Comparing co-complaint networks reveals distinct structures across police departments

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Motivation

- Minneapolis-based organization **Reinvestigation Workgroup** (RWG) wants to understand police misconduct in Minneapolis and compare to other cities
- Civilian complaints about police may help us understand patterns of police misconduct
- We represent patterns of misconduct by building networks based on complaint records
- Wood (2019), Ouellet (2019), and Zhao (2020, 2024) have used similar approaches to study misconduct in Chicago

Research Questions

- How are complaints distributed by **time** and **officer**?
- What are the **structural properties** of police co-complaint networks?
- Do these structural properties reveal **social patterns** of police misconduct?
- How do these patterns **vary across cities**?

Comparison Data

Top 50 cities by population in the U.S.

Google search for comparison cities with public data on complaints

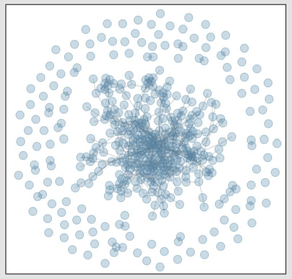
Preprocessing to identify which cities have sufficient data in timeframe

12 of these cities + Cincinnati (#66 pop.)

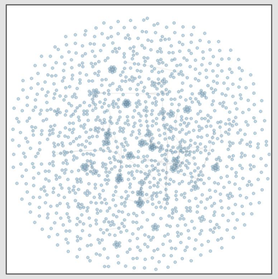
Minneapolis, Philadelphia, Cincinnati, Seattle (Feb 2023 - May 2025)

Minneapolis Police Dept.	Major Midwestern city pop. 429,000 History of police misconduct
Philadelphia Police Dept.	Similar reforms to complaint system in recent years, ~3x pop. of MPLS
Cincinnati Police Dept.	Similar size to Minneapolis (pop. 309,000), Midwestern city, has officer demographics, internal vs. external complaints separate
Seattle Police Dept.	Robust accountability due to federal consent decree in 2012

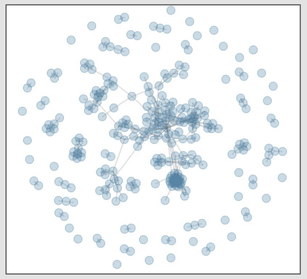
Exploratory Network Visualizations



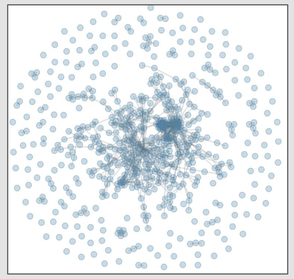
Minneapolis PD:
448 police officers
76% connected officers



Philadelphia PD:
1,324 police officers
77% connected officers



Cincinnati PD:
279 police officers
89% connected officers



Seattle PD:
609 police officers
76% connected officers

Nodes are defined as the individual officers that have any complaint against them.

Edges, or connections between nodes, are defined by two officers appearing together on the same complaint.

Officer A and Officer B are connected if they are both involved in at least one complaint.

- All officers with at least one complaint are included, even those that are not connected.
- These visualizations show how complaint co-involvement is structured within each department.
- Combined with network statistics and policy context, our analysis can help understand department culture both within and across jurisdictions.

Network Analysis

Network statistics are used to compare key structural features of the co-complaint networks across cities.

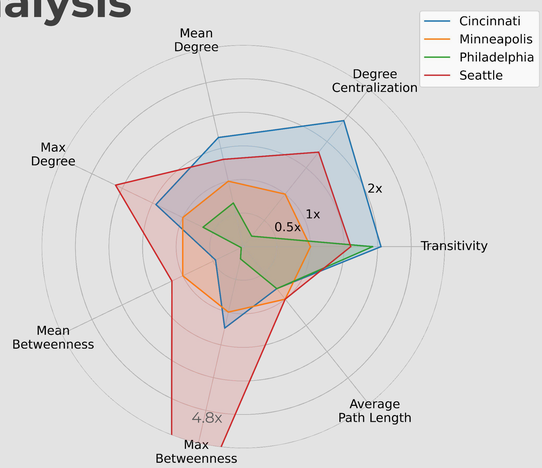
- **Transitivity**: proportion of closed triangles among all open and closed triangles; Values closer to 1 suggest more tightly connected clusters among officers.

Closed Triangle

Open Triangle

- **Degree**: number of edges connected to a node; Mean degree summarizes the average level of connectivity, while maximum degree identifies the most highly connected officer.
- **Degree centralization**: how unevenly connections are distributed; Values closer to 1 indicate that ties are concentrated around a few highly connected nodes.
- **Betweenness centrality**: how often a node lies on the shortest paths between other nodes; Mean betweenness reflects how common these connecting roles are overall, while maximum betweenness identifies the officer most responsible for linking different parts of the network.
- **Average path length**: how far apart connected officers are on average; Shorter paths indicates a more compact network.

Because network measures are sensitive to network size, comparisons across cities should be interpreted alongside the number of officers and connected nodes in each network.



All measures are standardized against Minneapolis. Higher values generally represent greater connectivity, clustering, or centralization (except average path length: higher = more dispersed).

- **Minneapolis PD**: comparatively less connected, less clustered, and less centralized across most network measures
- **Philadelphia PD**: stronger local clustering but fewer extreme hub or bridge officers
- **Cincinnati PD**: the most consistently interconnected network
- **Seattle PD**: highly hub-driven but less uniformly clustered, with a few highly connected/bridge officers shaping network structure

Discussion

Previous work shows networks can reveal patterns of misconduct
- Sustained through tight-knit social groups vs more diffuse? Impact of department policy?
- Community members can advocate for oversight

Even for similarly sized cities and PDs, networks reveal vastly different dynamics in connections
- Despite similar percent connectedness, Seattle has vastly higher max betweenness and centralization (4.8x, 1.8x), and Philadelphia lower (0.2x, 0.2x), than Minneapolis
- Similar max betweenness between Cincinnati and Minneapolis indicates potential similarity in department behavior and/or policy
- Multiple hubs of co-complaints vs centralization of complaint origin

Limitations and future directions:
- Short time window of comparison (2023-2025)
- Limited variables available, missing detail on officers (rank, unit, demographics)
- Unweighted: does not account for repeated officer pairs
- Exponential Random Graph Models can reveal more structure with clustering and triadic closure

Open Questions

- What department policies may influence how co-complaints appear?
- How could our work inform how misconduct is investigated and addressed and how could it be used to improve policy?
- How can we effectively facilitate an in-person meeting to further develop analytical results and brainstorm dissemination efforts?

Acknowledgements

We thank the Institute for the Quantitative Study of Inclusion, Diversity and Equity (QSIDE) and the Institute for Advanced Study (IAS) at the University of Minnesota for their generous support of this work.

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