Economic Burden of Prescription Opioid Abuse in the United States: A Systematic Literature Review

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Background & Objectives

- World's 80% of opioid supply is consumed by the US[1]
- Consequently, the abuse of opioids poses a significant challenge to the nation which declared it as an epidemic in 2013, and a national public health emergency in 2017[2]
- This systematic review evaluates the economic burden of prescription opioid abuse in the US after 2017

Methods

- A systematic review adhering to PRISMA guidelines was conducted searching Embase® and MEDLINE® using the interfaces Embase.com and PubMed in November 2023 to identify literature published from 1-January-2018 to 30-November-2023
- English only studies reporting cost and HCRU associated with abuse of prescription opioids were included. No further restrictions were applied
- Abstracts and full texts of records from databases were screened by two independent reviewers and conflicts relating to eligibility were resolved by a third reviewer
- Data was extracted and quality checked by independent reviewers

Results

- A total of 5,354 records were retrieved from Embase® (n=4,349) and MEDLINE® (n=1,005)
- After deduplication, 4,655 records were screened for TI/AB, followed by full-text screening of 728 records which finally led to the inclusion of 14[3-16] unique publications **(Figure 1)**
- Seven (50%) publications reported both HCRU and cost outcomes **(Table 1)**
- Retrospective observational study (78.5%) was the most adopted study design followed by cross-sectional study (14.3%) **(Table 1)**
- Most commonly reported type of abuse was dependence (29.4%), followed by overdose/prior overdose (23.5%), and OUD (17.6%) **(Table 1)**
- Most of the cost related publications (90%) reported the direct cost of opioid prescription abuse

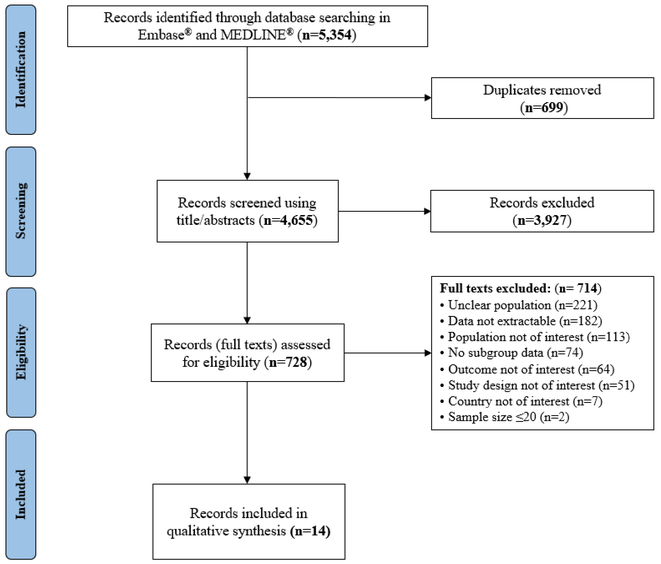

Figure 1: PRISMA diagram

Table 1. Characteristics of the included studies

Author, year	Study design	Perspective	Type of Abuse	Type of outcome
Balbale et al, 2022	Retrospective	NR	Dependence, abuse	Resource use
Patel et al, 2021	Cross-sectional study	Societal	Poisoning	Both
Barenie et al, 2020	Retrospective	NR	OUD, prior overdose	Cost
Chen et al, 2020	Retrospective	NR	OUD	Both
Rossiter et al, 2020	Retrospective	Societal	Misuse/abuse	Both
Sears et al, 2020	Retrospective	NR	Overdose	Resource use
White et al, 2020	Retrospective	Insurer/third party payer	OUD	Both
Geller et al, 2019	Retrospective	NR	Therapeutic misuse, Overdose	Resource use
Ruchi et al, 2019	Retrospective	NR	Overdose	Both
Schepis et al, 2019	Interview/ Survey	NR	Misuse	Resource use
Sharma et al, 2019	Retrospective	NR	Dependence	Cost
Wilson et al, 2019	Retrospective	NR	Dependence	Both
Sharma et al, 2018	Retrospective	NR	Dependence	Both
Vietri et al, 2018	Cross-sectional study	NR	Dependence	Cost

- **Table 2** and **Table 3** present key findings from studies that reported only cost and only resource use from included studies, respectively
- Barenie et al. (2020) reported average copayment was $24.83 for naloxone vs $9.74 for the index opioid in patients receiving opioid prescriptions and at high risk for opioid overdose (**Table 2**)
- Sharma et al. (2019) reported that the patients in DD and NDD groups were likely to incur 3.03 and 2.28 times the overall costs, respectively, compared with the patients in the NDND group

Table 2. Studies reporting only cost related data

Author, year [Population size]	Cost data (in USD)
Barenie et al, 2020 [3,096]	Direct cost, Mean (SD): The average copayment was $24.83 (67.66) for naloxone versus $9.74 (19.75) for the index opioid The average out of pocket cost was $31.01 (73.64) for naloxone versus $13.48 (34.95) for the index opioid
Sharma et al, 2019 [212 patients were identified to have opioid dependence after surgery]	Total cost: DD and NDD were likely to incur 3.03 and 2.28 times respectively the overall costs compared with patients in group NDND (p<0.0001), at 3 to 15 months post-surgery (median $21,648; $40,975; and $13,571 for NDD, DD, and NDND groups respectively)
Vietri et al, 2018 [Abuse without tampering: 118; Abuse with tampering: 107]	Direct cost: Estimated 3-month medical costs, Mean (SD) Abuse with tampering (n= 107); Abuse without tampering (n=118) Total: $8,790 (13,546); Total: $2,223 (4,813) Indirect cost: Estimated 3-month costs, Mean (SD) Abuse with tampering (n=81) Absenteeism: $1,861 (3,021); Presenteeism: $1,824 (2,477) Abuse without tampering (n=81) Absenteeism: $675 (1,853); Presenteeism: $2,276 (3,252)

Table 3. Studies reporting only resource use data

Author, year [Population size]	Resource use data
Balbale et al, 2022 [3,430]	ED visits, N (%): 1,614 (47.1) Hospital stays, N (%): 2,103 (61.3)
Sears et al, 2020 [NR]	Hospitalization count due to overdose Payer only: 138 Payer + E-codes: 142 State-level average annual prescription opioid overdose/AE hospitalization rates ranged from 0.3 to 1.2 per 100,000 employed worker
Geller et al, 2019 [40,499]	ED visits, % (95%CI): 11.3 (8.6-14.0)
Schepis et al, 2019 [Prior to past-year misuse= 752; Past-year misuse= 70; Both past-year and prior misuse= 459]	Overnight hospitalizations, % (95%CI) Prior to past-year misuse: 13.6 (10.7-17.0) Past-year misuse: 45.6 (32.8–59.0) Both past-year and prior misuse: 31.4 (25.7-37.6) ED Visit, % (95%CI) Prior to past-year misuse: 24.8 (21.4-28.5) Past-year misuse: 47.7 (33.0–62.8) Both past-year and prior misuse: 42.7 (37.4-48.2)

- Sears et al. (2020) reported that the state-level average annual prescription opioid overdose hospitalization rates ranged from 0.3 to 1.2 per 100,000 employed workers (**Table 3**)
- Schepis et al. (2019) reported high rates of ED visits (42.7%) in older adults due to prescription opioid misuse

Table 4. Studies reporting both cost and resource use data

Author, year [Population size]	Cost data (in USD)	Resource use data
Patel et al, 2021 [NR]	Total direct costs (estimated): $21.1 million Total indirect (productivity) costs: $209.7 million Total costs of pediatric prescription opioid poisonings and exposure: $230.8 million	Mean days Absent Days (LOS + Recovery): 2 Inpatient stay (LOS + Recovery) -None to minor severity: 2.81 -Moderate severity: 5.37 -Major to extreme severity: 12.75
Chen et al, 2020 [THA: 1,921; TKA: 2,569]	Total hospital charges in 2017 $ THA: Median (Q1; Q3): 64,527 (40,149; 91,427) TKA: Median (Q1; Q3): 59,595 (36,317; 82,847)	LOS in days; Mean (SD) THA: 4.88 (5.15) TKA: 3.99 (2.85)
Rossiter et al, 2020 [Diagnosed abusers: 22,119; Undiagnosed abusers: 340,334]	Current formulary Total Medical cost: $188,730,568 Total healthcare cost: $498,228,507 Revised formulary Total Medical cost: $188,173,247 Total healthcare cost: $497,888,230	Excess Events per Diagnosed Abuser ED visits: 0.9 Outpatient visits: 3 Hospitalizations: 0.5 Excess Events per Undiagnosed Abuser ED visits: 0.27 Outpatient visits: 0.9 Hospitalizations: 0.15
White et al, 2020 [Matched: 2,311]	Healthcare costs, Mean (SD) Total costs Matched: $6,798 (23,023) Total prescription costs Matched: $1,387 (6,471) Work loss costs for matched population Total work-loss costs: $8,193 (14,694)	Matched, Mean (SD) ED visits: 0.5 (1.3) Outpatient visits: 6.7 (8.5) Inpatient days: 0.5 (2.5) Substance use rehabilitation days: 0.2 (2.0) Work loss due to disability for matched population, Mean (SD) Total work loss days due to medical visits: 17.8 (18.5)
Ruchi et al, 2019 [3,231]	Annual Medicare cost per patient Median (IQR): $46,000, (26,000-73,000)	Hospital admissions: % 2006-2012: 0.10%- 0.16% (p-value < 0.001) LOS, median (IQR): 4 (2-8) ICU LOS, median (IQR): 2 (1-4)
Wilson et al, 2019 [9,832]	TKA (Mean [SD]) Inpatient cost: $20,394 (11,067) Total 90-day cost: $22,873 (15,793) THA (Mean [SD]) Inpatient cost: $22,307 (15,385) Total 90-day cost: $26,198 (21,360)	LOS, mean (SD) TKA: 4.39 (4.22) THA: 5.26 (9.40)
Sharma et al, 2018 [NDD: 383; DD: 677]	Index hospitalization payment, Median (IQR) NDD: $41,052 (28,651-67,503) DD: $43,524 (27,937-65,007)	Index hospitalization; Median LOS in days (IQR) NDD: 4 (2-4) DD: 3 (3-5)

- **Table 4** presents key findings from studies reporting both cost and resource use outcomes
- Patel et al. (2021) reported total, direct, and indirect costs of pediatric prescription opioid poisonings as $230.8 million, $21.1 million, and $209.7 million, respectively
- White et al. (2020) reported significant work loss associated with prescription opioid use disorder (OUD), with indirect mean cost estimates of US$8,193 per employee (OUD) versus US$5,438 per employee (no OUD) (p<0.001)

Conclusions

- The evidence indicates that the prescription opioid abuse still contributes to significant economic and HCRU burden in the US
- This calls for more effective measures in controlling the epidemic. Further, there were lack of studies investigating the indirect costs of prescription opioid abuse which warrants further research

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Abbreviations: AE: Adverse event, DD: Prior dependent who remain dependent, E-codes: External cause of injury codes, ED: Emergency department, HCRU: Health care resource utilization, LOS: Length of stay, NA: Not applicable, NDD: Prior nondependent who become dependent, NDND: Prior nondependent who remain nondependent, NR: Not reported, OUD: Opioid use disorder, PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses, SD: Standard deviation, THA: Total hip arthroplasty, TI/AB: Title/Abstract, TKA: Total knee arthroplasty, US: United States

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