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<div align="center">Mapping Lexington Collisions</div>

INTRODUCTION

The purpose of this mapping project is to provide a visualization of the most dangerous roadways in the city of Lexington, KY. The intended audiences of this map are the motorists and cyclists of the city and residents of Lexington in general. Lexington is known for having small streets, heavy traffic, a substantial population of cyclists, and numerous unusual intersections compared to most American cities of comparable size. These maps were created to show the extent to which these unusual features may correlate with traffic collisions.

DATA & MAPPING

We downloaded collision data from the UK MapShop website [1] and shapefiles for roadways, railroads, and bike trails from the Lexington-Fayette Open Data Portal [2]. We used QGIS to generate both maps. All data points were used for the initial heat map. Additionally, subsets of the data were extracted to draw attention to fatal collisions and collisions involving a bicycle.

We used the heat map style feature in QGIS to turn the layer containing all collisions into a heat map. Note that this heat map was not normalized to traffic patterns. We then added fatal collisions as an extra layer to draw attention to collisions that resulted in one or more deaths. There were 23,343 collisions from 2004 to 2014 in Lexington-Fayette. Of those, 100 caused at least one fatality and 269 involved a bicycle. Surprisingly (in an uplifting way), none of the collisions involving a bicycle had fatalities. We created a second map to show the spatial distribution of those vehicle collisions involving a bicycle.

Both maps use colors that should not cause difficulties for colorblind readers [3], the text used is a an easy-to-read typeface (Helvetica) and color (black), and the points which mark the locations of collisions are large enough to be noticeable and in a color that makes them distinct against the background [3]. We chose to use red as the hottest color in the heat map for its associations with heat and blood. These maps ought to be suitable for nearly any sighted map-reader who is proficient in English and wishes to learn something about the spatial distribution of traffic collisions in Lexington, KY from 2004 to 2014.

In addition to the maps, we created the following plots to aid in visualizing the frequency of collisions over time and on specific roadways. Our QGIS project files, code used to filter the data and generate plots, and interactive plots are available in our project repository on GitHub [4].
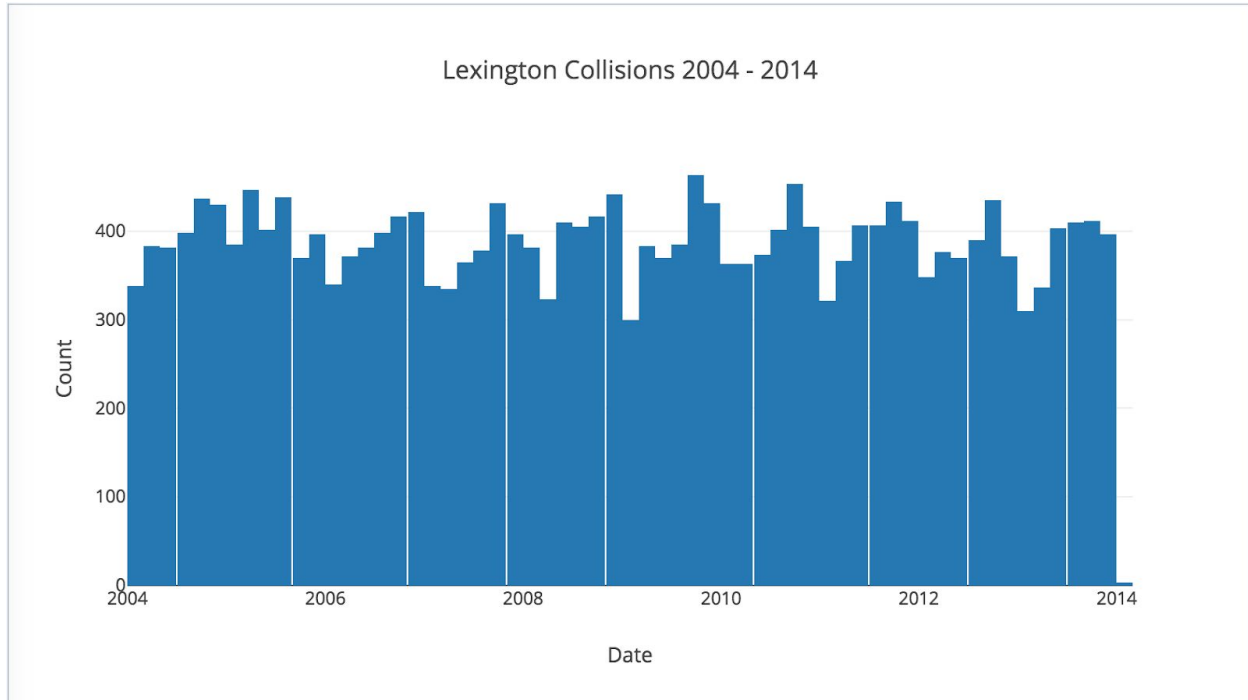
Collisions seem to occur most often in the month of October and the least in the month of January. See the interactive HTML version of this map in our GitHub repository [4] to view exact collision counts for specific months.
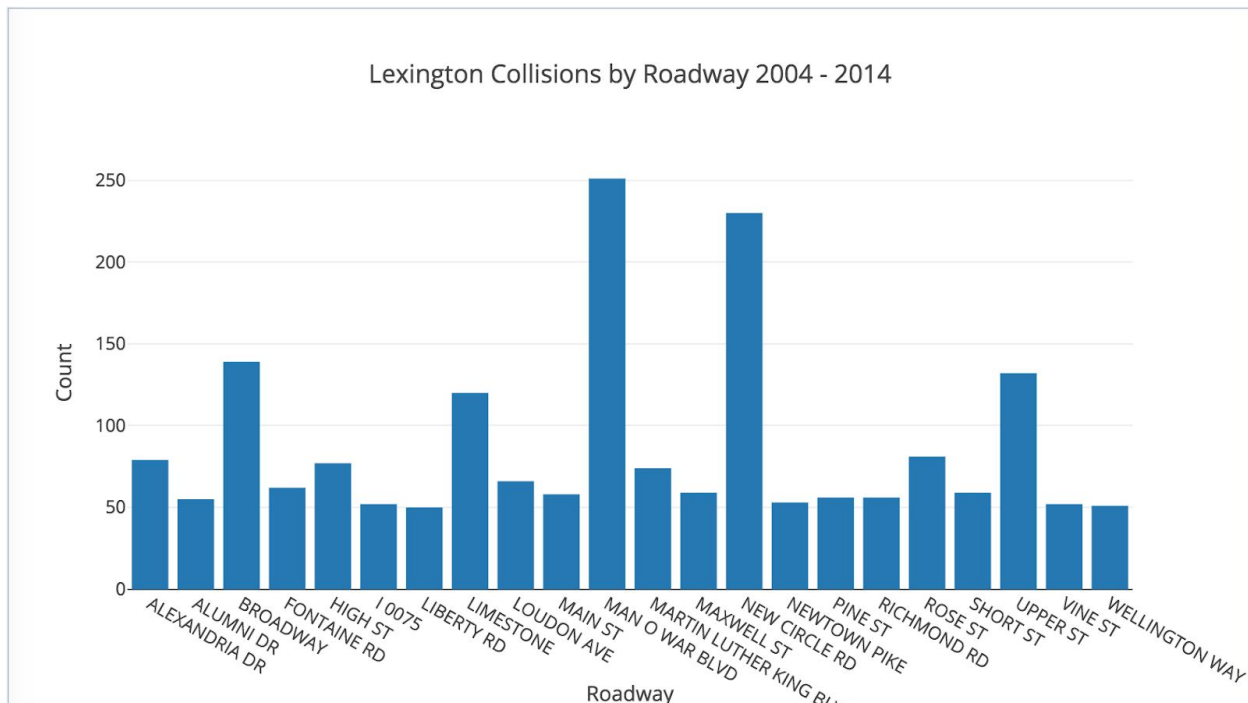
Only roadways with at least 50 collisions were included in this barplot for the sake of space. Man O War Blvd and New Circle Rd had the most and second-most collisions from 2004 to 2014. See the interactive HTML version of this map in our GitHub repository [4] to view exact collision counts for each roadway.

DISCUSSION

To map collisions overall, we used QGIS to create a heat map of the most dangerous intersections in the city. The red areas of the map show the areas with the most collisions while the lighter shaded areas show the areas with the most collisions. In addition to the heat map aspect, the map marks locations where a fatal collision occurred with a red and white star. A major limitation of the heat map is that we were unable to find traffic frequency data, thus our heat map is not normalized to traffic patterns. Therefore, one cannot conclude that a person is more likely to be involved in a collision at intersections with the hottest coloration on our map.

To make the bicycle collision map, we filtered the collision data to only include vehicle collisions with a bicycle. We initially turned this, too, into a heat map, but there are so few bicycle collisions (269) that it was too difficult to discern areas with the most collisions. Unsurprisingly, the most collisions happen downtown; this is the same pattern observed in the main heat map, likely because downtown seems to have some of the heaviest traffic in the city. There are also quite a lot of bicycle collisions in and near the UK campus area. This is also expected because cycling is a very popular transportation method among college students and even professors (anecdotally, both of my faculty mentors commute to campus via bicycle). The further one moves out from the city center, the less likely one is to find a bike lane, so it is expected that fewer cyclists travel on those peripheral roads and are thus less likely to be involved in a collision on the outskirts of the city. Note that the map over-represents bike trails. For some reason, that shapefile contains more bike trails than actually exist. For example, the paved path at the UK Arboretum is for walking only, yet it appears in the bike trail layer. We believe that the Lexington Open Data Portal erroneously labelled this shapefile as bike trails. A more accurate name would be something like "non-motorist paved trails and roads with bike lanes".

In terms of non-fatal collisions, most happen downtown. This is not particularly surprising. Most of Lexington's business activity occurs downtown, bringing suburban commuters there on a regular basis. Additionally, basketball games at Rupp Arena tend to bring upwards of 20,000 people to the downtown area at once. Given how downtown Lexington does not have any highways and that very few streets are more than four lanes wide, there are bound to be numerous traffic accidents within the downtown area.

In addition to the number of non-fatal collisions downtown, there two other areas of Lexington which stand out: Nicholasville road, Richmond Road, and North Broadway. South Limestone Street and Nicholasville Road are infamous for the traffic they receive in Lexington. The stretch of South Limestone from the University of Kentucky to downtown is shaded a dark shade of red, as is the area of Nicholasville Road from Southland Drive to New Circle Road. There are also a number of fatal collisions that have been reported on Nicholasville Road, most notably around the intersection with New Circle Road. One apparent fact about the intersection with New Circle Road is that it had many more accidents than the intersection between New Circle Road and Harrodsburg Road. The latter is well known for its diverging diamond interchange which brings traffic from one side of the road to the other.

The distribution of fatal collisions was another intriguing feature of the heat map. Most were concentrated around downtown, Nicholasville Road, and New Circle Road, with a couple of other notable areas such as the intersection between Interstate 75 and Interstate 64 just north of Lexington. Given the high number of non-fatal collisions both downtown and along Nicholasville Road, it is not surprising that this would be an area with many fatal accidents. The same is true with New Circle Road, which also has many accidents — both fatal and non-fatal. Both the older and newer parts of New Circle Road have numerous features that we believe to be unsafe. The older part has frequent traffic lights which inhibit the flow of traffic, businesses which vehicles turn onto the road from on a regular basis, and lanes which end suddenly. The newer part on the other hand is rarely more than four lanes wide in either direction and has unusual short merges to the highway, even at junctions with busy roads such as Harrodsburg and Nicholasville Road.

One of the most interesting finds with the heat map was the high number of fatal accidents at the interchange of Interstate 75 and Interstate 64 and along the stretch of Georgetown road that passes over the junction. Neither of these stretches of road have large numbers of non-fatal accidents, yet the bridge over I-75 and I-64 on Georgetown Road has three fatalities while the junction of I-75 and I-64 itself has two.

MAPS
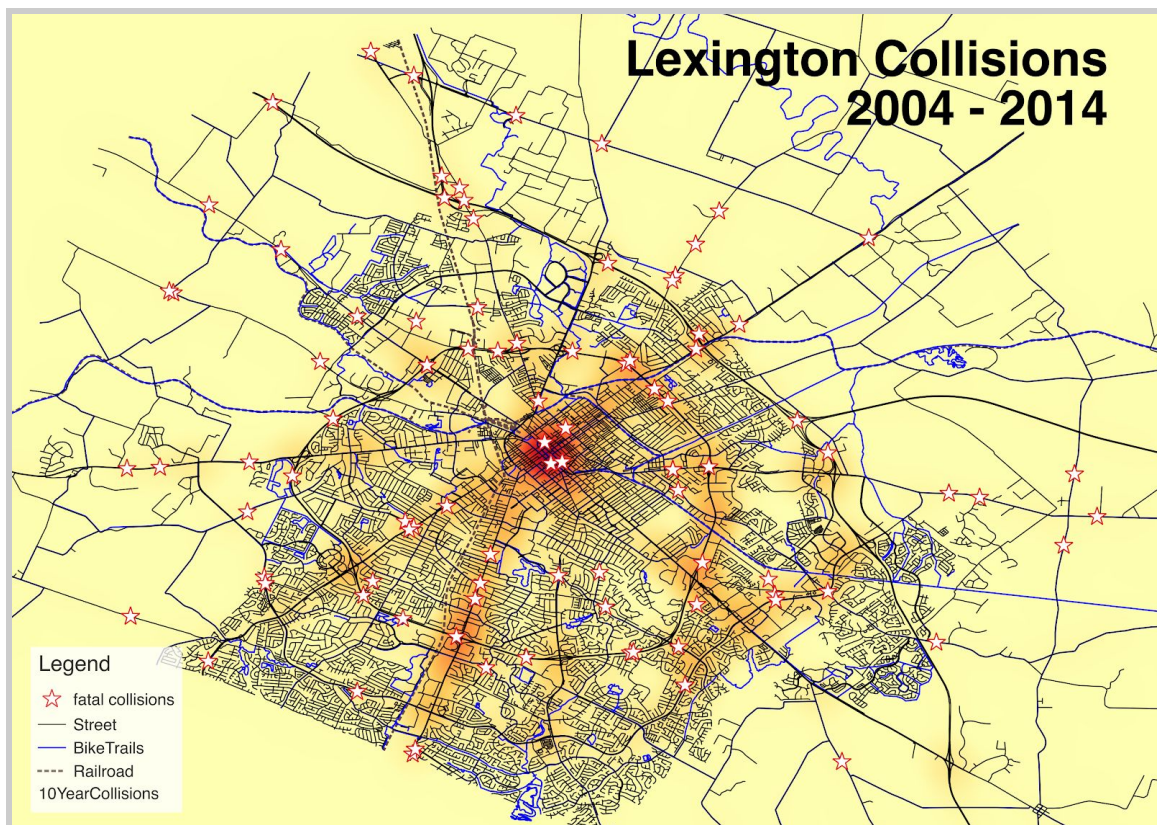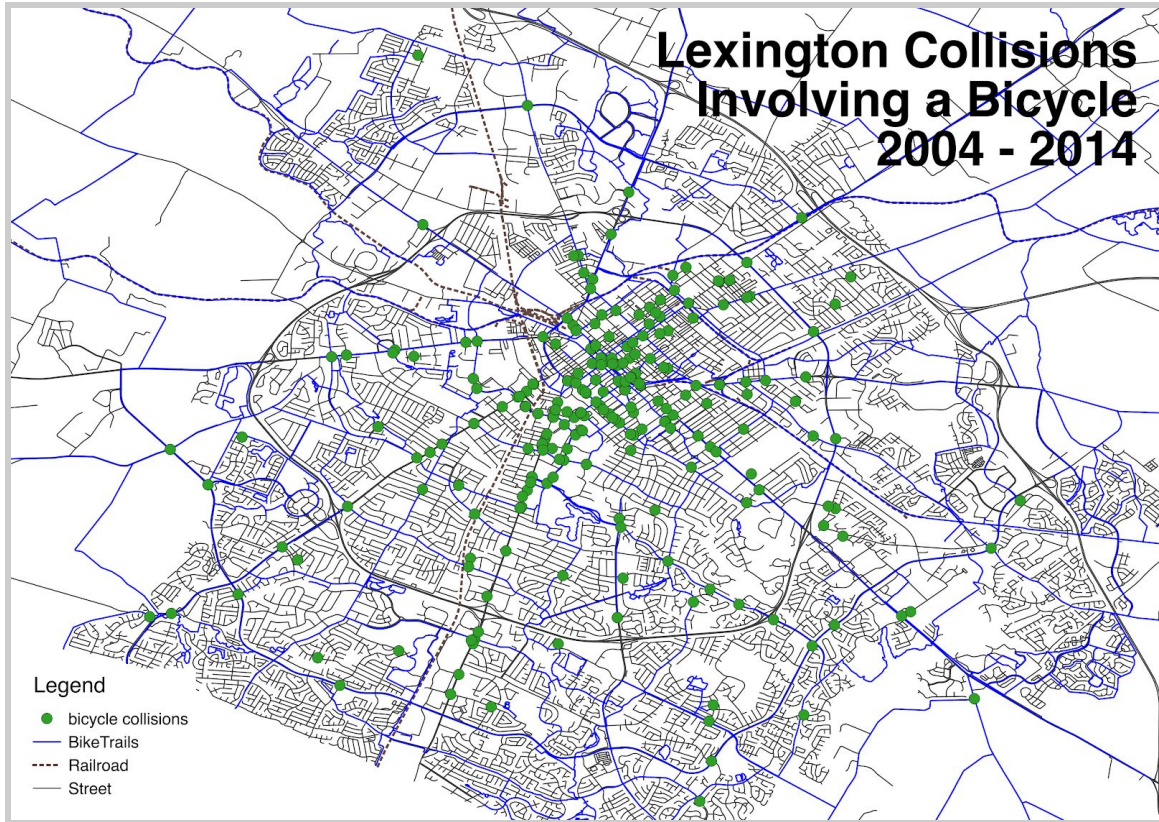
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2. Lexington-Fayette Urban County Government. 2017. Lexington's Open Data Portal. Accessed 23 Mar 2018. https://data.lexingtonky.gov/
3. Krygier, J., Wood, D. Making Maps: A Visual Guide to Map Design for GIS. The Guilford Press; 2016. p. 49, 265-266.
4. Kelly Sovacool & Geoff Hill. 2018. GEO109 Final Project. https://github.com/kelly-sovacool/geo109-project