Opioid Mortality Disparities in New York State

Jean Jimenez

Abstract

- **Intro:** The opioid crisis has severely affected New York State, especially after the COVID-19 lockdowns which worsened mental health issues. This study focuses on analyzing data from before the pandemic to identify the trends that have led to increased opioid misuse and mortality rates. A key question is whether patients from different counties or with different insurance types in New York experience varying outcomes in opioid-related deaths.
- **Methods:** Data from the New York State Department of Health, covering the years 2010-2018, was utilized. The analysis included mortality rates per 1000, categorization by county type (urban or rural), and insurance type. ANOVA (Analysis of Variance) was employed for statistical examination.
- **Results:** The analysis revealed that patients in the Medicaid group had a higher mortality rate per 1000 compared to other insurance groups, with the largest disparity observed between Medicaid and commercially insured patients. Furthermore, rural counties reported significantly lower mortality rates than urban counties
- **Discussion and Conclusion:** These findings suggest a need for targeted policy interventions, particularly in urban counties and for Medicaid patients, to mitigate the increasing mortality rates associated with opioid use. Understanding these disparities can be instrumental in formulating effective strategies to combat the opioid crisis in New York State.

Overview

- The Opioid crisis is a public health emergency.
- COVID Pandemic lockdowns, social distancing measures, and other effects inadvertently spawned a parallel crisis in mental health and many individuals have turned to opioid medications to cope.
- Street opioids are unreliable when it comes to dosing and have been becoming more lethal
- This has led to an unprecedented increase in mortality rates.
- By analyzing pre-pandemic data, we can find trends regarding what influences these mortality rates.

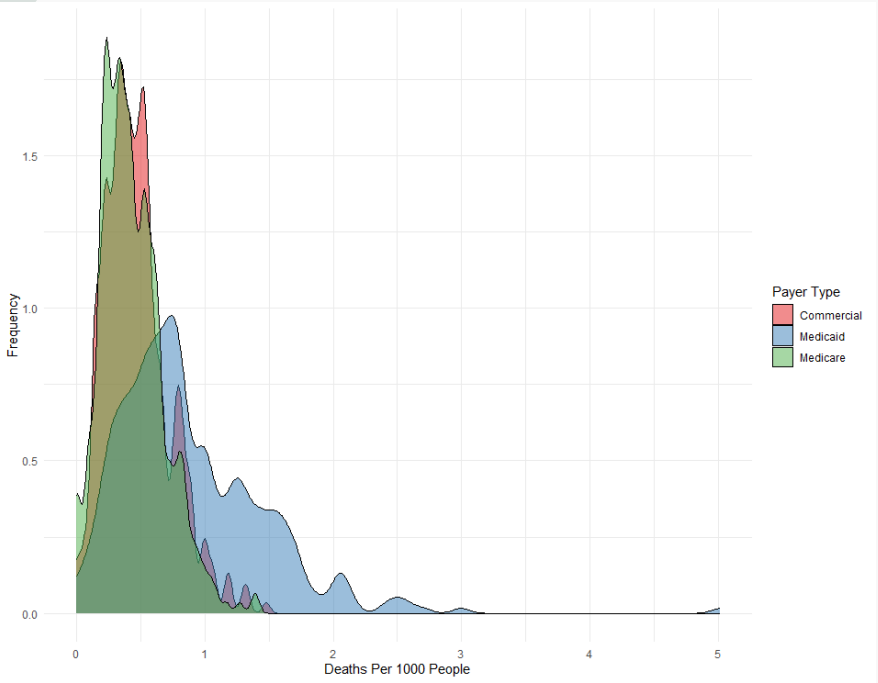
Overview

- Opioid Intro Info
- Data From DATA.NY.GOV using its API:
  - All Payer Opioid-Related Facility Visits in NYS 2010-2018

- Do NY patients with different types of insurance or from different counties experience different outcomes when it comes to Opioid deaths?
  - Dependent Variable:
    - Mortality Rate (# of dead / total # opioid hospital visits) x 1000
  - Independent Variables:
    - Insurance Type (Commercial vs. Medicaid vs. Medicare)
    - County Type (Urban vs. Rural)

EDA By Insurance Type

Fig 01) Density of Mortality per 1000 Across Different Payers



Payer Type	n	mean	sd	min	max	range	se	variance	contrast
Commercial	22912	0.4717	0.2548	0	1.4790	1.4790	0.0017	0.0649	-0.1242
Medicaid	22912	0.8834	0.5690	0	5.0130	5.0130	0.0038	0.3237	0.2875
Medicare	22912	0.4326	0.2430	0	1.4030	1.4030	0.0016	0.0590	-0.1633
Total	**68736**								

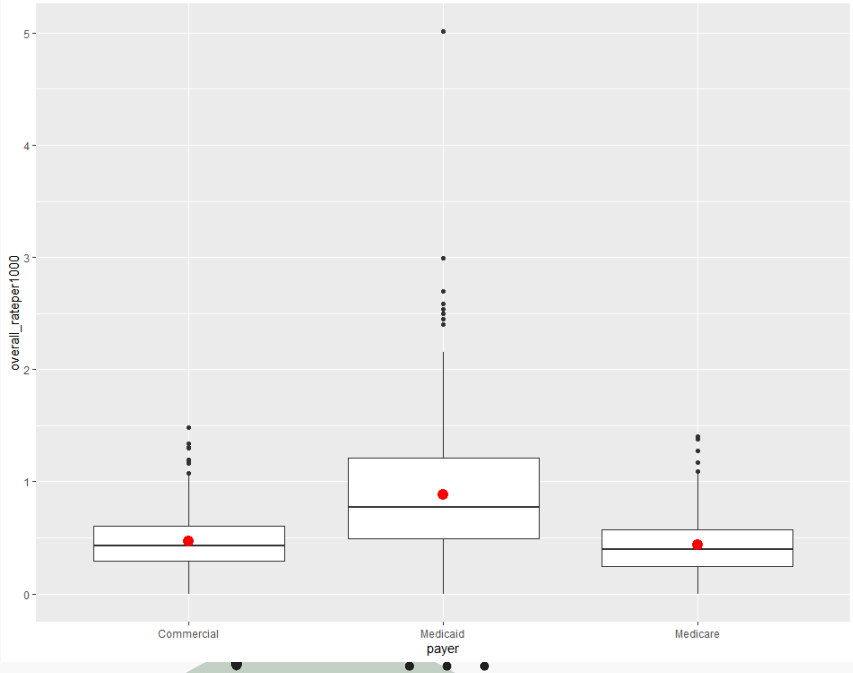
Table 01) Number of Observations and Stats per Payer Type

Stat	Value
Grand Mean	0.5959
Grand Variance	0.1908
Pooled Variance	0.1492

Table 02) Stats per Payer Type Continued

EDA By Insurance Type

Fig 02) Boxplot of Deaths per 1000 Across Different Payers



Payer Type	n	mean	sd	min	max	range	se	variance	contrast
Commercial	22912	0.4717	0.2548	0	1.4790	1.4790	0.0017	0.0649	-0.1242
Medicaid	22912	0.8834	0.5690	0	5.0130	5.0130	0.0038	0.3237	0.2875
Medicare	22912	0.4326	0.2430	0	1.4030	1.4030	0.0016	0.0590	-0.1633
Total	68736								

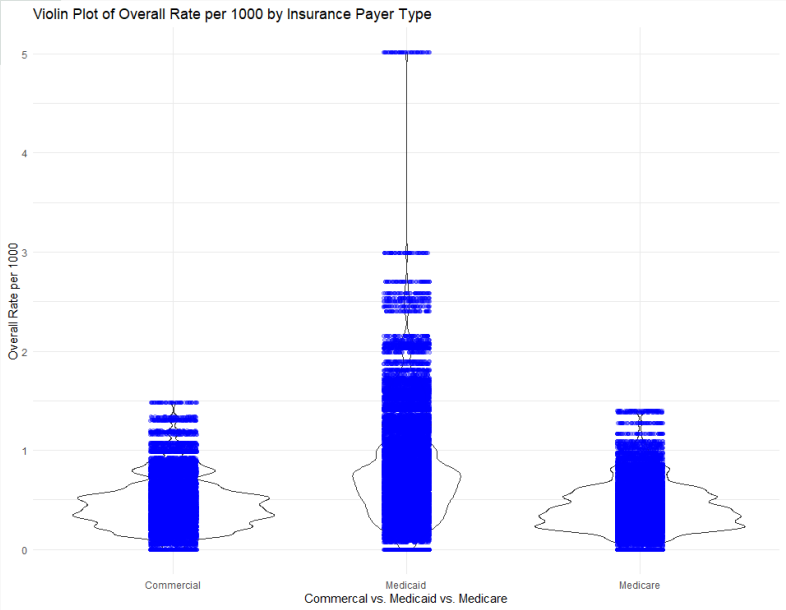
Table 01) Number of Observations and Stats per Payer Type

Stat	Value
Grand Mean	0.5959
Grand Variance	0.1908
Pooled Variance	0.1492

Table 02) Stats per Payer Type Continued

EDA By Insurance Type

Fig 03) Violin Plot of Deaths per 1000 Across Different Payers



Payer Type	n	mean	sd	min	max	range	se	variance	contrast
Commercial	22912	0.4717	0.2548	0	1.4790	1.4790	0.0017	0.0649	-0.1242
Medicaid	22912	0.8834	0.5690	0	5.0130	5.0130	0.0038	0.3237	0.2875
Medicare	22912	0.4326	0.2430	0	1.4030	1.4030	0.0016	0.0590	-0.1633
Total	68736								

Table 01) Number of Observations and Stats per Payer Type

Stat	Value
Grand Mean	0.5959
Grand Variance	0.1908
Pooled Variance	0.1492

Table 02) Stats per Payer Type Continued

Hyp. Testing By Insurance Type

- H_0 = There is no significant difference between the means of opioid death rates when comparing between Commercia, Medicaid, and Medicare insurance.
- H_A = There is a significance difference between the means of opioid death rates when comparing between Commercia, Medicaid, and Medicare insurance.

- I will use ANOVA to test this hypothesis.
  - The data is distributed normally (Bell-curve with mean at ~0.5)
  - The mortality rate of one group is independent of other group
  - NOT equal variance (violates assumption of variance homogeneity)
  - Equal sample size

Hyp. Testing By Insurance Type

	Payer	Residuals
Sum of Squares	2858.283	10256.855
Df	2	68733
RSE	0.3862	

Table 03) ANOVA Results across payers

- 38.62% of variation is not explained by the model
- High F-Value and low p-value (below 0.05) indicate that there is a statistically significant difference between the three groups.
- Therefore, I reject the null hypothesis
  - There is a significance difference in the means of opioid mortality rate per 1000 when comparing between Commercial, Medicaid, and Medicare insurance.

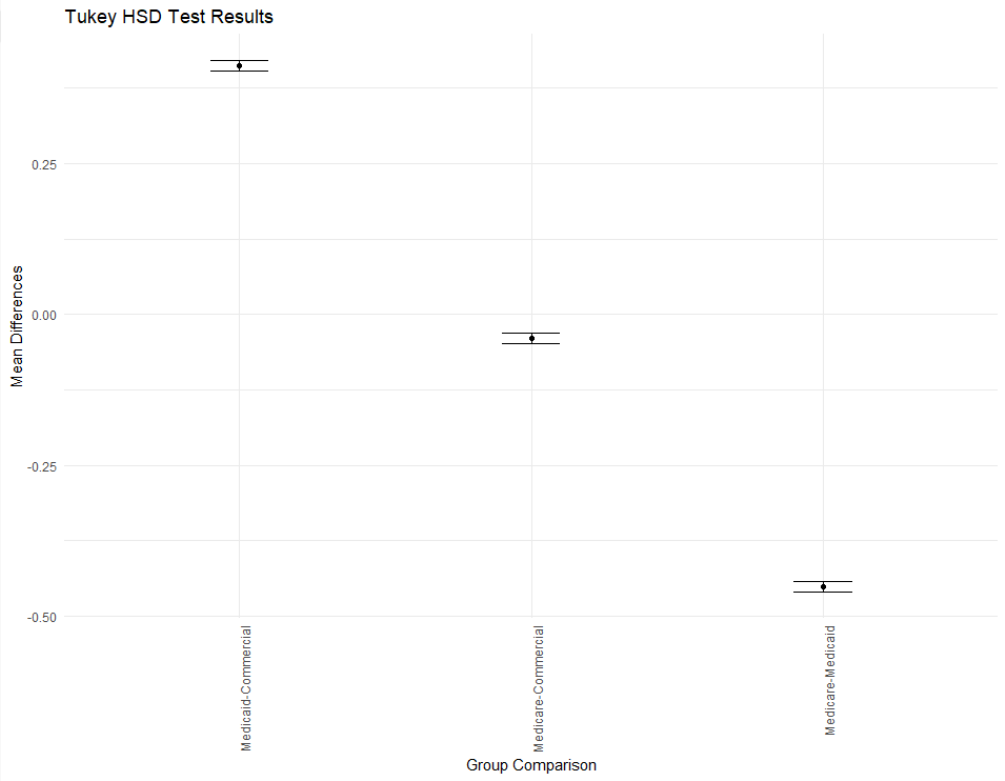
	Df	Sum Sq	Mean Sq	F Value	Pr(>F)
payer	2	2858	1429.1	9577	<2e-16 ***
Residuals	68733	10257	0.1		

Table 04) ANOVA Summary across payers

Hyp. Testing By Insurance Type

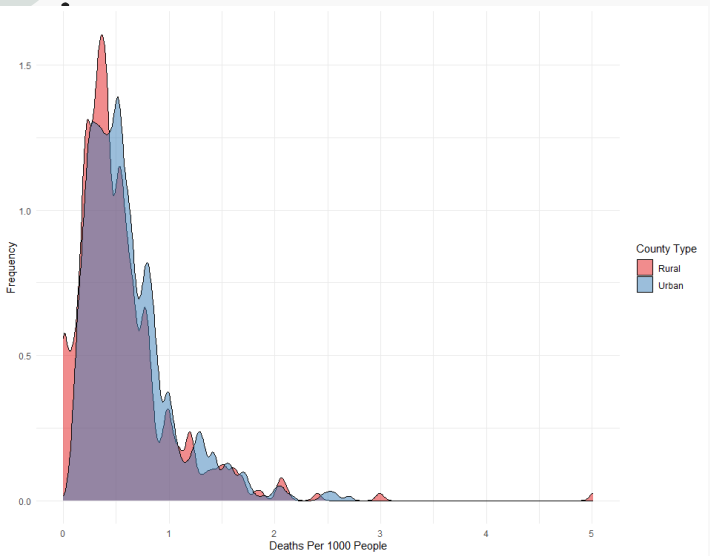
Fig 04) Turkey HSD Results Between Different Payers

- There is a significant difference in the mean mortality rate per 1000 of Opioid patients with Medicaid vs Commercial Insurance
- There is a significant difference in the mean mortality rate per 1000 of Opioid patients with Medicaid vs Medicare Insurance



EDA By County Type

Fig 05) Density of Deaths per 1000 Across Different County Types



Payer Type	n	mean	sd	min	max	range	se	variance	contrast
Rural	25776	0.5545	0.4730	0.0000	5.0130	5.0130	0.0029	0.2237	-0.0331
Urban	42960	0.6207	0.4116	0.0420	2.6980	2.6560	0.0020	0.1694	0.0331
Total	**68736**								

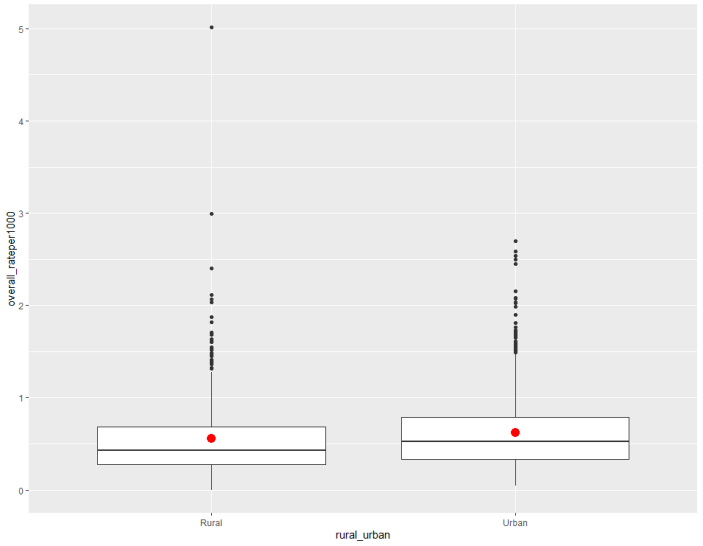
Table 05) Number of Observations and Stats per Payer Type

Stat	Value
Grand Mean	0.5959
Grand Variance	0.1908
Pooled Variance	0.1966

Table 06) Stats per Payer Type Continued

EDA By County Type

Fig 06) Boxplot of Deaths per 1000 Across Different County Types



Payer Type	n	mean	sd	min	max	range	se	variance	contrast
Rural	25776	0.5545	0.4730	0.0000	5.0130	5.0130	0.0029	0.2237	-0.0331
Urban	42960	0.6207	0.4116	0.0420	2.6980	2.6560	0.0020	0.1694	0.0331
Total	68736								

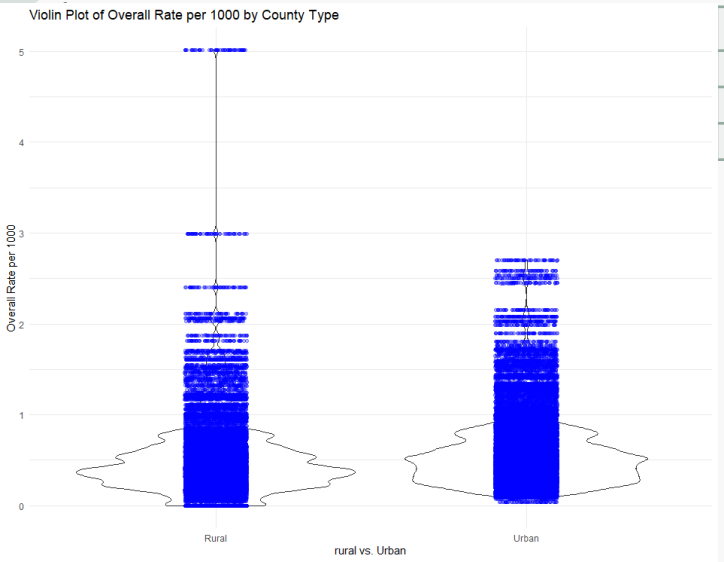
Table 05) Number of Observations and Stats per Payer Type

Stat	Value
Grand Mean	0.5959
Grand Variance	0.1908
Pooled Variance	0.1966

Table 06) Stats per Payer Type Continued

EDA By County Type

Fig 07) Violin of Deaths per 1000 Across Different County Types



Payer Type	n	mean	sd	min	max	range	se	variance	contrast
Rural	25776	0.5545	0.4730	0.0000	5.0130	5.0130	0.0029	0.2237	-0.0331
Urban	42960	0.6207	0.4116	0.0420	2.6980	2.6560	0.0020	0.1694	0.0331
Total	**68736**								

Table 05) Number of Observations and Stats per Payer Type

Stat	Value
Grand Mean	0.5959
Grand Variance	0.1908
Pooled Variance	0.1966

Table 06) Stats per Payer Type Continued

Hyp. Testing By County Type

- H_0 = There is no significant difference between the means of opioid death rates when comparing between rural and urban county.
- H_A = There is a significance difference between the means of opioid death rates when comparing between rural and urban county.

- I will ANOVA to test these hypothesis.
  - The data is distributed normally (Bell-curve with mean at ~0.6)
  - The mortality rate of one group is independent of other group
  - NOT equal variance but closer (violates assumption of variance homogeneity)
  - Equal sample size

Hyp. Testing By County Type

	Rural_urban	Residuals
Sum of Squares	70.598	13044.540
Df	1	68734
RSE	0.4356	

Table 07) ANOVA Results across county type

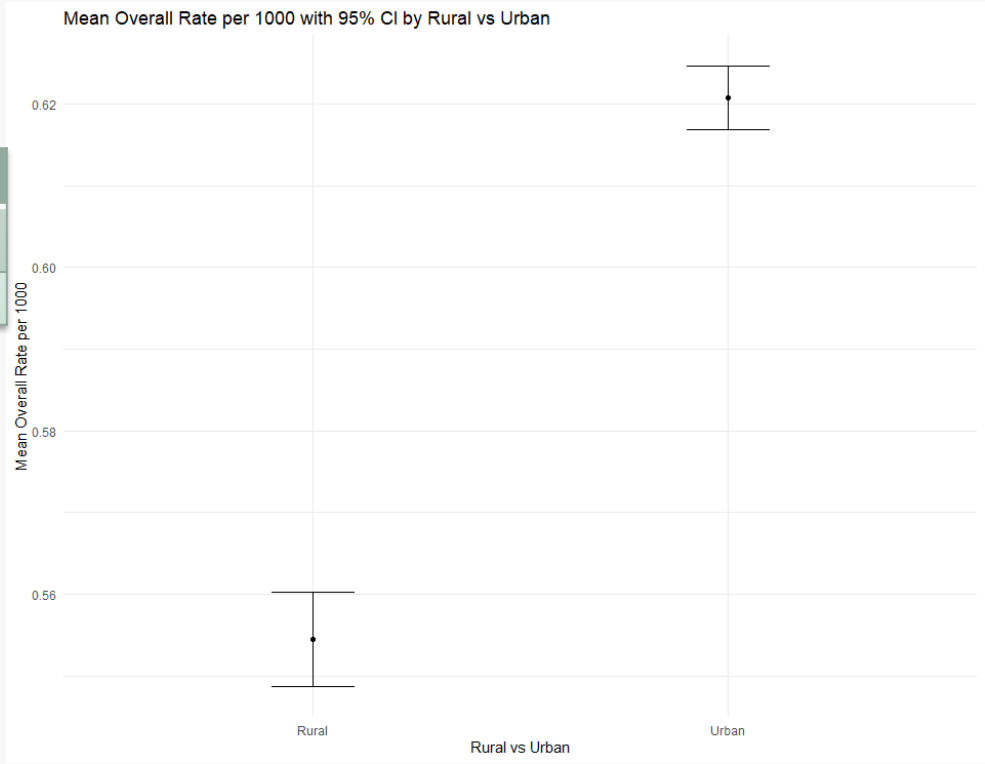
- 43.56% of variation is not explained by the model
- High F-Value and low p-value (below 0.05) indicate that there is a statistically significant difference between the two groups.
- Therefore, I reject the null hypothesis
  - There is a significance difference in the means of opioid mortality rate per 1000 when comparing between Urban and Rural Counties.

	Df	Sum Sq	Mean Sq	F Value	Pr(>F)
Rural_urban	1	71	70.60	9577	<2e-16 ***
Residuals	68734	13045	0.19		

Table 08) ANOVA Summary across county type

Hyp. Testing By County Type

Fig 08) Mean Overall Rate between Rural and Urban with 95% CI



	Mean	se	ci_upper	ci_lower
Rural	0.555	0.00295	0.560	0.549
Urban	0.621	0.00199	0.625	0.617

Table 09) Summary across county type

- There is a significant difference in the mean mortality rate per 1000 of Opioid patients with Urban vs Rural

Conclusion

- There is a significance difference in the means of opioid mortality rater per 100 when comparing between Commercial, Medicaid, and Medicare insurance.
- There is a significant difference between patients with Medicaid and patients with Commercial Insurance. These two groups compared have the most differences.
- There is a significant difference between patients with Medicaid and patients with Medicare Insurance.
- Overall, Medicaid patients suffer higher mortality rates compared to the other payers.
- There is a significant difference between patients in a rural county vs patient in an urban environment. Rural county has a significantly lower mortality rate.
- These results can help guide policies that aim to reduce mortality rates in Urban counties/ for Medicaid patients

Citations

- https://health.ny.gov/press/releases/2023/2023_01-17_opioid_quarterly_report.htm#:~:text=Fentanyl%20has%20contributed%20to%20an,2020%20data%2C%20include%20the%20following
- All Payer Opioid-Related Facility Visits in NYS 2010-2018

Thank you

- Questions/comments?