

Statistical Analysis of Network Data

Final Presentations

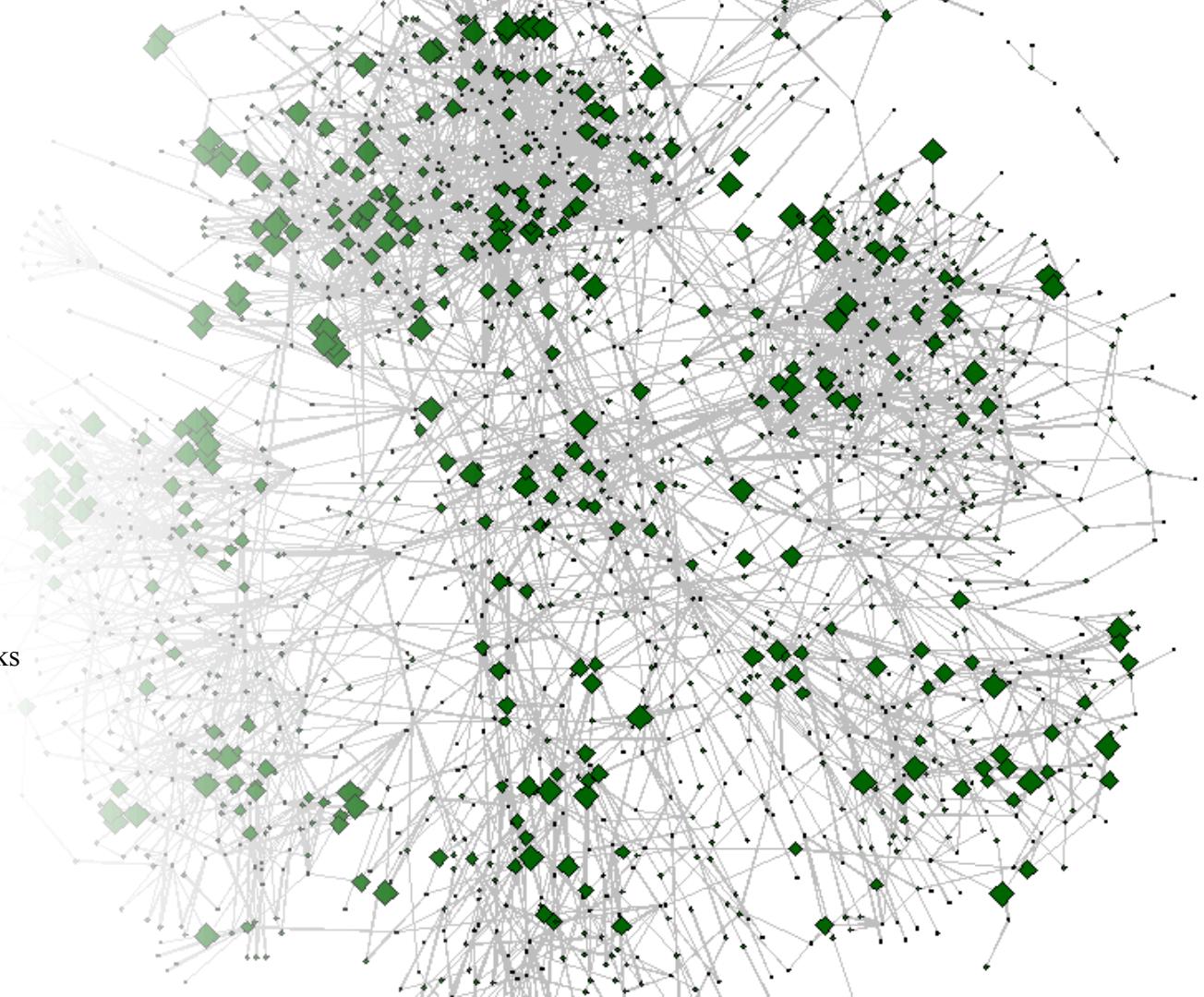
Cohort Homophily in Police Officer Use of Force Networks

Matthew Durán

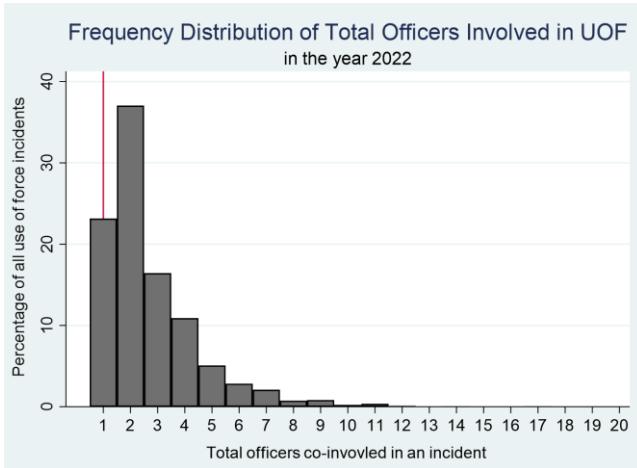
Arizona State University

CRJ 605: Statistical Analysis of Networks

Dr. Jacob Young



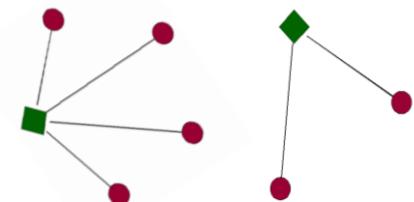
Background



- Prior use of force research has broadly conceptualized use of force incidents as encounters between a single officer and citizen.



- Data for the current study indicates 76.85% of UOF incidents involved **two or more officers**.



- Much research has investigated individual- and incident-level characteristics of use of force, but less attention has explored group-level characteristics.

Current Study

Objective

Offers measurement strategies for two group-level variables: *cohort-incident ratio* (incident-level) and *cohort homophily* (network-level)

Data

Uses administrative data from a medium-sized police agency in the United States.

Method

Applies network analysis to investigate a cohort-level effect on the probability two officers will be co-involved in a use of force incident.

Research questions

Study 1

How often do use of force incidents involve officers from the same cohort?

Study 2

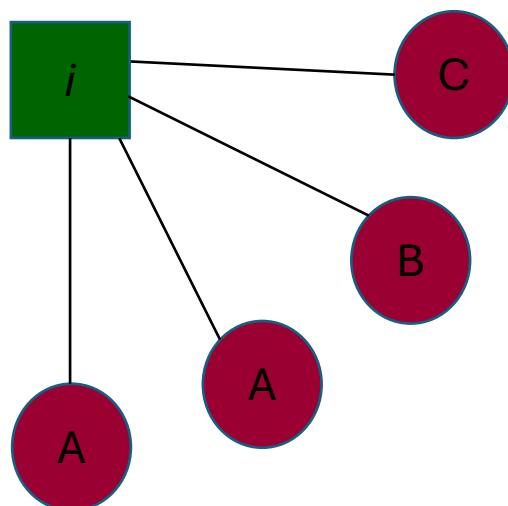
Are officers from the same cohort more likely to be co-involved in use of force incidents?

Study 1 - Methods

Calculate the cohort-incident (CI) ratio for each incident_i (for $i = 1, 2, 3, \dots$), where the total number of co-involved officers from the same academy cohort (*total cohort*) is divided by the total number of co-involved officers (*total officers*).

$$CI\ ratio = \frac{total\ cohort_i}{total\ officers_i}$$

Example calculation of the cohort-incident (CI) ratio



$$CI_i = \frac{\text{total cohort}_i}{\text{total officers}_i}$$



$$CI_i = \frac{2}{4}$$



$$CI_i = 0.5$$

Study 1 - Results

Table 1. Descriptive statistics of use of force incidents during observation period

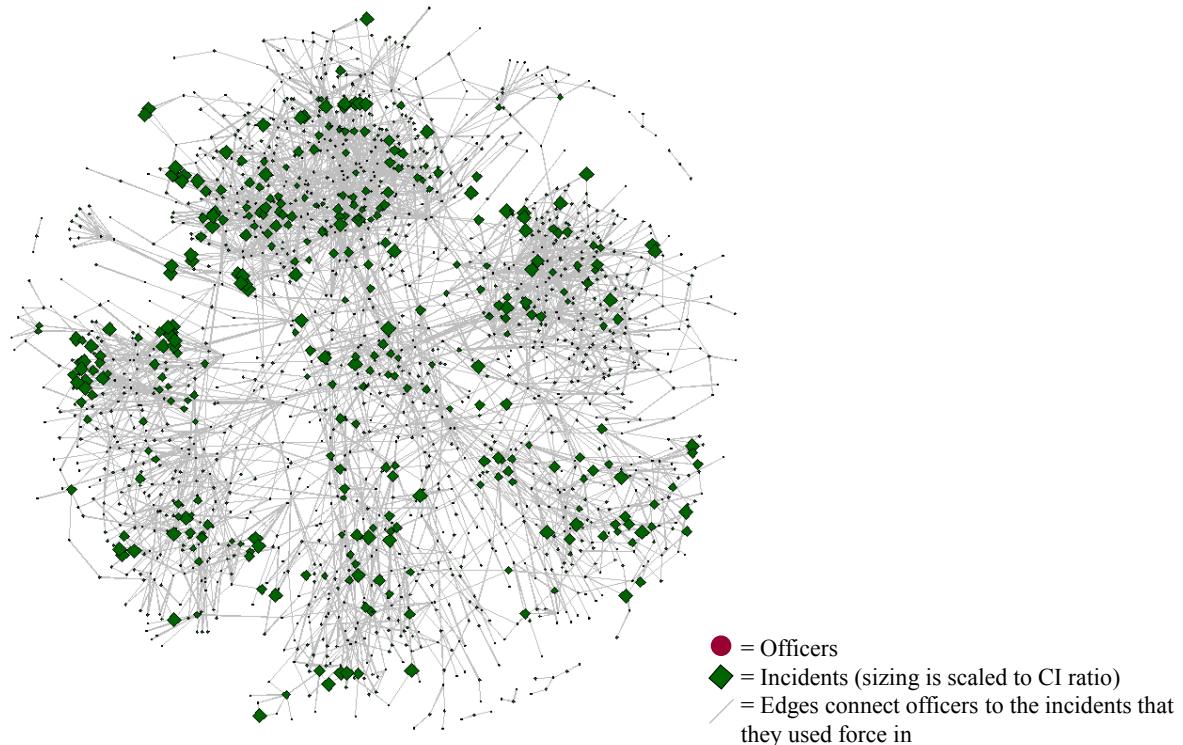
	Mean	SD	Min	Max
2017 (N = 506)				
Total officers per incident	2.83	1.27	2	11
CI ratio	.48	.18	-	-
2018 (N = 489)				
Total officers per incident	2.96	1.43	2	12
CI ratio	.48	.19	-	-
2019 (N = 560)				
Total officers per incident	2.81	1.18	2	9
CI ratio	.50	.20	-	-
2020 (N = 757)				
Total officers per incident	2.92	1.23	2	11
CI ratio	.52	.21	-	-
2021 (N = 861)				
Total officers per incident	3.15	1.51	2	13
CI ratio	.52	.22	-	-
2022 (N = 1,209)				
Total officers per incident	3.23	1.78	2	17
CI ratio	.48	.20	-	-
All years				
Total officers per incident	3.02	1.47	2	17
Mean CI ratio	.50	.20	-	-

Note. Use of force incidents are only those with two or more co-involved officers; N = Total use of force incidents; CI = Cohort-incident ratio; SD = standard deviation

- On average, three officers used force during an incident.
- Approximately 50% of officers were from the same cohort. This is consistent across all six years.

Study 1 - Results

Bipartite (officer/incident) UOF network – 2022



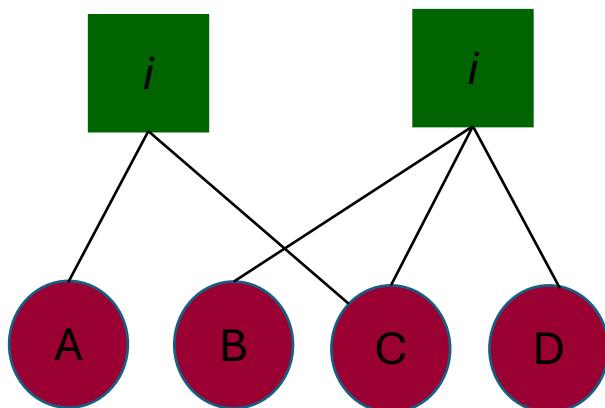
Study 2 - Methods

1. Create a one-mode projection of officers co-involved in use of force incidents (the next slide provides an illustrative example).
2. Code officer cohorts as a continuous variable (e.g., 99th = 99, 100th = 100...).
3. Estimate the impact of cohort homophily on officers being co-involved in a use of force incident using exponential random graph models (ERGMs), where the probability of a tie between i and j is dependent on the absolute difference of the co-involved officers' cohort ranking.

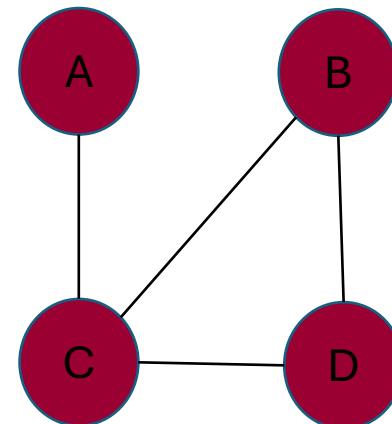
$$\Pr(Y = y) = \frac{\exp[\theta^\top g(y)] h(y)}{k(\theta)}$$

Example of network projection

Bipartite (actor-event) network



Unipartite (actor-actor) network



Descriptive statistics of the unipartite (officer/officer) UOF network

Table 2. Descriptive statistics of one-mode officer network (2022)

<i>Officer-level</i> ($N = 630$ officers)	% (M)	Min	Max
Age	(36.17)	21	65
Years of service	(8.55)	<1	36
Total force incidents	(5.69)	1	41
Gender			
Male	85.6	-	-
Female	14.4	-	-
Race			
Alaskan Native/Native American	0.3	-	-
Asian/Pacific Islander	1.4	-	-
Black	2.4	-	-
Hispanic	82.9	-	-
White	13.3	-	-
<i>Network-level</i> (Density = 0.02)			
Degrees	(12.76)	1	57
Betweenness	781	0	16,877
Closeness	(0)	0	0

On average, officers were co-involved in 5.69 use of force incidents, and shared incidents with 12.76 other officers during the year 2022.

Unipartite (officer/officer) UOF network in year 2022



Study 2 - Results

Table 3. Coefficients and standard errors for ERGMs

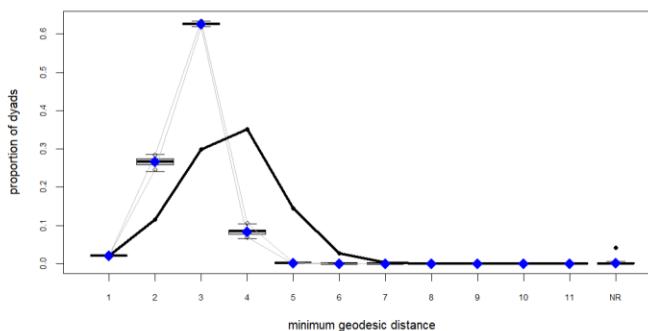
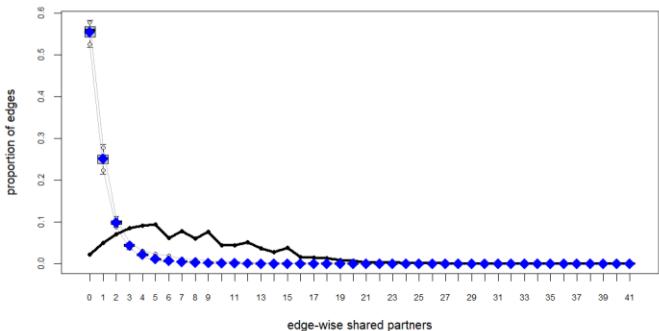
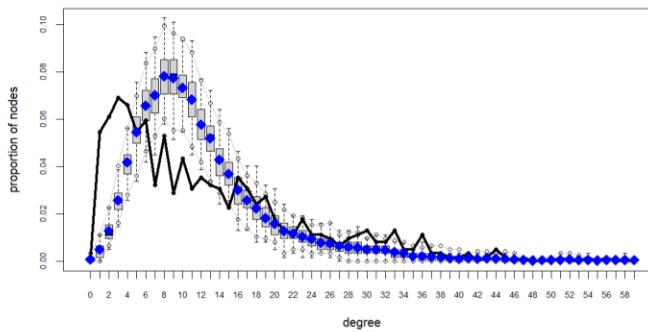
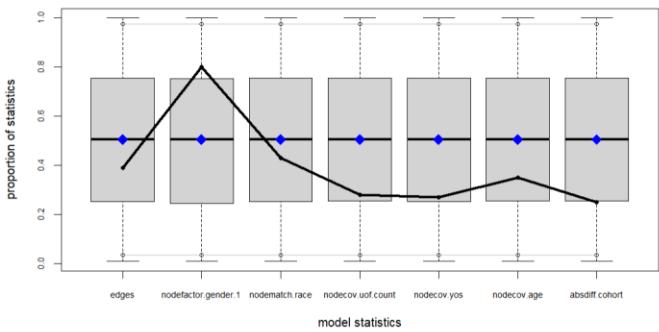
	Model 1		Model 2		Model 3	
	b	SE	b	SE	b	SE
edges	-3.87 **	.02	-4.74 **	.05	-4.75 **	.14
Female	-	-	.17 **	.03	.15 **	.03
Race homophily	-	-	.05	.04	.05	.04
Total UOF incidents	-	-	.07 **	.00	.07 **	.00
Years of service	-	-	-	-	-.01 **	.00
Age	-	-	-	-	.00	.00
Cohort homophily	-	-	-.03 **	.00	-.02 **	.00
AIC	38,567		35,762		35,754	
BIC	38,577		35,812		35,825	

Note. The reference category for gender is Male.

* $p < .05$; ** $p < .01$

Study 2 - Results

Goodness-of-fit diagnostics



Key Findings

Study 1

- Use of force incidents typically involve more than one officer.
- Half of all officers involved in a use of force incident are from the same cohort.

Study 2

- Officers from recent cohorts are most likely to share use of force incidents with one another.
- Officers from older graduating cohorts are less likely to be co-involved in use of force incidents with officers from recently graduated cohorts.
- The *cohort homophily* variable was strongly correlated with *years of service* ($r = -.98$).

Future Research

Qualitative Research

- Use semi-structured interviewing techniques to uncover cases where cohort homophily/heterophily impacted the outcome of a UOF incident.
- Conduct focus groups of officers to understand small group-level decision-making strategies during UOF incidents.
- Identify task-solving behaviors among small groups of officers.

Quantitative Research

- Conduct a comparative analysis on the impact of cohort homophily on UOF incident outcomes (e.g., citizen or officer injury, instances and types of force used, complaints).

Prison Family Matters: Social Engagement and Outcomes Among Women in Prison

Alexis Klemm
CRJ 605 Final Presentation

Project Overview

This project explores the structure of a prison family network of incarcerated women and analyzes how certain individual- and network-level characteristics correlate with particular behavioral outcomes.

The purpose of this project is to better understand how age and social integration impact behavioral outcomes in prison, such as engaging in programming and engaging in misconduct.

Peer Influence & Social Networks in Prison

Research on peer influence in prison has viewed the impact of peer influence on both positive outcomes such as peer education, role models, and treatment (Devilly et al., 2005; Kreager et al., 2019), and negative outcomes such as drug use and criminal learning (Damm & Gorinas, 2020; Woodall, 2005).

Social networks in prison are an ideal methodology for identifying and visualizing the social structures of different contexts in the prison setting (e.g., treatment programs) as well as analyzing mechanisms of socialization and social influence (Kreager, 2019; Kreager & Kruttschnitt, 2018; Schaefer, 2017).

Prison Families

Women often develop pseudo-familial social structures in prison as a means of coping with separation and imprisonment, and a means of maintaining a cultural identity similar to that in the outside world (Jones, 1993; Kolb & Palys, 2018).

Pseudo-families depict a gendered hierarchy structure within prisons. A manifestation of power and control similar to political or gang structures more commonly found within men's prisons (Kolb & Palys, 2018).

Pseudo-families taking on the hierarchical, control mechanism of women's prisons often makes them vulnerable to blame for conflict and problems on the unit. Research has shown that not only are pseudo-families typically a positive source of social support for incarcerated women, they also do not typically contribute to unit conflict in significant ways (Dillavou et al., 2022; Huggins et al., 2006; Kolb & Palys, 2018).

Current Study

The body of research on social structures and social influence in prison is still growing. There is less currently known about the social structure of prison families specifically to include how influence is transmitted throughout the network, who is the most influential, who is the most influenced, and in what ways. This study builds on the research in this area by looking at individual- and network-level characteristics of prison families of incarcerated women, and the ways these characteristics may impact particular outcomes.

A network approach allows us to visualize and quantify an individual's place in the prison family structure to better understand how positionality impacts particular outcomes.

Research Questions

This project investigates three primary research questions -

- Does age correlate with an individual's engagement in programming? In misconduct?
- Does age correlate with an individual's social integration (degree) in the prison family network structure?
- Do individuals who are more socially integrated report higher engagement in programming? In misconduct?

Data

The Women's Prison Inmate Network Study (WO-PINS)

Variables used:

- Prison family network developed from the question “*who in the unit is in your prison family?*”
- WO-PINS administrative data
 - Age (in years)
 - Programming (count of programs)
 - Misconduct (count of misconduct)

Measures

Concept	Conceptualization	Operationalization
Social influence/popularity	Social integration in prison family network	Degree centrality
Negative behavioral outcome	Engaging in misconduct	Count of misconduct
Positive behavioral outcome	Engaging in programming	Count of programs

Causal Model

Research question 1: *Does age correlate with an individual's engagement in programming? In misconduct?*

IV: Age (individual-level)

DV: Programming (individual-level), Misconduct (individual-level)

Research question 2: *Does age correlate with an individual's social integration (degree) in the prison family network structure?*

IV: Age (individual-level)

DV: Degree centrality (network-level)

Research question 3: *Do individuals who are more socially integrated report higher engagement in programming? In misconduct?*

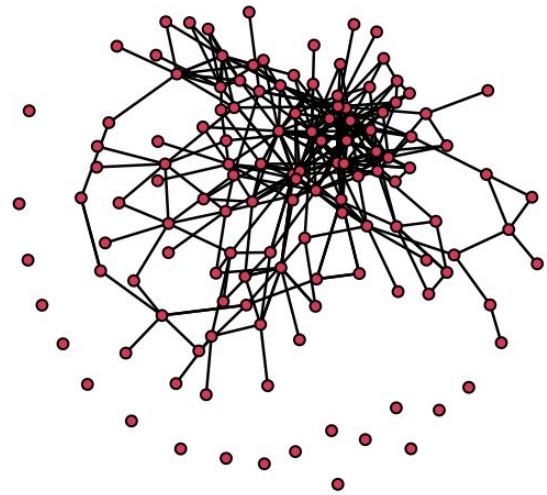
IV: Degree centrality (network-level)

DV: Programming (individual-level), Misconduct (individual-level)

Analyses

- Descriptive statistics (Age, Programming, Misconduct)
- Calculate degree centrality
 - Descriptive statistics of degree centrality
- Correlation tests and t-tests (at 95% confidence level)
 - Age-Programming
 - Age-Misconduct
 - Age-Degree centrality
 - Degree centrality-Programming
 - Degree centrality-Misconduct

WO-PINS Prison Family Network



“Who in the unit is in your prison family?”

131 women

18 not identified as being a member of the
prison family network of the unit

Descriptives

Age:

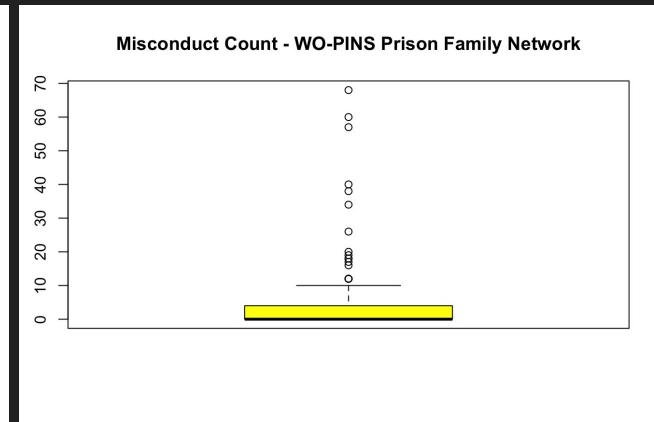
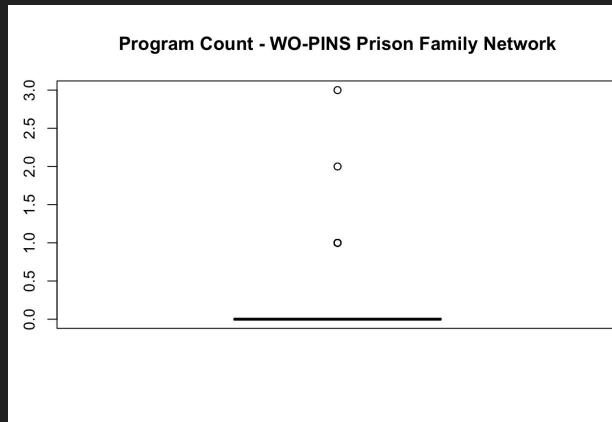
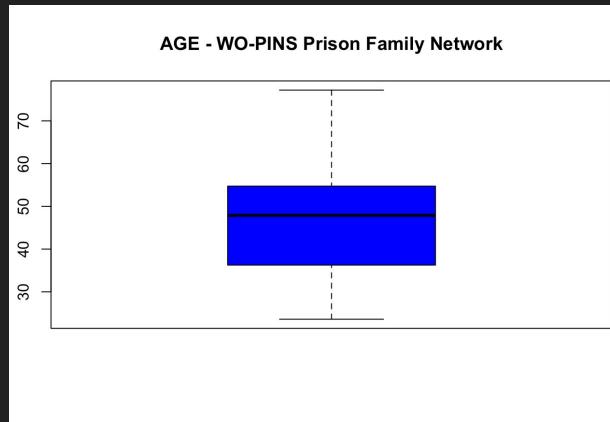
- Min - 23.6
- Max - 77.2
- Mean - 47.1
- Median - 47.9

Program Count:

- Min - 0
- Max - 3
- Mean - 0.3
- Median - 0

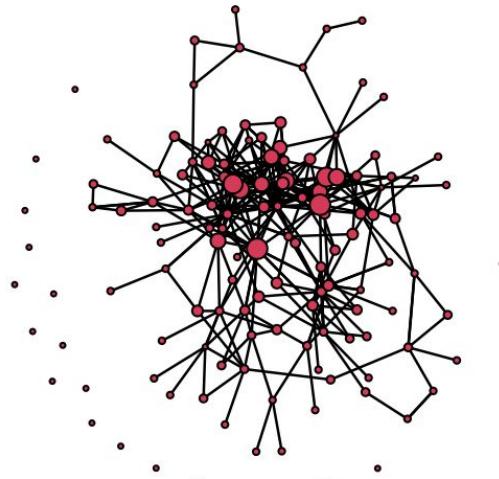
Misconduct Count:

- Min - 0
- Max - 68
- Mean - 4.9
- Median - 0



Degree Centrality

Degree Centrality Plot of WO-PINS Prison Family Network



Degree Centrality:

- Min - 0
- Max - 11
- Mean - 2.4
- Median - 2

Analytic Results

Age-Programming

- $t = -1.16$
- $df = 129$
- $p = 0.25$
- $\text{corr} = -0.10$

Age-Misconduct

- $t = 1.13$
- $df = 129$
- $p = 0.26$
- $\text{corr} = 0.099$

Age-Degree

- $t = 3.67$
- $df = 129$
- $p = 0.0004$
- $\text{corr} = 0.31$

Degree-Programming

- $t = -0.91$
- $df = 129$
- $p = 0.36$
- $\text{corr} = -0.08$

Degree-Misconduct

- $t = 1.20$
- $df = 129$
- $p = 0.23$
- $\text{corr} = 0.11$

Limitations & Future Directions

Future research in this area should use a more sophisticated measure for programming, specifically one that captures voluntariness.

Social integration (degree) does not capture the frequency in which individuals actually engage with their network. Future versions of this project will seek to incorporate the self-reported frequencies of social engagement of women, based on responses to the question “*when not at work or locked in, how do you typically spend your free time?*”

Social integration (degree) is a crude measure of social influence in a network. Future versions of this project will incorporate a variable of power and influence, based on responses to the question “*who are the unit residents you feel are the most powerful and influential?*”

Discussion & Conclusion

The lack of meaningful or significant relationships between age and engagement in programming and misconduct, as well as between social integration (degree centrality) and engagement in programming and misconduct suggest that age nor social integration in the family structure seem to influence behavior.

The significant relationship between age and social integration (degree centrality) suggests that age does impact an individual's positionality within the family structure. Specifically, the older you are, the more socially integrated you are.

Questions

Warrior Women: A Network Analysis of Women in Policing during Officer Involved Shootings

Stephanie Geoghan
Zeina Elqadah

Overview

Women in policing have been struggling with being a marginalized group

- Perceived as weak
- Incapable of fulfilling the duties the job requires
- Harassed by both male colleagues and supervisors
- Not the preferred partner by male officers

Concern: police subculture is influencing their retention rates

- 30 x 30 initiative finds that many women resign from the force due to the hyper-masculine, tight-knit male culture
- Their solution is to create more inclusive policies that will make women feel more comfortable, and ultimately increase their recruitment and retention

Overview

Gap: Having more inclusive policies may not be the most efficient way of addressing recruitment and retention

- Addressing the root of the problem, the male-dominated police subculture needs to be the focus
- If women are resigning due to their negative experiences with police subculture, it is possible that their work performance is being negatively affected as well

Using the available body-worn-camera footage of Officer-Involved-Shootings in Phoenix, AZ, we conducted a Video Content Analysis to:

- (1) Capture how women in policing navigate these incidents when compared to men
- (2) Investigate the role they play when addressing these stressful and potentially lethal situations when working with their male counterparts

Introduction

Officer use-of-force, especially lethal force, is an area of concern for both policing scholars and the public



Introduction



To address these issues, many police departments nationwide are transitioning from the traditional role of police to Community Oriented Policing (COP)

Warrior → Guardian

Introduction

The way women tend to do
police work is consistent with
the goals of COP



(Belknap, 2020)

What We Know: Women in Policing

Women represent less than 13% of law enforcement officers. The 12.6% percentage of women in law enforcement has been stagnant since 2016



(Belknap, 2020)

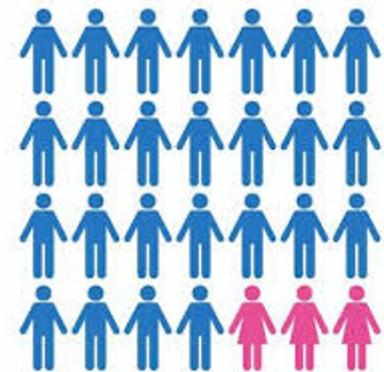
30 x 30 Initiative

Through the use of both qualitative and quantitative research on recruitment and retention, the initiative strives to have women represent 30% of law enforcement across the country by 2030

30X30
WE ARE
ABOVE AVERAGE
WE AIM TO GO
EVEN HIGHER



Gap in the Research



What is not being assessed is:

how the police culture of male dominance is not only causing women to resign from the force, but may be negatively impacting their performance in the field as well, including within Officer-Involved Shootings

What We Know: Officer-Involved-Shootings

Officer-Involved-Shootings (OIS) are one of the most dangerous situations for officers to be in, especially with the use of potentially lethal force

"The reality of policing finds that a very small portion of the job is spent in dangerous or potentially violent situations." (Hunt, 1990)



Officer Involved Shootings - Continued

Phoenix PD's use of force policy follows that an officer can apply force when it is reasonable, necessary, and proportional with keeping the sanctity of life and the value and worth of all persons as top priorities

Prior research on officer-involved-shootings has predominantly focused on racial disparities between officers and suspects¹⁻³

(¹Crawford & Burns, 2008; ²McElvain & Kposowa, 1998; ³Nix et al., 2017)

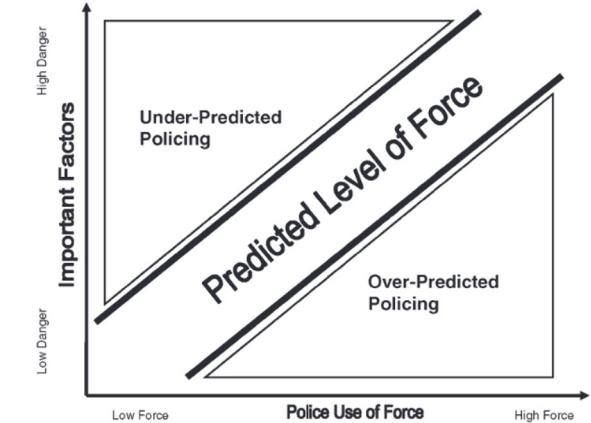
What We Know: Female Officer Use of Force

When compared to their male counterparts, females have been found to either use less force¹⁻³, or the same amount of force⁴

(¹Garner, 2002; ²Rabe-Hemp, 2008a; ³Schuck & Rabe-Hemp, 2007), ⁴Terrill & Mastrofski,

Female Use of Force

Underpredicted Policing → “a circumstance where an officer uses less force than the situation would normally indicate.”



(Schuck & Rabe-Hemp, 2007)

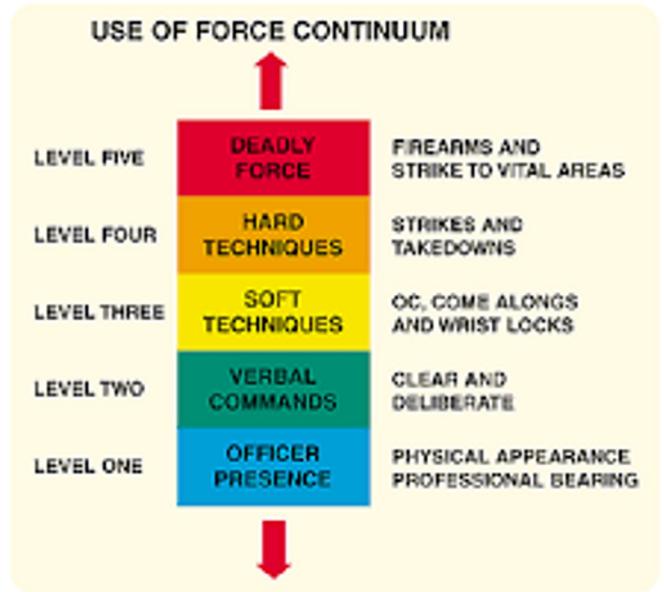


CRITICAL INCIDENT BRIEFING

June 14, 2020 - Union Hills

Use of Force

“Although there is always the possibility of injury, in theory, injury may be more likely in situations where the officer does not take the appropriate action at the appropriate time.”



(Schuck & Rabe-Hemp, 2007)

Police Subculture

Male officers prefer to work with a male partner, and have stated that they are over-protective of women due to their lack of confidence in them



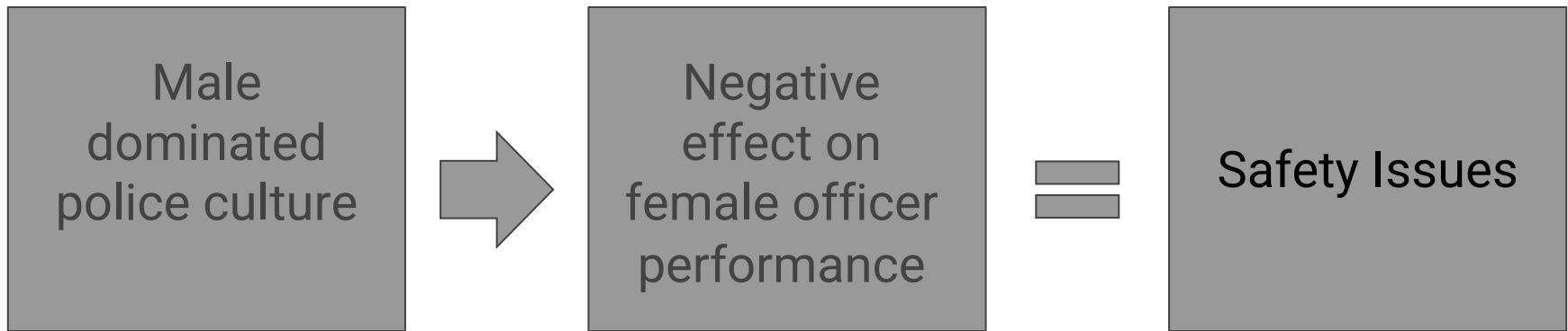
Police Subculture



“Police administrators have voiced concern about the ability of female officers to handle themselves effectively in violent encounters with citizens”

(Bell, 1982; Martin, 1980)

Motivation and Need for Network Approach



Research Question

Women are struggling to assimilate and are considered out-group members partially due to police subculture, causing many to ultimately resign from the force -

How does this influence their behavior in the field, particularly in a potentially life-threatening situation?

Data

- Phoenix Open Data portal for OIS - Officer Summary from 2019 - February 2024
 - Grouped by Incident Report Number
 - Dropped cases without officer ID numbers
 - 114 Actors, 47 Events

Merged with Media Coverage Data

- Available Media Footage/Coverage of OIS from 2019 - February 2024
- 159 identified actors, 64 events

Analysis

Video Content Analysis:

- Body-worn-camera footage was assessed to capture if more women were involved in OIS incidents
 - 101 Total
- Specifically interested in the behavior of female officers within the bipartite networks

Only 5 women in the original Officer Summary data



Findings

15 total women were identified after merging the datasets

- 4 of these incidents were dropped due to these being 1 v 1 incidents
 - Women were found to de-escalate for an extended period of time
 - Gave multiple verbal commands, fired their taser multiple times, shot the suspect 1-2 times only when they had a weapon (commonly a knife) and were charging towards them
 - Resulted in non-life threatening injuries for 3 out of the 4
- 11 Women included in network analysis
 - 4 women followed their male colleagues' lead by shooting at the same time as them
 - 1 officer needed backup after a suspect broke free from her take-down
 - 1 officer was shot when assessing a domestic violence report - injured, but alive
 - 1 stood the furthest away from suspect and gave verbal commands, while male officers tried to approach and take-down suspect
 - 1 officer was proactive and the first to shoot the suspect when compared to her male partner
 - 2 officers gave verbal commands for 35 minutes - then were shot and injured
 - 1 officer deployed her taser multiple times to gain compliance

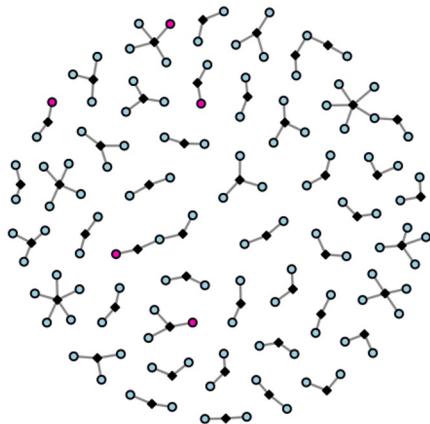
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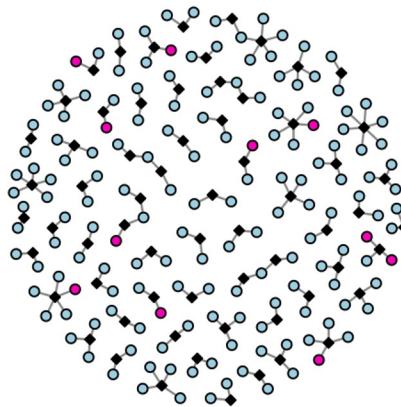
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Results - Bipartite Graphs of Officers and OIS Incidents

OIS Incidents Network
(color reflects gender)



OIS Incidents Network - VCA Addition
(color reflects gender)



Implications

- Mechanism to inform the 30 x 30 Initiative
 - Socialization process needs to change - women need to be fully accepted
- Warrior → COP



Future Considerations

- Need for more robust data source
 - Need to have a balanced comparison between male and female officers
- Addition of Qualitative and Quantitative components
 - Interviews
 - Surveys
 - Capture social relationships
- Future pathways



Questions?

Regulation on biological materials, network structure and research productivity of university scientists

Jinghuan Ma, PhD student
School of Public Affairs, Arizona State University

Presented for CRJ 605
April 24, 2024

Content

- Background and research question
- Literature review and research hypothesis
- Data and method
- Results
- Discussion

Background and research question

- Biological data and materials are important sources of research input
- Regulations governing access to and exchange of biological materials established to conserve biodiversity, protect property rights and safeguard human and environmental safety and health
- Structure of scientists' data and material exchange network influences their access to research materials, and their research productivity
- Research question:

What is the relationship between regulations, structure of material exchange network and scientists' research productivity?

Regulation and research productivity

- The relationship between regulatory burden and scientists' research productivity
 - Negative: Regulations impede the transfer of materials, delay or interrupt research processes, discourage communication , undermining research productivity (Eisenberg, 2001; Jinnah & Jungcurt, 2009; Welch et al., 2017; Yeh et al., 2017)
 - Positive: Simple and standardized MTAs ensure proper recognition of the contribution of the provider (Bubela, Guebert, and Mishra 2015; Derrick and Bryant 2013)

Hypothesis 1: perceived regulation extensiveness for biological materials is negatively related to future publications.

Hypothesis 2: perceived regulation reasonableness for biological materials is positively related to future publications.

Collaboration network and research productivity

- A number of network features are found to be important predictors for individual performance
 - Size: larger networks contribute to more heterogeneous information, resources and opportunities, which could translate into higher productivity (Borgatti & Foster, 2003; Montgomery, 1992)
 - Tie strength: number of strong ties in the focal author's professional support network positively related to his or her total citation count (Seibert et al., 2017)

Hypothesis 3: size of material and data exchange network is positively related to future publications.

Hypothesis 4: communication frequency for biological data and materials is positively related to future publications.

Collaboration network and research productivity (cont'd)

- Homophily: the tendency of individuals to associate with similar others (Lawrence & Shah, 2020)
- The contradictory effect of homophily on research productivity
 - Positive: similarity-attraction hypothesis (Byrne, 1997) contends that people are more likely to interact with those with whom they share similar traits; similarity facilitate connection (McPherson, et al., 2001)
 - co-authorship with researchers that attend to the same PhD program (Gallivan,& Ahuja, 2015)
 - Negative: homophily reduces diversity in knowledge, resources, perspectives, and network reach (Cross & Cummings, 2004; Horwitz & Horwitz, 2007)

Hypothesis 5: homophily in institution is negatively related to future publications.

Hypothesis 6: homophily in region is negatively related to future publications.

Data

- Data sources:
 - 2016 Survey conducted by CSTEPS in ASU: Individual and ego-centric network data
 - National sample of 3,933 tenured and tenure-track academic scientists in marine biology, entomology, and ecology in US universities
 - Ego-centric data: Respondents were asked to specify the people requested biological materials or genetic data from in the past two academic years.
 - Response rate: 37.1% (AAPOR RR2)
 - Final data set: 451 eligible respondents and 1,653 relationships
 - Bibliometric data from 2017 to 2022 retrieved from the Scopus database
- The final data set consists of 451 eligible respondents and 2,087 relationships.

Variables

- Dependent Variables:
 - ***Number of Publications***, the sum of peer-reviewed journal articles published between 2017 and 2022
- Independent Variables:
 - ***RegExtensiveness***: perceived regulatory extensiveness
 - ***RegReasonableness***: perceived regulatory reasonableness
 - ***Network size***: the size of material and/or data exchange network
 - ***Tie strength***: mean communication frequency in their network
 - ***Homophily in institutions***: the proportion of people in their network that are from the same institution
 - ***Homophily in region***: the proportion of people in their network that are from the same region
- Control variables:
 - Individual level: gender; age; proportion of time spent on research, teaching and services; total amount of fund received, discipline
 - Organizational level: R1, university assistance, university monitor

Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max
Number of journal publications	451	17.16	14.02	1	85
RegExtensiveness	450	2.65	0.84	1	4
RegReasonableness	447	2.81	0.52	1	4
Self-reported gender	446	0.34	0.48	0	1
Age	441	52.65	10.73	31	79
ResearchTime	451	0.46	0.18	0.05	1
TeachingTime	451	0.30	0.16	0	0.8
log(Grant Dollars)	406	10.81	4.98	0	17.37
Research 1 Institution	451	0.62	0.49	0	1
UniversityAssistance	442	2.83	1.19	1	5
UniversityMonitoring	441	3.21	1.09	1	5
MarineBiology	451	0.23	0.42	0	1
Ecology	451	0.48	0.50	0	1
Exchange network size	451	4.63	3.64	1	27
Proportion of friend in network	451	0.36	0.36	0	1
Proportion of senior in network	451	0.31	0.35	0	1
Proportion of female in network	451	0.29	0.30	0	1
Mean communication frequency	451	2.70	0.71	1	4
Proportion of people of the same gender	451	0.60	0.36	0	1
Proportion of people from the same institute	450	0.19	0.29	0	1
Proportion of people from the same region	449	0.76	0.29	0	1

Model

- Zero-Truncated negative binomial model

$$\begin{aligned} L(\beta | \mathbf{y}, \mathbf{X}) &= \prod_{i=1}^N \Pr(y_i | \mathbf{x}_i) \\ &= \prod_{i=1}^N \frac{\Gamma(y_i + \alpha^{-1})}{y_i! \Gamma(\alpha^{-1})} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu_i} \right)^{\alpha^{-1}} \left(\frac{\mu_i}{\alpha^{-1} + \mu_i} \right)^{y_i} \end{aligned}$$

where $\Pr(y_i | x_i)$ is the probability truncated negative binomial distribution, y_i is the number of journal publications between 2017 and 2022 of the i th scientist, x_i is the set of variables of the i th scientist. L is the likelihood function, μ_i is the estimated number of journal publications of the i th scientist, and α is the overdispersion parameter.

- Overdispersion

Results

	Dependent variable: Number of journal publications						
	model 1	model 2	model 3	model 4	model 5		
(Intercept):1	2.138456 ***	2.038087 ***	1.821327 ***	1.772004 ***	1.930148 ***		
(Intercept):2	0.743026 ***	0.767108 ***	0.779295 ***	0.809035 ***	0.816788 ***		
RegExtensiveness	0.155617 **	0.13577 **	0.128474 **	0.123889 **	0.12007 *		
RegReasonableness	0.179529 *	0.183279 *	0.177635 *	0.161296 *	0.154524 *		
Gender	-0.131546	-0.132922	-0.129574	-0.100195	-0.090044		
Age	-0.012804 ***	-0.013317 ***	-0.01367 ***	-0.01345 ***	-0.013595 ***		
ResearchTime	0.409941	0.457902.	0.467048.	0.472715.	0.515829 *		
TeachingTime	-0.653021 *	-0.575583 *	-0.543859.	-0.543795.	-0.503431.		
log(Grant Dollars)	0.032409 ***	0.031239 ***	0.029679 ***	0.027533 ***	0.02723 ***		
Research 1 Institution	0.16936 *	0.153545.	0.144339.	0.140238.	0.139862.		
UniversityAssistance	0.059401.	0.060552.	0.065381.	0.065454.	0.070945 *		
UniversityMonitoring	-0.032586	-0.035943	-0.038102	-0.02851	-0.027106		
MarineBiology	-0.161136	-0.131872	-0.129523	-0.149469	-0.155876		
Ecology	-0.018177	0.025437	0.015928	-0.005277	-0.006948		
Exchange network size	-	0.025939 *	0.025374 *	0.022511 *	0.019044.		
Mean communication frequency	-	-	0.102174.	0.170941 **	0.175111 **		
Homophily_institution	-	-	-	-0.438778 **	-0.359762 *		
Homophily_region	-	-	-	-	-0.243313.		
Log-likelihood	-1449.808	-1446.153	-1444.391	-1439.879	-1434.529		

Discussion

- Both regulation extensiveness and reasonableness have positive relationships with future publications.
- Size of material and data exchange network and communication frequency are positively related to future publications.
- Homophily in institution and region are negatively related to future publications.
- Next steps:
 - Explore interaction effect of university assistance and network characteristics

Conclusion

- Limitations
 - Limitations in measurement:
 - fail to capture the possible changes in scientists' perceptions of regulations
 - did not have objective measures of regulatory burden
 - The use of single item measure for DV
 - External validity

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Thank you!