

Pedestrian/Auto Collisions

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May 8, 2018

Pedestrian/Automobile Incidents in Harris County

Based on the TxDOT data from 2010 to 2017, I have analyzed incidents where pedestrians got hit by cars. First we will begin with some general statistics, and then bore down to some more specific items.

CDC Data

From the website for the Centers for Disease Control, we have the following information regarding Pedestrian incidents:

Who is most at risk?

Older adults

Pedestrians ages 65 and older accounted for 19% of all pedestrian deaths and an estimated 13% of all pedestrians injured in 2015.

Children

In 2015, one in every five children under the age of 15 who were killed in traffic crashes were pedestrians.

Drivers and pedestrians who are alcohol-impaired

Almost half (48%) of crashes that resulted in pedestrian deaths involved alcohol for the driver or the pedestrian. One in every three (34%) of fatal pedestrian crashes involved a pedestrian with a blood alcohol concentration (BAC) of at least 0.08 grams per deciliter (g/dL) and 15% involved a driver with a BAC of at least 0.08 g/dL.

Additional Risk Factors

Additionally, higher vehicle speeds increase both the likelihood of a pedestrian being struck by a car and the severity of injury.

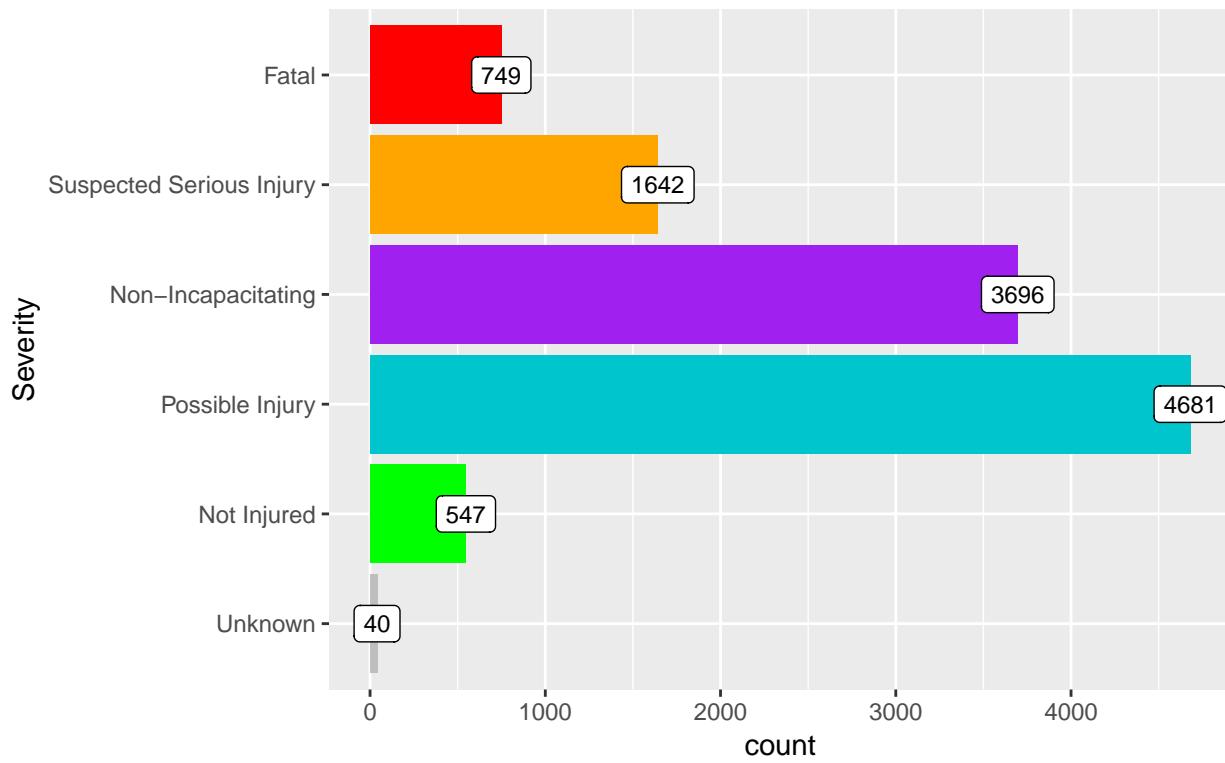
Most pedestrian deaths occur in urban areas, non-intersection locations, and at night.

Injury Distribution

The state has six categories of injury (if we include “Unknown”). Somewhat surprisingly, there are about 100 pedestrian fatalities per year in the county. And about 3 incidents per day, on average.

It is important to keep in mind that there is almost certainly heavy reporting bias in these numbers. Every fatality and serious injury will likely get reported. Minor injuries may escape being reporting, and non-injury incidents are probably not reported most of the time.

Pedestrian/Auto Collisions in Harris County, 2010–2017



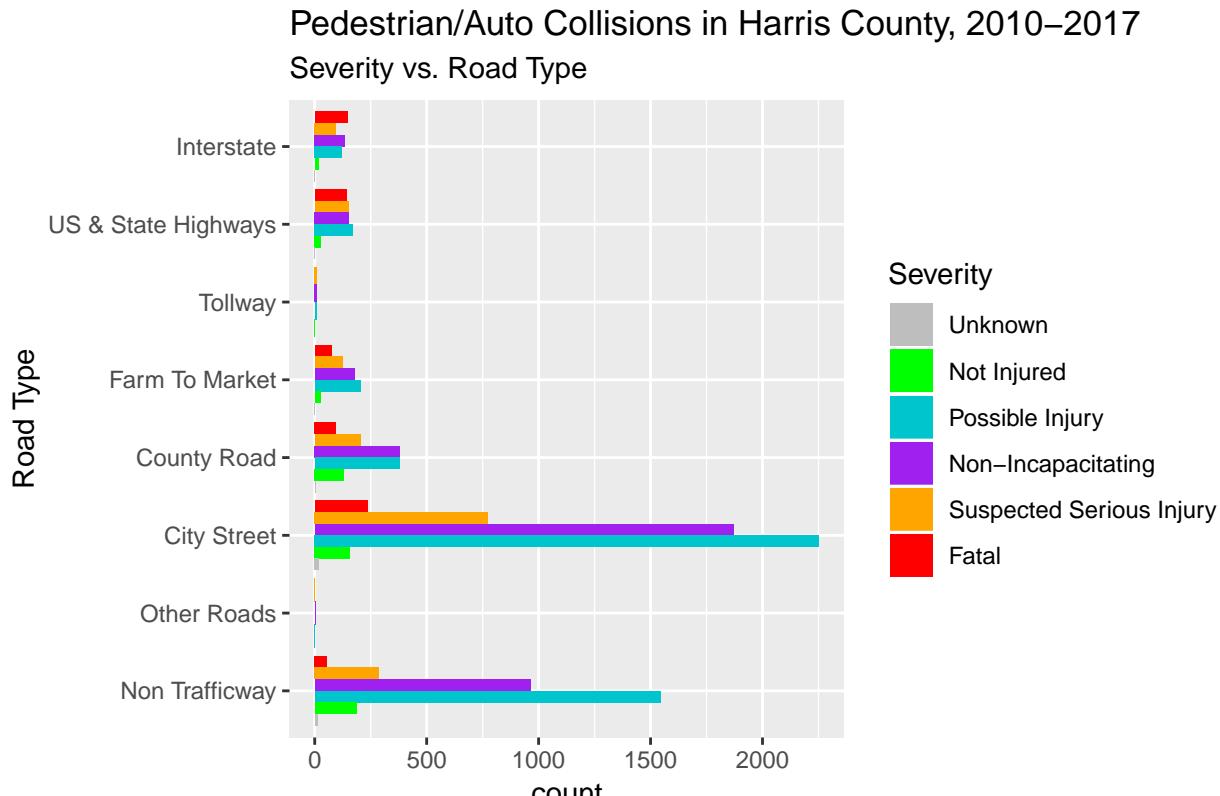
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Injuries as a function of road type

It seems obvious that if you get hit on the freeway, you are more likely to die, but let's test that hypothesis, just to be sure.

As the plot indicates, injuries on a highway are much more likely to be fatal, but most collisions occur on city streets.

But what the heck is this “non trafficway” category of road? I think it must mostly be parking lots, with a few driveways thrown in.



Data issues

The data is not perfect, there are a few issues. Not all of the locations make sense, and so cannot be linked to a latitude and longitude location, limiting the analysis to a degree. Only 70.5% of the data is geocoded.

City Streets and Pedestrians

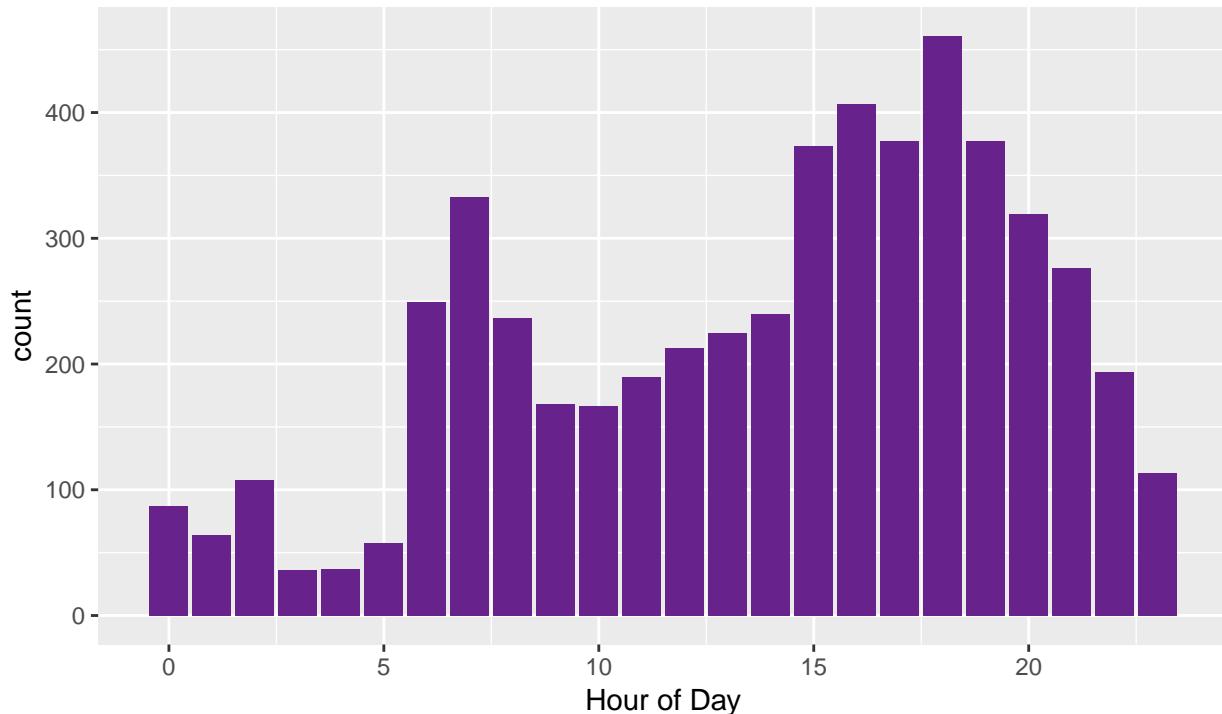
My primary interest is looking at city streets, to see where there may be hotspots, and to try to predict which spots are most likely to see a fatality or serious injury. So for now, I will restrict analysis to “City Streets”.

Let’s consider what time of day these incidents occur. I have heard it proposed that many incidents may be due to bars letting out and people wandering into the road in an impaired state. Or perhaps the driver is impaired.

Doesn’t look like impairment is a major factor. It appears that the incidents peak during rush hour. Well, there is a minor peak at 2 AM when the bars close. And an intriguing jump at 3 PM. Is that related to school letting out? I’ll have to look at that later.

Pedestrian/Auto Collisions, Houston City Streets, 2010–2017

Hour of Day

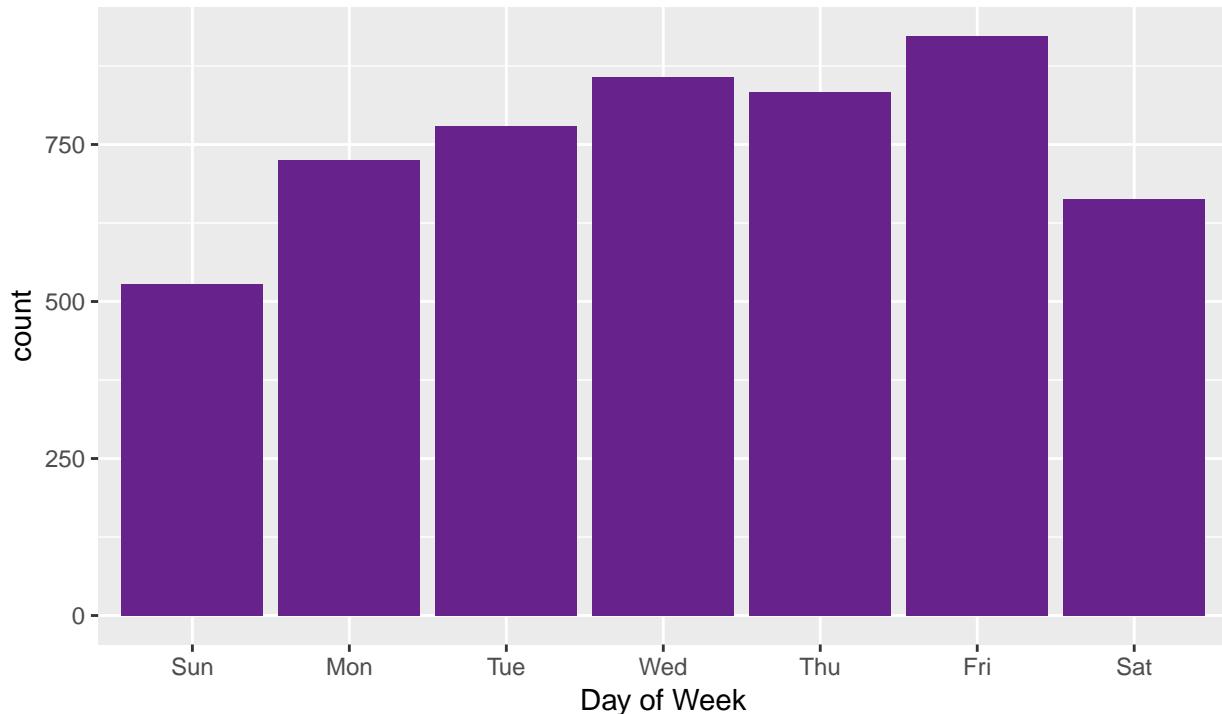


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Day of Week

How about day of the week? Not surprisingly, Sunday is the low day, and Saturday is rather low as well. Friday is the most dangerous day. Is that due to everyone being in a hurry? Drinking? Something else? Later we'll examine the weekend effect with respect to location. Perhaps the drop represents not many people downtown on the weekend?

Pedestrian/Auto Collisions, Houston City Streets, 2010–2017 Day of Week



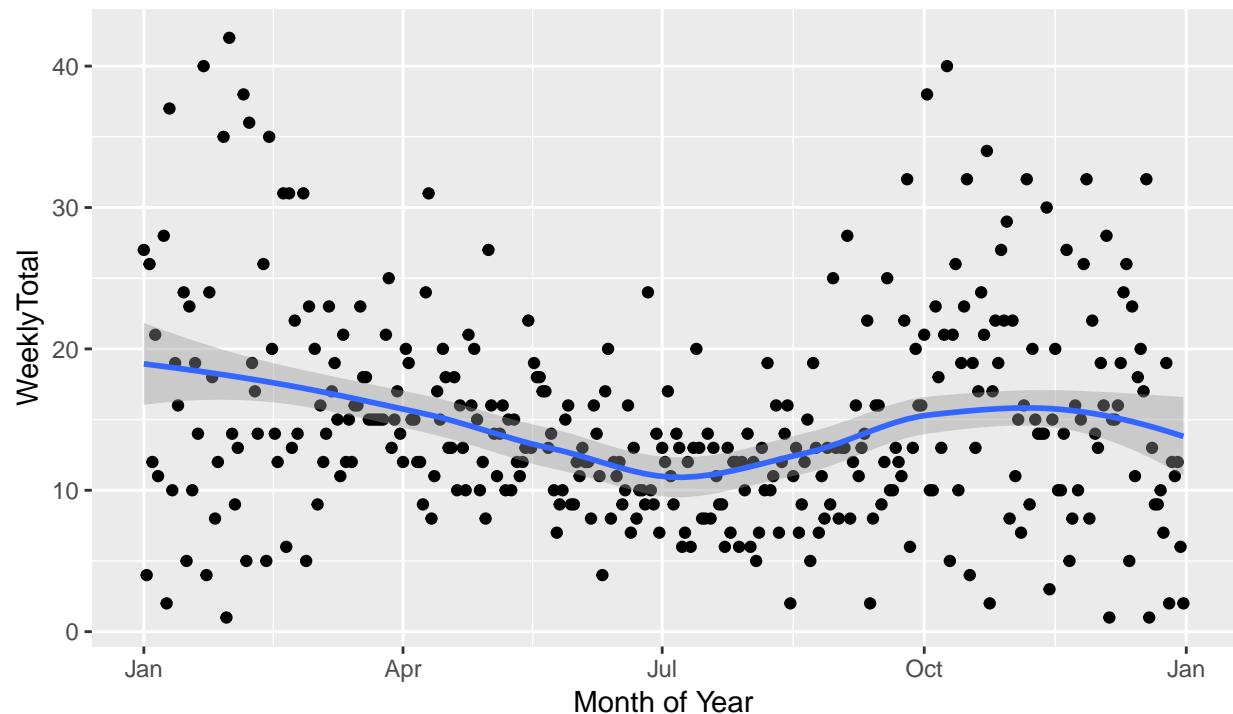
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Time of Year

There is a strong indication that there are fewer incidents during the summer than other times. Is that related to school being out? People on vacation? Maybe drivers are mellower during the summer? Certainly life is less hectic for commuters with kids - and the hours that people commute tend to change a bit with the season. But the large week-to-week scatter outside summer is puzzling. I have no idea what that means.

Pedestrian/Auto Collisions, Houston City Streets, 2010–2017

Month of Year

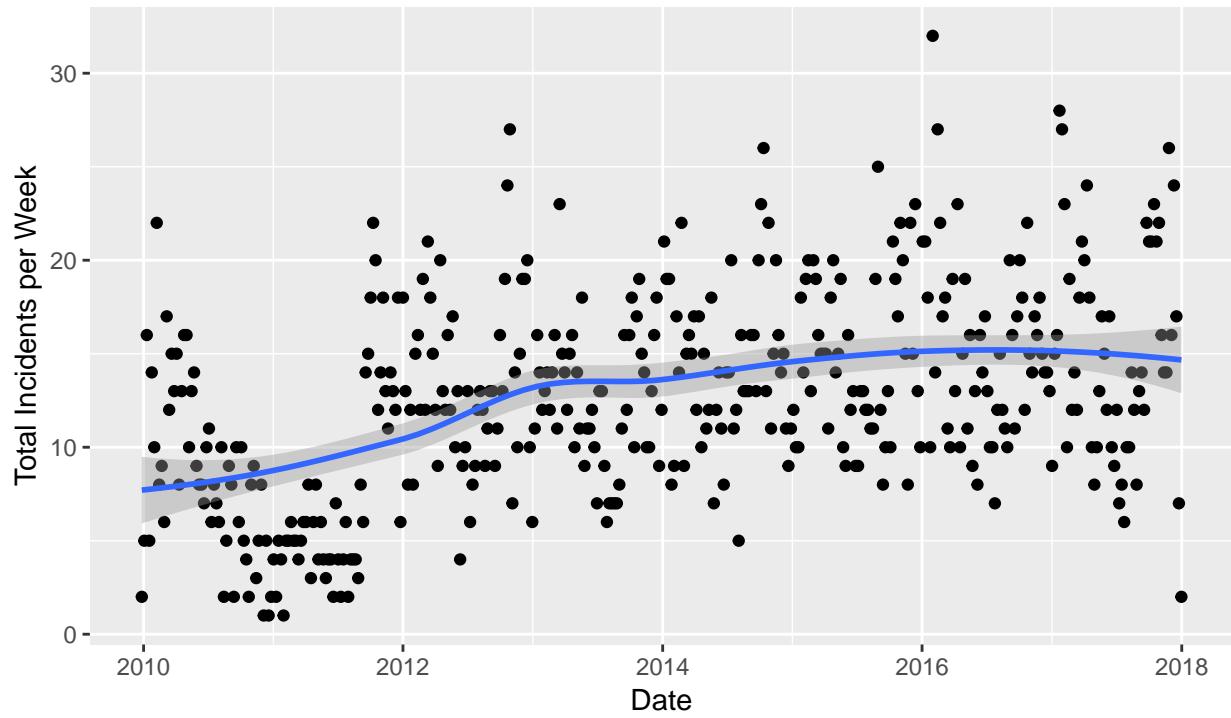


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Long-term trends - is it getting better?

Sadly, it appears that the rate has increased significantly since 2010, rising from around 10 incidents per week to 15 by 2013. The good news is that it appears that the rate has leveled off since then, but no discernable improvement.

Pedestrian/Auto Collisions, Houston City Streets, 2010–2017 Weekly Totals



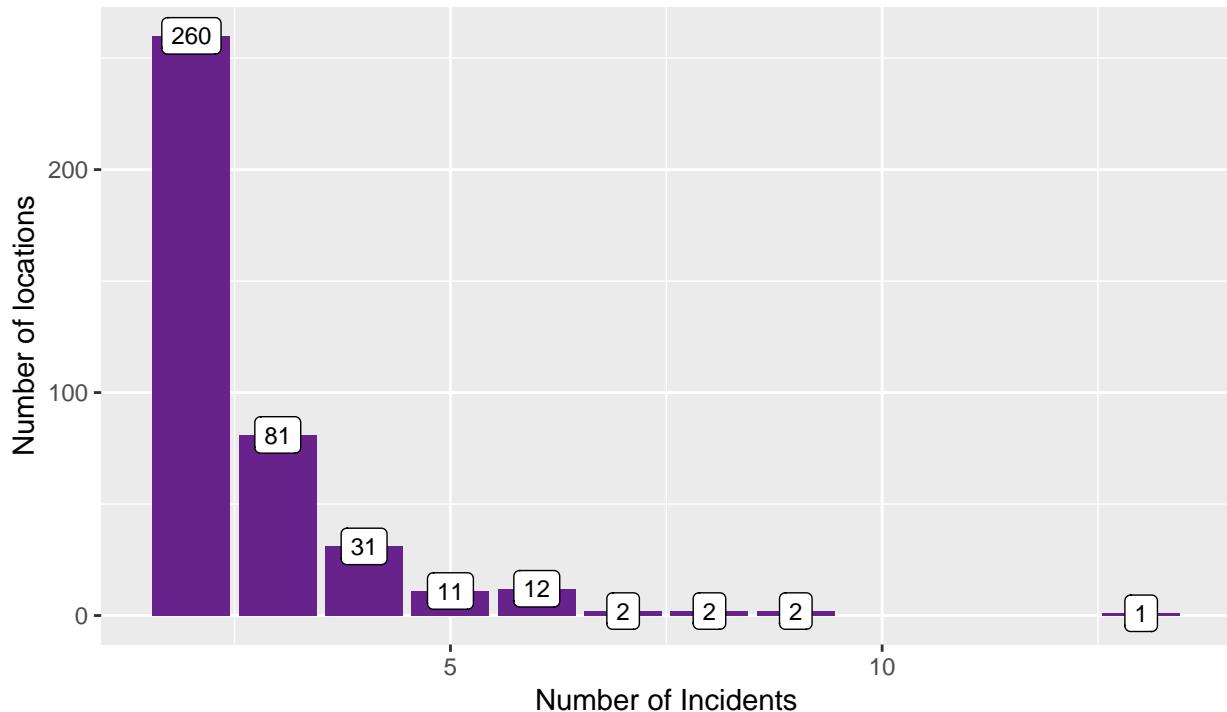
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Where are the worst spots for number of incidents?

The worst is a location that has racked up 13 incidents in 7 years - about one incident every 6 months. 260 locations have seen two incidents, 81 locations have seen three. If one were looking for a way to prioritize work, this might be a good start.

Pedestrian/Auto Collisions in Harris County, 2010–2017

Number of locations with more than one incident



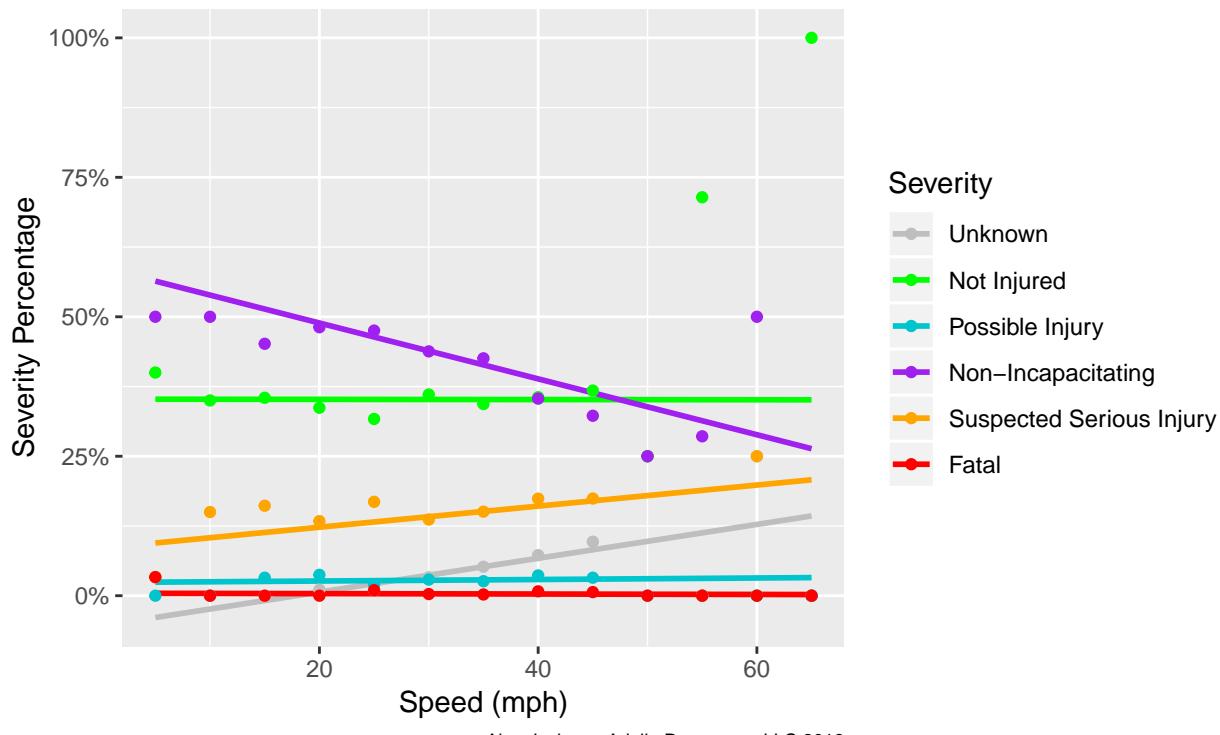
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What controls the Severity?

What controls how serious an incident turns out to be? Most probably the speed of the vehicle. So let's take a look at that.

Not as clear as one might think. Certainly serious injuries rise with speed, and slight (non-incapacitating) injuries fall, so that fits with expectations. But not injured stays flat - surprisingly. Fatal also is flat - but the numbers are so small that that may not be significant.

Pedestrian/Auto Collisions in Harris County, 2010–2017 Severity Percentage versus Speed, weighted fit



Does the number of incidents predict fatalities?

Do you prioritize improving locations where there has been a fatality? Or do you prioritize by number of incidents - even if none of them were serious. To get a handle on this, let's look at whether or not the number of incidents is related to the number of serious incidents.

Looks pretty ambiguous to me. Note that for greater than about 6 incidents, the statistics are pretty poor, as this table illustrates.

incidents_per_location

total_incidents

1

1

4151

2

2

520

3

3

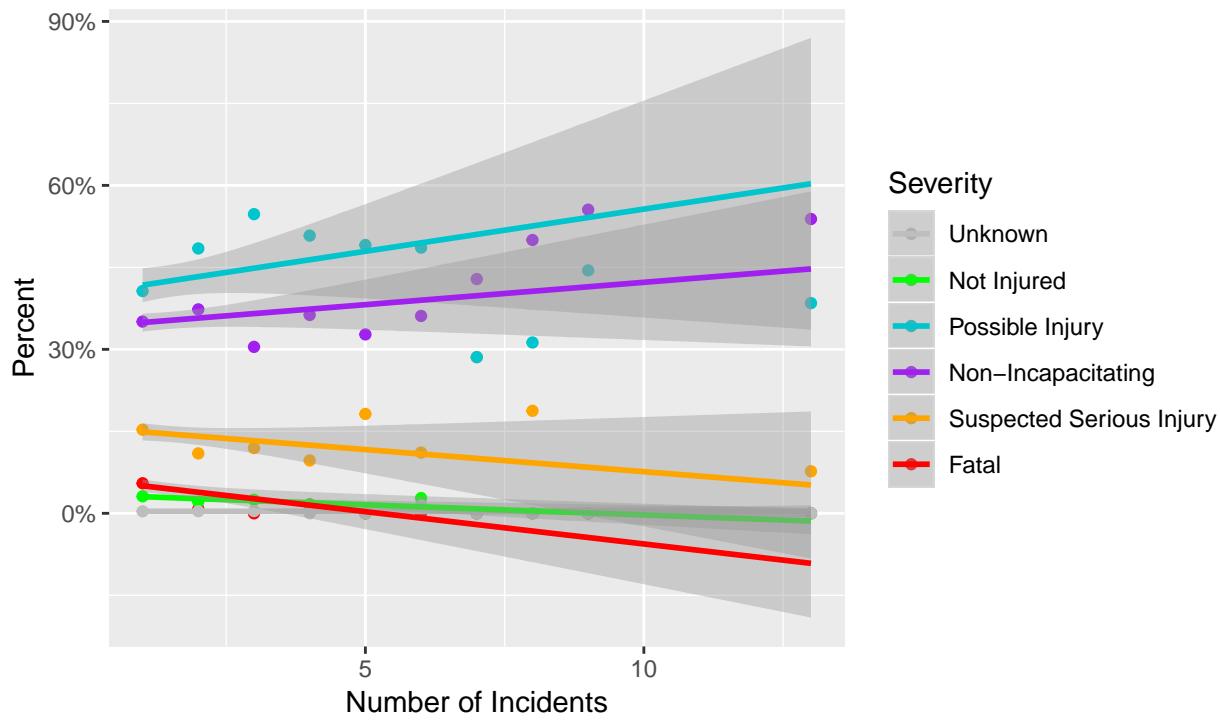
243

4

4
124
5
5
55
6
6
72
7
7
14
8
8
16
9
9
18
10
13
13

Pedestrian/Auto Collisions, Houston City Streets, 2010–2017

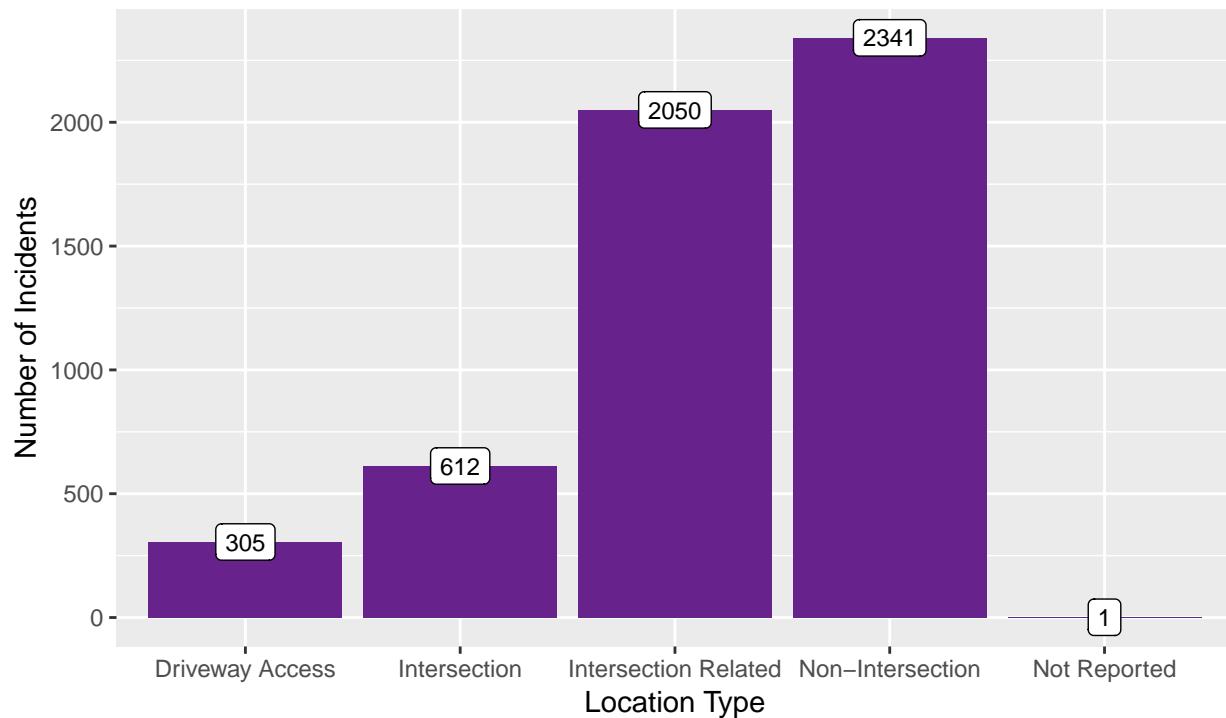
Severity fraction vs. number of incidents – how dangerous is a given spot?



What about Jaywalking?

Is there a pattern related to where the incident took place? At an intersection, or somewhere else? Generally, pedestrians are supposed to cross streets at corners - perhaps that is a factor? It looks like nearly half of the incidents may be related to jaywalking! Now, that does not of necessity place blame on the victim. There are many locations which are far from an intersection, and due to poor design, pedestrians are encouraged by the design to cross where they should not.

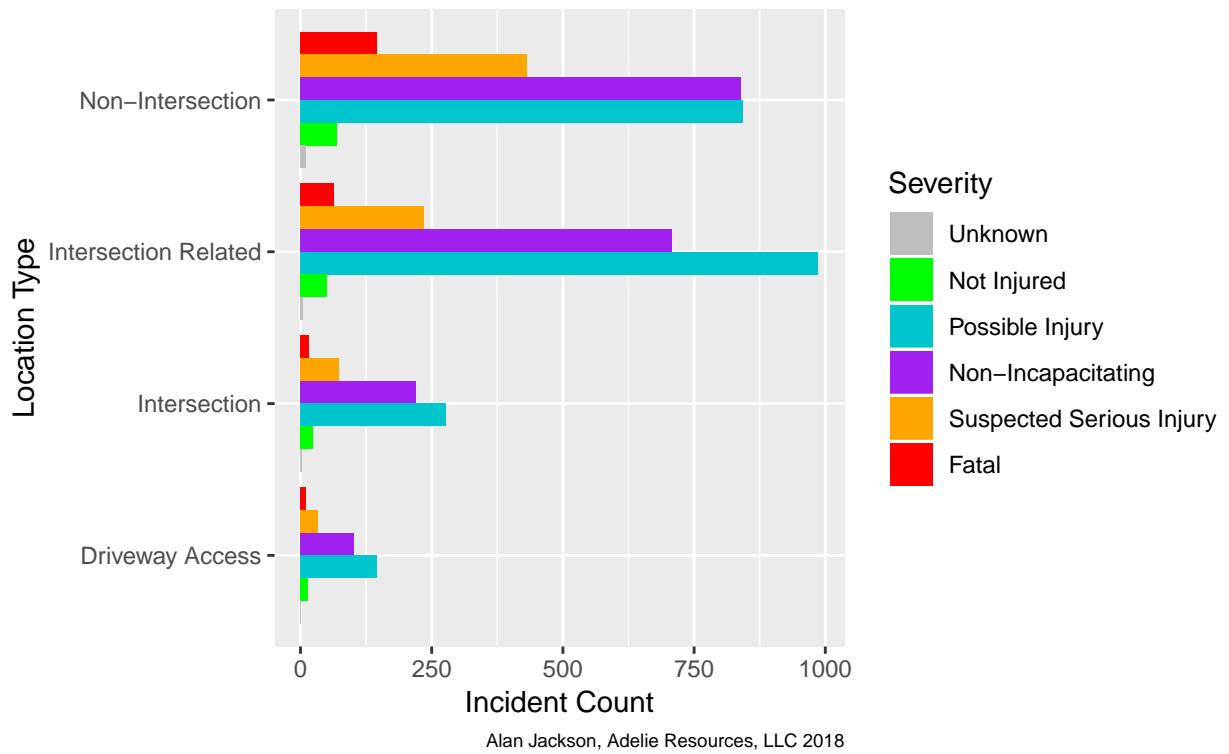
Pedestrian/Auto Collisions in Harris County, 2010–2017 Incidents Relative to Intersections



How does the type of crossing relate to the injury severity?

It looks bad to not cross at an intersection. Certainly away from an intersection an automobile is more likely to be traveling at the speed limit (or above), and also is not likely to expect to see a pedestrian.

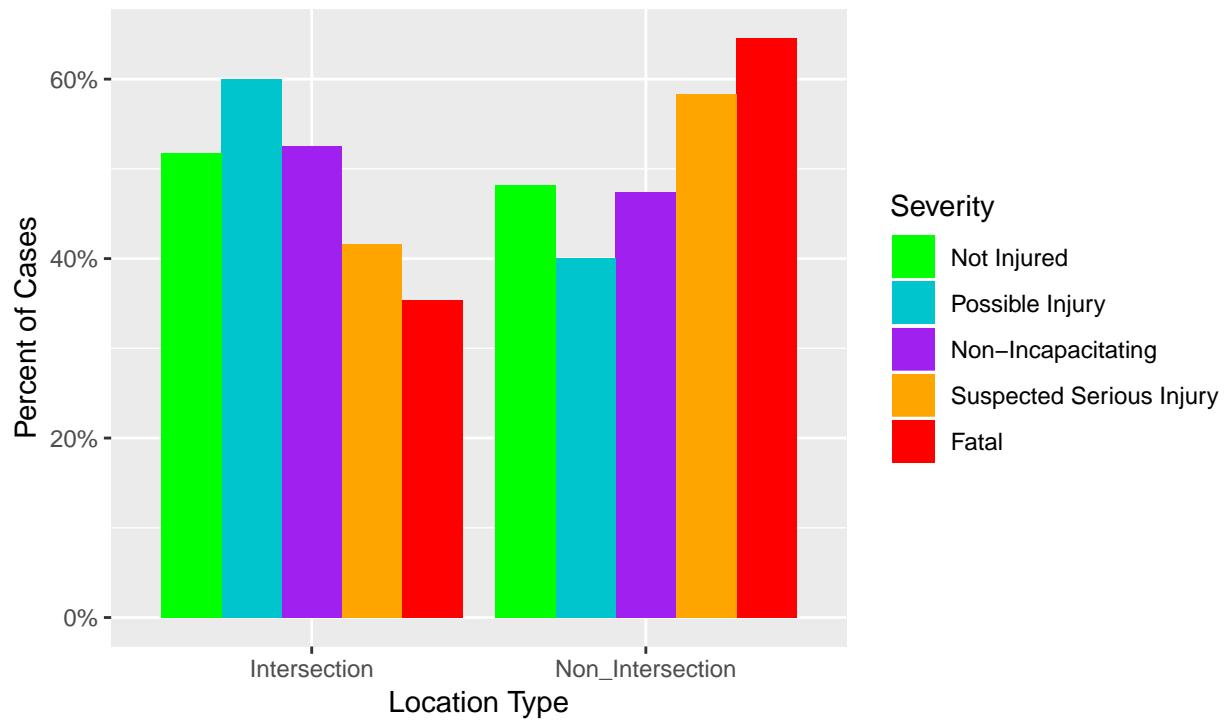
Pedestrian/Auto Collisions in Harris County, 2010–2017 Severity vs. Location Type



Another look at location type and injury severity

Here we see quite clearly - after consolidating “Intersection Related” and “Intersection” together - that not being at an intersection is much more dangerous. The likelihood of serious injury or death is about 50% greater at non-intersections.

Pedestrian/Auto Collisions in Harris County, 2010–2017 Severity vs. Location Type



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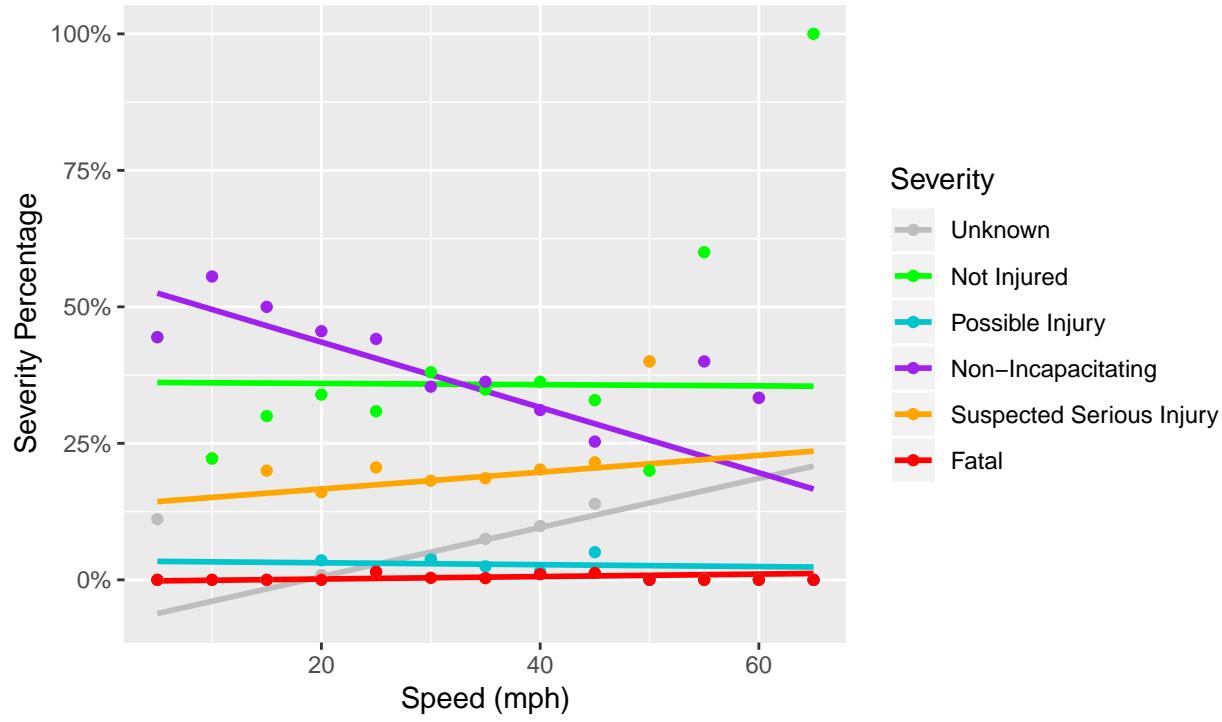
What about speed at non-intersections?

We saw that speed versus severity did not show a tremendously robust result, but perhaps if we look only at the non-intersection data. After all, near an intersection, cars will often be going much slower than the speed limit.

I see some effect, it does enhance the tradeoff between non-incapacitating injuries and serious injuries.

Pedestrian/Auto Collisions in Harris County, 2010–2017

Severity Percentage versus Speed, weighted fit, Non-Intersection locations only

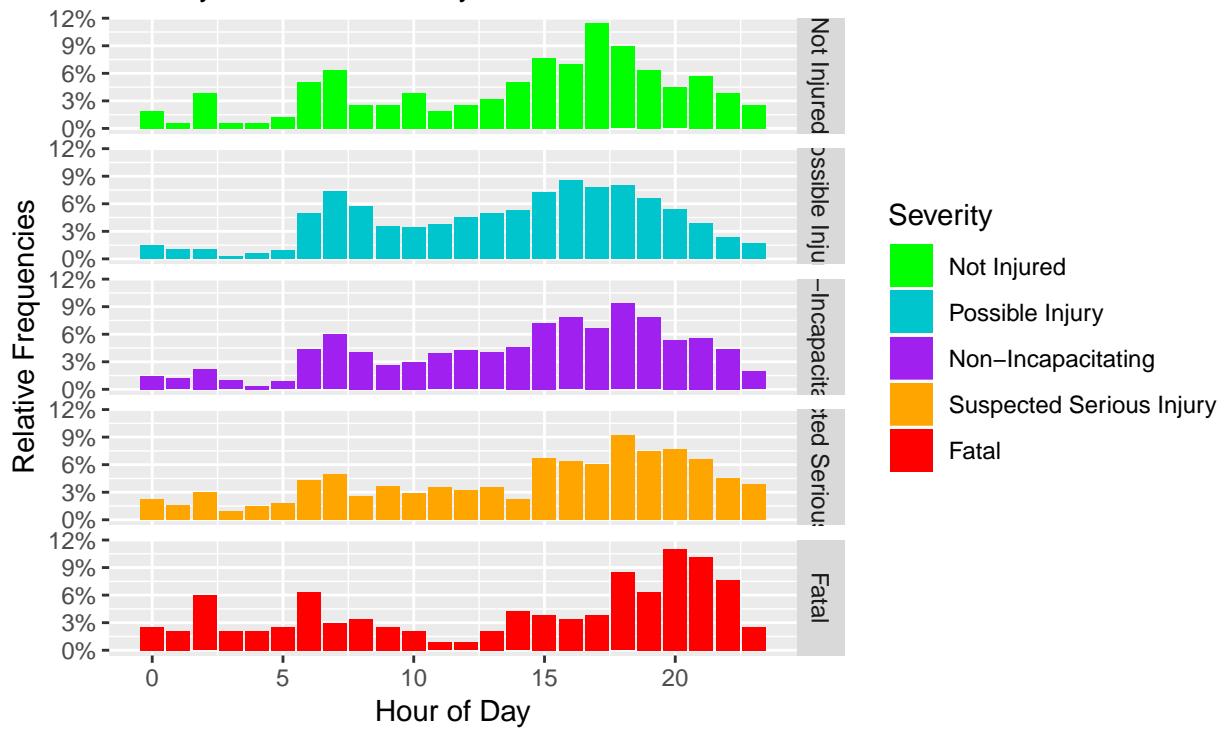


Subset exploration - Injury vs. Time of Day

It appears that less serious injuries largely occur during rush hour - 6-8 AM and 3-7 PM - while serious injuries and fatalities tend to occur later in the day, more like 6-10 PM. Is the interesting peak in fatalities at 6 AM due to less traffic, so cars can travel faster at that hour than later in the day?

Pedestrian/Auto Collisions in Harris County, 2010–2017

Severity versus Time of Day



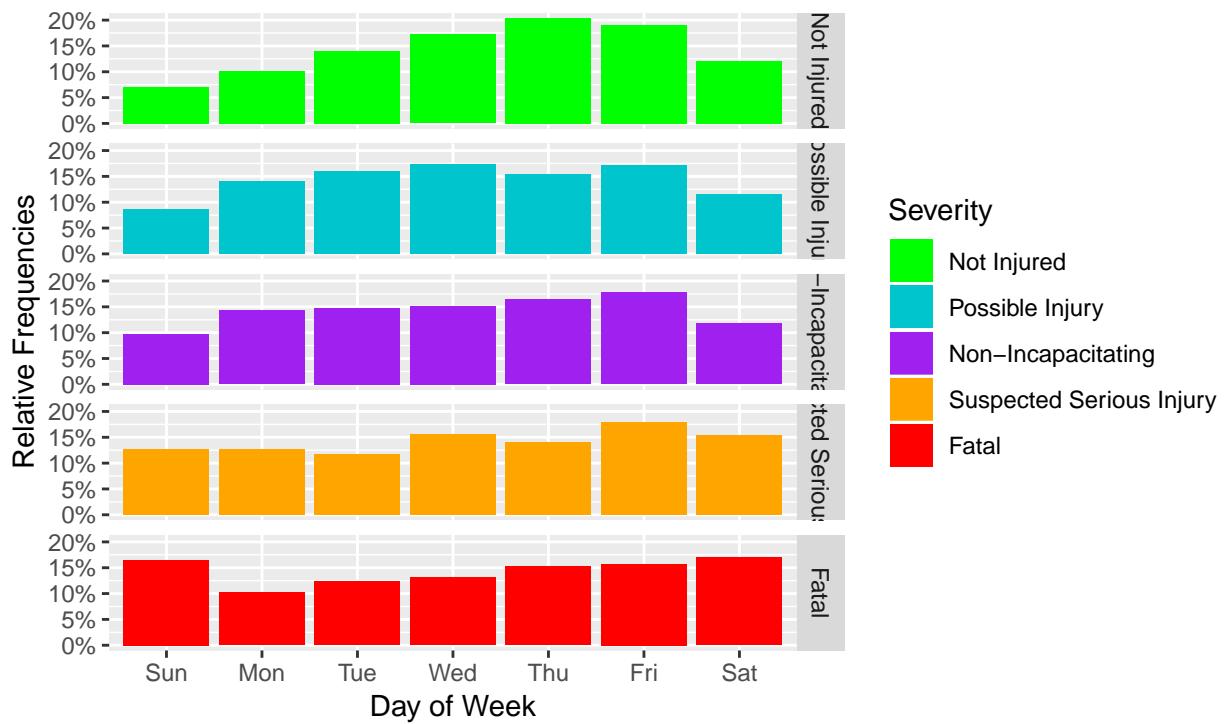
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Subset exploration - Injury vs. Day of Week

All of the injury categories mirror each other, showing lower values on the weekend and higher values during the week. Except fatalities. There the pattern is reversed, with the largest percentages being on Saturday and Sunday. Is that due to the 2 AM spike?

Pedestrian/Auto Collisions in Harris County, 2010–2017

Severity versus Day of Week



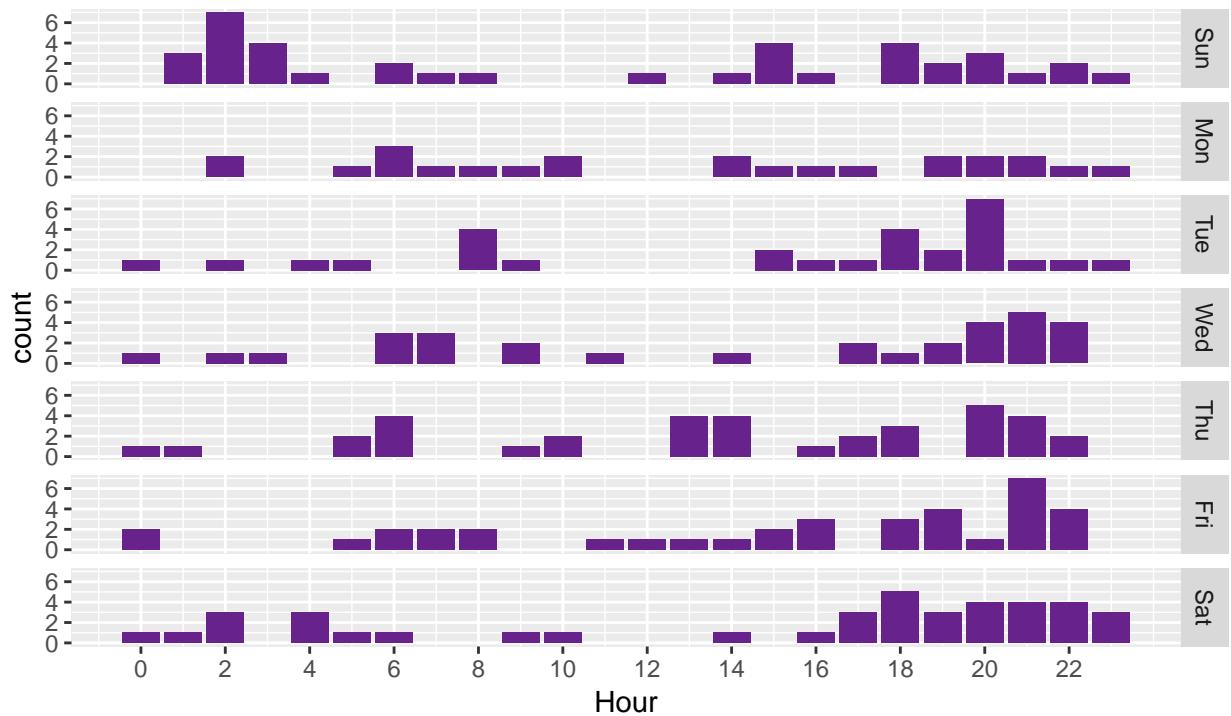
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Exploration of Fatalities by Day and Hour

The numbers are getting small, so the statistics are getting suspect, but it does appear tha the Sunday spike in fatalities is dominated by the early hours - Saturday night really. The Saturday spike has a small increase at 2 AM, but also a significant late night component. I would guess that alcohol is involved - either for the driver or the pedestrian, or both.

Pedestrian/Auto Collisions, Houston City Streets, 2010–2017

Fatalities, Day and Hour



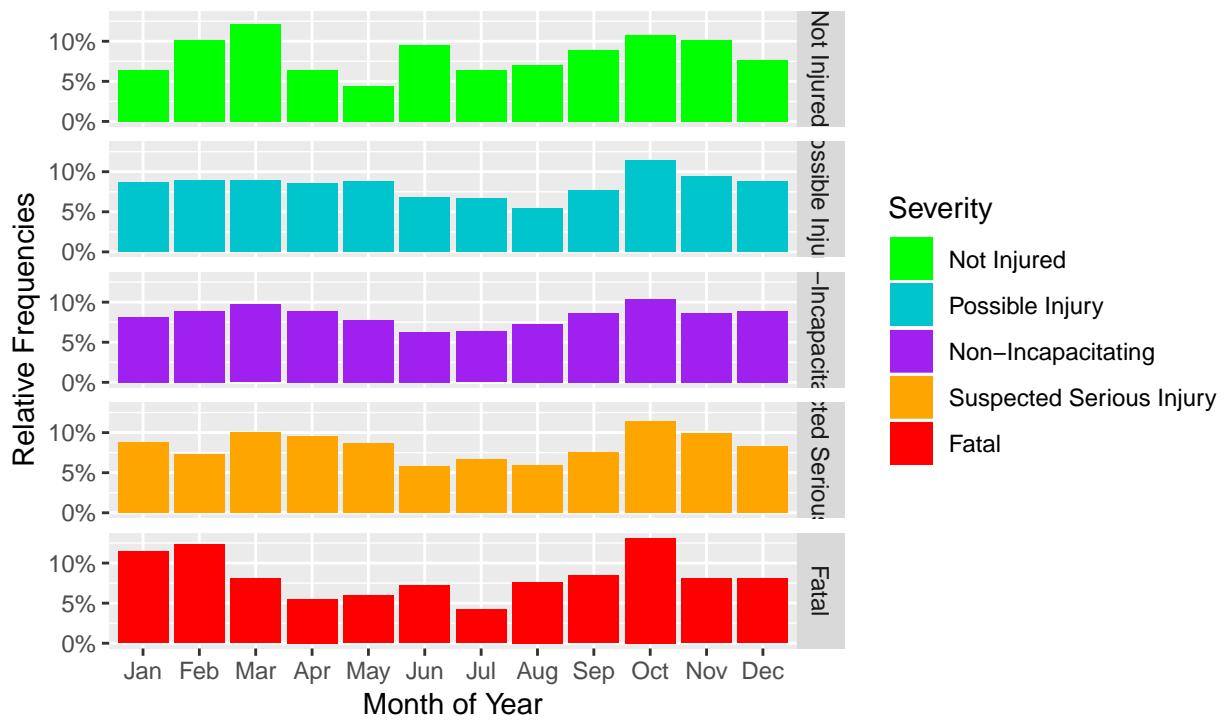
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Subset exploration - Injury vs. Month of Year

All of the injury categories mirror each other, showing lower values in the summer and higher values in the spring and fall. Death takes a holiday? This may be a measurement of more pedestrians on the streets during good weather. It may in part also be due to school children not walking to school in the summer. In support of that hypothesis, December is also low.

Pedestrian/Auto Collisions in Harris County, 2010–2017

Severity versus Month of Year



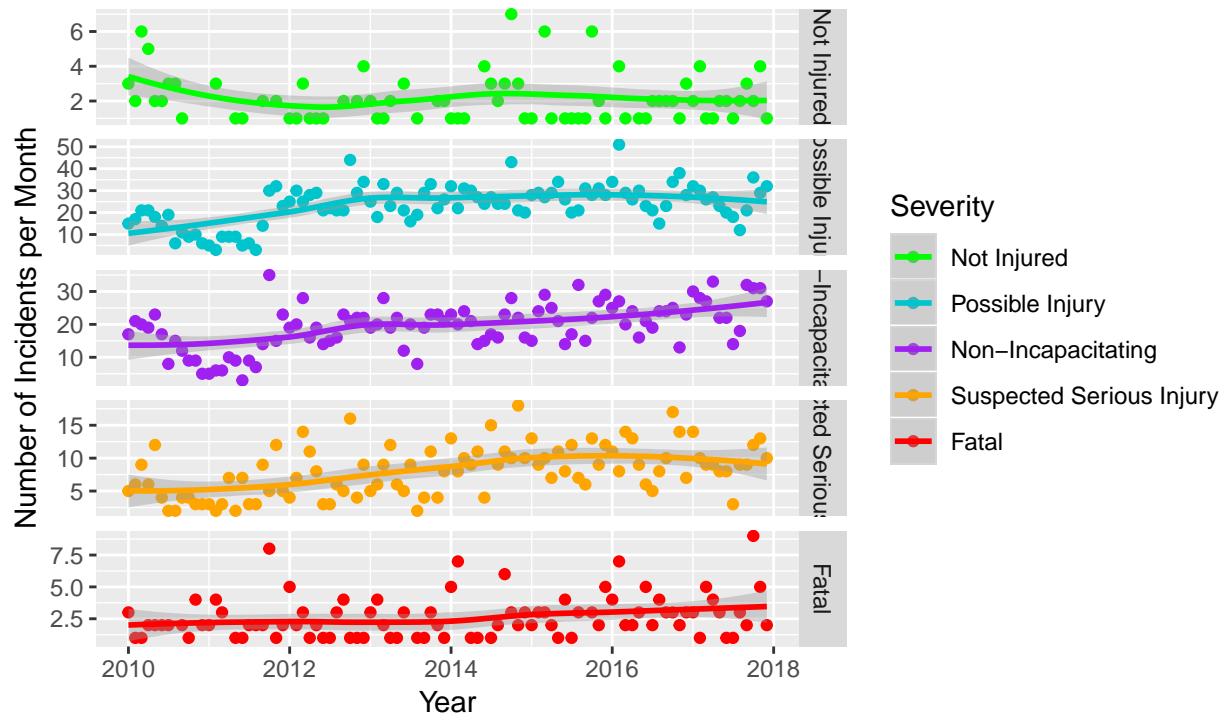
Subset exploration - Injury vs. Date

All of the injury categories mirror each other, showing an increase starting around 2012, and leveling off around 2013-2014, except for “not injured”, which shows no change. It would be interesting to compare with other cities - is this a national trend? Is it related to the economy?

According to the Governors Highway Safety Association, pedestrian fatalities have been rising since 2009, by 10%-20% per year nationwide. So Houston is not immune from this trend.

Pedestrian/Auto Collisions in Harris County, 2010–2017

Severity versus Date



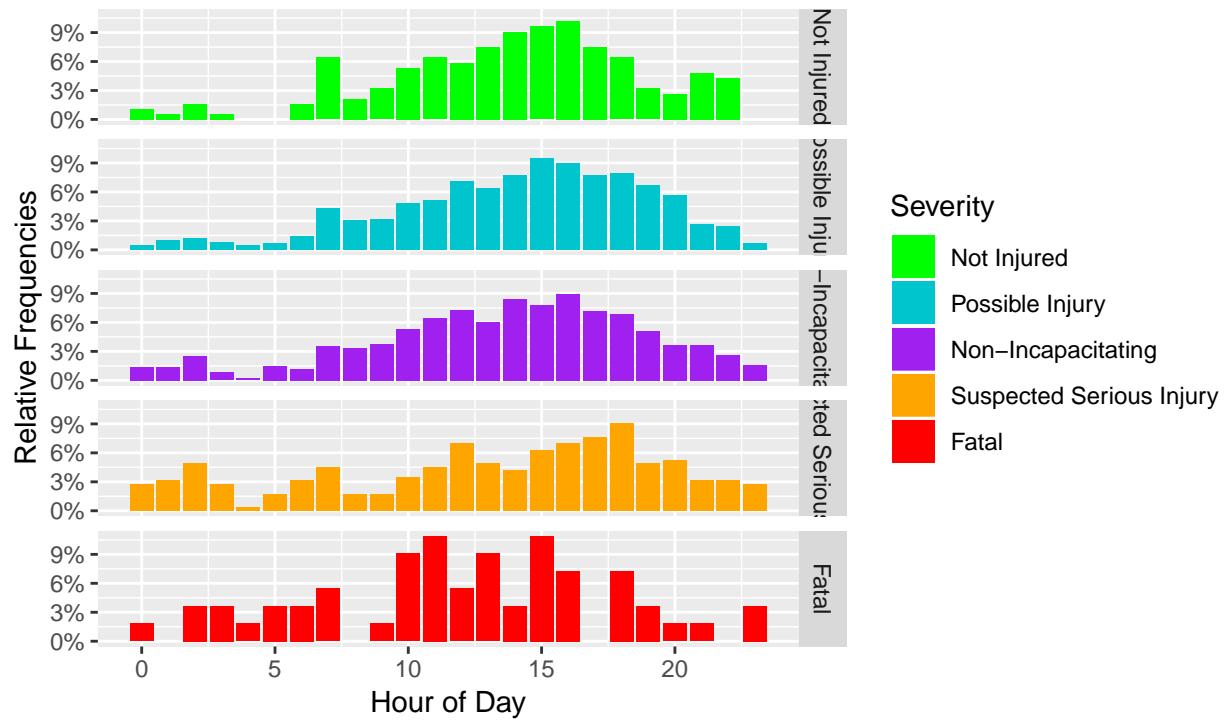
Brief Interlude to consider Parking Lots

Let's take a break from city streets to consider Non-Trafficways.

Non-Trafficways, Time of Day

Not surprisingly, parking lots are especially dangerous when most used - in the middle of the day.

Pedestrian/Auto Collisions in Harris County, 2010–2017 Non-Trafficway, Severity versus Time of Day

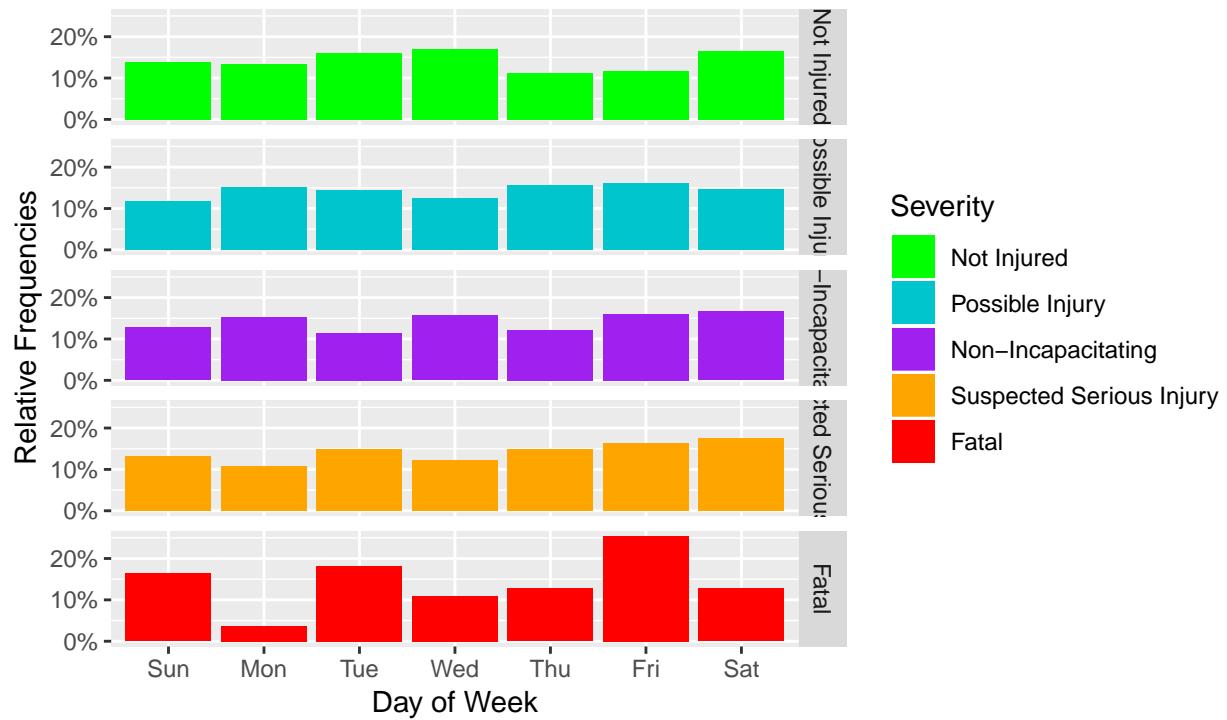


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Non-Trafficways, Day of Week

Hard to say that there is much dependence on day of week. Note that the numbers of fatalities are small, so for that row we may be seeing statistical fluctuation.

Pedestrian/Auto Collisions in Harris County, 2010–2017 Non-Trafficway, Severity versus Day of Week

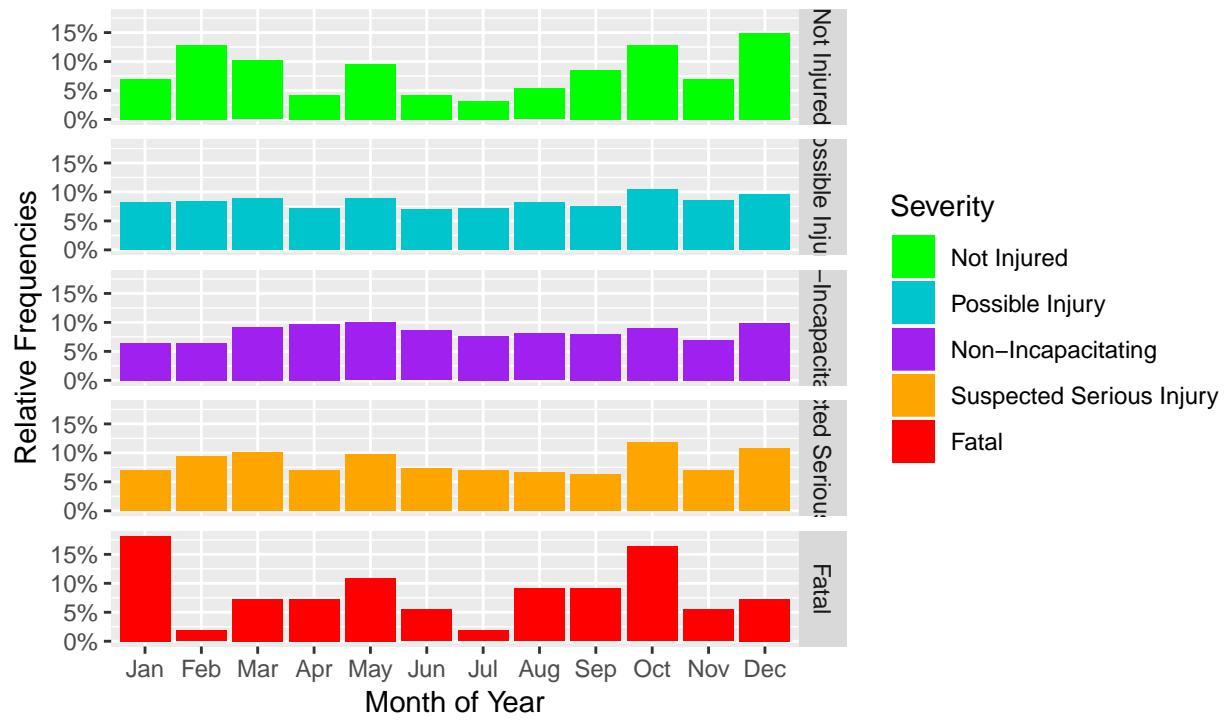


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Non-Trafficways, Month of Year

No obvious patterns to me.

Pedestrian/Auto Collisions in Harris County, 2010–2017 Non-Trafficway, Severity versus Month of Year

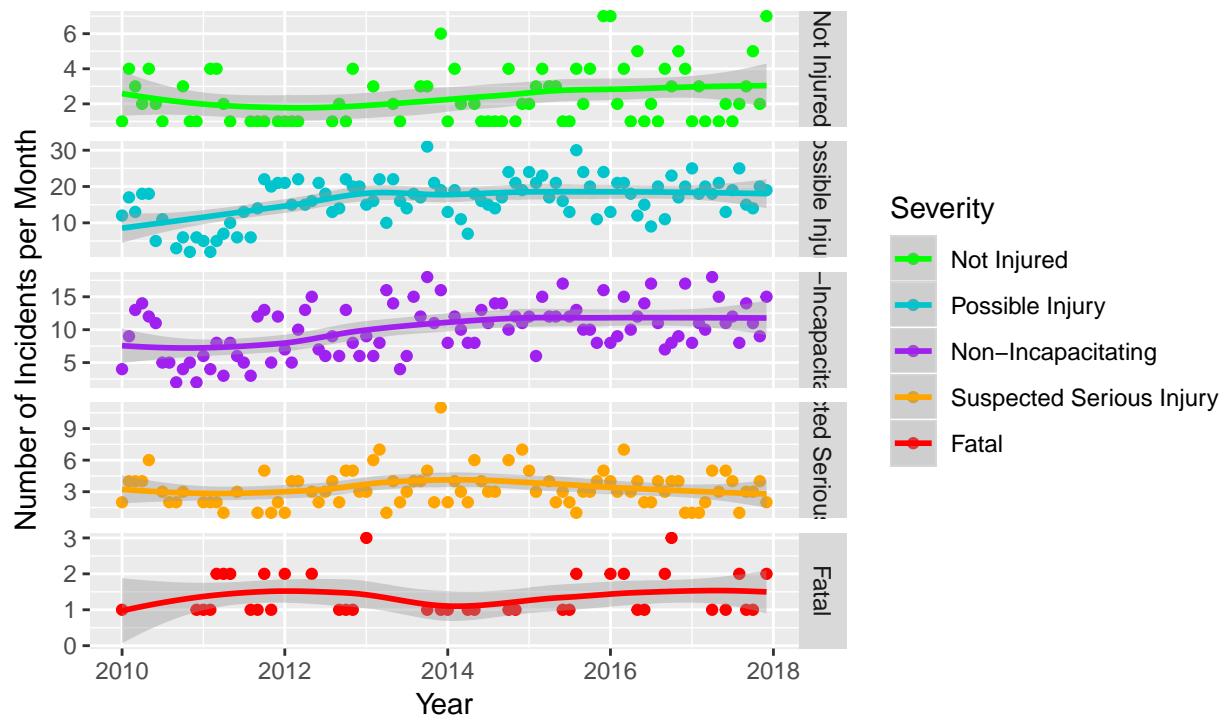


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Non-Trafficways, Date

Interestingly, we see the same trend in the non-trafficway data as in the city street data. Is this related to cell-phone distracted pedestrians? Improved economy? Hard to say.

Pedestrian/Auto Collisions in Harris County, 2010–2017 Non-Trafficway, Severity versus Date



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Where are most Incidents?

Bellaire and Westheimer look pretty dangerous. Especially since the Montrose entry is at the intersection with Westheimer.

Street

Total

1

FANNIN

8

2

WESTHEIMER

8

3

MCKINNEY

7

4

WESTHEIMER

7

5

RICHMOND

6

6

MONTROSE

6

7

ANTOINE

6

8

BELLAIRE

6

9

BELLAIRE

6

10

BISSONNET

6

11

SAN JACINTO

5

12

AIRLINE

5

13

BISSONNET

5

Maps

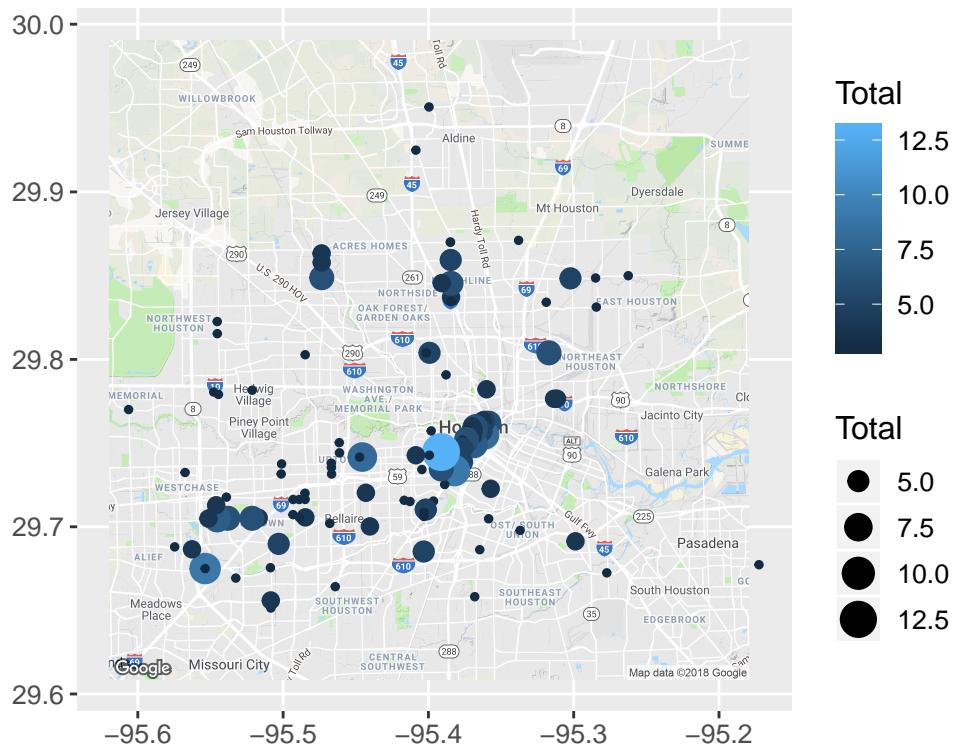
Let's make some maps.

If we plot all locations that had three or more incidents, we produce the map below. A Large concentration of incidents downtown - that's where all the pedestrians are - but also some of the largest values are outside of downtown.

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.8,-95.4&zoom=11&size=640x640&
```

Collisions 2010–2017

Three or more incidents only



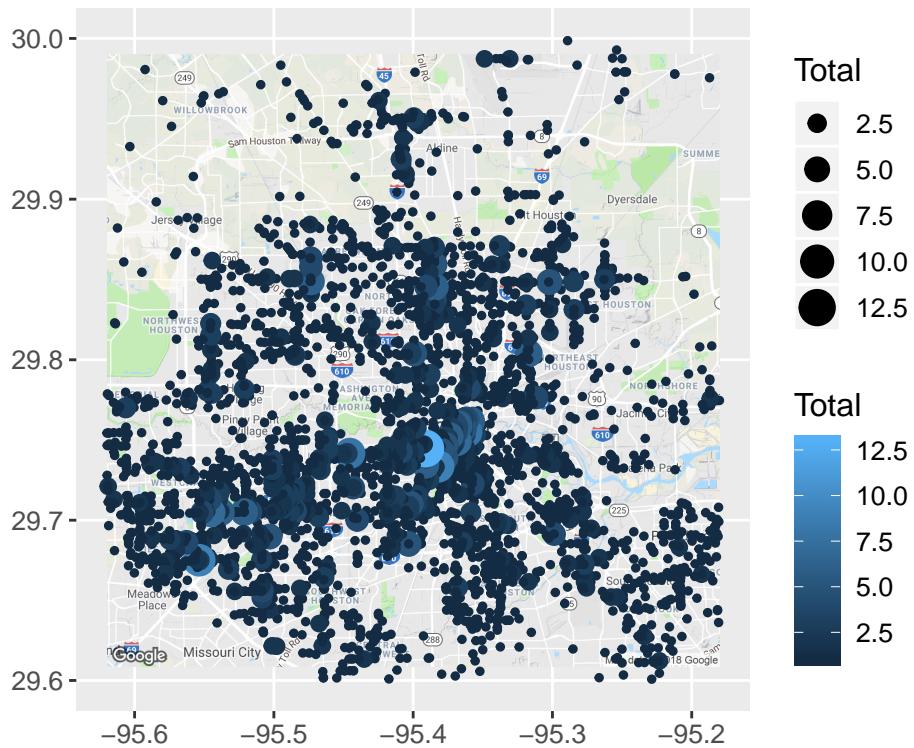
Serious Incidents only

Let's look at locations that had a fatality or serious injury.

Few obvious single locations pop out, however, a number of streets resemble a string of pearls, indicating that there are stretches of some streets that seem to be particularly dangerous. Perhaps there are too few controlled crossings? Perhaps there are businesses or other heavily trafficked buildings far from a crosswalk? Or maybe bus stops are poorly placed?

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## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.8,-95.4&zoom=11&size=640x640&
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Collisions 2010–2017 Fatal or Serious Only



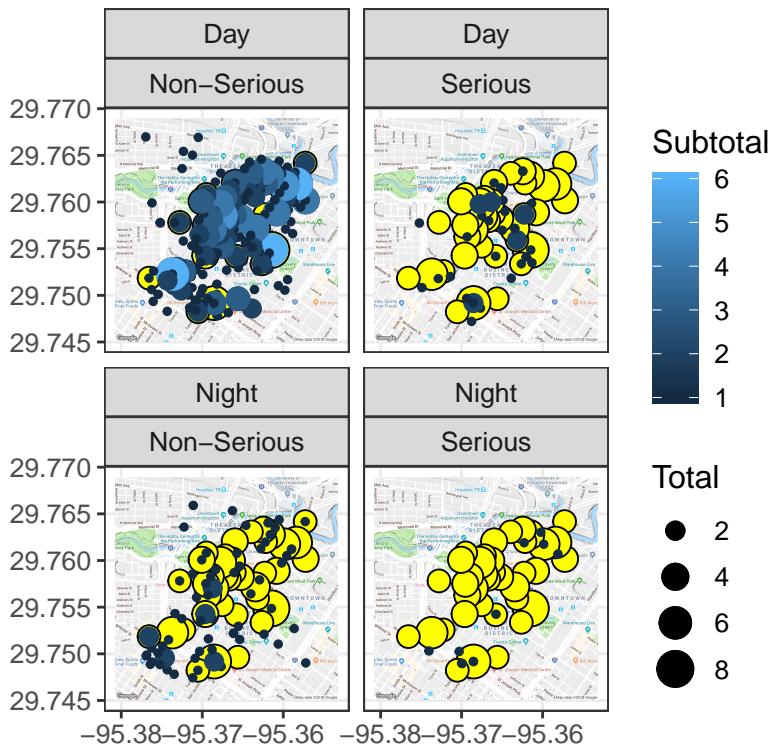
Downtown

Not surprisingly, almost all incidents downtown occur during the day. St. Joseph Parkway, especially at San Jacinto, seems to be a bad spot. Smith around Tranquility Park, and a block away, Rusk at Louisiana is a bad spot.

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## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.757,-95.367&zoom=15&size=640x640
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Pedestrian Collisions Downtown 2010–2017

Yellow for total incidents of 3 or more, blue for subset by time and



Montrose/Midtown

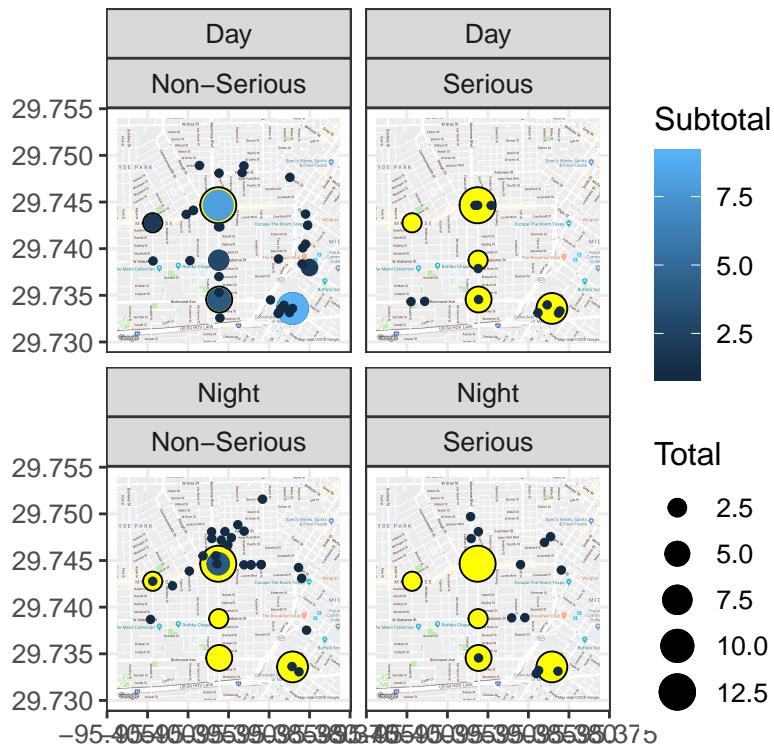
Montrose receives the record for most incidents at a single location. The intersection of Montrose Blvd and Westheimer has seen 13 incidents - most not serious, but with that number of incidents reported, it seems like only a matter of time.

Montrose itself in this area seems to have a string of incidents almost every block. Runner-up on this map, Montrose at Richmond, with 8 incidents.

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.742,-95.39&zoom=15&size=640x640
```

Pedestrian Collisions Midtown 2010–2017

Yellow for total incidents of 3 or more, blue for subset by time and



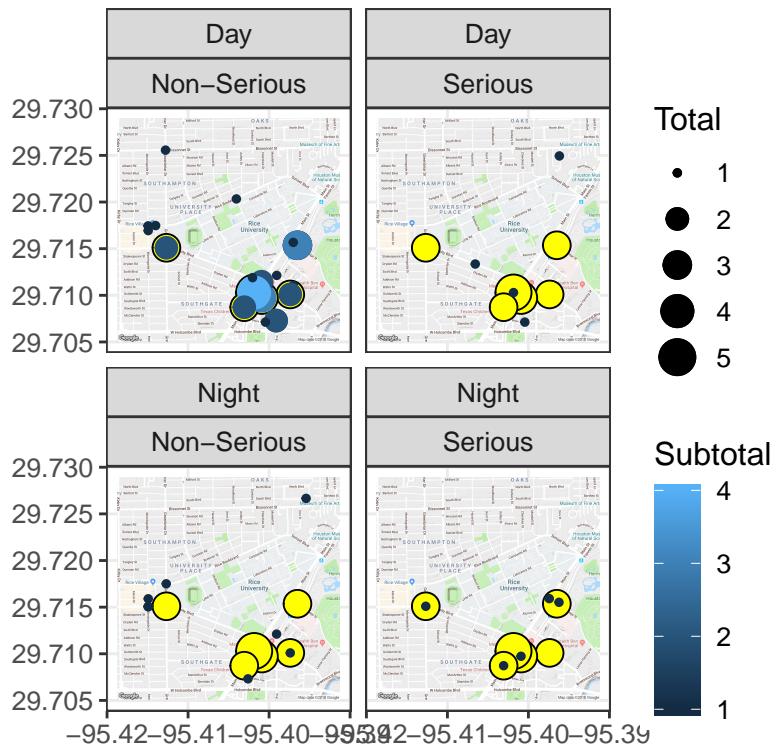
University Place

Curiously, there are no pedestrian incidents recorded at Main and Sunset, though it seems to be deadly for bicycles. However, plenty of action to the south on Main once the Medical Center enters the picture.

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.717,-95.405&zoom=15&size=640x
```

Pedestrian Collisions University Place 2010–2017

Yellow for total incidents of 3 or more, blue for subset by time and



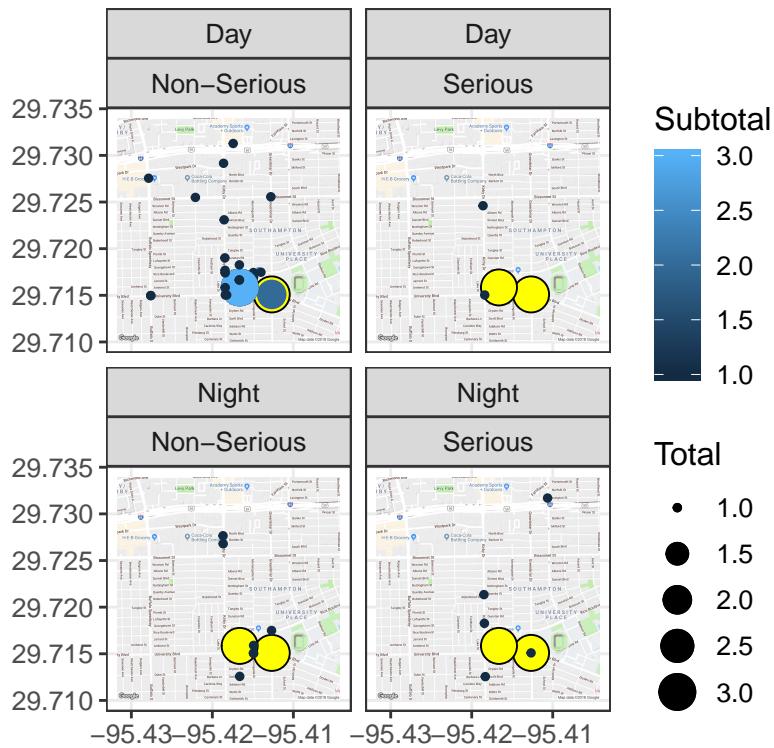
Kirby

A lot of incidents strung along Kirby between University Blvd and Sunset - from the satellite photos it appears that the only crosswalks are at those two cross streets and Rice Blvd, nearly 1/2 a mile without a crossing. To make it worse, there are 3 bus stops in that interval several blocks from a crossing. Most of the streets do not line up, so it is impossible to cross from corner to corner in most of that interval.

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.722,-95.418&zoom=15&size=640x
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Pedestrian Collisions Kirby 2010–2017

Yellow for total incidents of 3 or more, blue for subset by time and



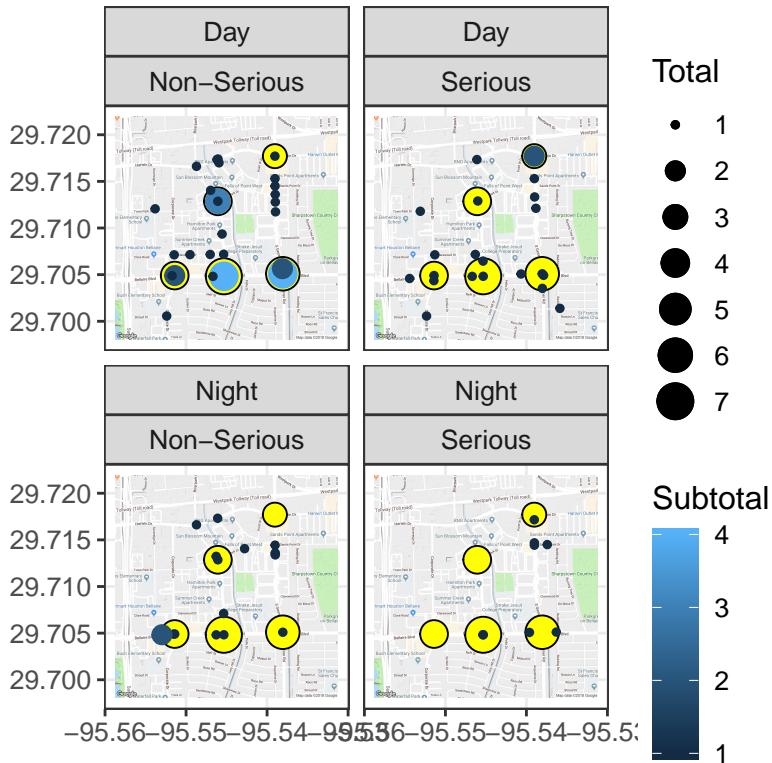
Chinatown

Bellaire Boulevard from Gessner to the Sam Houston Tollway is quite dangerous. Four incidents at Gessner and Bellaire, another four at Ranchester and Bellaire, three at Bellaire and Corporate, plus several Bellaire incidents away from those intersections. Eleven incidents on Bellaire were serious or fatal.

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=29.71,-95.545&zoom=15&size=640x640
```

Pedestrian Collisions Sharpstown 2010–2017

Yellow for total incidents of 3 or more, blue for subset by time and



Greater Inwood

Antoine from Tidwell to Little York has a string of incidents. Most are not serious, but it is probably just a matter of time. I'm guessing that the incidents at Holly View and Antoine are probably related to many apartments on the east side of Antoine, a park on the west side, and no crosswalk to get between them.

Map from URL : <http://maps.googleapis.com/maps/api/staticmap?center=29.859,-95.471&zoom=15&size=640x480>

Pedestrian Collisions Acres 2010–2017

Yellow for total incidents of 3 or more, blue for subset by time and severity

