



**SEALED**

IN THE DISTRICT COURT OF CLEVELAND COUNTY  
STATE OF OKLAHOMA

STATE OF OKLAHOMA, ex rel.,  
MIKE HUNTER,  
ATTORNEY GENERAL OF OKLAHOMA

Plaintiff,

vs.

- (1) PURDUE PHARMA L.P.;
- (2) PURDUE PHARMA, INC.;
- (3) THE PURDUE FREDERICK COMPANY;
- (4) TEVA PHARMACEUTICALS USA, INC.;
- (5) CEPHALON, INC.;
- (6) JOHNSON & JOHNSON;
- (7) JANSSEN PHARMACEUTICALS, INC.;
- (8) ORTHO-MCNEIL-JANSSEN  
PHARMACEUTICALS, INC., n/k/a  
JANSSEN PHARMACEUTICALS;
- (9) JANSSEN PHARMACEUTICA, INC.,  
n/k/a JANSSEN PHARMACEUTICALS, INC.;
- (10) ALLERGAN, PLC, f/k/a ACTAVIS PLC,  
f/k/a ACTAVIS, INC., f/k/a WATSON  
PHARMACEUTICALS, INC.;
- (11) WATSON LABORATORIES, INC.;
- (12) ACTAVIS LLC; and
- (13) ACTAVIS PHARMA, INC.,  
f/k/a WATSON PHARMA, INC.,

Defendant

STATE OF OKLAHOMA  
CLEVELAND COUNTY J.S.S.  
FILED In The  
Office of the Court Clerk  
MAY 02 2019

For Judge Balkman's  
Consideration

Case No. CJ-2017-816  
Honorable Thad Balkman

William C. Hetherington  
Special Discovery Master

In the office of the  
Court Clerk MARILYN WILLIAMS

**SEALED**

DEFENDANTS TEVA PHARMACEUTICALS USA, INC.,  
CEPHALON, INC., WATSON LABORATORIES, INC., ACTAVIS LLC,  
AND ACTAVIS PHARMA, INC., f/k/a WATSON PHARMA, INC.'S  
MOTION FOR SUMMARY JUDGMENT AND BRIEF IN SUPPORT

**EXHIBIT 76 FILED UNDER SEAL**

# EXHIBIT 76

# **EXHIBIT S**

**Supplemented Exhibit S - Christopher J. Ruhm, Ph.D.**

**A. Dr. Ruhm is expected to testify about the following subject matters, facts and/or opinions:**

Dr. Ruhm is expected to testify about the subject matters, facts and/or opinions, including the grounds therefor, set forth in the attached Exhibit S-1. A brief summary of the matters identified in Exhibit S-1 is provided below.

Dr. Ruhm is expected to offer expert opinions regarding the economic costs in net present value to the State of Oklahoma of measures currently proposed to abate the opioid crisis in Oklahoma over a 20-year, 25-year and 30-year period. As set forth in Exhibit S-1, these opinions will include a description of the methodology Dr. Ruhm used to calculate the projected minimum economic costs to the State of Oklahoma of these currently proposed abatement activities over a 20-year, 25-year and 30-year period.

Based on information and analysis available to date, and as set forth in Exhibit S-1, Dr. Ruhm is expected to testify that the total net present value of the minimum economic costs to the State of Oklahoma for the measures currently proposed to abate the Oklahoma opioid crisis amounts to at least:

- \$12,833,252,568 over a 20-year period;
- \$15,393,740,178 over a 25-year period; and
- \$17,760,678,601 over a 30-year period.

As discovery is ongoing in this matter, and as set forth in Exhibit S-1, Dr. Ruhm reserves the right to amend or supplement the facts and/or opinions to which he is expected to testify in the event that different or additional information becomes available. However, Dr. Ruhm's methodologies are expected to remain consistent.

**B. Summary of the grounds for each opinion**

The basis, grounds and methodology for Dr. Ruhm's opinions are set forth in Exhibit S-1. Among others, these grounds include Dr. Ruhm's education, knowledge, skill, experience, training, and expertise in the fields of economics, and particularly the areas of health economics, labor economics and public economics. Moreover, these grounds include the methodologies that Dr. Ruhm has applied and described to reach the opinions set forth in Exhibit S-1.

**C. Dr. Ruhm's Compensation**

Dr. Ruhm is being compensated at a rate of \$750 per hour for research and analysis, and a rate of \$950 per hour for deposition and trial testimony.

**D. Dr. Ruhm's Qualifications**

Dr. Ruhm's qualifications are reflected in Exhibit S-1 and his *curriculum vitae*, which is attached as Exhibit S-2 hereto.

**E. Dr. Ruhm's Publications**

Dr. Ruhm's publications are listed in his *curriculum vitae* (Exhibit S-2 hereto).

**F. Dr. Ruhm's Prior Testimony**

A list of matters in which Dr. Ruhm has testified as an expert witness in the past four years is set forth in an Appendix to Exhibit S-1.

# **EXHIBIT S-1**

**Costs to the State of Oklahoma of Abating the Opioid Crisis**

Prepared by: Christopher J. Ruhm, Ph.D.

December 21, 2018  
Supplemented February 5, 2019

Qualifications

I received a B.A. degree in Economics from the University of California at Davis in 1978 and an M.A. and Ph.D. in Economics from the University of California at Berkeley in 1981 and 1984. From 1984-1991, I was an Assistant Professor at Boston University. From 1991-2010, I held positions as Associate Professor, Professor and Jefferson-Pilot Excellence Professor of Economics at the University of North Carolina at Greensboro. Since 2011, I have been a Professor of Public Policy and Economics at the University of Virginia. During 1996-1997, I served on President Clinton's Council of Economic Advisers as a Senior Staff Economist with primary responsibilities in the areas of health policy and aging.

I have published 140 books, articles, book chapters or policy publications. The majority of my work has focused on the areas of health and labor economics. Most of my health research examines factors influencing or determining health outcomes, and much of my recent work addresses opioid and other drug problems. My work has appeared in leading economic and health journals including the *Quarterly Journal of Economics*, *American Economic Review*, *Journal of Health Economics* and *American Journal of Preventive Medicine*. I have served as Associate Editor or Editorial Board member for the *Journal of Health Economics*, *Journal of Population Economics*, *Southern Economic Journal*, *European Economic Review*, *American Journal of Health Economics*, *Economics Letters* and *Journal of Labor Research*. I am a Research Associate in the Health Economics, Health Care and Children's programs at the National Bureau of Economic Research and a Research Fellow at the Institute for Labor Economics. I serve on the Board of Directors of the American Society of Health Economists and am on the Steering Committee of the Southeastern Health Economics Study Group. I have just completed a two-year term as President of the Southern Economic Association, where I was previously Vice President and member of the Board of Trustees. In 2017 and 2018, I chaired the International Health Economics Association Kenneth J. Arrow Award Committee, which selects the best article in the field of health economics published during the previous year.

My research has received more than 17,000 Google Scholar citations, and I have received grant funding from a variety of foundations, parts of the National Institutes of Health, and other government agencies. I have been ranked as one of the top 50 health economics authors and one of the top 1000 Economists in the world in bibliometric analyses. I received a University-wide Research Excellence Award from the University of North Carolina at Greensboro and two Faculty Excellence awards at the University of Virginia.

I am being compensated at the rate of \$750 per hour for research and analysis, and \$950 per hour for deposition and trial testimony. My compensation in this matter is not contingent or based on the content of my opinion in this or any other matter or the outcome of this or any other matter. A list of my testimony in the last four years is attached in Appendix D.



## Background

Oklahoma, like most of the country, is suffering from an opioid crisis. The 2017 *President's Commission On Combatting Opioid Addiction and the Opioid Crisis* documents the magnitude of this crisis including the following.<sup>1</sup>

- in 2016, 91.8 million (34.1%) or more than one-third of U.S. civilian, noninstitutionalized adults used prescription opioids; 11.5 million (4.3%) misused them and in 2015, 1.6 million (0.7%) of them had an opioid use disorder (OUD).
- 3.4 million people aged 12 or older in 2016 were current misusers of pain relievers (1.2% of this age group).
- At least 630,000 individuals had a heroin use disorder (HUD) in 2016.
- Among people needing substance use treatment, just 8.2%, 7.2% and 12.1% of 12-17, 18-25 and ≥26 year-olds, respectively, received treatment at a specialty facility in the past year.
- Nonmedical use of prescription opioids is a key risk for conversion to heroin use.
- Opioid misuse and OUD have large negative health, financial and social consequences.

All three of the Defendant corporate families in this case admit Oklahoma is in the midst of an opioid crisis.

- Purdue:  
Q: We've got a crisis. You agree?  
A: We have a crisis. That's right.<sup>2</sup>  
Purdue: <https://www.purduepharma.com/> ("Read about our ongoing efforts to help address the opioid crisis here")
- J&J:  
Q: Is there a prescription opioid crisis in Oklahoma?  
MR. LIFLAND: Object to the form of the question.  
A: There's a prescription opioid problem nationally, and I assume that Oklahoma is part of the same problem.  
Q: Is there an opioid addiction crisis in Oklahoma?  
A Same response. I assume that there is an opioid addiction issue problem nationally and I take it that the problem exists in Oklahoma as well.<sup>3</sup>
- Teva:  
Q: Do you agree there's an opioid epidemic in Oklahoma?  
MR. BARTLE: Objection. Beyond the scope. You can answer in your personal capacity if you know.  
A: I agree that there's an opioid epidemic across the country including Oklahoma.<sup>4</sup>

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<sup>1</sup> Christie, Chris, et al. "The president's commission on combating drug addiction and the opioid crisis." *Washington, DC, US Government Printing Office*, (Nov. 1, 2017).

<sup>2</sup> Deposition of Lisa Miller, Aug. 29, 2018 (hereinafter "Lisa Miller"), at 107:13-15.

<sup>3</sup> Deposition of Bruce Moskovitz, Aug. 28, 2018 (hereinafter "Bruce Moskovitz"), at 302:20—303:7.

<sup>4</sup> Deposition of John Hassler, Aug. 29, 2018 (hereinafter "John Hassler"), at 49:4-9.

While this crisis has certainly wreaked havoc across the country, Oklahoma's situation does differ from those of many other states in a variety of ways, the most important probably being that deaths and opioid use problems are much more concentrated among prescription opioid analgesics, and are less likely to involve heroin than in other states. For example, an analysis of CDC-Wonder Multiple Cause of Death data indicates that heroin was mentioned on 6.5% of 2016 death certificates involving drug overdoses in Oklahoma and prescription opioids on 48.2% of them, whereas the comparable figures for the entire US were 24.3% and 51.0%.<sup>5</sup>

The statistics for Oklahoma are staggering. According to the Final Report of the Oklahoma Commission on Opioid Abuse, drug overdose deaths have increased by 91 percent over the last 15 years.<sup>6</sup> Nearly 1,000 Oklahomans die every year from a drug overdose. And over 1,300 newborns tested positive for substance exposure in Oklahoma just in the last three years. As the report described: "If Oklahoma is not ground zero, it is close."

For the purposes of this report, abatement refers to efforts to mitigate or reverse the consequences of the opioid crisis in Oklahoma by preventing new cases of addiction, treating opioid use disorder, and addressing problems related to opioid use. The scope of my work below is limited to providing an objective and independent analysis of the cost to the state of Oklahoma of measures proposed to abate the opioid crisis.

As the Defendants in this case have recognized, this crisis is expansive.<sup>7</sup> The crisis affects a great number of Oklahomans.<sup>8</sup> The crisis will be expensive to fix.<sup>9</sup> And, if something isn't done to abate the crisis, the crisis can still get worse.<sup>10</sup> Accordingly, this abatement plan attempts to match that expanse with a comprehensive, multi-faceted approach to the crisis.

My opinions are stated with a reasonable degree of certainty and are based on the information that has been provided me to date. I reserve the right to supplement my opinions or modify my analysis if additional information becomes available. Unless otherwise noted, all estimates of abatement costs are rounded to the nearest whole dollar and are presented in 2019-year dollars. The net present value of abatement costs is \$12,833,252,568 for the 20-year period 2019-2038, \$15,393,740,178 for the 25-year period 2019-2043, and \$17,760,678,601 for the 30-year period 2019-2048. This almost certainly understates the total costs to abate the opioid crisis in Oklahoma because many of these costs are likely to extend beyond the 30-year period considered. In addition, the State has previously undertaken a variety of abatement activities, the expense of which has not been included in this report. The calculations and assumptions resulting in these estimates are described below. This report does not offer an opinion on the necessity or propriety of the items included in the abatement plan.

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<sup>5</sup> Source: *CDC Wonder: Multiple Cause of Death*, <https://wonder.cdc.gov/mcd-icd10.html>. Prescription opioids include natural/semisynthetic opioid, methadone and synthetic opioids. These statistics understate the actual involvement of specific drug categories because they do not account for incomplete reporting (Ruhm, Christopher J. "Corrected US Opioid-Involved Drug Poisoning Deaths and Mortality Rates, 1999-2015" *Addiction* 113(7), July 2018, 1339-1344.) Corrections for this under-reporting are incorporated in other analyses used in this case.

<sup>6</sup> Final Report, The Oklahoma Commission on Opioid Abuse (Jan. 23, 2018) ("Final Report of the Oklahoma Commission on Opioid Abuse"), <http://www.oag.ok.gov/Websites/oag/images/Oklahoma%20Commission%20on%20Opioid%20Abuse%20Final%20Report.pdf>.

<sup>7</sup> Lisa Miller at 108:1-16; 403:14-22.

<sup>8</sup> Bruce Moskovitz at 303:13 – 304:15; 304:24 – 305:10; John Hassler at 127:2 – 129:13.

<sup>9</sup> Bruce Moskovitz at 287:17-25.

<sup>10</sup> Lisa Miller at 442:21 – 443:13.

## Development of Abatement Plan

The abatement plan costs estimated in this report are largely based on recommendations of the State. The abatement costs are calculated for a 20-year period beginning in 2019 and ending in 2038, a 25-year period beginning in 2019 and ending in 2043, and a 30-year period beginning in 2019 and ending in 2048. It should be noted that many expenses associated with abating Oklahoma's opioid crisis are likely to extend beyond the 30-year period. For example, since opioid use disorder (OUD) is often a lifelong condition, individuals receiving medically assisted treatment (MAT) services may need to continue to obtain treatment well after the 2048 end date of this analysis. For this reason, the estimates provided here are likely to be conservative, in that the actual costs will be higher than these amounts. It is my understanding that additional abatement areas may be added before trial due to the fact that discovery is still ongoing. Costs were modeled on the best information available at the time of this report and may change.<sup>11</sup> To the extent abatement areas and/or costs change, I reserve the right to modify my opinions as necessary to reflect any such costs.

The Plan proposed for Oklahoma is consistent with a variety of other proposals and recommendations for abating the consequences of the opioid crisis. For instance, the recent President's Commission Report includes the following recommendations.<sup>12</sup>

- Student assessment and screening tools to identify at-risk students.
- Multi-platform media campaigns addressing the hazards of substance use, the danger of opioids and stigma.
- Development of a national curriculum and standard of care for opioid prescribers, including special targeting for primary care physicians.
- Development and dissemination of a model training program to all levels of medical education.
- Enhanced support for prescription drug monitoring programs.
- Encouragement of hospitals/clinics and retail pharmacies to become authorized collectors of drugs.
- Strengthened data collection and surveillance activities.
- Incorporation of measures that address addiction screenings and treatment referrals.
- Broad establishment of drug courts.
- Use of medication-assisted treatment with pre-trial detainees and upon release.
- Expanded use of recovery coaches.
- Increases in the number of addiction-trained physicians, nurses and other medical professionals, particularly in localities with above average opioid use/abuse.

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<sup>11</sup> Service and cost information was obtained from at least the following: Oklahoma Department of Mental Health and Substance Abuse Services ("ODMHSAS"), Oklahoma State University ("OSU"), University of Oklahoma ("OU"), Oklahoma Bureau of Narcotics and Dangerous Drugs ("OBND"), Oklahoma State Department of Health ("OSDH"), Oklahoma Healthcare Authority ("OHCA"), Oklahoma Board of Pharmacy ("OBP"), Oklahoma Office of Juvenile Affairs (OJA), Oklahoma Hospital Association (OHA), Oklahoma Attorney General ("OAG"), Oklahoma Office of Chief Medical Examiner, Oklahoma Veterinary Board, Oklahoma State Board of Osteopathic Examiners, Oklahoma Board of Nursing, Oklahoma Board of Medical Licensure and Supervision, and Saxum.

<sup>12</sup> Christie, Chris, et al. "The President's Commission on Combating Drug Addiction and the Opioid Crisis." *Washington, DC, US Government Printing Office, Nov 1 (2017).*

- Identification and provision of successful college recovery programs.

A 2018 Surgeon General's Report emphasizes the following activities as important for containing and reversing the opioid crisis.<sup>13</sup>

- Primary prevention and screening.
- Access to medication-assisted treatment combined with behavioral therapies.
- Harm reduction strategies including overdose prevention education, expanded access to naloxone and supervised withdrawal management.
- Staff training and development.
- Recovery support services including ongoing support during and after treatment.

The 2016 Oklahoma state plan for reducing prescription drug abuse highlights the following interventions.<sup>14</sup>

- Increased public education through media campaigns of various types.
- Provider/prescriber education through dissemination of guidelines, provider-oriented programs, pain management courses and other interventions for medical students and practice facilitation services.
- Increased availability of medication disposal sites for both the public and providers/prescribers.
- Enhanced surveillance and monitoring through the Oklahoma Prescription Monitoring Program (PMP), establishment of an emergency department discharge database and public surveillance of neonatal abstinence syndrome (NAS).
- Expanded availability of naloxone, enactment of "Good Samaritan" legislation, increased screening by primary care and emergency departments and ongoing training/consultation services for health professionals.

And the 2018 Final Report of the Oklahoma Commission on Opioid Abuse recommended the following.<sup>15</sup>

- Enact legislation to mandate the use of electronic prescriptions ("e-prescribing").
- Enact a Good Samaritan Law to grant limited immunity to individuals who call to report a drug overdose.
- Enact legislation that imposes maximum quantity limits on first, second, and subsequent opioid prescriptions and includes formal patient notice and informed consent requirements.
- Enact legislation that requires opioid manufacturers, wholesalers, and distributors to register with the OBNDD.

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<sup>13</sup> U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, *Facing Addiction in America: The Surgeon General's Spotlight on Opioids*. Washington, DC: HHS, September 2018. [https://addiction.surgeongeneral.gov/sites/default/files/Spotlight-on-Opioids\\_09192018.pdf](https://addiction.surgeongeneral.gov/sites/default/files/Spotlight-on-Opioids_09192018.pdf).

<sup>14</sup> "Reducing Prescription Drug Abuse in Oklahoma, 2016: A Review of Progress and Updated State Plan", [https://www.ok.gov/health2/documents/UP\\_Rx\\_Abuse\\_Prevention\\_State\\_Plan\\_2016.pdf](https://www.ok.gov/health2/documents/UP_Rx_Abuse_Prevention_State_Plan_2016.pdf).

<sup>15</sup> Final Report of the Oklahoma Commission on Opioid Abuse.

- Enact legislation to create a Drug Overdose Fatality Review Board or Task Force to study causes of opioid overdoses and identify ways to prevent death and refer appropriate cases for criminal prosecution.
- Encourage use of the ODMap application by law enforcement, first responders, and health officials to track overdose events in real time so that resources can be directed to “hot-spot” areas and criminal investigations can be conducted, if necessary.
- Support expanded and improved utilization of the PMP by providers and proactive programming by OBN administrators which would provide alerts to prescribers and pharmacists regarding dangerous prescription combinations, high daily dosages of opioids, and doctor-shopping.
- Create a statewide emergency department (“ER”) discharge database to study overdose events and aftercare results.
- Encourage the mandatory offering of Naloxone by prescribers and pharmacists to individuals receiving their first opioid prescription or those receiving an opioid prescription in addition to a benzodiazepine.
- Provide all first responders with Naloxone and training on how to recognize signs of an overdose and how to use the drug.
- Encourage nursing homes and long-term care facilities to develop best practices with regard to medication safety, storage, and disposal and to promote best practices with regard to accurately documenting patient medications.
- Pursue rule changes with the appropriate medical boards to require at least one hour of continuing education for all prescribers every reporting period on proper prescribing and the risks of opioids and recognizing addiction and diversion.
- Pursue rule changes with the appropriate board to require at least one hour of continuing education every reporting period for pharmacists on how to recognize signs of addiction and diversion.
- Propose and provide specific training for law enforcement personnel and investigators through the Oklahoma Council on Law Enforcement Education and Training (“CLEET”) on handling opioid diversion investigations.
- Continue and expand the first responder overdose program through the Department of Mental Health and Substance Abuse Services, which is providing Naloxone to first responders.
- Expand the 19 community-based Naloxone programs in the State to include homeless shelters.
- Make more inpatient treatment beds and outpatient treatment options immediately available.
- Support the expansion of OSU’s Project ECHO in order to increase the number of doctors trained in addiction medicine and increase their availability to patients in rural areas of Oklahoma.
- Promote and encourage the use of SBIRT tools by primary care and other providers to increase the identification of addiction and make appropriate referrals for treatment.
- Promote training for middle school and high school student athletes and coaches on the risk of addiction to opioid pain medications after sports injuries and encourage the use of early intervention screening tools.

In addition, the Defendants in this case formerly used sales representatives to detail and target doctors and pharmacies to get them to prescribe (doctors) and stock (pharmacies) opioids. Many publications, including the White House Commission Report, recognize that these (and other) aggressive marketing tactics are a cause of the opioid crisis in America. These aggressive

marketing tactics occurred in Oklahoma. Each of the Defendants has stopped detailing doctors in the State of Oklahoma. For example, Purdue has engaged in an extensive marketing campaign via newspaper and online advertising in which Purdue states that one of the primary things Purdue has done to try to help abate the crisis is to fire all of its United States sales staff and stop detailing medical care professionals.<sup>16</sup> The State's Plan includes the cost to provide counter detailing in the State of Oklahoma to correctly train and educate medical care professionals, pharmacists/pharmacies, and the public about opioid use.

### The Plan

Table 1 provides a listing of the Plan's programs and services. The first column displays the category and subcategories of programs or services. The second column identifies the corresponding exhibit in Appendix B. The third column sets forth overall cost of services for the category in the first year for which expenses will be incurred: 2019 for all categories except syringe services which will start in 2020. Details regarding the subcategories and component and total costs for each subcategory are provided in the set of exhibits in Appendix B. In addition to the component description and basis for the cost calculations, the exhibits set forth the net present value of total costs for each subcategory for each of the 20-year, 25-year and 30-year plans. Adjustments to 2019 dollars, where needed, are obtained using percentage changes for the relevant price index over the most recent 12-month or other relevant period, using information shown in Appendix Table A.1.

### Annual Costs By Category

Table 2 shows the annual abatement cost, between 2019 and 2048, for each of the major categories detailed in Table 1. All entries are rounded to the nearest 2019-year dollars. Total costs for the year are shown in the final column of the table.

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<sup>16</sup> (<https://www.purduepharma.com/ongoing-efforts-to-help-address-the-opioid-crisis/what-we-are-doing-now/>)

Table 1: Abatement Plan Major Categories

Brief Description	Exhibit	First-Year Cost (\$2019)
<b>Opioid Use Disorder Prevention, Treatment &amp; Recovery Services (TREAT)</b>		<b>729,301,392</b>
Addiction Treatment Services (TREAT)	T.1	232,947,710
Addiction Treatment – Supplementary Services (TREAT-S)	T.2	85,962,677
Addiction & Mental Health Helpline (HELP)	T.3	4,094,400
Public Medication Disposal (DISPOSE)	T.4	139,883
Technical Assistance (TECH)	T.5	945,806
Specialty Courts (COURT)	T.6	15,865,800
Transportation Services (TRANS)	T.7	6,130,545
Universal Screening (SCREEN)	T.8	89,975,632
Pharmacy Disposal (PHARM)	T.9	10,255,032
Pain Services (PAIN)	T.10	103,277,835
K12 Prevention (K12)	T.11	55,958,231
K12 Supplementary Prevention (K12SUP)	T.12	68,156,406
Community Prevention (COMM)	T.13	18,476,953
Higher-Ed Discretionary Prevention Funds (HED)	T.14	10,154,112
Public Education (PUB)	T.15	26,690,370
<b>Overdose Prevention &amp; Response (PREV)</b>		<b>23,085,643</b>
Naloxone Distribution/Education (NALOX)	P.1	1,594,035
Grief Support Services (GRIEF)	P.2	1,218,084
University Behavioral Health (UNIVB)	P.3	20,273,524
Syringe Service Program (SYRINGE)	P.4	30,829,551
<b>Medical Education (EDUC)</b>		<b>38,932,590</b>
Continuing Medical Education (CME)	M.1	843,446
Addiction Medicine Course (COURSE)	M.2	758,725
Medical Case Management/Consultation (CASE)	M.3	3,953,832
Residency Training Programs (RESID)	M.4	287,632
Academic Medicine (ACAD)	M.5	26,358,785
Counter-Detailing (DETAIL)	M.6	4,094,400
Behavioral Health Workforce Development (WORK)	M.7	2,635,770
<b>Neonatal Abstinence Syndrome / Child Services (NAS)</b>		<b>34,618,221</b>
NAS Evaluation/Assessment (NASA)	N.1	155,587
Prenatal Screening (PRENAT)	N.2	10,250,305
Neonatal Treatment (NAST)	N.3	24,212,329
<b>Data Surveillance, Reporting, Research (SURV)</b>		<b>31,635,111</b>
Opioid Overdose Review Board (REVIEW)	D.1	163,356
PMP System/Upgrades (PMP)	D.2	1,727,269
Program Management Monitoring/Evaluation (MONTR)	D.3	2,334,219
Health Information Exchange (HIE)	D.4	25,590,000
Epidemiological Staffing (EPI)	D.5	798,370
Data Collection (DATA)	D.6	832,339
NAS Reporting (NASR)	D.7	189,558
<b>Enforcement/Regulatory (REGUL)</b>	C.1	<b>13,283,599</b>
<b>2019 Total</b>		<b>870,85,556</b>

Note: First-year costs are those projected for 2019 in all cases except the syringe service program, where they refer to 2020. Major category and overall total refer to 2019 costs and so exclude syringe services.

Confidential

Table 2: Abatement Costs By Major Cost Category and Year

Year	TREAT	PREV	EDUC	NAS	SURV	REGUL	TOTAL
2019	729,031,392	23,085,643	38,932,590	34,618,221	31,635,111	13,283,599	870,586,556
2020	600,268,064	53,898,719	24,528,388	26,780,202	44,443,168	11,512,541	761,431,082
2021	593,096,994	53,765,993	24,454,587	26,868,109	44,851,834	11,512,541	754,550,057
2022	594,119,152	53,784,069	24,380,785	26,956,398	36,254,368	11,512,541	747,007,313
2023	595,145,756	53,802,350	24,306,984	27,045,071	36,663,034	11,512,541	748,475,736
2024	630,655,512	53,820,838	24,233,182	30,915,053	36,257,438	10,335,401	786,217,425
2025	590,292,844	50,944,130	24,159,381	27,223,577	36,663,034	10,335,401	739,618,367
2026	591,332,904	48,067,633	24,085,579	27,313,412	36,254,368	10,335,401	737,389,297
2027	592,377,488	45,191,351	24,011,778	27,403,638	36,663,034	10,335,401	735,982,690
2028	593,426,615	42,315,285	23,937,976	27,494,257	36,254,368	10,335,401	733,763,903
2029	632,823,084	39,439,438	23,922,162	31,419,420	36,666,104	10,335,401	774,605,609
2030	592,483,136	36,563,813	23,906,347	27,676,679	36,254,368	10,335,401	727,219,744
2031	593,546,014	36,583,819	23,890,532	27,768,485	36,663,034	10,335,401	728,787,286
2032	594,613,516	36,604,051	23,874,718	27,860,691	36,254,368	10,335,401	729,542,745
2033	595,685,662	36,624,512	23,858,903	27,953,298	36,663,034	10,335,401	731,120,810
2034	638,160,695	36,645,205	23,843,089	31,827,231	36,257,438	10,335,401	777,069,058
2035	597,843,965	36,666,132	23,827,274	28,139,722	36,663,034	10,335,401	733,475,529
2036	598,930,163	36,687,297	23,811,459	28,233,543	36,254,368	10,335,401	734,252,231
2037	600,021,086	36,708,701	23,795,645	28,327,772	36,663,034	10,335,401	735,851,639
2038	601,116,755	36,730,348	23,779,830	28,422,411	36,254,368	10,335,401	736,639,113
2039	643,615,413	36,752,240	23,758,744	32,351,611	36,666,104	10,335,401	783,479,513
2040	603,322,411	36,774,380	23,758,744	28,612,925	36,254,368	10,335,401	739,058,230
2041	604,432,441	36,796,771	23,758,744	28,708,804	36,663,034	10,335,401	740,695,195
2042	605,547,299	36,819,416	23,758,744	28,805,100	36,254,368	10,335,401	741,520,328
2043	606,667,006	36,842,317	23,758,744	28,901,815	36,663,034	10,335,401	743,168,318
2044	649,189,808	36,865,478	23,758,744	32,779,874	36,257,438	10,335,401	789,186,743
2045	608,921,055	36,888,901	23,758,744	29,096,509	36,663,034	10,335,401	745,663,645
2046	610,055,438	36,912,590	23,758,744	29,194,492	36,254,368	10,335,401	746,511,033
2047	611,194,756	36,936,547	23,758,744	29,292,901	36,663,034	10,335,401	748,181,383
2048	612,339,030	36,960,775	23,758,744	29,391,738	36,254,368	10,335,401	749,040,057

Note: Table shows annual abatement costs for the specified category in 2019-year dollars.



### Discounting to Present Value

If abatement costs are received in the form of a lump-sum payment, the funds could be invested, in which case they would earn a yield. The net present value (NPV) of a future expense is the amount of money that, if invested, would yield the future payment at a specified date. Future abatement costs should therefore be “discounted” to present value using an appropriate rate of return. Although it is difficult to project the appropriate rate of return with accuracy for any single year, it is possible to estimate an *average* discount rate over a longer period of time. This analysis assumes that any lump sum will be invested in 10-year U.S. Treasury Securities. Over the 1998-2018 period, these yielded an average of 3.68 percent per year (Appendix Table A.1).<sup>17</sup> Over the same period, the average inflation rate, as measured by the change in the Gross Domestic Product Implicit Price Deflator, was 1.93 percent per year.<sup>18</sup> Therefore, the real (inflation-adjusted) discount rate used in this analysis is 1.75 percent (3.68 – 1.93) per year. The lump-sum payment could be invested in different ways. One possibility would be to invest it in shorter-term Treasury securities (or a blend of longer and short-term government bonds). A second would be to pay down some existing Oklahoma debt obligations. Appendix C provides an analysis of these alternatives and shows that each of them would imply a lower discount rate and, subsequently, a larger estimate of the net present value of abatement costs.

### Net Present Value of Abatement Costs

Table 3 details the overall abatement costs for the state of Oklahoma covering the period 2019-2048. All costs are expressed in 2019-year dollars. The second column of the table shows the undiscounted total abatement expenses for the specified year. The third column displays the discount factor, assuming a real discount rate of 1.75 percent per year. The fourth column indicates the net present value (NPV) of annual abatement costs, obtained by multiplying the undiscounted costs in column (2) by the discount factor in the third column. The final column of the table presents the cumulative net present value of abatement expenses, through the specified year. The last column indicates that the net present value of abatement costs is \$12,833,252,568 for the 20-year period 2019-2038, \$15,393,740,178 for the 25-year period 2019-2043, and \$17,760,678,601 for the 30-year period 2019-2048.

<sup>17</sup> Source: 1998-2017: *Economic Report of the President, 2018*, Table B-25. 2018 yields calculated as monthly average from 12/17-11/18 using data from the Federal Reserve Economic Data (*FRED*), <https://fred.stlouisfed.org> (series GS10)

<sup>18</sup> Source: Federal Reserve Economic Data (*FRED*) series GDPDEF.

Table 3: Net Present Value of Abatement Expenditure

YEAR	Total Abatement Cost	Discount Factor	Net Present Value (NPV) of Abatement Cost	Cumulative NPV of Abatement Cost
2019	870,586,556	1.000	870,586,556	870,586,556
2020	761,431,082	0.983	748,335,216	1,618,921,772
2021	754,550,057	0.966	728,818,219	2,347,739,991
2022	747,007,313	0.949	709,123,046	3,056,863,037
2023	748,475,736	0.933	698,296,804	3,755,159,841
2024	786,217,425	0.917	720,892,613	4,476,052,454
2025	739,618,367	0.901	666,501,575	5,142,554,029
2026	737,389,297	0.886	653,064,241	5,795,618,270
2027	735,982,690	0.870	640,607,851	6,436,226,121
2028	733,763,903	0.855	627,691,983	7,063,918,104
2029	774,605,609	0.841	651,233,088	7,715,151,192
2030	727,219,744	0.826	600,879,053	8,316,030,246
2031	728,787,286	0.812	591,817,459	8,907,847,704
2032	729,542,745	0.798	582,241,705	9,490,089,410
2033	731,120,810	0.784	573,465,499	10,063,554,909
2034	777,069,058	0.771	599,022,793	10,662,577,702
2035	733,475,529	0.758	555,693,021	11,218,270,723
2036	734,252,231	0.745	546,713,969	11,764,984,692
2037	735,851,639	0.732	538,481,441	12,303,466,133
2038	736,639,113	0.719	529,786,435	<b>12,833,252,568</b>
2039	783,479,513	0.707	553,782,575	13,387,035,144
2040	739,058,230	0.695	513,400,020	13,900,435,164
2041	740,695,195	0.683	505,687,634	14,406,122,798
2042	741,520,328	0.671	497,543,950	14,903,666,748
2043	743,168,318	0.659	490,073,430	<b>15,393,740,178</b>
2044	789,186,743	0.648	511,469,020	15,905,209,198
2045	745,663,645	0.637	474,950,232	16,380,159,430
2046	746,511,033	0.626	467,312,015	16,847,471,446
2047	748,181,383	0.615	460,302,355	17,307,773,800
2048	749,040,057	0.605	452,904,801	<b>17,760,678,601</b>

Note: All costs are in 2019 dollars. Total (undiscounted) abatement costs are obtained from the final column of Table 2. The real discount rate is assumed to 1.75 percent per year.

## Appendix A: Additional Supporting Tables

Table A.1: Changes in Price Indices and Treasury Yields (Constant Maturities)

Year	Price Changes			U.S. Treasury Security Yields	
	GDP-Deflator	PCI-Health	PCI- Pharmaceutical/ Medical Products	3-Year	10-Year
1998	75.433	67.636	63.242	5.14%	5.26%
1999	76.462	69.115	65.972	5.49%	5.65%
2000	78.309	71.260	68.454	6.22%	6.03%
2001	80.004	73.543	71.692	4.09%	5.02%
2002	81.194	75.492	74.835	3.10%	4.61%
2003	82.712	78.414	76.964	2.10%	4.01%
2004	85.056	81.199	79.157	2.78%	4.27%
2005	87.783	83.689	81.491	3.93%	4.29%
2006	90.481	86.431	84.717	4.77%	4.80%
2007	92.776	89.355	85.937	4.35%	4.63%
2008	94.690	91.854	87.892	2.24%	3.66%
2009	94.938	94.308	90.693	1.43%	3.26%
2010	96.222	96.710	93.902	1.11%	3.22%
2011	98.553	98.514	97.006	0.75%	2.78%
2012	100.225	100.309	100.000	0.38%	1.80%
2013	101.918	101.423	100.484	0.54%	2.35%
2014	104.029	102.769	103.343	0.90%	2.54%
2015	105.117	103.344	107.163	1.02%	2.14%
2016	106.172	104.575	111.304	1.00%	1.84%
2017	108.097	105.930	114.652	1.58%	2.33%
2018	110.645	108.036		2.57%	2.87%
Average Δ: 1998–2018	1.934%	2.369%	3.147%	2.64%	3.68%
Adjustment to 2019\$	2.36%	1.99%	3.01%	N/A	N/A

Sources. Price Changes: Federal Reserve Economic Data (*FRED*), <https://fred.stlouisfed.org>  
Series: Gross Domestic Product: Implicit Price Deflator, Index 2012=100, Quarterly, Seasonally Adjusted (GDPDEF); Personal consumption expenditures: Services: Health care (chain-type price index), Index 2012=100 (DHLCRG3Q086SBEAF); Personal consumption expenditures: Nondurable goods: Pharmaceutical and other medical products (chain-type price index), Index 2012=100 (DPHMRG3A086NBEA). U.S. Constant Maturity Treasury Yields - 1998-2017: *Economic Report of the President, 2018*, Table B-25. 2018 yields calculated as monthly average from 12/17-11/18 using data from *FRED* (GS3 & GS10).

Price Indices refer to July 1 of specified year; except PCI-Pharmaceutical which refers to January 1.

20-year Average Δ: Average annual Δ in prices from 1998-2018, except 1997-2017 for PCI-Pharmaceutical. Adjustment to 2019\$ shows change needed to convert 2018\$ to 2019\$, based on most recent available one-year change in price index (e.g. 2018 vs. 2017 for GDP-deflator).

**Appendix B: Detailed Exhibits Showing Abatement Costs By Subcategory**

**Exhibit T.1**

**Service: Addiction Treatment Services (TREAT)**

**Description:** All Oklahoma residents will receive assessment and comprehensive treatment and recovery services based on the American Society for Addiction Medicine (ASAM) level of care needed, including: early intervention; outpatient; ambulatory detoxification; intensive outpatient; partial hospitalization; residential; medically managed detoxification; and medication.<sup>19</sup>

**2018 Costs (net of administrative costs)**

<b>Service</b>	<b>Cost</b>
Early Intervention	\$5.0000 million
Outpatient Services	\$37.5000 million
Ambulatory Detoxification	\$24.0000 million
Intensive Outpatient	\$40.5000 million
Partial Hospitalization	\$51.0000 million
Residential Care	\$41.0625 million
Medically Managed Detoxification (residential)	\$13.6875 million
Medication	\$9.0000 million

**Total: \$232.94771 million (2019\$)**

[Total: \$221.75 million. \$228.4025 million (Total with 3% administrative costs included). Costs expected to increase at medical care inflation rate, estimated to be 0.435% per year higher than the general inflation rate. Conversion of 2018 costs (\$228.4025 million) to 2019\$ (1.99% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$4,128,961,169
25-year period (2019-2043):	\$5,003,978,362
30-year period (2019-2048):	\$5,823,895,409

<sup>19</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

Exhibit T.2

**Service: Addiction Treatment – Supplementary Services (TREAT-S)**

Description: Supportive services related to addiction and recovery, including: halfway house; recovery housing; housing first; IPS (employment services); case management; peer recovery support; and healthcare services. Additional halfway house and residential facilities to be established in high need areas.<sup>20</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Halfway House	\$18.25 million
Recovery Housing	\$8.40 million
Housing First	\$1.50 million
IPS (Employment Services)	\$1.50 million
One-Time Cost (in 2019) for building halfway house/residential facilities	\$54.166666 million
<b>Personnel<sup>21</sup></b>	<b>Cost</b>
Mental Health Consultant, Juvenile Justice System	\$82,033
Care Navigator, Juvenile Justice System <sup>22</sup>	\$82,033

**Total (2019\$)**

**First Year: \$85.962677 million**

**Later Years: \$30.157678 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$83.980732 million & \$29.814066 million 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$569,874,489
25-year period (2019-2043):	\$672,851,768
30-year period (2019-2048):	\$767,272,927

<sup>20</sup> Primary Information Sources: Oklahoma Department of Mental Health and Substance Abuse Services, Office of Juvenile Affairs.

<sup>21</sup> Unless stated elsewhere in these Exhibits, personnel costs include benefits of 1.4915 x Salary.

<sup>22</sup> (<https://members.naco.org/FileUpload/Awards/Storage/2018/107790/CJS%20Family%20Navigator.pdf> & <https://cohfs.org/family-navigator>)

Exhibit T.3

**Service: Addiction & Mental Health Helpline (HELP)**

**Description:** Statewide, 24/7 live helpline (telephonic and text services) for Oklahomans, including: crisis and de-escalation support; brief education on behavioral health topics; service referral; service navigation support; and follow-up services.<sup>23</sup>

2018 Costs

<b>Service</b>	<b>Cost<sup>24</sup></b>
Substance & Mental Health Helpline	\$4.0 million

**Total: \$4.0944 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$4.0 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$69,793,375
25-year period (2019-2043):	\$83,774,231
30-year period (2019-2048):	\$96,593,454

<sup>23</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>24</sup> Costs comparable to similar helpline services for Oklahoma tobacco cessation support (<https://tset.ok.gov/sites/g/files/gmc166/f/TSET%20FY18%20AR%20%28singles%29.pdf>).

Exhibit T.4

**Service: Public Medication Disposal (DISPOSE)**

**Description:** Expand and maintain Safe Trips for Scripts medication disposal program.<sup>25</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
177 disposal boxes	\$14,750 <sup>26</sup>
Consumables	\$1,770 <sup>27</sup>
Compactor	\$6,000 <sup>28</sup>
<b>Personnel</b>	
Staff required to administer and maintain	\$114,138 <sup>29</sup>

**Total: \$139,883 (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$136,658) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$2,384,454
25-year period (2019-2043):	\$2,862,102
30-year period (2019-2048):	\$3,300,064

<sup>25</sup> Primary Information Source: Oklahoma Bureau of Narcotics and Dangerous Drugs Control.

<sup>26</sup> 177 disposal boxes (\$500 each, 6 year life). Cost: (177 x \$500)/6: \$14,750.

<sup>27</sup> \$10/box. Cost (177 x \$10): \$1,770.

<sup>28</sup> 2 needed at \$30,000 each & last 10-years. Cost: (\$60,000/10 years) \$6,000.

<sup>29</sup> 12 hours per box = 2,124 hours. Agent 3 salary = \$107,475, assume 2,000 hours/year of work. Cost: (\$107,475 x 2,124/2,000) \$114,138.



Exhibit T.5

**Service: Technical Assistance (TECH)**

Description: Provide technical assistance and training in evidence-based practices for opioid assessment and treatment, including Medication Assisted Treatment/Therapy.<sup>30</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
12 evidence-based practice disseminations per year	\$624,000 <sup>31</sup>
Annual conference	\$300,000 <sup>32</sup>

**Total: \$945,806 (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$924,000) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$16,122,263
25-year period (2019-2043):	\$19,351,839
30-year period (2019-2048):	\$22,313,078

<sup>30</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>31</sup> \$50,000 per dissemination for training fees and materials, expert consultation and technical assistance services; \$1,000 per training event for logistic and administrative management expenses; and \$1,000 for venue fees. Total: 12 x \$52,000 = \$624,000.

<sup>32</sup> Annual conference to disseminate best practice training, research findings, and emerging and innovative approaches in opioid use disorder prevention and treatment at \$300,000 per year.

Exhibit T.6

**Service: Specialty Courts (COURT)**

**Description:** Develop 60 family drug courts in Oklahoma to divert non-violent, eligible offenders from prison to structured, court-supervised treatment services.<sup>33</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Develop and maintain 60 specialty courts	\$15.5 million <sup>34</sup>

**Total: \$15.8658 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$15.5 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$270,449,327
25-year period (2019-2043):	\$324,625,146
30-year period (2019-2048):	\$ 374,299,634

<sup>33</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>34</sup> \$15.5 million to develop and maintain 60 specialty courts, including treatment services and administrative costs.

Exhibit T.7

**Service: Transportation Services (TRANS)**

Description: Develop transportation program providing treatment and recovery transportation services for consumers.<sup>35</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Develop and maintain transportation program	\$5.9892 million <sup>36</sup>

**Total: \$6.130545 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$5.9892 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$104,501,618
25-year period (2019-2043):	\$125,435,154
30-year period (2019-2048):	\$144,629,376

<sup>35</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>36</sup> Estimate 35,000 covered lives = 420,000 covered life months. Cost for services, based on clients in Medicaid's SoonerRide (non-emergency transportation) program are \$14.26 per person-month.

Exhibit T.8

**Service: Universal Screening (SCREEN)**

**Description:** Enable all primary care practices and emergency departments to enroll in the Screening, Brief Intervention, and Referral to Treatment (SBIRT) practice dissemination program for academic detailing, continuing education, electronic medical record integration consultation, and embedded practice facilitation services. Implement universal substance use patient screening and intervention for SoonerCare patients.<sup>37</sup>

SoonerCare SBIRT Services<sup>38</sup>

Service	Cost/Service	Number Served	Annual Tests	Cost
Alcohol and/or substance (other than tobacco) abuse structured screening (e.g. DAST), and brief intervention (SBI) services; <i>15-30 minutes</i>	\$30.96	345,919	1	\$10.709652 million
Alcohol and/or substance (other than tobacco) abuse structured assessment (e.g. DAST), and intervention <i>greater than 30 minutes</i>	\$60.20	345,919	1	\$20.824324 million
Administration of patient-focused health risk assessment instrument (e.g. health hazard appraisal) with scoring and documentation, per standardized instrument ( <i>the negative screen</i> )	\$3.53	345,919	2	\$2.442188 million

Sub-Total of SoonerCare SBIRT Cost: \$33.976164 million

<sup>37</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services; Oklahoma Health Care Authority.

<sup>38</sup> Assumptions: each patient eligible for one 15-30 minute screen/intervention per year, one > 30 minute screen/intervention per year, and two negative screens. Rates based on current CMS rates. Number of adult (19-64 year old) patients reported in SFY17 annual report (n=345,919).

SBIRT Practice Dissemination<sup>39</sup>

<b>Service</b>	<b>Cost<sup>40</sup></b>	
Disseminate to 2,157 primary care practices and emergency departments in Oklahoma	Per Site Cost (Year 1):	\$25,000
	Per Site Cost (Years 2-5):	\$6,250

Sub-Total of Repeating 5-year Cost Structure:

First-Year Cost: \$53.92500 million

Years 2-5 Cost: \$13.48125 million

**Total Costs: Repeating 5-Year Cost Structure (2019\$)**

**First-Year Cost: \$89.975632 million**

**Years 2-5 Cost: \$48.577409 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$87.901164 million & \$47.457741 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038): \$974,127,550

25-year period (2019-2043): \$1,169,262,657

30-year period (2019-2048): \$1,348,184,483

<sup>39</sup> Source: Oklahoma Hospital Association.

<sup>40</sup> Costs: \$25,000/site in year 1; \$6,250/site in each of next four years. Then cycle repeats.

Exhibit T.9

**Service: Pharmacy Disposal (PHARM)**

**Description:** Develop pharmacy-based medication take-back programs.<sup>41</sup>

	Year 1 Startup Costs	Year 1 Operating Costs	Year 2 Operating Costs
Overall Cost (King County) <sup>42</sup>	\$86,000	\$532,275	\$558,119
Cost per Site: \$2012	\$1,075	\$6,653	\$6,976
Cost per Site: \$2019 (12.27% increase)	\$1,207	\$7,469	\$7,832
Cost for 1,182 Sites <sup>43</sup>	\$1,426,674	\$8,828,358	\$9,257,424

**Total Costs: (2019\$)**

**First-Year Cost: \$10.255032 million<sup>44</sup>**

**Subsequent Costs: \$9.257424 million**

**Total NPV of Costs**

20-year period (2019-2038):	\$158,800,183
25-year period (2019-2043):	\$190,410,850
30-year period (2019-2048):	\$219,395,068

<sup>41</sup> Primary Information Sources: Oklahoma Board of Pharmacy; King County, Washington Board of Health.

<sup>42</sup> Source: [www.kingcounty.gov/depts/health/board-of-health/regulations/secure-medicine/~media/depts/health/board-of-health/documents/securemed/DefiningCostsResponsibility.ashx](http://www.kingcounty.gov/depts/health/board-of-health/regulations/secure-medicine/~media/depts/health/board-of-health/documents/securemed/DefiningCostsResponsibility.ashx).

<sup>43</sup> Assumes disposals in 1,182 pharmacies in Oklahoma.

<sup>44</sup> \$1.426674 million + \$8.828358 million.

## Exhibit T.10

**Service: Pain Services (PAIN)**

**Description:** Pain prevention and non-opioid pain management therapies, including Cognitive Behavioral Therapy for pain, physical therapy, and exercise programs.<sup>45</sup>

2018 Costs

## Oklahoma Health Care Authority (OHCA)

Service	Cost
Pain Service Per Eligible	\$2,904
Administrative/Personnel Costs	\$593,617

## Calculation of Cost/Eligible

Type of Service	% Eligible Using Service	Cost/Session	# of Sessions Annually	Cost Per User	Cost Per Eligible
Acupuncture	5%	\$55	12	\$660	\$33
Additional Treating Physician/NPP E&M Oversight	100%	\$80	3	\$240	\$240
Chiropractic Care	25%	\$36	30	\$1,080	\$270
DME – Bracing, etc.	20%	\$437	1	\$437	\$87
Epidural Steroid Injections	20%	\$184	12	\$2,208	\$442
Home Health Services	2%	\$31	3	\$93	\$2
Median Nerve Ablation	5%	\$351	4	\$1,404	\$70
Meditation by Trained Instructor	5%			\$960	\$48
Osteopathic Manipulative Therapy	5%	\$52	30	\$1,560	\$78
Outreach/Training: Members/Providers					\$50
Physical Therapy	40%	\$106	30	\$3,180	\$1,272
Spinal Cord Stimulators	0.50%	\$5,756	1	\$5,756	\$29
Transportation Costs, additional	100%	\$21	12	\$252	\$252
Yoga/Exercise Therapy	5%	\$12	52	\$624	\$31

Total Cost Per Eligible: \$2,904

Total Per Eligible Cost: \$93.444912 million<sup>46</sup>

Sub-Total OHCA Cost: \$94.038529 million

<sup>45</sup> Primary Information Source: Oklahoma State Department of Health; Oklahoma Health Care Authority; Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>46</sup> Total Per Eligible Cost = \$2,904 x 32,178 SoonerCare Members receiving ≥3 opioid prescriptions from 1/1/17-12/31/17 = \$93.444912 million.

Oklahoma State Department of Health (OSDH)

Personnel	Cost
Physical Therapist, Occupational Therapist or Similar	\$75,000
Supplies	
Per Person Per Year	\$1,000

Total Personnel Cost: \$3.150 million<sup>47</sup>

Total Supplies Cost: \$42,000<sup>48</sup>

Sub-Total OSDH Cost: \$3.1920 million

Oklahoma Department of Mental Health and Substance Abuse Services (ODMHSAS)

Services	Cost
Cognitive Behavioral Therapy for Pain Per User <sup>49</sup>	\$2,500

Sub-Total ODMHSAS Cost: \$4.022250 million<sup>50</sup>

**Total Pain Services: \$103.277835 million (2019\$)**

[Program costs expected to increase at blend of general and medical care inflation rate: OHCA non-administrative costs at medical care inflation rate (96.1% of total), other costs at general rate (3.9%) of total. Conversion of 2018 costs (\$101.252779 million) to 2019\$ (.961 x 1.99% + .039 x 2.36% = 2.00%) = \$103.277835 million. Later year costs, in \$2019 rise by 0.418% / year ((2.369% - 1.934%) x 0.961)]

**Total NPV of Costs**

20-year period (2019-2038):	\$1,760,479,834
25-year period (2019-2043):	\$2,113,135,316
30-year period (2019-2048):	\$2,436,489,548

<sup>47</sup> Cost: \$75,000 per person x 3 persons per district (one coordinator and two specialists (e.g., physical therapist, occupational therapist, or similar)) x 14 districts = \$3,150,000.

<sup>48</sup> Cost: \$1,000 per person x 3 persons per district x 14 districts = \$42,000.

<sup>49</sup> The number of eligible users is 1,608.9 (5% of 32,178 SoonerCare Members receiving ≥3 opioid prescriptions from 1/1/17-12/31/17.

<sup>50</sup> Cost: 1,608.9 users x \$2,500 = \$4,022,250.



Exhibit T.11

Service: **K12 Prevention (K12)**

**Description:** All K-12 schools to receive training, program materials, and support services from ODMHSAS to implement defined age-appropriate, evidence-based prevention programs, including Botvin LifeSkills Training, PAX Good Behavior Game and Penn Resiliency Program.<sup>51</sup>

**Key Information/Assumptions:** Number of Students, Student/Administrative Support Staff Ratio, Student/Counselor Ratio and Average Classroom Size.<sup>52</sup>

2018 Costs

Personnel	Cost
Program Director	\$98,066
Program Manager (3 required)	\$250,572
Field Representative (6 required)	\$434,027
Evaluator	\$144,676
Administrative Officer (0.25 required)	\$16,406
<b>Local Travel</b>	
Cumulative	\$35,400
<b>Supplies</b>	
Cumulative	\$24,120

Sub-Total Personnel Costs/Expenses: \$1.003267 million

Service	Cost Per Unit	Cost
Good Behavior Game	\$2,300	\$11.3298 million <sup>53</sup>

<sup>51</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>52</sup> Number of students calculated using Oklahoma 2015 population data for 5-9, 10-14, 15-19 year olds from *US Census Factfinder*, with populations in these groups being 270,923, 264,490 and 260,966 respectively. Equal proportions are assumed across these age groups and 3-5, 6-8 and 9-12<sup>th</sup> graders assumed to be 8-10, 11-13, & 14-17 years old. Given these assumptions, there are assumed to be 108,369 (270,923 x 0.4) 6-7 year olds, 161,267 [(270,923 x 0.4) + (264,490 x 0.2)] 8-10 year olds, 158,694 (264,490 x 0.6) 11-13 year olds and 209,478 (264,490 x 0.2 + 260,966 x 0.6) 14-17 year olds. Also, there are 52,191 (260,955/5) 15 year olds.

Student/Administrative Support Staff ratio: 29.4 (source: [https://nces.ed.gov/ccd/tables/2009305\\_04.asp](https://nces.ed.gov/ccd/tables/2009305_04.asp))

2014-2015 student/counselor ratio in Oklahoma is 427:1; recommended ratio is 250:1 (source: American School Counselor Association. "State-By-State Student to Counselor Ratio Report: 10 Years Trends." (2015), [www.nacacnet.org/globalassets/documents/publications/research/state-by-state-ratio-report.pdf](http://www.nacacnet.org/globalassets/documents/publications/research/state-by-state-ratio-report.pdf).) Here and in exhibit T.12 the number of counselors will be calculated based on an increase to recommended level.

Average classroom size assumed to be 22 (source: [https://nces.ed.gov/surveys/ntps/tables/ntps\\_7t\\_051617.asp](https://nces.ed.gov/surveys/ntps/tables/ntps_7t_051617.asp)).

<sup>53</sup> \$2,300/classroom for training, materials, support and evaluation. Average classroom size assumed to be 22 (NCES data), 4,926 6-7 year old classrooms (108369/22).

Sub-Total Good Behavior Game Cost: \$11.3298 million.

Service	Cost Per Unit	Cost
Botvin Lifeskills		
Curriculum sets:		
Elementary levels 1,2,3 <sup>54</sup>	\$655	\$4.801150 million <sup>57</sup>
Middle school – Levels 1,2,3 <sup>55</sup>	\$645	\$4.652385 million <sup>58</sup>
9 <sup>th</sup> grade <sup>56</sup>	\$265	\$0.628580 million <sup>59</sup>
Curriculum Sub-Total		\$10.082115 million
Training:		
Foundational Training Workshop <sup>60</sup>	\$235	\$4.325175 million
Training of Trainers Workshop <sup>61</sup>	\$1,070	\$0.010700 million
Training Sub-Total		
First Year		\$4.335875 million
Later Years <sup>62</sup>		\$0.481282 million

Sub-Total Botvin Lifeskills Cost:

First Year: \$14.417990 million

Later Years: \$10.563397 million

<sup>54</sup> Grades 3-5:  $161,267/22 = 7,330$  classrooms/sets.

<sup>55</sup> Grades 6-8:  $158,694/22 = 7,213$  classrooms/sets.

<sup>56</sup> Grade 9:  $52,191/22 = 2,372$  classrooms/sets.

<sup>57</sup>  $7,330$  sets x  $\$655 = \$4.801150$  million.

<sup>58</sup>  $7,213$  sets x  $645 = \$4.652385$  million.

<sup>59</sup>  $2,372$  sets x  $\$265 = \$0.6380580$  million.

<sup>60</sup> One-day foundation training workshop is provided to the total number of 3<sup>rd</sup> through 9<sup>th</sup> grade classrooms + total number of school counselors. Total number of students:  $161,267 + 158,694 + 52,191 = 372,152$ . Number of Teachers:  $372,152/22 = 16,916$ . Number of Counselors:  $372,152/250 = 1,489$ . Total number of Teachers and Counselors = 18,405.

<sup>61</sup> Training of Trainers Workshop is provided to 10 staff statewide.

<sup>62</sup> All teachers/counselors trained in first year. After that, assume 11.1% attrition rate, which is the fraction of OK teachers leaving state public schools from 2006-2014. (Source: Hendricks, Matthew D. "An Empirical Analysis of Teacher Salaries and Labor Market Outcomes in Oklahoma". Oklahoma Business & Education Coalition, undated. [www.ossba.org/wp-content/uploads/2015/11/Teacher\\_Pay\\_FINAL\\_revised\\_cw.pdf](http://www.ossba.org/wp-content/uploads/2015/11/Teacher_Pay_FINAL_revised_cw.pdf))

Service	Cost Per Unit	Cost
<b>Penn Resiliency Program</b>		
One-day Professional Development <sup>63</sup>	\$161.11	
First Year <sup>64</sup>		\$3.535317 million <sup>67</sup>
Later Years		\$0.392420 million <sup>68</sup>
Resiliency Program Instruction to Youth	\$2,666.67	
First Year <sup>65</sup>		\$19.505358 million <sup>69</sup>
Later Years		2.165095 million <sup>70</sup>
Phone Support <sup>66</sup>		
First Year		\$4.876333 million <sup>71</sup>
Later Years		\$0.541273 million <sup>72</sup>

**Sub-Total Penn Resiliency Program Cost:**

First Year: \$27.917008 million  
 Later Years: \$3.098788 million

**Total K12 Prevention Costs (2019\$)**

**First Year: \$55.958231 million**  
**Later Years: \$26.608740 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$54.668065 million and \$25.995252 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038): \$482,923,582  
 25-year period (2019-2043): \$573,782,556  
 30-year period (2019-2048): \$657,092,287

<sup>63</sup> Number of Teachers (grades 6-12):  $(158,694 + 209,478)/22 = 16,735$ . Number of Professional staff:  $(158,694 + 209,478)/29.4 = 12,523$ . Total teachers + professional staff = 29,258.

<sup>64</sup> For 75% of teachers/professional staff in middle & high school to receive 1-day of professional development.

<sup>65</sup> Remaining 25% of teachers/staff for intensive 5-day workshop to provide Penn Resiliency Program Instruction to Youth.

<sup>66</sup> Phone-support for Staff providing Penn Resiliency Program Instruction to Youth: \$40,000 per 60 staff providing training. Support services for all trainers will continue.

<sup>67</sup>  $29,258 \times 0.75 \times \$161.11$ .

<sup>68</sup> New teachers/staff, using 11.1% attrition rate defined above.

<sup>69</sup>  $29,258 \times 0.25 \times \$2,666.67$ .

<sup>70</sup> New teachers/staff, using 11.1% attrition rate defined above.

<sup>71</sup>  $(29,258 \times 0.25)/60 \times \$40,000$ .

<sup>72</sup> New teachers/staff, using 11.1% attrition rate defined above.

Exhibit T.12

**Service: K12 Supplementary Prevention (K12SUP)**

**Description:** Discretionary prevention funds to all public and private K-12 schools to plan and implement supplementary and/or additional evidence-based prevention and intervention services.<sup>73</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Discretionary School Fund—Evidence-Based Prevention Services	\$3.5 million <sup>74</sup>
<b>Personnel</b>	
School Counselors <sup>75</sup>	\$63.085 million <sup>76</sup>

**Total Cost: \$68.156406 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$66.585 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$1,161,797,963
25-year period (2019-2043):	\$1,394,526,798
30-year period (2019-2048):	\$1,607,918,784

<sup>73</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>74</sup> \$3.5 million per year in discretionary school funds for evidence-based prevention services. This amount is based on the final year's award to Oklahoma from the Federal Safe and Drug Free Schools and Communities Act state grant program.

<sup>75</sup> Number of students calculated using OK 2015 population data for 5-9, 10-14, 15-19 year olds from *US Census Factfinder*, with populations in these groups being 270,923, 264,490 and 260,966, respectively. K-12 assumed to cover the ages 5-17, so the total is 691,993 (270,923 + 264,490 + 0.6\*260,966).

Current student to counselor ratio is 427 to 1 (based on national data, see exhibit T.11). As such, there are currently 1,621 counselors (691,993/427). The desired student to counselor ratio is 250 to 1. The total required number of counselors is 2,768. A total of 1,147 new counselors are required.

<sup>76</sup> Counselor cost: 1,147 x \$55,000 = \$63.085 million.

Exhibit T.13

**Service: Community Prevention (COMM)**

**Description:** Resources for every Oklahoma county to implement community-based prevention services, including developing/supporting at least one community-based coalition for prevention services, major population centers will be provided resources for more than one community coalition program to implement the Communities That Care model, for a total of 79 community prevention programs, and regional health educators.<sup>77</sup>

2018 Costs

Oklahoma Department of Mental Health and Substance Abuse Services (ODMHSAS)

<b>Service</b>	<b>Cost</b>
Community Prevention Programs	\$11.850 million <sup>78</sup>
<b>Personnel</b>	
Program Director	\$98,066
Field Representative (4 required)	\$289,351
Evaluator	\$144,705
Program Officer (0.25 FTE)	\$16,407
<b>Local Travel</b>	\$35,400
<b>Supplies</b>	\$24,120

Sub-Total ODMHSAS Cost: \$12.458049 million.

Oklahoma State Department of Health (OSDH)

**Health Educator Costs:** One (1) Coordinator each for 68 county health departments and two (2) independent city-county health departments. One (1) Clinical Advisor for OSDH Injury Prevention Service.

<b>Personnel</b>	
Project Coordinators (70 required) <sup>79</sup>	\$5.347160 million <sup>80</sup>
Clinical Advisor	\$245,742

Sub-Total OSDH Cost: \$5.592902

<sup>77</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services (ODMHSAS); Oklahoma State Department of Health (OSDH).

<sup>78</sup> Coalition costs: \$150,000 @ 79 communities: \$11,850,000.

<sup>79</sup> \$76,388 per project coordinator.

<sup>80</sup> \$76,388 x 70 = \$5.347160 million.

**Total Cost: \$18.476,953 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$18.050951 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$314,959,189
25-year period (2019-2043):	\$378,051,127
30-year period (2019-2048):	\$435,900,916

Exhibit T.14

**Service: Higher-Education Discretionary Prevention Funds (HED)**

**Description:** Institutions of higher education will plan and implement evidence-based substance use prevention services.<sup>81</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Discretionary funds provided to 62 college campuses per year based on student population for expenses to implement best practices prevention programs.	\$6.20 million
<b>Personnel</b>	
University Health Education Professionals	\$3.72 million <sup>82</sup>

**Total Cost: \$10.154112 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$9.920 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$173,087,569
25-year period (2019-2043):	\$207,760,094
30-year period (2019-2048):	\$239,551,766

<sup>81</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>82</sup> Personnel: One (1) FTE university health education professional @ \$60,000/year x 62 college campuses = \$3,720,000.

Exhibit T.15

**Service: Public Education (PUB).**

Description: Develop and disseminate sustained, universal marketing campaign related to: access to prevention and treatment services, stigma reduction, opioid education, skills for preventing or managing pain. Develop and disseminate public education campaign to reach specific high risk/high potential populations, including healthcare professionals, pain patients, young people, caring adults, and those at risk for overdose and addiction. Develop/disseminate campaign created to inform public of Good Samaritan protections for people calling for help and staying with person who has overdosed. Print material including posters and rack cards for distribution by outreach teams, syringe service programs, and other stakeholders and internet ads will be developed. Campaigns to utilize social/digital media, television, print, direct mail, outdoor advertising, and news media.<sup>83</sup>

<b>Public Education Service</b>	<b>Annual Cost (2019\$)</b>
Year 1	\$26.690370 million
Year 2	\$24.464040 million
Years 3-5	\$16.275240 million
Years 6-10	\$9.355704 million
Years 11-20	\$6.300258 million

Report details: "Opioid Marketing Abatement.pdf" provided by Saxum; 20-year plan is provided with detailed foundational and execution tactics. Counter-detailing costs (\$4 million per year) excluded and put in later category.

[Conversion of 2018 costs: Year 1: \$26.075 million; Year 2: \$23.9 million; Years 3-5: \$15.9 million; Years 6-10: \$9.14 million; Years 11-20: \$6.155 million) to 2019\$ (2.36% increase). Costs expected to increase at general inflation rate]

**Total NPV of Costs**

20-year period (2019-2038):	\$187,580,467
25-year period (2019-2043):	\$209,093,510
30-year period (2019-2048):	\$228,819,089

<sup>83</sup> Primary Information Source: Saxum.



Exhibit P.1

**Service: Naloxone Distribution/Education (NALOX)**

Description: Targeted naloxone distribution and overdose prevention education to those at high risk of experiencing or witnessing overdose. Populations of focus to be determined through review of academic literature and epidemiological data; will minimally include naloxone medication at behavioral health provider agencies, county jails/state prisons/juvenile detention centers, emergency departments, hospitals, and pain and primary care offices.<sup>84</sup>

2018 Costs

Oklahoma Department of Mental Health and Substance Abuse Services (ODMHSAS)

<b>Service</b>	<b>Cost</b>
Costs for access to naloxone kits plus administrative costs	\$1.10 million <sup>85</sup>

Sub-Total for ODMHSAS: \$1.10 million.

Oklahoma State Department of Health (OSDH)

<b>Personnel</b>	<b>Cost</b>
Project Coordinator	\$76,388
Epidemiologist	\$85,000
Naloxone Training Coordinator	\$80,000
Support Staff	\$50,000
<b>Non-Personnel Costs</b>	
Naloxone Kits in Agency Vehicles	\$53,702
Naloxone Kits in Fire Departments	\$39,468
Printing, Supplies	\$7,500
Training Supplies	\$5,000
Tracking Software	\$35,000
<b>One-Time Cost</b>	
Training Aid Manikins	\$16,000 <sup>86</sup>

Sub-Total for OSDH

First Year: \$448,058

Subsequent Years: \$432,058

**Total NALOX (2019\$)**

**First Year: \$1.594035 million**

**Subsequent Years: \$1.577560 million**

<sup>84</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services (ODMHSAS); Oklahoma State Department of Health (OSDH).

<sup>85</sup> Naloxone costs are \$675,000; Overdose education services cost are \$90,000; Administrative costs are \$335,000.

<sup>86</sup> 16 total manikins x \$1,000/per = \$16,000.

[Costs expected to increase at pharmaceutical inflation rate. Conversion of 2018 costs (1.548058 million and 1.532058 million) to 2019\$: (2.97% increase:  $0.934 \times 3.01\% + 0.066 \times 2.36\%$ )]

**Total NPV of Costs**

20-year period (2019-2038):	\$29,498,410
25-year period (2019-2043):	\$36,321,254
30-year period (2019-2048):	\$42,939,727

Exhibit P.2

**Service: Grief Support Services (GRIEF)**

**Description:** Community Mental Health Centers to coordinate at least one grief support group in 17 service regions for those impacted by overdose death.<sup>87</sup>

2018 Costs

<b>Service</b>	<b>Cost Per Region</b>	<b>Cost</b>
Grief Support Groups	\$70,000	\$1.190 million

**Total Cost: \$1.218084 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$1.190 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$20,763,529
25-year period (2019-2043):	\$24,922,834
30-year period (2019-2048):	\$28,736,553

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<sup>87</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

## Exhibit P.3

**Service: University Behavioral Health (UNIVB)**

**Description:** Clinical integration of licensed alcohol and drug counselors to deliver screening and intervention services at health and mental health clinics on each campus. Develop sober living opportunities for individuals in recovery for campuses with  $\geq 20,000$  students.<sup>88</sup>

**2018 Costs**

<b>Personnel</b>	<b>Cost Per</b>	<b>Cost</b>
Licensed Counselors <sup>89</sup>	\$76,450 <sup>90</sup>	\$16.971900 million <sup>91</sup>

Strategy needs to be in place for 5 - 7 years before it can be slowly reduced, starting with the smallest state institutions of higher education and ending with the largest at about 10 - 15 years after implementation.

Assume phase-down starting in year 7 and ending in year 12. (Number of counselors assumed to be:  $\leq 2024$ : 222; 2025: 185; 2026: 148; 2027: 111; 2028: 74; 2029: 37;  $\geq 2030$ : 0)

**Cost Per Collegiate Recovery Community<sup>92</sup>**

<b>Service</b>	<b>Cost Per Campus</b>
On campus recovery program participant housing allowance	\$270,000 <sup>93</sup>
Other substance use counseling and resources/programming on campus	\$80,000
<b>Personnel</b>	
Recovery Counselor	\$83,400
Residence Hall Advisor (RA) (2 required)	\$66,720
Recovery Counselor (lower level) (2 required)	\$66,720
<b>Total Cost</b>	<b>\$566,840</b>

**Sub-Total Collegiate Recovery Community: \$2.834200 million**

**Total Cost (2019\$)**

**First Year: \$20.273524 million**

**Later Years: see phase-down as above**

<sup>88</sup> Primary Information Source: Oklahoma State University, Center for Wellness and Recovery.

<sup>89</sup> Licensed counselors at a rate of 1 per 1,000 students for a total of 222 counselors in Oklahoma institutions of higher education based on 222,217 students (calculations based on source information from [https://0201.nccdn.net/1\\_2/000/000/195/93c/STANDARDS-Sec.-IV.-Amended-10-22-2016--edited-12-2016--edited-10-13-2018.pdf](https://0201.nccdn.net/1_2/000/000/195/93c/STANDARDS-Sec.-IV.-Amended-10-22-2016--edited-12-2016--edited-10-13-2018.pdf) and Oklahoma State Regents for Higher Education, 2016-2017: <https://www.okhighered.org/studies-reports/enrollment/Trends/10-yr-comparison-chart-0708-1617.pdf>).

<sup>90</sup> Benefit rate of 39% was applied in Exhibit P.3.

<sup>91</sup> \$76,450 x 222 licensed counselors = \$16,971,900.

<sup>92</sup> Provided to Oklahoma's top 5 universities.

<sup>93</sup> \$750 a month housing expenses for 12-month program x 30 students per year = \$270,000.

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$19.806100 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$187,557,943
25-year period (2019-2043):	\$197,464,079
30-year period (2019-2048):	\$206,547,139

## Exhibit P.4

**Service: Syringe Service Program (SYRINGE)**

**Description:** Develop a comprehensive syringe service program to reduce transmission of blood borne pathogens among persons who inject drugs by providing access to sterile injecting equipment; substance use disorder treatment referral; and screening for infectious disease.<sup>94</sup>

**2018 Costs**

Estimated costs of a comprehensive syringe services program									
Category	Large			Medium			Small		
	Rural	Suburban	Urban	Rural	Suburban	Urban	Rural	Suburban	Urban
<b>Costs in \$2016</b>									
<b>Costs Per Facility (\$1000's)</b>									
Annual Costs	1698.7	1732.9	1855.0	986.3	1012.8	1102.5	449.2	470.6	546.8
Startup Cost	13.2	13.6	15.4	9.6	9.8	10.5	7.3	7.4	7.7
Cost/Client	661.3	675.2	724.1	752.6	774.3	846.2	1615.1	1703.0	2007.7
<b>Conversion of Costs to \$2019</b>									
<b>Costs Per Facility (\$1000's), \$2016</b>									
Annual Costs	1788.1	1824.1	1952.6	1038.2	1066.1	1160.5	472.8	495.4	575.6
Startup Cost	13.9	14.3	16.2	10.1	10.3	11.1	7.7	7.8	8.1
Cost/Client	696.1	710.7	762.2	792.2	815.0	890.7	1700.1	1792.6	2113.3

Source: Alice Asher, Eyasu Teshale, Ryan Augustine, Eliana Duncan, Patty Dietz, Maria Aslam, John Ward, Jonathan Mermin, Kwame Owusu-Edusei, ESTIMATING THE COST OF A COMPREHENSIVE SYRINGE SERVICES PROGRAM IN THE UNITED STATES.

Note: original estimates are in 2016\$. \*Large SSPs serve 2,500 clients per year and distribute approximately 1.5 million syringes per year, medium SSPs serve 1,250 clients per year and distribute approximately 0.75 million syringes per year, and small SSPs serve 250 clients per year and distribute approximately 0.15 million syringes per year. Conversion to 2019 \$ costs uses a 5.26% inflation factor.

Area/Population	Population and # Injection Drug Users & Syringe Services Programs				
	Total Population <sup>95</sup>		# Injection Drug Users		#/Type SSP
	Males	Females	Males	Females	
Tulsa MSA	486,496	504,210	1751	1059	1 urban large
OKC MSA	682,738	700,999	2458	1472	2 urban large
Lawton MSA	65,849	61,500	237	129	1 urban medium
Non-MSA	1,947,562	1,983,302	7011	4165	9-rural medium

Note: Population figures refer to 2017 and were provided by OSDH.

<sup>94</sup> Primary Information Source: Oklahoma State Department of Health.

<sup>95</sup> Estimated Proportion Injecting Drugs: Males: 0.36%; Females: 0.21%. (Source: Lansky, A., Finlayson, T., Johnson, C., Holtzman, D., Wejnert, C., Mitsch, A., Crepaz, N. (2014). Estimating the number of persons who inject drugs in the United States by meta-analysis to calculate national rates of HIV and hepatitis C virus infections. *PLoS one*, 9(5), e97596 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4026524/pdf/pone.0097596.pdf>).

Additional Details for Cost Calculations		
	Ongoing Costs	First-Year Costs
<b>SSP Costs</b>		
Urban: large @ 3	\$5,857,800	\$48,600
Urban: medium @ 1	\$1,160,560	\$11,000
Rural: medium @9	\$9,343,800	\$90,900
<b>Additional Per User Cost</b>		
Urban: large	\$5,137,228	N/A
Urban: medium	\$325,996	N/A
Rural: medium	\$8,853,627	N/A
<b>Total</b>	<b>\$30,678,951</b>	<b>\$150,600</b>

**Total Costs (2019\$)****First Year: \$30.829551 million<sup>96</sup>****Later Years: \$30.678951 million**

[Costs expected to increase at general inflation rate]

**Total NPV of Costs**

20-year period (2019-2038): \$492,424,198

25-year period (2019-2043): \$597,181,431

30-year period (2019-2048): \$693,234,652

<sup>96</sup> Program will start in 2020, not 2019.

Exhibit M.1

**Service: Continuing Medical Education (CME)**

**Description:** Continuing education courses delivered in geographically diverse regions of Oklahoma. Course material shall be evidence-based and free from proprietary and pharmaceutical industry influence. Topics should include pain prevention, pain management, opioid management, non-pharmacological/non-opioid therapies, addiction/mental health, overdose, and the critical appraisal of medical evidence.<sup>97</sup>

2018 Costs

<b>Personnel</b>	<b>Cost Per CME</b>	<b>Cost</b>
Instructors	\$850 <sup>98</sup>	\$34,000
Providers	\$18,750 <sup>99</sup>	\$750,000
<b>CME Location Costs</b>		
Rental space for CME events	\$1,000	\$40,000

Assumes 40 trainings per year and 150 providers per training.

Efforts should take less time overall each year. 40 events in first year, 8 events in year 10. (Assume number drops by 3.25 events per year through year 10 then 0.75 per year through year 20).

**Total (2019\$)<sup>100</sup>**

**First Year: \$843,446**

**Later Years: see phase-down above**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$824,000) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$5,568,868
25-year period (2019-2043):	\$5,568,868
30-year period (2019-2048):	\$5,568,868

<sup>97</sup> Primary Information Source: Oklahoma State University, Center for Wellness and Recovery.

<sup>98</sup> Instructor time to conduct the CME trainings, assuming 2.5 hours of preparation for new events (25% of the time), and 2.5 hours of travel time per CME delivered is approximately \$850 per CME event.

<sup>99</sup> Provider time based on 150 providers/CME at \$125/hour/person.

<sup>100</sup> Not included in cost estimates: Costs for support podcasts and online CME.



Exhibit M.2

**Service: Addiction Medicine Courses (COURSE)**

**Description:** Addiction medicine courses addressing drug use, recovery programs, legal aspects of controlled substances and physician addiction. Offered to a variety of health professionals such as medical students, dentists, physician assistants, nurses and physicians.<sup>101</sup>

2018 Costs

<b>Personnel<sup>102</sup></b>	<b>Cost Per</b>	<b>Number Needed</b>	<b>Cost</b>
Dentist	\$220,051	0.5 (2 x .25 FTE)	\$110,026
Physician Assistant	\$136,470	1 (4 x .25 FTE)	\$136,470
Nurse	\$93,811	2.5 (10 x .25 FTE)	\$234,528
Physician	\$260,208	1 (4 x .25 FTE)	\$260,208
<b>Total</b>			<b>\$741,232</b>

**Total Cost: \$758,725 (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$741,232) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$12,933,269
25-year period (2019-2043):	\$15,524,034
30-year period (2019-2048):	\$17,899,538

<sup>101</sup> Primary Information Source: Oklahoma State University, Department of Psychiatry and Behavioral Sciences.

<sup>102</sup> Benefit rate of 39% was applied in Exhibit M.2.

Exhibit M.3

**Service: Medical Case Management/Consultation (CASE)**

**Description:** Project ECHO. Nationwide initiative providing consultation/education through regular video conference composed of brief educational session on high yield clinical topic followed by case consultation and then real-world recommendations, including medications with doses and frequencies provided in written format. Cost is that required to reach 9,014 primary care physicians, OBGYNs, nurse practitioners, and physician assistants.<sup>103</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Clinician stipends for participation in Project ECHO	\$3.250 million <sup>104</sup>
<b>Personnel (0.625 FTE)<sup>105</sup></b>	
Director-Addictionologist	\$258,540
Pharmacist	\$112,590
IT	\$17,522
Coordinator	\$37,947
CME Coordinator	\$4,170
Director	\$106,335
Associate Dean	\$75,569
<b>Total</b>	<b>\$612,673</b>

**Total Cost: \$3.953832 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$3.862673 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$67,397,245
25-year period (2019-2043):	\$80,898,114
30-year period (2019-2048):	\$93,277,230

<sup>103</sup> Primary Information Source: Oklahoma State University, Department of Psychiatry and Behavioral Sciences.

<sup>104</sup> Clinician stipends for participation in Project Echo; \$125 per week x 52 weeks x 25 participants per ECHO cohort x 20 ECHO cohorts per year (500 clinicians) = \$3.250 million.

<sup>105</sup> Benefit rate of 39% was applied in Exhibit M.3.

Exhibit M.4

**Service: Residency Training Programs (RESID)**

Description: 8 hour training course for all second year medical residents.<sup>106</sup>

2018 Costs Per School

<b>Personnel</b>	<b>Cost Per Medical School</b>
Instruction and administrative	\$120,000 <sup>107</sup>
<b>Location Costs</b>	
Rental Space	\$12,000 <sup>108</sup>
Food	\$8,500 <sup>109</sup>

**Total Cost: \$287,632 (2019\$)<sup>110</sup>**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$281,000) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$4,902,991
25-year period (2019-2043):	\$5,885,148
30-year period (2019-2048):	\$6,785,700

<sup>106</sup> Primary Information Source: Oklahoma State University, Center for Wellness and Recovery.

<sup>107</sup> Instruction and administrative: \$10,000/course @ 12/year: \$120,000.

<sup>108</sup> Rental space: \$1,000/day @ 12 days: \$12,000.

<sup>109</sup> Food: \$708.33/day @ 12 days:8,500.

<sup>110</sup> Program implemented at two medical schools.

Exhibit M.5

**Service: Academic Medicine (ACAD)**

Description: Establishment of an academic addiction medicine department attending to addiction disorders, providing education and utilizing a comprehensive approach to behavioral health via research, education and treatment. Offers individualized, evidence-based substance use disorder treatment, including medication-assisted treatment and therapeutic services.<sup>111</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
One-time cost for 2 endowed chairs	\$14.0 million

<b>Personnel<sup>112</sup></b>	<b>Cost Per</b>	<b>Number Needed</b>	<b>Cost</b>
Outpatient Providers	\$387,810	10	\$3.8781 million
Inpatient Providers	\$387,810	10	\$3.8781 million
Consultant Providers	\$387,810	6	\$2.32686 million
Addiction Medicine Fellows	\$139,000	12	\$1.668 million
<b>Total</b>			<b>\$11.751060 million</b>

**Total Cost (2019\$)**

**First Year: \$26.358785 million**

**Later Years: \$12.028385 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$25.75106 million and \$11.75106 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$219,366,933
25-year period (2019-2043):	\$260,439,404
30-year period (2019-2048):	\$298,099,268

<sup>111</sup> Primary Information Source: Oklahoma State University, Department of Psychiatry and Behavioral Sciences.

<sup>112</sup> Benefit rate of 39% was applied in Exhibit M.5.

Exhibit M.6

**Service: Counter-Detailing (DETAIL)**

Description: Comprehensive direct-to-medical care professionals and pharmacy and detailing program, deploying detailers to all Oklahoma health care professionals, pharmacies and pharmacists, with targeted detailing visits. Such a counter-detailing program must include training and compensating qualified personnel, mileage, visual aids, and patient/staff education material, as well as access to and analysis of medical care professional and pharmacy prescription data.<sup>113</sup>

2018 Costs

Service	Cost
Counter-Detailing <sup>114</sup>	\$4.0 million

**Total Cost: \$4.0944 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$4.0 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$69,793,375
25-year period (2019-2043):	\$83,774,231
30-year period (2019-2048):	\$96,593,454

<sup>113</sup> Primary Information Source: Saxum.

<sup>114</sup> Report details: "Opioid Marketing Abatement.pdf"; 20-year plan was provided by Saxum and contained detailed foundational and execution tactics. Includes counter-detailing costs (\$4 million per year).

Exhibit M.7

**Service: Behavioral Health Workforce Development (WORK)**

**Description:** Develop a loan forgiveness and tuition reimbursement program to incentivize mental health professionals, licensed or under supervision, and other practitioners in related disciplines to work in underserved and high-burden communities.<sup>115</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Student Loan Reimbursement	\$2.0 million <sup>116</sup>
Tuition Assistance	\$500,000 <sup>117</sup>
Administration fee (3%)	\$75,000

**Total Cost: \$2.63577 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$2.575 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$44,929,485
25-year period (2019-2043):	\$53,929,661
30-year period (2019-2048):	\$62,182,036

<sup>115</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>116</sup> Student loan reimbursement will be awarded to at least 100 licensed applicants in an amount up to \$20,000 each year. The amount awarded will be determined by the profession or licensure of the individual. This portion of the program will be funded at \$2,000,000 annually.

<sup>117</sup> Tuition assistance will be awarded to at least 100 applicants currently enrolled in graduate courses in program leading toward behavioral health licensure in an amount up to \$5,000 each year (statutorily defined limit). This portion of the program will be funded at \$500,000 annually.

Exhibit N.1

**Service: NAS Evaluation/Assessment (NASA)**

**Description:** NAS treatment evaluation standards will be developed and disseminated, including continuing education courses.<sup>118</sup>

2018 Costs

<b>Service</b>	<b>Cost</b>
Vermont Oxford Network Quality Improvement Implementation Package for NAS	\$52,000 <sup>119</sup>
<b>Personnel</b>	
Staff support to coordinate program	\$100,000 <sup>120</sup>

**Total Cost (2019\$)**

**First Year: \$155,587**

**Years 2-10: \$102,360**

Then cycle repeats.

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$152,000 and \$100,000) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$1,842,811
25-year period (2019-2043):	\$2,229,954
30-year period (2019-2048):	\$2,550,435

<sup>118</sup> Primary Information Source: University of Oklahoma Health Sciences Center and Oklahoma State Department of Health.

<sup>119</sup> \$52,000/year for state license to participate in the Vermont Oxford Network Quality Improvement Implementation Package for NAS (<https://public.vtoxford.org/neonatal-abstinence-syndrome-implementation-package/>). License to be purchased once every 10 years.

<sup>120</sup> \$100,000/year for state-level staff support to coordinate the program, estimated level of effort: Director (0.1 FTE), Nurse Program Manager (0.3 FTE), Office Manager (0.3 FTE) and Data Analyst (0.3 FTE).

## Exhibit N.2

**Service: Prenatal Screening (PRENAT)**

Description: Enable all OBGYN practices and hospitals to enroll in Screening, Brief Intervention and Referral to Treatment (SBIRT) practice dissemination program for academic detailing, continuing education, electronic medical record consultation, and embedded practice facilitation services. Implement universal substance use screening for pregnant women.<sup>121</sup>

2018 Costs

Service	Cost Per Site	Number of Sites	Cost
SBIRT Practice Dissemination			
<u>Year 1</u>	\$25,000	197 <sup>122</sup>	\$4.925 million
<u>Years 2-5</u>	\$6,250	197	\$1.23125 million

Cycle repeats after year 5.

Sub-Total of SBIRT Practice Dissemination

First-Year Cost: \$4.925 million

Years 2-5 Cost: \$1.23125 million

Then cycle repeats.

Universal Screening for Pregnant Women

DEFINED	COST	# SERVED	ANNUAL # TESTS	ANNUAL COST
Alcohol and/or substance (other than tobacco) abuse structured screening (e.g. DAST), and brief intervention (SBI) services; <i>15-30 minutes</i>	\$30.96	51,812	1	\$1,604,100
Alcohol and/or substance (other than tobacco) abuse structured assessment (e.g. DAST), and intervention <i>greater than 30 minutes</i>	\$60.20	51,812	1	\$3,119,082
Administration of patient focused health risk assessment instrument (e.g. health hazard appraisal) with scoring and documentation, per standardized instrument ( <i>the negative screen</i> )	\$3.53	51,812	2	\$365,793

Assumptions: each annually receives one 15-30 minute screen/intervention, one > 30 minute screen/intervention, and two negative screens. Rates based on current CMS rates. Number of adult (19-64 year old) patients reported in SFY17 annual report (n=342,925).

Sub-Total Screening Cost: \$5.088975 million

<sup>121</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services; Oklahoma Health Care Authority.

<sup>122</sup> 352 OBGYNs in Oklahoma (source: OSDH 2017). Median practice size nationally was 5-10 in 2016. (Source: Kane, Carol K. "Updated Data on Physician Practice Arrangements: Physician Ownership Drops Below 50 Percent", American Medical Association, 2017. <https://www.ama-assn.org/sites/ama-assn.org/files/corp/media-browser/public/health-policy/PRP-2016-physician-benchmark-survey.pdf>).

Assume practice size of 7.5, then 47 practices in OK. 150 hospitals in Oklahoma (source: Oklahoma Hospital Association).



**Total Cost (2019\$)**

**First Year: \$10.250305 million**

**Years 2-5: \$6.469382 million**

Then cycle repeats.

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$10,013,975 and \$6,320,225) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038): \$123,618,499

25-year period (2019-2043): \$148,381,487

30-year period (2019-2048): \$171,086,981

Exhibit N.3

**Service: Neonatal Treatment (NAST)**

**Description:** Medical treatment for infants born with neonatal abstinence syndrome or suffering from opioid withdrawal.<sup>123</sup>

**Total Cost (2019\$)**

**First Year: \$24.212329 million**

**Second Year: \$20.208460 million**

[Program Costs after second year expected to increase at medical inflation rate]

**Total NPV of Costs**

20-year period (2019-2038):	\$360,731,754
25-year period (2019-2043):	\$436,311,648
30-year period (2019-2048):	\$507,132,248

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<sup>123</sup> Primary Information Source: Dr. James Gibson Expert Disclosure (and supplementation).

Exhibit D.1

**Service: Opioid Overdose Review Board (REVIEW)**

**Description:** Two full-time professionals needed to coordinate the Oklahoma Opioid Overdose Fatality Review Board, prepare cases for review, produce reports, act on recommendations.<sup>124</sup>

2018 Costs

<b>Personnel</b>	<b>Cost Per</b>	<b>Number Needed</b>	<b>Cost</b>
Coordinators	\$79,795	2	\$159,590

**Total Cost: \$163,356 (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$159,590) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$2,784,576
25-year period (2019-2043):	\$3,342,376
30-year period (2019-2048):	\$3,853,830

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<sup>124</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

Exhibit D.2

**Service: PMP System/Upgrades (PMP)**

Description: Fund the Oklahoma PMP Aware program and the necessary administrative staff including a full-time PMP Administrator, PMP support providers, and PMP system educators. Develop needed system enhancements including reports, alerts, and other requested features. Employ full-time data professionals to prepare PMP data for analysis, analyze PMP data, develop special reports and analyses, and link data sets such as health outcome data and claims data.<sup>125</sup>

2018 Costs

Oklahoma Bureau of Narcotics and Dangerous Drugs (OBNDD)

<b>Service</b>	<b>Cost</b>
PMP System and Upgrades	\$443,227
PMP upgrades and Integration into registrant workflow	\$600,000
Data Extracts Maintenance	\$27,000
<b>Personnel<sup>126</sup></b>	
PMP Analysts (2 additional required)	\$147,500
PMP and Compliance Trainers (2 additional required)	\$120,000
<b>Service</b>	<b>Cost</b>
One-Time 2019 Setup Cost	\$80,000 <sup>127</sup>

Sub-Total OBNDD PMP Cost  
 Recurring Costs: \$1.337727 million  
 One-Time Cost: \$80,000

Oklahoma State Department of Health (OSDH)

<b>Personnel</b>	<b>Cost</b>
Epidemiologist III (2 required)	\$183,330
Epidemiologist II (1 required)	\$76,388
<b>Non-Personnel Costs</b>	
Printing Supplies	\$10,000

Sub-Total OSDH PMP Cost: \$269,718

**Total PMP Cost (2019\$)**  
**First Year: \$1.727269 million**  
**Later Years: \$1.645381 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$1,687,445 million and \$1,607,445 million) to 2019\$ (2.36% increase)]

<sup>125</sup> Primary Information Source: Oklahoma Bureau of Narcotics and Dangerous Drugs and Oklahoma State Department of Health.

<sup>126</sup> These costs do not include the \$308,951 for personnel currently required as a result of the opioid crisis.

<sup>127</sup> One-Time 2019 Setup Costs; Data Extracts (\$24,000); Configurable Reports (\$36,000); Delegate Audit Account (\$20,000). Total \$80,000.

**Total NPV of Costs**

20-year period (2019-2038): \$28,129,146

25-year period (2019-2043): \$33,747,511

30-year period (2019-2048): \$38,899,061

## Exhibit D.3

**Service: Program Management Monitoring/Evaluation (MONTR)**

Description: Provide program management and coordinate intervention process and outcome evaluation services related to implementation of state abatement plan and related activities.<sup>128</sup>

2018 Costs

Service			
<b>Program Management</b>			
<b>Personnel</b>	<b>Cost Per</b>	<b>Number Needed</b>	<b>Cost</b>
Director	\$178,900	1	\$178,900
Finance Director	\$126,778	1	\$126,778
Operations Director	\$126,778	1	\$126,778
Senior Program Manager	\$111,862.5	2	\$223,725
Program Manager	\$96,947.50	4	\$387,790
Program Officer	\$82,032.50	4	\$328,130
Finance Officer	\$82,032.50	2	\$164,065
Administrative Assistant	\$59,660	2	\$119,320

Sub-Total Program Management Cost: \$1.655486 million

Service			
<b>Monitoring</b>			
<b>Personnel</b>	<b>Cost Per</b>	<b>Number Needed</b>	<b>Cost</b>
ODMHSAS Staff	\$89,490	5	\$447,450
OSDH Evaluator III	\$91,665	1	\$91,665
OSDH Evaluator II	\$76,388	1	\$76,388
<b>Non-Personnel Cost</b>			
Data Costs	\$3,600	2	\$7,200
Printing/Supplies			\$10,000

Sub-Total Program Monitoring Cost: \$632,703

**Total Cost: \$2.3342190 million (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$2.288189 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$39,789,229
25-year period (2019-2043):	\$47,759,721
30-year period (2019-2048):	\$55,067,965

<sup>128</sup> Primary Information Sources: Oklahoma Department of Mental Health and Substance Abuse Services; Oklahoma State Department of Health.

Exhibit D.4

**Service: Health Information Exchange (HIE)**

**Description:** Purchase technology and hire staff to support connectivity among the state agencies' HIE and private HIEs. Increase HIE use and adoption by healthcare providers through public education via a contract with a marketing firm, and incentivize non-meaningful use providers.<sup>129</sup>

2018 Cost

<b>Service</b>	<b>Cost</b>
HIE Startup	\$25.0 million
Years 2-3	\$38.0 million
Years 4+	\$30.0 million

**Total HIE Costs (2019\$)**

**Startup: \$25.59 million**  
**Years 2-3: \$38.8968 million**  
**Years 4+: \$30.708 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$25.0 million, \$38.0 million and \$30.0 million) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038): \$534,289,814  
 25-year period (2019-2043): \$639,146,239  
 30-year period (2019-2048): \$735,290,410

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<sup>129</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

Exhibit D.5

**Service: Epidemiological Staffing (EPI)**

**Description:** Employ epidemiologists to develop public health surveillance and descriptive studies with fatal/nonfatal injury, addiction, risk/protective factor, health record/claim, and other data. Support development of web-based data query/reporting systems.<sup>130</sup>

2018 Costs

<b>Personnel</b>	<b>Cost Per</b>	<b>Number Needed</b>	<b>Cost</b>
ODMHSAS Staff	\$89,490	5	\$447,450
OSDH			
Epidemiologist III	\$91,665	1	\$91,665
Epidemiologist II	\$76,388	2	\$152,776
Epidemiologist I	\$63,672	1	\$63,672
<b>Non-Personnel Cost</b>			
Data Costs	\$3,600	4	\$14,400
Printing/Supplies			\$10,000

**Total Costs: \$798,370 (2019\$)**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$779,963) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$13,609,060
25-year period (2019-2043):	\$16,335,198
30-year period (2019-2048):	\$18,834,827

<sup>130</sup> Primary Information Sources: Oklahoma Department of Mental Health and Substance Abuse Services; Oklahoma State Department of Health.



## Exhibit D.6

**Service: Data Collection (DATA)**

**Description:** Support costs of added indicators in existing surveys and development of new sources of data collection for key measures related to monitoring trends and measuring change.<sup>131</sup>

**2018 Costs**

<b>Service</b>	<b>Cost</b>
New Data Collection and Surveys <sup>132</sup>	\$200,000
Survey Costs	\$399,244 <sup>133</sup>
Addition of Indicators	\$9,500 <sup>134</sup>
<b>Personnel</b>	
OJA Data Analyst	\$104,405
OSDH Analyst	\$100,000

**Total Cost (2019\$)**

**Even numbered years: \$832,339**

**Odd numbered years: \$423,673**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$813,149 and \$413,905) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$10,735,238
25-year period (2019-2043):	\$13,019,274
30-year period (2019-2048):	\$14,857,481

<sup>131</sup> Primary Information Sources: Oklahoma Department of Mental Health and Substance Abuse Services; Oklahoma State Department of Health (OSDH), Office of Juvenile Affairs (OJA).

<sup>132</sup> Development and administration of new data collection instruments and addition of opioid-related items in existing surveys or data collection efforts.

<sup>133</sup> Risk/Protective Factor Survey of 6, 8, 10, 12<sup>th</sup> graders every other year beginning in 2020.

Cost: \$1.98 per student for first 50,000 surveys. For additional students cost is \$1.75 per student for online survey and \$1.93/student for paper administered survey. Assuming 75% of these are paper administered, so average cost above 50,000 is  $(0.25 \times \$1.75) + (0.75 \times \$1.93) = \$1.89/\text{student}$ .

Number of students calculated using OK 2015 population data for 10-14, 15-19 year olds from *US Census Factfinder*, with populations in these groups being 264,490 and 260,966 respectively. Equal proportions are assumed across these age groups and 6, 8, 10, and 12<sup>th</sup> graders assumed to be 11, 13, 15 and 17 years old. Total number of students in this age groups then is:  $(0.4 \times 264,490) + (0.4 \times 260,966) = 210,182$

Survey costs then are:  $(50,000 \times \$1.93) + (160,182 \times \$1.89) = \$399,244$ .

<sup>134</sup> Five (5) additional indicators at \$1,900/indicator = \$9,500.

## Exhibit D.7

**Service: NAS Reporting (NASR)**

**Description:** Fund the development of neonatal abstinence syndrome as a required reportable condition, including OSDH and hospital-level management and infrastructure costs.<sup>135</sup>

**2018 Costs**

<b>Service</b>	<b>Cost</b>
Database development and annual maintenance	
Year 1	\$85,000
Subsequent Years	\$80,000
<b>Personnel</b>	
Analyst	\$92,187
<b>Non-Personnel Costs</b>	
Computer Software	\$5,000
Laptop/Docking Station (first and then every 5 years)	\$3,000

**Total Costs: (2019\$)**

**First-Year: \$189,557**

**After first-year (no computer): \$181,369**

**Every fifth year (computer): \$184,439**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs (\$185,187, \$177,187 and \$180,187) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038): \$ 3,107,578

25-year period (2019-2043): \$ 3,729,056

30-year period (2019-2048): \$ 4,298,896

<sup>135</sup> Primary Information Source: Oklahoma State Department of Health.

Exhibit C.1

**Service: Enforcement/Regulatory (REGUL)**

**Description:** Funding for investigatory and regulatory actions related to the opioid crisis.

2018 Cost

Oklahoma Department of Mental Health and Substance Abuse Services (ODMHSAS)<sup>136</sup>

Service	Cost
Crisis Intervention Team Training	\$500,000 <sup>137</sup>

Sub-Total ODMHSAS: \$500,000

Oklahoma Bureau of Narcotics and Dangerous Drugs (OBND)<sup>138</sup>

Personnel	Cost Per	Number Needed	Cost
Criminal/Civil Analyst	\$109,998	1	\$109,998
Compliance Inspectors	\$45,192.45	2.5	\$112,981
Compliance Agents			
First Year	\$223,725	10	\$2.237250 million
Later Years	\$149,150	10	\$1.491500 million
Agents			
First Year	\$223,725	5	\$1.118625 million
Later Years	\$149,150	5	\$0.745750 million
Staff Attorney	\$155,854	1	\$155,854
Expert Witness Evaluator	\$149,150	1	\$149,150
<b>Non-Personnel Cost</b>			
Registration Operating Cost			\$206,000
Heroin/Opioid Taskforce			\$450,000

Sub-Total OBND

First Year: \$4.539858 million  
 Later Years: \$3.421233 million

<sup>136</sup> Primary Information Source: Oklahoma Department of Mental Health and Substance Abuse Services.

<sup>137</sup> Annually for statewide implementation of Crisis Intervention Team (CIT) training for law enforcement officers.

<sup>138</sup> Primary Information Source: Oklahoma Bureau of Narcotics and Dangerous Drugs (OBND).

Agency/Board Costs

Oklahoma Veterinary Board

<b>Personnel</b>	<b>Cost</b>
Investigator	\$77,558
<b>Non-Personnel Costs</b>	
Car Expense	\$6,000
Training	\$3,600
Equipment	
First Year	\$5,000
Later Years	\$3,600
<b>Training Costs</b>	
2 investigators, Executive Director, Board Counsel and one (1) Board Member	\$18,000

Sub-Total Veterinary Board

First Year: \$110,158  
 Later Years: \$108,758

Oklahoma State Board of Osteopathic Examiners

<b>Personnel</b>	<b>Cost</b>
Prosecutor	\$119,608
Support staff for prosecutor	\$59,804
Investigator (2 required)	\$178,980
Investigator support staff (2 required)	\$119,320
<b>Non-Personnel Costs</b>	
Increase in rent for larger space to house new personnel	\$12,000

Sub-Total Board of Osteopathic Examiners: \$489,712

Oklahoma Board of Nursing

<b>Personnel</b>	<b>Cost</b>
Prosecuting Attorney	\$136,188
Nurse Investigators	\$234,864
Legal Secretary	\$61,454
RN Case Manager, Peer Assistance Program	\$117,432
Educator- RX Authority, RN, Practice, PAP, Prevention	\$117,432
<b>Non-Personnel Costs</b>	
Administrative Costs (rent, payroll, insurance supplies)	\$15,660
<b>One-Time Costs</b>	
Equipment (computers, phone, furniture)	\$45,200
IT Development Costs for Education Materials – Videos	\$60,000

Sub-Total Nursing Board

First Year: \$788,230  
 Later Years: \$683,030

Oklahoma Board of Medical Licensure and Supervision

<b>Personnel</b>	<b>Cost</b>
Investigators (3 required)	\$335,588
Investigator assistant	\$74,575
Support Services administrator	\$74,575
<b>Training</b>	
Training for 8 investigators	\$32,000
<b>RX Complaints</b>	
50 with expert medical review @ \$7,000 each	\$350,000
<b>One-Time Costs</b>	
Surveillance equipment	\$5,000

Sub-Total Medical

First Year: \$871,738  
 Later Years: \$866,738

Oklahoma Dentistry Board

<b>Personnel</b>	<b>Cost</b>
Experienced investigators (5 required)	\$671,175
<b>Training (1<sup>st</sup> 5-years only)</b>	
Board members, Board staff, investigators, attorneys	\$50,000
For 11,500 licensees @ \$500 each (over 1 <sup>st</sup> 5 years)	\$1,150,000

Sub-Total Dentistry

Years 1-5: \$1,821,175  
 Years 6+: \$671,175

Office of Chief Medical Examiner

<b>Personnel</b>	<b>Cost</b>
Salary increases for OMCE physicians for retention	\$969,475
Forensic pathologist	\$894,900
Forensic chemist	\$149,150
Medicolegal death scene investigators (2 required)	\$238,640
<b>Instrument Maintenance</b>	
Maintenance of equipment	\$250,000 <sup>139</sup>
<b>One-Time Cost</b>	
CT Scanner	\$450,000

Sub-Total Chief Medical Examiner

First Year: \$2,952,165

Years 2-5: \$2,502,165

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<sup>139</sup> Maintenance of equipment purchased to increase the analytical capacity of the toxicology laboratory, facilitate the speed of drug screening and ease workload by obviating the need for a traditional surgical autopsy in some cases.

Office of the Attorney General (OAG)<sup>140</sup>

<b>Services/Programs/Personnel needed to abate the opioid crisis</b>	<b>\$854,298.00</b>
<b><u>Criminal Justice</u></b>	<b>\$460,965.00/annually</b>
2 Assistants Attorney General – Opioid Task Force & Insurance Fraud	
\$65,000 annual salary plus 49.5% fringe benefits x 2 =	\$194,350.00
\$4,780 non-personnel costs (equipment, training, etc.) x 2 =	\$ 9,560.00
	\$203,910.00
2 investigators	
\$60,000 annual salary plus 49.5 % fringe benefits x 2 =	\$179,400.00
\$6,258 non-personnel costs (equipment, training, etc.) x 2 =	\$ 12,516.00
	\$191,916.00
1 support staff	
\$42,000 annual salary plus 49.5% fringe benefits =	\$62,790.00
\$2,349 non-personnel costs (equipment, training, etc.) =	\$ 2,349.00
	\$65,139.00
<b><u>Medicaid Fraud Control</u></b>	<b>\$73,468.00</b>
1 Assistant Attorney General (0.25 FTE)	
\$65,000 annual salary plus 49.5% fringe benefits =	\$24,293.75
\$4,780 non-personnel costs (equipment, training, etc.) =	\$ 1,195.00
	\$25,488.75
2 investigators (0.25 FTE)	
\$60,000 annual salary plus 49.5 % fringe benefits x 2 =	\$ 44,850.00
\$6258 non-personnel costs (equipment, training, etc.) x 2 =	\$ 3,129.00
	\$ 47,979.00
<b><u>Legal/Agency Counsel</u></b>	<b>\$203,910.00</b>
2 Assistants Attorney General	
\$65,000 annual salary plus 49.5% fringe benefits x 2 =	\$194,350.00
\$4,780 non-personnel costs (equipment, training, etc.) x 2 =	\$ 9,560.00
	\$203,910.00
<b><u>Victim Services</u></b>	<b>\$14,000.00</b>
\$2000 Addiction/Substance Abuse Training/Travel x 7 =	\$14,000.00
<b><u>Policy &amp; Legislative Development/Tracking</u></b>	<b>\$101,955.00</b>
1 Assistant Attorney General	
\$65,000 annual salary plus 49.5% fringe benefits =	\$97,175.00
\$4,780 non-personnel costs (equipment, training, etc.) =	\$ 4,780.00
	\$101,955.00

Sub-Total Office of Attorney General: \$854,298

<sup>140</sup> All figures are annual costs, calculations by OAG.

Total Agency Costs

<u>Agency</u>	<u>Year 1</u>	<u>Years 2-5</u>	<u>Later Years</u>
ODMSAS	\$500,000	\$500,000	\$500,000
OBNDD	\$4,539,858	\$3,421,233	\$3,421,233
Veterinary Board	\$110,158	\$108,758	\$108,758
Board of Osteopathic Examiners	\$489,712	\$489,712	\$489,712
Board of Nursing	\$788,230	\$683,030	\$683,030
Board of Medical Licensure	\$871,738	\$866,738	\$866,738
Dentistry Board	\$1,871,175	\$1,821,175	\$671,175
Office of Chief Medical Examiner	\$2,952,165	\$2,502,165	\$2,502,165
Office of Attorney General	\$854,298	\$854,298	\$854,298
Total	\$12,977,334	\$11,247,109	\$10,097,109

**Total Enforcement/Regulatory Costs (2019\$)**

**First Year: \$13.283599 million**  
**Years 2-5: \$11.512541 million**  
**Later Years: \$10.335401 million**

[Costs expected to increase at general inflation rate. Conversion of 2018 costs \$12,977,334, \$11,247,109 and \$10,097,109) to 2019\$ (2.36% increase)]

**Total NPV of Costs**

20-year period (2019-2038):	\$183,635,585
25-year period (2019-2043):	\$218,927,145
30-year period (2019-2048):	\$251,286,418



## Appendix C: Alternative Methods of Discounting to Net Present Value (NPV)

Abatement costs are discounted to net present value assuming a discount rate of 1.75 percent per year, the difference between the average yield on 10-year U.S. Treasury Securities over the 1998-2018 period (3.68 percent per year) and the change in the average inflation rate over the same period (1.93 percent per year). The lump-sum payment could be invested in different ways. One possibility would be to invest it in shorter-term Treasury securities (or a blend of longer and short-term government bonds). A second would be to pay down some existing Oklahoma debt obligations. This appendix shows that using either alternative would lead to a lower discount rate and so a larger estimate of the net present value of abatement costs.

The average annual yield on 3-year Treasury Securities, over the 1998-2018 period was 2.64 percent (Appendix Table A.1).<sup>141</sup> Therefore, the relevant real discount rate would be 0.71 (2.64 – 1.93) percent per year, rather than 1.75 percent annually using 10-Year Treasury security yields. A lower discount rate implies a larger value for future abatement costs.

An alternative possibility would be to use the lump-sum payment to reduce outstanding debt owed by the State of Oklahoma. To examine the discount rate resulting when doing so, I first obtained information on the maturity-specific yield on bonds issued by the Oklahoma Capital Improvement Authority as state revenue bonds between 2009 and 2018. This information is provided in Table C.1. Next I used this information to calculate average yields for these bonds at maturity lengths ranging from one to 21 years. These yields are shown in the last column of Table C.1 and the second column of Table C.2. Over the 2009-2018 period, the Gross Domestic Implicit Price Deflator rose by an average of 1.716 % per year ( $[110.645/94.938]^{1/9}$ ) (see Table A.1). Since all calculations of abatement costs are in “real” terms (i.e. using 2019-year dollars) the price deflator is subtracted from the maturity-specific yield to give the maturity-specific real discount rate, shown in the third column of the Table C.2. The fourth column displays the (real) discount factor to be used when converting abatement costs occurring in future years to 2019 net present value. The discount factor is calculated using the maturity-specific discount rates for all maturities through the number of years in the future the abatement costs are incurred. Specifically, for  $r_t$  the real discount rate discount rate (in absolute rather than percentage terms)  $t$  years after 2019, the discount factor at time  $t$  is calculated as:

$$D_t = \prod_{n=0}^t \left( \frac{1}{1+r_{t-n}} \right).^{142}$$

The final two columns of Table C.2 show corresponding discount factors obtained when basing the discounting on 10-year and 3-year Treasury securities. Since the discount rates are constant across years in these cases, the discount factors can be calculated more simply as:

<sup>141</sup> Source: 1998-2017: *Economic Report of the President, 2018*, Table B-25. 2018 yields calculated as monthly average from 12/17-11/18 using data from the Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org> (series GS3)

<sup>142</sup> For example, if the real discount rate was 1% for a 1-year maturity and 2% for a 2-year maturity, the discount factor for abatement costs incurred two years in the future would be  $0.9707 = \left( \frac{1}{1.01} \right) \left( \frac{1}{1.02} \right)$ .

$$D_t = \left(\frac{1}{1+r}\right)^t$$

where,  $r$ , here is the (time-constant) annual discount rate. For example, the discount factor – which is the amount abatement costs need to be multiplied by to obtain the net present value – in 2018 is 0.7192 when based on 10-year U.S. Treasury security yields, compared to 0.8742 and 0.8598, respectively, when based on 3-Year Treasuries and Oklahoma revenue bonds.

**Confidential**

**Table C.1: Oklahoma State Bond Offerings and Yields by Time to Maturity**

Years to Maturity	Bond Offering																Average Yield	
	2018D	2018c	2018B	2018a	2017b	2017a	2016	2015b	2015a	2014c	2014b	2014a	2013	2012	2010	2009a		2009b
1				1.57%	0.90%	1.08%			0.20%	0.18%	0.17%	0.28%	0.45%	2.00%		1.00%	0.60%	0.766%
2	2.11%	1.93%		1.74%	1.15%	1.31%		0.79%	0.54%	0.38%	0.40%	0.51%	0.63%	2.00%	0.52%	1.70%	1.11%	1.121%
3	2.21%	2.05%		1.91%	1.36%	1.51%	1.04%	1.15%	0.80%	0.71%	0.73%	1.00%	0.85%	2.00%	0.72%	2.00%	1.53%	1.348%
4	2.34%	2.18%		2.04%	1.58%	1.68%	1.15%	1.41%	1.07%	1.00%	1.15%	1.35%	1.04%	2.00%	0.97%	2.25%	1.91%	1.570%
5	2.46%	2.29%		2.17%	1.86%	1.89%	1.27%	1.69%	1.28%	1.28%	1.49%	1.70%	1.34%	2.00%	1.36%	2.65%	2.31%	1.815%
6	2.58%	2.46%		2.32%	2.13%	2.10%	1.40%	1.99%	1.53%	1.60%	1.83%	2.15%	1.64%	2.00%	1.66%	2.85%	2.55%	2.049%
7	2.71%	2.57%		2.47%	2.39%	2.31%	1.53%	2.27%	1.74%	1.92%	2.12%	2.50%	1.87%	2.00%	1.96%	3.05%	2.81%	2.264%
8	2.87%	2.71%		2.61%	2.58%	2.49%	1.68%	2.41%	1.90%	2.22%	2.35%	2.72%	2.09%	2.00%	2.16%	3.22%	3.06%	2.442%
9	2.99%	2.80%	3.71%	2.72%	2.70%	2.67%	1.77%	2.58%	2.02%	2.45%	2.57%	2.90%	2.32%	2.00%	2.41%	3.42%	3.28%	2.665%
10	3.09%	2.88%	3.82%	2.83%		2.80%	1.89%	2.71%	2.14%	2.66%	2.71%	3.04%	2.51%	2.00%	2.61%	3.62%		2.754%
11	3.19%	2.98%	3.92%	2.94%		3.00%	2.03%	2.85%		2.92%		3.15%	2.68%	2.00%		3.80%		2.955%
12	3.27%	3.19%	3.97%	3.02%		3.13%	2.14%			2.62%		3.30%		2.00%		3.95%		3.059%
13	3.43%	3.12%	4.02%	3.12%			2.23%			3.05%		3.39%		2.00%		4.07%		3.159%
14	3.42%	3.18%	4.07%	3.21%			2.30%			2.99%		3.49%				4.14%		3.350%
15	3.47%	3.45%		3.31%			2.51%			3.14%		3.62%				4.20%		3.384%
16	3.53%	3.30%		3.37%			2.67%			3.15%		3.71%						3.288%
17		3.53%		3.44%			2.38%			3.14%								3.121%
18		3.42%		3.49%			2.77%			3.26%								3.235%
19		3.47%		3.53%						3.48%								3.493%
20		3.50%		3.54%						3.57%								3.537%
21		3.52%																3.520%

Note: Table shows bond yields by time to maturity in nearest whole years. The last column shows the unweighted average yield for all bond offerings shown on table. In cases where bond offering shows two yields for same maturity date, the unweighted average of these is displayed.

Table C.2: Discount Rates and Discount Factors by Year

Year	<u>Based on: Oklahoma Bonds at Various Maturities</u>			<u>Based on Treasury Securities</u>	
	<u>Nominal Discount Rate</u>	<u>Real Discount Rate</u>	<u>Discount Factor</u>	<u>3-Year Discount Factor</u>	<u>10-Year Discount Factor</u>
2020	0.766%	-0.950%	1.0096	0.9930	0.9828
2021	1.121%	-0.595%	1.0156	0.9859	0.9659
2022	1.348%	-0.368%	1.0194	0.9790	0.9493
2023	1.570%	-0.146%	1.0209	0.9721	0.9330
2024	1.815%	0.099%	1.0199	0.9652	0.9169
2025	2.049%	0.333%	1.0165	0.9584	0.9011
2026	2.264%	0.548%	1.0109	0.9517	0.8856
2027	2.442%	0.726%	1.0036	0.9450	0.8704
2028	2.665%	0.949%	0.9942	0.9383	0.8554
2029	2.754%	1.038%	0.9840	0.9317	0.8407
2030	2.955%	1.239%	0.9720	0.9251	0.8263
2031	3.059%	1.343%	0.9591	0.9186	0.8121
2032	3.159%	1.443%	0.9454	0.9121	0.7981
2033	3.350%	1.634%	0.9302	0.9057	0.7844
2034	3.384%	1.668%	0.9150	0.8993	0.7709
2035	3.288%	1.572%	0.9008	0.8930	0.7576
2036	3.121%	1.405%	0.8883	0.8867	0.7446
2037	3.235%	1.519%	0.8750	0.8804	0.7318
2038	3.493%	1.777%	0.8598	0.8742	0.7192

Note: Nominal discount rate is calculated as the average yield of Oklahoma Capital Improvement Bonds for maturities equal to the number of years from 2019 until the specified year. Real discount rates calculated as the nominal discount rate minus 1.176%, which is the average annual change in the GDP Implicit Price Deflator from 2009-2018. Discount factors are calculated as discussed in text.

Appendix D: Christopher Ruhm Deposition and Trial Testimony in Last Four Years

<b>Date</b>	<b>Case</b>	<b>Court</b>	<b>Party Represented (Attorney)</b>	<b>Description</b>
9/5/2018	Jacquelyn Burton Harvey and Alfred Harvey II, GAL for Gabriel Christopher Flip Harvey, et al. v. Lindsay Gray, MD et al.	Deposition, Durham County Superior Court, NC	Plaintiff (Bailey Melvin)	Economic damages, medical malpractice
7/9/2018	Trinity Fayte Owen & Koenig v. Healthcare Foundation of Wilson, Daniel Peter Michalak MD, Wilson Ob/gyn, PA, Ketarah C. Robinson, MD, Eastern Carolina Pediatrics	Deposition, Nash County Superior Court, NC	Plaintiff (Bailey Melvin)	Economic damages, medical malpractice
6/28/2018	Estate of Jerry D. Beasley v. Mateen Akhtar, MD, Matthew A. Hook, MD, Craig S. Carter MD, 17 CVS 1179	Deposition, Johnson County Superior Court, NC	Plaintiff (Bailey Melvin)	Economic Damages, wrongful death
10/16/2015	Jeffrey Allen Webster v. Alamance Regional Medical Center, Lankford Protective Services, Paul Malinda, M.D., Eugene Wilson Griner M.D., Michael Greenberg, M.D., Emcare Inc.	Deposition, Guilford County Superior Court, NC	Plaintiff (Mark Gray)	Economic Damages from injury

# **EXHIBIT S-2**

## Curriculum Vitae

### Christopher J. Ruhm

Home Address:  
3638 Twin Creeks Road  
Charlottesville, VA 22901  
(336) 254-6307  
[christopher.ruhm@gmail.com](mailto:christopher.ruhm@gmail.com)

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Frank Batten School of Leadership & Public Policy  
University of Virginia  
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Charlottesville, VA 22904-4893  
(434) 243-3729  
[ruhm@virginia.edu](mailto:ruhm@virginia.edu)  
<https://sites.google.com/site/christopherjruhm/home>

### Education

University of California, Berkeley, Ph.D. 1984

University of California, Berkeley, M.A. 1981

University of California, Davis, B.A. (with highest honors) 1978

*Fields of Specialization:* Health Economics, Labor Economics, Public Economics

### Teaching, Research, and Other Experience

Professor of Public Policy and Economics, Frank Batten School of Leadership and Public Policy,  
University of Virginia, 2010-present

Associate Dean for Academic Affairs, 2013-2015

Other Responsibilities:

Executive Board Member, Center for Health Policy (2014-2016)  
Contemplative Council/Directing Circle, Contemplative Sciences Center (2014-present)  
Dean's Search Committee, Frank Batten School (2013-2014)  
Fellow, Center for Health Policy (2012-present)  
Deans Council, Frank Batten School (2012-2013)  
Personnel Committee (chair), Frank Batten School (2012-2013)  
Admissions Committee, Frank Batten School (2012-2013)  
Faculty Search Committee, Frank Batten School (2010-present, committee chair  
multiple years)  
Faculty Search Committee, Economics Department (2015-2017)  
Faculty Senate, UVA (2011-2012)

Department of Economics, Joseph M. Bryan School of Business and Economics, University of  
North Carolina Greensboro, 1991-2010. (Professor Emeritus, 2011-present, Jefferson-  
Pilot Excellence Professor of Economics, 1997-2010; Professor of Economics, 1994-  
1997; Associate Professor of Economics, 1991-1994.)

Other Responsibilities:

Economics Department Graduate Program Committee (1991-2010).  
Recruiting Committee, Economics Department (1992-93, 1997-98, 2000-2010)  
Faculty Governance Task Force, Joseph M. Bryan School (2009-2010)  
Promotion and Tenure Committee, Joseph M. Bryan School (1997-2010)  
Strategic Planning Committee, Joseph M. Bryan School (1997-1999)  
Executive Council Member, Joseph M. Bryan School (1992-1995)

University Committees: Academic Research Data Archive, Assessment in General Education, Child and Family Research Network Executive Committee, Faculty Grievance, Gerontology Program, Honor Code, Institutional Effectiveness, Research Advisory Council, Research Policies, University Planning Council

Senior Staff Economist, Council of Economic Advisers, 1996-1997.

**Responsibilities:**

Provide the President with economic analysis and advice on the development and implementation of economic policy.

Assist in writing the *Economic Report of the President* and the *Weekly Economic Briefing of the President*.

Advise the President, Vice President, and the White House senior staff on economic issues by preparing memoranda, participating in Cabinet and sub-Cabinet working groups, and interfacing with other government agencies.

Assistant Professor, Department of Economics, Boston University, 1984-1991.

**Other Responsibilities:**

Research Associate, Center for Applied Social Science (1985-1990).

Director of Evening Graduate Program (1985-1989).

University Coordinator, ICPSR (1985-88).

Teaching Associate; Department of Economics and School of Business Administration, U.C. Berkeley, 1980-84.

Research Assistant; Department of Economics, U.C. Berkeley, 1983.

Consultant; Economics Group, Los Alamos National Laboratory, 1982-83. Research Assistant; Economics Group, Los Alamos National Laboratory, 1981-82.

Research Associate; Energy and Environmental Division, Lawrence Berkeley Laboratory, 1980.

**Grants, Contracts and Fellowships**

Pivotal Ventures. "State Paid Family and Medical Leave Research", 2016-2021, (Co-Investigator, \$992,070)

Washington Center for Equitable Growth/Russell Sage Foundation. "Understanding Employer Provision of Paid Parental Leave in NY, NJ, and PA", 2016-2018, (Co-Investigator, \$73,000)



Alfred P. Sloan Foundation (through subcontract with Michigan State University), "Changes in Pensionable Ages and Their Effects on Establishments", 2016-2018 (Local Principal Investigator, \$87,566)

Bill & Melinda Gates Foundation, "Estimating the Economic Value of the Cognitive Benefits from Improved Breastfeeding", 2015-2017 (Senior Researcher, \$723,586)

United States Department of Agriculture, Economic Research Service, "Are Eating and Obesity a Family Affair", 2012-2013 (Principal Investigator, \$32,000)

Alfred P. Sloan Foundation (through subcontract with Michigan State University), "The influence of the employment environment on working longer: New evidence from the LIAB", 2011-2013 (Local Principal Investigator, \$106,919)

United States Department of Agriculture, Economic Research Service (through subcontract with Old Dominion University), "Local Economic Conditions, Food Assistance and Food Insecurity Among Households with Children", 2010-2013 (Local Principal Investigator, \$55,734)

National Institute of Alcohol Abuse and Alcoholism (through subcontract with Drexel University), "Quality Substitution Among Heavy and AUD Drinkers and Alcohol Tax Policy", 2009-2011 (Local Principal Investigator, \$220,189)

Robert Wood Johnson Foundation, "The Effects of Nurse Presenteeism on Quality of Care and Patient Safety", 2008-2010 (Co-Investigator, \$264,106)

National Institute of Child Health and Human Development (through subcontract with Columbia University), "Work-Family Policies and Child and Family Well-Being", 2006-2012. (Local Principal Investigator, \$348,615)

Russell Sage Foundation "Inequality in Early Childhood Education and Care", 2001-2005. (Principal Investigator, \$129,887)

National Institute of Child Health and Human Development, "Parental Employment and Child Development", 2000-2005. (Principal Investigator, \$435,496)

National Science Foundation, "Economic Conditions, Health Investments, and Health Outcomes", 1999-2004. (Principal Investigator, \$201,687)

National Institute on Alcohol Abuse and Alcoholism, "Economic Conditions and Drinking Behavior", 1999-2003. (Principal Investigator, \$125,034)

National Bureau of Economic Research Faculty Fellowship for the Study of Nonprofit Institutions, "Compensation in the Nonprofit Sector", 1998-1999. (Principal Investigator, \$25,000)

National Institute on Alcohol Abuse and Alcoholism, "Economic Conditions and Alcohol Use", 1993-96. (Principal Investigator, \$163,049)

U.S. Department of Labor, "High School Employment: Consumption or Investment?", 1993-94. (Principal Investigator, \$16,100)

Employment Policies Institute, "The Effects of Early Work Experience on Future Economic Attainment", 1993. (Principal Investigator, \$10,000)

Pension and Welfare Benefits Administration, U.S. Dept. of Labor: "The Receipt of Private Pension Income: Determinants and Changes", 1992-93. (Principal Investigator, \$9,983)

National Science Foundation (through subcontract with Bentley College): "Old Industries, New Industries, and Regional Development", 1992.

National Institute for Mental Health Post-Doctoral Research Fellowship, Florence Heller School, Brandeis University, 1988-90.

Employment and Training Administration, U.S. Department of Labor: "The Economic Consequences of Prior Notification Provisions on Post-Displacement Outcomes, 1988-89. (Principal Investigator, \$59,651)

National Planning Association: "Worker Preparedness in a Turbulent Economy", 1988.

Commonwealth Fund: "Expanding Part-time Employment Opportunities for Older Workers", 1987-88.

Bureau of International Labor Affairs, U.S. Department of Labor: "Development of Policy Guidelines for Assisting Displaced Workers", 1986-87. (Principal Investigator, \$10,000)

Health Care Financing Administration: "Pediatric Prospective Payment", 1986-87.

### **Honors**

Faculty Excellence Award for University and Professional Service, Frank Batten School, UVA, 2017

Faculty Excellence Award for Public Engagement, Frank Batten School, UVA, 2016

Top 100 Health Economists, 1969-2010 (ranked 35<sup>th</sup> based on publications); in Wagstaff, Adam and Anthony J. Culyer, "Four Decades of Health Economics through a Bibliometric Lens", *Journal of Health Economics* 31(2), 2012, 406-439.

Top 5% of Economists in the World by RePEc (Research Papers in Economics); <http://ideas.repec.org/top/top.person.all.html>.

Top 1000 Economists in the World, 1990-2000 (ranked 77<sup>th</sup> based on publications); <http://homepages.ulb.ac.be/~tcoupe/>

Top 50 Health Economics Authors, 1991-2000 (ranked 36<sup>th</sup> based on total pages); in Chang, C. and R. Rubin, "A Bibliometric Analysis of Health Economics Articles in the Economics

Literature: 1991-2000" *Health Economics*, 2003, 12(5), 403-414.

UNCG Senior Faculty Research Excellence Award, 2003

Who's Who in America, 2003-06, 2008-present

Who's Who in American Education, 2006-08

Who's Who in Finance and Business, 2008-2009

Who's Who in the South and Southwest, 1994-98

Who's Who Among Young American Professionals, 1992

Phi Kappa Phi (Univ. of Calif., Davis), 1978

National Merit Scholarship Commendation, 1973.

### **Other Information**

Member: American Economic Association  
American Society of Health Economists  
Association for Public Policy Analysis and Management  
National Academy of Social Insurance  
Southern Economic Association

Research Fellow: Institute of Labor Economics (IZA) (2002 to present)

Research Associate: National Bureau of Economic Research (1994 to present)

Special Review Committee Member: National Institute on Drug Abuse  
National Institute on Aging  
National Institute on Alcohol Abuse and Alcoholism

Technical Advisory Committee: Robert Wood Johnson Policy and Law for a Culture of Health  
Research Initiative (2015)

Chair: iHEA Kenneth J. Arrow Award Committee (2017-present)

Co-Chair: iHEA Kenneth J. Arrow Award Committee (2014-2016)

Board of Directors: American Society of Health Economists (2012 to present)

President, President-Elect and Program Chair: Southern Economic Association (2016 to present)

Vice President: Southern Economic Association (2009 to 2011)

Board of Trustees: Southern Economic Association (2004 to 2008)

Associate Editor: *Journal of Health Economics* (2016 to present)  
*Journal of Population Economics* (2010 to 2016)  
*Southern Economic Journal* (2006 to present)  
*International Journal of Information Security and Privacy* (2006 to 2013)  
*European Economic Review* (2003 to 2008)

Editorial Board: American Journal of Health Economics (2014 to present)  
 Economics Letters (2012 to present)  
 Journal of Labor Research (2009 to present)

Steering Committee: Southeastern Health Economics Study Group (2002 to present)

Mentor: Diversity Initiative for Tenure in Economics (2010 to 2012)

External Faculty Reviewer (for hiring or promotion and tenure cases, partial listing):

Auburn University, Bentley University, Case Western Reserve University, Claremont McKenna College, Columbia University, Drexel University, Emory University, Georgia State University, Korea University, Lehigh University, Queens College (CUNY), Rutgers University, San Diego State University, Stanford University, State University of New York – Albany, Texas A&M University, Tufts University, University of California at Santa Barbara, University of Toronto, University of Wisconsin – LaCrosse, University of Wisconsin – Madison.

Referee (partial listing):

*Addiction, Administration and Policy in Mental Health and Mental Health Services Research, AERA Open, Alcoholism: Clinical and Experimental Research, Alfred P. Sloan Foundation, American Economic Journal: Economic Policy, American Economic Journal: Applied Economics, American Economic Review, American Economic Review: Insights, American Journal of Agricultural Economics, American Journal of Health Economics, American Journal of Preventive Medicine, American Journal of Public Health, American Sociological Review, Berkeley Electronic Journals in Economic Analysis and Policy, Canadian Journal of Economics, Comparative Economic Studies, Comparative Labor Law and Policy Journal, Contemporary Policy Issues, Danish Council for Independent Research, Demography, Developmental Psychology, Economic Development & Cultural Change, Economic Development Quarterly, Economic Inquiry, Economic Journal, Economica, Economics and Human Biology, Economics of Education Review, Empirical Economics, Encyclopedia of Gerontology, European Economic Review, European Journal of Health Economics, European Journal of Population, European Sociological Review, Feminist Economics, Fiscal Studies, Gerontologist, Growth and Change, Health Affairs, Health Economics, Health Economics Letters, Health Services Research, Industrial and Labor Relations Review, Industrial Relations, International Journal of Epidemiology, International Journal of Social Welfare, IZA Journal of Labor Economics, Journal of Aging and Social Policy, Journal of Applied Econometrics, Journal of Children and Poverty, Journal of Development Economics, Journal of Environmental and Public Health, Journal of Environmental Economics and Management, Journal of the European Economic Association, Journal of Finance, Journal of Gerontology: Social Sciences, Journal of Health Economics, Journal of Health Politics, Policy and Law, Journal of Human Resources, Journal of the Japanese and International Economies, Journal of Labor Economics, Journal of the American Medical Association, Journal of Policy Analysis and Management, Journal of Political Economy, Journal of Population Economics, Journal of Public Economics, Journal of Sports Economics, Journal of the Royal Statistical Society, Labor Studies Journal, Labour Economics, Labour: Review of Labor Economics and Industrial Relations, Marsden*

Fund, *Milbank Quarterly*, National Research Council, National Science Foundation, National Science Foundation, *Nonprofit and Voluntary Sector Quarterly*, Organization for Economic Cooperation and Development, *Oxford Economic Papers*, *Policy Studies Journal*, *Population Space and Place*, *Portugese Economic Journal*, *Proceedings of the National Academy of Sciences (PNAS)*, *Quantitative Economics*, *Quarterly Journal of Economics*, *Review of Economics of the Household*, *Review of Economics and Statistics*, *Review of Industrial Organization*, *Review of Social Economy*, Robert Wood Johnson Foundation, *Scandinavian Journal of Economics*, *Science*, *Social Science and Medicine*, *Social Science Quarterly*, *Social Security Bulletin*, *Socio-Economic Planning Sciences*, *Southern Economic Journal*, Upjohn Institute for Employment Research, *World Bank Economic Review*, *Women's Health Issues*.

Guest Lectures, Symposia, and Presentations (partial listing):

Academia Sinica (Taiwan), Aarhus Business School (Denmark), American Enterprise Insitute, American University, Amherst College, Boao Forum (China), Boston University, Brandeis University, Brigham Young University, Bureau of Economic Analysis, Case Western Reserve University, Centers for Disease Control and Prevention, Ca' Foscari University of Venice (Italy), Center for Economic Policy Research, Center for European Economic Research (Germany), College of William & Mary, Colorado State University, Columbia University, Commonwealth Fund, Cornell University, Dalhousie University (Canada), Department of Labor, Duke University, Elon University, Erasmus University (Netherlands), Emory University, Federal Reserve Bank of Atlanta, Federal Reserve Bank of New York, Federal Reserve Board of Governors, Florida State University, Georgetown University, George Washington University, Georgia State University, Harvard University, Humboldt University (Germany), Indiana University, Indiana University and Purdue University at Indianapolis, Institute for the Study of Labor (Germany), Institute for Women's Policy Research, Inter-American Development Bank, Korea University, Louisiana State University, Lund University (Sweden), Massachusetts Institute of Technology, McMaster University, Miami University, National Bureau of Economic Research, National Federation for Independent Business, National Planning Association, New School for Social Research, New Zealand Treasury Department, North Carolina State University, Northeastern University, Northwestern University, Ohio State University, Pennsylvania State University, Princeton University, Qatar Research Foundation (Qatar), Queen's University (Northern Ireland), Rand, Research Institute of Industrial Economics (Sweden), Research Triangle Institute, Rice University, Robert Wood Johnson Foundation, Rutgers University, Sam Houston University, Stanford University, Syracuse University, Swarthmore College, Tufts University, Tulane University, University College, Dublin (Ireland), Universidad Nacional de Educación a Distancia (Spain), University of Alabama at Birmingham, University of Bergamo (Italy), University of Bristol (England), University of Bologna (Italy), University of Calgary (Canada), University of California at Berkeley, University of California at Davis, University of California at Irvine, University of California at Santa Barbara, University of California at Santa Cruz, University of Cambridge (United Kingdom), University of Canterbury (New Zealand), University of Chicago, University of Colorado at Boulder, University of Connecticut, University of Essex (United Kingdom), University of Georgia, University of Iceland, University of Illinois at Chicago, University of Illinois at Urbana-Champaign, University of Kentucky, University of Michigan, University of Munich (Germany), University of North Carolina at Chapel Hill, University of New Hampshire, University of Pittsburgh, University of Oregon, University of

Oslo (Norway), University of Oxford (United Kingdom), University of Pennsylvania, University of Quebec in Montreal, University of South Florida, University of Stavanger (Norway), University of Texas at Austin, University of Vermont, University of Virginia, University of Washington, University of Wisconsin, University of York (United Kingdom), Vanderbilt University, Viller's Foundation, Virginia Commonwealth University, Virginia Polytechnic Institute and State University, Wake Forest University, Washington Center for Equitable Growth, World Bank.

**Media Citations (partial listing):**

**Print/Internet:** *The Atlantic, Associated Press, Axios, Baltimore Sun, Biotech Transfer Week, Bloomberg Business, Bloomberg View, Bloomberg News, Boston Channel.com, Boston Globe, Boston Herald, Bottom Line, Breitbart, Business Journal (Greensboro), Business Week, BuzzFeedNews, Canada.com, Capital Magazine (Germany), Charlotte Observer, Chicago Policy Review, Chicago Tribune, Christian Science Monitor, Chronicle of Higher Education, Chronicle of Philanthropy, Dagbladet (Norway), Daily Progress (Charlottesville), Daily Mail (London), Daily Yonder, Denver Post, Detroit Free Press, Discover Magazine, Economix, Fast Company, Financial Times (London), FiveThirtyEight, Fiscal Times, Forbes, Fortune Magazine, Globe and Mail (Canada), Handelsblatt, Harper's Magazine, Herald-Sun (Durham), Hiram7, In These Times, International Business Times, International Herald Tribune, Inc Magazine, International Business Times, Kansas City Star, LaPresse (Montreal), Lifewhile.com, London Times, Los Angeles Times, Marginal Revolution, Market Watch, Medical Xpress, Money Magazine, Mother Jones, National Journal, NBC News, NBER Digest, News & Observer (Raleigh), News & Record (Greensboro), Newsweek, New York Magazine, New York Post, New York Times, Orlando Sentinel, Reuters, Pittsburg Post-Gazette, Quartz, Richmond Federal Reserve Bank, Richmond Times-Dispatch, Roanoke Times, Scientific American, Slate, SSTI Weekly Digest, St. Petersburg Times, Sun-Sentinel (Florida), The Daily Caller, The Economist, The Fix, The Times (El Paso), Time Magazine, Triad Business Journal (Greensboro), USA Today, UVA Today, US News and World Report, Vox, Wall Street Journal, Washington Business Journal, Washington Post, Washington Times, Wirtschaft Sonntags Zeitung (Zurich), Yahoo Finance.*

**Radio/TV:** *ABC News Radio, BBC World Service, Bryan Lehrer Show, CBC Radio (Montreal), CBS MarketWatch Weekend, CBS News Radio, CNBC, CNN, Dennis Prager Radio Show, Freakonomics/Market Place Radio, Good Morning America (ABC), Herald-Mail.com, Internet Broadcasting, KNPR (Las Vegas), La Presse (Montreal), Last Week Tonight (John Oliver), MSNBC, Market Place (National Public Radio), National Public Radio, QR77 Radio (Calgary), PBS NewsHour, REACHMD XM160, UNC Public Radio, WFDD (Winston-Salem), WGST (Atlanta), WFMY (Greensboro), WLNI Radio (Lynchburg), WNYC (New York), WOKB (Orlando), WPTF (Raleigh), WSJS/WTQR Radio (Greensboro), WVTF Radio IQ (Virginia), WXII (Winston-Salem).*

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