

Opioid Misuse, Labor Market Outcomes, and Means-Tested Public Expenditures: A Conceptual Framework

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Introduction

As the opioid epidemic continues to grow, with 45,000 opioid-related overdose deaths in 2017 alone in the United States,¹ several studies have estimated the economic cost of the epidemic.²⁻⁹ One particular area of emphasis is the financial burden resulting from opioid-related reductions in employment and labor market productivity. To date, estimates have largely focused on the costs borne at the societal level. This article provides a conceptual framework for understanding how opioid-related effects on the labor market translate into increased costs to state and federal governments, both in terms of reduced tax revenue and increased spending on means-tested programs.

Background

An increasing number of studies have assessed how opioid misuse may impact labor market outcomes.¹⁰⁻¹³ In addition, several studies have estimated how the resulting lost productivity due to opioid misuse translates to costs, typically focusing on 5 main categories: unemployment/underemployment, absenteeism, presenteeism, incarceration, and premature mortality. One study³ also includes disability-related costs. The estimated opioid-related productivity losses range from \$4.5 billion to \$431.7 billion annually. Much of the large variability of estimates can be attributed to methodological differences across studies, including which categories of the aforementioned costs are included and how they are estimated.

In this section, we briefly summarize previous estimates, highlight key estimation issues, and provide an outline of important considerations for assessing the costs of increased public expenditures due to opioid misuse. **Table 1**²⁻⁹ summarizes the cost estimates in the literature associated with lost productivity due to opioid misuse. Three studies²⁻⁴ estimate costs of unemployment/underemployment due to opioid misuse by extrapolating from a report by the Office of National Drug Control Policy.¹⁴ Each study²⁻⁴ analyzes the effect of all types of drug use on employment and wages, making adjustments specific to opioids. As the approach of the studies is essentially descriptive, each make assumptions about the fraction of overall addiction attributable to opioids and

ABSTRACT

As the opioid epidemic has drawn increased attention, many researchers are attempting to estimate the financial burden of opioid misuse. These estimates have become particularly relevant as state and local governments have begun to take legal action against pharmaceutical manufacturers, distributors, and others who are identified as being potentially responsible for the worsening epidemic. An important category of costs includes those related to the effect of opioid misuse on labor market outcomes and productivity. Most published estimates of opioid-attributable productivity losses estimate the financial burden borne by society, failing to distinguish between costs internalized by individuals and those that spill over to third parties, such as state and federal governments. This article provides an overview and a conceptual framework for 2 types of labor market-related costs borne by state and federal governments that typically have not been incorporated into existing estimates, which may represent important categories of expenditures. Because detailed estimates of lost tax revenue are available elsewhere, this article focuses largely on whether, and how, to incorporate opioid-related expenses incurred by means-tested government programs into more general estimates of the economic harm created by the opioid epidemic.

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opioid-specific unemployment values to construct estimates of lost wages because of opioid misuse.

The next 2 types of cost—absenteeism and presenteeism—are conceptually similar. Absenteeism captures lost wages due to lost work time (eg, attending a doctor’s visit or a hospital admission), while presenteeism captures lower productivity at work (eg, not being able to work at the normal level of productivity due to the impact of addiction).¹⁵ Both are difficult to measure empirically, as reflected by the wide range of absenteeism estimates in the literature (\$0.3 billion-\$16.2 billion).^{3,5,7} There are 2 significant challenges to estimating these costs, both of which could lead to overestimation of the forgone tax revenue resulting from absenteeism or presenteeism. First, employees may be able to make up lost work hours in a way that is difficult to observe in standard data sets. Second, lost work time or reduced productivity may not reduce taxable income when workers are salaried. In both cases, either because time is made up or because of limited effects on income, the forgone tax revenue attributed to absenteeism and presenteeism may actually be lower than if one assumes that

measured reductions in hours or productivity translate into lower tax payments in a 1-to-1 fashion.

The estimates in the next category, incarceration-related costs, also exhibit a wide range (\$0.7 billion-\$14.8 billion).^{2-4,7,8} These costs include lost productivity for those who are incarcerated and unable to work. Although several studies explicitly calculate incarceration costs, a number of studies that estimate the effect of opioid misuse on employment combine effects of incarceration into overall estimates of reduced employment or lost productivity by estimating the overall effect of opioid misuse on labor force exits regardless of cause.¹⁰⁻¹³

The category that typically contains the largest overall cost estimates is premature mortality. Losses from premature mortality are calculated either by using a human capital approach to estimate what an individual would have earned had they worked the typical number of additional years²⁻⁷ or by using a set value of a statistical life.⁹ The latter generally leads to larger estimates.

Each of the aforementioned studies estimate costs using the full dollar value of lost productivity. However, when analyzing the

TABLE 1. Summary of Opioid-Related Cost Estimates of Reduced Productivity in the Literature (in billions USD)²⁻⁹

Study	Year Costs Are Measured	Premature Mortality Costs	Unemployment/ Underemployment	Absenteeism	Presenteeism	Disability	Incarceration-related Employment Costs	Total Productivity Costs ^a
Birnbaum et al (2006)	2001	\$0.865	\$3.024	–	–	–	\$ 0.658	\$4.55
Birnbaum et al (2011)	2009	\$11.22	\$7.931	\$1.814	\$2.044	\$0.81	\$1.768	\$25.58
Hansen et al (2011)	2006	\$12.4	\$14.7	–	–	–	\$14.8	\$42.00
Inocencio et al (2013)	2011	\$17.91	–	\$0.335	–	–	–	\$18.24
Rice et al (2014)	2012	–	–	\$3773 per misuser ^b	–	–	–	–
Florence et al (2016)	2013	\$21.43	–	\$16.26 ^c	–	–	\$4.18	\$41.87
Rhyan (2017)	2016		–	–		–		
Private		\$31.1			\$8.1		\$0.9	\$40.00
Federal tax		\$8.2			\$2.1		\$0.2	\$10.6
State tax		\$2.2			\$0.6		\$0.1	\$2.8
Local tax		\$1.7			\$0.4		\$0.1	\$2.2
CEA (2017)	2015	\$431.7	–	–	–	–	–	\$431.7

CEA indicates Council of Economic Advisers.

^aTotal productivity costs represent a sum across each of the individual categories of costs. Note that the total reported may be different from the sum of each component due to rounding.

^bRice et al⁶ only report absenteeism and disability costs together; however, they report number of work days missed separately for each. They report 47.4% of days missed were due to disability and 52.6% were due to medically-related absenteeism. They also only report per misuser relative to the comparison group without summing them.

^cFlorence et al⁷ estimate the loss in total productivity due to opioids by including work as well as household production. They do not divide into absenteeism, presenteeism, and disability.

financial burden borne by state and federal governments, we must consider which specific components of lost productivity actually translate into costs to federal and state governments. This narrower focus may lead to lower estimates compared with studies that consider costs related to lost productivity more expansively. For example, an earlier report,⁸ with limited detail on the analytical approach, finds \$2.8 billion in lost state tax revenue, \$2.2 billion in lost local tax revenue, and \$10.6 billion in lost federal tax revenue, which are in line with estimates of lost income and sales tax revenue in a recent study.¹⁶

Conceptual Framework

The effect of opioid misuse on labor market outcomes can negatively impact state and federal budgets through 2 main channels (Figure). First, adverse labor market outcomes can lead to lower income, therefore lowering state and federal income tax, as well as state sales tax revenues. Second, reductions in household income due to opioid misuse could lead users or their families to become eligible for a wide range of means-tested state and federal programs. Below, we provide a more detailed, conceptual description of these 2 avenues by which opioid misuse may impose costs on state and federal governments.

Lost Tax Revenue

In our previous work,¹⁶ we separately estimate tax revenue losses due to opioid-related labor force exits and opioid-related premature mortality. Building upon earlier work by Krueger,¹⁰ we combine plausibly causal estimates of the effect of opioid misuse on prime-age (aged 25–54 years) labor force exits with data on median wages and family structure taken from the National Survey of Drug Use

and Health. We then use the National Bureau of Economic Research TAXSIM calculator to estimate state and federal income tax losses. For premature mortality, we use a similar approach to estimate forgone taxes for those who died during prime working years using CDC's WONDER mortality data.

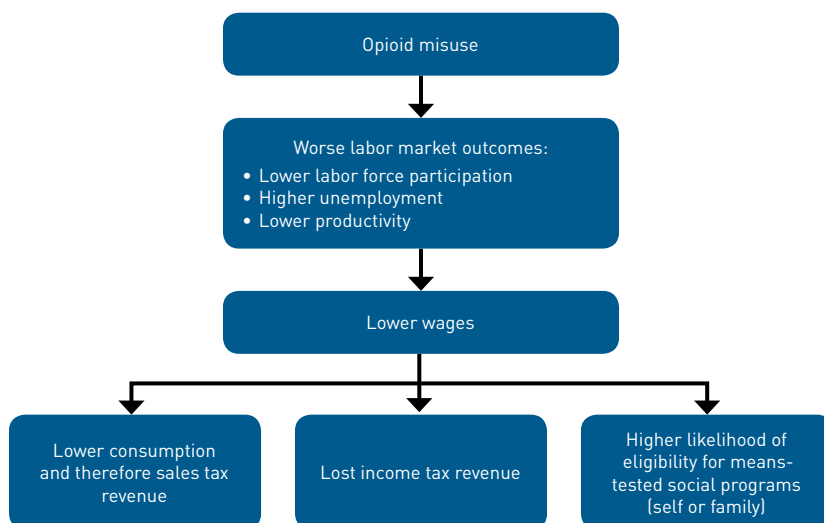
Means-Tested Social Programs

To the extent that opioid misuse leads to a greater likelihood of leaving the labor force or suffering reduced income, this may lead a number of means-tested social programs to increase their expenditures on those who were previously employed or those who remain employed but whose incomes have dropped below eligibility thresholds. These types of programs include cash assistance, unemployment insurance, disability coverage, workers' compensation, publicly funded health insurance, nutrition programs, and employment training programs, all of which have funding mechanisms that differ in the extent to which they are predominantly federally funded, state funded, or some combination of each. To date, most studies have not examined these costs. Table 2^{17–37} highlights specific programs and the degree of federal–state cost sharing.

Cash Assistance

Individuals and families facing adverse labor market outcomes and lower incomes due to opioid misuse may become eligible for federal and/or state income assistance programs. The federal government provides the greatest share of funding for cash assistance programs,¹⁷ with the Earned Income Tax Credit^{17,38,39} for lower-income families being the largest program. Depending on household size, families below a specific income threshold are eligible to receive a credit between \$519 to \$6431 for tax year 2018.⁴⁰ In addition, low-income families may qualify for the Temporary Assistance for Needy Families (TANF) Program.^{41–43} Under TANF, the federal government provides states with block grants to assist needy families for up to 60 months, while recipients are required to engage in work activities. However, states have flexibility in terms of both how they spend the federal block grant and, within the general requirements, whom they deem eligible for benefits.⁴² Spending can include basic assistance, supporting work activities and job training, and child care. Furthermore, states are required to provide supplemental funding in the form of Maintenance of Effort (MOE). For example, Pennsylvania spent \$455 million on MOE in 2016.⁴³ A large range of cash assistance programs exist, but to date there is little empirical evidence on how opioid misuse increases the use of such programs.

FIGURE. Conceptual Framework for Effect of Opioid Misuse on Adverse Labor Market Outcomes and Resulting Government Costs



Although a report from Express Scripts suggests that TANF recipients may have higher rates of opioid use, it does not provide evidence for higher rates of opioid *misuse* among them.⁴⁴

Unemployment Benefits

Adverse labor market outcomes may also lead to eligibility for unemployment benefits. However, for 2 reasons, the total opioid-attributable cost of unemployment benefits borne by state and federal governments is likely to be low. First, unemployment is funded by experience-rated taxes imposed on employers, meaning that if opioid misuse increases the rate of unemployment claims, the increase would largely be recouped through higher taxes on employers.^{18,19} The exception would be if the state or federal government is the employer. Second, unemployment benefits are typically available only to workers who lose their jobs without cause.^{19,20} However, opioid-related job separations may be more likely to result from employees being fired for cause or due to voluntary separations initiated by workers, in which case expenditures would likely be lower. Overall, if firing for cause is difficult and opioid misuse leads to increased claims, then governments might bear substantial, increased costs in their capacity as employers.

Disability Benefits

The disabled population is eligible for additional assistance programs. Because opioids are often prescribed for the types of injuries or illnesses that lead individuals to become disabled,^{21,45} and given that opioid use is significantly higher in the disabled population,^{21,46,47} this category of costs may be important. To date, the only estimates that include disability-related costs is a 2011 study by Birnbaum et al,³ which focuses on lost productivity following disability rather than on the cost of the disability benefits themselves.

In terms of potential governmental expenditures, most disability claims are paid by federal sources such as the Social Security Administration’s Supplemental Security Income Program and Social Security Disability Insurance,²² but many states also provide supplemental income to disabled individuals who are eligible for federal assistance.²³ Further, state and federal governments may have additional expenses when they provide their employees with supplemental disability insurance.^{24,37}

Importantly, individuals are not eligible for federal disability coverage if “drug addiction or alcoholism is a contributing factor material to the determination that the claimant is disabled.”²⁶ Therefore, the primary mechanism by which opioid misuse could lead to increased disability payments is that an injured employee becomes eligible due to an injury but experiences a longer disability period due to opioid misuse. It remains unknown whether opioids lead to longer disability spells,^{45,48-51} with several important studies still in progress. Given the mixed evidence regarding the effect of opioid misuse on extended disability periods, it is unclear how large opioid-attributable costs for disability benefits may be. This cost is likely to be larger for the federal government than for state governments due to the relatively smaller fraction of disability benefits supported by state funding.

TABLE 2. Means-Tested Programs by Type of Government Funding¹⁷⁻³⁷

Program Type	Federally Funded ¹⁷	Funded by States
Cash assistance	<ul style="list-style-type: none"> EITC TANF 	<ul style="list-style-type: none"> Maintenance-of-effort funding for TANF recipients Various state programs
Unemployment benefits ^{18-20,35}	<ul style="list-style-type: none"> Typically offered in less common circumstances such as during disasters or times of high unemployment when many may have exhausted state benefits³⁵ 	<ul style="list-style-type: none"> Risk-rated coverage paid by employers but managed by states
Disability benefits ^{21-24,26,37}	<ul style="list-style-type: none"> Social Security Supplemental Income Program Social Security Disability Insurance 	<ul style="list-style-type: none"> Various state programs
Workers’ compensation ^{27,36}	<ul style="list-style-type: none"> Several programs under Office of Workers’ Compensation Programs for federal employees³⁶ Several smaller section-specific programs such as Federal Black Lung Program 	<ul style="list-style-type: none"> Risk-rated coverage paid by employers but states bear administrative costs
Publicly funded health insurance ^{28,29}	<ul style="list-style-type: none"> Medicaid SCHIP Premium and cost-sharing subsidies for Marketplace plans 	<ul style="list-style-type: none"> Varying state matches for Medicaid and SCHIP
Nutrition programs ^{30,31}	<ul style="list-style-type: none"> Supplemental Nutrition Assistance Program Special Supplemental Nutrition Program for Women, Infants, and Children National School Lunch Program and National School Breakfast Program Variety of other programs 	<ul style="list-style-type: none"> Largely federally funded, administered by states Some additional programs by state
Job training programs ^{25,32-34}	<ul style="list-style-type: none"> Largely covered through TANF 	<ul style="list-style-type: none"> TANF administration Additional programs may vary by state

EITC indicates Earned Income Tax Credit; SCHIP, State Children’s Health Insurance Program; TANF, Temporary Assistance for Needy Families.

Workers' Compensation

While workers' compensation claims may be associated with opioid use, no clear conceptual link exists between opioid misuse and elevated governmental expenditures on workers' compensation; this is primarily because, as was the case with unemployment insurance, costs are generally borne by employers. Again, direct costs may exist where the state or federal government is the employer. Moreover, although some evidence ties opioid use to higher workers' compensation claims,^{27,52} it is difficult to disentangle the role of opioid misuse in causing workplace injuries from their role in appropriately medicating workers with existing injuries unrelated to prior opioid use, both of which would yield a positive correlation between use and claims. A final possibility is that existing injuries could lead to opioid use and subsequent misuse, which in turn could impede one's ability to work and thus increase the size of the workers' compensation claim.

Publicly Funded Health Insurance

Opioid-attributable declines in income may also result in individuals or families becoming eligible for means-tested, publicly funded health insurance. The 2 largest programs are Medicaid and the Children's Health Insurance Program (CHIP).¹⁷ Previous studies have emphasized the funding Medicaid (or potentially other public payers) provides for opioid misuse treatment,^{53,54} including a study by Leslie et al⁵⁵ in this volume. Here, we focus on how opioid misuse may lower household income and potentially increase enrollment in Medicaid or CHIP, including family members who are not using opioids. Although both Medicaid and CHIP are state programs, they include significant federal matching funds, and, in both cases, eligibility, funding, and the types of plans available vary significantly by state.^{28,29} Additionally, we note that although Medicare is also a large health insurance program that includes significant federal funding, eligibility is largely based on age and is not initiated by opioid-related declines in labor force participation. One relevant exception is disabled individuals who become eligible for Medicare.⁵⁶ To the extent that opioid misuse leads to greater Medicare eligibility due to disability, Medicare could bear increased cost. Lastly, the Affordable Care Act includes both premium and cost-sharing subsidies that may be available to low-income individuals who purchase health insurance through the individual marketplace. Although no study has directly estimated the impact of opioid misuse on greater eligibility and use of publicly funded health insurance, it potentially represents a significant expense to both state and federal governments.

Nutrition and Employee Training Programs

Lower family incomes due to opioid misuse may also lead to eligibility for, and therefore greater use of, food assistance and job training programs. The largest food assistance program is the

Supplemental Nutrition Assistance Program, which is funded by the federal government, with states covering administrative costs.^{17,30} The federal government also funds the Special Supplemental Nutrition Program for Women, Infants, and Children, the National School Lunch Program, and the National School Breakfast Program, as well as a variety of other programs.³¹ On the job training side, the federal government covers significant employment training programs through TANF,³² but states vary in whether and which additional training programs they offer. Many state job training programs target dislocated workers or firms that hire low-income workers and may be less relevant for those exiting the labor force due to opioid misuse.^{25,33,34} Similar to the other cost categories, little evidence exists regarding the effect of opioid misuse on expenditures by either of these types of programs.

Gross Cost Estimates

We estimate that between 2000 and 2016, opioid misuse reduced state tax revenue by \$11.8 billion, including \$10.1 billion in lost income tax revenue and \$1.7 billion in lost sales tax revenue.¹⁶ In this survey article, we do not attempt to empirically estimate the impact of opioid misuse on state and federal spending on means-tested programs, but instead provide an overview of programs that, based on their eligibility criteria, funding mechanisms, and other rules, are most vulnerable to adverse impacts from the opioid epidemic. However, if detailed state- or county-level data on means-tested program participation were available, we could envision how future studies might estimate these costs. Using an approach similar to the one employed by Krueger to estimate the effect of opioid misuse on increased labor force exits,¹⁰ or others that adopt an instrumental variables strategy to isolate exogenous geographic variation in opioid use,^{11,12} one could use state- or county-level variation in opioid prescribing to estimate their effect on means-tested program participation. Combining the resulting estimates with state and federal budget data, it should be possible to estimate the change in public expenditures due to increased participation. A major challenge in many cases is identifying county-level sources for means-tested program participation data.

Future Directions

To date, studies that analyze the effect of opioid misuse on governmental expenditures, including forgone tax revenue, have focused on how increased prescribing may have led to worse labor market outcomes. However, with the concurrent decline in prescribing and increase in treatment, an important question for future research is how treatment affects labor market outcomes, state and federal tax revenues, and participation in the means-tested public programs discussed in this article. For example, does the effect vary by treatment type? Does medication-assisted therapy improve labor market

outcomes more than other forms of treatment? A related question is the extent to which opioid-related arrests and convictions may moderate this effect if having a criminal record limits an individual's ability to return to the labor force or limits their earning ability. States continue to implement a number of opioid mitigation strategies, such as prescription drug monitoring programs,⁵⁷ increased funding for treatment and access to naloxone, and criminal justice diversion programs, among others. It remains to be seen whether these programs will lead to improved labor market outcomes, thereby partially offsetting the cost of such programs and in the process reducing the impact of the opioid epidemic on state and federal budgets more generally.

Although we highlight a number of factors to consider when estimating the effect of opioid misuse on disability, workers' compensation, and various means-tested assistance programs, future research is needed to expand on these ideas, as limited research has been published to date. Other state and federal assistance programs may also be important, but we note that obtaining reliable estimates will be difficult if relevant data sources are not available. Therefore, partnerships with state and federal governments may be necessary to produce an accurate accounting of the full impact of the opioid epidemic on state and federal budgets. ■

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