Rhode Island Unintentional Drug Overdose Death Trends and Ranking – Office of the State Medical Examiners Database

YONGWEN JIANG, PhD; JAMES MCDONALD, MD, MPH; MARIA E. LENA WILSON, BS; JENNIFER KOZIOL, MPH; ARIEL GOLDSCHMIDT, MD; EWA KING, PhD; SAMARA VINER-BROWN, MS; SANDRA M. POWELL, BA; NICOLE ALEXANDER-SCOTT, MD, MPH

Drug overdose is a public health crisis in the United States.[1] It is the leading cause of injury death in the U.S., causing about 52,000 deaths in 2015,[1, 2] and is a major public health concern in Rhode Island. Based on the age-adjusted rate of death due to drug overdose in 2015, Rhode Island ranked fifth in the U.S. The top five states included West Virginia (41.5 per 100,000), New Hampshire (34.3), Kentucky (29.9), Ohio (29.9), and Rhode Island (28.2).[3] The number of drug overdoses has risen rapidly during 2009–2016. In Rhode Island, the number of drug overdose deaths exceeds the combined number of deaths due to suicide, homicide, and motor vehicle crashes in 2016.

Drug overdose deaths contribute to physical, mental, social, and public health problems, and have a major impact on individuals, families, and communities.[4] One of the Healthy People 2020 goals is to "reduce substance abuse to protect the health, safety, and quality of life for all, especially children."[2] The increase in drug overdose deaths highlights the urgent need for accurate and timely surveillance. The Rhode Island Department of Health (RIDOH)'s Center for the Office of State Medical Examiners (OSME) certifies about 10% of all deaths that occur within Rhode Island, and is a critical source of information regarding drug overdose deaths. The objectives of this report were to: (1) describe Rhode Island's longitudinal trends and geographic patterns in unintentional drug overdose death using available medical examiners' office data; (2) compare Rhode Island's performance to neighboring states, using the newly-available Centers for Disease Control and Prevention (CDC) data; and (3) generate a linear equation to predict future four-year deaths due to drug overdose in the absence of effective interventions.

METHODS

Data sources

Two data sources were used: (1) The OSME database was searched for all cases from January 2009 through December 2016 with drug overdose reported as cause of death. The death must have occurred within Rhode Island. The underlying cause of death must have been officially confirmed by a medical examiner. (2) The 2015 drug overdose death data on the CDC website was used to rank the 50 states and D.C.[3] Death causes were classified using the International Classification of Diseases, Tenth Revision (ICD–10).[3]

Data analyses

(1) GIS map: During 2009–2016, Rhode Island only had two teen deaths due to drug overdose, so we calculated the average annual adult death rate of drug overdose by using Rhode Island's 2010 census city/town adult (18 years and older) populations. Mapping of drug overdose death rates by cities and towns where overdoses occurred was conducted using ArcGIS 10.2 (Environmental Systems Research Institute, Inc., Redlands, CA). We employed the Jenks Natural Breaks Classification method to develop the value ranges of the overdose death rate.

(2) Linear equation: The drug overdose deaths were modeled as a function of the year of when they occurred. Based on Rhode Island 2009–2016 data, we generated a linear equation to predict future year deaths due to drug overdose if the current rates were to continue in the absence of effective interventions. A linear equation was used to calculate the annual number of deaths projected for 2017–2020.

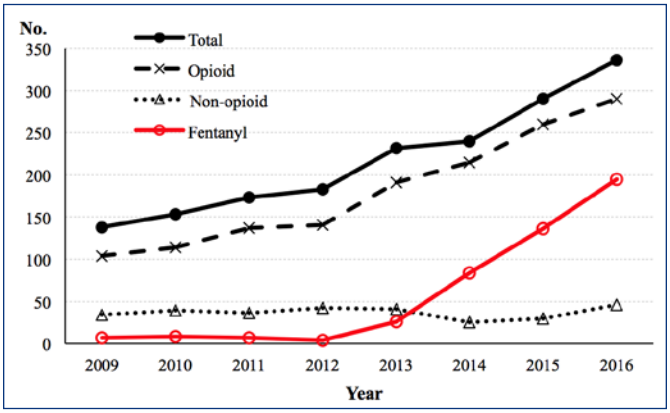
RESULTS

During 2009 through 2016, 1,745 Rhode Island adults died of a drug overdose. The ages ranged from 16–87 years old and the average age was 42.7 (data not shown). A trend analysis over eight years demonstrated that drug overdose deaths in Rhode Island increased significantly from 2009 to 2016. Specifically, Rhode Island OSME data revealed that the number of drug overdose deaths in Rhode Island increased nearly 2.5-fold over the past eight years. Fentanyl, as the cause of overdoses, was first reported in Rhode Island in March of 2013. Deaths due to fentanyl overdoses rose sharply during 2013–2016, while non-opioid overdose deaths remained stable (**Figure 1**).

In 2015, Rhode Island ranked 5th among the 50 states and Washington, D.C. for the age-adjusted rate of death due to drug overdose. Rhode Island outpaced neighboring states, except New Hampshire (**Figure 2**). In New England, Vermont, Maine, and Connecticut had lower rates than Massachusetts, Rhode Island, and New Hampshire. New England states with statistically significant increases in drug overdose death rates from 2014 to 2015 included Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island (**Table 1**).

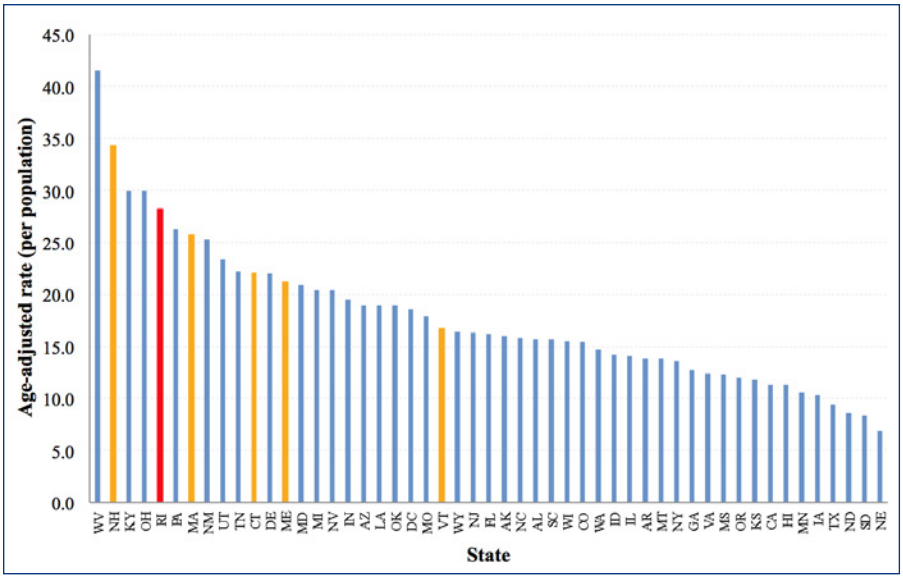
The crude rates display some area clustering, with the highest (worst) death rates observed in the urban (four core

Figure 1. Unintentional drug overdose deaths occurred in Rhode Island, 2009–2016



Data source: Rhode Island Office of the State Medical Examiners database.

Figure 2. 50 states and District of Columbia ranked by age-adjusted rate of drug overdose deaths, 2015[a]



Data source: CDC Drug Overdose Death Data Website (www.cdc.gov/drugoverdose/data/statedeaths.html)
a Ranking is based on the 50 states and District of Columbia.

Table 1. Drug overdose deaths in New England states, 2015

State	Age-adjusted rate (per 100,000)[a]	Rank[b]	Percent change from 2014-2015	Statistically Significant
New Hampshire	34.3	2	30.9	Yes
Rhode Island	28.2	5	20.5	Yes
Massachusetts	25.7	7	35.3	Yes
Connecticut	22.1	11	25.6	Yes
Maine	21.2	13	26.2	Yes
Vermont	16.7	23	20.1	No

Data source: CDC Drug Overdose Death Data Website (https://www.cdc.gov/drugoverdose/data/statedeaths.html)
a Age-adjusted death rates were calculated as deaths per 100,000 population using the direct method and the 2000 standard population.
b Ranking is based on the 50 states and District of Columbia.

cities) and some suburban areas. The four Rhode Island core cities (defined as having 25% or more of children living below the federal poverty threshold) had the highest average annual rates of adult drug overdose deaths and were Woonsocket (48.7 per 100,000 population), Providence (38.2), Pawtucket (37.6), and Central Falls (37.3). The four towns with the lowest adult overdose rates were Little Compton (8.8), Exeter (7.4), Jamestown (5.7), and Barrington (2.1) (**Figure 3**).

As noted, Rhode Island drug overdose deaths increased for eight consecutive years (2009-2016) and for the total drug overdose deaths, the regression model is statistically significant ($p < 0.0001$). The linear equation is Prediction = 93.786 + 27.631*(Year - 2008). The linear equation indicates that annual drug overdose deaths could reach 342 deaths in 2017, 370 deaths in 2018, 398 deaths in 2019, and 425 by 2020 in the absence of any interventions (**Figure 4**).

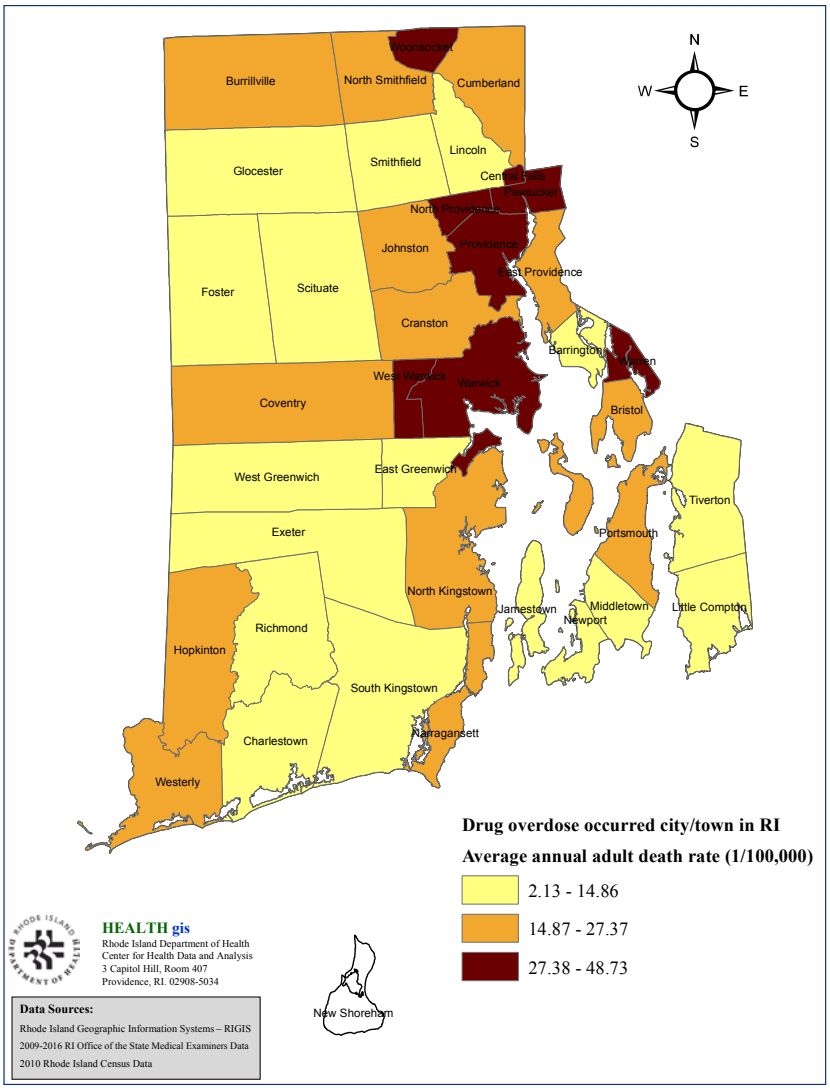
DISCUSSION

Understanding drug overdose death data can help public health professionals target high-risk populations and areas, monitor overdose deaths, and prioritize resources. The authors identify trends and geographic patterns to help strategically assign prevention, response, and treatment resources. Opioid-related drug overdose deaths have risen rapidly over the last eight years in Rhode Island. Such an unsettling trend highlights the importance of comprehensive efforts addressing this crisis in a systematic manner. Efforts focusing on prevention, improving access to substance abuse treatment, increased availability of naloxone, and strategies to promote recovery are currently under way in Rhode Island.[6]

The OSME data can help Rhode Island identify geographic patterns of drug overdose. Consideration of where overdoses occurred could enhance specific overdose prevention interventions, such as targeted training on naloxone administration.[1] This report represents the first known estimate of drug overdose deaths in Rhode Island for the next four years in the absence of effective interventions. The projection can help plan prevention efforts, manage public health resources, and assess whether interventions are effective.[5]

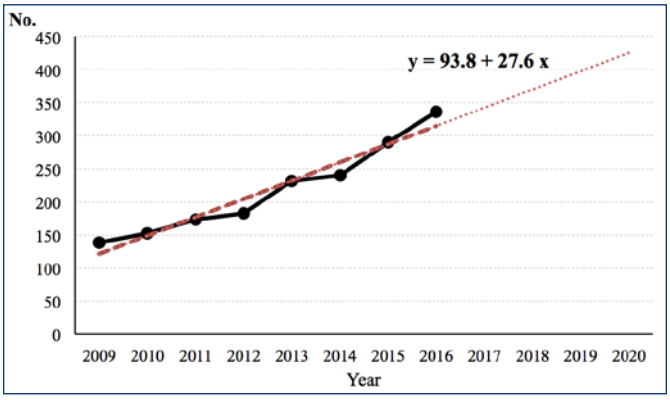
This report has at least two limitations. (1) The adult (18 years and older) population in New Shoreham is 888 in the 2010 census data. Due to the instability of the small number, the adult drug overdose death rate in New Shoreham is not reported. (2) The study focuses on the city or town where an overdose occurred. However, when this information was

Figure 3. Average annual drug overdose rate (1/100,000) among adults aged 18 and older by overdose occurred cities and towns in Rhode Island, 2009-2016*



*The adult drug overdose death rate in New Shoreham is not reported due to the instability of the small numbers.

Figure 4. Annual number of deaths from unintentional drug overdose in Rhode Island, 2009–2016, with projections to 2020



Data source: Rhode Island Office of the State Medical Examiners database.

not available (12% of the cases), residency was used as a proxy if decedents lived in Rhode Island.

In summary, there is a clear need for continued surveillance and an interdisciplinary approach to identifying, communicating, and managing the drug overdose crisis.[6] The OSME database will continue to be an effective source in surveillance of drug overdose deaths. If drug overdose deaths in Rhode Island decline, it implies that recent efforts may be effective.[5]

Acknowledgment

We thank David G. De Tora, Sr. at the Rhode Island Department of Health for his subject matter expertise on the Center for the Office of State Medical Examiners' data. We would like to express our particular thanks to Steve Sawyer, Rhode Island Department of Health, for his GIS technical assistance.

References

1. Mack KA, Jones CM, Ballesteros MF. Illicit Drug Use, Illicit Drug Use Disorders, and Drug Overdose Deaths in Metropolitan and Nonmetropolitan Areas - United States. MMWR *Surveill Summ* 2017;66(19):1-12.

2. Office of Disease Prevention and Health Promotion (ODPHP). Substance Abuse. 2020 Topics & Objectives 2017 Novermber 03 [cited 2017 November 03]; Available from: https://www.healthypeople.gov/2020/topics-objectives/topic/substance-abuse

3. CDC National Center for Injury Prevention and Control. Drug Overdose Death Data. 2016 [cited 2017 September 13]; Available from: https://www.cdc.gov/drugoverdose/data/statedeaths.html

4. National Center for Injury Prevention and Control. CDC Injury Center Research Priorities. Injury Prevention & Control 2015 [cited 2017 November 08]; Available from: https://www.cdc.gov/injury/researchpriorities/index.html

5. Darakjy S, Brady JE, DiMaggio CJ, Li G. Applying Farr's Law to project the drug overdose mortality epidemic in the United States. *Inj Epidemiol* 2014;1(1):31.

6. Prevent Overdose RI. We have one goal: to save lives. Providence: Rhode Island Gov (RI.GOV), RI Department of Health (RIDOH), Behavioral Healthcare, Developmental Disabilities and Hospitals (BHDDH), Brown University (brown.edu), hampson.us. http://preventoverdoseri.org/; 2017.

Authors

Yongwen Jiang, PhD, is a Senior Public Health Epidemiologist in the Center for Health Data and Analysis at the Rhode Island Department of Health, and Assistant Professor of the Practice of Epidemiology, School of Public Health, Brown University.

James V. McDonald, MD, MPH, is the Medical Director of the Division of Customer Services, Division of Policy, Information and Communications, and of the Drug Overdose Prevention Program, as well as Chief Administrative Officer of the Board of Medical Licensure and Discipline, Board Certified Pediatrics and Preventive Medicine, at the Rhode Island Department of Health.

Maria E. Lena Wilson, BS, is Programmer/Analyst II of the Office of Information Systems at the Rhode Island Department of Health.

Jennifer Koziol, MPH, is the Program Manager of the Drug Overdose Prevention Program in the Center for Health Promotion, Division of Community Health and Equity, Rhode Island Department of Health.

Ariel Goldschmidt, MD, is an Assistant Medical Examiner of the Rhode Island Center for the Office of State Medical Examiners at the Rhode Island Department of Health and Clinical Assistant Professor of Pathology and Laboratory Medicine at Brown University.

Ewa King, PhD, is the Associate Director of Health, and the Director of the Division of State Laboratories and Medical Examiners at the Rhode Island Department of Health.

Samara Viner-Brown, MS, is the Chief of the Center for Health Data and Analysis at the Rhode Island Department of Health.

Sandra M. Powell, BA, is the Associate Director of Health, and the Director of the Division of Policy, Information and Communications at the Rhode Island Department of Health.

Nicole Alexander-Scott, MD, MPH, is the Director of the Rhode Island Department of Health; Associate Professor of Pediatrics and Medicine, Alpert Medical School of Brown University and Associate Professor of Health Services, Policy and Practice, School of Public Health, Brown University.

Disclosure

The authors have no financial interests to disclose.

Correspondence

Yongwen Jiang, PhD
yongwen_jiang@brown.edu