



Analysis of fatal train-pedestrian collisions in metropolitan Chicago 2004–2012



Ian Savage*

Northwestern University, USA

ARTICLE INFO

Article history:

Received 2 February 2015

Received in revised form 19 October 2015

Accepted 3 November 2015

Available online 18 November 2015

Keywords:

Railroad

Safety

Pedestrians

Chicago

Suicide

ABSTRACT

The paper analyzes spatial and temporal data on fatal train-pedestrian collisions in the Chicago metropolitan area between 2004 and 2012. In comparing different municipalities within the region, the density of grade crossings and stations is found to increase the frequency of unintentional deaths. However, unintentional deaths do not increase with train volume suggesting that pedestrians may exercise more care around busier lines. The distribution of apparent intentional deaths is less strongly related to the density of crossings and stations suggesting that those intending self-harm will seek out a point of access. Apparent intentional deaths are more prevalent on lines with frequent passenger trains, and in municipalities with higher incomes and lower population densities. While most of the apparent intentional deaths (about 70%) are not associated with any copycat activities, the dataset contains possible clusters of intentional deaths that are proximate in both time and space. There was also a highly publicized suicide that led to a 95% increase in apparent intentional deaths throughout the region in the 18 weeks following the incident.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Approximately 800 non-motorized members of the general public die each year on the railroads in the United States.¹ These are primarily pedestrians, but also include wheel-chair users, pedal bicyclists and horse riders. As shown in Table 1, they represent about four out of every five railroad-related deaths (79.8%) during the period 2012–2014. This proportion is not only large, but has also increased during the past 35 years.

Annual non-motorized deaths have not changed much in recent decades whereas the counts in other categories of death on the railroads have declined. The total number of persons who died at places along the right-of-way other than grade crossings (commonly referred to as “trespassers”) has been reasonably consistent within the range of 400–500 a year for decades. The same is true for the number of non-motorized fatalities at grade crossings that have fluctuated in the range of 60–100 a year. A time trend for intentional deaths (suicides) is not available because prior to June 2011

railroads were not required to report suicidal acts to the federal government. In contrast there has been a considerable reduction in employee fatalities. The total number of employees is only half of what it was in 1976, and the fatality risk per employee hour has fallen by 70% (Savage, 2013). Even more astonishing is the decline in the number of motor vehicle occupant fatalities at grade crossings from 1016 in 1976 to about 160 in recent years despite highway traffic doubling in volume.

These divergent trends have had their effect on public policy. One of the most pressing safety issues facing the railroad industry in the 1970s was grade crossing collisions. In the early-1970s the number of non-motorized and vehicular fatalities at grade crossings exceeded trespassing fatalities elsewhere on the railroad by a ratio of three to one. Programs were put into place that reduced the risk (Mok and Savage, 2005; Savage, 2006). By 1997 the number of trespasser fatalities exceeded the number killed in collisions at grade crossings for the first time since 1941. The trend continued and today the number of crossing fatalities is only about half of the number of trespasser fatalities. Consequently the railroad industry, both in the United States and elsewhere in the world, has increasingly turned its attention to understanding and mitigating unintentional pedestrian deaths and suicides (Botha et al., 2014; Fitzpatrick et al., 2015; Gabree et al., 2014; Harrison and DaSilva, 2013; Havârneanu et al., 2015; RESTRAIL Consortium, 2014; and a working group known as the Global Railway Alliance for Suicide Prevention (GRASP)).

* Correspondence to: Department of Economics, Northwestern University, 2001 Sheridan Road, Evanston, IL 60208, USA.

E-mail address: ipsavage@northwestern.edu

¹ The railroads considered are freight, intercity passenger, regional commuter and switching railroads regulated by the Federal Railroad Administration. Incidents on urban rapid transit subway and light rail systems are not included.

Table 1
Annual railroad fatalities in United States (average of 2012, 2013 and 2014).

Primarily non-motorized members of the general public		Other fatalities	
On the right-of-way at places other than grade crossings ^a	441	Motorized highway users at grade crossings	163
Confirmed intentional deaths ^b	274	Employees and contractors	19
Pedestrians and non-motorized highway users at grade crossings	79	Other persons lawfully on the railroad, such as delivery drivers	13
		Passengers on trains	5
		Bystander not on railroad property	1
<i>Total</i>	794	<i>Total</i>	201

Source: Federal Railroad Administration.

^a A small number of persons in this category are occupants of motor vehicles that leave an adjacent highway and end up on the tracks, and some snowmobile and all-terrain vehicle riders.

^b There are a handful of intentional deaths involving motor vehicles stopped on grade crossings.

The purpose of this paper is to assist efforts to mitigate these risks by analyzing a dataset of 338 fatalities from collisions between pedestrians and other non-motorized members of the general public with railroad trains in metropolitan Chicago between 2004 and 2012. This dataset has the advantage relative to national data that intentional acts are included (intentional acts were not reportable to the federal government prior to June 2011, and even after that time detailed data on individual incidents are not made publicly available). The analysis looks at the type of activity that preceded the death, demographics of the decedent, the time of the incident, the characteristics of the railroad service, and the land use in the vicinity of the incident location. Statistical analyses are also used to discern the extent to which there is any contagion whereby an intentional death spurs others to imitate the act.

2. Literature review

2.1. Literature on unintentional deaths

Savage (2007) undertook a time series analysis of unintentional fatalities (at locations other than grade crossings) in the United States from 1947 to 2003. He found that while the total number of such fatalities may not have changed in recent decades, the per-capita risk has declined as the population has increased. Part of the explanation is that the railroad network has shrunk and new housing and workplace developments have occurred in places that are far away from the nearest railroad track. However, the resurgence in rail traffic since the 1980s has seen average train volumes increase on the parts of the network that remained open. There are also demographic factors at work. Trespassers tend to be in their 20s and 30s, and as the baby boom generation has aged a smaller proportion of the population is in that age group.

A particularly insightful literature involves the analysis of post-mortem reports from coroners and medical examiners. The Centers for Disease Control and Prevention (CDC) conducted two such studies in the 1990s in North Carolina (Pelletier, 1997) and Georgia (CDC, 1999). Subsequently the Federal Railroad Administration (FRA) commissioned a report that matched up 61% of the trespassing fatalities (unintentional deaths not at grade crossings) in the FRA national database for 2002, 2003 and 2004 with coroners' reports (George, 2008). The work was updated with 2005–2010 data in FRA (2013). At the risk of generalizing, these analyses concluded that about two-thirds of the trespasser casualties were single adult males in their 20s and 30s under the influence of alcohol.

This problem is not confined to the United States. Lobb (2006) presents an international overview of the relatively small literature that existed at the time on the nature of trespass and potential countermeasures. More recent work includes work in Finland looking at the characteristics of decedents (Silla and Luoma, 2012) and an evaluation of the effectiveness of specific countermeasures (Silla and Luoma, 2011). The former study found that decedents in accidental collisions were primarily in the 20–29 age group, 77% were male and 70% were intoxicated. In the latter study fencing and landscaping barriers were found to be more effective than just posting warning signs, but at a much higher cost. The estimated ratio of benefits to costs was 4.7:1 for fencing and landscaping and 5.4:1 for just signage. Work in Australia has used surveys of pedestrian users of grade crossings to determine why people engage in risk behaviors (Freeman et al., 2013; Lloyd's Rail Register, 2007).

2.2. Literature on intentional deaths

In contrast to the somewhat sparse literature on unintentional deaths, suicides have engendered a comparatively large literature. Much of the literature deals with deaths on subway systems. Review articles include Mishara (2007), Ratnayake et al. (2007) and Krynska and De Leo (2008).

In theory, suicides should not have been reported to the FRA or included in the trespassing statistics prior to June 2011. However, the FRA (2013) found that between 28% and 36% of the deaths in the FRA trespasser database were either ultimately determined to be suicides by a coroner, or the coroner's report contained language strongly suggesting suicide as the motive. Martino et al. (2013b) provide some descriptive statistics on 696 deaths in the FRA trespasser database between 2005 and 2010 that were determined to be suicides. Then Martino et al. (2013a) examined 55 of these suicides in detail by conducted a "psychological autopsy" that involved interviewing friends and relatives of the deceased. Sung et al. (2015) from the CDC recently analyzed coroners' reports on 479 train suicides that occurred in 16 states between 2005 and 2011. They found that decedents in train suicides were typically younger than was the case for suicides in general, and were primarily male and single. Two-fifths of decedents tested positive for alcohol, and a quarter of female decedents tested positive for anti-depressant drugs.

The problem of rail suicides appears to be worse in Europe than it is in the United States. Dense rail passenger networks and restrictions on gun ownership result in trains being chosen as the method in a higher proportion of total suicides. Silla and Luoma (2012) found that suicide was the explanation for 85% of fatal train-pedestrian collisions. Suicide decedents were primarily in the 20–39 age group and 70% were male. Half of these decedents were intoxicated, and two-fifths had received prior mental health treatment.

Another strand of the literature has looked at the geographical location of incidents to try to determine whether specific land uses affect the frequency of incidents. Botha et al. (2010) looked at 200 intentional deaths that occurred along a 77-mile stretch of railroad near San Francisco, California between 1992 and 2010. In part they found that suicides occurred more frequently in older residential neighborhoods where the railroad right-of-way was a more integral part of the community. Andriessen and Krynska (2012) analyzed 482 suicides on the Belgian mainline (which is to say non-rapid transit) railways between 2003 and 2007 and identified 34 "hot spots" that accounted for 35% of all of the suicides. Characteristics of these locations were a lack of fencing, the presence of a nearby grade crossing, and in half of the locations the presence of a nearby mental health institution. Uittenbogaard and Ceccato (2015) analyzed the locations of suicides on the Stockholm subway system and found that there were higher rates of suicide at stations located in

Download English Version:

<https://daneshyari.com/en/article/6965435>

Download Persian Version:

<https://daneshyari.com/article/6965435>

[Daneshyari.com](https://daneshyari.com)