



Predicting Police Misconduct in Philadelphia, PA

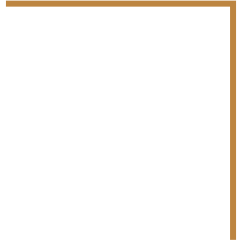
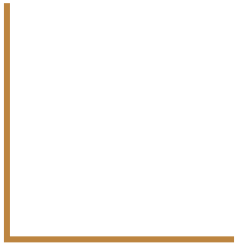
Chante Solomon | Faraz Khan | Kaila Gilbert

Agenda

- The Problem
- Data Collection and Analysis
- Analytic Techniques
- V2 Workflow
- Lessons Learned & Limitations
- Q&A



The Problem





Fired, then rehired

Once-secret records show how the police arbitration system overturned the firings or discipline of more than 100 questionable Philadelphia cops.

by [William Bender](#) and [David Gambacorta](#), Updated: September 12, 2019



Philly's police misconduct cases drain taxpayer money | Opinion

Updated: October 1, 2019 - 9:00 AM

\$ Millions to Settle Philly Police Misconduct Cases

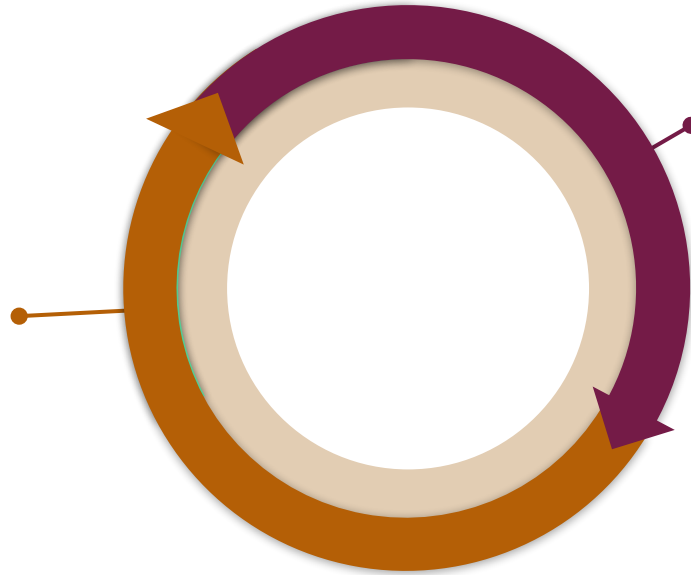
Loaded on MARCH 16, 2018 by [Derek Gilna](#) published in Criminal Legal News April, 2018, page

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Filed under: [Police Misconduct](#). Location: [Pennsylvania](#).

A Problem

Increase civic
distrust between
civilians & cops



Increase in police
misconduct

The Three Questions

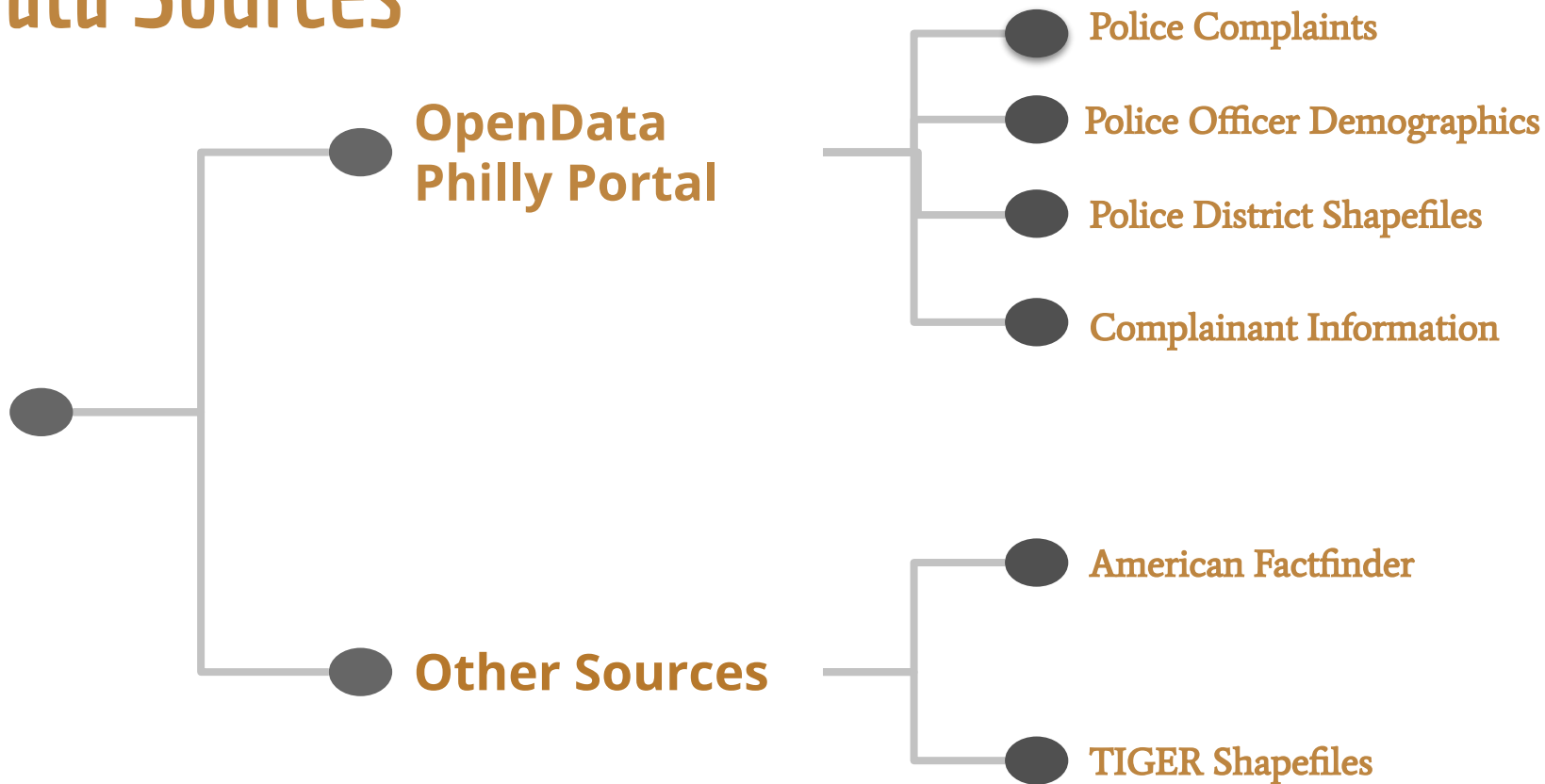
- **Decision-Maker:** Philadelphia Mayor's Office
- **Decision Being Informed:** Which police districts should we target for increased training and resources?
- **Value of an Improved Decision:**
 - Reduced amount of litigation fees
 - Increased civic and neighborhood cohesion
 - Safer neighborhoods

Scope Limitations

Our goal is **NOT** to measure causality between data-driven insights and the impact on police misconduct.

Our goal is to enable decision-makers to make informed decisions about where they would like to target for interventions.

Data Sources

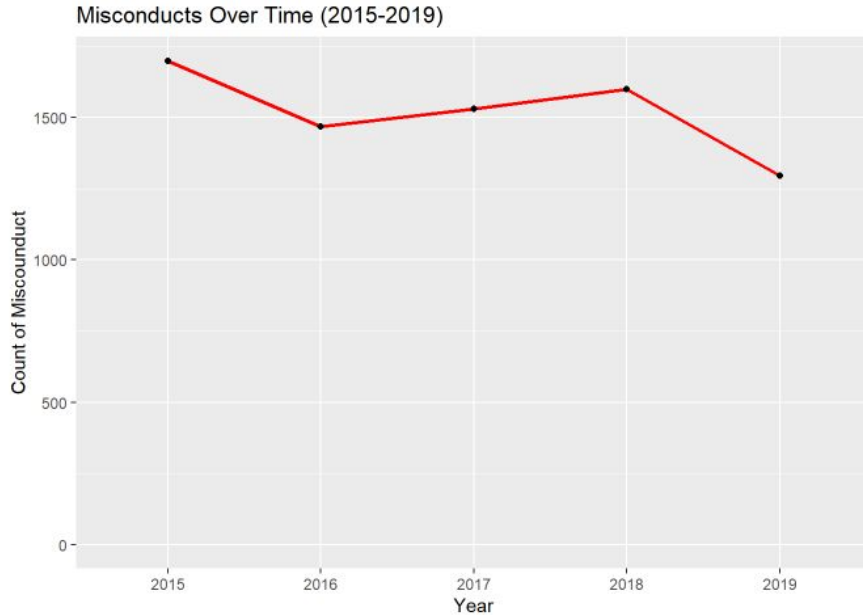




Data Collection and Analysis



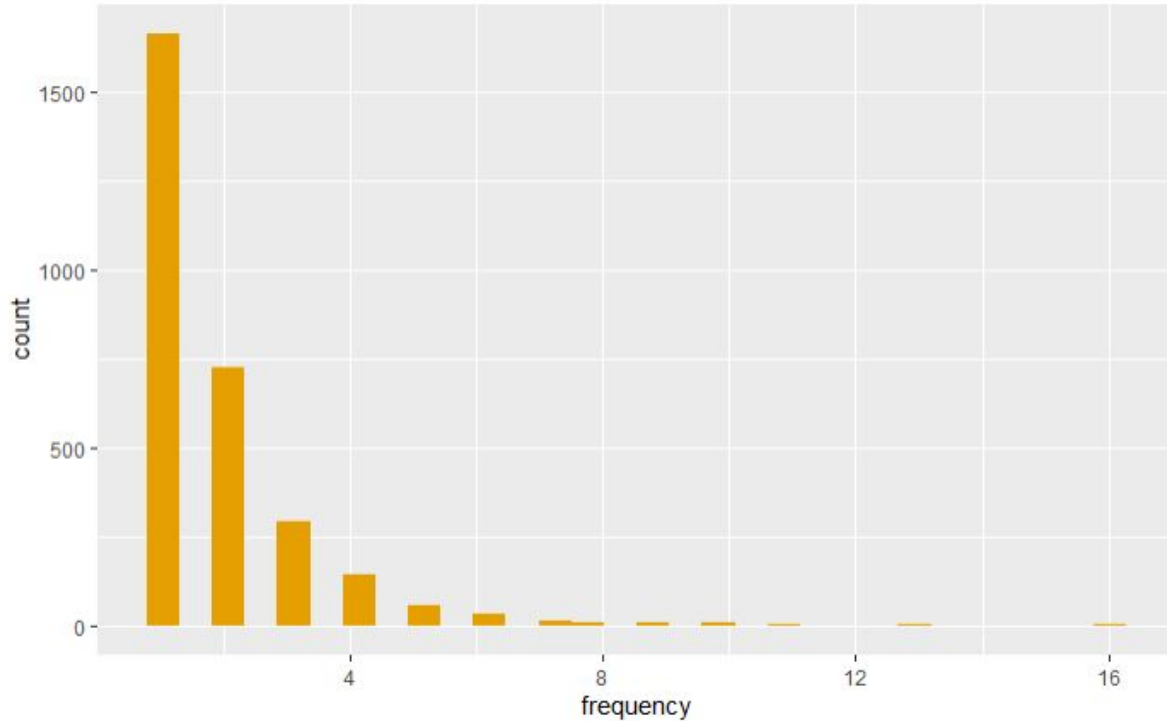
EDA: General Trends



Between **1300 and 1800** police complaints are received every year by the Philadelphia Police Department.

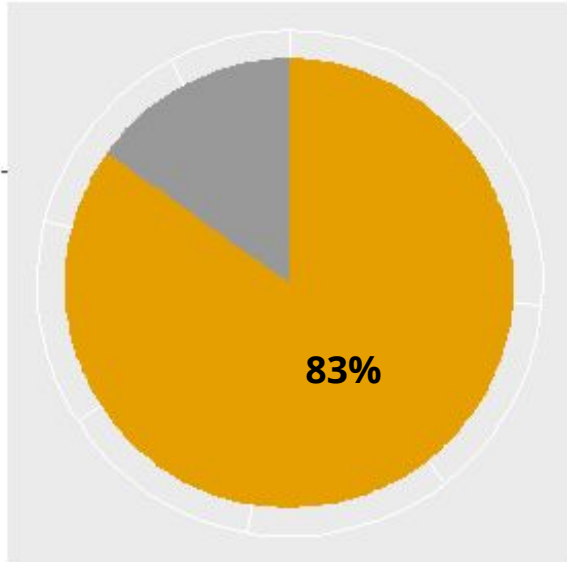
Available data is limited to 2015 and 2019

EDA: General Trends

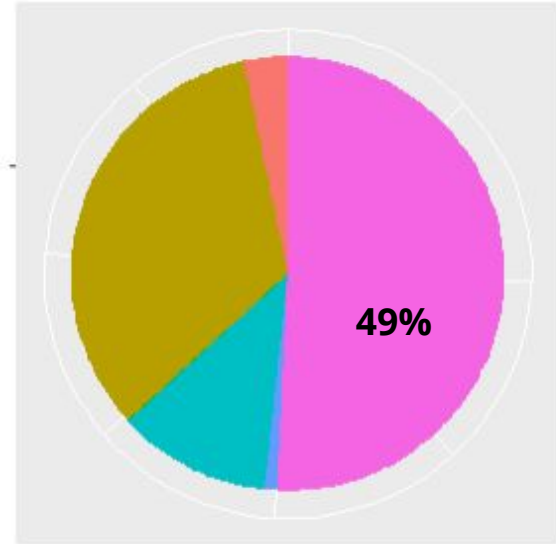


Most officers only have a few complaints.

EDA: Officers in Misconduct Dataset



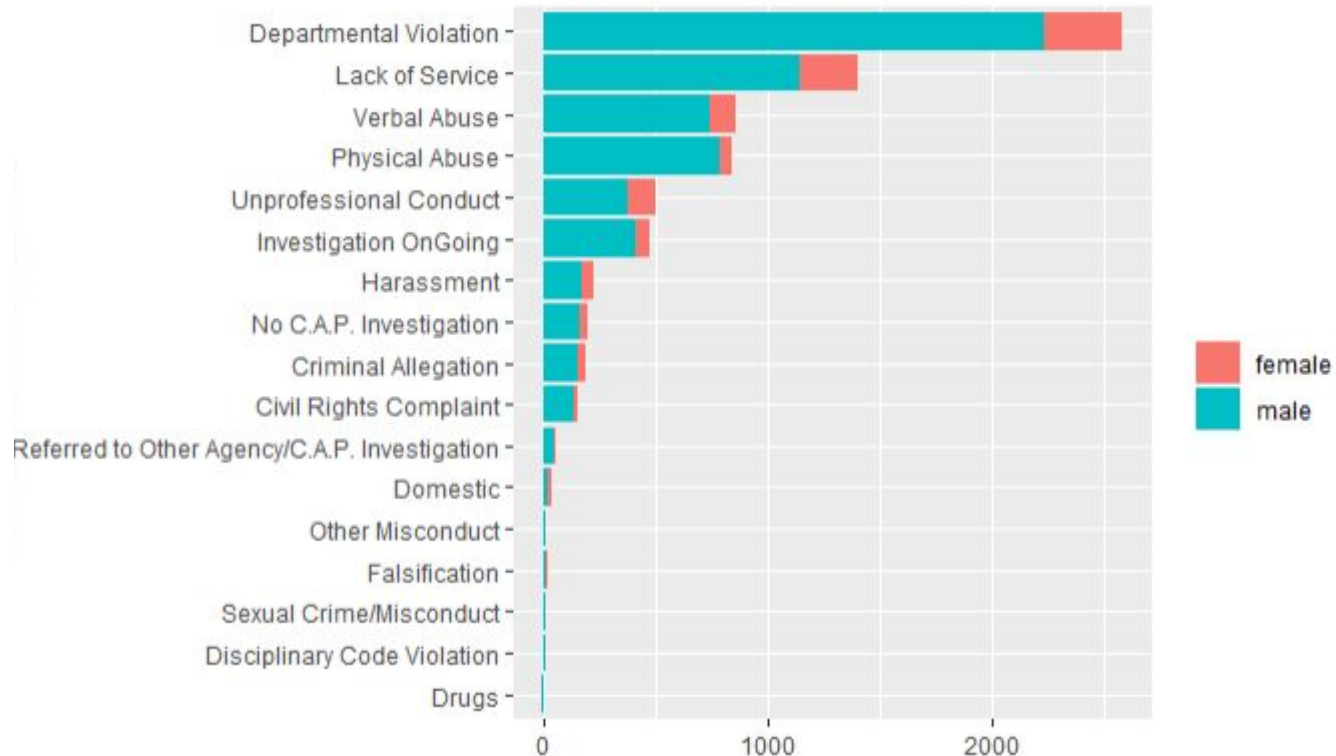
female
male



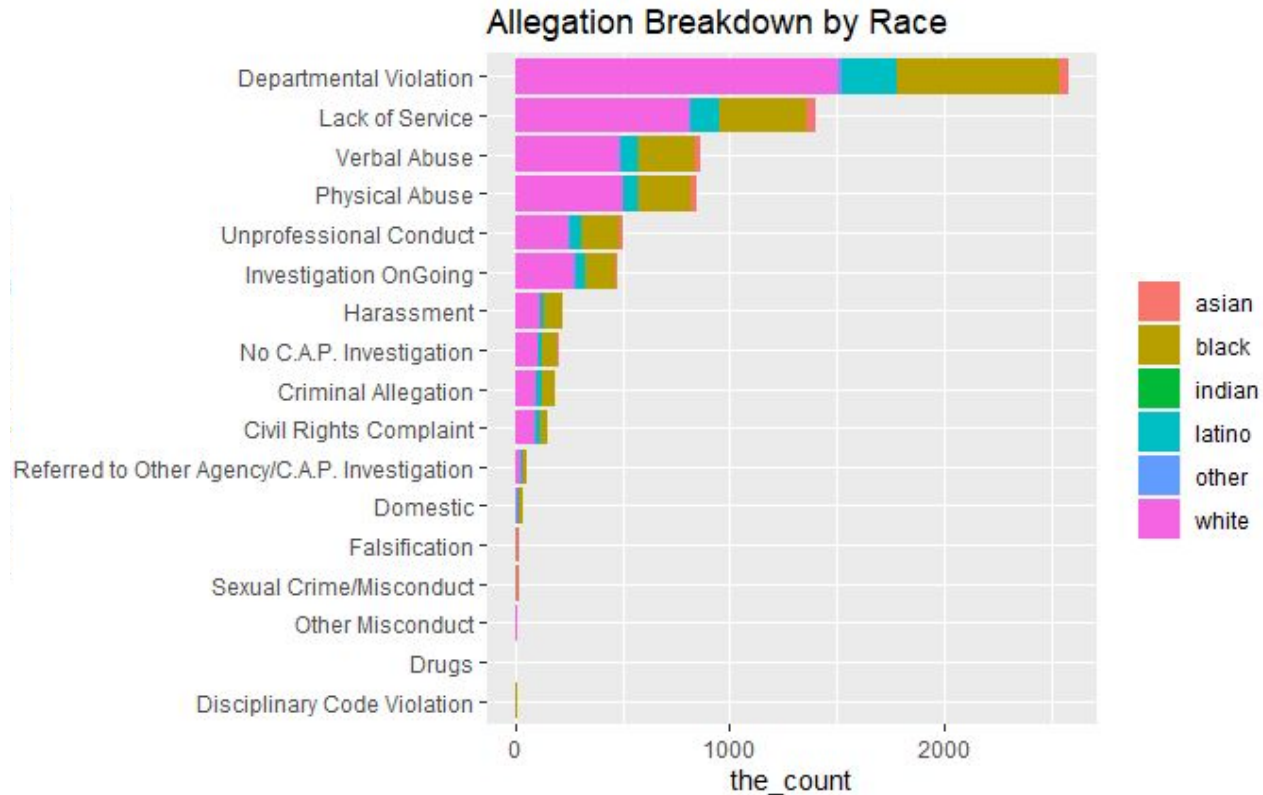
asian
black
indian
latino
other
white

EDA: Misconduct by Officer Demographics

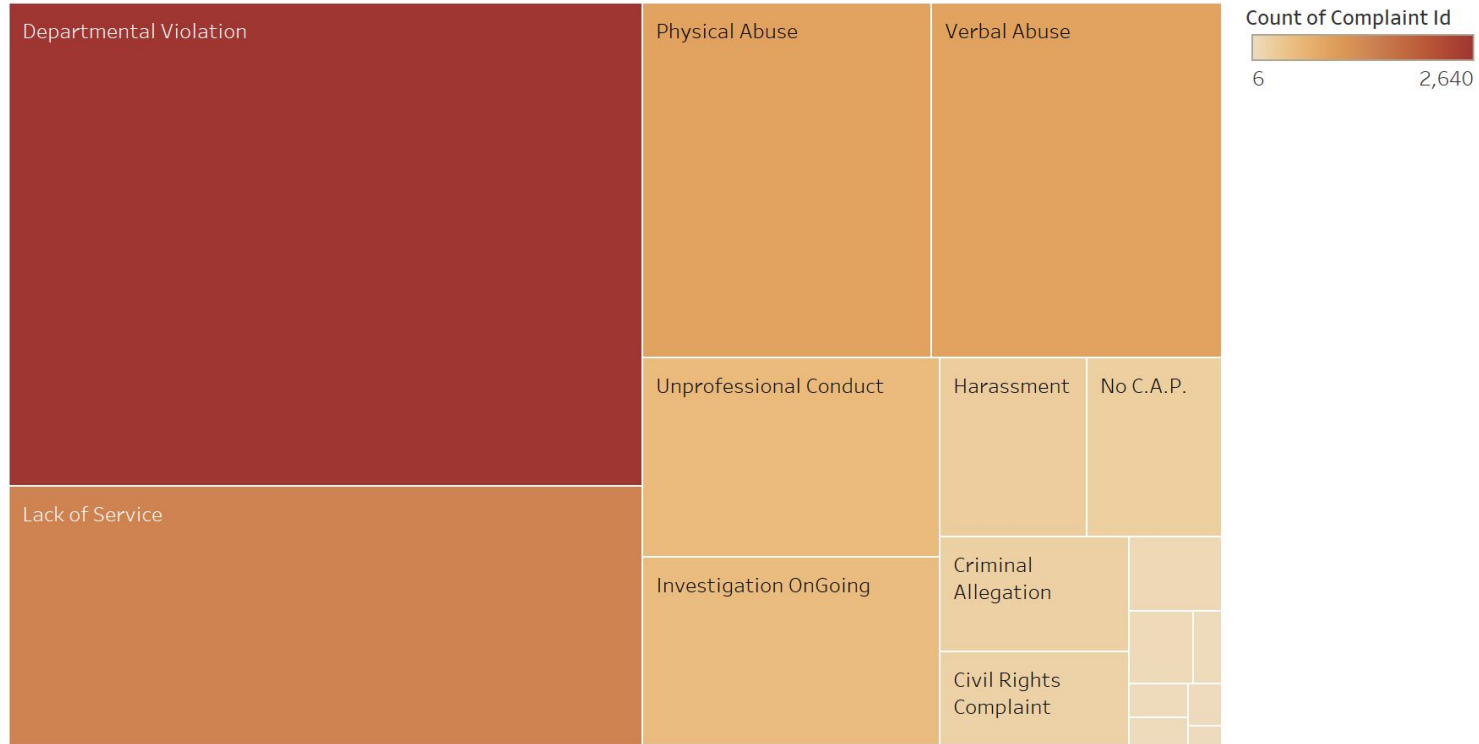
Allegation Breakdown by Sex



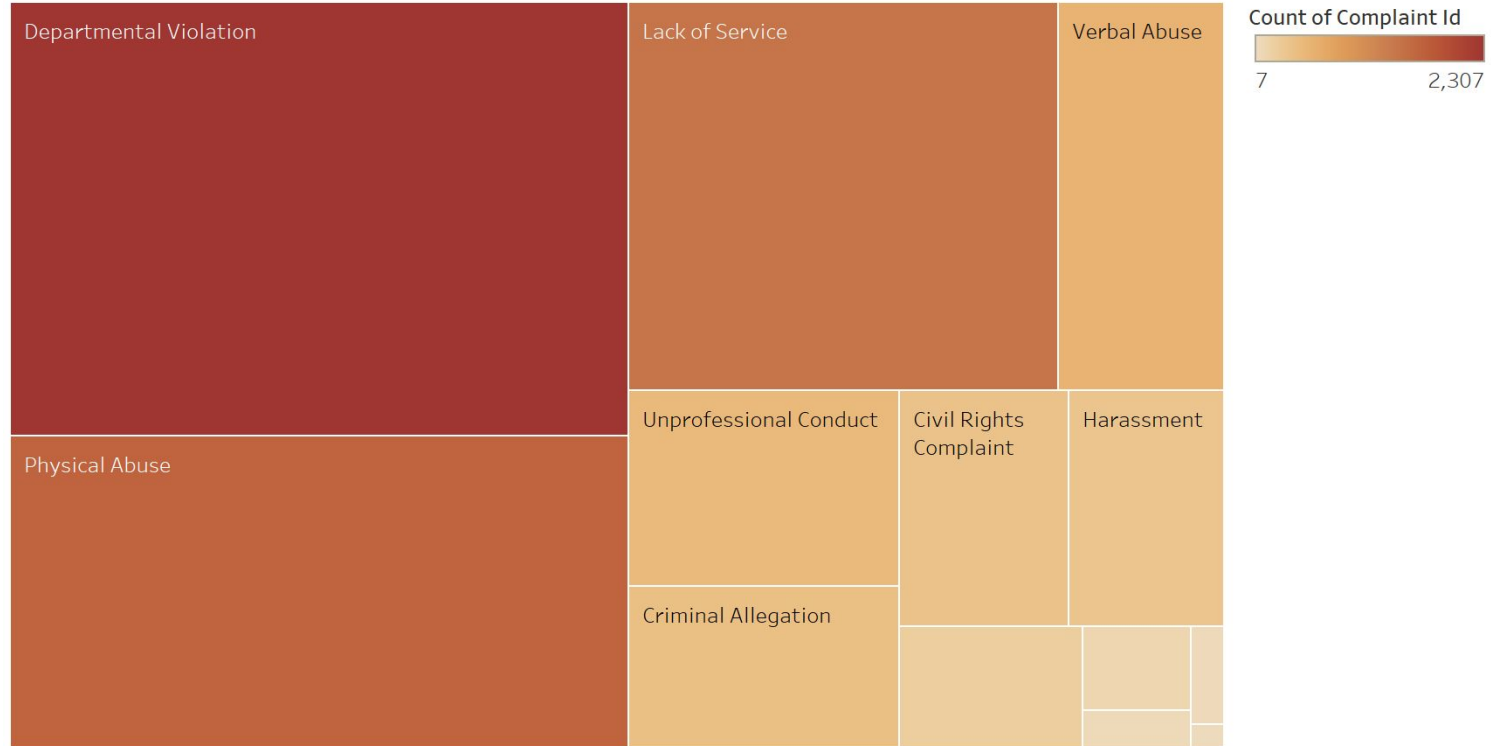
EDA: Misconduct by Officer Demographics



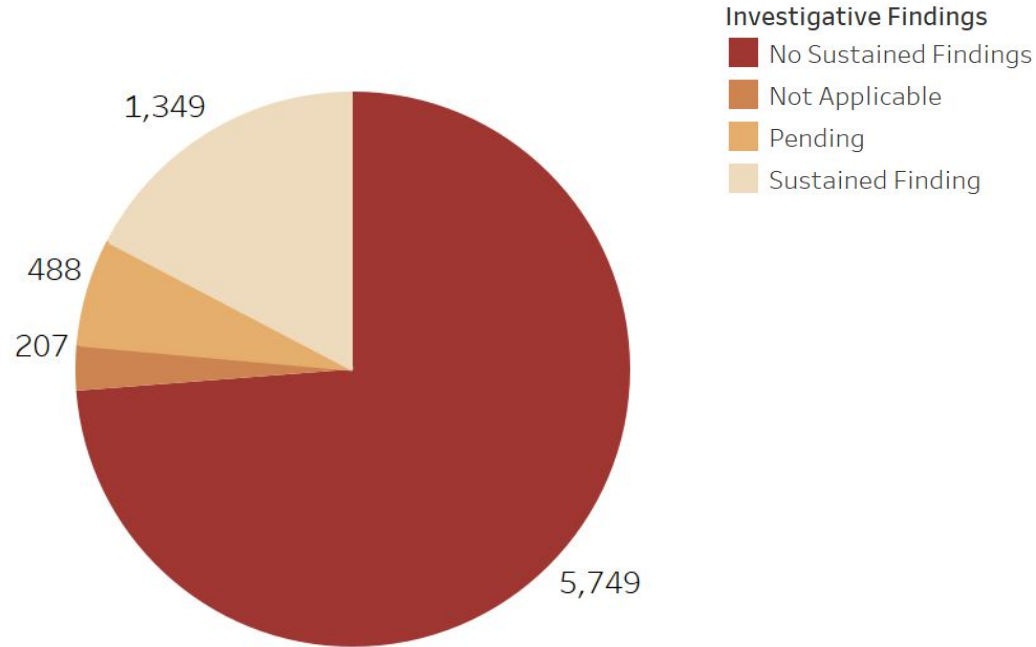
EDA: Common Allegations Reported



EDA: Classification of Misconduct



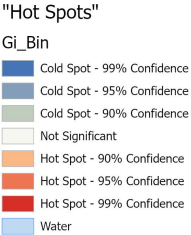
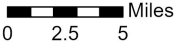
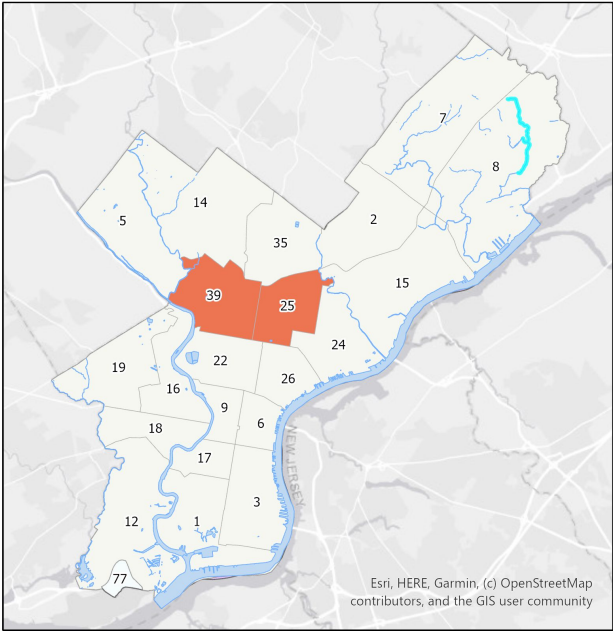
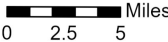
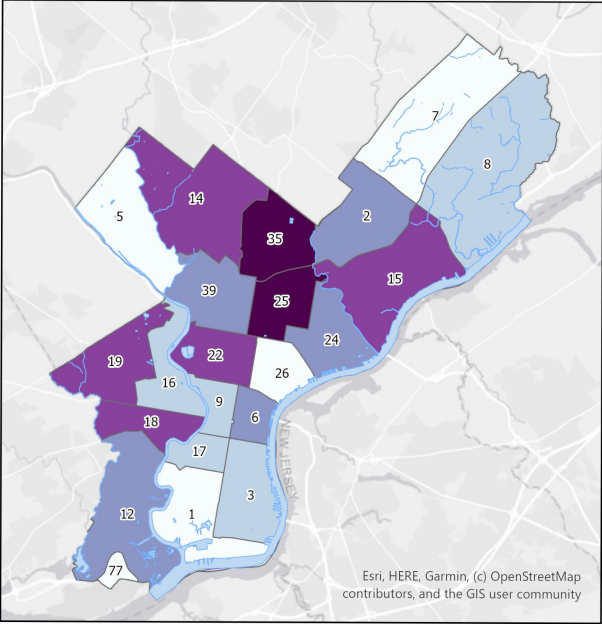
Sustained vs. Unsustained Findings



Investigative Findings by Category



EDA Using ArcGIS





Analytic Techniques



Analytic Techniques

1. Clustering (*K-Means*)

- What are naturally occurring trends/separations of these police stations?

2. Prediction (*Logistic Regression, Random Forest*)

- Which districts are more likely to yield the most complaints?
- Which officers are at highest risk of receiving a complaint?

3. Optimization (*Multi-Objective Linear Programming*)

- How can the Mayor's Office best distribute limited funds across necessary locations or individuals?

The Dashboard



V2 Workflow

Project Stages & Milestones

Stage 1: Exploration

- Client Scoping Meeting
- Secure datasets
- Conduct data analysis in R and ArcGIS
- Explore additional visualizations in Tableau

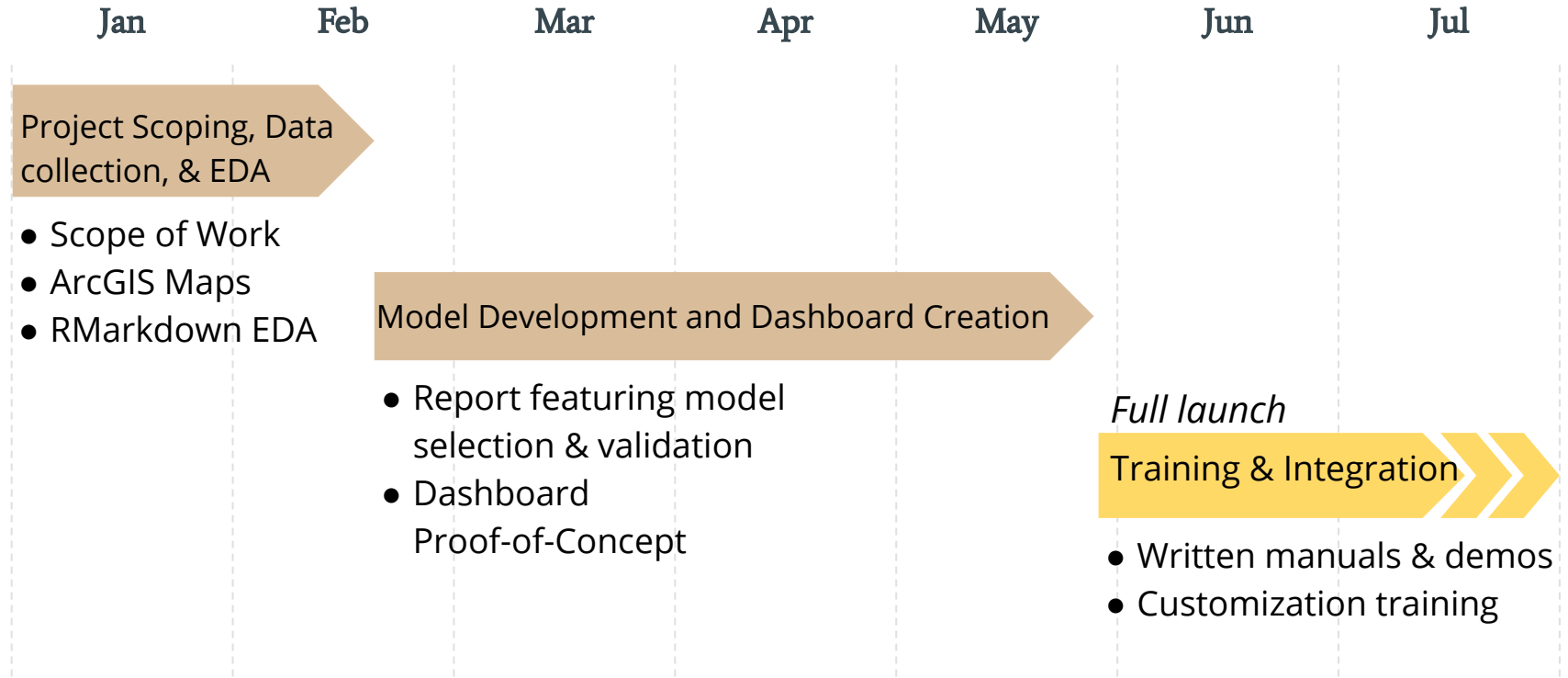
Stage 2: Modeling

- Data segregation
- Model selection and training
- Model evaluation
- Meet with decision-maker to finalize key metrics & create dashboard

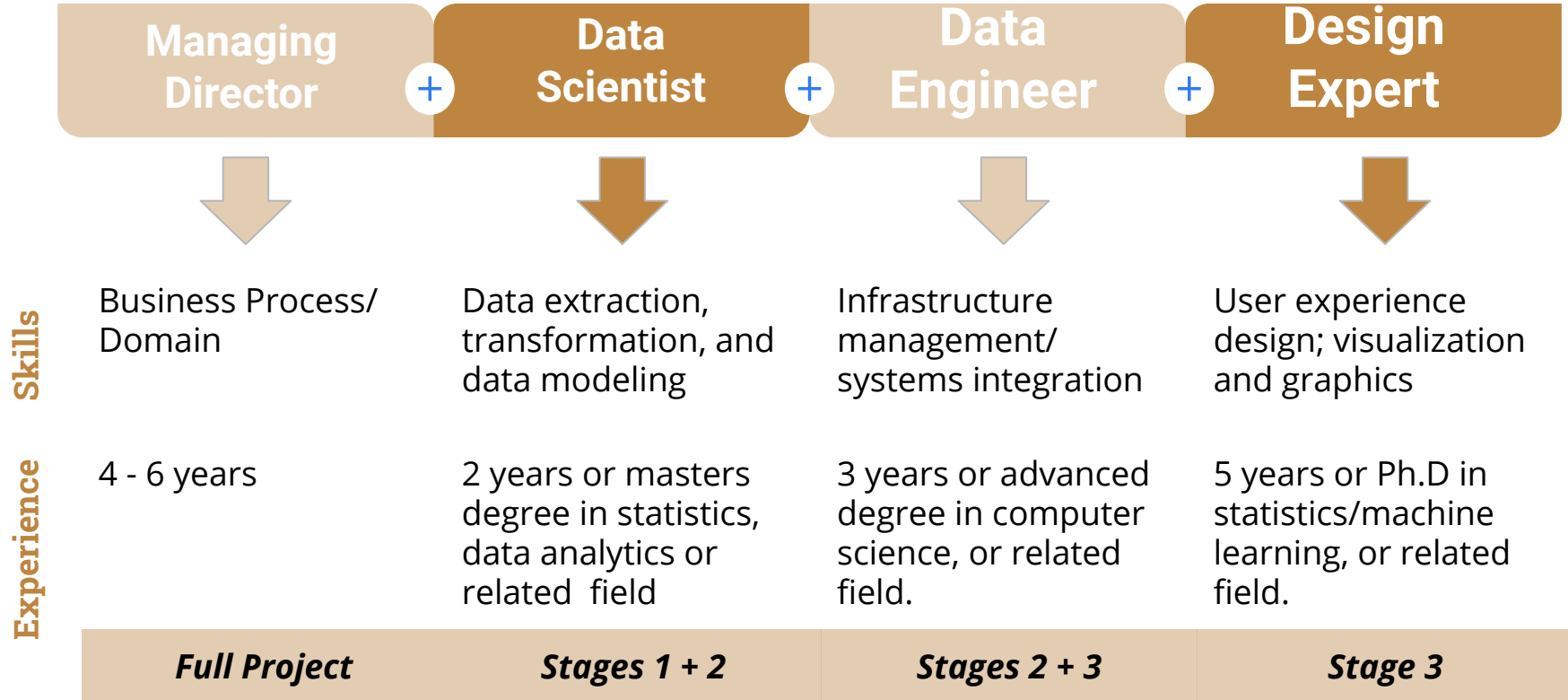
Stage 3: Implementation

- Integration of dashboard into current system
- Customized training webinars for different stakeholders
- Knowledge transfer and documentation

Project Timeline & Deliverables



Team Composition



Hardware and Software Needs



Dashboard
Hosted Locally *



Risks and Mitigation

Risk	Impact Level	Concern	Mitigation
Data Availability	2	Acquiring more data, in particular individual-level data, may take time to procure due to data and legal requirements.	<p>Build partnerships with necessary gatekeepers early on</p> <p>Stress the mission critical nature of this step and the potential financial outcomes if not addressed.</p> <p>Allow data-related processes (like prep, acquisition, and visualization) to work in parallel.</p> <p>Utilize modular data pipeline unit testing so that once data is acquired, can get ground running.</p>
Regulatory Changes	2	Changes in administrations or policies could result in deregulation or other political process could harm our legitimacy	Conduct SWOT analysis early to assess potential policy agendas and how they may influence the project to inform strategies.

Risks and Mitigation

Risk	Impact Level	Concern	Mitigation
Police Pushback / Union Involvement	2	<p>If the police are informed of the project, they may may resent the project or feel infringed upon</p> <p>Alternatively, this could lead to lobbying efforts against the Mayor's Office and project.</p>	<p>Control messaging early-on to frame projects as beneficial, good for public trust.</p> <p>Engage officers in business understanding efforts to gain perspective and inform design.</p> <p>Incorporate Union early and often to address concerns and ; find ways to ensure their support</p>
External Crisis or Event	1	<p>Another Trayvon Martin event could create instability;</p> <p>On the other hand, favorable events and political pressure could harm our progress if it leads to deregulation and less oversight</p>	<p>Develop messaging strategy early to frame project as public works/civic initiative.</p> <p>Engage citizens in focus groups/etc to understand community needs.</p> <p>If exposure is negative, limit the exposure of this project</p>

Measuring Success

Monitor performance of a pilot program to ensure that product works as planned. Indicators of success:

- ✓ **Performance:** Model has a 90% precision rate at the top 3 facilities
- ✓ **Utilization:** 90% of relevant actors are trained on the tool
- ✓ **Satisfaction:** 90% favorable ratings 90% (via survey)



Lessons Learned & Limitations



Lessons Learned

1. Analytics tasks follow the **capability of the data.**
 - Availability of labels
 - Quality of the data
 - Accessibility of the data gatekeeper
2. **Agility is a necessary trait** when dealing with imperfect data and imperfect information
3. **Business understanding is paramount** for the success of project.

Limitations

- Lacked demographic information in 25% of the data
- Instances of misconduct are likely under-reported

In Philly, filing complaint against a cop isn't always easy

by JAN RANSOM, ransomj@phillynews.com 215-854-5218, Posted: January 31, 2011



Questions?