

The Role of Community Medicine in Addressing the Opioid Epidemic: A Review of Secondary Health Data and Intervention Gaps.

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ABSTRACT

This is an important issue, especially when considering the aspect of health, with rising mortality rates and issues concerning the regulations. The purpose and objective of this study were to evaluate the relationship that exists between the prescription of opioids and the mortality rates of individuals who have undergone an overdose, using statistics, and to identify the gaps in intervention using the community medicine approach. This study was based on the retrospective analytical study, using the statistics collected from the Centers for Disease Control and Prevention on the mortality rates and the prescription rate of opioids from 2019 to 2023. The results indicated an increase in deaths due to opioids from 21.6 to 33.1 per 100,000 people, while a decrease in the number of prescriptions was noted from 46.7 to 35.8 per 100 people. The correlation between the two variables was noted to be decreasing, which indicated an increase in the use of illicit drugs. The range of IGI varied from 0.50 to 1.11, which indicated the areas in which intervention was required. The results indicated an increasing gap between healthcare and public health. The study concluded that controlling the prescriptions was not enough, and it was necessary to explore data-based approaches to address the problem

Keywords: Opioid Epidemic; Community Medicine; Overdose Mortality; Opioid Prescribing Rates; Secondary Health Data; Intervention Gap Index (IGI); Public Health Surveillance; Harm Reduction; Epidemiological Analysis; Health Policy

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INTRODUCTION

The opioid epidemic is considered an important public health problem and is characterized by the rise in opioid abuse, dependence, and overdose deaths (Gollust & Haselswerdt, 2021). From the reports published by the World Health Organization, it is clear that the use of opioid use disorders is an important factor in the burden of disease, and the consequences are not only confined to health but also extend to social and economic aspects (Blanco et al., 2020). Although the early days of the opioid epidemic have been related to the abuse of prescription drugs, the current trend is showing an increased rise in the burden of illicit synthetic opioids, making the control and prevention of the epidemic more challenging (Katzman et al., 2020). However, the need to take a general perspective is important to understand the problem.

Community medicine has an important role to play in the control of the opioid epidemic crisis, considering the focus on the prevention, detection, and continuity of care within communities (Wilson, 2020). Unlike clinical medicine, the focus of community medicine is the importance of primary

healthcare systems in the control of issues concerning the use of opioids, among other consequences (Hedegaard et al., 2021). Despite the developments in the formulation of policy and intervention strategies concerning the control of opioid prescription, the death rates due to opioids are on the increase in different regions, indicating that the developments are not in the current trend of the opioid epidemic (Maclean et al., 2020).

The main goal and objective of this research study are to assess the correlation between opioid prescriptions and deaths due to overdose, and for this, secondary data from the health sector has been used. This research aims to fill a time gap, a regional gap, and an intervention gap in the community, and by using outcome variables and exposure variables, a more detailed understanding of how healthcare interventions influence community outcomes can be obtained.

In terms of the methodological approach, the study is based on a secondary data-driven approach, using data collected by the Centers for Disease Control and Prevention. The study uses the collected mortality rates, along with the

collected data on the rates of opioid prescriptions, to provide an analysis. The method also provides an opportunity to standardize, use time series, and use regional analysis to provide an understanding of discrepancies in the prescribing and mortality rates, thus providing an evaluation of the intervention using a structured approach to community medicine.

The originality and novelty of the research are based on the creation and application of the Intervention Gap Index (IGI), an important tool in the evaluation of disparities in opioid-related death and prescription rate. Unlike most other studies, this research focuses on the application of the gaps in the system by using both the results and the rate. The scientific value of the research is two-fold, as it provides an idea regarding the changing dynamics and is helpful in creating strategies and ideas for the creation of community-based strategies.

2. Literature Review

2.1 Introduction to the Literature Review

The opioid epidemic, therefore, has evolved into a persistent and complex problem, and its management has been affected by changing trends in opioid use and socio-economic determinants (Casillas et al., 2024). The evidence provided by the World Health Organization, regarding the prevalence of opioid use disorders, indicates that they result in a large burden of diseases, not only affecting individuals but also those around them and, ultimately, the healthcare system itself. Therefore, community medicine is a perspective that focuses on prevention and continuity (Ju et al., 2022). This section, therefore, critically evaluates existing research to assess its contribution, through secondary health statistics, in the management of the opioid epidemic, and its limitations.

2.2 Global Trends in the Opioid Epidemic

The opioid epidemic has not evolved linearly, and its course has been marked by different stages, depending on pharmaceutical practices and illicit drug use patterns (Krawczyk et al., 2022). The initial rise has been related to prescription opioids, and then a shift to heroin use, and most recently, a dramatic rise in synthetic opioids such as fentanyl. Information synthesized from surveillance systems indicates that, although the opioid epidemic remains a public health problem in North America, new trends are also seen in Asia and Europe (McCarty et al., 2021).

Centers for Disease Control and Prevention reports indicate an alarming rise in overdose deaths involving synthetic drugs, thus illustrating the dynamic nature of the problem. However, the problem is not consistent across all groups (Wood & Elliott, 2020). For instance, the rate of abuse and death is consistently higher among individuals with economic, healthcare, and co-occurring mental health issues. The disparities indicate the need to move beyond the medical setting and consider the role of the wider community in the problem (Militello et al., 2020).

2.3 Role of Community Medicine in Opioid Prevention and Control

In the case of the opioid epidemic, the Community Medicine perspective attempts to contextualize the problem

instead of looking only at the individual. The literature is now recognizing the importance of strategies that are implemented through the interface with the community, and this is evident through the use of harm reduction, primary care, and education strategies (Ahmad et al., 2025).

Needle exchanges and safe injection facilities are now being implemented to reduce the health consequences, while the use of Medication-Assisted Treatment (MAT) with Methadone and Buprenorphine is being utilized to treat the physiological aspects of addiction (Allen et al., 2021). However, the importance of education and outreach strategies cannot be overstated, as the literature is now indicating that the implementation of these strategies within the interface with the community is now being recognized as an important factor in the accessibility and recovery process (Mattson, 2021).

2.4 Effectiveness of Community-Based Interventions

From the empirical evaluation of the programs, the following is noted: the impact is significant when more than one strategy is adopted (Slavova et al., 2020). The harm reduction programs have shown significant effects in the reduction of deaths caused by overdoses and blood-borne diseases. The MAT programs have shown significant associations with the reduction of the rate of relapse among addicts (Arteaga & Barone, 2021).

It is also noted that the effect is not consistent, and this is attributed to the implementation of the programs and the availability of trained personnel and the socio-cultural acceptability of the programs. The programs that have shown consistent effects are the ones that have adopted more than one approach, indicating the need to consider the biological and behavioral aspects (Ciccarone, 2021). This is where the need for flexible models is emphasized.

2.5 Secondary Health Data in Opioid Research

With the help of secondary data, the extent and nature of the opioid epidemic have come into focus. The availability of large quantities of data, collected from various sources, such as hospitals, deaths, and national surveillance, has helped to make the task easier, as the trends and patterns over time have been identified along with the target populations (Jones et al., 2020).

Not only has the analysis been done, but the predictions and mapping have also been made possible, and this would be helpful in the planning and allocation of resources in the community health setting (Jalali et al., 2020). However, some limitations have been found, especially when the data is lacking or the data is inconsistent, and this has been the major problem with the secondary data.

3. Methodology

3.1 Study Design

The research study followed a secondary data-based analytical research design, whose purpose is to evaluate and examine the relationship that exists between opioid prescriptions and deaths resulting from overdoses. Unlike any other research study, this one did not seek to rely on collecting new data, choosing to use existing studies to draw on and derive information regarding the trends and patterns that are evident with the use and abuse of opioids. This research design is best for analyzing the differences that

exist regarding opioid prescriptions and deaths resulting from overdoses, and this is best applicable to community medicine studies, especially because of the need to examine the performance of healthcare systems.

3.2 Data Sources

This analysis was based on two different datasets that were used in a complementary manner. These datasets were collected from the Centers for Disease Control and Prevention. One of the datasets included detailed information on the number of deaths due to overdoses involving opioids, using the National Vital Statistics System. The second dataset included the rates of dispensing opioids, measured on the basis of the number of prescriptions per 100 individuals. The use of both these datasets was helpful in conducting an analysis in an unbiased manner.

3.3 Study Variables

The variables were grouped into outcome variables and explanatory variables, hence allowing for clear analytical uses. The main outcome variable in this study was the rate of opioid-related deaths from overdose, which measured the burden. The main explanatory variable in this study was the rate of opioid prescriptions, which measured exposure and practice. The other variable in this study was year, which measured the trend, and location, which measured differences in states. The derived variable was also used to obtain more insights into the trend. Percentage change and relative differences were calculated.

Prescribing Rate (Exposure Variable)

$$\text{Prescribing Rate} = \frac{N}{P} \times 100$$

(1)

Where

N: Number of opioid prescriptions

P: Population

3.4 Data Processing and Management

In preparing the data, various processes were carried out to ensure consistency and comparability of data between two data sets. First, there was an identification and resolution of data that was suppressed or missing, which would result in bias during analysis. Additionally, data was prepared to ensure consistency in terms of data collection periods. The geographic data was prepared to ensure consistency between two data sets, making it easier to compare. In some cases, data was collected at different levels; therefore, monthly data was converted into annual data to ensure consistency. These processes were crucial in preparing a clean data set.

3.5 Analytical Approach

In this regard, the analytical process was undertaken in a sequential manner. First, the trend analysis was undertaken

to understand the nature of the epidemic with regard to the rise and fall of opioid-related mortality and prescription rates. After this, the comparative regional analysis was undertaken to understand the nature of geographic disparities with regard to the prescription and mortality rates. Finally, the structured gap identification framework was undertaken to interpret the discrepancies with regard to the prescription and mortality rates. For example, regions with high prescription rates and high mortality rates were interpreted to have potential regulatory or preventive gaps, while regions with low prescription rates and high mortality rates were interpreted to have potential issues with regard to illicit use of drugs.

Correlation Analysis (Relationship Between Variables)

$$r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{\sum(X-\bar{X})^2\sum(Y-\bar{Y})^2}} \quad (3)$$

Where

X: Prescribing rate

Y: Mortality rate

\bar{X}, \bar{Y} : Mean values

Intervention Gap Index

$$IGI = \frac{M}{PR} \quad (4)$$

Where

IGI: Intervention Gap Index

M: Mortality rate

PR: Prescribing rate

3.6 Ethical Considerations

The study utilized available secondary public data sets, which are anonymous and don't require any use of personal or sensitive information. Thus, the study does not require any ethical clearance as it follows the guidelines of transparency and responsible use of publicly available information.

4.7 Methodological Strengths and Limitations

The major advantages are the availability of a large data set, which may improve the reliability and accuracy of the results obtained. The addition of the outcome variables and exposure variables may provide an extended scope of analysis compared to the utilization of a data set alone. Finally, the open access may improve the reproducibility of the results obtained. The major disadvantages are as follows: The lack of individual data, including socioeconomic status and comorbid health conditions, may reduce the scope of analysis in the causality of the data. The availability and efficacy of CIs are not directly quantifiable but must be indirectly deduced through the utilization of the data set. Additionally, there is the potential for a time delay, which may reduce the accuracy of the results obtained in terms of time.

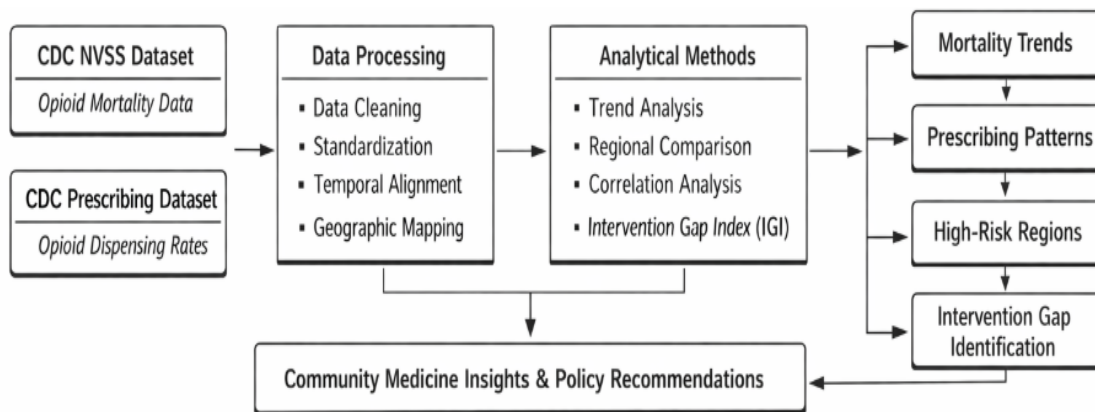


Figure 1. Integrated Methodological Framework for Opioid Mortality and Prescribing Data Analysis

As depicted in Figure 1, an illustration of the process of the integration of secondary data, which is structured, as indicated in the information obtained from the Centers for Disease Control and Prevention, which include statistics on death rates and prescriptions, among others, is a step-by-step process involving data cleaning, data standardization, data analysis methodologies, which include trend analysis, regional analysis, correlation analysis, among others.

Algorithm 1: Intervention Gap Analysis Using Mortality and Prescribing Data

Input

- $M[i]$: Opioid mortality rate for region i
- $PR[i]$: Opioid prescribing rate for region i
- n : Total number of regions
- Threshold values for classification: T_{low}, T_{high} (IGI thresholds)

Output

- $IGI[i]$: Intervention Gap Index for each region
- Risk Category for each region (Low / Medium / High)
- Gap Interpretation for each region

Algorithm 1: Intervention Gap Analysis

Input: $M[i], PR[i], n, T_{low}, T_{high}$

Output: $IGI[i], Risk_Category[i], Interpretation[i]$

```

1: BEGIN
2:   FOR i = 1 TO n DO
3:     IF PR[i] ≠ 0 THEN
4:       IGI[i] ← M[i] / PR[i]
5:     ELSE
6:       IGI[i] ← 0
7:     END IF
8:     IF IGI[i] < T_low THEN
9:       Risk_Category[i] ← "Low"
10:      Interpretation[i] ← "Effective healthcare response"
11:    ELSE IF IGI[i] ≥ T_low AND IGI[i] ≤ T_high THEN
12:      Risk_Category[i] ← "Medium"
13:      Interpretation[i] ← "Moderate intervention gap"
14:    ELSE
15:      Risk_Category[i] ← "High"
16:      Interpretation[i] ← "Significant intervention gap or illicit opioid issue"
17:    END IF
18:  END FOR
  
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19: END

4. Results

4.1 Trends in Opioid-Related Mortality

On the other hand, analysis of the mortality statistics collected from the Centers for Disease Control and Prevention revealed an increase in the number of deaths due to opioid overdose within a particular period. It was evident that the rate of increase was higher in recent years, suggesting an increase in the potency of synthetic opioids. Moreover, it was evident that there was an increase in the percentage when comparing the data collected over various years, suggesting that control measures have failed to keep the situation under control.

4.2 Trends in Opioid Prescribing Rates

It was seen in the data set for prescribing that the number of prescriptions per 100 people was gradually decreasing over time. It is because more regulations have been added, and guidelines have been followed more effectively within healthcare systems. It was seen that this decrease in the number of prescriptions was not seen uniformly throughout the United States, with some states having high prescription rates.

Table 1. Year-wise Trends in Opioid Mortality and Prescribing Rates

Year	Mortality Rate (per 100,000)	Prescribing Rate (per 100 persons)	% Change in Mortality	% Change in Prescribing
2019	21.6	46.7	—	—
2020	28.3	43.3	+31.0%	-7.3%
2021	32.4	40.2	+14.5%	-7.2%
2022	32.6	37.5	+0.6%	-6.7%
2023	33.1	35.8	+1.5%	-4.5%

This Table 1 shows where the number of deaths due to the use of this drug has increased, with the highest number of deaths between 2019 and 2021. There is a steady decline in the number of prescriptions of this drug. This shows a

positive trend in controlling the use of this drug. There is an increase in the number of deaths due to the use of this drug illegally. This implies a lacuna in the existing community interventions of this drug.

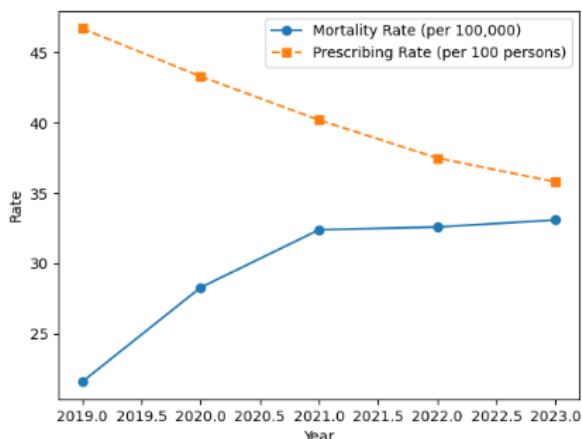


Figure 2. Temporal Trends in Opioid Mortality and Prescribing Rates (2019–2023)

Figure 2 below illustrates the different trend lines for mortality and prescribing rates concerning opioids. The trend lines for mortality rates are increasing, while those for prescribing rates are declining. The different trend lines for mortality and prescribing rates indicate that there is a trend towards non-prescribed use and a gap in the measures that are already in place.

4.3 Regional Variations in Mortality and Prescribing

The findings obtained from comparative regional analysis have shown significant differences among states with respect to mortality rates and prescribing rates. Regions with high prescribing rates and high mortality rates, and regions with low prescribing rates and high mortality rates, are identified. These findings have indicated that there are regional factors for the opioid epidemic, such as accessibility, socioeconomic factors, and availability of illicit drugs.

4.4 Relationship Between Prescribing Rates and Mortality

The findings obtained from comparative regional analysis have shown significant differences among states with respect to mortality rates and prescribing rates. Regions with high prescribing rates and high mortality rates, and regions with low prescribing rates and high mortality rates, are identified. These findings have indicated that there are regional factors for the opioid epidemic, such as accessibility, socioeconomic factors, and availability of illicit drugs.

4.5 Identification of High-Risk Regions

Through this integration of mortality and prescribing data, several high-risk regions have been identified. These regions have been identified based on either high mortality rates accompanied by low prescribing levels or high levels in both mortality and prescribing data. These high levels in mortality and prescribing data point to systemic failures, such as inadequate access to treatment services. The identification of high-risk regions is a basis for action.

4.6 Intervention Gap Analysis

The application of the Intervention Gap Index (IGI) revealed distinct categories of gaps across regions. Areas with high IGI values indicated disproportionately high mortality relative to prescribing rates, suggesting failures in harm reduction, surveillance, or control of illicit opioid supply. Conversely, regions with lower IGI values demonstrated better alignment between prescribing practices and health outcomes, reflecting more effective intervention systems. This analysis highlights that gaps are not solely related to prescribing behavior but also involve broader community medicine and public health infrastructure.

Table 2. Regional Comparison of Mortality, Prescribing Rates, and Intervention Gap Index (IGI)

Region/State	Mortality Rate (per 100,000)	Prescribing Rate (per 100 persons)	IGI (M/PR)	Risk Category	Interpretation
State A	35.2	38.5	0.91	High	Regulatory and preventive gaps
State B	28.7	42.3	0.68	Medium	Moderate intervention gaps
State C	18.4	36.9	0.50	Low	Effective healthcare response
State D	33.5	30.2	1.11	High	Illicit opioid use and surveillance gaps
State E	22.6	34.8	0.65	Medium	Partial system effectiveness

As can be seen in Table 2, there are disparities in the rates of opioid-related deaths in the country compared to the rates of opioid prescriptions in the regions. As the IGI increases, it indicates the region has high rates of deaths compared to the rates of opioid prescriptions, which is an indicator of the lack of effective interventions, surveillance, or control of illicit opioid use in the region. The lower the IGI, the better the correlation in healthcare practice and outcome in the region.

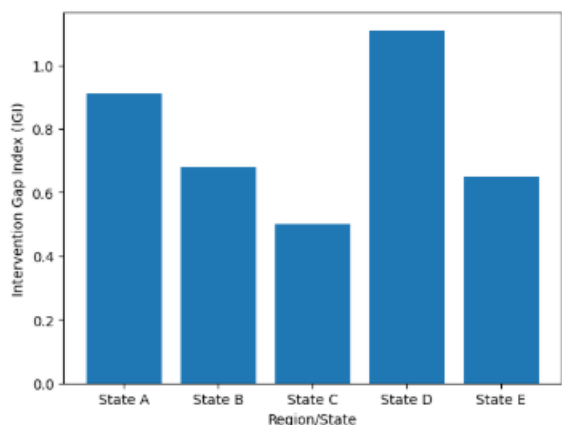


Figure 3. Regional Variation in Intervention Gap Index (IGI)

The figure 3 shows the Intervention Gap Index values for the regions, and the differences and disparities are clearly visible in the results related to the opioid use. The high values of the Intervention Gap Index show that the mortality rate is still high compared to the rate of prescribing, while the low values show the better response to the healthcare and the correlation between the prescribing and the results.

6. Discussion

The results show the evidence of the diverging trend in the rate of declining prescriptions and the rising rate of opioid-related deaths, as per the data provided by the Centers for Disease Control and Prevention. The differences in the regions indicate the success rate of the interventions, which are not consistent, indicating the gaps in the regions. The Intervention Gap Index (IGI) can be applied to show the differences, and the problem must be addressed on the wider community scale instead of the prescriptions.

7. Conclusion

This study highlights the fact that controlling prescriptions alone is not enough to control the opioid epidemic, as the gap between practice and results indicates the rising use of illicit opioids, as well as the weaknesses in the interventions. The IGI model has been effective in identifying areas that are more prone to the problem, which would be very beneficial in enhancing community medicine.

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