drug-induced attribution factor for property crime published by the National Drug Intelligence Center (NDIC) and applying the same proportion of overall illicit substance abuse disorder that is attributed to opioid misuse.

Child & Family Assistance Costs

Table G.5: Child & Family Assistance Costs, \$ in Millions (2019 Estimates)

Cost Category	2019 Mid. Estimate	2019 Low Estimate	2019 High Estimate
Child welfare	\$1,371	\$1,297	\$1,539
Food and nutritional assistance	\$2,567	\$2,429	\$2,882
Income assistance	\$578	\$547	\$649
Housing / homeless assistance	\$3,236	\$3,062	\$3,633
Child & Family Assistance Total	\$7,752	\$7,335	\$8,703

To estimate the total costs for child and family assistance programs between 2015 and 2017, Davenport et al. (2019) sourced federal child welfare program funding data from the Congressional Research Service, costs for the Supplemental Nutrition Assistance Program (SNAP) from the U.S. Department of Agriculture, cost estimates for Temporary Assistance for Needy Families (TANF) from the Office of Family Assistance, payments data for Social Security Income (SSI) from the Social Security Administration, and spending on housing assistance from the U.S. Data Lab. The annual rates between 2015 and 2017 were trended forward to estimate the total programming costs for 2018 and 2019.

The proportion of federal spending on child and family assistance programs related to substance abuse disorder and addiction in 2009 published by the National Center on Addiction and Substance Abuse (NCASA) and the assumed proportion of total illicit substance abuse disorder that non-medical opioids account for from the National Survey on Drug Use and Health (NSDUH) were then applied to estimate the amount of child and family assistance funding spent on non-medical opioid use.

Education Costs

Table G.7: Productivity Loss Costs, \$ in Millions (2019 Estimates)

Cost Category	2019 Mid. Estimate	2019 Low Estimate	2019 High Estimate
Education Total	\$1,257	\$1,190	\$1,412

The study omits education spending for higher education programs related to substance abuse disorder and addiction due to insufficient data, suggesting lack of substance abuse disorder programs at higher education institutions. Using Common Core of Data reports for federal education expenditure data, Davenport et al. (2019) apply the proportion of federal education spending on substance abuse disorder or addiction from a

study by the National Center on Addiction and Substance Abuse (NCASA) and assumptions on the ratio of non-medical opioid use to total illicit substance abuse from the National Survey on Drug Use and Health (NSDUH) to derive estimates for education costs.

Productivity Loss Costs

Table G.7: Productivity Loss Costs, \$ in Millions (2019 Estimates)

Cost Category	2019 Mid. Estimate	2019 Low Estimate	2019 High Estimate
Reduced labor force participation and absenteeism	\$23,094	\$21,414	\$25,995
Incarceration	\$3,909	\$3,600	\$4,120
Short-term disability	\$443	\$412	\$514
Long-term disability	\$40	\$38	\$47
Workers' Compensation	\$535	\$497	\$621
Productivity Loss Total	\$28,022	\$25,961	\$31,296

The costs of lost productivity were calculated by determining the costs of reduced working hours related to non-medical opioid use and the costs of incarcerations related to non-medical opioid use.

For the former, individuals can miss employment (absenteeism) or drop out of the labor force due to illicit drug use. Davenport et al. (2019) calculated the prevalence rates of OUD by age and sex using the 3 healthcare claims datasets used to estimate healthcare costs and extrapolated to national population estimates. They multiplied the resulting national OUD estimates with the per-person annual production values by age and sex from Grosse et al. (2009) and indexed for each year using the Federal Reserve Economic Data Implicit GDP Price Deflator. Lastly, the authors applied the proportion of lost productivity attributed to non-medical opioid use published by the National Drug Intelligence Center (NDIC) to estimate productivity loss.

Lost productivity due to incarceration associated with non-medical opioid use was determined using the number of incarcerations attributed to non-medical opioid use as determined for the estimates of criminal justice costs and the per-person annual production values by age and sex from Grosse et al. (2009), indexing and adjusting using the Federal Reserve Economic Data Implicit GDP Price Deflator.

Additionally, there are lost productivity costs taken on by employers, including short-term disability pay, long-term disability pay, and workers' compensation. To calculate the proportion of these costs borne by employers that are associated with non-medical opioid use, Davenport et al. (2019) used the same matched case-control analysis and data from IBM's MarketScan Health and Productivity Database to first estimate the total amount of short- and long-term disability pay and workers' compensation for employees diagnosed with OUD. The distribution of OUD in the commercial insurance population was applied to U.S. Census Bureau data for extrapolation and for deriving the total number of employees with OUD. The assumed proportions of employees with disability pay and workers' compensation were sourced from the Bureau of Labor Statistics and Employers Insurance Company and by applying these percentages, Davenport et al. (2019) were able to determine the number of employees with OUD that were eligible for each type of benefit. The number of employees with OUD and eligibility for disability pay or workers' compensation was then multiplied by the additional costs per employee diagnosed with OUD to obtain the non-medical opioid-related costs borne by employers. These costs were then indexed using the Federal Reserve Economic Data GDP Implicit Price Deflator.

H. Conclusion

The United States faces an ongoing crisis related to substance abuse disorders. While the direct medical costs of this crisis may be the most apparent, our society also absorbs a significantly higher total of indirect and intangible costs related to substance use. We have estimated these costs in order to provide decisionmakers with a perspective that may help prioritize and direct public resources and attention to this problem.

There are several areas we did not consider in our analysis. For example, we did not look at employee turnover, replacement costs, training for medical professionals, or the impact of presenteeism. We did not address the

additional frictional economic costs of higher insurance premiums needed to cover property, auto, health, and life insurance claims related to substance abuse.

We used the most updated data and attribution information that was available. However, some of the information used such as the prescription drug treatment spend may be out of date.

We did not consider the potentially offsetting effects of higher lifetime healthcare and other category expenses for people whose lives are not cut short by substance abuse, choosing to focus on the first- and second-order effects of substance abuse disorder. In addition, we did not address any offsetting “productive” value of the economic activity associated with managing the effects of substance abuse disorder, such as the employment of medical, legal, and social services personnel, and spending on treatment expenses, end of life care costs and other categories. In this, we drew upon a great depth of modern economic thinking⁴⁴, taking the position that redirecting these economic resources to more productive uses would be a net benefit to our nation.

We hope this analysis will be a valuable tool to put into perspective the vast resources consumed by substance abuse in the United States, and to guide those whose decisions directly affect public and private sector efforts to cope with the economic and social costs of substance abuse and to provide access to treatment.

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⁴⁴ *e.g.*, Frederic Bastiat’s “parable of the broken window” and subsequent analyses from more contemporary sources.

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