Female Officers and the Discovery of Domestic Violence

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Job Market Paper

Abstract

Domestic violence (DV) is a crime that usually has female victims and is often under-reported. This paper studies the effect of having a female officer dispatched in the primary unit on the discovery of DV in physical abuse incidents in Milwaukee and Chicago. Using three-year calls for service data and conditional random assignment of officers in the dispatch process, the paper finds that the existence of a female officer in the primary unit scales up the likelihood of discovering DV in physical abuse incidents by 10% in Milwaukee. Analysis of data from Chicago indicates a similar effect. These results indicate that female officers play an important role in discovering DV.

JEL Codes: J12, J16, J78, K42

*Contact email: yixinchen@ucsb.edu. I thank Kelly Bedard, Heather Royer, Gonzalo Vazquez-Bare, and participants in seminars and conferences at UCSB and ACLEC for helpful comments and suggestions. I thank Milwaukee Police Department and Chicago Police Department for providing the data.

1 Introduction

Domestic violence (DV) is a common yet under-reported gender-based crime. In DV incidents, victims are largely female and offenders are largely male. One of the most common forms of DV is physical abuse. There are approximately 2.5 to 4.5 million physical abuse incidents against women in the US each year (Rand & Rennison, 2005). DV has different interpretations. It is interpreted to be a way for a man to dominate his partner (Dobash & Dobash, 1979), to provide positive utility to some men (Tauchen et al., 1991; Aizer, 2010), and to be an unintentional outcome when an argument becomes out of control (Straus et al., 1980; Johnson, 2009). DV has adverse health outcomes in women's health systems that include the brain system, cardiovascular system, gastrointestinal system, immune and endocrine system, musculoskeletal system, and reproductive system (Black, 2011). Besides, DV has psychological impacts that parallel with the trauma of being taken hostage and subjected to torture (Dutton, 2000; Herman, 2015). Also, DV has intergenerational effects that are transmitted from parents to children (Pollak, 2004).

Despite its severe health outcomes, psychological impacts, and intergenerational effects, DV frequently remains under-reported. By summarizing data from the National Crime Victimization Survey (NCVS), Reaves (2017) finds that nearly 50% of DV incidents remain unreported. Reasons for not reporting these incidents include social stigma (Devries et al., 2011), distrust of the institution (Belknap, 2010), fear of retaliation (Kishor & Johnson, 2005), lack of awareness (Casey et al., 2011), and financial barriers (Wolf et al., 2003). Under-reporting has detrimental consequences from various perspectives. It perpetuates such incidents and causes extended sufferings for victims. It also limits people's understanding of the actual magnitude of these incidents, which makes developing effective mitigation strategies difficult (Sahay, 2021).

Although under-reporting DV has detrimental consequences from various perspectives, the question of how to respond to incidents so that more DV can be discovered and reported

remains mostly unsolved. One potential solution is to have female officers respond to physical abuse incidents in order to discover more DV incidents. Given that female officers often express more empathy (Rabe-Hemp, 2008) and victims find female officers more favorable in these incidents (Lonsway et al., 2003), it is plausible that officers' gender may play a role in discovering DV related physical abuse.

This paper provides the first empirical evidence on the effect of dispatching female officers on discovering DV related physical abuse incidents using 911 calls for service data. A call for service is a primary way in which the public can solicit the assistance of police. However, the classification of the call may be inaccurate because of ambiguous information from callers and time pressure in the classification process (Simpson & Orosco, 2021). Therefore, it is likely that officers on the scene discover DV elements in physical abuse incidents and then reclassify the calls. Given that DV victims are predominantly female, female officers might be important for discovering these incidents.

This paper uses the calls for service data merged with officer characteristics data from the Milwaukee and Chicago Police Departments to study the effect of having a female officer dispatched in the primary unit on discovering DV related physical abuse incidents. The two cities are very different in sizes, populations, and police demographics. Both police departments provided three years of data from 2017 to 2019. In both police departments, there is a telecommunicator or call taker who picks up a 911 call, and a dispatcher who assigns available officers to the call. Calls are dispatched based on priority. This dispatch process indicates that the variation in whether there exists a female officer in the primary unit is as good as random conditional on district and time fixed effects. This conditional random assignment of officers in the police dispatch process overcomes issues arisen when there is nonrandom officer selection into situations (Hoekstra & Sloan, 2022).

Results indicate that the existence of a female officer in the primary unit improves the discovery of DV in physical abuse incidents by 10% in the Milwaukee Police Department. A positive effect is also found by analyzing data from the Chicago Police Department. Results

show that the existence of a female officer in the primary unit scales up the discovery of DV in physical abuse incidents by 13%. These results support the notion that the empathy of female officers (Rabe-Hemp, 2008), along with victims' preferences for female officers (Lonsway et al., 2003), play a significant role in the enhanced discovery of DV in physical abuse incidents. Moreover, results from the heterogeneity analysis show that the significant increase is mostly contributed by those working in the shift from 8 am-4 pm and those with at least 10 years of experience in both police departments.

Results in this paper have policy implications for policing in the US. There have been controversies on the integration of female officers (Martin & Jurik, 2006). Opponents believe that since women are generally smaller and weaker than men, they are less capable at policing. They are concerned that there may also be lower standards for female officers in the hiring process, which lowers average officer quality (Miller & Segal, 2019). Contrary to these views, this paper provides evidence on the vital role that female officers play. Although there are only two cities in the analysis, results in this paper imply that DV can be under-reported when male officers are the only ones dispatched in the primary unit. The existence of a female officer in the primary unit is important for discovering DV in physical abuse incidents. Hence, female officers are an indispensable part in the police force.

This paper contributes to the literature from three perspectives. It makes contributions to the economics of crime literature on DV by directly providing quantitative evidence of the effect of gender roles on the novel outcome of discovering DV related physical abuse incidents. Previous literature has studied the effects of arrests (Iyengar, 2009; Amaral et al., 2023), prosecution (Aizer & Dal Bo, 2009), unilateral divorce laws (Dee, 2003; Stevenson & Wolfers, 2006), gender wage gap (Aizer, 2010), unemployment (van den Berg & Tertilt, 2012), upset losses in football games (Card & Dahl, 2011), rainfall shocks (Sekhri & Storeygard, 2014), and female representation among officers in an area (Miller & Segal, 2019) on DV incidents. Specifically, Miller & Segal (2019) analyze data from the NCVS and Uniform Crime Reporting (UCR) program using OLS and IV approaches. Using responses to the

questions on crime incidents and whether these incidents are reported to the police, the authors conclude that increasing female representation among officers in an area through affirmative action plans increases reports of DV. Using homicide data from the UCR program, they find a negative relationship between the previous year's female share of officers in the county and the current year's intimate partner homicide rates. The data from NCVS and UCR program do not allow the authors to observe how people in the area know there are more female officers and how these police-civilian interactions take place. This paper fills in the gap by directly estimating the effect of female officers in calls for service. A key advantage of using calls for service data is that the existence of a female officer in the primary unit is conditionally random. This empirical strategy avoids problems generated by endogenous police-civilian interactions. The idea of using a different approach to solve this endogeneity issue is related to works by West (2018) who utilizes conditional random assignment of officers to traffic accidents to study racial bias in traffic citations, Weisburst (2022) who uses 911 call data to assess the individual police officers' value added, and Hoekstra & Sloan (2022) who use 911 call data to examine race and police use of force.

This paper also contributes to the literature that studies the effects of police staffing and policies. Previous literature has focused on the size of police forces (Levitt, 1997; Chalfin & McCrary, 2013), the adoption of information technology (Garicano & Heaton, 2010), and the use of DNA databases (Doleac, 2017). This paper considers another aspect of police staffing by studying the effects of officers' gender. The focus on officers' gender is related to Lonsway et al. (2003) who use survey data to describe advantages of hiring women in law enforcement agencies. Using survey data does not allow the authors to establish causal inferences on the effects of gender and it has issues with sampling error. This paper deals with sampling issues and estimates causal effects of female officers by using calls for service data. Moreover, the focus on officers' gender in this paper is broadly related to the literature on police demographics. Previously, studies have related officer race to arrests (Donohue III & Levitt, 2001), search (Antonovics & Knight, 2009), and use of force (Fryer Jr, 2019;

Hoekstra & Sloan, 2022). The difference between this paper and that literature is that this paper considers the role of gender in interactions between police and victims while that literature mainly considers interactions between police and suspected offenders.

Furthermore, this paper contributes to the literature that studies the effects of female representation. The finding of an increased discovery of DV related physical abuse with female officer dispatched in this paper highlights the importance of female officers in the police force, a field traditionally dominated by male officers. As a result, this paper is related to studies on the effects of female representation. Previously, Chattopadhyay & Duflo (2004) point out that women leaders in local government invest more in the public goods that are more closely linked to women's concerns. Iyer et al. (2012) find that an increase in female representation in local government increases reports of crimes against women. Matsa & Miller (2011) show that female representation on corporate boards influences the gender composition of the top management in companies. Matsa & Miller (2013) and Miller (2018) focus on the effects of gender quotas for corporate board seats on corporate decisions and find that there are fewer workforce reductions in these corporations. I'm unaware of any studies that examine the effects of female representation in primary units for calls for service on discovering DV incidents.

The rest of the paper proceeds as follows. Section 2 discusses the research design. Section 3 presents empirical analysis. Section 4 concludes.

2 Data

To obtain the data needed in this paper, I sent Freedom of Information Act (FOIA) requests to police departments in the top twenty cities in terms of homicide rate in the US.[1] Homicide is one of the most serious violent crimes. Cities ranked in the top in terms of homicide rate are more likely to incur other violent crimes such as physical abuse. These physical abuse

[1]The ranking of the homicide rate of cities in the US comes from `https://en.wikipedia.org/wiki/List_of_United_States_cities_by_crime_rate`.

incidents are the focus of this paper. Moreover, cities with higher violent crime rates are more likely to maintain database to record crimes in order to analyze crime patterns and better serve the community.

For the dataset in this paper, I need to be able to observe and link the gender of the police officer to 911 calls. Among the twenty police departments with FOIA requests sent, only the Milwaukee Police Department and Chicago Police Department provided the calls for service data and officer characteristics data that can be linked together from 2017-2019. The other 18 police departments did not provide the data required for the analysis.[2]

The background information of the two cities is introduced below. Milwaukee is the largest city in the state of Wisconsin with a population of about 570,000. There are seven police districts in this city. Like other law enforcement agencies in the US, it uses the computer aided dispatch system to record the call information such as type of incident, officer assigned, and dispatch time, as well as information on officer availability. When a civilian calls 911, the first available telecommunicator takes the call. A telecommunicator's responsibility includes ascertaining incident information, establishing incident priority, and forwarding the incident for dispatch (National 911 Program, 2022). After the telecommunicator assigns the call to the appropriate district dispatcher, the dispatcher assigns available officers in the shift to the call based on call priority. I emailed officers in the police department and they confirmed that calls are dispatched based on priority. Chicago is the largest city in the state of Illinois and the third most populous city in the US. Its population is around 2.75 million. There are twenty-two police districts in the city. In this police department, call takers pick up 911 calls. Call takers gather information about the emergency and input it into the police computer aided dispatch system (Neusteter et al., 2019). According to the General Order G03-01-01 in the directive of the Chicago Police Department, the

[2]For the 18 police departments that did not provide the data required for the analysis, Indianapolis and Philadelphia Police Departments did not respond. Atlanta, Baltimore, Cleveland, Detroit, District of Columbia, Kansas City, Memphis, Mobile, New Orleans, Newark, Pittsburgh, and Tulsa Police Departments did not provide the calls for service data. Baton Rouge, Cincinnati, St. Louis, and Stockton Police Departments provided the calls for service data without information on officers dispatched to the call.

system automatically prioritizes each event, and then dispatchers assign available officers to the call based on call priority.

The empirical analysis uses calls for service data linked to officer characteristics data from the Milwaukee and Chicago Police Departments from 2017-2019. The calls for service data contains information on call created time and date, call dispatched time and date, original and final call type, officer dispatched, primary unit dispatched, and police district. The primary unit is generally the first unit to arrive on the scene. The time between call and dispatch represents call priority, since higher ranked calls are at the top of the dispatch queue. The officer characteristics data has information on officer race, gender, and date that the officer was first appointed at the police department. The linked calls for service data and officer characteristics data allow observation of dispatched officers and their characteristics for each of the call.

DV related physical abuse is any type of physical force against the intimate partner that causes injury or puts the person's health in danger (Office on Women's Health, 2021). Most police intervention of these incidents starts from emergency calls (HM Inspectorate of Constabulary, 2014). In the Milwaukee Police Department, there are nine call types that fall under DV related physical abuse. These calls have the suffix "DV" to differentiate themselves from others. For example, the police department records "battery cutting" and "battery cutting-DV" separately. Table 1a presents call types that belong to DV related physical abuse and their corresponding ones without the "DV" suffix. Observation of the data indicates that the final call type can be different from the original call type. About 50% of calls that are reclassified as DV related physical abuse come from call types related to physical abuse only. This implies that there are ambiguities in the original call type classification, as officers on the scene know more details about incidents than dispatchers who often have limited information. In the Chicago Police Department, the call type that falls under DV related physical abuse is domestic battery. The corresponding physical abuse incidents without DV elements are classified as battery related. Table 1b presents the call

type that belongs to DV related physical abuse and the corresponding ones without DV elements at the Chicago Police Department.

To study whether female officers are more likely to discover DV related physical abuse on the scene, the sample is restricted to call types related to physical abuse only as listed in the second column of Table 1a for the Milwaukee Police Department and the second column of Table 1b for the Chicago Police Department. For the Milwaukee Police Department, roughly 28% of the calls have one officer dispatched and roughly 71% of the calls have two officers dispatched in the primary unit in the sample. Characteristics of the officer with more years of experience in the primary unit are important, as less experienced officers often learn from more experienced ones. This echoes the accumulation of human capital with more knowledgeable coworkers (Herkenhoff et al., 2024). These officers with more years of experience in primary units are very familiar with the districts that they work at. Similar to Hoekstra & Sloan (2022), the analysis uses home district to proxy the district to which the officer responds to the most calls. To be more precise, it calculates the home districts for officers each month. By conducting a comparison of officers' home districts across months, results reveal that there is an 85% chance that these officers remain assigned to their home districts. This pattern corresponds to the community policing philosophy, which emphasizes long-term assignment of officers to specific areas in order to increase trust in police and improve community partnerships (U.S. Department of Justice, 2014). Column (1) of Table 2 presents summary statistics for incidents in the sample. These incidents receive speedy response. The time between call and dispatch is about 9 minutes on average. There is a 95% chance that the call is from the home district of the officer with more years of experience in the primary unit. About 21% of the primary units have female officers. Roughly 64% of the officers with more years of experience in primary units are white. On average, more experienced officers in primary units have worked for about 11 years. Column (2) of Table 2 presents summary statistics for incidents in the sample for the Chicago Police Department. The time between call and dispatch is about 5 minutes on average. There is a 97% chance

that the call is from the home district that the more experienced officer in the primary unit responds to the most calls. The probability that there exists a female officer in the primary unit is around 32%. About 42% of the officers with more years of experience in primary units are white. On average, more experienced officers in primary units have worked for roughly 11 years.

The way that the dispatch process works in calls for service leads to conditional random assignment. In both police departments, there is a telecommunicator or call taker who picks up a 911 call, and a dispatcher who assigns available officers to the call. Calls are dispatched based on priority. The dispatcher does not have direct contact with the caller and only has limited information from the telecommunicator or call taker, which rules out that the dispatcher has extra information on specific needs of the caller (Amaral et al., 2023). Moreover, calls in the sample from both police departments receive speedy response. The way that the dispatch process works implies that conditional on district and time fixed effects, the variation in whether there exists a female officer in the primary unit is as good as random. As a result, the regression controls for district-by-year fixed effects in the baseline regression, and district-by-year-by-week-by-shift fixed effects in the preferred specification.[3]

To assess the validity of the design, the paper directly examines the correlation between call characteristics and whether there exists a female officer in the primary unit. Specifically, the assessment separately regresses time between call entry and call dispatch, and whether the call is from the home district of the officer with more years of experience in the primary unit on the existence of a female officer in the primary unit with district-by-year fixed effects and district-by-year-by-week-by-shift fixed effects. Hoekstra & Sloan (2022) also use a similar approach to examine the correlation. Since calls with higher priority are at the top of the dispatch queue, the first assessment checks whether primary units with female officers are

[3]In district-by-year-by-week-by-shift fixed effects, shifts are defined as 8 am-4 pm, 4 pm-midnight, and midnight-8 am. Hoekstra & Sloan (2022) also define shifts in these three time periods.

dispatched to more or less urgent incidents using the following equation:

$$TimeBetween_{dct} = \alpha_0 + \alpha_1 I(\text{Female officer in primary unit})_{dct} + \theta_{dt} + \varepsilon_{dct}. \quad (1)$$

$TimeBetween_{dct}$ represents the time between call entry and call dispatch for the call c from district d in time period t. $I(\text{Female officer in primary unit})_{dct}$ is an indicator variable that takes on a value of one if there exists a female officer in the primary unit for the call. θ_{dt} contains district and time fixed effects. In the first column of the regression table, it represents the district-by-year fixed effects. In the second column of the regression table, it represents the district-by-year-by-week-by-shift fixed effects. The standard error is clustered at the officer with more years of experience in the primary unit for the call for service. Table 3 presents regression results. Results in panel a for Milwaukee and results in panel b for Chicago show little evidence of correlation between the time between call entry and call dispatch and the existence of a female officer in the primary unit. The lack of statistical significance of the coefficients is consistent with the identifying assumption in the paper. The second assessment checks whether primary units with female officers are dispatched to districts where officers with more years of experience respond to the most calls using the following equation:

$$HomeDist_{dct} = \alpha_0 + \alpha_1 I(\text{Female officer in primary unit})_{dct} + \theta_{dt} + \varepsilon_{dct}. \quad (2)$$

$HomeDist_{dct}$ represents whether the call comes from the home district of the officer with more years of experience in the primary unit. Table 4 presents regression results. Results in panel a for Milwaukee imply there is little evidence of correlation between whether the call comes from the home district of the more experienced officer in the primary unit and the existence of a female officer in the primary unit. Results in panel b for Chicago show that primary units with female officers are roughly 0.3 percentage points less likely to be dispatched to calls from the home district of the officer with more years of experience in

the primary unit. Given that 97% of the calls come from the home district of the officer with more years of experience in the primary unit, a deviation of 0.3 percentage points is negligible. The lack of statistical and economic significance of the coefficients in the table are consistent with the identifying assumption in the paper. Hoekstra & Sloan (2022) also have similar issues and use this argument to justify the identifying assumption.

3 Empirical Analysis

3.1 Regression Model

The empirical analysis uses the regression below to estimate the effect of having a female officer in the primary unit on the probability of discovering DV related physical abuse. As discussed in the previous section, the identifying assumption is that conditional on district and time fixed effects, the variation in whether there exists a female officer in the primary unit is as good as random. The regression model incorporates the identifying assumption in the following equation:

$$Discover_{dct} = \beta_0 + \beta_1 I(\text{Female officer in primary unit})_{dct} + \theta_{dt} + \gamma X_c + \varepsilon_{dct}. \quad (3)$$

$Discover_{dct}$ is a binary variable equal to one when call c from district d in time period t is classified into DV related physical abuse in the final call type. X_c includes call controls that contain the time between call and dispatch, whether the call is from the home district of the officer with more years of experience in the primary unit, race of the officer with more years of experience in the primary unit, as well as fixed effects for the day of the week, original call type, and maximum years of experience for officers in the primary unit. An officer's home district is proxied by the district to which the officer responds to the most calls in a month. The standard error is also clustered at the officer with more years of experience in the primary unit for the call for service.

3.2 Main Results

Table 5 reports the regression results. Column (1) shows regression results with district-by-year fixed effects. Column (2) shows regression results with district-by-year-by-week-by-shift fixed effects and all call controls except whether the call is from the home district of the officer with more years of experience in the primary unit. The reason for having this column is because of the small effect found when regressing whether the call is from the home district of the officer with more years of experience in the primary unit on the existence of a female officer in the primary unit for the Chicago Police Department in Section 2. Column (3) shows regression results with district-by-year-by-week-by-shift fixed effects and all call controls.

Results in panel a for Milwaukee show that there is a significant increase in the probability of discovering DV in physical abuse incidents when there exists a female officer in the primary unit across the specifications in the three columns, and the estimates remain similar. Results from the preferred specification in column (3) indicate that having a female officer in the primary unit increases the probability of discovering DV related physical abuse by about 0.3 percentage points. Given that 3% of the original call types are reported as DV related physical abuse in this city, having a female officer in the primary unit is 10% more likely to discover these incidents.

Results from the preferred specification in column (3) of panel b for Chicago imply that having a female officer in the primary unit enhances the probability of discovering DV related physical abuse by 0.4 percentage points. Given that approximately 3% of the calls for service are classified as domestic battery initially in this city, having a female officer in the primary unit scales up the likelihood of discovering these incidents by 13%.

For robustness check, the analysis conducts a logit regression. Due to concerns that the logit estimator can have convergence issues when there are many fixed effects in the regression (Chamberlain, 1980), the logit regression controls for district-by-year fixed effects. Table A1 reports the regression results in odds ratio. Results in panel a for Milwaukee and panel b

for Chicago also imply significant increases in the probability of discovering DV in physical abuse incidents when a female officer exists in the primary unit.

According to previous literature, two potential channels can contribute to the increased discovery of DV related physical abuse when there exists a female officer in the primary unit. First, female officers have greater empathy and better communication skills (Rabe-Hemp, 2008). They also express more concerns, patience, and understanding than male officers when dealing with violence against women (Homant & Kennedy, 1985; Lonsway et al., 2003). The care and patience by female officers can be related to finding out more DV related physical abuse on the scene. Second, most victims of DV are female. They find female officers more helpful and favorable in these incidents (Lonsway et al., 2003). This echoes the notion of female officers helping women (Miller & Segal, 2019) and the notion of female role modelling in positions of authority (Athey et al., 2000; Keiser et al., 2002; Meier & Nicholson-Crotty, 2006; Carrell et al., 2010). So victims can be more willing to disclose incident details to female officers. As a result, it is reasonable that female officers are more likely to discover DV related physical abuse when they are dispatched to calls that may have ambiguity.

3.3 Heterogeneity Analysis

This section considers two dimensions of heterogeneity. First, it considers the heterogeneity analysis of estimated effects by the timing of shifts. There is some evidence that people perform better during the day (Cho et al., 2020). Furthermore, Santhi et al. (2016) point out that there is more night-time impairment in cognitive performance in women than in men. These imply that there can be gender differences in levels of performance in different periods of the day. Therefore, the heterogeneity analysis fits separate models for incidents in the three eight-hour shift windows to observe the performance of primary units that contain a female officer in each shift. Card & Dahl (2011) also use a similar approach for analysis related to the timing.

Table 6 presents regression results. Results for Milwaukee in panel a show that having a female officer in the primary unit increases the probability of discovering DV related physical abuse by about 0.5 percentage points in the 8 am-4 pm shift and 0.4 percentage points in the 4 pm-midnight shift. Given that roughly 3% of the original call types are classified as DV related physical abuse in the two shifts in Milwaukee, having a female officer in the primary unit enhances the likelihood of discovering these incidents by about 17% in the 8 am-4 pm shift and about 13% in the 4 pm-midnight shift. These results imply that the significant increase in the probability of discovering DV related physical abuse when there is a female officer in the primary unit in the main result is largely contributed by those working in the 8 am-4 pm shift. Moreover, results for Chicago in panel b indicate that having a female officer in the primary unit enhances the probability of discovering DV related physical abuse by about 0.8 percentage points in the 8 am-4 pm shift. Given that approximately 2% of the original call types are classified as DV related physical abuse in this shift in Chicago, having a female officer in the primary unit increases the likelihood of discovering these incidents by about 40%. This result also shows that the significant increase in the probability of discovering DV related physical abuse in the presence of a female officer in the primary unit in the main result is mostly contributed by those working in the 8 am-4 pm shift.

Second, this section considers the heterogeneity of estimated effects of having a more or less experienced female officer in the primary unit on the probability of discovering DV related physical abuse. This is motivated by Ba et al. (2021) who find that more experienced officers are more effective at deterring violent crime. This implies that female officers with more years of experience can be more effective at discovering DV related physical abuse. Hence, this heterogeneity analysis explores whether having a female officer with a minimum of 10 years of experience or one with less than 10 years of experience in the primary unit contributes to the significant increase in the probability of discovering DV in physical abuse incidents. The cutoff for more or less experience is at 10 years, which approximates the average work experience for the more experienced officer in the primary unit in Table 2.

Table 7 shows regression results. Column (1) reports results when there exists a female or male officer with at least 10 years of experience in the primary unit. Column (2) reports results when there does not exist an officer with at least 10 years of experience in the primary unit. For simplicity, I drop incidents that have a female officer with at least 10 years of experience in the primary unit and a male officer with at least 10 years of experience in the primary unit. Results in panel a for Milwaukee show that for incidents that have a female or male officer with at least 10 years of experience in the primary unit, having a female officer increases the probability of discovering DV related physical abuse by about 0.6 percentage points. Given that around 3% of the original call types are classified as DV related physical abuse in this city, having a more experienced female officer in the primary unit enhances the likelihood of discovering these incidents by about 20%. Results in panel b for Chicago indicate that for incidents involving a female or male officer with at least 10 years of experience in the primary unit, the presence of a female officer enhances the probability of discovering DV related physical abuse by about 0.6 percentage points. Given that approximately 3% of the original call types are classified as DV related physical abuse in this city, having a more experienced female officer in the primary unit increases the likelihood of discovering these incidents by about 20%. Results from both cities imply that the significant rise in the probability of discovering DV related physical abuse in the presence of a female officer in the primary unit in the main result is mostly contributed by those with at least 10 years of experience.

4 Conclusion

This paper examines the effects of having a female officer in the primary unit on the discovery of DV in physical abuse incidents. It exploits the as-good-as-random variation in the existence of a female officer in the primary unit in calls for service dispatch at the Milwaukee and Chicago Police Departments. Results provide strong evidence that female officers

play an important role. Having a female officer in the primary unit scales up reports of DV in physical abuse incidents by 10% in the Milwaukee Police Department. Results from the Chicago Police Department also find positive effects. Estimates indicate that having a female officer in the primary unit scales up DV reports in physical abuse incidents by 13%. These results can be driven by empathy and concerns from female officers (Rabe-Hemp, 2008), as well as preferences for female officers from victims (Lonsway et al., 2003). Results from the heterogeneity analysis imply that the significant increase is mostly contributed by those working in the shift from 8 am-4 pm and those with at least 10 years of experience in both police departments.

Overall, findings in this paper indicate that female officers play a vital role in discovering DV in physical abuse incidents. These findings have policy implications. The majority of police officers are male. Females are often considered to be less capable at policing (Miller & Segal, 2019). But results in this paper imply that when male officers are the only ones dispatched in the primary unit, DV may not be discovered and can be under-reported. Therefore, it is important to have a female officer in the primary unit so that more DV incidents can be discovered and reported in physical abuse incidents. Results in this paper justify that female officers are an indispensable part in the police force.

References

Aizer, A. (2010). The gender wage gap and domestic violence. *American Economic Review*, *100*(4), 1847–1859.

Aizer, A., & Dal Bo, P. (2009). Love, hate and murder: Commitment devices in violent relationships. *Journal of Public Economics*, *93*(3-4), 412–428.

Amaral, S., Dahl, G. B., Endl-Geyer, V., Hener, T., & Rainer, H. (2023). Deterrence or backlash? arrests and the dynamics of domestic violence. *NBER Working Paper 30855*.

Antonovics, K., & Knight, B. G. (2009). A new look at racial profiling: Evidence from the boston police department. *The Review of Economics and Statistics*, *91*(1), 163–177.

Athey, S., Avery, C., & Zemsky, P. (2000). Mentoring and diversity. *American Economic Review*, *90*(4), 765–786.

Ba, B., Bayer, P., Rim, N., Rivera, R., & Sidibé, M. (2021). Police officer assignment and neighborhood crime. *NBER Working Paper 29243*.

Belknap, J. (2010). Rape: Too hard to report and too easy to discredit victims. *Violence Against Women*, *16*(12), 1335–1344.

Black, M. C. (2011). Intimate partner violence and adverse health consequences: implications for clinicians. *American Journal of Lifestyle Medicine*, *5*(5), 428–439.

Card, D., & Dahl, G. B. (2011). Family violence and football: The effect of unexpected emotional cues on violent behavior. *Quarterly Journal of Economics*, *126*(1), 103–143.

Carrell, S. E., Page, M. E., & West, J. E. (2010). Sex and science: How professor gender perpetuates the gender gap. *Quarterly Journal of Economics*, *125*(3), 1101–1144.

Casey, S. E., Gallagher, M. C., Makanda, B. R., Meyers, J. L., Vinas, M. C., & Austin, J. (2011). Care-seeking behavior by survivors of sexual assault in the democratic republic of the congo. *American Journal of Public Health*, *101*(6), 1054–1055.

Chalfin, A., & McCrary, J. (2013). The effect of police on crime: New evidence from us cities, 1960-2010. *NBER Working Paper 18815*.

Chamberlain, G. (1980). Analysis of covariance with qualitative data. *The Review of Economic Studies*, *47*(1), 225–238.

Chattopadhyay, R., & Duflo, E. (2004). Women as policy makers: Evidence from a randomized policy experiment in india. *Econometrica*, *72*(5), 1409–1443.

Cho, S.-S., Lee, D.-W., & Kang, M.-Y. (2020). The association between shift work and health-related productivity loss due to either sickness absence or reduced performance at work: a cross-sectional study of korea. *International Journal of Environmental Research and Public Health*, *17*(22), 8493.

Dee, T. S. (2003). Until death do you part: The effects of unilateral divorce on spousal homicides. *Economic Inquiry*, *41*(1), 163–182.

Devries, K., Watts, C., Yoshihama, M., Kiss, L., Schraiber, L. B., Deyessa, N., ... others (2011). Violence against women is strongly associated with suicide attempts: evidence from the who multi-country study on women's health and domestic violence against women. *Social Science & Medicine*, *73*(1), 79–86.

Dobash, R. E., & Dobash, R. (1979). *Violence against wives: A case against the patriarchy* (Vol. 15). Free Press New York.

Doleac, J. L. (2017). The effects of dna databases on crime. *American Economic Journal: Applied Economics*, *9*(1), 165–201.

Donohue III, J. J., & Levitt, S. D. (2001). The impact of race on policing and arrests. *The Journal of Law and Economics*, *44*(2), 367–394.

Dutton, M. A. (2000). *Empowering and healing the battered woman: A model for assessment and intervention*. Springer Publishing Company.

Fryer Jr, R. G. (2019). An empirical analysis of racial differences in police use of force. *Journal of Political Economy*, *127*(3), 1210–1261.

Garicano, L., & Heaton, P. (2010). Information technology, organization, and productivity in the public sector: Evidence from police departments. *Journal of Labor Economics*, *28*(1), 167–201.

Herkenhoff, K., Lise, J., Menzio, G., & Phillips, G. M. (2024). Production and learning in teams. *Econometrica*, *92*(2), 467–504.

Herman, J. L. (2015). *Trauma and recovery: The aftermath of violence–from domestic abuse to political terror*. Hachette UK.

HM Inspectorate of Constabulary. (2014). *Everyone's business: Improving the police response to domestic abuse*. Retrieved 07.05.2023, from `https://www.justiceinspectorates.gov.uk/hmicfrs/wp-content/uploads/2014/04/improving-the-police-response-to-domestic-abuse.pdf`

Hoekstra, M., & Sloan, C. (2022). Does race matter for police use of force? evidence from 911 calls. *American Economic Review*, *112*(3), 827–860.

Homant, R. J., & Kennedy, D. B. (1985). Police perceptions of spouse abuse: A comparison of male and female officers. *Journal of Criminal Justice*, *13*(1), 29–47.

Iyengar, R. (2009). Does the certainty of arrest reduce domestic violence? evidence from mandatory and recommended arrest laws. *Journal of Public Economics*, *93*(1-2), 85–98.

Iyer, L., Mani, A., Mishra, P., & Topalova, P. (2012). The power of political voice: women's political representation and crime in india. *American Economic Journal: Applied Economics*, *4*(4), 165–193.

Johnson, M. P. (2009). Differentiating among types of domestic violence: Implications for healthy marriages. In *Marriage and family: Perspectives and complexities* (pp. 281–298). Columbia University Press.

Keiser, L. R., Wilkins, V. M., Meier, K. J., & Holland, C. A. (2002). Lipstick and logarithms: Gender, institutional context, and representative bureaucracy. *American Political Science Review*, *96*(3), 553–564.

Kishor, S., & Johnson, K. (2005). Profiling domestic violence: a multi-country study. *Studies in Family Planning*, *36*(3), 259–261.

Levitt, S. D. (1997). Using electoral cycles in police hiring to estimate the effect of police on crime. *American Economic Review*, *87*(3), 270–290.

Lonsway, K., Moore, M., Harrington, P., Smeal, E., & Spillar, K. (2003). Hiring and retaining more women: The advantages to law enforcement agencies. *National Center for Women & Policing*.

Martin, S. E., & Jurik, N. C. (2006). *Doing justice, doing gender: Women in legal and criminal justice occupations*. Sage Publications.

Matsa, D. A., & Miller, A. R. (2011). Chipping away at the glass ceiling: Gender spillovers in corporate leadership. *American Economic Review*, *101*(3), 635–639.

Matsa, D. A., & Miller, A. R. (2013). A female style in corporate leadership? evidence from quotas. *American Economic Journal: Applied Economics*, *5*(3), 136–169.

Meier, K. J., & Nicholson-Crotty, J. (2006). Gender, representative bureaucracy, and law enforcement: The case of sexual assault. *Public Administration Review*, *66*(6), 850–860.

Miller, A. R. (2018). Women and leadership. *The Oxford Handbook of Women and the Economy*, 539–560.

Miller, A. R., & Segal, C. (2019). Do female officers improve law enforcement quality? effects on crime reporting and domestic violence. *The Review of Economic Studies*, *86*(5), 2220–2247.

National 911 Program. (2022). *Developing a public safety telecommunicator job description.* Retrieved 08.04.2023, from `https://www.911.gov/assets/N911-Program_BLS_Toolkit_Parts_1-4_08JUNE2022_Final.pdf`

Neusteter, S. R., Mapolski, M., Khogali, M., & O'Toole, M. (2019). The 911 call processing system: A review of the literature as it relates to policing. *Vera Institute of Justice*.

Office on Women's Health. (2021). *Physical abuse.* Retrieved 08.09.2023, from `https://www.womenshealth.gov/relationships-and-safety/other-types/physical-abuse`

Pollak, R. A. (2004). An intergenerational model of domestic violence. *Journal of Population Economics*, *17*, 311–329.

Rabe-Hemp, C. E. (2008). Female officers and the ethic of care: Does officer gender impact police behaviors? *Journal of Criminal Justice*, *36*(5), 426–434.

Rand, M. R., & Rennison, C. M. (2005). Bigger is not necessarily better: An analysis of violence against women estimates from the national crime victimization survey and the national violence against women survey. *Journal of Quantitative Criminology*, *21*, 267–291.

Reaves, B. A. (2017). *Police response to domestic violence, 2006-2015.* US Department of Justice, Office of Justice Programs, Bureau of Justice Statistics.

Sahay, A. (2021). *The silenced women: Can public activism stimulate reporting of violence against women?* The World Bank.

Santhi, N., Lazar, A. S., McCabe, P. J., Lo, J. C., Groeger, J. A., & Dijk, D.-J. (2016). Sex differences in the circadian regulation of sleep and waking cognition in humans. *Proceedings of the National Academy of Sciences*, *113*(19), E2730–E2739.

Sekhri, S., & Storeygard, A. (2014). Dowry deaths: Response to weather variability in india. *Journal of Development Economics*, *111*, 212–223.

Simpson, R., & Orosco, C. (2021). Re-assessing measurement error in police calls for service: Classifications of events by dispatchers and officers. *Plos one*, *16*(12), e0260365.

Stevenson, B., & Wolfers, J. (2006). Bargaining in the shadow of the law: Divorce laws and family distress. *Quarterly Journal of Economics*, *121*(1), 267–288.

Straus, M., Gelles, R., & Steinmetz, S. (1980). *Physical violence in a nationally representive sample of american families*. The Family in Change, International Library', Vasteras.

Tauchen, H. V., Witte, A. D., & Long, S. K. (1991). Domestic violence: A nonrandom affair. *International Economic Review*, 491–511.

U.S. Department of Justice. (2014). *Community policing defined.* Retrieved 09.04.2023, from `https://portal.cops.usdoj.gov/resourcecenter/RIC/Publications/cops-p157-pub.pdf`

van den Berg, G., & Tertilt, M. (2012). *Domestic Violence over the Business Cycle* (2012 Meeting Papers No. 1171). Society for Economic Dynamics.

Weisburst, E. K. (2022). "whose help is on the way?": The importance of individual police officers in law enforcement outcomes. *Journal of Human Resources*.

West, J. (2018). Racial bias in police investigations. *Retrieved from University of California, Santa Cruz website: https://people. ucsc. edu/jwest1/articles/West RacialBiasPolice. pdf*.

Wolf, M. E., Ly, U., Hobart, M. A., & Kernic, M. A. (2003). Barriers to seeking police help for intimate partner violence. *Journal of Family Violence*, *18*, 121–129.

Tables

Table 1: Call types for DV related physical abuse and physical abuse only

(a) Milwaukee

Call types for DV related physical abuse	Call types for physical abuse only
ABDUCTION-DV	ABDUCTION
BATTERY DV	BATTERY
BATTERY CUTTING-DV	BATTERY CUTTING
FIGHT-DV	FIGHT
HOSTAGE SIT-DV	HOSTAGE SITUATION
RECK USE OF W-DV	RECK USE OF WEAP
SHOTS FIRED-DV	SHOTS FIRED
SUBJ WITH GUN-DV	SUBJ WITH GUN
SUBJ W/WEAPON-DV	SUBJ WITH WEAPON

(b) Chicago

Call types for DV related physical abuse	Call types for physical abuse only
	BATTERY IP
	BATTERY JO
	BATTERY REPORT
DOMESTIC BATTERY	BATTERY VICTIM INJ.

Table 2: Summary statistics for calls in the sample

	Milwaukee	Chicago
Time between call and dispatch (in minutes)	9.450	5.023
	(26.658)	(13.013)
Call from home district of officer with more years of experience in primary unit	0.953	0.965
	(0.212)	(0.183)
Female officer in primary unit	0.214	0.316
	(0.410)	(0.465)
Black officer as officer with more years of experience in primary unit	0.173	0.196
	(0.378)	(0.397)
Hispanic officer as officer with more years of experience in primary unit	0.140	0.118
	(0.347)	(0.322)
White officer as officer with more years of experience in primary unit	0.642	0.422
	(0.479)	(0.494)
Max years of experience for the officer in primary unit	10.694	10.606
	(6.892)	(7.916)
Observations	102050	184189

This table reports the mean, standard deviation, and the number of observations for each variable. Officer home district is proxied by the district to which the officer responds to the most calls in a month. Standard deviations are in parentheses.

Table 3: Correlation between time between call entry and call dispatch and whether there exists a female officer in the primary unit

(a) Milwaukee

	(1)	(2)
Female officer in primary unit	0.508	0.322
	(0.415)	(0.414)
Observations	102050	102048
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average time between call and dispatch (in minutes)	9.450	9.450

(b) Chicago

	(1)	(2)
Female officer in primary unit	-0.132	-0.0456
	(0.0861)	(0.0836)
Observations	184189	184040
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average time between call and dispatch (in minutes)	5.023	5.023

This table reports the coefficient on *Female officer in primary unit* from separate regressions of time between call entry and call dispatch on a binary variable representing whether there exists a female officer in the primary unit dispatched. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

Table 4: Correlation between whether the call comes from the home district of the officer with more years of experience in the primary unit and whether there exists a female officer in the primary unit

(a) Milwaukee

	(1)	(2)
Female officer in primary unit	-0.00932	-0.00896
	(0.00831)	(0.00783)
Observations	102050	102048
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average probability of having a call from the home district of officer with more years of experience in primary unit	0.953	0.953

(b) Chicago

	(1)	(2)
Female officer in primary unit	-0.00324**	-0.00274*
	(0.00152)	(0.00150)
Observations	184189	184040
District-by-year FE	Yes	No
District-by-year-by-week-by-shift FE	No	Yes
Average probability of having a call from the home district of officer with more years of experience in primary unit	0.965	0.965

This table reports the coefficient on *Female officer in primary unit* from separate regressions of whether the call comes from the home district of the officer with more years of experience in the primary unit on a binary variable representing whether there exists a female officer in the primary unit dispatched. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

Table 5: The effect of having a female officer in the primary unit on discovering DV related physical abuse

(a) Milwaukee

	(1)	(2)	(3)
Female officer in primary unit	0.00401**	0.00310*	0.00323*
	(0.00174)	(0.00170)	(0.00165)
Observations	102050	102045	102045
District-by-year FE	Yes	No	No
District-by-year-by-week-by-shift FE	No	Yes	Yes
Call controls except whether the call is from the home district of the officer with more years of experience in the primary unit	No	Yes	No
Call controls	No	No	Yes
Probability of having DV related physical abuse as the original call types	0.0301	0.0301	0.0301

(b) Chicago

	(1)	(2)	(3)
Female officer in primary unit	0.00567***	0.00450***	0.00426***
	(0.00131)	(0.00134)	(0.00133)
Observations	184189	184040	184040
District-by-year FE	Yes	No	No
District-by-year-by-week-by-shift FE	No	Yes	Yes
Call controls except whether the call is from the home district of the officer with more years of experience in the primary unit	No	Yes	No
Call controls	No	No	Yes
Probability of having DV related physical abuse as the original call type	0.0280	0.0280	0.0280

This table shows the effect of having a female officer in the primary unit on discovering DV related physical abuse. Call controls contain time between call and dispatch, whether the call is from the home district of the officer with more years of experience in the primary unit, race of the officer with more years of experience in the primary unit, as well as fixed effects for the day of the week, original call type, and max years of experience for the officer in the primary unit. Officer home district is proxied by the district to which the officer responds to the most calls in a month. Standard errors are reported in parentheses and are clustered at the level of the officer in the primary unit with more years of experience.

Table 6: The effect of having a female officer in the primary unit in different shifts on discovering DV related physical abuse

(a) Milwaukee

	(1)	(2)	(3)
	midnight-8 am	8 am-4 pm	4 pm-midnight
Female officer in primary unit	-0.00124	0.00478*	0.00444*
	(0.00343)	(0.00286)	(0.00245)
Observations	23038	31774	47233
District-by-year-by-week-by-shift FE	Yes	Yes	Yes
Call controls	Yes	Yes	Yes
Probability of having DV related physical abuse as the original call types in different shifts	0.0318	0.0269	0.0320

(b) Chicago

	(1)	(2)	(3)
	midnight-8 am	8 am-4 pm	4 pm-midnight
Female officer in primary unit	0.00319	0.00811***	0.00199
	(0.00269)	(0.00248)	(0.00183)
Observations	46191	54075	83771
District-by-year-by-week-by-shift FE	Yes	Yes	Yes
Call controls	Yes	Yes	Yes
Probability of having DV related physical abuse as the original call types in different shifts	0.0344	0.0241	0.0281

This table shows the effect of having a female officer in the primary unit in different shifts on discovering DV related physical abuse. Estimates are based on the same model as column (3) of Table 5 (including district-by-year-by-week-by-shift fixed effects and all call controls). Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Table 7: The effect of having a female officer with a minimum of 10 years of experience or not in the primary unit on discovering DV related physical abuse

(a) Milwaukee

	(1) Officer $\geq$ 10 years of experience in primary unit	(2) No officer $\geq$ 10 years of experience in primary unit
Female officer in primary unit	0.00612**	-0.00105
	(0.00286)	(0.00224)
Observations	50718	47497
District-by-year-by-week-by-shift FE	Yes	Yes
Call controls	Yes	Yes

(b) Chicago

	(1) Officer $\geq$ 10 years of experience in primary unit	(2) No officer $\geq$ 10 years of experience in primary unit
Female officer in primary unit	0.00642***	0.00263
	(0.00206)	(0.00192)
Observations	88731	89780
District-by-year-by-week-by-shift FE	Yes	Yes
Call controls	Yes	Yes

This table shows the effect of having a female officer with more and fewer years of experience in the primary unit on discovering DV related physical abuse. Estimates are based on the same model as column (3) of Table 5 (including district-by-year-by-week-by-shift fixed effects and all call controls). Incidents that have a female officer with $\geq$ 10 years of experiences in primary unit and a male officer with $\geq$ 10 years of experience in primary unit at the same time are dropped. These incidents constitute about 3.5% in the sample for the Milwaukee Police Department and 2.4% in the sample for the Chicago Police Department. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.

Appendix

Table A1: The effect of having a female officer in the primary unit on discovering DV related physical abuse using logit regression

(a) Milwaukee

	(1)
Female officer in primary unit	1.105**
	(0.0468)
Observations	102050
District-by-year FE	Yes
District-by-year-by-week-by-shift FE	No
Call controls	No

(b) Chicago

	(1)
Female officer in primary unit	1.111***
	(0.0265)
Observations	184189
District-by-year FE	Yes
District-by-year-by-week-by-shift FE	No
Call controls	No

This table shows the effect of having a female officer in the primary unit on discovering DV related physical abuse using logit regression. Results are odds ratios. Standard errors are reported in parentheses and are clustered at the level of the dispatched officer in the primary unit with more years of experience.