Predictive Analysis of Drug Overdose Deaths

Executive Summary:

The opioid crisis has gripped the United States, leading to an alarming increase in drug overdose deaths. Our analysis aims to identify individuals at higher risk and understand contributing factors using data from the years 2012 to 2018. The report encapsulates our approach, key findings, and offers strategic recommendations to the CDC.

Introduction:

Drug overdose deaths have surged, becoming a significant public health concern. Predictive modeling offers insights into patterns, helping design effective interventions.

Methodology:

Data Collection and Preparation:

We utilized a dataset spanning from 2012 to 2018, consisting of 5,100 records detailing demographics, substances involved, and more. After meticulous cleaning and feature engineering, the data was ready for analysis.

Exploratory Data Analysis (EDA):

Key observations include:

- A rising trend of drug overdose deaths, peaking around 2016-2017.
- Males and the White population were more affected.
- Cities like Hartford, New Haven, and Waterbury reported the highest number of deaths.
- Heroin, Fentanyl, and Cocaine were the most common substances involved.

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Modeling:

Three models were employed: Logistic Regression, Random Forest, and Support Vector Classifier. After hyperparameter tuning,

the Random Forest model emerged as the most promising, highlighting the importance of substances, especially Fentanyl,

and demographic factors.

Findings:

Demographic variables such as Age, Sex, and Race significantly influenced the risk of overdose deaths. Specifically:

- Older individuals, especially in the 40-49 age group, are increasingly at risk.
- Males consistently exhibited higher overdose occurrences.
- The White racial group experienced the highest number of overdoses.

Substances like Heroin, Fentanyl, and Cocaine were predominant in overdose deaths. The presence of Fentanyl was a particularly

strong predictor, underscoring its lethality.

Recommendations:

1. Age-Specific Interventions: Given the increasing risk in the 40-49 age group, tailored interventions targeting this demographic

could be vital. Programs could focus on awareness, early detection, and rehabilitation.

2. Fentanyl Awareness Campaigns: Considering Fentanyl's strong association with overdose deaths, nationwide campaigns highlighting

its dangers could be impactful. Collaborations with pharmaceutical companies to ensure restricted and responsible usage are also recommended.

3. Localized Community Programs: Cities like Hartford, New Haven, and Waterbury, with high overdose occurrences, should have

community outreach programs offering resources, support, and education to mitigate substance abuse.

Further Research:

- Incorporating socioeconomic factors, education level, and healthcare accessibility might provide more comprehensive insights.
- Deep-diving into geospatial data could identify localized patterns, aiding targeted interventions.
- Evaluating existing substance abuse prevention programs against our findings might offer areas for improvement.

Conclusion:

Our analysis offers a data-driven approach to understanding and combating the drug overdose crisis. By emphasizing specific

demographics and substances, targeted interventions can be designed, offering hope in addressing this public health menace.