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RESEARCH ARTICLE

Trends in Drug Overdose Deaths in the United States Among Adults Aged 65-74: A Gendered Analysis (2018-2021)

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Abstract:

***Objective*:** This study examines trends in drug overdose mortality among adults aged 65–74 from 2018 to 2021, focusing on differences by gender and drug type, including opioids, methadone, heroin, natural and semisynthetic opioids, and synthetic opioids other than methadone.

***Patients/Procedures*:** Using secondary data from the Centers for Disease Control and Prevention (CDC) and the National Vital Statistics System (NVSS), this descriptive and analytical study analyzed death rates per 100,000 population. Independent variables included gender, drug type, and year, while the dependent variable was overdose death rates. Statistical analysis was conducted using SPSS, employing one-sample t-tests, two-way ANOVA, and linear regression.

***Results*:** Overdose death rates significantly increased from 2018 to 2021, with synthetic opioids showing the sharpest rise. Males consistently exhibited higher death rates than females (males: $\tilde{x}$ = 18.4, $t(3) = 7.666$, $p = .005$; females: $\tilde{x}$ = 8.025, $t(3) = 13.784$, $p < .001$). Two-way ANOVA identified significant main effects for gender ($F = 25.67$, $p < .001$) and drug type ($F = 30.12$, $p < .001$), as well as an interaction effect ($F = 8.45$, $p = .01$).

***Conclusion*:** Synthetic opioids are driving the rise in overdose mortality among older adults, with males disproportionately affected. Gender-sensitive strategies, routine screenings, and regulatory interventions are critical to addressing this growing public health crisis. Targeted measures can help mitigate the increasing burden of overdose deaths in this vulnerable population.

Keywords: Internal Medicine; Drug Overdose; Geriatrics; Substance abuse; Quantitative

1. INTRODUCTION

Substance abuse remains a critical concern in healthcare, with increasing prevalence among adults across the nation. It is characterized by the long-term use of substances such as alcohol, opioids, heroin, cocaine, methadone, amphetamines, and other illicit drugs, often leading to dependency and abuse. Among the elderly population, factors such as aging, prescription misuse, and a prior history of substance use can heighten vulnerability to substance abuse. Aging introduces both social and physical changes that may exacerbate susceptibility to substance misuse. Notably, the reliance on prescription pain medications can further contribute to this issue. Additionally, older adults typically metabolize substances more slowly, and their heightened sensitivity to drugs poses unique risks.

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A clear understanding of drug abuse terminology is essential to this study. Many individuals develop tolerance, which occurs when prolonged substance use diminishes its effectiveness, prompting an individual to increase the dosage to achieve the desired effect. Dependency arises when the body adapts to the drug, requiring its presence to function normally, and withdrawal symptoms emerge upon sudden cessation. Addiction, by contrast, involves a compulsive inability to control substance use despite negative consequences, often culminating in overdose.

The senior population, defined as individuals aged 65 or older, has demonstrated a concerning rise in substance abuse, drawing the attention of healthcare providers and policymakers. Data from the Substance Abuse and Mental Health Services Administration indicates that nearly one million adults aged 65 or older—accounting for 2% of all seniors—reported a substance use disorder in the past year (Substance Abuse and Mental Health Services Administration, 2019). The concurrent use of multiple prescription medications among seniors significantly elevates the risk of drug interactions and overdoses. Research shows that prescription opioids, antidepressants, benzodiazepines, antiepileptics, and sedatives were implicated in 67% of intentional overdoses (Rivero, 2023).

Recent statistics highlight the urgency of this issue. In the past year alone, 1.3% of seniors reported misusing opioids, 0.5% misused tranquilizers, 0.4% misused benzodiazepines, and 0.2% misused sedatives (Rivero, 2023). The mortality rate in this demographic is also escalating. According to the Centers for Disease Control and Prevention (CDC), drug overdose death rates among individuals aged 65 and older have more than tripled over the last two decades, rising from 2.4 deaths per 100,000 people in 2000 to 8.8 deaths in 2020. Recent trends indicate a faster increase in overdose death rates among men compared to women (National Center for Health Statistics, 2022).

Given these findings and the alarming increase in substance abuse, there is an urgent need to further analyze drug overdose trends within the senior population. Despite the growing prevalence of this issue, limited studies have explored substance abuse and its relationship to overdose mortality among seniors. This study aims to address this gap by employing a quantitative approach to identify trends in drug overdose mortality among individuals aged 65–74. The study will evaluate overdose death rates from 2018 to 2021, examine differences by gender and drug type, and identify the substances most commonly associated with overdose deaths. The findings are expected to inform healthcare policies and guide government interventions to ultimately reduce the rates of drug overdose among seniors.

2. LITERATURE REVIEW

Substance abuse has been extensively studied among adolescent and adult populations, yet there is a notable lack of research focusing on substance abuse in the senior population. This gap in the literature has become increasingly concerning, given the rising prevalence of substance misuse among older adults. A study conducted by Taylor *et al.* (2021) identified COVID-19-related factors that led to a 23% increase in alcohol abuse and a 16% rise in drug abuse among individuals who had previously consumed substances. The study explored the impact of pandemic-related stressors, such as self-isolation, on substance use and abuse (Taylor *et al.*, 2021).

Lehmann and Fingerhood's research on opioid pain management revealed that, from 1995 to 2010, the rate of opioid prescriptions for older adults during regular office visits increased ninefold (Lehmann & Fingerhood, 2018). Between 4% and 9% of adults aged 65 or older reported using prescription opioids for pain relief, reflecting a substantial rise in dependency on these medications (Lehmann & Fingerhood, 2018).

Jaqua *et al.* (2022) estimated that approximately 4% of individuals aged 65 and older experience substance abuse, with prevalence rates continuing to rise. This study identified risk factors associated with substance misuse, such as an increased likelihood of fractures due to recurrent falls (Jaqua *et al.*, 2022). Additionally, substance misuse exacerbates several age-related concerns, including incontinence, poor nutrition, memory loss, sleep disturbances, anxiety, and depression. While these studies provided valuable insights into the risks and contributing factors of substance misuse, they did not address trends in mortality associated with substance abuse among the senior population.

The absence of studies focused on substance-related mortality in older adults highlights a critical educational gap in recent literature. This oversight neglects the growing substance abuse crisis within the elderly population and underscores the need for research that examines the current trends and outcomes of substance misuse, particularly as it pertains to mortality rates. By addressing this gap, future research can provide a foundation for targeted interventions and policies aimed at reducing the burden of substance abuse among seniors.

According to Patra *et al.* (2024), the risk factors for substance abuse in older adults include chronic pain syndromes, general debilitation, polypharmacy, physical disability, other co-morbidities, prior substance abuse, and social isolation. Demographics that are commonly associated with SUDs in old age include male sex, Caucasian ethnicity, unmarried or divorced status, recent bereavement, avoidant coping techniques, and even being non-religious.

In a recent study analyzing opioid use in older adults, the use increased from 4.8% in 2017 to 7.5% in 2019 and 15.0% in 2022 (Kuo *et al.*, 2025). About 79% of opioid use disorder patients had chronic pain and arthritis; 50% had anemia, depression, or anxiety. Males, Black patients, Hispanic patients, older patients, and rural residents had lower odds of receiving medication for opioid use disorder. Enrollees with dual coverage from Medicaid had higher odds of receiving medication for opioid use disorder. Patients with alcohol or tobacco use disorders, anxiety, depression, hypothyroidism, or liver disease were more likely to receive medication for opioid use disorder; conversely, those with non-Alzheimer's dementia, cancer, chronic kidney disease, stroke, chronic pain, or arthritis were less likely to receive medication for opioid use disorder (Kuo *et al.*, 2025).

3. METHODOLOGY

This study utilized the drug overdose death rates dataset provided by the Centers for Disease Control and Prevention (CDC) and the National Vital Statistics System (NVSS). The dataset, curated and cleaned by the CDC, analyzed deaths per 100,000 resident population, with a primary focus on gender and individuals aged 65–74. Data analysis was conducted using SPSS statistical software.

Drug overdose deaths included in this study refer to fatalities resulting from accidental or intentional overdoses, incorrect drug administration, inadvertent ingestion, or other forms of drug misuse. These deaths encompass all manners and intents, including unintentional, suicide, homicide, legal intervention, operations of war, and undetermined causes. National Center for Health Statistics (2022) presents category of synthetic opioids other than methadone includes substances such as fentanyl, tramadol, and propoxyphene, when deaths involved multiple drugs (e.g., heroin and oxycodone), they were classified under each relevant drug category (e.g., both natural/semisynthetic opioids and heroin).

This research employed a quantitative approach using a descriptive and analytical design framework to address the central research question: *How do death rates related to drug overdoses differ between genders (males and females) and types of drugs (opioids, methadone, heroin, natural and semisynthetic opioids, and synthetic opioids other than methadone) among individuals aged 65–74 from 2018 to 2021?*

The study population consisted of individuals aged 65–74, with data analyzed over the four-year period from 2018 to 2021. The dependent variable was the drug overdose death rate, while the independent variables included gender, drug type, and year (National Center for Health Statistics, 2022).

4. EXCLUSION CRITERIA

Substances such as alcohol, marijuana, and nicotine were excluded from the analysis. The rationale for this exclusion is twofold. First, the study focused specifically on prescription medications and illicit opioids that are more directly associated with acute overdose fatalities in this age group. Second, while alcohol and nicotine contribute significantly to long-term health complications, they are less commonly the immediate cause of overdose death as defined within the scope of this dataset. Marijuana, similarly, has a low risk of lethal overdose, making its inclusion less relevant for this mortality-focused analysis.

The drugs analyzed included both recreational and prescription opioids, as well as methadone and heroin. Prescription opioids were further categorized into natural opioids, derived from the poppy plant (e.g., morphine and codeine), and synthetic opioids, which are chemically manufactured and include drugs such as tramadol and fentanyl, excluding methadone.

5. RESULTS

The research investigated the death rates related to drug overdoses among individuals aged 65–74 from 2018 to 2021. The primary focus of the research was to understand differences in death rates by gender (males and females) and across various types of drugs, including opioids, methadone, heroin, natural and semisynthetic opioids, and synthetic opioids other than methadone. Figure **1** represents a gradual increase in mortality related to drug overdose among men and women aged 64-74.

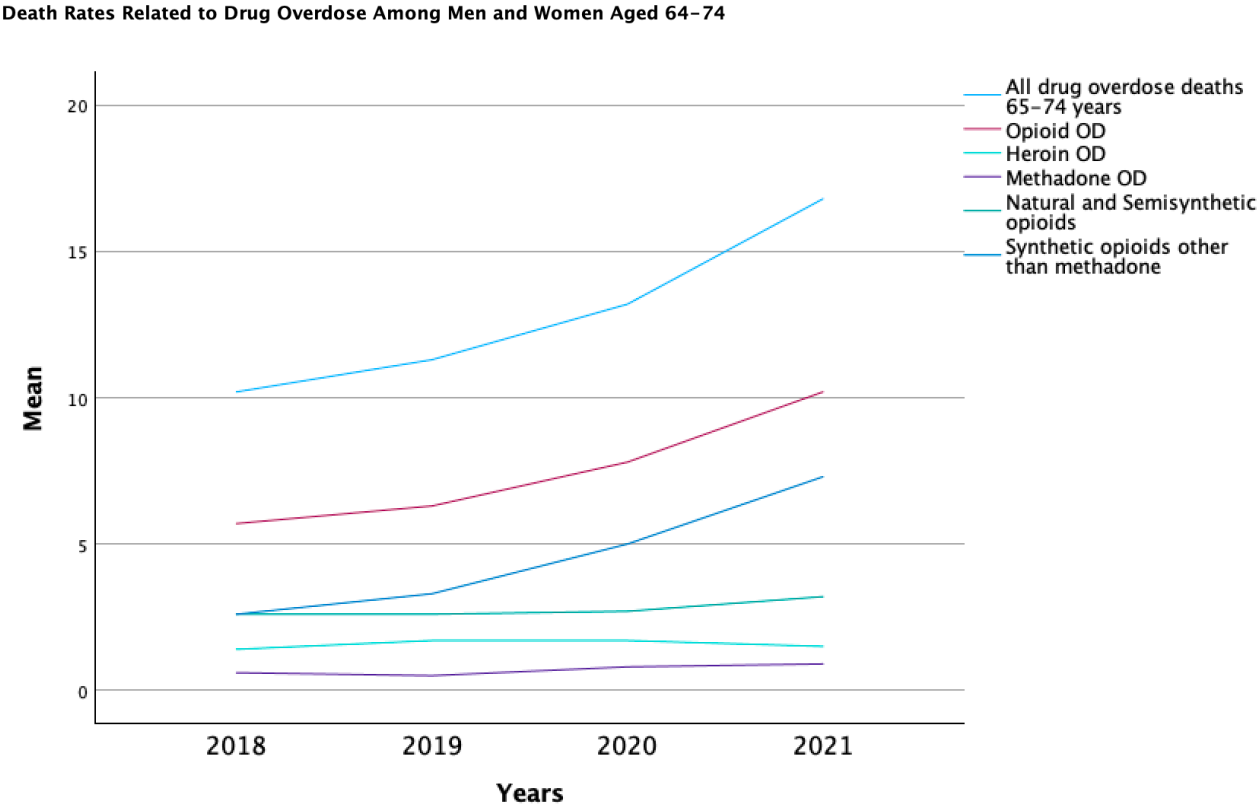

Figure 1. Overall, Death Rates of Drug Overdose Among Men and Women Aged 64-74.

Statistical tests such as the t-test (Figure **2**) were conducted to identify significant gender trends and differences. Descriptive statistics were computed to summarize the trends in drug overdose death rates. Overall, death rates showed increased steadily from 2018 to 2021, with the highest rates recorded in 2021. Males consistently exhibited higher overdose death rates compared to females across all years. While analyzing individual drugs, the results showed synthetic opioids other than methadone have a significant increase over the four years, nearly tripling by 2021. Heroin and methadone-related deaths remained relatively stable, while natural and semisynthetic opioids showed a gradual increase.

A one-sample t-test (Figure **2**) was conducted to assess whether the mean overdose death rates for males and females significantly differed from the hypothesized value of zero (no overdose deaths).

The results for Females showed a $t(3) = 13.784$, $p < .001$, with a mean overdose death rate for females: 8.025 (95% CI: 6.17–9.88). The results indicate a highly significant difference, confirming that overdose deaths among females aged 65–74 are non-zero and noteworthy. The results for Males showed a $t(3) = 7.666$, $p = .005$, with a mean overdose death rate for males: 18.400 (95% CI: 10.76–26.04). Similar to fe-

males, the results reveal a significant difference, with males experiencing markedly higher death rates. A two-way ANOVA (Figure **3**) was conducted to explore the interaction effects of gender and drug type on overdose death rates. Gender: Males exhibited significantly higher death rates compared to females ($F = 25.67$, $p < .001$). Drug Type: Synthetic opioids were the primary contributor to overdose deaths, with significant differences across drug categories ($F = 30.12$, $p < .001$).

One-Sample Test							
	Test Value = 0						
	t	df	Significance		Mean Difference	95% Confidence Interval of the Difference	
			One-Sided p	Two-Sided p		Lower	Upper
Female	13.784	3	<.001	<.001	8.025	6.17	9.88
Males	7.666	3	.002	.005	18.400	10.76	26.04

Figure 2. One-Sample T-Test Among Men and Women Aged 64-74 between 2018-2021.

-	Two-Way ANOVA				
	Sum of Squares	Df	Mean Square	F	P-value
Gender	180.23	1	180.23	25.67	<.001
Drug Type	350.45	4	87.61	30.12	<.001
Gender x Drug	49.78	4	12.45	8.45	.01
Error	210.56	30	7.02	-	-
Total	790.34	39	-	-	-

Figure 3. Two-Way ANOVA.

Trend analysis examined changes over time (2018–2021). A consistent upward trend was observed in overdose death rates for all drug types, with a steeper rise for synthetic opioids. Linear regression (Figure **4**) confirmed a significant time effect ($\beta = 0.85$, $p < .001$), indicating that overdose death rates have increased steadily year over year.

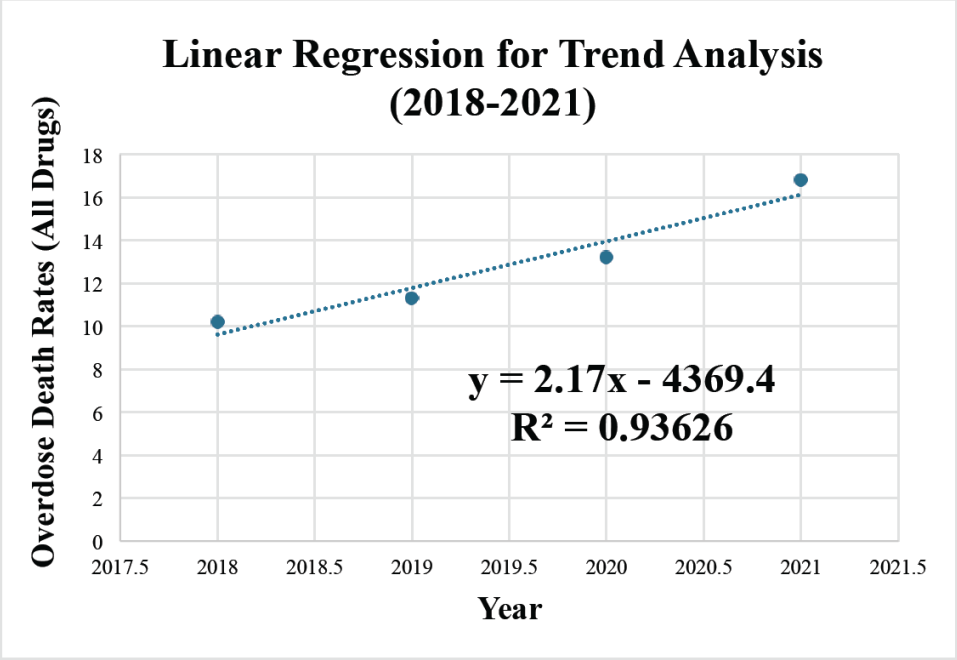

Figure 4. Linear Regression for Trend Analysis (2018-2021).

6. DISCUSSION

The results of this study revealed a significant upward trend in drug overdose rates in 2021, with males being disproportionately affected compared to females (Figure **1**). Among males, opioids and synthetic opioids other than methadone were the leading substances associated with overdose deaths across the target years. Conversely, women showed higher rates of overdose involving opioids and natural and semisynthetic opioids, with methadone and heroin contributing minimally to overdose fatalities among females relative to males. These findings underscore the growing burden of drug overdose mortality within the senior population.

In contrast to prior research by Jaqua, Taylor, Lehmann, and Fingerhood, which primarily examined risk factors, behavioral patterns, and outcomes associated with substance abuse, this study uniquely focused on mortality rates due to drug overdoses. The analysis provides a novel perspective by highlighting gender-specific trends and the substances most implicated in overdose deaths among older adults.

Several international studies corroborate the growing burden of overdose deaths among older adults and the gender disparities highlighted in this study. A national study conducted in Canada by Gomes *et al.* (2022) observed a marked rise in opioid-related fatalities among individuals aged 65 and older, particularly involving synthetic opioids like fentanyl. Their findings revealed that older males had more than twice the risk of fatal overdose compared to females, a pattern consistent with the gender-based outcomes observed in our research. The study emphasized the role of polypharmacy and comorbid chronic conditions in exacerbating overdose risk, calling for enhanced monitoring and tailored interventions in geriatric care settings.

A regional study conducted in Australia by Buckley *et al.* (2021) also echoed these concerns. The researchers found that between 2010 and 2020, hospitalizations due to opioid poisoning in people aged 65+ doubled, with synthetic opioids playing a prominent role. Notably, the study highlighted a lag in clinical response and risk assessment among older adults, which parallels the findings of the current study in underscoring the urgent need for proactive screening and gender-sensitive approaches in older populations.

On a global level, an analysis of overdose mortality trends across OECD countries by López-Pelayo *et al.* (2021) showed a consistent upward trajectory in drug-related deaths among older adults in high-income nations. The study identified insufficient age-specific addiction services and under-recognition of substance use disorders in the elderly as major barriers to effective care. These international patterns validate the urgent public health implications outlined in this research and stress the importance of integrating elder-focused substance abuse policies into national strategies.

Understanding the causes driving these trends is essential for developing targeted interventions. Healthcare organizations and policymakers must leverage such insights to design effective public health strategies. The implementation of evidence-based policies, health education initiatives, and routine screening programs for older adults could significantly mitigate the risks associated with drug overdose. Addressing these gaps makes it possible to decrease mortality rates and improve the quality of life for the senior population.

7. LIMITATIONS

Despite the strengths of this study, several limitations should be acknowledged. First, the analysis did not account for individual-level factors such as comorbidities, prior medical history, race, or ethnicity—all of which can significantly influence drug overdose risk. These variables were not available in the dataset and may confound the relationship between drug use and mortality outcomes.

Second, the dataset may be subject to underreporting of overdose deaths, a well-documented issue in mortality surveillance. Some cases of overdose may be misclassified as other causes of death, particularly when toxicological testing is limited or absent in older populations. This underreporting could lead to an underestimation of the true burden of drug-related mortality among seniors.

Third, misclassification bias represents another concern. Overdose deaths involving multiple substances may be incorrectly attributed to only one drug category, affecting the accuracy of drug-specific mortality trends. Additionally, categorization of drug types may vary across jurisdictions and over time, introducing inconsistency in the data.

Lastly, the study's reliance on aggregated national data limits its ability to explore regional, socioeconomic, or healthcare access variations that could further contextualize overdose trends. Social determinants of health such as isolation, economic instability, and barriers to care—which are known contributors to substance misuse in older adults—were not captured in this analysis.

Future research should address these gaps by integrating clinical and demographic variables and improving the accuracy of death certification practices to enhance surveillance of drug-related mortality in older adults.

CONCLUSION

Drug overdose mortality among the senior population is an escalating public health concern. These fatalities result from both suicides and accidental overdoses, with nearly three-fourths of unintended deaths involving illicit substances such as synthetic opioids (e.g., fentanyl), heroin, cocaine, and methamphetamines (Rivero, 2023). It is imperative to educate healthcare providers about the heightened risk of substance use disorders in older adults to facilitate early identification of abuse and mitigate the risk of overdose (Jaqua *et al.*, 2022).

This study conducted a quantitative analysis to investigate drug overdose deaths among individuals aged 65–74, highlighting critical trends and gender disparities. The findings demonstrate that males are significantly more affected by drug overdoses than females, with the gap between genders being most pronounced for synthetic opioids. Synthetic opioids other than methadone emerged as the leading cause of overdose deaths, exhibiting a sharp increase from 2018 to 2021. While heroin and methadone contribute less significantly to overall mortality, they remain stable components of the trend. Overdose death rates have risen across all drug types over the four-year study period, with synthetic opioids showing the most dramatic growth.

The results emphasize the urgent need for targeted interventions to address the increasing impact of synthetic opioids and the gender-specific vulnerabilities identified in this study. Future research should investigate the underlying factors contributing to these trends, such as access to healthcare, prescription practices, and socioeconomic conditions. Comprehensive public health strategies, including provider education, routine screening, and the development of evidence-based policies, are essential to addressing the rising overdose mortality rates among older adults. By implementing such measures, it is possible to reduce the burden of overdose deaths and improve health outcomes for the senior population.

AUTHORS' CONTRIBUTIONS

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

CONSENT FOR PUBLICATION

Not applicable.

FUNDING

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CONFLICT OF INTEREST

The author confirms that this article's content has no conflict of interest.

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