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Amusement ride injury data in the United States

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ABSTRACT

Amusement ride injuries are generally understood to be infrequent, but are notable when they occur. Quantitative and qualitative assessment of amusement safety is in the public interest and important for continuous improvement. This paper reports on an analysis of the amusement injury data collected by the National Electronic Injury Surveillance System (NEISS) for 2010. Inflatable sides and bounces are involved with at least 42% of amusement injuries, 56% of injured patrons are aged 15 or under, and females sustain 57% of injuries treated, predominating at all ages above 5. Relative risks for user categories or device types cannot be computed, as exposure data is inadequate. The source data also largely lacks adequate information about the injury producing events and specific equipment involved, which interferes with development of strategic safety improvement priorities. Improvements are needed at the point of data collection either through the existing system or development of a new data collection mechanism, or both.

1. Introduction

Amusement rides are a popular form of recreation for children and adults that comprise an important component of the tourism industry. For instance, the operations of Walt Disney World, including its supply chain, were estimated to comprise 2.5% of the Gross Domestic Product of the state of Florida (New Study Shows, 2011). At the other end of the business spectrum, there are many small businesses operating one or two devices, often travelling in conjunction with other operators on a fair circuit or supplying equipment rental for individual private functions, such as birthday party bouncy castles. Amusement rides are operated in both fixed site (amusement and theme parks) and portable (travelling carnival) forms. Small businesses are prevalent: 74% of Canadian amusement parks and 65% of U.S. parks have 20 employees or fewer, as do 93–94% of other amusement and recreation industries in both the United States and Canada (United States Census Bureau, 2013; Statistics Canada, 2013). Due to climate differences, major fixed site amusement parks and theme parks are more viable and thus prevalent in the USA than in Canada.

While the appeal of many amusements is the sensation of thrill and exhilarating sensations and simulation of precarious situations, it is also intrinsic to the appeal of the attraction that the patrons trust that they are in no actual jeopardy (Rabinowitz, 2001). Safety is therefore a high priority for the industry (International Association of Amusement Parks and Attractions, www.iaapa.org; Outdoor Amusement Business Association, www.oaba.org). Nevertheless, it can be difficult for patrons to evaluate the actual safety level of the amusement park and carnival sector.

Members of IAAPA, representing fixed-site amusement attractions, are expected to report accidents for analysis by the National Safety Council (NSC) if operating in the United States, otherwise to comparable entities in their operating region, if applicable. In 2010, 104 of 386 eligible facilities were able to provide these reports, with the aggregated data indicating an injury rate of 4.4 per million attendance and 0.7 per million patron-rides in the year 2010, with 5% of the injuries considered "serious", requiring hospitalisation for at least one night (NSC, 2011). The annual updates are publicly accessible online but receive little public attention. Some amusement parks also voluntarily report accidents on a periodic basis (such as quarterly) to their state regulator, and public reports are often published in the news media (Theme park attractions, 2012; O.C. theme park, 2012). The portable ride industry does not have a similar industry-wide reporting scheme.

Reporting obligations vary outside the United States. For instance in Canada, there are no national reporting schemes for amusement device injuries. Regulators in each provincial jurisdiction may mandate reporting according to their own policies, thus the types of events considered reportable and the information collected in such reports varies. Most of the reported data is not publicly accessible other than as aggregated annual totals (for instance, Ontario: TSSA, 2013). A complete review of reporting requirements, practices, and resulting reports in a full range of international jurisdictions is outside the scope of this paper, however many jurisdictions have a requirement to report injuries to some authority but few have meaningful public dissemination of the aggregated information.

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News media aggregator websites such as RideAccidents.com, 2013 compile news reports from English language news media around the world. Media aggregators include accidents as well as newsworthy non-accident events, such as patrons stranded and evacuated after safety stop events. News coverage favours dramatic and unusual accident situations. Hazard is inherently amplified when ride safety is viewed through the lens of the media aggregators. For example, 19% of media reports of non-occupational amusement ride accidents were fatal in one analysis although fatalities were far less prevalent at one per 2000–3000 injuries captured by government sources (Woodcock, 2008). The content particularly of initial media reports may be inaccurate, and media aggregators do not have systematic processes to harvest corrections and updates, although newsworthy updates such as legal proceedings are compiled in some cases.

Another means of data capture is through injury reports documented by the operator's employees when notified by a patron. Onsite reporting is limited as the patron may leave the amusement facility before the severity of the injury is evident, or symptoms may worsen over the ensuing days. Operators may not be present to collect delayed reports, particularly for travelling carnivals which may have dismantled and moved before the patron realises that it would be appropriate to report. The ASTM standard for ride operation (ASTM F770-11) recommends that the operator should maintain records of all cases requiring first aid treatment, with "first aid incident reports" completed when medical treatment or hospital admission is required or may be required in the future. However, compliance with consensus standards is voluntary unless mandated by a regulatory authority. The requirements of the authorities having jurisdiction vary, ranging from no state inspection and reporting requirements to publicly posted annual reports including incidence statistics. There are variations in relation to whether and under what circumstances injuries are to be reported to the regulator rather than documented in the log book with the device. The public has little access to these data to assess the safety level of amusement activities.

The U.S. Consumer Product Safety Commission (CPSC) uses a stratified probability sample of approximately 100 hospitals across the United States recruited to participate in the National Electronic Injury Surveillance System (NEISS). When a patient presents at the emergency department, any consumer product involvement is noted and the record captured for NEISS. Hospitals are selected for participation to comprise a sample that is then statistically extrapolated to estimate national figures.

There are weaknesses to the statistical assumptions required to use NEISS particularly for estimating injuries at fixed-site attractions (Arndt and Al-Tarawneh, 2003; Levenson, 2003). Due to the variation of use of certain consumer products, the validity of the extrapolation from sentinel hospitals may vary. For instance, extrapolation may be valid for kitchen appliances, which are dispersed across the country in proportion to the population, but amusement parks are not evenly distributed. The injury experience of an emergency department near a major amusement park would overstate the prevalence of amusement park injuries. Travelling carnivals are more evenly dispersed but carnival injuries may still be overstated if hospitals in areas near major state fairs are overrepresented in the sample. CPSC also collects supplementary data through further investigation of some reports and may issue bulletins and advisories, and mandate modifications where deemed necessary. However, only portable rides (carnivals) are within the jurisdiction of CPSC as fixed-site attractions are not considered to be "consumer products". NEISS data reflect only incidence, and not rates in relation to exposure, giving limited insight into the risk to consumers of participating in a certain activity (O'Connor and Swenson, 1997).

In 2006, CPSC discontinued its annual report on amusement injuries and made the NEISS database available in searchable form to the public. The objectives of this paper are to report descriptively on amusement ride injuries in the United States extracted from this database for the most recent complete year available, and to discuss the CPSC amusement ride injury data and alternatives for safety evaluation and analysis in this sector.

2. Method

2.1. Data preparation

Using the interactive search tool (CPSC, 2012), data for 2010 (the most recent year available) was extracted from the U.S. Consumer Product Safety Commission dataset for product code 1293, "amusement attractions (including rides)". This product category includes amusement devices that are typically considered to be part of amusement parks or carnivals, and the focus of this paper. The category also includes other amusement devices that must be excluded before analysing the dataset.

Each record included the age, gender, and race of the injured person, diagnosis, body part and disposition of their emergency room visit, and a narrative of up to 142 characters. Each narrative was reviewed to determine whether the record was eligible for inclusion, by pertaining to mechanically powered rides, inflatable devices, dry slides, spaceballs, and ziplines. Some of the excluded records were misclassified as they pertained to devices covered by other CPSC product classifications for trampolines (1233), water slides, public (stationary amusement rides) (3295), other playground equipment (3219), go-carts (3259), informal gymnastics including equipment (3263), riding toys (5005), and exercise equipment (3277). Other records were not clearly subsumed elsewhere but are not conventionally considered "amusement rides" found in amusement parks and carnivals, such as ball pits, obstacle courses, swan boats, games, laser tag, haunted houses/corn mazes, and mechanical horses in shopping centres and mechanical bulls in bars. In this initial review, injuries resulting from contact with physically disconnected fences, gates and measuring sticks not encountered during the ride itself were also excluded.

2.2. National estimates

All descriptive statistics and cross tabulations in this paper were based only on the included case records. The NEISS weighting factors were applied to the included records individually to derive national estimates.

To express the national estimates in relation to participation, reliable estimates of exposure are elusive. The annual report of fixed-site park injuries (NSC, 2011) estimates 290 million admissions nationally. The OABA, representing carnivals, states an estimate of 500 million admissions with over half participating in rides (Carnival safety statistics, 2012). While IAAPA's attendance is based on annual survey responses, OABA provides no substantiation for the estimate which implies that the largest 46 fairs in the U.S. represent just 8% of the total national attendance to carnivals, while the top 19 amusement/theme parks represent 40% of the IAAPA estimate of park attendance (Official Top 50, 2012; TEA/AECOM, 2011). A combined 2010 attendance of 545 million rider-admissions for both parks and carnivals was used, based on the IAAPA park estimate and just over half of the OABA figure. IAAPA's survey-derived estimate of 5.86 rides per admission (NSC, 2011, Table 1) was used for both sectors, as OABA does not provide an estimate.

Optimal injury prevention is to prevent the failures that produced the harmful situation. The variables coded in the NEISS data-