STAT 515 Redesign Project

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Overview and Agenda

Project Background

- Washington Association of Sheriffs and Police Chiefs publishes *Crime in Washington* Report Yearly
  - Report: capstone for administration of uniform system for collecting criminal justice data from contributing law enforcement agencies in State
  - Program: National Incident-based Reporting System (NIBRS)
  - Working to redesign visualizations we perceived as less effective

- Team 1 elected to redesign report visualization using STAT 515 concepts and R Studio

Agenda

- Overview
- Visualization Selected for Redesign
- Redesign Process
- Results
- Conclusion

Visualization Selected for Redesign

2018 Washington NIBRS Crimes Against Persons

Murder

Definition: The willful killing of one human by another.

Murder

Offenses Reported	220
Rate per 1,000	0.03
Total Arrests	153

The classification of this offense is based solely on police investigation as opposed to the determination of a court, medical examiner, coroner, jury, or other judicial body. Deaths caused by negligence, suicide, accident, or justifiable homicide are not included in the offense of Murder. Attempt to Murder is classified as Aggravated Assault, not as Murder.

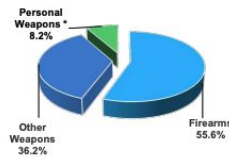**Murder Incidents by Type of Weapon Used in 2018**
(Up to three weapons can be reported)

Personal Weapons * 8.2%
Other Weapons 36.2%
Firearms 55.6%

* Personal Weapons are defined as "Hands, Fists, Feet etc."

Murder Five-Year Trend

171 (2014), 210 (2015), 195 (2016), 222 (2017), 234 (2018)

This chart includes both NIBRS and Summary Reporting data.

Murder Incidents "Top Seven" Locations

Residence	54.1%
Highway/Road	23.2%
Parking Lot/Garage	7.7%
Field/Woods	3.6%
Hotel/Motel	1.4%
Bar/Nightclub	1.4%
Park/Playground	1.4%

Relationship of Victim to Offender

Stranger/Unknown	46.8%
Acquaintance	18.5%
Otherwise Known	9.5%
Family Relationship	9.5%
Intimate Relationship	9.2%
Friend	6.5%

54.1% of Murder incidents occurred at a residence.

Fails to meet the following four criteria

Enable accurate comparisons
- Poor encoding; functional relationships not visualized well

Simplify appearance
- Scattered & fragmented data visualizations lumped together
- Does not use easily distinguishable colors

Provide or increase context
- Flat, basic data visualizations provide little context
- No spatial context utilized as available in dataset
- Lacks appropriate labels in portions of graphs
- Richness of dataset not reflected
- Difficult to facilitate conversation and draw meaning from data

Attract and Engage Reader/Analyst
- Text-heavy visualizations are challenging to read and interpret
- Charts and graphs not visually appealing or engaging

Redesign Process

NIBRS
- MASSIVE data set: 18,000+ LE Agencies contribute monthly
- 370k+ incidents in WA State 2018 data, spread across 43 tables; 250+ MB File Size
- Data is 'clean' at ingest (not raw)

Define Project Scope
- Aligned to midterm project objectives
- Redesign viz for Murder / Negligent Homicide
- Stay with 2018 data focused on this task

Key Tasks
- Reduce tables to a single data frame with fields to accomplish task
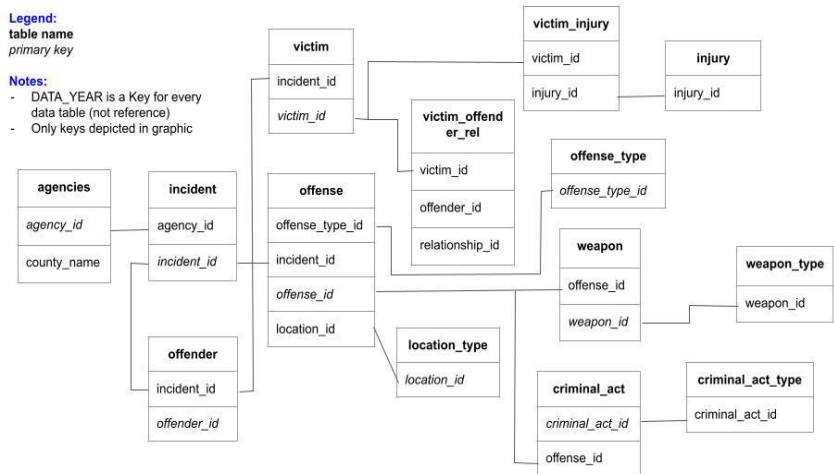- Better incorporate geospatial dimension

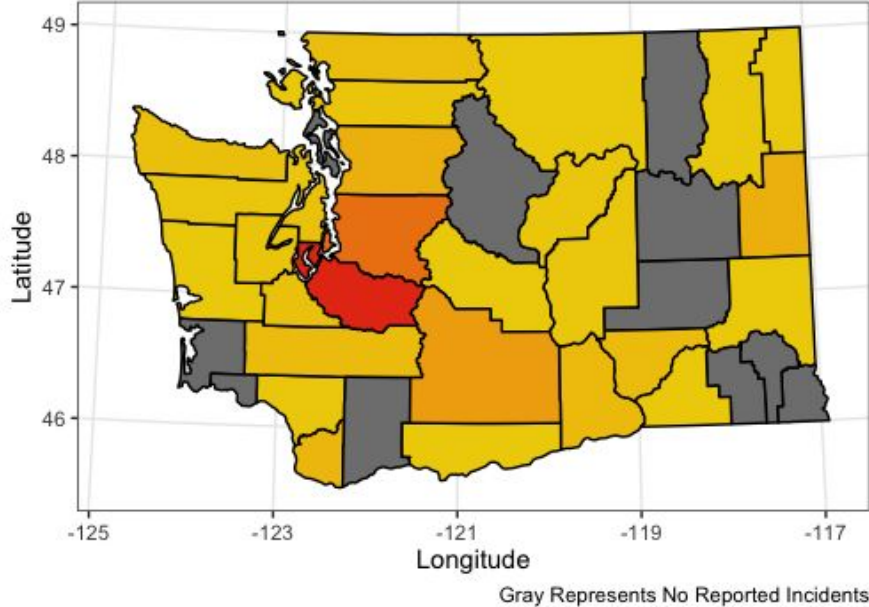**Table Reduction**

NIBRS Entity-Relationship Diagram for Project

Integrate Geospatial Dimension
- Urbnmapr

Results - Alternate Visualizations from R

2018 Murder and Negligent Manslaughter by County

Gray Represents No Reported Incidents

Guidelines

Enable accurate comparisons
- Encodes value counts will to geography
- Grid Line Usage

Simplify appearance
- Easily distinguished geographic context
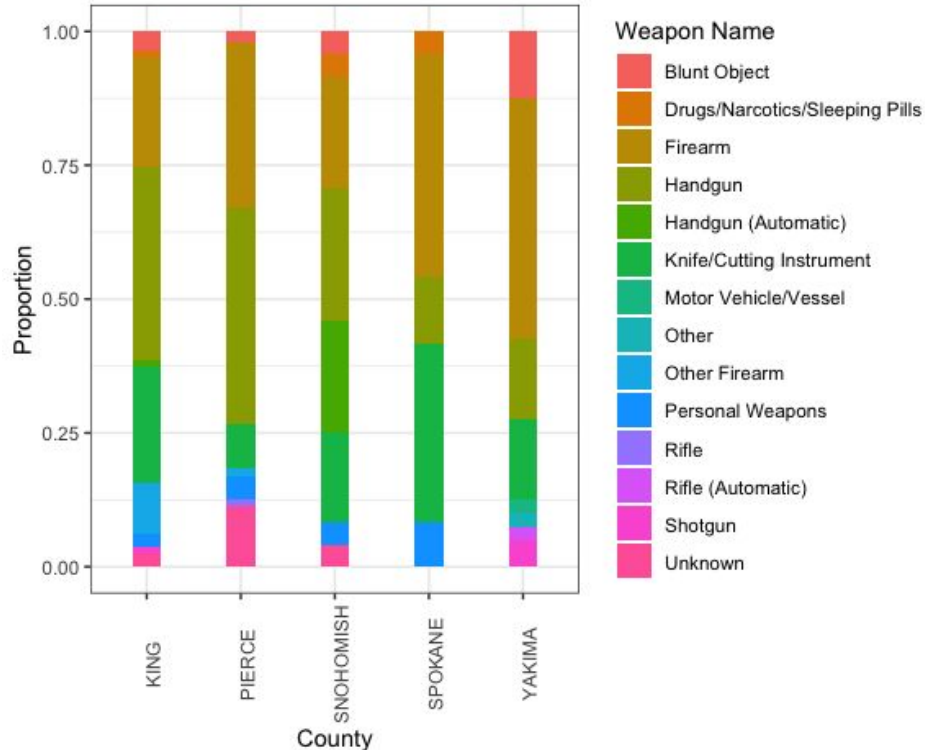- Aligned to preattentive vision

Provide or increase context
- Units of Measure provided in sliding scale
- Spatial context using map

Attract and Engage Reader/Analyst
- Colorful graphics to engage viewer
- Charts is visually appealing / engaging

Results - Alternate Visualizations from R

Weapons Used by County, Murder and Negligent Homicide, 2018

Guidelines

Enable accurate comparisons
- Volume used to encode the frequency of weapon utilization occurrence

Simplified data appearance
- Displays subset of data for the five counties with highest aggregate number of murders/negligent homicides.
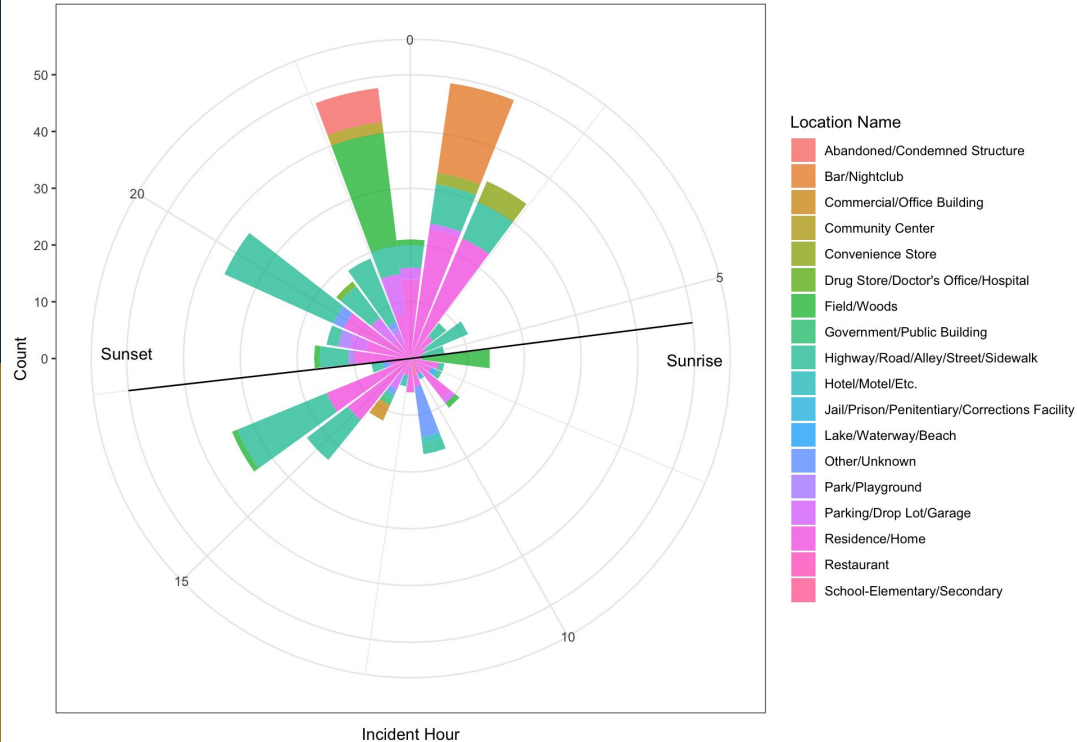
Provide or increase context
- Use volume to encode relative changes in crime weapon
- Proportion as unit of measure to facilitate discussion

Attract and Engage Reader/Analyst
- Chart facilitated quick relative comparison
- Colorful graphics

Results - Alternate Visualizations from R

2018 Murder/Neg. Homicides
By Incident Hour

Location Name
- Abandoned/Condemned Structure
- Bar/Nightclub
- Commercial/Office Building
- Community Center
- Convenience Store
- Drug Store/Doctor's Office/Hospital
- Field/Woods
- Government/Public Building
- Highway/Road/Alley/Street/Sidewalk
- Hotel/Motel/Etc.
- Jail/Prison/Penitentiary/Corrections Facility
- Lake/Waterway/Beach
- Other/Unknown
- Park/Playground
- Parking/Drop Lot/Garage
- Residence/Home
- Restaurant
- School-Elementary/Secondary

Black Lines depicts nom. sunrise-sunset

Guidelines

Enable accurate comparisons
- 24-hour clock face, radial length to encode data

Simplified data appearance
- Explicit display of differences between data points

Provide or increase context
- Added horizontal line and labeling to offer additional encoding of time of day

Attract and Engage Reader/Analyst
- Chart engages viewer to think about when crime occurs

Conclusion

- Great experience with real world data that demonstrates the power of R Studio
  - Task could NOT have been done using spreadsheets
  - Unfortunately what most criminal intelligence analysts have at their disposal

- Team was of equal programming ability
  - Facilitated equal contributions and dialog regarding project scope and design

- Best Practices
  - Know your data, visualize it
  - Common repository to remain synchronized (Dropbox, S3, Box, GDrive)
  - Research techniques, community is large and collaborative

QUESTIONS?