Understanding Crashes Involving Large Trucks on Rural Roads in Texas
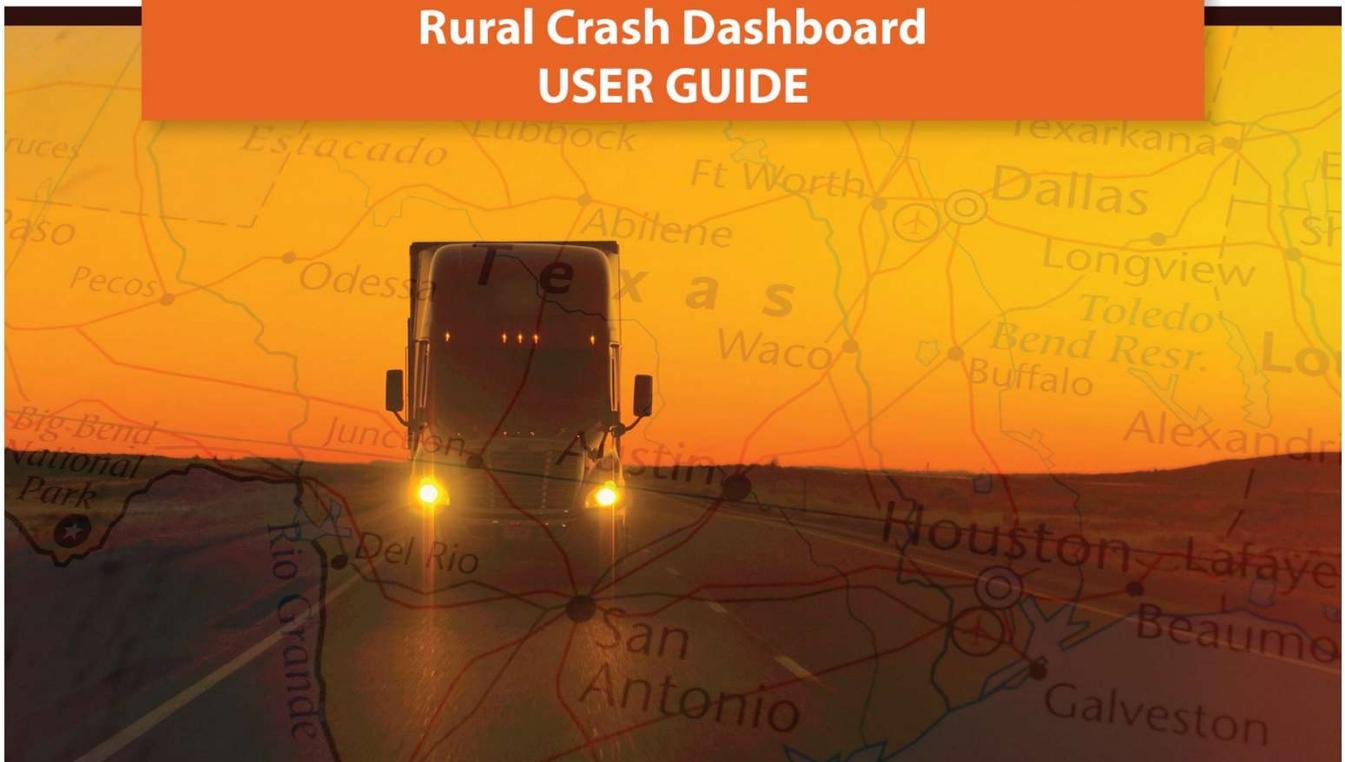
Truck Tractor and Heavy Truck/Pick-Up Rural Crash Dashboard
USER GUIDE

Texas A&M Transportation Institute

Center for Transportation Safety
Safety Research and Outreach

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Texas A&M Transportation Institute | Center for Transportation Safety

INTRODUCTION

The goal of this project this FMCSA sponsored project (Understanding Crashes Involving Large Trucks on Rural Roads in Texas) is to prevent crashes and reduce crash severity on rural roads involving large trucks by improving law enforcement and driver knowledge of hazardous roadways and behaviors on rural roads. This will be accomplished through an innovative analysis of crash and roadway data, and the production and dissemination of outreach and educational materials (e.g., fact sheets, data dashboards, and high-risk roadway maps). The dashboard is available at:

https://cts.tti.tamu.edu/large-truck-and-heavy-truck-pick-up-crash-dashboard/

Figure 1 shows the rural CMV safety dashboard "landing page" using the crash data described above. The default is rural areas for the entire state. Note the page advance selector at the bottom center and the full-page arrows at the lower right corner. (See Figure 2 for more detail.)
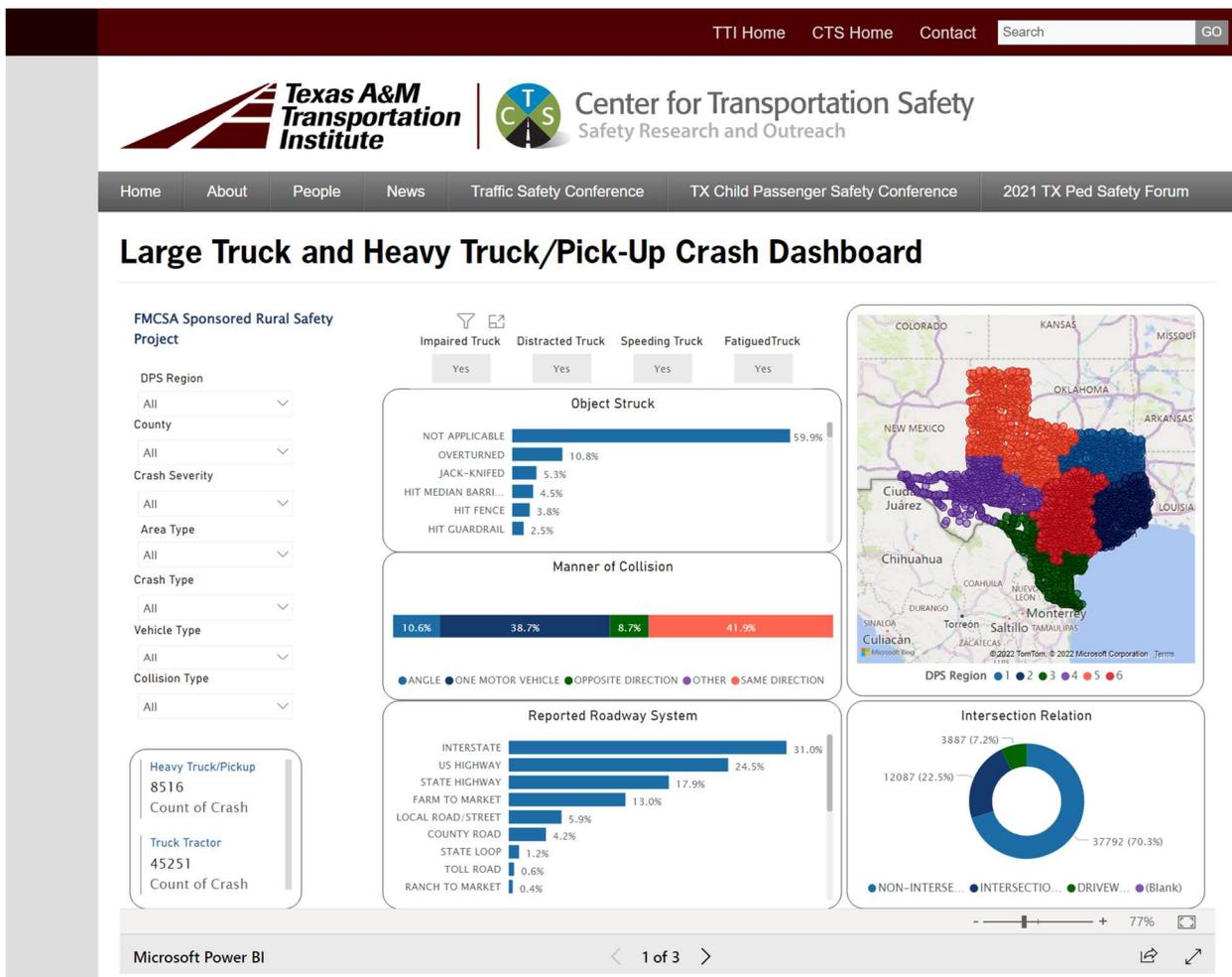

Figure 1. Rural CMV Safety Dashboard Landing Page.

Figure 2 shows the page advance and full-page toggle in detail.

Figure 2. Rural CMV Safety Dashboard Landing Page Display Controls.

Figure 3 shows the landing page in full screen mode. Note the "Location" box is visible at the lower right of the page in full screen mode. This provides an alternative to the page advance arrow, allowing page selection by topic (Location – Time – Drivers) rather than page number. Each topic page is discussed below.
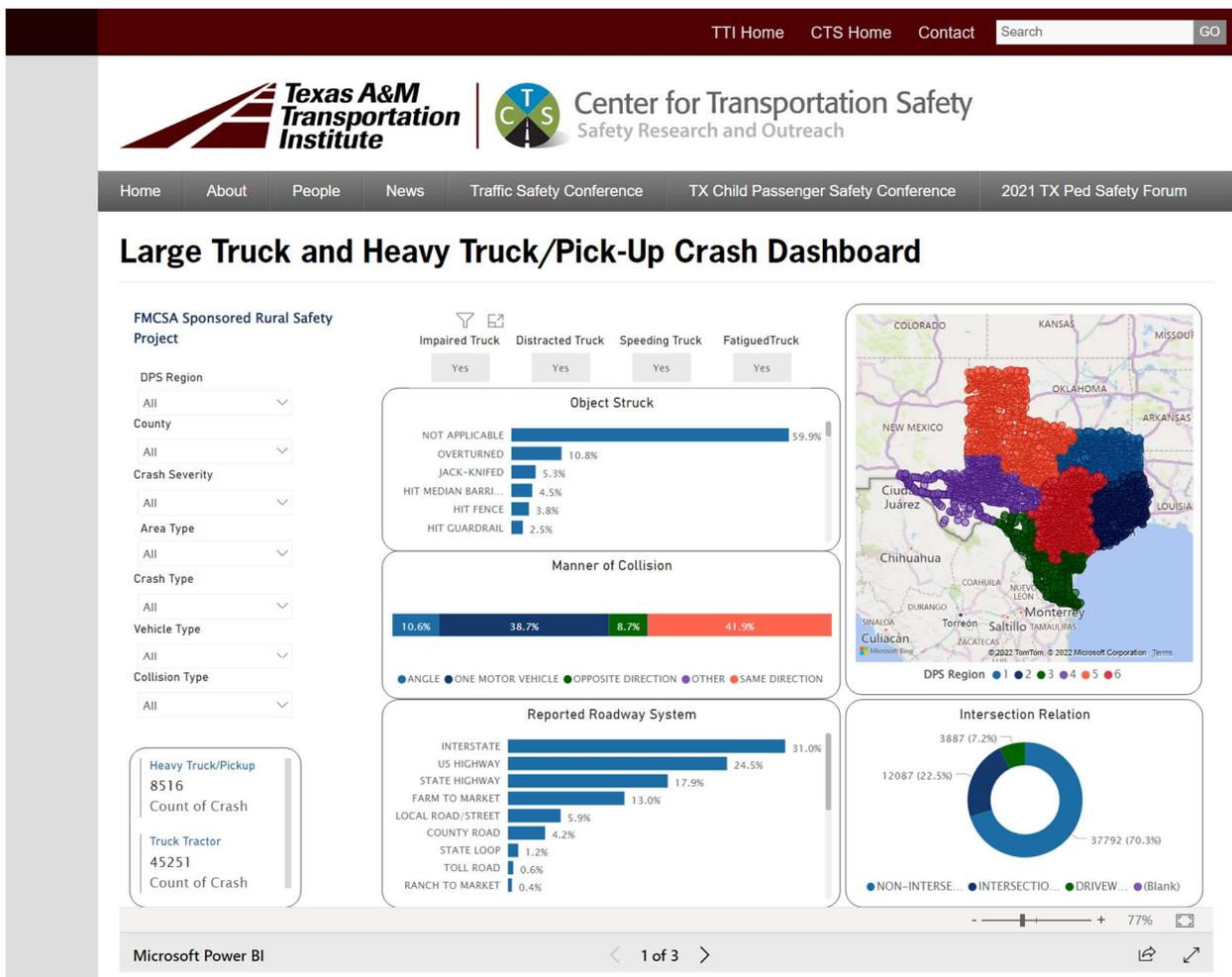

Figure 3. Full Screen Rural CMV Safety Dashboard Landing Page.

Figure 4 shows the various filters available on the rural CMV safety dashboard. Each filter is discussed separately below.

DPS Regions
- 1 Dallas
- 2 Houston
- 3 McAllen
- 4 El Paso
- 5 Lubbock
- 6 San Antonio

County
- Select All
- Individual County (254)

Crash Severity
- All
- Fatal
- Suspected Serious
- Suspected Minor
- Possible
- Not Injured
- Unknown

Area Type
- Select All
- Rural
- Urban Large Fringe
- Urban Medium Fringe
- Urban Small Fringe

Crash Type
- Select All
- Multi-Vehicle
- Single Vehicle

Vehicle Type
- Select All
- Heavy Truck/ Pick Up
- Truck Tractor

Collision Type (Crash Profiles)
- Select All
- Intersection
- Overturned
- Rear-end
- ROR, Curve
- ROR, Hit Fixed Object
- Sideswipe

Contributing Factors (Buttons)
- Impaired
- Distracted
- Speeding
- Fatigued

Figure 4. Rural CMV Safety Dashboard Data Filters.

DATA SELECTION FILTERS

The rural CMV safety dashboard is the result of extensive stakeholder input and has an array of features and filters to facilitate access to the crash data described above. Filtered crash data can be displayed on separate pages focused on Location, Time, and Drivers. The filters are described below, followed by descriptions of the three display pages.

DPS Regions

The six large DPS regions are available in the dashboard. The Capitol Region is not included since none of the Capitol Region lies in a rural area. The DPS Region pull-down menu is:

DPS Region
- 1 Dallas
- 2 Houston
- 3 McAllen
- 4 El Paso
- 5 Lubbock
- 6 San Antonio

Individual DPS regions may be selected, or the entire state (all 6 DPS Regions). Note that while the default is all DPS Regions, there is no "Select All" button for DPS Region. Multiple DPS regions can be selected by holding the Ctrl key down. To toggle from an individual DPS region selection to all regions, simply turn off the individual region selection by clicking on the selected region. Note also that DPS Region and County are linked. Just as selecting a DPS Region selects the counties in the region, selecting a county sets the DPS Region to the region containing that county.

County

The default is all 254 counties. Note that, like the DPS Region menu, there is no "Select All" button for County. Individual counties can be selected; however, multiple counties are not possible. County groups may be selected as DPS Regions. Note that selecting a county sets the DPS Region to the region containing that county. The County pull-down menu is:

County
- 254 Individual Counties (listed alphabetically)

Crash Severity

Crash severity varies by area type. Crashes are more likely to be severe in rural areas followed by urban-fringe areas, and then urban areas. The severity of crashes also varies by type of urban-fringe area. Crashes tend to be more severe in medium urban-fringe and small urban-fringe areas compared to large urban-fringe areas. With respect to vehicle type, crash severity is highest among heavy trucks/pickups. The Crash Severity pull-down menu is:

Crash Severity
- All
- Fatal
- Suspected Serious
- Suspected Minor
- Possible
- Not Injured
- Unknown

The default is "Select All". Individual crash severity types may be selected by turning off the select all and clicking on a single severity type. Groups of severity types may be selected by clicking "Select All" and then removing unwanted severity types, leaving the desired group of crash severity types.

Area Type

The process used to classify crashes by area type is based on data from the 2017 Census urban area geography file[1]and the 2017 American Community Survey 5-year population estimates[2] which defines urban areas based on population size. As noted above, fringe buffers are defined in accordance with the extraterritorial jurisdictions (ETJ) distances in the Texas Local Government Code.[3] The Area Type pull-down menu is:

Area Type
- Select All
- Rural
- Urban Large Fringe
- Urban Medium Fringe
- Urban Small Fringe

The default is "Select All". Individual area types may be selected by turning off the select all and clicking on a single area type. Groups of area types may be selected by holding the Ctrl key down or clicking "Select All" and then removing unwanted area types, leaving the desired group of area types. Note that all four area types are included, so selecting them all comingles fringe and rural as shown in Figure 5.

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[1] U.S. Census. Geography Tools. Retrieved from https://www.census.gov/programs-surveys/acs/geography-acs/geography-tools.html
[2] U.S. Census. 2013-2017 ACS 5-year Estimates. Retrieved from https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2017/5-year.html
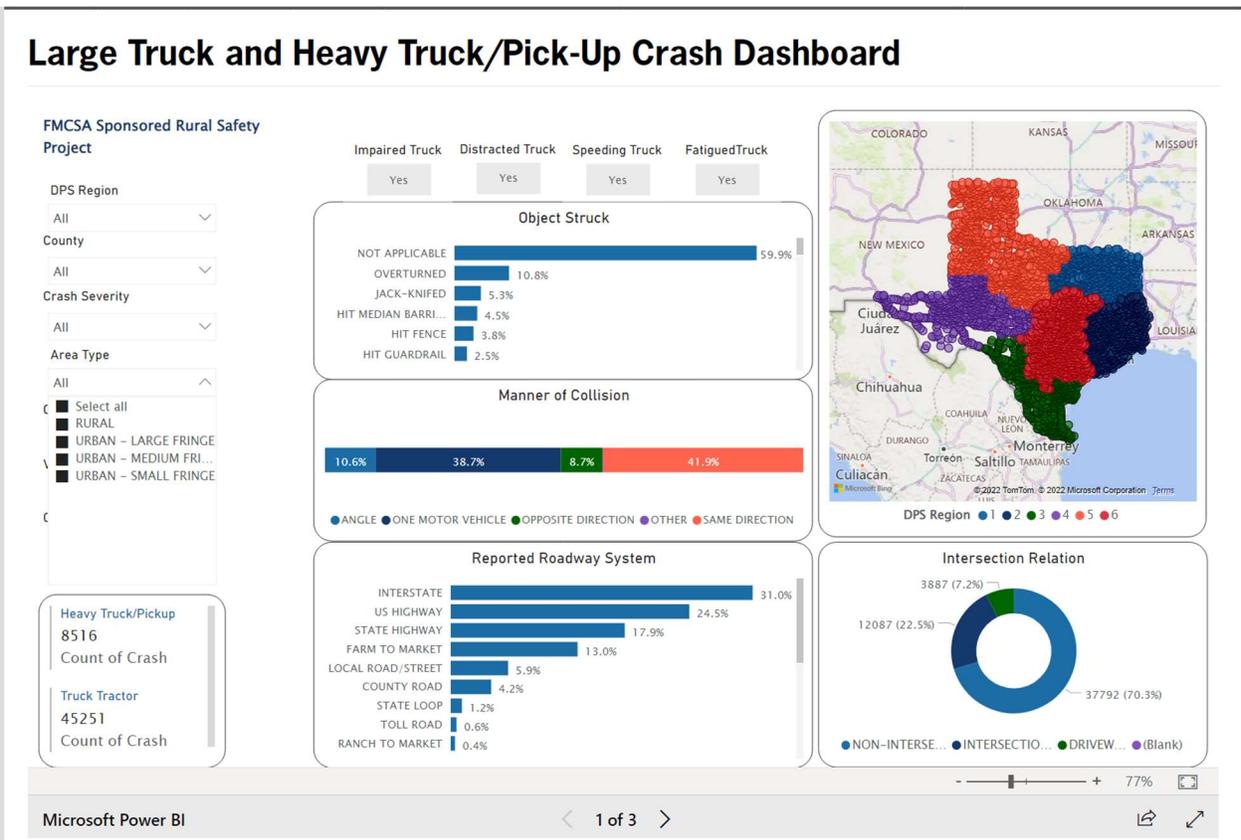[3] https://statutes.capitol.texas.gov/Docs/LG/htm/LG.42.htm

Figure 5. Area Type Menu Example.

Crash Type

Following standard crash report definitions, crash type is defined as either single vehicle or multiple vehicle. The Crash Type pull-down menu is:

Crash Type
- Select All
- Multi-Vehicle
- Single Vehicle

The default is "Select All" with either nothing clicked, or everything clicked. Individual crash types may be selected by clicking on a single crash type if nothing is clicked or turning off the undesired type if everything is clicked.

Vehicle Type

Commercial vehicles (CMVs) are classified as truck tractor or heavy truck/pickup (not a truck tractor but weighing ≥10,000 lbs. Gross Vehicle Weight Rating, the weight of the vehicle plus carrying capacity), from the VIN analysis and CRIS data. The Vehicle Type pull-down is:

Vehicle Type
- Select All
- Heavy Truck/ Pick Up
- Truck Tractor

The default is "Select All" with either nothing clicked, or everything clicked. Individual vehicle types may be selected by clicking on a single vehicle type if nothing is clicked or turning off the undesired vehicle type if everything is clicked. In addition, vehicle type is displayed along with the number of vehicles by type in a separate window in the lower left corner of the screen. Vehicle type may also be selected by clicking on the desired vehicle type in the window.

Collision Type

Crash profiles and diagrams were created for six common crash scenarios across all rural areas. These six common crash scenarios involved both heavy trucks/pickups and tractor trailers and resulted in fatalities or suspected serious injuries. These are captured on the dashboard as "Collision Type." Key features of each collision type/crash scenario are provided in a separate document. The default is "Select All" with either nothing clicked, or everything clicked.

Collision Type (Crash Profiles)
- Select All
- Intersection
- Overturned
- Rear-end
- ROR, Curve
- ROR, Hit Fixed Object
- Sideswipe

Contributing Factors

Contributing factors across all rural areas (rural and fringe) were identified for the six crash scenarios for heavy trucks/pickups and truck tractors. These are reflected on the dashboard as separate filters activated by buttons. The default is no filter (the filter is off).

Contributing Factors (Buttons)
- Impaired
- Distracted
- Speeding
- Fatigued

The buttons toggle the filter on and off. They are cumulative so multiple buttons filter for all the contributing factors. The number of incidents is shown in the "Count of Crash" in the lower right corner, by vehicle type (Heavy Truck/Pickup and Truck Tractor). For example, with all four filters engaged, there are eight Heavy Truck/Pickup incidents and 24 Truck Tractor incidents. Contributing factor filter settings are page specific, meaning they are set separately for each page and do not carry over from previous pages.

DATA DISPLAY PAGES

The rural CMV safety dashboard also has an array of display features to facilitate access to the crash data selected by the various combinations of filters. Within any combination of filters, separate pages with statistics and graphs are available for Location, Time, and Drivers. These are displayed by topic in the topic selection menu box on the lower left of the landing page in full screen mode (Figure 6) and are described below.

Figure 6. Page Topic Selection Box.

Location Data Page Display (Figure 7)

Map – Filtered crashes and DPS Region. Zoom to individual crashes. Click to display statistics.

Object Struck – Displayed as histogram with percentages. (Long list – scroll to see them all.)

Manner of Collision – Displayed as percentages on a single bar graph:
-    Angle
-    One Motor Vehicle
-    Opposite Direction
-    Other
-    Same Direction

Reported Roadway System (TxDOT classification) – Displayed as a histogram with percentages.
-    Interstate
-    US Highway
-    Local Road or Street
-    Farm to Market Road
-    State Highway
-    County Road
-    State Loop
-    Spur

Intersection Relation – Displayed as a circular pie chart with percentages.
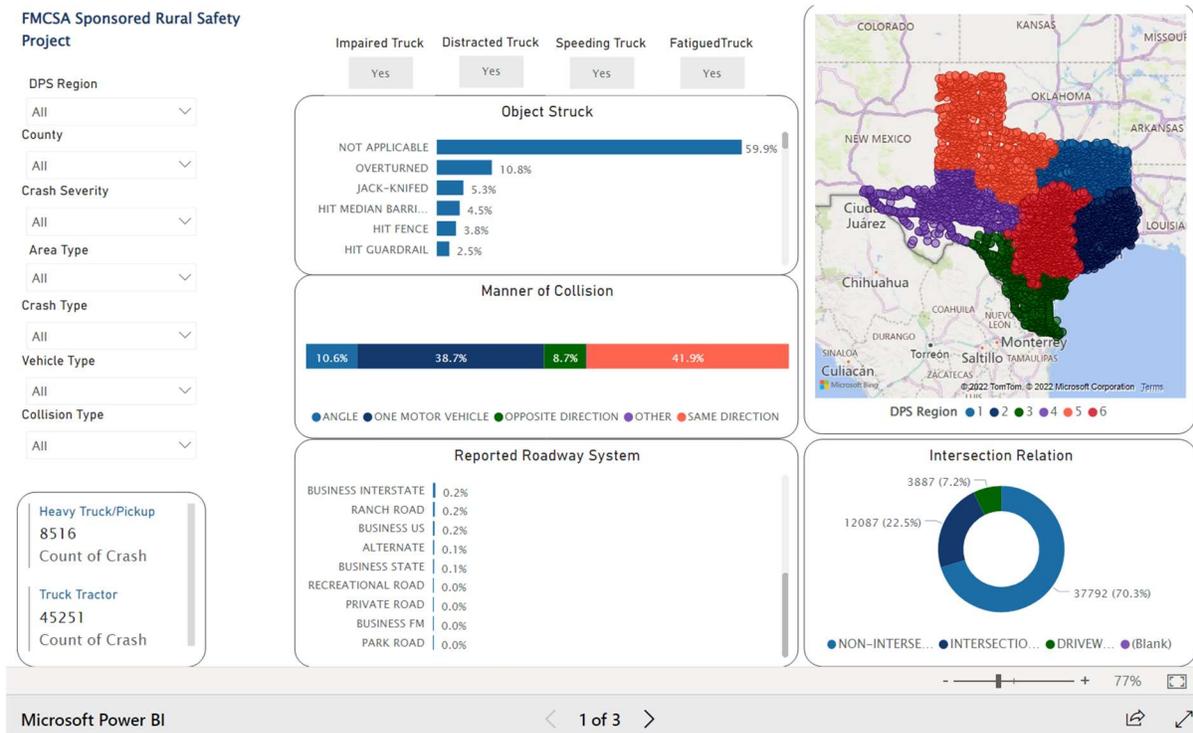-   Non-intersection
-    Intersection
-    Driveway

Figure 7. Location Page Example.

Time Data Display Page (Figure 8)

Map – Filtered crashes and DPS Region. Zoom to individual crashes. Click to display statistics.

Crash Hour – Time of crash / distribution of crashes by time of day – histogram with percentages

Month of Year – Distribution of crashes by month.

Light Condition – Distribution of crashes by light condition in percentages.
- Dark
- Dawn/Dusk
- Daylight

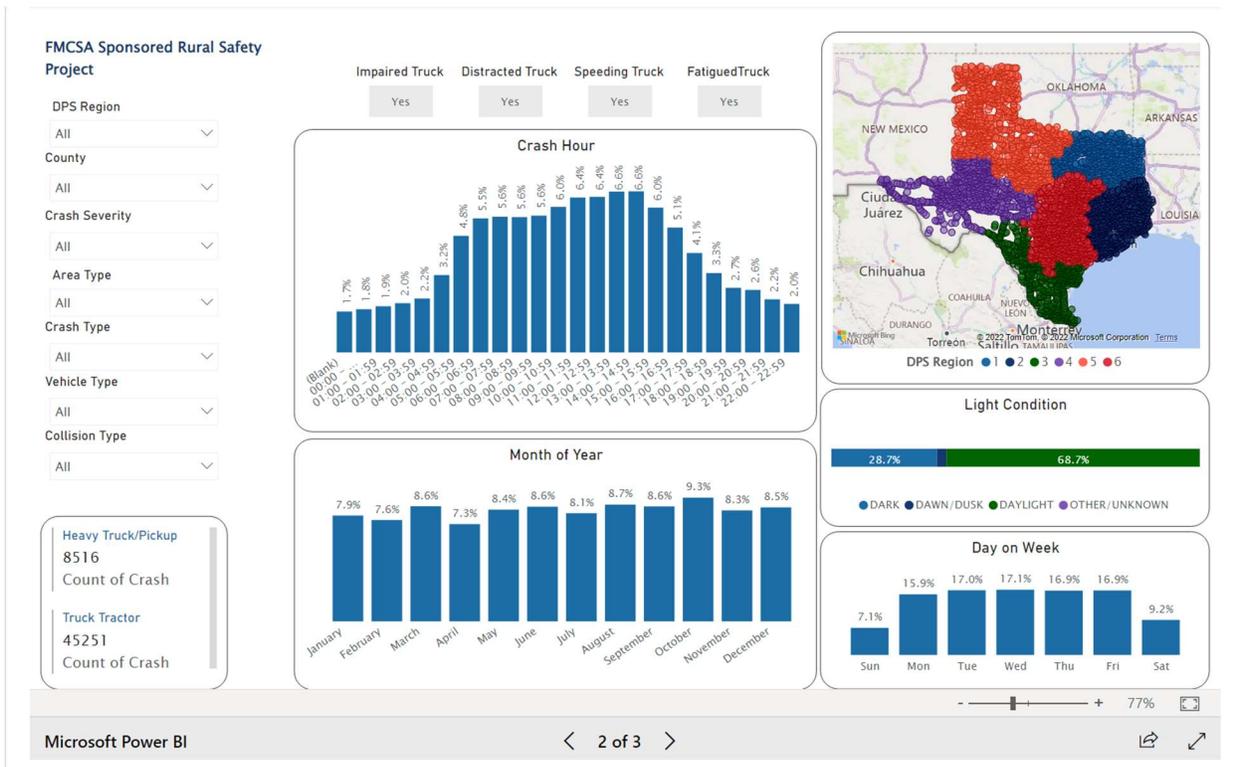Day of Week – Distribution of crashes by day of week as a histogram with percentages.

Figure 8. Time Data Page Example.

Driver Data Display Page (Figure 9)

Truck Driver Gender – Displayed as a pie chart with percentages.

Truck Driver Average Age – Average age in a separate window.

Passenger Vehicle Driver Average Age – Average age in a separate window.

Passenger Vehicle Gender – Displayed as a pie chart with percentages.

Driver Seatbelt – Truck – Displayed as a histogram with percentages.
  - Restraint Use
  - No Restraint
  - Other/Unknown

Driver Seatbelt – Passenger Vehicle – Displayed as a histogram with percentages.
  - Restraint Use
  - No Restraint
  - Other/Unknown

Truck Drivers by Age – Distribution of truck driver age.

Passenger Vehicle Drivers by Age – Distribution of passenger vehicle driver age.
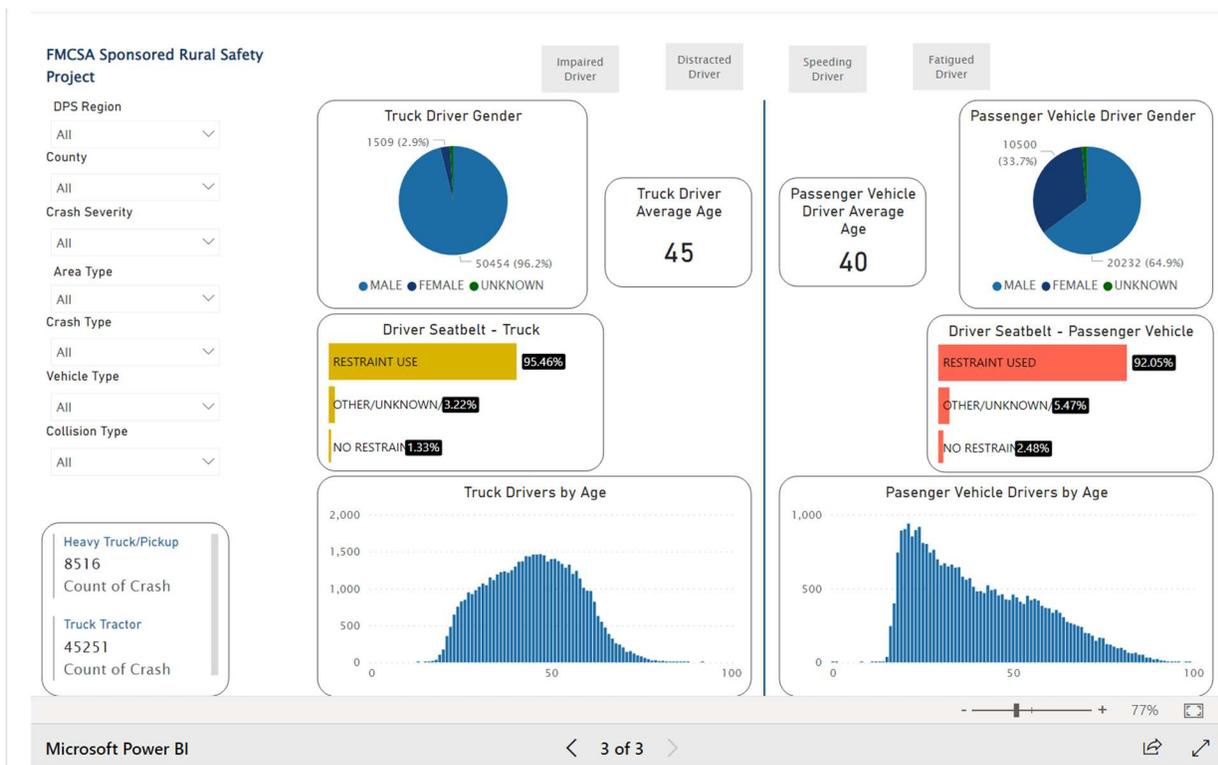
Figure 9. Driver Data Page Example.

DISCUSSION

This web-based dashboard provides interactive user-driven graphic and statistical access to the TxDOT reportable 2014 to 2018 Crash Records Information System (CRIS) crash data, focusing on large trucks and identified rural large truck crash profiles. This dashboard reflects the input from multiple stakeholders (e.g., law enforcement officers and private fleet operators).

The goal for this dashboard, along with other materials generated by the project, is to:
- Help law enforcement officers develop and apply more effective approaches to enforcement, optimizing their time and resources, and
- Provide fleet operators with information on rural road crash risks for them to use to become more pro-active with their safety through insight into the crash risk on rural roads with respect to both roadway characteristics and driver behavior.