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Network Exposure and Excessive Use of Force: Investigating the Potential for Social Contagion of Police Misconduct

Research Summary: This study investigates how a police officer's exposure to peers accused of misconduct shapes their own involvement in excessive use of force. Drawing from 8,642 Chicago police officers named in multiple complaints, we reconstruct police misconduct ego-networks using civilian and department complaint records. Results show that officer involvement in excessive use of force complaints is predicted by having a greater proportion of co-accused with a history of such behaviors.

Policy Implications: Findings suggest officers' peers may serve as social conduits through which misconduct may be learned and transmitted. The removal of officers engaging in use of force, at least until problematic behaviors are addressed, appears to be critical to reducing department-wide complaints. Future studies should investigate how social networks shape police misconduct, and ways network analysis might be used to diffuse intervention strategies within departments.

Keywords
police misconduct, network analysis, use of force, complaint records

Introduction

On the morning of October 5, 2018, the city of Chicago held its breath as a jury decided whether or not Chicago police officer Jason Van Dyke was guilty of murdering seventeen-year-old Laquan McDonald. The case centered on police dashcam video footage that showed Van Dyke, and his partner, arriving on an active scene surrounding a knife-wielding McDonald (Davey and Smith, 2015). Within six seconds of exiting his car, Van Dyke commanded McDonald to drop the knife; when McDonald failed to comply, Van Dyke shot McDonald 16 times, continuing to fire his weapon after McDonald was already laying on the ground. The shooting itself happened four years earlier, two months after Michael Brown was shot in Ferguson, MO and a month before Tamar Rice was shot in Cleveland, OH, but the video was released only after litigation filed by an investigative journalist. The release of the video sparked protests across the city and the nation, leading to the firing of the Chicago Police Superintendent, the failed reelection of the Cook County State's Attorney, and a massive inquiry into the patterns and practices of the Chicago Police Department (Davey and Smith, 2015; Department of Justice, 2017). Van Dyke was charged with first-degree murder. The city braced for the verdict, with residents and police fearing an acquittal might lead to protests and unrest similar to those after the acquittal of Los Angeles police officers in the beating of Rodney King (Sastry and Bates, 2017). It took the jury only one day to reach a verdict: Van Dyke was found guilty of second-degree murder and 16 counts of aggravated battery with a firearm—one count for each of the shots that hit McDonald. This was the first time in fifty years a Chicago police officer was convicted in the shooting of a citizen (Smith, Williams, and Davey, 2018). Yet, Van Dyke was acquitted of the charge of "official misconduct"—defined as "knowingly perform[ing] an act he knows he is forbidden by law to perform" (720 ILCS 5 § 33.3).

Police misconduct has a direct negative impact on citizens resulting in the tragic loss of life, massive racial disparities in criminal justice-related outcomes, and negative health consequences for neighborhoods and populations experiencing first- or even second-hand police abuses (Bor, Venkataramani, Williams, and Tsai, 2018; Sewell and Jefferson, 2016; Tyler and Wakslak, 2004). Police misconduct, abuse, and violence also rattles the very foundation of trust between residents and police (Sunshine and Tyler, 2003). The police-citizen relationship is one of the most distinctive features of police officers' jobs as their daily duties mandate interaction and cooperation with the public, often in unpredictable settings. When residents become cynical of the police, they tend to withdraw from contacting the police (Desmond, Papachristos, and Kirk, 2016) and, instead, may either seek out informal ways to police themselves or else leave some public safety matters unattended (Pattillo, 1998; Venkatesh, 2006). Police simply cannot do their jobs effectively without a working relationship with the community. Cynicism and mistrust of the police can stymie or hinder public safety efforts and, instead, keep crime rates higher in the very communities where fair and just policing practices are most needed (Baumer, 2002; Bobo and Thompson, 2006; Kirk and Papachristos, 2011). For example, a recent study in Milwaukee demonstrated that highly publicized instances of police abuse causes residents to shy away from calling 911—even for serious crimes such as robbery or assaults (Desmond et al., 2016). Understanding and doing something about police misconduct and abuse, then, becomes a significant policy issue not simply for repairing trust in the police but also for ensuring fair and just policing practices.

Explanations of police misconduct and abuse often begin by focusing on personality traits or characteristics of *individual officers*, including race, ethnicity, sex, education, temperament, and even psychological disposition (e.g., Brandl, Stroshine, and Frank, 2001; Chappell and Piquero, 2004). Such an individual approach often seeks out "problem officers" within a police department—the proverbial "rotten apples" approach. From such a rotten apples approach, Jason Van Dyke, not the more than seven other officers at the scene of the shooting or the Chicago Police Department more generally, are the source of the abuse and misconduct. And, indeed, prior to the murder of McDonald, Van Dyke had more than 20 documented complaints filed against him, many them for excessive "use of force;" one complaint against Van Dyke resulted in a $350,000 city payout to the complainant (McLaughlin, 2015; Wald, 2018). Other explanations prioritize *organizational* characteristics such as a unique police worldview, hypermasculinity, and the "noble cause" as the main drivers of police misconduct and abuses (e.g., Crank and Caldero, 2000; Delattre 2002; Hebert 1998; Kappeler, Sludder, and Alpert 1998; Klockars 1980). In contrast to the "rotten apples" approach, this "rotten barrel" perspective underscores the pervasive nature of police corruption, mismanagement, and biases that might suggest larger scale police reform. In the Chicago context, the legacy of systematic—and often consciously organized—police abuse spans decades and contributes to a highly racialized criminal justice system (Taylor, 2013; Department of Justice, 2017). The fact that the other officers at the Van Dyke shooting did nothing—while others are accused and awaiting trial for tampering with evidence—is indicative of larger systematic problems. A report on police accountability in Chicago issued by the Police Accountability Task Force (2016:7,13) summarizes the larger organizational and cultural situation in Chicago: "CPD's own data gives validity to the widely held belief the police have no regard for the sanctity of life when it comes to people of color. . . The community's lack of trust in CPD is justified."

While empirical studies have led to important findings on both the individual and organizational factors associated with police misconduct, results are inconclusive and, at times, inconsistent. Studies on the "rotten apple" perspective have shown that individual-level correlates associated with misconduct in one context, may not be found in another. Likewise, studies of organizational characteristics have shown that organizational effects associated with police misconduct are not necessarily the same across departments nor are the various forms (and seriousness levels) of misconduct (e.g., corruption vs. mismanagement). Yet, if we consider police misconduct as a form of *deviance*—a type of behavior that diverges from the expressed mission of police institutions—then, like other forms of deviance, it is likely a behavior learned through social relationships. The importance of social networks in the learning of deviant behavior is at the center of many core criminological theories (e.g., Akers, 1998; Sutherland, 1947) and applied to the context of police misconduct is consistent with a long line of research that underscores how police subculture shapes police behavior. Still, little is known about these transmission processes within the police context, and whether problem behavior can be learned, and passed on through exposure to more deviant colleagues (Roithmayr, 2016). A focus on these processes allows us to move beyond debates about "rotten apples" and "rotten barrels," and hone in on the mechanisms that facilitate misconduct.

The current study examines the role of deviant colleagues in facilitating exposure to, and the propensity to accrue, use of force complaints. Using an extensive dataset on citizen and department complaints filed against Chicago police officers, we investigate the prevalence of

repeated misconduct complaints, and particularly, the degree to which use of force complaints are concentrated around a small group of individuals (i.e., problem officers). Specifically, we use a series of frailty models for recurrent event data to test the effect of having higher proportions of peers with use of force complaints in one's social network on subsequent use of force complaints. Consistent with research on deviance in other settings, we hypothesize that social networks and exposure to the behavior of other officers in one's network plays an important role in the social transmission of police misconduct.

Though Chicago is a relatively unique setting given its unique history and size, it provides an ideal research setting for studying exposure to deviance. The Chicago Police Department represents one of the largest law enforcement agencies within the United States. It is also the site of one of the largest inquiries into the prevalence and persistence of misconduct within a department (e.g., Department of Justice, 2017), and thus provides an ideal research setting for providing vital insights into a problem that persists across the country. Understanding exposure to misconduct in social networks is likely to yield practical insights that can be used to curtail the spread of these behaviors in various organizational settings. Such findings might also be applied to other forms of deviant (occupational or non-occupational) networks. Our results indicate that being tied to officers with a history of use of force complaints elevates the risk of being involved in subsequent use of force complaints, suggesting that there may be some support for the social transmission of severe police misconduct (e.g., Roithmayr, 2016).

Background: Apples, Barrels, and Networks

Research on police misconduct can be (broadly) classified into one of two groups: studies that emphasize officer attributes as correlates of misconduct (i.e., "rotten apples") and studies that emphasize departmental or even institutional attributes as key to understanding misconduct (i.e., "rotten barrels"). Studies from both perspectives have led to the identification of a host of risk factors as important correlates of misconduct ranging from a general focus on individual-level correlates of an officer (e.g., sex, race, age, rank; Bloch and Anderson, 1974; Wolfe and Piquero, 2011) to organizational and occupational forces set forth by police administrators (e.g., Hickman, Piquero, and Piquero, 2004; Kappeler et al., 1998; Weisburd et al., 2000; Wolfe and Piquero, 2011), to the police culture and socialized behaviors (e.g., Chappell and Piquero, 2004; Herbert, 1998; Ingram, Terrill, and Paoline, 2018).

Studies examining individual-level predictors of officer misconduct, or traits that are conducive to a preferred policing style or orientation, have produced some mixed findings. For instance, on the one hand, research has found that minority officers received significantly fewer misconduct complaints when compared to their White colleagues (Wolfe and Piquero, 2011), or, alternatively, that race/ethnicity did not play a role in the receipt of filed complaints (Brandl et al., 2001). On the other hand, studies by Cohen and Chaiken (1972) and Kane and White (2009) have found that Black and Latino officers were more likely than White officers to engage in misconduct. Several studies also find the association with race and ethnicity might very well be confounded by the differential assignment of minority officers to high-crime neighborhoods, exposing them to greater opportunities for misconduct and use of force (Fyfe, 1988; Terrill and Mastrofski 2002; Terrill and Reisig, 2003; Worden, 1995).

Conversely, when compared to their male counterparts, female officers tend to be less aggressive in their role. Prior research has suggested that female officers are less likely to be involved in use of force complaints (Waugh, Ede, and Alley, 1998), or use physical force (Bazley, Lersch, and Mieczkowski, 2007; Rabe-Hemp and Schuck, 2005) and weapons (Hoffman and Hickey, 2005) in police-citizen encounters. Female officers initiate fewer citizen encounters, make fewer arrests (Bloch and Anderson, 1974; Morash and Greene, 1986), are subject to fewer citizen complaints (Brandl et al., 2001; Chappell and Piquero, 2004; Greene et al., 2004) and are less likely to be the subjects of excessive force complaints (Adams, 1999; Brandl et al., 2001). The mechanism behind why female officers are less likely to use physical force or are involved in use of force complaints is unclear. Scholars have suggested that female officers may rely on inherently different experiences, talents, and skills compared to males (Horne, 1980; Rabe-Hemp and Schuck, 2005). Yet, in a study of 1,545 officers dismissed or forced to leave the New York Police Department for reasons of misconduct, Fyfe and Kane (2006) found that officer sex was a non-significant attribute in predicting misconduct.

Officer tenure and rank have also been found to impact officer attitudes and behaviors that lead to misconduct. High-complaint officers are significantly more likely to be younger, less experienced, and more likely to receive departmental disciplinary action (Brandl et al., 2001; Donner and Jennings, 2014; Greene et al., 2004). This has been attributed to younger officers' heightened activity; "younger officers initiate more contact with the public, conduct a higher proportion of preventative patrolling, and record more crime reports" leading to a higher probability of receiving complaints (Adams, 1999; Brandl et al., 2001: 523). Further, higher-ranking officers have also been found to have lower rates of criminal or serious misconduct offenses (Kane and White, 2009).

Organizationally-oriented studies conceive of misconduct and deviance as the product of a "police worldview" or subculture generated by organizational practices and the unique nature of policing as a profession (e.g., Kappeler et al., 1998; Wilson, 1968). Broadly speaking, such a perspective maintains that police misconduct is learned through this unique policing subculture, which prescribes a set of common beliefs, values, and norms among officers (Crank, 1998; Herbert, 1998; Ingram et al., 2018; Kappeler et al., 1998; Wilson, 1968). Police work engenders a set of demands and expectations that emphasize loyalty and encourages a sense of brotherhood designed to overcome resistance while creating an environment that protects the interests of officers who violate the law (e.g., code of silence; Skolnick, 1966; Wilson, 1968). Such a worldview is further driven by the real and perceived dangers of policing and facilitates a polarized "us" versus "them" mentality across the daily practices of officers (Alpert and Dunham, 1997; Barker, 1977; Herbert, 1998). These many aspects of police work may produce a hyper-masculine culture that encourages socialized behaviors that are compatible with other members in the organization (Harris, 2000; Messerschmidt, 1993; Schuck, 2014). This police subculture breeds an in-group mentality whereby officers learn, and exchange, cultural knowledge and a set of constructs that are favorable to their group identity (Chappell and Piquero, 2004: 93). Thus, in parallel with the behaviors and attitudes that are formed and shaped by the subculture, criminal and deviant behavior is likely to be transmitted through these occupational groups and in association with other like-minded individuals (Reiss and Farrington, 1991; Warr and Stafford, 1991; Weerman, 2003).

To interrogate the importance of police subculture in such a socialization process, Savitz (1970) examined how recruits from the Philadelphia Police Department advanced from the police academy to the streets. During their first three years on the job, Savitz (1970) found that new officers were socialized into their occupational role and that greater exposure to the police subculture facilitated more permissive towards deviant police behavior. Newer officers frequently adopted the "cynical" beliefs of older more experienced officers. Police officers themselves have also been found to direct such cynicism against their own police organizations and consider their own deviant behavior or misconduct as an adaptation for the sake of "noble cause of public safety and justice" (Wolfe and Piquero 2011: 335). In other words, officers can see departmental policies as a hindrance to "good police work." For example, in a sample of 483 Philadelphia police officers, Wolfe and Piquero (2011) found that officers who perceived their agency as engaging in fair management practices (e.g., engaged in distributive outcomes through pay and promotions) held fewer beliefs that were favorable to noble-cause corruption. These officers also showed lower levels of adherence to the code of silence within their department. Conversely, officers who were associated with a greater percentage of deviant peers that favored minor forms of police misconduct showed greater adherence to the code of silence, and stronger beliefs that supported corruption for a noble cause.

Both individual and organizational perspectives of police misconduct bring forward compelling but incomplete explanations of police misconduct. Without a doubt, organizational and cultural dimensions of police work influence patterns of misconduct. For example, officers have virtually no say in their assignments or partners, let alone the political priorities of a police chief or mayor. And, still, individual officers vary in their responses to police culture with some engaging in misconduct while others do not. For all their differences, the 'rotten apples' and 'rotten barrels' perspectives are similar in their weaknesses: they both acknowledge the fact that behaviors are learned, modified, and adopted through the formal and informal interactions of individuals within organizations but fail to empirically test these notions in the same way as criminologists have approached other deviant behaviors. Students of deviant behavior have persistently noted the importance of considering the social contexts from which deviance emerges—and the very same logic might apply to understanding the importance of networks in the learning of police deviance.

The Importance of Networks

The focus of this study, a police officer's social network, captures a conceptual middle ground in this "individuals versus organizations" debate. Elements of police culture clearly facilitate and potentially even perpetuate police misconduct, but police agencies do not teach misconduct so transparently. Police do not, for example, learn how to make false arrests in the academy. Rather, individual officers learn different forms of misconduct through interactions (formal and informal) with their fellow officers—a proposition consistent with social learning theories more generally (e.g., Akers 1998), empirical studies of networks and deviance in organizations more specifically (e.g., Baker and Faulkner, 1993; 2003), as well as insights gleaned from police ethnographies on the informal socialization "on the job" (Manning, 1977; Moskos, 2008; Reiss, 1973; Westley, 1970). Chappell and Piquero (2004) underline this point in a study of how police officers' perceptions of peer behavior affected misconduct complaints. In their study of Philadelphia police officers, Chappell and Piquero (2004) found that officers who perceived

their peers as likely to rationalize deviant behaviors (e.g., excessive use of force) were more likely to have misconduct complaints filed against them.

Despite understanding that police subculture may facilitate deviant behavior, no studies have applied formal network methods to examine if social networks impact police misconduct.[1] Our assertion that police deviance is socially transmitted through peer networks embodies a core theme of criminological research on crime and delinquency (Brandl et al., 2001; Harris, 2010; Roithmayr, 2016). Through various mechanisms, it is a firmly established fact that much of crime is committed in the company of others (Reiss and Farrington, 1991; Warr and Stafford, 1991; Weerman, 2003). The role of social connections and processes in shaping offending patterns has a long theoretical history (Akers, 1998; Matsueda, 1982; Sutherland, 1947; Warr, 2002), and has been supported by numerous empirical studies (Conway and McCord, 2002; Haynie, 2001; 2002; McGloin, Sullivan, and Thomas, 2014). A growing area of research has begun to apply formal network models and methods as a way to directly measure the link between an individual's social connections and the social influence processes that condition deviant outcomes (for reviews, see Gravel and Tita, 2017; Haynie and Kreager, *forthcoming*; Papachristos 2011).

In a recent theoretical essay, Roithmayr (2016) explicitly draws on a similar networked-logic to argue that police use of excessive force may spread between officers through a contagion-like process. Roithmayr (2016) suggests that excessive use of force may spread through a process of social contagion, much like violent victimization has been shown to diffuse in networks of gang members and their associates (Green, Horel, and Papachristos, 2017; Papachristos, Braga, Hureau, 2012; Papachristos, Braga, Piza, and Grossman, 2015). Roithmayr (2016: 427) focuses on "program-level sequence learning" which entails learning by observation in social settings of the organization of behaviors that can be applied to future situations. Police officers may learn to employ excessive use of force once they have learned—by observing other officers engaged in the behavior—how to identify situations where it can be applied to achieve a goal, such as subduing a citizen resisting arrest. Learning of such behavior through observations is particularly likely to occur if "a police officer observes another officer using excessive force and obtaining a positive reward—say, approval by the officer's colleagues or the reward of reducing risk by shortening the duration of an encounter with a resistant civilian" (Roithmayr, 2016: 429). This perspective is consistent with research more broadly by Sierra-Arévalo (2016) who emphasizes that certain behaviors that are adopted in the name of the "danger imperative," though not necessarily in line with departmental policy, are often learned through informal means of socialization.

The adoption of deviant behavior by police officers and the social mechanisms that drive their adoption suggests that informal networks may play an important role in the diffusion of behaviors in a police department. Establishing social contagion as a mechanism for driving the adoption of behaviors is a complicated process that requires a study of the structural features of relevant networks (Burt, 1987; Valente, 1996). The current study seeks to establish whether the necessary condition for social contagion—the link between exposure and subsequent behavior adoption—can be established in the context of police misconduct. Our objective is to assess whether exposure to officers with a history of excessive use of force increases one's own likelihood of engaging in similar behavior. We measure social networks through co-involvement of officers

[1] However, important studies have examined the role of officer social networks in facilitating racial integration within police academies (e.g. Conti and Doreian, 2010; Doreian and Conti, 2012).

in misconduct complaints where officers are linked by virtue of being named in the same complaint. Our main hypothesis is that officers are at a heightened risk of use of force complaints if their ego-network has a high concentration of colleagues with a history of such behaviors (measured as the proportion of prior co-accused with prior use of force complaints). The overall objective is to look at how variation in the exposure to excessive use of force behaviors in misconduct networks can affect an officer's propensity for the same behavior.

Data and Methods

This study relies on complaint records filed with the Chicago Police Department (CPD) from 2007 to 2015 to determine involvement in use of force situations. These data were retrieved by the Invisible Institute, a nonprofit organization, who obtained the records through a series of FOIA and litigation requests.[2] Each record was coded according to a series of indicators and has since been made publicly available on the Invisible Institute's website and Github page.[3,4] The complaint records include detailed information on all the officers named in the complaint (e.g., sex, race/ethnicity, date of birth, tenure, rank and unit within the CPD), as well as details of the complaint itself, including the date and a description of the incident. The complaint records cover the period 2000 to mid-2016; however, we focus on complaints made from January 1, 2007 to December 31, 2015, the years for which information was most complete at the time of this writing. These data comprise 11,686 officers who were involved in at least one of 30,450 complaints. Important for the current study, 76 percent of officers (n = 8,914) were involved in multiple complaints, allowing us to examine how exposure to deviant peers influences misconduct patterns over time.

These data are well suited for the analysis of misconduct networks on excessive use of force. Use of force complaints represent more visible forms of misconduct, albeit not without its caveats (discussed in the limitations section) and have been found to be relatively reliable measures of misconduct (McCluskey and Terrill, 2005: 513). Our interest in the use of force, allows us to exploit variation in the types of misconduct across officers and specifically involvement in repeated misconduct complaints. Our focus on the social transmission of deviant behavior required that we retain officers who had at least two separate incidents over the observation period to examine how behavior in one period influenced behavior in the next. This creates a final sample of 8,624 officers named in more than one complaint over the observation period (2007-2015). It excludes officers who had missing information on key covariates, were only named in complaints with more than 15 co-accused, and complaints for which there were no details on the nature of the incident. Because officers were involved in multiple complaints (M = 6.19 complaints per officer; standard deviation (SD) = 5.17), this resulted in a study sample of 43,718 officer-complaint observations.

Use of Force

Use of force represents an important social issue. Implications incurred from use of proper or improper force are high, undermining police legitimacy (Westley, 1970), increasing legal

[2] For detailed information on these data see Ba (2016), and Rozema and Schanzenbach (2018).
[3] Available at https://github.com/invinst/chicago-police-data (Accessed September 8, 2018).
[4] Available at https://invisible.institute/police-data (Accessed September 8, 2018).

cynicism, and diminishing cooperative behaviors, on the part of citizens, that are needed to help police effectively carry out their daily duties (Bayley, 2002; Decker, 1981; Desmond, Papachristos, and Kirk, 2016; Reiss, 1968; Skolnick and Fyfe, 1993). For each officer-complaint observation, we generated a dichotomous measure of whether the officer was involved in a use of force complaint (1 = use of force, 0 = non-use of force). Complaints were classified as use of force complaints if the complaint entailed: excessive force (use of a firearm, use of conductive energy device), unnecessary physical contact, and acts that resulted in injury/death. The most frequent categories were excessive force that resulted in an injury (59%), excessive force that did not result in an injury (19%), followed by unnecessary physical contact (12%) and use of a firearm (8%). Of the unique officers in our sample, 52 percent (n = 4,523) received at least one use of force complaint over the study period.

Misconduct Networks

A key feature of complaint records is that they provide details on all officers accused of the incident. This allows us to examine each officer's misconduct network (i.e., all other officers accused of misconduct with the officer) across their history of complaints and detect whether changes in these networks are associated with subsequent misconduct patterns. An officer's misconduct network includes all co-accused officers who were named in the same complaint with the focal officer, creating a network in which officers are linked to each other through complaints. These misconduct networks represent a particular type of social network more accurately described as behavioral networks similar to co-offending networks (e.g., Papachristos, Wildeman, and Roberto, 2015), needle-sharing networks (Koester, Glanz, and Barón, 2005), and sexual networks (Bearman, Moody, and Stovel, 2004). Presence in the network requires at least some involvement in the behavior and captures only relationships between individuals that are recorded (in our case, involvement in police misconduct). A network based on citizen complaints represents only a fraction of the social ties between officers, so we are likely underestimating the true network and emphasizing only relationships with a potentially negative influence. We discuss the implications of this limitation in the discussion section.

Of the officers in our sample, 95 percent (n = 8,194) were named in at least one complaint with two or more officers. On average, complaints had 1.89 officers (SD = 1.58), with 56 percent involving more than one officer. Because some complaints may only involve a single officer, we include a measure of the number of individuals named on the complaint and a measure of the number of times an officer was named in a prior solo complaint as covariates in our models.

We measure exposure to peers with a history of excessive use of force as the proportion of co-complainants who have previously been accused of a use of force complaint. Thus, an officer's exposure at time t is thought to influence their behavior at time $t + 1$.[5] It differs from the other network measures in that it is calculated before the complaint, measuring an officer's exposure to co-complainants with prior histories of use of force. We first identify the number of unique individuals that an officer had been named in a complaint with prior to the current event. Then, for each unique co-complainant, we identify whether they had been named in any use of force complaint prior to the current event. Lastly, this information is used to calculate the proportion of

[5] Also see Fujimoto and Valente (2012) and Papachristos, Wildeman, and Roberto (2015) for additional applications of network exposure models.

officers in their network who have been named in a use of force complaint.[6] Thus, the likelihood of an officer being named in a use of force complaint at time *t* is a function of their network exposure (i.e., the proportion of officers in their complaint network with a prior use of force complaints) at time *t* – x. A positive and statistically significant effect would suggest a social influence mechanism whereby an officer's likelihood of becoming involved in a use of force complaint increases as the proportion of contacts with a history of use of force in his or her personal misconduct network increases.

Figure 1 provides a visual demonstration of how we measure an officer's exposure to use of force. The figure represents a hypothetical officer's ("ego") exposure to use of force from their first complaint (Complaint 1) until their last complaint (Complaint 3). The ego represents the focal officer, and the officer's ego network by nodes A through E. White nodes represent officers who have not been named in any use of force complaints, and black nodes represent officers who have been named in a use of force complaint(s). Because officers' network exposure is calculated from previous complaints, an officer's network exposure is only available after their first complaint. In Complaint 2 the ego's network exposure is 0 percent, as none of the officers's in their ego network were named in a use of force complaint at *t* – x (i.e., Complaint 1). In Complaint 3, the ego's network exposure increases to 50 percent, based off changes to their exposure in Complaint 2. In Complaint 2 the ego's misconduct network consisted of four other officers (i.e., Officers A, B, C, and D). Of these, two officers had been named in a prior use of force complaint (i.e., Officer's C and D). Thus, for each complaint, an officer's misconduct network has the potential to remain stable (i.e., re-offend with the same officers) or grow (offend with new officers). The degree to which they are exposed to use of force depends on whether officers in their ego network have engaged in this behavior.

Figure 1 about here

To avoid confounding network exposure with an individual's prior behavior, we also include a lagged measure of the cumulative number of use of force complaints an officer has been named in at the time of the complaint.[7] Because officers observed earlier on in the study are less likely to have been exposed to peers with a history of use of force, as compared to officers observed later on, we also control for the year of the complaint in our models.

Tenure Co-accused

We also look at how other dimensions of police ego networks may structure officer misconduct patterns, including the impact of being named in complaints with more experienced officers. We measure the experience-level within an officer's misconduct network by creating a continuous measure of the mean years of service with the CPD for all the co-complainants at the time of the incident. While some studies have suggested officers with greater experience may have more to lose from being named in a complaint and may also have acquired the necessary

[6] We also estimated network exposure in our models as two direct effects: 1) the number of unique co-accused in an officer's network previously accused of use of force; and 2) the number of unique co-accused in an officer's network. The results were substantively similar to those reported in the paper.

[7] As a sensitivity analysis, we also ran all models without this lagged variable. All substantive results remained the same to those reported in the paper.

experience to diffuse situations from escalating to force (e.g. Brandl et al., 2001), others have suggested length of service is associated with increased cynicism and misconduct (Chappell and Piquero, 2004; Donner and Jennings, 2014). Here, we examine how being named in a complaint with more tenured officers influences the likelihood of being involved in use of force complaints. In this way, we aim to capture a mentorship relationship that has traditionally been viewed as the tendency for recruits to be paired with veteran officers once they graduate from the academy (Asch, 1968; Edmundson, 1999; Muir, 1977). More experienced "veteran" officers can serve as mentors to newer officers, enhancing their familiarity with the community and administrative areas, and thus guiding recruits on the culture, and practices of law enforcement (Edmundson, 1999; Muir, 1977). Alternatively, in other contexts, mentors may (formally or informally) socialize recruits to conduct the same types of unethical behaviors (Manning, 1977; Skolnick, 1966).

Heterogeneity of Co-accused

We also examine how the sex and racial/ethnic composition of the misconduct network influences the likelihood of being involved in use of force complaints. We measure sex as the proportion of co-complainants who were female at the time of the complaint. We measure race/ethnicity as the proportion of co-complainants who shared the same race as the officer at the time of the complaint. Previous studies have highlighted that cross-race interactions are unequally distributed across police networks (Haarr, 2005). Here we examine whether the distribution of cross-race interactions influences the likelihood of being involved in use of force complaints.

Additional Covariates

Our models also include additional individual-level controls for sex, race/ethnicity, and length of service. An officer's sex (female, male) and race (White, Black, Hispanic, and other) are all dummy coded and included as static variables. We also include an officer's tenure, measured as the number of years from the officer's appointment date to the complaint date, along with tenure-squared to control for a potential non-linear effect of tenure as continuous dynamic variables in all models.

Further, complaints are not likely to be randomly distributed across officers but related to their degree of exposure to citizens and high crime neighborhoods. We control for this with two dummy indicators of an officer's exposure based on their rank (0 = rank above a police officer[8]; 1 = police officer) and unit (0 = non-specialized unit, 1 = specialized unit[9]) within the police department. We assume that officers with higher ranks within the CPD are less likely to be exposed to the public and more likely to face higher costs associated with complaints. In contrast, officers who belong to specialized units, such as strike force units, gang units, narcotics units and special weapons and tactics, are more likely to be exposed to opportunities for complaints. Officers within these units do not respond to service calls, rather they are tasked with seeking out problematic

[8] Rank above police officer: Sergeant (12%), Detective (6%), Field Training Officer (2%), Lieutenant (2%), Captain (0.53%), ET (0.53%), Commander (0.35%), Agent (0.02%), and Chief (0.07%).

[9] Specialized units include gang-related units (53%), narcotics units (41%), special weapons and tactics (SWAT) (4%), and mobile strike force units (2%). We also estimated models using dummy variables for each specialized unit rather than classifying them into a single group; however, none of these variables were significantly associated with use of force complaints.

activity. Previous investigations of the Chicago Police Department have suggested that these units, which has involved "jump out squads" tasked with seeking arrests, often creates situations conducive to increased involvement in use of force, (i.e., suspects fleeing) (Department of Justice, 2017: 31). Further, officers who belong to these units may be self-selective, with younger, highly active officers more likely to select into these units (see Moskos, 2008: 137).

Lastly, we control for the year the complaint was made to the department. During the period we analyzed, a complaint could be initiated remotely, yet for a complaint to be investigated, the complainant was required to sign an affidavit in-person at an oversight agency in the city. On December 19, 2011, the location of the oversight agency where complainants could sign an affidavit moved from the South Side to the Near West Side of Chicago. The new location was not only less accessible by transit, but also represented a shift from a neighborhood with a high proportion of Black residents to a neighborhood with a high proportion of White and Hispanic residents, thus differentially influencing the convenience of filing complaints (Ba, 2016). These administrative and location changes not only impacted how misconducts were filed, but also impacted the rates at which complaints were sustained through a civilian's willingness, and decision to file a complaint and/or to subsequently to complete their complaint against the police (for a discussion on this see Ba, 2016). Our measure for the year the complaint occurred aims to, at least partially, control for this policy change in our models.

Analytic Strategy

Our analysis proceeds through two main steps. First, we provide a descriptive summary of the distribution of use of force complaints in our sample, which allows us to assess the prevalence of use of force and the degree to which these complaints are concentrated around a small group of individuals. Second, we estimate frailty models for recurrent event data to assess the association between exposure to use of force and an officer's likelihood of engaging in use of force complaints. This approach allows us to assess our main variable of interest, whether an officer's misconduct network influences their subsequent involvement in use of force.

A key element of our research design is that officers can experience the event – involvement in a use of force complaint – more than once. Recurrent event data are a special type of event history data that allows for multiple events and records the timing of transitions between events (Therneau and Grambsch, 2000). To model dependence between events, we extend the hazard models to include a frailty component. The frailty component is analogous to a random effect, accounting for unobserved variability within individuals over time (Therneau and Grambsch, 2000).

Officers are identified as entering the risk set after their first recorded complaint and remain at risk of use of force complaints even after having been involved in a use of force complaint. The risk intervals between events capture the number of days between complaints (Andersen and Gill 1982). This approach effectively models the risk of being named in a use of force complaint since the last complaint. Thus, rather than re-setting an officer's time at risk to zero after experiencing an event, it preserves the number of days and picks up from the last date, allowing officers to enter the risk set at different time points for different durations. Because some officers were named in more than one complaint on the same day, we only counted this as a single event, taking the values

for the most serious complaint and maximum value across the covariates. In addition, because our models include both use of force and non-use of force complaints, officers may be censored after entering the risk set for a non-use of force complaint. This approach allows us to include information from all complaints and not just those where the officer 'failed' (i.e., use of force complaints).

Another important component of estimating recurrent event models concerns the unknown starting times for a subset of officers. These officers may have already been accused of a complaint at time *t* when the period began, and thus we do not know the exact time when officers were first accused of a complaint. We address this in our regression models two ways. First, we treat all officers in the window period as if they had first experienced the event in time *t* and not *t* - x. Second, we include a continuous variable that indicates the number of years the officer has been with the force (i.e., *tenure*). Officers appointed prior to 2007, the beginning of our observation period, may have already experienced the event. Including the number of years an officer has been on the force should effectively control for the effect of extra exposure time. All models were estimated using the survival package (Therneau, 2015) in the R software for statistical computing (R Core Team, 2018).

Results

Figure 2 shows the distribution of misconduct complaints over time. From 2007 to 2015 our sample includes 29,634 recorded complaints made to the Chicago Police Department. Figure 2 disaggregates these into use of force and non-use of force complaints. Complaints made to the CPD gradually decreased over the study period, from a high of 4,511 complaints in 2007 to a low of 1,904 complaints in 2015. Despite this drop, the proportion of use of force complaints stays relatively stable from 2007 to 2012, representing approximately 20 percent of all complaints each year. However, in 2013 this starts to drop with use of force complaints representing only seven percent of all complaints by 2015. This drop may be attributed to administrative changes, and civilian oversight on police performance (Ba, 2016).

Figure 2 about here

Figure 3 (left) shows the distribution of complaints across officers in the final sample (n = 8,624) from 2007 to 2015. Because this only includes repeat officers, all officers received at least two complaints. Of these officers, approximately one half (48%) received five or more complaints. Figure 3 (right) shows the distribution of officers who received at least one use of force complaint (n = 4,523). Of these officers, approximately one half (52%) were named in a single use of force complaint. It was relatively rare for officers to be named in multiple use of force complaints, with only 359 officers, receiving five or more complaints. Officers with five or more use of force complaints represent 4 percent of our overall sample but contribute 29 percent of person-complaints for use of force.

Figure 3 about here

Table 2 presents the results from the frailty models. Model I serve as our baseline, examining officer characteristics associated with use of force complaints. Results show that officer

characteristics, including sex, tenure, and rank are all associated with recurrent use of force complaints. Male officers were more likely to be involved in multiple use of force complaints. In contrast, officers' who had served with the CPD over a longer period were less likely to be named in use of force complaints. However, our square term for years of service is positive and significant, suggesting a curvilinear relationship. We interpret this as a reflection of how officers progress in their careers, with officers who have been with the department for longer periods less likely to be on routine patrol duties that may expose them to opportunities for complaints. Figure 4 plots the hazard ratio at different values of tenure for an average male, White police officer (not in a specialized unit) along with the probability density function for the tenure variable. As seen in Figure 4, the hazard associated with tenure drops dramatically until about ten-years on the job and begins to level off in the subsequent decade, suggesting that use of force is much more likely in the early part of an officer's career. Officer race and ethnicity are not significantly associated with use of force complaints.

Figure 4 about here

Unsurprisingly given the trend shown in Figure 2, complaints made against officers in later years are negatively associated with use of force complaints. Another significant control variable is the number of prior solo complaints. Each additional past solo complaint increases the likelihood of future use of force complaints by seven percent in Model I, indicating that officers who are named in many complaints by themselves have a greater likelihood of engaging in more serious offenses. As is commonly found in research on offender versatility (e.g. Gottfredson and Hirschi, 1990; Guerette, Stenius, and McGloin, 2005), this result may suggest that police officers who engage in any complaint are likely to escalate into use of force complaints. On the other hand, our results point to a decrease in the likelihood of future use of force complaints as officers accumulate past complaints for the same type of misconduct. As we mentioned above, repeat use of force misconduct, while not necessarily rare, is not particularly common in our sample, despite a few unusually persistent officers. While we do not have information regarding the outcome of these misconduct complaints (i.e., whether the complaint was sustained or not), this finding may point to the fact that repeated serious misconduct such as excessive use of force may be more likely to be met with discipline leading to the deterrence of problem officers. However, we are cautious in this assessment given past reports on the lack of, or relatively lax discipline that officers received for involvement in use of force complaints (Department of Justice, 2017: 36-37). The findings for all three of these control variables remain significant across all subsequent models.

Table 2 about here

Model II introduces the effects of officers' misconduct networks. Results show that officers' co-complainants exerted a positive effect on the probability of being involved in recurrent use of force complaints. Being paired with a higher proportion of female officers had a negative and statistically significant impact on an offender's likelihood of receiving use of force complaints. Consistent with our individual-level results, the proportion of an officer's network who share the same race/ethnicity as the officer had no statistically significant association with subsequent use of force complaints. Similarly, the mean years of service of officers' co-complainants had no statistically significant relationship with use of force complaints.

In support of our main hypothesis, exposure to colleagues with a history of use of force is positively and significantly associated with use of force complaints (*HR* = 1.66, *95% CI* = [1.52-1.81], $p < .001$). Compared to an officer in a network with no officers previously involved in use of force, an officer with an average proportion (39%) of officers with a history of use of force in their immediate network is 26 percent more likely to be involved in a future use of force complaint. Conversely, officers whose misconduct networks consist of fewer officers who were previously involved in use of force, are less likely to become involved in use of force complaints. Figure 5 shows the hazard ratios at different values of exposure to use of force (left) and percent female officer for an average male, white police officer (not in a specialized unit) along with the probability density function for each variable. Being named in a use of force complaint increases as an officer's exposure to colleagues with prior use of force complaints increases. In contrast, being named in a use of force complaint increases as an officer's exposure to female colleagues decreases.

Figure 5 about here

Discussion

Prior studies of police misconduct have primarily analyzed the individual- or departmental-level correlates of deviance. These studies have led to important debates on whether patterns in misconduct can be traced to a few individual officers or whether misconduct is a product of larger departmental issues. This article presents one of the first studies to use formal network analyses to investigate how officer networks influence involvement in misconduct, examining how misconduct may be socially transmitted across deviant officers. In addition to confirming the importance of several individual-level attributes—such as sex, tenure, and history of use of force—our results highlighted the importance of exposure to police misconduct in one's network as a predictor of subsequent use of force behavior. Officers who were embedded in networks with a higher proportion of colleagues previously named in use of force complaints were more likely to be named in subsequent use of force complaints. These findings held even after controlling for officers' characteristics and for the opportunity of being named in future use of force complaints.

The finding that networks matter for understanding police misconduct echoes research on the role of peers in structuring patterns of delinquency and crime patterns more broadly. Specifically, the results are consistent with Conway and McCord's (2002) finding that co-offending with more serious offenders increases one's own likelihood of being involved in more serious offenses. The authors contend that deviance is learned and passed on through impromptu social contexts where co-offenders converge. But, police officers in many ways are distinct from general offenders in several fundamental ways, the least of which is their sworn role as public servants charged with helping maintain public safety. Moreover, unlike the informal nature of peer groups, policing is not an impromptu social context. Police officers share relatively long-standing relationships that are highly controlled by police organizations themselves. Many officer relationships are directly tied to other structural features, including their graduating class, the unit they are assigned to, the partners with whom they are assigned, and the geographic areas where they patrol. Such contextual factors create conditions for more or less repetitive and stable interactions. In the context of social learning, being embedded in stable relationships may

condition processes associated with the transmission of deviant behavior.[10] Officers may rely on what they have heard or observed when making challenging decisions – much of which may be learned through their colleagues.

Our findings are also consistent with a long line of ethnographic and empirical research that has highlighted the role of social forces in structuring officer behavior, especially informal socialization. In his ethnography of the police subculture, Moskos (2008) argued that officer behavior is often structured by an informal police code of conduct than by formal regulations and policies. Describing the police subculture, Moskos (2008: 104-105) states: "the code also states that to enter and back down from a conflict is a loss of face. Nobody wants to be 'punked', least of all the police. Police play by these street rules with the assumption that any sign of weakness on their part will make future interactions much more difficult and dangerous. Police, quite simply, cannot afford to lose confrontations." These social pressures to react or retaliate may be influenced by, and further exacerbated, by the officers' exposure to deviant colleagues. Such an interpretation is also consistent with Roithmayr's (2016) recent exposition on the possible learning dynamics involved in police use of force.

This police subculture may also help attenuate officers' perceptions of the risks associated with engaging in misconduct. Officers who are named in complaints may receive criminal sanctions, suspension, lack of promotion, and even termination of one's career. With the risk of potentially career-ending behavior in the mix, how does an officer's misconduct network change the equation with regards to adopting these risks? We argue that not only do police officers learn patterns of deviance through their colleagues, but that these networks alter the perception of informal and formal risks associated with misconduct, thereby neutralizing behaviors that otherwise would be considered deviant, or against academy-learned theory and training. The likelihood of being sanctioned, either from formal bodies or informally through your peers, may be reduced (or perceived to be reduced) in situations where officers are surrounded by a higher proportion of officers who have previously engaged in deviant behavior. Rather than be shunned for inappropriate behavior, engaging in similar behaviors may increase solidarity and loyalty between officers. For example, officers, or pairs of officers, that accept money or rewards (e.g., brides) to ignore some type of violation, officers that drink on the job together, or increasingly aggressive officers that get promoted with their behaviors misconstrued as greater engagement on the job, signs of leadership, courageous, and a "tough" on crime stance (Barker, 1977; Savitz, 1970). Fellow officers may be tolerant, and less likely to hold others accountable for their actions if, they, themselves have previously engaged in serious misconduct (Savitz, 1970; Chappell and Piquero, 2004), and may choose to sanction those that do not participate in such behaviors (Barker, 1977).

[10] Such a proposition is consistent with the core idea of social learning and differentiational association theory in that the frequency, duration, intensity and priority of a tie relates to the probability of transmission. Relatedly, a foundational element of learning theory is instrumental conditioning and imitation, in that, one's attitudes and behaviors are interconnected; thus, delinquency is learned, and thereby repeated, with persons that predominantly comprise or control one's network, and in return, provide a source of reinforcement (see Sutherland, 1947; Akers 1985; 1998; Cressey, 1955).

Limitations

First, the number of complaints likely underestimates the full scope of deviance within a police department. The discrepancy between complaint records and the 'true' prevalence of misconduct, largely stems from the fact that the latter only requires that a misconduct event takes place, whereas the former is related to the likelihood the event is reported. This additional burden of reporting introduces the potential for both false positives (cases where a victim misreports an incident) and false negatives (cases where misconduct occurs but is not reported). This is important given that the probability a citizen will report a complaint may vary across neighborhoods and populations. Ideally, we would have characteristics of the complainants which would allow us to control for this[11], as well as information on the outcome of the complaint (sustained or not).[12] However, the lack of information on outcomes, coupled with the heavy critiques levied against the CPD for the lack of integrity in the systematic application of their discipline system and investigation of complaints (see Department of Justice, 2017), precluded us from controlling for the outcomes from complaints. That said, a recent study using similar complaint data in Chicago showed a strong relationship between citizen complaints and future civil rights litigations (Rozema and Schanzenbach, 2018), suggesting that misconduct complaints may be good proxies for officer behavior, particularly among repeat offenders.

An additional limitation is that we do not have information on officers' beat or other geographic assignments. Previous studies have emphasized that differential assignment of officers to higher crime neighborhoods may explain variation in complaints (e.g., Terrill and Reisig, 2003). As a sensitivity analysis we attempt to control for this by including information on the level of crime and concentrated disadvantage for the area where the complaint occurred. Information on crime levels was obtained from the Chicago Police Crime Summary, which reports the number of Index crimes detected for each police beat within the past year.[13] Our measure of concentrated disadvantage was modelled from Sampson, Raudenbush, and Earls (1997), relying on census track data to conduct principle component analysis on percent unemployed, below the poverty line, receiving food stamps, single female household, black, and 18 years old or younger (Appendix, Table C).[14] While complaint records provided information on the police beat where the incident occurred, concentrated disadvantage was measured at the census-tract level. We obtained district-level measures of concentrated disadvantage by merging census tracts that overlapped 50 percent or more with the associated district.[15] Further, because some complaint records lacked information

[11] Complaint records did provide information on complainant race, but only for a fraction of the incidents. Focusing only on use of force complaint, information on victim race was only available for 47 percent of all officer-complaint observations. A descriptive analysis of these complaints showed that 77 percent were made by black citizens; however, the lack of information precluded us from including it in our models.

[12] Information on the complaint outcome was provided for less than half of all complaints. Of the 43,718 police-complaint observations, only five percent were reported as sustained, likely capturing a process issue rather than a reflection of guilt.

[13] Available at Http://gis.chicagopolice.org/website/clearMap_crime_sums/viewer.htm?SUMTYPE=BEAT&SUMCATA=INDEX_&SUMTIME=365 accessed on August 2, 2017.

[14] All variables load above 0.4 except for percent residents aged 18 years or younger (0.35). We selected a one-factor solution which resulted in an eigenvalue of 5.05.

[15] It should also be noted that officer-complaint records are nested within police beats, which are nested within police districts. We attempted to control for this by nesting officer-complaints within beats, and districts in our

on the location of the incident, our final sample only included 40,773 police-complaint observations.[16] Results regarding the effect of network exposure remain robust to the inclusion of these controls. Exposure to a greater proportion of colleagues with a history of use of force was positively and significantly associated with use of force complaints (see Appendix, Table A). In addition, concentrated disadvantage was also positively associated with use of force complaints, showing officers who received complaints in areas with greater concentrated disadvantage were more likely to have use of force complaints lodged against them.[17]

Further, our study only captures an officer's misconduct network and not the broader social structure (and partnerships) in which an officer is embedded. Ideally, we would have access to non-deviant officers (those who were not named in any misconduct complaints) in addition to the full set of deviant officers (named in at least one misconduct complaint), allowing us to disentangle what initially leads officers into misconduct, and how deviant and non-deviant partnership structures offending.[18] Our interpretation is therefore limited to the extent to which their *known deviant* colleagues (with at least one formal misconduct complaint) have engaged in excessive use of force. Officers operate within established institutions and are typically assigned to partners, or units and/or communities where they are more likely to interact with some officers more than others. These structural constraints on the interactions between officers may lead to a limited set of colleagues playing a prominent role in their socialization in the force. Thus, our measure of exposure to deviant peers may be exaggerated if they have a high number of non-problematic partnerships that are not captured in our dataset.

Finally, the results of the study are based on one agency and lack organizational-level indicators of change. Results based on a single agency limits external validity, and the ability to generalize to other contexts and places. The CPD represents a case study whose high levels of misconduct led to a major inquiry by the Department of Justice, an overhaul of the complaint oversight body, and the appointment of a new police superintendent. Chicago, in many ways, has similar patterns to other large cities that have been under consent decrees such as Los Angeles, Cleveland, Miami, Newark, Baltimore, and New Orleans. The high levels of impunity of officers in Chicago may shape how these social norms are transmitted between officers in the CPD, and potentially enable a subculture that predisposes officers to act in ways that they would not have had they been employed in another sector where punishment was more certain, or officer cynicism was low. Lacking information about changes in organizational-level indicators over time may be

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frailty models; however, they did not converge. This does mean that there is a potential for biased standard errors and false-positives. We thus urge caution in the interpretation of these results.

[16] To effect model comparisons, we also re-estimated the original model (Table 2, Model II) with only 40,773 police-observations. The log-likelihood of this model was -57,585.33 ($p < .001$) and AIC 120,129.53, which suggests that adding in measures of crime and collective disadvantage did not improve model fit.

[17] When we control for crime-count and concentrated disadvantage our results show that Hispanic officers are significantly more likely to be involved in recurrent use of force complaints. However, we attribute this as an artefact of the data, rather than capturing a significant relationship. According to bivariate analyses, individuals with missing data on this measure appear to be slightly different than individuals who have complete data. Hispanic officers were more likely to be recorded on complaints that had missing data on the police beat in which the incident occurred ($p < .01$), whereas White officers were more likely to be listed on complaints that had recorded data for the police beat ($p < .01$). Further, Hispanic officers who had a use of force complaint, were *less* likely to be excluded ($p < .01$), whereas White officers with a use of force complaint were *more* likely to be excluded ($p < .01$).

[18] This limit characterizes much of the literature on co-offending that relies on arrest data that only captures "deviant" peers rather than others in one's interpersonal networks.

an important limitation given that misconduct has been attributed to the organization size of the department, the percentage of officers relative to supervisors, the internal operations of the agency, and training or hiring process (Huff, White, and Decker, 2018; Kappeler et al., 1998). On a larger scale, political culture, policy, or enforcement objectives, which often go unmeasured, are reflected in the structural makeup of the organization and may have an impact on the prevalence of misconduct over time. Nonetheless, our central hypotheses about the importance of officer networks readily invites comparative research that can assess the importance of officer networks within and across different police organizational contexts. Opportunities for collecting social network data within police departments are plentiful but require a desire and commitment by police departments to engage in such a research process. Future investigations may collect social network data using information on police partnerships, the units they are assigned to, and even academy classes, allowing examinations to tease out how various relationships structure officer behavior.

Conclusion and Policy Implications

Our study is one of the first to use formal network methods to measure how social relationships within an entire police department impacts the likelihood of misconduct. Similar to the ways that networks have been shown to influence criminal behavior in other contexts, our findings highlight one-way social networks may shape deviance within police departments: through exposure to deviant officers. While our study cannot pinpoint the exact mechanism through which misconduct diffuses through police networks, it suggests that networks might very well play a role in shaping how behavioral scripts influence police work through interactions between colleagues in the field (Fagan and Geller, 2015; Roithmayr, 2016; Sierra-Arévalo, 2016; Skolnick, 1966). Our study reinforces previous findings and gives further credence to the theory of social contagion of police excessive use of force brought forward by Roithmayr (2016) and others. Future research in this vein would do well to gather and analyze social network data depicting the informal social structure of police departments as well as try to pinpoint precise mechanisms of contagion such as learning, imitation, and so on. As bounded organizations, police departments are ideal settings to collect and study social networks. Such data would enable researchers to not only consider the content of social networks, but also the structural features of these networks.

The finding that officers' misconduct networks influence their own involvement in use of force complaints carries some significant policy implications. The finding that being named on a complaint with female officers reduces the future likelihood of use of force complaints suggests that greater exposure to female officers in an officers' network could lead to a reduction in misconduct incidents. Schuck (2014) suggested that female officers are less likely to internalize hypermasculine values prevalent in police culture during the occupational socialization process and that the growing place of women in police departments may disrupt the traditional masculine culture of policing. Our findings suggest that female officers may not only be less likely to be involved in use of force complaints themselves, but their association with male officers may also reduce their likelihood of future use of force complaints among other officers. In other words, female officers may have a beneficial social influence in police networks – even misconduct networks.

Similarly, the effect of tenure is consistent with prior findings that consider officer age and experience. Multiple studies have found that relatively younger, less experienced, officers are likelier to make arrests and to be involved in disciplinary action (Brandl et al., 2001; Crank, 1993; Sherman, 1980). In contrast, and consistent with our findings, officers who are more experienced, and have been on the force over a longer period are less likely to be named in use of force complaints. Perhaps the tendency for "youth" to make more arrests and resort to improper use of force is centered on hypermasculine values that facilitate a "kick ass" reputation (Toch, 1995), a scenario which may be aggravated if newer officers with more physical prowess are also those who are more likely to be called to a scene. When a lack of experience and pressure to perform are combined, new officers may be inclined to overcompensate (e.g., prove themselves) to impress their peers and mitigate fear and safety concerns as they become socialized into police (sub)culture on the job. Findings such as this highlight the importance of adequate academy training as well as the important role of field training officers (FTOs) in socializing recruits to the departments set of values, principles, and code of ethics (see Getty, Worrall and Morris, 2014). Importantly, our findings on the length of such risk (e.g., Figure 4) further suggest that such socialization may continue well into the first decade on the job—such a focus on "youth" is thus not just on the newest recruits. It is imperative that departments monitor FTOs, recruits, and officers with due attention placed on *which* officers are conducting the training, their rank, and their overall status and reputation across the department and in the community.

The most salient policy implication of this study relates to the social influence of officers with a prior history of use of force complaints. Not only are officers with a prior history of being named in use of force complaints more likely to be involved in future similar complaints, but they appear to also influence others in being named in use of force complaints. Many early warning systems have been designed to account for the former (history of complaints) but fail to consider the latter (the social networks of officers involved in misconduct). Although further research is needed before one could claim that police misconduct is truly socially "contagious", our findings provide evidence that exposure to officers with a history of misconduct is associated with subsequent use of force behavior. Police departments seeking to curb use of force complaints may want to consider how assigning officers with such histories of use of force could impact the behavior of other officers. For example, temporarily removing officers named in use of force complaints from the field until problematic behaviors are addressed might limit the negative consequences of exposure. Likewise, the significance of our exposure parameter suggests that departments might also limit the number of officers with histories of use of force complaints from working as partners or in the same unit. These findings raise options for expanding already implemented prevention mechanisms. Previous studies have shown that early warning systems, which first identify potentially problematic officers and then divert them into non-disciplinary programs, such as counselling and retraining, can be effective measures for reducing civilian allegations of misconduct (e.g., see Walker, Alpert, and Kenney, 2001). The CPD currently has multiple early warning systems in place, some of which include measures to re-assign problematic officers (e.g. see Police Accountability Task Force, 2016). Our study recommends expanding these early warning systems to account for officers' network characteristics, particularly to account for clustering of problematic behaviors. If early problematic behaviors are detected, restructuring assignments may reduce the negative social influence we find in this study.[19]

[19] The CPD currently has multiple early warning systems in place, and a history of adopting innovative and cutting-edge programs to identify problematic officers. However, prior investigations of the CPD have suggested that although

Individual incidents of police misconduct and violence—even those like the shooting of Laquan McDonald—represent more than a debate between bad apples and bad institutions. Officer Jason Van Dyke fired the 16 shots that killed McDonald and he had a history of abusive behaviors. Yet, his act occurred among a department with a long history of abuse, misconduct, and a lingering code of silence that kept many of the other officers on the scene from acting in accordance with the fundamental police mandate to "protect and serve." A network approach to police misconduct can provide new ways to help us understand the social contexts that can lead to such tragic events. What is more, detecting and doing something about the types of network effects that facilitate police misconduct can possibly help repair the severely damaged relationship between the police and community in cities like Chicago. Legal authorities, especially the police, shape the behavior and reaction of the communities they police, and in return, the public's reactions to the police impact their ability to efficiently and effectively maintain social order and combat crime. Tankebe (2009:261) explains that "what poor police treatment of citizens does is to weaken moral identification with police institutions." Ultimately being treated fairly by those in positions of power and authority impacts the public's view of legitimacy, group conformity, and their level of voluntary cooperation with, and in support of, legal societal norms (Tyler, 2004; Tyler and Huo, 2002).

Police misconduct diminishes the public's willingness to cooperate and engage with the police (Desmond et al., 2016) – exacerbating attitudes that resemble legal cynicism (Kirk and Papachristos, 2011), and thus, indirectly affecting perceptions of police legitimacy. Our findings call for innovations in the management and facilitation of police services, heightened levels (and expectations) of professionalism, and greater accountability (e.g., meaningful departmental discipline (e.g., Kelling and Coles, 1996; Silverman and O'Connell, 1999). While such efforts should be applied across the recruitment and training phases of police careers, our study also suggests that interventions must move beyond a focus on individual officers and, instead, also incorporate methods to detect and dissipate the effects of deviant police networks *within* police departments. This raises a call for greater transparency and accountability across agencies so that officers are monitored and placed through training programs such as integrity testing that can insulate, identify, and then correct the behaviors of officers with a propensity for wrong-doing (e.g., Macintyre and Prenzler, 1999). A step further would be to isolate highly problematic officers that appear to be unresponsive to sanctions from their larger network of peers and provide interventions that account for the influence of both community-level and organizational correlates of misconduct.

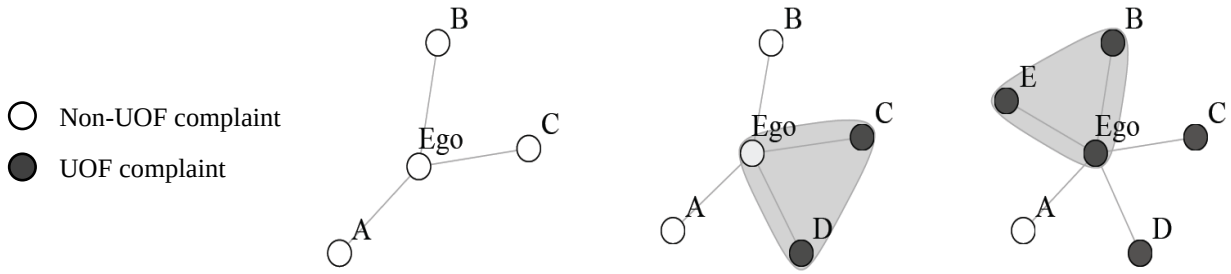
Some of the policy recommendations and implications of our finding—such as increases to transparency and oversight—require large investments of political capital of cities and police departments. In some cases, like Chicago, such requirements are being wrapped into consent decrees and overseen by the court. Changes in the cultural aspects of the police worldview are also needed to help address the ways in which norms and learning unfold within departments and are

problem officers are easily identifiable, and often well-known, there has been a failure to systematically implement diversion programs to correct officer behavior (Police Accountability Task Force, 2016). As with any early warning system, the effectiveness will be contingent upon distinguishing between symbolic gestures of adoption versus commitment and buy-in from all levels of department in their implementation.

likely to necessitate changes not readily discussed here. But many of the network interventions described above—such as the allocation of current officers by experience or prior history of use of force—do not require large-scale policy changes; these sorts of changes can be done at the management level within willing police departments. The sorts of data analyzed here can readily be gathered and analyzed from within management systems. The biggest challenge to this sort of network approach is the willingness of departments to dive into their own data (or build positive working relationships with researchers) to affect change.

Tables and Figures

Figure 1. Hypothetical Example of an Officer's Network Exposure to Use of Force Complaints[a]



Complaint	**Complaint 1** Failure to provide service	**Complaint 2** Arrest, improper procedures	**Complaint 3** Use of Force
Number of officers accused in current complaint	4	3	3
Number of officers in ego's misconduct network with a UOF complaint (*t*-x)	-	0	2
Number of officers in ego's misconduct network (*t*-x)	-	3	4
Ego's network exposure	-	0%	50%

ABBREVIATIONS: UOF = Use of Force

[a] Shaded regions in figure represents officers who were named in the current complaint.

Figure 2. Distribution of Police Misconduct Complaints, 2007-2015

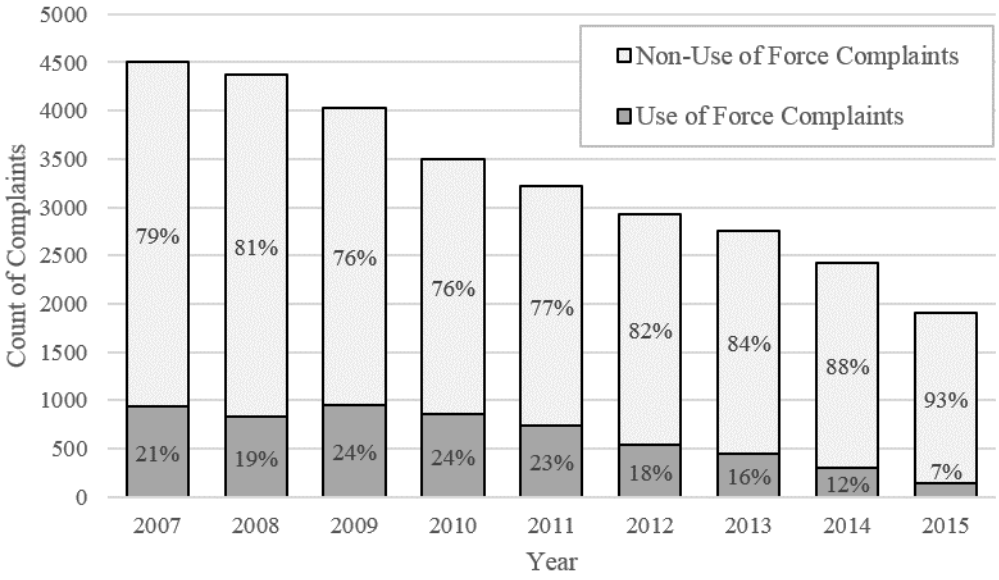
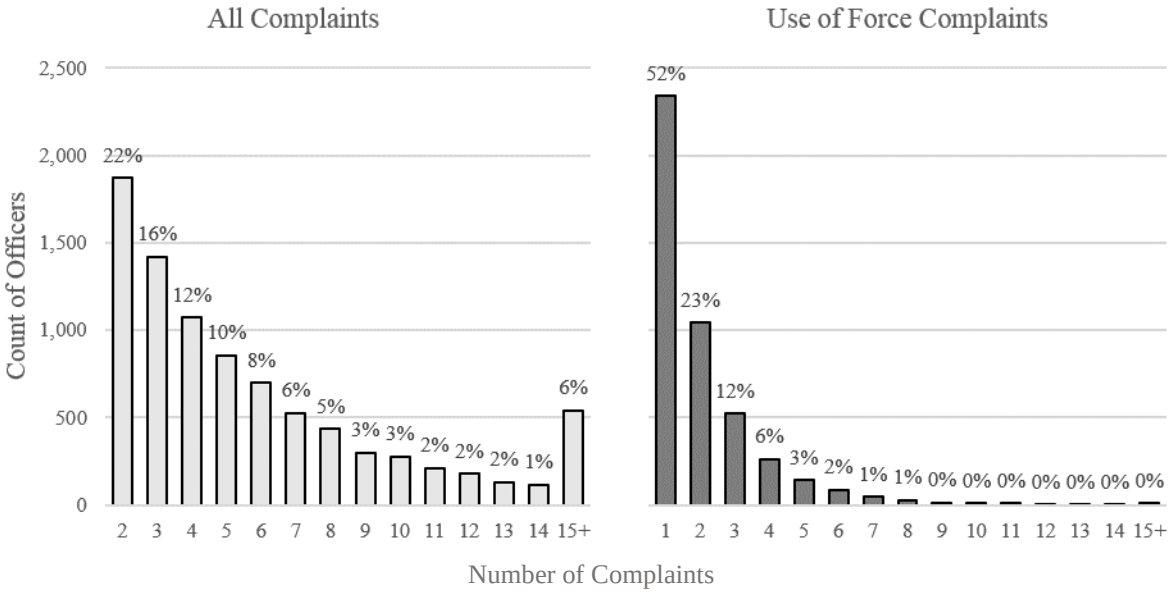
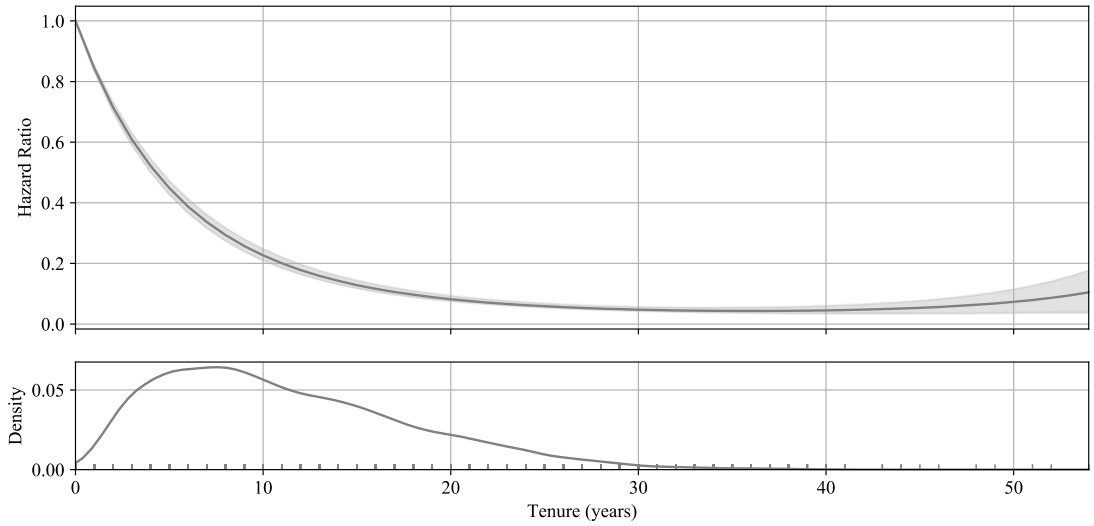


Figure 3. Frequency of Misconduct Complaints across Officers, 2007-2015[a,b]



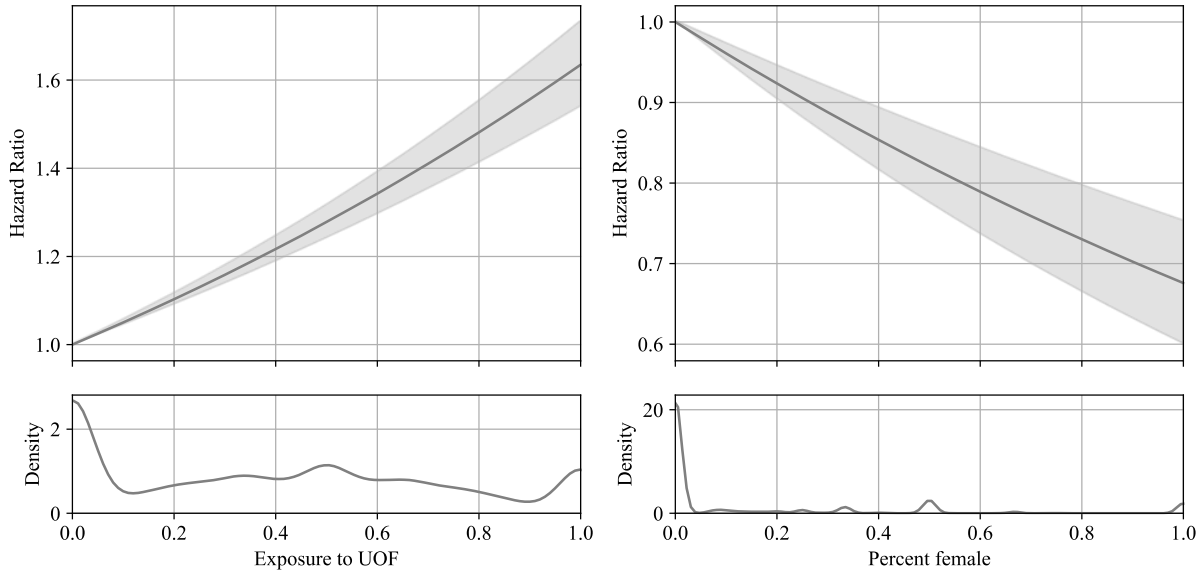
[a] All complaints: Percentages represent the number of complaints received by the officers in our sample (n = 8,624)
[b] Use of force complaints: Percentages represent the number of complaints received by the officers in our sample who had at least one use of force complaint (n = 4,523)

Figure 4. Hazard Ratios for Average Officer[a] Over Values of Officer Tenure (top) with Variable Probability Density Function (bottom)



[a] Simulated using average values of continuous variables and the following values for categorical variables: male, white, police officer, and not member of a special unit.

Figure 5. Hazard Ratios for Average Officer[a] over Values of Exposure to Use of Force (left) and Percent Female in Complaint Network (right) with Variable Probability Density Function (bottom)



[a] Simulated using average values of continuous variables and the following values for categorical variables: male, white, police officer, and not member of a special unit.
ABBREVIATIONS: UOF = Use of force

Table 1. Summary Statistics

Variables	Mean	SD	Minimum	Maximum
Officer				
Use of force (1 = Yes)	0.18	0.39	0	1
Sex (1 = Male)	0.86	0.34	0	1
Race				
White	0.52	0.50	0	1
Black	0.24	0.43	0	1
Hispanic	0.21	0.41	0	1
Other	0.03	0.17	0	1
Tenure	11.29	6.74	0	56
Rank (1 = Officer)	0.79	0.41	0	1
Special unit (1 = Yes)	0.15	0.36	0	1
N solo complaints	1.57	2.26	0	34
N prior UOF complaints	1.23	1.90	0	22
Incident year	2010.67	2.37	2007	2015
Misconduct network				
N co-accused	2.24	3.09	0	14
Female (%)	0.14	0.27	0	1
Same race (%)	0.43	0.44	0	1
Tenure (mean)	7.80	6.69	0	64
Exposure to UOF	0.39	0.34	0	1
No. Observations: 43,718				
No. Officers: 8,624				

ABBREVIATIONS: SD = Standard deviation; UOF = Use of force

Table 2. Frailty Models Assessing the Influence of Colleagues Accused of Misconduct on Officer Use of Force Complaints[a]

	Model I			Model II		
	HR		95% CI	HR		95% CI
Officer						
Sex (1 = Male)	1.79	***	1.60-1.99	1.19	*	1.03-1.38
Race (ref = White)						
Black	1.05		0.96-1.15	1.02		0.94-1.11
Hispanic	1.09		0.99-1.20	1.09		0.99-1.19
Other	1.02		0.82-1.26	1.02		0.83-1.24
Tenure	0.85	***	0.84-0.87	0.87	***	0.85-0.88
Tenure^2[b]	1.35	***	1.28-1.42	1.30	***	1.24-1.36
Rank (1 = Officer)	0.92		0.84-1.01	0.90	*	0.82-0.98
Special unit	0.93		0.83-1.04	1.04		0.94-1.15
N solo complaints	1.07	***	1.05-1.09	1.05	***	1.03-1.07
N prior UOF complaints	0.93	***	0.91-0.95	0.93	***	0.92-0.95
Incident year	0.38	***	0.37-0.39	0.38	***	0.37-0.39
Misconduct network						
N co-accused				0.91	***	0.90-0.92
Female (%)		–		0.57	***	0.48-0.67
Same race (%)		–		1.02		0.95-1.08
Tenure (mean)		–		1.00		0.99-1.00
Exposure to UOF[c]		–		1.66	***	1.52-1.81
Theta		0.85			0.67	
N observations		43,718			43,718	
N officers		8,624			8,624	
LL		-61,256.46***			-61,432.89***	
AIC		128,536.06			128,134.01	

ABBREVIATIONS: AIC = Akaike information criterion; HR = hazard ratio; CI = confidence intervals; LL = log-likelihood; RE = Random Effects; UOF = Use of force

[a] HR = exp(*b*)

[b] Tenure squared was divided by 100 to facilitate interpretation.

[c] Proportion co-accused with prior use of force complaint

*p < .05; **p < .01; ***p <.001 (two-tailed)

Appendix

Table A. Correlation Matrix (*n* = 43,718 officer-complaint observations)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Use of Force	1	-														
2 Male	0.06	1	-													
3 White	0.00	0.06	1	-												
4 Black	-0.02	-0.12	-0.58	1	-											
5 Hispanic	0.01	0.03	-0.54	-0.29	1	-										
6 Other	0.01	0.04	-0.18	-0.10	-0.09	1	-									
7 Tenure	-0.10	0.01	0.00	0.10	-0.08	-0.05	1	-								
8 Rank	0.03	-0.03	-0.13	0.07	0.07	0.03	-0.36	1	-							
9 Special unit	0.00	0.08	0.02	-0.03	0.01	-0.02	-0.10	0.09	1	-						
10 N solo	0.01	0.01	-0.09	0.13	-0.03	0.01	0.20	0.01	-0.07	1	-					
11 N prior UOF	0.07	0.13	0.02	-0.04	0.02	0.00	-0.05	0.06	0.07	0.49	1	-				
12 Incident year	-0.10	-0.03	-0.02	0.00	0.02	0.01	0.21	0.04	-0.05	0.21	0.23	1				
13 N co-accused	-0.10	0.08	0.06	-0.09	0.02	-0.01	-0.05	-0.05	0.21	-0.20	-0.03	-0.11	1	-		
14 % Female	-0.07	-0.79	-0.08	0.13	-0.03	-0.03	0.02	0.02	-0.10	0.00	-0.11	0.03	-0.09	1	-	
15 % Same race	-0.01	0.03	0.24	-0.06	-0.16	-0.15	-0.10	0.03	0.03	-0.21	0.01	-0.03	0.15	-0.03	1	-
16 Tenure (mean)	-0.07	0.02	0.06	-0.06	-0.01	-0.01	0.13	-0.03	0.06	-0.21	-0.01	0.11	0.33	-0.03	0.39	1
17 Exposure to UOF	0.05	0.09	0.02	-0.05	0.03	-0.01	-0.12	0.06	0.05	0.07	0.39	0.25	-0.02	-0.08	0.04	0.01

ABBREVIATIONS: UOF = Use of force

Table B. Correlation Matrix (*n* = 40,773 officer-complaint observations)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Use of Force	1	-																
2 Male	0.06	1	-															
3 White	0.00	0.06	1	-														
4 Black	-0.02	-0.12	-0.59	1	-													
5 Hispanic	0.01	0.03	-0.54	-0.29	1	-												
6 Other	0.01	0.04	-0.18	-0.10	-0.09	1	-											
7 Tenure	-0.09	0.01	0.00	0.10	-0.09	-0.05	1	-										
8 Rank	0.02	-0.03	-0.13	0.07	0.07	0.03	-0.36	1	-									
9 Special unit	0.00	0.08	0.02	-0.03	0.01	-0.02	-0.10	0.09	1	-								
10 N solo	0.01	0.01	-0.09	0.14	-0.03	0.01	0.21	0.00	-0.06	1	-							
11 N prior UOF	0.07	0.13	0.02	-0.04	0.02	0.00	-0.05	0.06	0.07	0.49	1	-						
12 Incident year	-0.10	-0.03	-0.02	0.00	0.02	0.01	0.22	0.04	-0.05	0.22	0.23	1	-					
13 Crime count	0.01	0.01	-0.07	0.10	-0.02	-0.01	-0.09	0.00	0.04	0.00	0.03	0.01	1	-				
14 Concentrated disadvantage	0.01	0.02	-0.09	0.12	-0.01	-0.03	-0.19	0.01	0.14	-0.02	0.07	-0.04	0.23	1	-			
15 N co-accused	-0.11	0.08	0.06	-0.09	0.02	-0.01	-0.04	-0.05	0.21	-0.20	-0.03	-0.12	0.01	0.14	1	-		
16 % Female	-0.07	-0.79	-0.08	0.13	-0.03	-0.03	0.02	0.02	-0.10	0.01	-0.12	0.03	-0.01	-0.03	-0.09	1	-	
17 % Same race	-0.01	0.03	0.24	-0.06	-0.17	-0.15	-0.10	0.03	0.03	-0.21	0.01	-0.03	0.02	0.05	0.14	-0.03	1	-
18 Tenure (mean)	-0.08	0.02	0.06	-0.06	-0.01	-0.01	0.14	-0.02	0.06	-0.20	-0.01	0.12	-0.05	-0.05	0.32	-0.03	0.38	1
19 Exposure to UOF	0.05	0.09	0.02	-0.05	0.03	-0.01	-0.12	0.06	0.05	0.07	0.39	0.25	0.05	0.09	-0.02	-0.08	0.04	0.01

ABBREVIATIONS: UOF = Use of force

Table C. Summary Statistics for Measure of Concentrated Disadvantage

	Mean	SD	Minimum	Maximum
Single female households (%)	0.22	0.13	0.04	0.43
18-year-old or less (%)	0.23	0.07	0.08	0.31
Receiving food stamps (%)	0.18	0.11	0.05	0.37
Black (%)	0.42	0.37	0.01	0.97
Below poverty line (%)	0.23	0.09	0.09	0.43
Unemployed (%)	0.13	0.06	0.05	0.29
Concentrated disadvantage	0.00	2.30	-3.25	4.47

ABBREVIATIONS: SD = Standard deviation

Table D. Frailty Models Assessing the Influence of Colleagues Accused of Misconduct on Officer Use of Force Complaints with controls for Beat and District-level Indicators[a]

	HR		95% CI
Officer			
Sex (1 = Male)	1.19	*	1.03-1.39
Race (ref = White)			
Black	0.99		0.91-1.08
Hispanic	1.10	*	1.01-1.20
Other	1.02		0.83-1.25
Tenure	0.88	***	0.86-0.89
Tenure^2[b]	1.28	***	1.22-1.34
Rank (1 = Officer)	0.91	*	0.83-0.99
Special unit	1.04		0.94-1.15
N solo complaints	1.06	***	1.04-1.08
N prior UOF complaints	0.94	***	0.92-0.96
Incident year	0.38	***	0.37-0.40
Crime count (beat-level)	1.05		0.97-1.12
Concentrated disadvantage (district-level)	1.02	*	1.00-1.03
Misconduct network			
N co-accused	0.91	***	0.90-0.92
Female (%)	0.57	***	0.48-0.67
Same race (%)	1.01		0.95-1.08
Tenure (mean)	1.00		0.99-1.00
Exposure to UOF[c]	1.69	***	1.54-1.85
Theta		0.65	
N observations		40,773	
N officers		8,430	
LL		-57,593.98***	
AIC		120,122.16	

ABBREVIATIONS: AIC = Akaike information criterion; HR = hazard ratio; CI = confidence intervals; LL = log-likelihood; RE = Random Effects; UOF = Use of force

[a] HR = exp(*b*)

[b] Tenure squared was divided by 100 to facilitate interpretation.

[c] Proportion co-accused with prior use of force complaint

*p < .05; **p < .01; ***p <.001 (two-tailed)

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Statute

Illinois Compiled Statutes, 720 ILSC 5, § 33.3