Tenth Annual Conference on Managing Fatigue: Abstract for Review

Title: The Use of Geospatial Network Analysis to Identify Commercial Vehicle Driver Crashes Involving Sleepiness and/or Fatigue

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Problem: The total number of commercial vehicle crashes increased 16% from year 2013 to 2014. In 2014, there were 7,281 commercial vehicle crashes in Kentucky; 3,884 involved semi trucks, 1,697 involved single unit trucks, and 171 involved buses. The commercial vehicle crashes were associated with 1,396 injuries and 64 fatalities, and 457 involved a commercial vehicle driver who was sleepy or fatigued. To examine the association and clustering of commercial vehicle crashes and fatigue and/or sleepiness cited in commercial vehicle crash reports, a multi-distance spatial cluster analysis was performed.

Methods: Kentucky commercial vehicle driver crash (in motion and not parked) data from 2005-2014 with geocoded X/Y coordinates were mapped for using ArcGIS, version 10.3. The 64,759 commercial vehicle crashes were buffered by a 0.5 mile drive distance using the underlying state road network for the multi-distance spatial cluster analysis. It was assumed that the crashes covering 10 years sufficiently represented the geospatial areas where a commercial vehicle crash could occur. The sleepiness/fatigue crashes (n=457) were mapped and analyzed using Ripley's K Function for complete spatial randomness within the statewide geographical context.

Results: There were two major statistically significant clusters of commercial vehicle crashes involving fatigued/sleepy commercial drivers located in northern Kentucky. The majority of sleepiness/fatigue commercial vehicle crash clusters had a radius of almost 1-mile (4,775 feet) indicating specific roadway sections in those two geographical areas at high risk for sleepiness/fatigue commercial vehicle crashes.

Discussion: Geospatial network analysis has the potential to identify specific roadway sections where fatigue/sleepiness commercial vehicle crashes are occurring. These results can be used by highway transportation engineers and local officials to inform roadway design changes and improvements. Further focused analyses of the hot spot areas will be performed that account for traffic volume.

Figure 1. Hot Spot Analysis of Commercial Vehicle Driver Crashes Involving Sleepiness and/or Fatigue, 2005-2014.
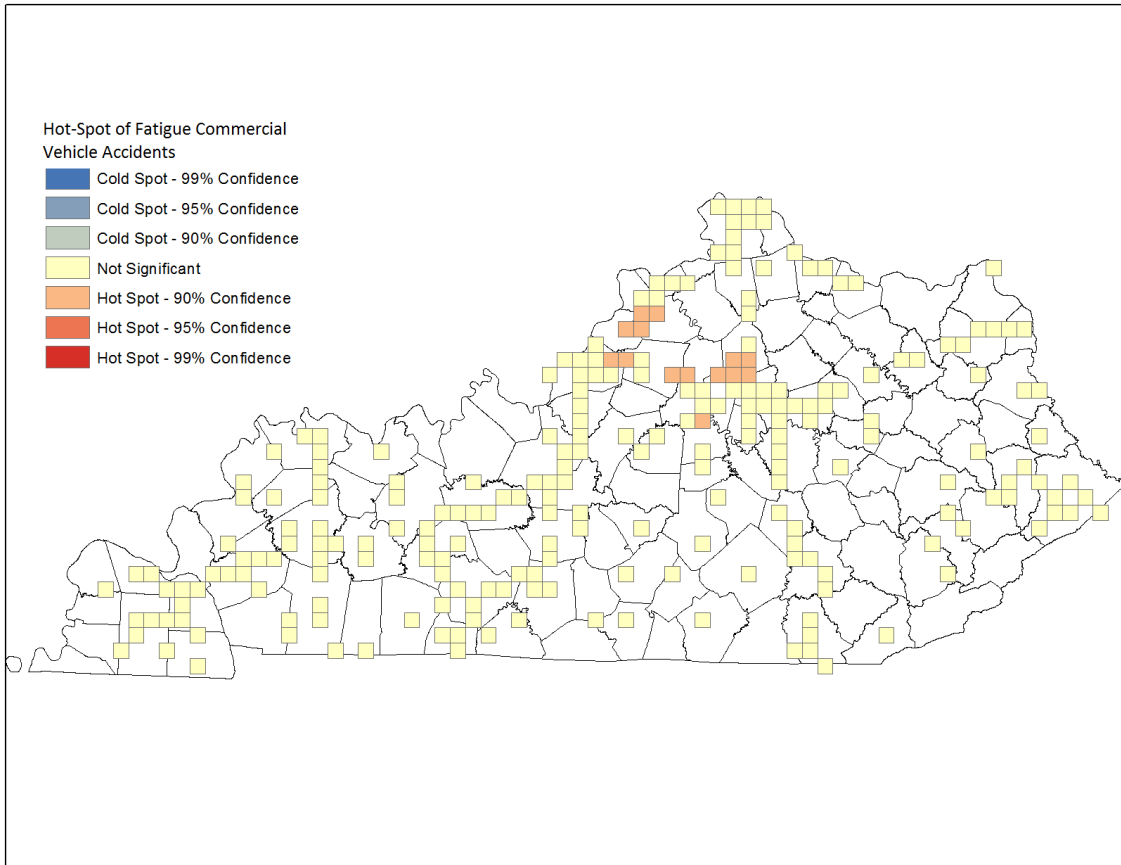
Figure 2. Cluster/Dispersion of Commercial Vehicle Driver Crashes Involving Sleepiness and/or Fatigue, 2005-2014