**Introduction**

According to the National Highway Traffic Safety Administration, US motorcycle injuries increased from 53,000 to 92,000 between 1997 and 2014. During the same period of time, motorcycle fatalities (Fig. 1), motorcycle crash fatality rates per 100,000 registered motorcycles, and motorcycle crash fatality rates per 100 million vehicle miles travelled also increased.

**Florida Motorcycle Safety Policy**

With a vision to promote a safer transportation system for motorcyclists and other members of the motoring community, an assessment of Florida’s motorcycle safety efforts conducted by a multi-disciplinary team of experts from across the nation in 2008, led to the development of the Motorcycle Safety Strategic Plan (MSSP). All efforts were put forth to achieve the overarching goal of improving motorcycle safety in Florida by reducing the number of motorcycle fatalities, serious injuries and crashes beginning in 2009.

**Motorcycle Crash Data**

To study the selected characteristics of injury-producing crash locations involving a motorcycle in Florida, crash locations at a precise geographic scale had to be assemblated. Florida crash data includes a crash event file that identifies contains the longitude and latitude points for each crash record. A list of crash locations involving a motorcycle from 2008 to 2014 was extracted from the crash event file obtained from the FDOT Safety Office.

**Census Block Group Data**

For analysis purposes, 2010 census block group data was used as is the smallest level of census data that retains detailed demographic and socioeconomic information such as:
- Median Household Net Income
- Population
- Housing Density

**Block Group Analysis Findings**

Motorcycle crashes over the seven-year period were aggregated to Florida census block group boundaries using a spatial overlay procedure in GIS. Initial groupings were then classified into categories using five manual breaks (L = Low; ML = Moderately Low; M = Moderate; MH = Moderately High; H = High) as shown in Table 1.

**Research Objectives**

This research attempts to pioneer motorcycle safety research at a census block group level of geography from a crash event standpoint by:
- Identifying geographic areas experiencing the most (hot) and least (cold) number of injury-producing motorcycle crashes.
- Providing insight on the influence of:
  - Land Use
  - Population
  - Demographics
  - Economic Activity

at the identified motorcycle crash locations.

**Hot Spot Analysis Findings**

An optimized hot spot analysis was then utilized for further analyses and although majority of the total area proved to be insignificant meaning that motorcycle crashes in these areas occur at random, the results (Fig. 6 and Table 2) showed similar trends to that of the initial block group analysis in terms of the areas of high and low concentration.

**Future Research**

- Findings from the spatial analysis began to show interesting results such as:
  - Areas with higher “Asian” and “Other” populations are associated with higher incidences of motorcycle crashes, this is important because of cultural modes of travel.
  - Based upon current findings, future research will further study the effect of such variables by analyzing specific crash types, building various econometric models and crash mapping the residential locations of riders involved in these specific crashes to their crash locations.

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**Table 1: Motorcycle Crash Incidents by Block Group**

<table>
<thead>
<tr>
<th>Category</th>
<th>Low (L)</th>
<th>Low-Med (ML)</th>
<th>Med (M)</th>
<th>Med-High (MH)</th>
<th>High (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>3,900</td>
<td>4,320</td>
<td>5,280</td>
<td>4,564</td>
<td>5,280</td>
</tr>
<tr>
<td>Total Crashes</td>
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<td>5,280</td>
<td>4,564</td>
<td>5,280</td>
</tr>
<tr>
<td>Age 1-21</td>
<td>0.9</td>
<td>1.0</td>
<td>1.2</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Total Oil-Petroleum</td>
<td>5,276</td>
<td>50,755</td>
<td>11,267</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ave Blocks</td>
<td>35.9</td>
<td>38.6</td>
<td>40.4</td>
<td>37.2</td>
<td>35.9</td>
</tr>
<tr>
<td>Ave Population</td>
<td>14,548</td>
<td>12,309</td>
<td>11,048</td>
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**Table 2: Hot Spot Analysis Findings Compared to State Findings**

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**FIGURE 3**

Motorcycle Crash Incidents by Block Group

- Low (L) 30%
- Med-Low (ML) 40%
- Med (M) 20%
- Med-High (MH) 10%
- High (H) 0%

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**FIGURE 4**

Florida Motorcycle Crash Locations

- Low (L) 30%
- Med-Low (ML) 40%
- Med (M) 20%
- Med-High (MH) 10%
- High (H) 0%