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UNDERSTANDING THE ECONOMIC LOSSES RESULTING FROM OPIOID OVERDOSE DEATHS IN THE USA BETWEEN 2018-2020

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Introduction

Opioids—mainly synthetic opioids (other than methadone)—are currently the main driver of drug overdose deaths, with fentanyl taking over as the nexus of this epidemic. The NIH reports that since 2013, fentanyl has emerged as the principal driver of overdose deaths with 70,601 fatalities reported in 2021, a 7.5-fold increase since 2015. This staggering loss of life disrupts families and communities through broken relationships and loss of social capital. However, more work is needed to understand the economic implications of the lives lost to the opioids.

One approach to understanding the economic impacts of opioid deaths is to examine the Years of Potential Life Lost (YPLL) and the Value of Statistical Life (VSL). YPLL is used to estimate premature mortality and the number of years lost from a predefined age, such as life expectancy, with a higher YPLL suggestive of premature mortality (1). VSL is commonly used by policymakers to estimate the value of risk reduction strategies when creating new legislation and public health interventions. Although prior studies have assessed the economic impacts of total overdose deaths and at a regional level, there remains a paucity of information regarding the financial burdens due to specific types of opioids at a national level. The aim of this paper is to estimate the YPLL and the VSL to better understand the national economic costs of various opioid overdose deaths in the U.S.

Materials and Methods

The total number of deaths from drug overdoses from fentanyl, hydrocodone, hydromorphone, oxycodone, and oxymorphone was extracted from the National Vital Statistics System (NVSS) for 2018-2020 (2). Fentanyl deaths also included those from fentanyl analogs and metabolites. The data were stratified by age range and gender. Period life expectancy was extracted from the 2019 actuarial life tables from the SSA website. Period life expectancy is the average number of years of life remaining if a group of persons at that age were to experience the mortality rates for 2017 over the course of their remaining life.

The baseline age of death was calculated by taking the upper value of the midpoint for each age range. Annual YPLL for each age range was calculated by multiplying the number of deaths by the 2019 period life expectancy for males

and females at the midpoint of each respective age range. The population average value of statistical life year (VSLY), which is used by policymakers to calculate the economic value of reducing mortality risks, was determined to be US$240,676 based on previously published literature. The VSL for each age range was then calculated by multiplying the YPLL by the VSLY (1).

All extracted data was publicly available and did not require approval from the IRB.

Results/Case Report

The total number of opioid overdose deaths (due to fentanyl, hydrocodone, hydromorphone, oxycodone, and oxymorphone) increased from 39,183 in 2018 to 64,464 in 2020, an almost 65% increase. In 2018, an estimated 1,501,014 YPLL lost with a total VSL of US$361.25 billion. By 2020, the YPLL had increased to 2,490,366 and total VSL of US$599.37 billion.

A disproportionately high number of opioid overdose deaths were attributed to fentanyl alone (Figure 1). In 2018, fentanyl overdose mortality resulted in a total YPLL of 1,202,437 and a total VSL of US$289.39 billion. In 2020, total YPLL rose to 2,193,793 and VSL of US$527.93 billion (Table 1, Figure 1). In 2018, fentanyl was the primary cause of death in 77% of opioid overdose deaths, and by 2020, that number had risen to 86% (Table 1). Males accounted for nearly two-thirds of all overdose deaths, and this pattern was consistent across the period. Most fatalities occurred in persons within the 25-34 age range, followed ages of 35-44 years (Figure 2).

Oxycodone accounted for 13% of opioid overdose deaths in 2018 with a total YPLL of 171,181 and a total VSL of US$41.20 billion and in 2020, it accounted for 8% with a total YPLL of 175,241 and VSL of US$42.17 billion. Hydrocodone, hydromorphone, and oxymorphone contributed to 4%, 0.9%, and 0.87% of opioid overdose deaths in 2020, respectively.

Discussion

Opioid overdose deaths rose between 2018-2020, with a notable upsurge in 2020, possibly a sequela of the socioeconomic burdens of the COVID-19 pandemic. The pandemic was a period of economic and social instability for many Americans, and these stressors disproportionately affected populations with a history of substance use disorders, mental illness, and homelessness.

Fentanyl overdose deaths consistently led to the most premature years of life lost (YPLL) and the greatest losses to the economy (VSL). Fentanyl is a pure agonist of the mu receptors and exerts dose-dependent analgesia making it more prone to abuse, unlike partial agonists which typically have a ceiling for the cardiac and respiratory depression they can induce (3). This trend may also be linked to newer, potent fentanyl derivatives (4) and their low-cost leading to more lacing of fentanyl with other drugs including heroin, methamphetamine, and cocaine, increasing the likelihood of a fatal interaction (5). Our analysis by age also found that most fentanyl overdose deaths and subsequent monetary loss occurred in men ages 25-34. Further investigation is needed to understand why rates of opioid use and overdose are higher in this demographic to help reduce the high years of potential life lost.

Combating opioid overdose requires an understanding of the fundamental mechanisms that make these drugs particularly addictive and a comprehensive assessment of the economic and psychosocial contexts that perpetuate this epidemic. This paper sought to quantify years of potential lives lost from premature opioid overdose deaths and associated economic losses. Potential limitations include the lack of data on how the drugs were obtained (prescription, illicit sources) and routes of administration (parenteral, transdermal, trans-buccal, etc.). One criticism against the utility of VSL is its assumption that every

given person in a population has the same VSL, an oversimplification of the many factors that go into cost-benefit analysis such as an individual's income, health, fatality risk, environmental quality, and other social determinants of health. Capturing this data and conducting qualitative research in hard-hit communities could identify high-risk groups and inform policies to mitigate risk.

References

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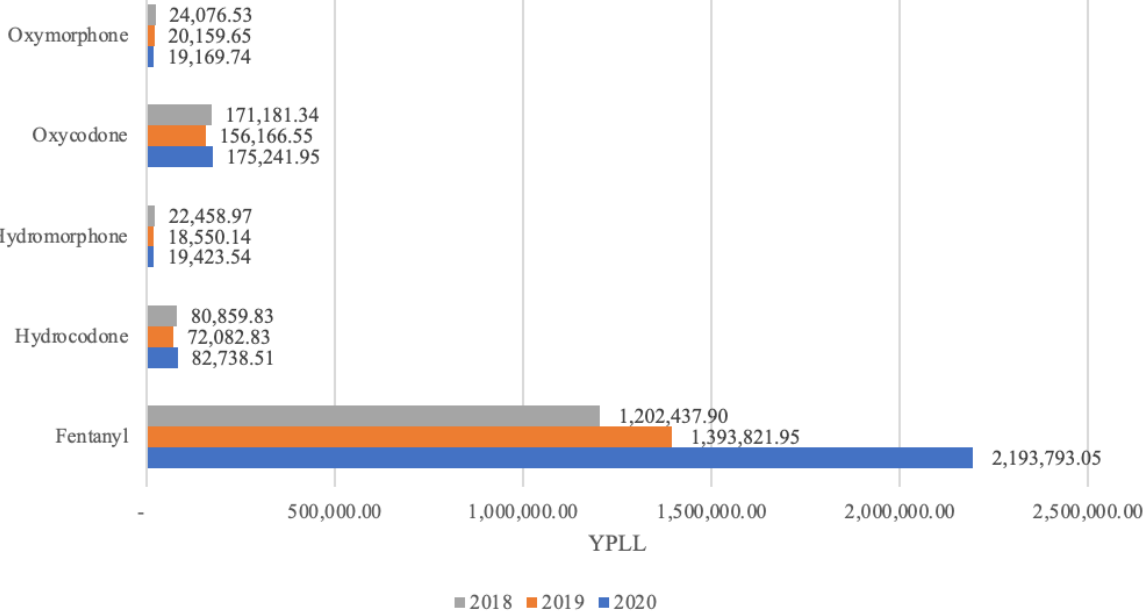
Disclosures

No

Tables / Images

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Opioid Type	YPLL		

Chart data (YPLL by Opioid Type, 2018 / 2019 / 2020):

- Oxymorphone: 24,076.53 (2018); 20,159.65 (2019); 19,169.74 (2020)
- Oxycodone: 171,181.34 (2018); 156,166.55 (2019); 175,241.95 (2020)
- Hydromorphone: 22,458.97 (2018); 18,550.14 (2019); 19,423.54 (2020)
- Hydrocodone: 80,859.83 (2018); 72,082.83 (2019); 82,738.51 (2020)
- Fentanyl: 1,202,437.90 (2018); 1,393,821.95 (2019); 2,193,793.05 (2020)

Legend: ■ 2018 ■ 2019 ■ 2020

	2018		2019		2020	
Deaths	30,230		35,449		55,653	
	Total YPLL	**Total VSL (USD)**	**Total YPLL**	**Total VSL (USD)**	**Total YPLL**	**Total VSL (USD)**
Base case	1,202,437.9	$289,397,944,020.40	1,393,821.95	$335,459,491,638.20	2,193,793.05	$527,993,336,101.80
Lower bound	1,093,645.84	$263,214,306,187.84	1,266,297.03	$304,767,303,992.28	1,993,270.68	$479,732,414,179.68
Upper bound	1,341,069.22	$322,763,175,592.72	1,556,391.14	$374,585,994,010.64	2,449,420.53	$589,516,735,478.28