Firearm Injury Trends in Texas: Regional Disparities and Emerging Challenges

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BACKGROUND

Firearm injuries remain a critical public health challenge in Texas, with significant implications for both individual well-being and healthcare systems. Despite the prominence of gun violence research in national discussions, there is a lack of comprehensive, Texas-specific studies examining the geographic and demographic disparities associated with firearm injuries.

Rural areas, often overshadowed by urban-focused analyses, may experience unique burdens due to limited healthcare access, differing socioeconomic conditions, and varied risk factors. Existing research indicates that firearm injuries disproportionately affect certain populations, yet the underlying social and geographic contributors remain understudied.

Prior estimates highlight the economic and social costs of gunshot wounds, further underscoring the urgency for state-specific data to guide public health strategies[1,2]. This gap in understanding limits the development of targeted interventions and policies to address disparities in firearm-related harm across Texas.

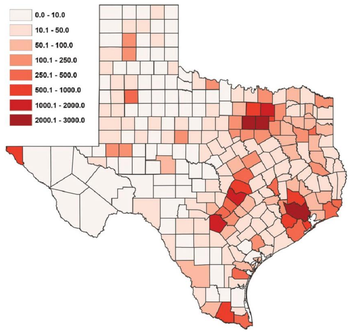

Figure 1. Map of Texas by county highlighting population density[3]

OBJECTIVES

This study aims to characterize the epidemiology of firearm injuries in Texas from 2016 to 2023, with a specific focus on identifying geographic and population trends and disparities in injury prevalence. By analyzing de-identified hospitalization and emergency department data, this research seeks to:

- Examine county-level disparities in firearm injury rates across Texas.
- Highlight the influence of social determinants of health on injury prevalence, including factors such as income, education, and access to healthcare.
- Provide a foundation for future interventions aimed at reducing firearm-related harm and addressing health disparities within the state.

METHODS

This retrospective study analyzes firearm injury data from the Texas Emergency Department Public Use Data File (PUDF) and hospitalization records from the Texas Department of Health and Human Services. The dataset includes firearm-related injuries reported from 2016 to 2023, encompassing inpatient and outpatient records. The 2022 county population data was gathered from US Census data and the county distinction (rural vs. urban) was obtained via the 2024 Index of Texas counties from Texas Department of Housing and Community Affairs[4].

Data included and analyzed encompasses the following:
1. Injury details
2. Patient demographics
3. Social determinants of health

Descriptive statistics were calculated to assess county-level injury rates and geographic disparities. Statistical analyses were performed using Stata to identify trends and potential associations between social determinants of health and injury prevalence. Analysis consisted of using logistic regressions with firearm injury as a binary outcome (>1% or not per 1k as 1, otherwise 0). Independent variables were binary, including education rate (1 when higher than TX average), unemployment rate (1 when higher that TX average) and uninsurance rate (1 when higher than TX average).

RESULTS

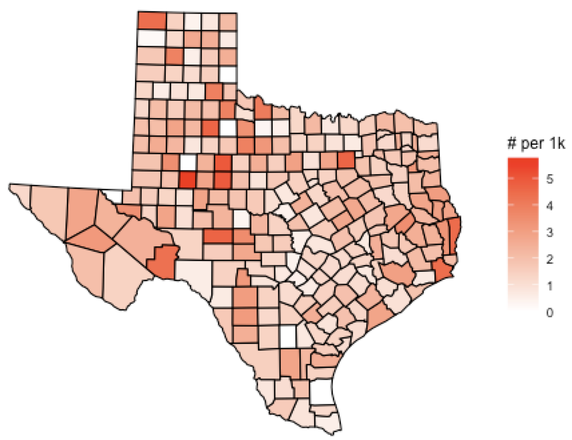

Figure 2. Heat map showing aggregate rate of firearm injuries per 1000 people by county.

TX County	2022 Population	Firearm Injury Rate	County Distinction
Howard	33,672	5.76	Rural
Fisher	3,622	4.97	Rural
Nolan	14,473	4.91	Rural
Schleicher	2,357	4.67	Rural
Dallas	2,600,840	4.65	Urban
Dickens	1,726	4.63	Rural
Newton	12,052	4.48	Rural
Jefferson	250,830	4.44	Urban
Dallam	7,241	4.42	Rural
Terrell	693	4.33	Rural

Table 1. Table showing top ten TX counties with the highest firearm injury rates.

Covariate	p-value	Odds ratio	95% C.I. for OR
High school graduation rate	0.002	0.362069	[0.1903548, 0.6781614]
Unemployment rate	0.115	1.649351	[0.8833822, 3.083566]
Uninsurance rate	0.868	1.054852	[0.5545276, 1.974396]

Table 2. Table showing results of logistic regressions against firearm injury with calculated odds ratio and 95% confidence interval.

CONCLUSIONS

- Preliminary findings challenge the assumption that firearm injuries are primarily an urban issue, revealing high injury rates in several rural Texas counties.
- Rural counties such as Howard (5.76), Fisher (4.97), and Nolan (4.91) counties have the top three highest firearm injury rates per 1000 people.
- These results highlight the need for targeted firearm safety and violence prevention interventions in rural areas across Texas.
- Education rate, when lower than the state average, is shown to be significant when predicting firearm injury rates.
- Of the tested variables, firearm injury regresses on only education rate, making it a significant predictor of firearm injury rate when the education rate is lower than the state average (obtained via 2022 US Census data).
- Insurance and employment status do not appear to be statistically significant predictors of firearm injury rates.
- Further analysis is required to explore the role of social determinants of health in shaping geographic disparities in firearm injury rates.

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