



Analysis of Non-Motorized Rail Fatalities in Metropolitan Chicago 2004-10

J Ken Fuller

Transportation and Logistics Program 2011, now with the Canadian National Railway

and Ian Savage

Northwestern University

Origin for this work . . .

- A conversation with Marc Magliari of Amtrak at the NU/City of Lake Forest symposium in June 2010
- Northwestern Transportation and Logistics Minor paper by Ken Fuller
- Subsequently revised and expanded
- Present an analysis that is both spatial (displayed in Google Earth) and statistical

Data Set . . .

- 260 fatalities from 257 collisions between moving trains and non-motorized persons (251 pedestrians, 9 bicyclists, 0 on-train deaths) in seven-year period 2004-2010 in the 6-county Chicago Metropolitan region
- Mainline railroads only, does not include Chicago Transit Authority rail service
- Uses the Illinois Commerce Commission data base that was more expansive and inclusive than the “official” Federal Railroad Administration data



Illinois Commerce Commission data amalgamation of ...

- Reports to Federal National Response Center
- Reports to Illinois Emergency Management Agency
- FRA Office of Safety official databases (FRA only started require reporting of suicides on July 1, 2011, but not for public reporting)
- News clips
- Police reports

Three Categories of Pedestrians . . .

260 “Pedestrian” deaths 2004-2010 in 6-county region

- Suicides (120 deaths, 46%)
- Non-suicides at stations and crossings (16 at stations, 43 at crossings, 59 total, 23%)
- Non-suicides not at stations or crossings – “trespassers” (81 deaths, 31%)

Comparison with “official” FRA database ...

- FRA fatality database* contains:
 - 56 of 59 (95%) of non-suicides at stations and crossings
 - 64 of 81 (79%) of non-suicide trespassers
 - 30 of 120 (25%) of suicides
- Four fatalities are listed as non-fatal injury by FRA
- At this time, suicides were not reportable to the FRA, but our classification of a “suicide” is more permissive
- Undercounts in first two categories is surprising

* FRA database contains five additional cases. Three do not meet the criteria for this analysis, one is a duplicate double-count, and one is incorrectly shown as occurring in the Chicago area

As a comparison, fatalities 2004-10 . . .

Pedestrians

Crossings/Stations	59
Trespassers	81
Suicides	<u>120</u>
	260

Other Fatalities

Vehicle Occupants	29
Employees	5
Contractors	6
Passengers on Trains	4
Misc. other	<u>3</u>
	47



Demographic Analysis

Month and Time of Day Analysis

Fatalities by Gender . . .

	Stations & Crossings	Trespassers	Suicides
Male	31	49	81
Female	23	14	32
Not Reported	5	18	7

Fatalities by Gender . . .

- Considerable lack of information due to absence of gender field on FRA report form
- Females involved in 43% of station and crossing deaths, 22% of trespassing deaths, and 28% of suicides (where gender is known)
- Trespassing is overwhelmingly a male activity

Fatalities by Age . . .

	Stations & Crossings	Trespassers	Suicides
< 19	6	6	14
19-40	24	27	39
41-65	17	28	43
65+	8	4	3
Not Reported	4	14	21

Incidents by Age . . .

- Despite press attention, deaths involving persons aged under 19 (especially non-suicidal deaths) are surprising few
- In contrast to national data (where males in their 20s and 30s predominate), there is also a prevalence of 40-65 year old trespassers in Illinois
- There are less incidents of trespassing and suicides by senior citizens than one might have imagined

Fatality Risk by Age . . .

Age Range	Annual Risk per Million Population
< 19	2.1
19-40	5.7
41-65	5.6
65+	2.9

Fatalities by Time of Year . . .

	Stations & Crossings	Trespassers	Suicides
Dec-Feb	22%	12%	20%
March-May	14%	30%	31%
June-Aug	41%	23%	28%
Sept-Nov	24%	35%	21%



Fatalities by Time of Year . . .

- Fatalities are higher in the warmer months
- Trespassing deaths peak in May and November
- 30% of station/crossing deaths occurred in the month of June
- The peak months for suicides are March to October, with November through February having lower counts

Fatalities by Time of Day . . .

	Stations & Crossings	Trespassers	Suicides
Mid-3am	2%	14%	14%
3am-6am	14%	7%	5%
6am-9am	24%	15%	17%
9am-noon	2%	12%	13%
Noon-3pm	8%	12%	15%
3pm-6pm	24%	19%	14%
6pm-9pm	24%	11%	12%
9pm-mid	3%	10%	11%

Fatalities by Time of Day . . .

- 58% of station/crossing fatalities occurred in the commute hours of 7am-9am and 3pm-7pm
- Trespassing fatalities are equally spread across all hours of day and night
- Suicides are distributed across the day with hotspots in the 1am, 7am, noon, 5pm and 6pm hours

Fatalities by Day of Week . . .

	Stations & Crossings	Trespassers	Suicides
Monday	15%	5%	14%
Tuesday	15%	16%	13%
Wednesday	8%	21%	14%
Thursday	20%	14%	13%
Friday	22%	14%	20%
Saturday	12%	12%	10%
Sunday	7%	19%	16%

Fatalities by Day of Week. . .

- Surprising consistency across the week
- Trespassing fatalities do not increase on the weekend (of course, there are less trains)
- Perhaps some increase in suicides on a Friday



Spatial Analysis

Fatalities by Route Type and Train . . .

Metra Routes (217 fatalities, 83%)	Amtrak Train	20
	Freight Train	44
	Metra Train	153
Non-Metra Routes (43 Fatalities, 17%)	Amtrak Train	6
	Freight Train	37

Three Categories of Pedestrians . . .

- Suicides (**light blue** marker)
- Non-suicides at stations and crossings (**red** marker with a cross)
- Non-suicides not at stations or crossings – “trespassers” (**yellow** marker with a star)

Location of six trespassing cases could not be accurately determined

Demonstration of *Google Earth* data and capabilities



Numerical Spatial Analysis

Annual Fatality Risk per Million Population

County	Stations/ Crossings	Trespassers	Suicides	Total
DuPage	0.6	1.6	5.1	7.3
Lake	1.0	1.2	4.3	6.5
Suburban Cook	1.6	1.7	2.2	5.5
McHenry	1.4	0.9	2.8	5.1
City of Chicago	0.9	1.5	0.6	3.0
Will	0.0	0.8	1.5	2.3
Kane	0.6	0.3	0.8	1.7
<i>Average</i>	<i>1.0</i>	<i>1.4</i>	<i>2.0</i>	<i>4.5</i>



Risk by Metra Route ...

- Annual risk per million population in communities route passes through (2010 Census)
- Calculated based on fatalities and population in the suburbs, and excludes the City of Chicago

	Stations / Crossings	Trespassers	Suicides	Total
Milwaukee - North	2.7	2.2	6.5	11.4
UP - West	0.7	2.4	6.9	10.1
UP - Northwest	1.8	1.2	6.7	9.7
Milwaukee - West	1.9	1.1	5.3	8.3
BNSF	2.2	2.0	2.2	6.3
Rock Island	1.3	1.3	3.1	5.8
South West Service	0.7	2.0	1.4	4.1
UP - North	0.8	0.4	2.4	3.7
Heritage Corridor	0.0	1.1	1.1	2.2
North Central Service	0.7	0.4	1.1	2.1
Metra Electric	0.0	0.7	0.0	0.7
NICTD – South Shore	0.0	0.0	0.0	0.0

	Per capita risk	Av. Tracks	Av. Daily Trains	Metra	Amtrak	Freight
Milwaukee - North	11.4	1.6	87	56%	18%	25%
UP - West	10.1	2.9	97	49%	0%	51%
UP - Northwest	9.7	2.4	57	91%	0%	9%
Milwaukee - West	8.3	2.2	63	75%	0%	25%
BNSF	6.3	3.3	134	55%	6%	39%
Rock Island	5.8	2.1	78	69%	0%	31%
South West Service	4.1	1.7	29	76%	0%	24%
UP - North	3.7	2.1	59	95%	0%	5%
Heritage Corridor	2.2	2.0	20	20%	50%	30%
North Central Service	2.1	1.9	38	42%	0%	58%
Metra Electric	0.7	4.6	153	95%	4%	1%
NICTD – South Shore	0.0	2.0	32	100%	0%	0%

Risk by Metra Route ...

- Adjust the annual risk per million population in communities route passes through (2010 Census) by the annual number of trains
- Multiply by a million for ease of display
- Remember this is based on fatalities and population in the suburbs, and excludes the City of Chicago

Risk Rating	Stations/ Crossings	Trespass	Suicide	Total	Av. Tracks	Non- Metra
UP - Northwest	88	58	322	468	2.4	9%
South West Service	64	192	128	383	1.7	24%
Milwaukee - North	85	68	205	359	1.6	44%
Milwaukee - West	81	49	228	358	2.2	25%
Heritage Corridor	0	145	145	291	2.0	80%
UP - West	20	69	197	285	2.9	51%
Rock Island	47	47	110	205	2.1	31%
UP - North	38	19	113	169	2.1	5%
North Central Service	51	26	77	153	1.9	58%
BNSF	45	40	45	129	3.3	45%
Metra Electric	0	13	0	13	4.6	5%
NICTD – South Shore	0	0	0	0	2.0	0%

Top 10 Riskiest Communities . . .

10,000 + population and 3 or more fatalities

	City	Annual Risk per 10,000 population	Stations / Crossings	Trespassers	Suicides	Total
1	Barrington	0.83	0	0	6	6
2	La Grange	0.55	2	2	2	6
3	Villa Park	0.46	1	2	4	7
4	Lake Forest	0.37	2	1	2	5
5	Franklin Park	0.31	0	1	3	4
6	Mokena	0.30	0	0	4	4
7	Chicago Ridge	0.30	0	2	1	3
8	Roselle	0.25	0	0	4	4
9	Round Lake	0.23	0	0	3	3
10	Bartlett	0.21	1	2	3	6

OL in Top 10 Riskiest Communities . . .

10,000 + population and 3 or more fatalities

Risk rank	City	Annual Risk per 10,000 population	Annual OL Audience per 10,000 population	Rank among 98 Metra communities with population > 10,000
1	Barrington	0.83	1,267	2
2	La Grange	0.55	814	9
3	Villa Park	0.46	1,115	3
4	Lake Forest	0.37	509	18
5	Franklin Park	0.31	1,349	1
6	Mokena	0.30	343	38
7	Chicago Ridge	0.30	355	36
8	Roselle	0.25	284	47
9	Round Lake	0.23	214	61
10	Bartlett	0.21	148	73

Analysis by Suburban Municipality ...

- Correlations for 137 suburban municipalities that have a Metra route pass through them
- Look at correlations with annual fatality risk per 10,000 population
- We have data on the number of *Operation Lifesaver* presentations and events 2004-10 and the number of attendees



Correlations for 137 Suburban Municipalities ...

	Annual Risk per 10,000 Residents		
	Stations / Crossings	Trespassing	Suicides
Annual OL Audience per 10,000 Residents	0.36	-0.02	0.31
Population Density	-0.07	0.11	-0.08
Average Household Income	0.15	-0.12	0.11

In Conclusion . . .

- Pedestrian fatalities dwarf motor vehicle fatalities (260 to 29)
- Suicides are at least 46% of the total
- Victims are typically adults, not minors or seniors
- Geographically, incidents do not seem to be random



Contact Information . . .

- ipsavage@northwestern.edu
- (847) 491-8241
- Read my rail safety papers at:
<http://faculty.wcas.northwestern.edu/~ipsavage/rail.html>