



Legal Consumer Fireworks in Iowa Corresponds with a Dramatic Uptick in Injuries

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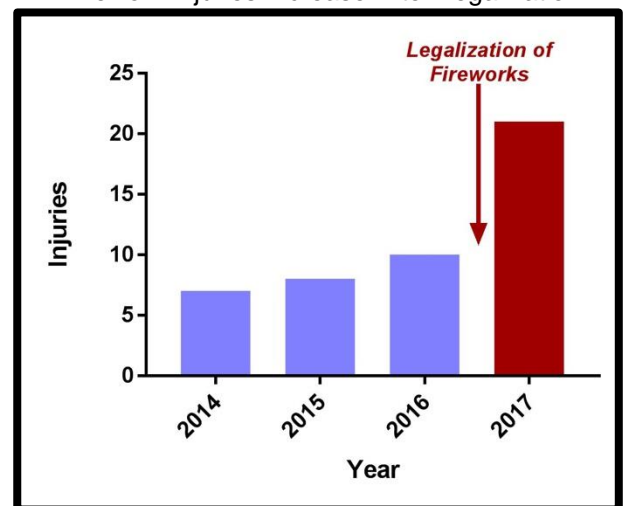
University of Iowa Health Care

On May 9, 2017, the Iowa legislature approved SB489, which for the first time allowed the sale of fireworks in Iowa from June 1 through July 8 and December 10 through January 3. Although sales during these periods are legal statewide, counties and municipalities are able to restrict sales locally. We examine trends in emergency department visits to Iowa's largest trauma hospital before and after implementation of the law. Researchers at The University of Iowa Hospitals and Clinics (UIHC) Department of Emergency Medicine, in association with the Injury Prevention Research Center and the Department of Surgery, examined trends of firework injuries at University of Iowa Hospitals and Clinics, for the years 2014-2017 in order to identify the public health implications of the new law.

Key Findings:

- ◆ Firework related injuries were fairly consistent (seven to ten injuries per year) in years prior to the legalization of consumer fireworks (2014-2016). In 2017 (the year of legalization) firework injuries more than doubled to 21.
- ◆ Injuries after legalization were more severe, with 57% of encounters requiring surgery compared to just 20% in the years prior to legalization.
- ◆ Patients under the age of 18 increased by 26%, with 5 times more firework handlers being under 18 years old.
- ◆ The proportion of injured patients who were bystanders increased compared to that of firework handlers.

Firework Injuries Increase After Legalization



Recommendations:

- ◆ Establish safety campaign messages to alert all potential fireworks handlers and bystanders of hazards
- ◆ Fund research to examine statewide data
- ◆ Establish a firework sales/injury surveillance system with annual reporting of trends
- ◆ Explore options for targeted interventions for high risk populations
- ◆ Engage stakeholders such as the Iowa Department of Public Health and the State Fire Marshal to prioritize prevention approaches.

Firework Injuries More Than Double in 2017 as Compared to Previous 3 Years

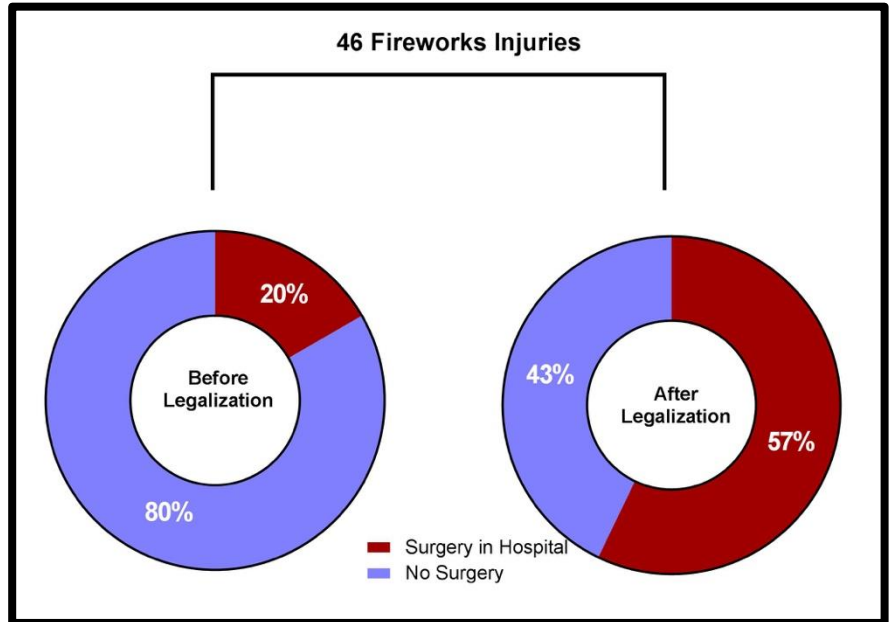
In the three years prior to the implementation of the new legislation, firework-related injuries increased from seven patients in 2014 to ten patients in 2016. After the legalization of fireworks in 2017, the number of injuries more than doubled to 21, representing a **210% increase** over the previous year and a **252% increase** over the previous three-year average. Iowa's increase is far higher than national trends, which ranged from a 9% decrease to an 11% increase during this time period.

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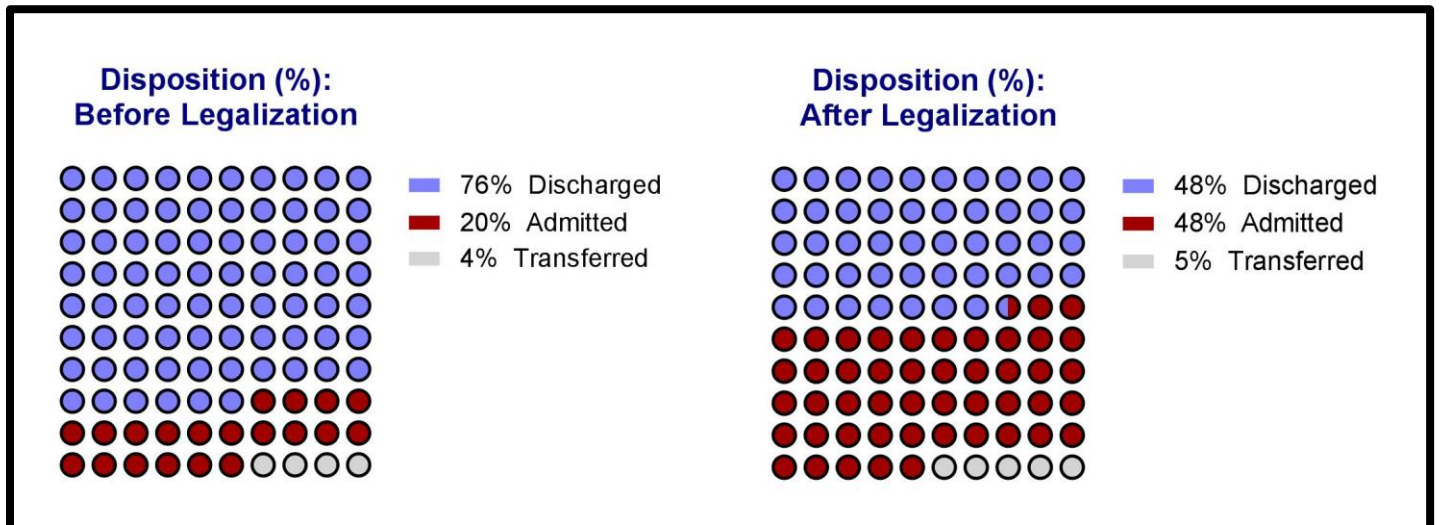
Injuries from Fireworks Are More Severe After Legalization Than Before

Burns were the most common injury type across all 4 years studied. Tissue trauma, and fractures were the next most common. However, tissue trauma and fractures were 2.2 times more frequent in 2017. Other injury types that occurred with increased frequency following implementation were eye injuries (4.2 times more frequent in 2017), ear injuries including hearing loss (4.5 times more frequent in 2017), and head injuries (zero in 2014-2016, one in 2017). In addition to increases in each injury category, the proportion of injured patients who required surgery increased from 20% in 2014-2016 to 57% in 2017. On average, fewer than two patients per year were admitted to the hospital in the three years prior to legalization. In 2017, ten patients were admitted representing a more than a five-fold increase over previous years. Those admitted prior to the legalization of fireworks stayed in the hospital for an average of 2.7 days, and those admitted after legalization stayed an average of 1.9 days. Increases in the number of admissions and patients requiring surgery indicate an increase in healthcare utilization costs following legalization.

Number of Patients Requiring Surgery Increased after Legalization



After Legalization of Fireworks, More Patients Were Admitted to the Hospital from the Emergency Department

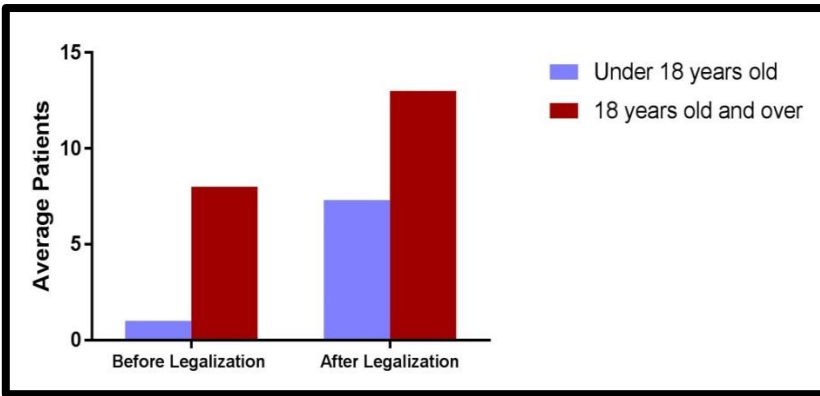


Patients Under 18 Were Affected Disproportionately

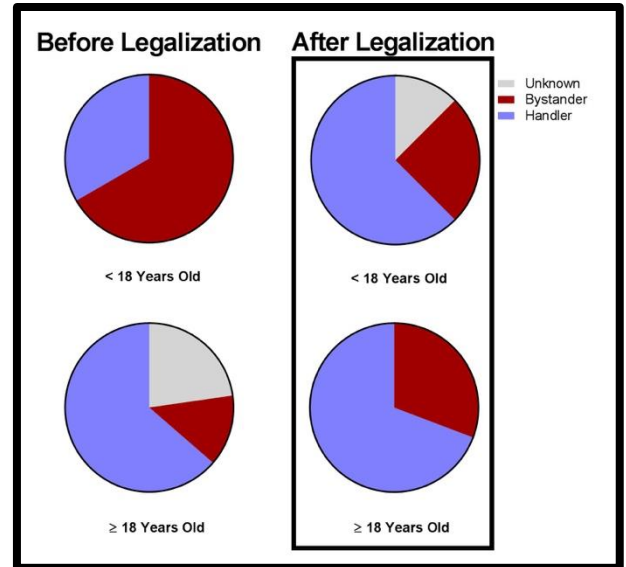
The average age of a firework injury patient before the legalization of consumer fireworks was 35 years old. After legalization, the average age decreased to 24 years old. **After legalization 38% of patients were under 18 years old. In the three years prior to legalization, just 12% of patients were minors.** Prior to the legalization of fireworks, a majority of patients under 18, 66%, were bystanders. After legalization that number

dropped to 25%, a 41% decrease. In comparison, patients over 18 experienced a 17% increase in bystander injuries. Although the law prevents individuals under 18 from purchasing fireworks, the law clearly doesn't protect minors, nor does it keep minors from using fireworks. **Post legalization, the majority of minors were firework handlers, 62.5%**, very similar to the handler proportion for adults which was 69%.

Patients Under 18 Years Old Increased After Legalization of Fireworks



Bystanders Experienced an Increased Number of Injuries After Legalization



The Proportion of Injuries Experienced by Bystanders Increased More Than the Proportion Experienced by Firework Handlers

Bystanders are being injured at a higher proportion compared to handlers than before the legislation. The risk of a firework handler being injured from 2014-2016 was about three times that of a bystander. In 2017, bystander injury increased 3.6 times and handler injury increased 2.8 times in 2017. Bystanders were four times more likely to require surgery and be admitted after legalization of fireworks compared to previous years. Additionally, the average bystander was younger (22.5 years) than the average handler (25.2) after legalization. Prior to legislation the average bystander was 30.6 years old and average handler 34.7.

Men Are Most Likely to be Injured by Fireworks

Before legalization 68% of patients seen for firework related injuries were men. Following legalization 81% of patients were men.

Research Methods

Data was collected by querying all UIHC electronic health records (EHR's) using a search algorithm to locate the word "firework" in any part of a patient's EHR between June 1 and July 8 for the years 2014-2017. This data was reviewed to remove false positives and obtain demographics and encounter details. This data was compiled into a database with specifically defined variables. Statistical analyses were then performed on the database to create a dataset that conclusions could then be drawn from.

Research Limitations

This study only identified 47 patients across four years who suffered injuries from fireworks. It is possible that the method used to identify firework injuries missed patients who in fact were injured by fireworks, but it was

not noted in the patient's EHR. Additionally, the majority of cities and towns in Johnson County, where UIHC is located, banned the use of fireworks within their jurisdictions, which could have reduced the number of injuries seen at UIHC. This research identified all patients with firework injuries presenting to UIHC providers regardless of state of residency. While few patients came from out of state (five patients, all prior to legalization), that could slightly change the dataset. UIHC's status as a top hospital in Iowa, as well as its exceptional burn unit put it in a unique position to access data, but it may not provide a representative sample of fireworks injuries in Iowa.

Acknowledgements

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