

Mapping femicide: using GIS and hotspot analysis to study the murder of female intimate partners

by

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## **Abstract**

Intimate partner violence is a global phenomenon that affects individuals every day, with the most extreme cases leading to femicide. Both intimate partner violence and femicide have been studied previously, but rarely have either been studied through a spatial analysis lens. Crime mapping is an effective addition to research that can allow for better visual and spatial research. Using Women Count U.S.A. Data, a media-based collection of femicide cases, and ArcGIS Online to map all femicide cases collected for 2018, this study explores how femicide occurrences coincide with the availability of domestic violence services and firearm ownership. This analysis finds that state-level firearm ownership may not influence femicide rates, while domestic violence service availability developed mixed results. At the city level, the availability of domestic violence services seems to aid in decreasing the femicide rate, while evidence is weak at the broader state level. Examining how domestic violence services impact the femicide rate could be utilized by social services and law enforcement to better allocate resources based on this spatial relationship, and further studies on femicide mapping may provide visual aspects to understand whether state policies are effective in decreasing violent crime.

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## **Chapter 1 - Introduction**

In 2023, approximately 51,100 women and girls were victims of murder at the hands of an intimate partner or a family member throughout the world, which is equivalent to approximately 140 women and girls each day, one being killed every 10 minutes (Gibbons, 2024). When a female dies at the hands of her male intimate partner, it is referred to as femicide, feminicide, intimate partner homicide, or female homicide, depending on the specific context of the event (Campbell et al., 2007; Fitz-Gibbon & Walklate, 2023; Sinauer et al., 1999). Femicide in this study focuses specifically on the killing of a female by a male intimate partner (Fitz-Gibbon & Walklate, 2023). While femicide has become a prominent social issue in many countries, including the United States (Gibbons, 2024), it is difficult to ascertain the prevalence as these murders are often grouped into general homicide statistics from police departments and other governmental institutions (Brodie, 2024). Crime mapping, a common tool used in homicide research, is underutilized in femicide cases (Wang et al., 2012). This study will incorporate crime mapping for femicide cases only, highlighting the importance and value to academics, social services, first responders, and the public.

Crime mapping has been a valuable addition within homicide research, but it is uncharted territory when separately focusing on femicide. Mapping allows researchers to examine hot and cool spots located throughout rural areas, metropolitan areas, states, and entire countries (Santos, 2005). Hot spots are locations where higher crime rates occur compared to the average number within that specific level of analysis (e.g., a single block, neighborhoods, rural areas, or even a whole city) (Eck et al., 2005), whereas cool spots indicate a low occurrence of crimes. Police departments and social service agencies utilize hot spot analysis to better allocate their resources (Santos, 2005). Analysis of crime hot spots is another way to visualize social phenomena, which

many theories have attempted to explain, including critical feminist perspectives, social disorganization theory, and routine activities theory.

This quantitative study will help bridge the gap between research and practical responses to violence against women by mapping femicide cases within the United States. Reliable and accurate criminal statistics are very difficult to obtain, which is why individuals outside of law enforcement and traditional academia are utilizing novel ways to capture the occurrence of all social problems, including femicide. As the methods of collecting data have changed over time, news outlets, podcasts, books, and personal submissions are emerging ways of collecting data, specifically in media-based form. Using media-based data collection to develop crime maps can enhance police agency data. The purpose of the current project is to use spatial analysis to provide social services and law enforcement agencies with data in a map form to help visualize hot spots, while also creating maps of domestic violence services and firearm availability to better understand how these correspond to femicide cases. This analysis may provide a foundation to argue for the reallocation of services to decrease the number of femicides. This research is informed by social disorganization theory to better explain the usage of crime maps and their benefits, critical feminist theory to understand how both IPV can escalate to femicide through power and control struggles, and routine activities theory to understand how the escalation to femicide occurs in specific situations and what is needed for this to happen. To better understand crime mapping, femicide, and the theories used to inform this research and what benefits they have to offer, it is essential to review the existing body of literature.

## **Chapter 2 - Literature Review**

Femicide research is best understood within the broader context of intimate partner violence (IPV) as IPV is one of the most common risk factors of femicide (Jiang et al., 2018). The consequences of IPV must be examined first before understanding the most detrimental of these outcomes: death by an intimate partner. Femicide estimates will be explored to provide an overview of how data collected at the federal level differ. The history of crime mapping is useful in exploring how practices have developed over time. Domestic violence service availability and firearm availability will also be explored. Each one of these areas will aid in creating a foundation for the current study as femicide and crime mapping have not been explored together prior.

### **IPV Victims and Perpetrators**

The number of women experiencing intimate partner violence each year in the United States alone is astounding. According to the National Intimate Partner and Sexual Violence Survey (2022), approximately every 2 in 5 women report experiencing at least one instance of physical violence by their intimate partner, which translates into 52 million women being physically victimized within the United States in their lifetime (Leemis et al., 2022). National Death Report data indicate that, from 2018-2021, 49.3% of femicide victims were non-Hispanic White, 29.9% were non-Hispanic Black or African American, and 14.8% were Hispanic or Latino (Rowh & Jack, 2024). IPV victims tend to be young: more than 70% of females reported their first victimization had occurred before the age of 25 (Leemis et al., 2022). In one nationally representative adult sample, male perpetrators' average age was approximately 42.6 years (Rowh & Jack, 2024). Having a lower income was also significantly associated with IPV victimization (Napier et al., 2021; Vest et al., 2002) and perpetration (Rowh & Jack, 2024; Singh et al., 2014).

Victims who had previously been divorced, widowed, or single had an increased likelihood of IPV compared to those who were currently married (Vest et al., 2002). Mothers with multiple children were also reported to experience higher levels of IPV victimization (Nash et al., 2022). Considering these demographic trends is essential, especially when considering the broader impacts of IPV victimization on a person's life.

### **Effects of IPV Victimization**

IPV causes injuries that can impact survivors for a few days, months, or even their whole lives. Women who are impacted by IPV experience psychological impacts (Joseph et al., 2024; Karakurt et al., 2014; Lutgendorf, 2019; Machorrinho et al., 2023; McCollum et al., 2024; O'Connor & Nepomnyaschy, 2019; Steele-Baser et al., 2024; White et al., 2023), interpersonal issues (Bosch et al., 2015; O'Connor & Nepomnyaschy, 2019; Sigurvinsdottir et al., 2016; Temple et al., 2024; Woerner & Sullivan, 2019), and physical injuries (Berishaj et al., 2024; Bosch et al., 2015; Brown et al., 2024; Coker et al., 2021; Karakurt et al., 2014; Lutgendorf, 2019; Machorrinho et al., 2023). Understanding the impacts of IPV is a foundational element for femicide research, as an intimate relationship between a female victim and a male perpetrator is a significant predictor of femicide.

Many studies have focused on the mental health consequences for survivors, with stress, sadness (Karakurt et al., 2014), depression (Joseph et al., 2024; Lutgendorf, 2019; Machorrinho et al., 2023; O'Connor & Nepomnyaschy, 2019; Steele-Baser et al., 2024), suicidality, PTSD, and traumatic brain injuries (Lutgendorf, 2019) being the most common ones. A systematic review and meta-analysis on the mental health effects of survivors globally found that IPV victims were 5.52 times more likely to experience suicidal ideation and 2.19 times more likely to experience depression than individuals who had never been victims of IPV (White et al., 2023).

Machorrinho and colleagues (2023) found that IPV survivors exhibited high rates of bodily dissociation and a weaker sense of body ownership, meaning they are less likely to engage in bodily self-care and healthy behavior.

Physical injuries can occur directly as a result of an act of violence, or they can present themselves later. The most reported injuries were related to soft tissues, swelling, bruising, lacerations, and abrasions (Berishaj et al., 2024; Brown et al., 2024). Fractures and burns were less likely to be reported but still occur due to IPV (Brown et al., 2024). Survivors also report sleep issues, headaches/migraines, insomnia, pelvic pain, sexual dysfunction, smoking problems, respiratory issues, and irritable bowel symptoms as common occurrences following IPV (Karakurt et al., 2014; Lutgendorf, 2019; Machorrinho et al., 2023). Over time, survivors of IPV have been found more likely to be overweight, current smokers, binge drinkers (Bosch et al., 2015), or heavy drinkers (Coker et al., 2021). Some people are at greater risk of IPV-related injuries: survivors who have a disability were more likely to report experiencing anoxic and hypoxic symptoms and injuries than those without a disability (Berishaj et al., 2024). Survivors' injury location differed, but the most common ones included the arms, neck, torso, legs, head, and face (Berishaj et al., 2024; Brown et al., 2024). IPV victimization often leads to life-changing injuries, with the most detrimental being death.

### **Femicide Prevalence**

The prevalence of femicide within the United States is widely debated due to contradicting statistics and many databases grouping femicide with larger homicide statistics. For example, the National Violent Death Reporting System, maintained by the Centers for Disease Control and Prevention, includes data collected from death certificates, coroner/medical examiner reports, and law enforcement reports. Focusing upon 2018 data, which will be utilized

in the current study, the NVDRS states that approximately 958 women were murdered by a spouse or other intimate partner (Centers for Disease Control & Prevention, 2018).

The FBI provides its statistics through the Supplementary Homicide Report, which is compiled annually by the FBI and released to the public with the help of the National Center for Juvenile Justice. This report found that in 2018, 1,014 women were murdered by a husband or an intimate acquaintance. Approximately 28 women were shot and killed by their husbands or an intimate acquaintance during an argument (Violence Policy Center, 2020). The FBI is also the lead agency for the Uniform Crime Report (UCR). This report also relies on data from participating law enforcement agencies which do not have separate categories for homicide and femicide.

The National Incident-Based Reporting System (NIBRS) is maintained by the FBI and the Bureau of Justice Statistics (BJS). This system takes data from all the crimes recorded by state and local agencies, if they choose to participate. The BJS did not start focusing on female victims killed by an intimate partner until 2021. According to these data, out of the 4,970 female victims of murder and nonnegligent manslaughter, 34% were killed by an intimate partner (Smith, 2022). The BJS also conducts the National Crime Victimization Survey (NCVS), but homicide is not included within this research since it is based on victimization surveys.

### **Femicide in Context**

The biggest risk factor of femicide is IPV. One study found that 6 in every 10 victims experienced IPV before their murder (Jiang et al., 2018). Over a quarter of the victims were in an argument with their murderer, which preceded the victim's death. Approximately 18% of these femicide cases were due to jealousy. Campbell (2009) found that between 67-75% of intimate partner homicides occur after IPV occurs. Additional risk factors include forced sex, threats to

children, stalking, accessibility, and ownership of guns (Campbell et al., 2009; Glass et al., 2008). Risk factors are important in finding vulnerable populations. If we can locate the vulnerable populations early, like with IPV, then hopefully the number of victims will decrease.

Victims of femicide were often younger than their perpetrator (Garcia-Vergara et al., 2022), with the highest femicide rates among those aged 25–29 years (Azziz-Baumgartner et al., 2010). The mean age for perpetrators is 34.9 years old, and the most frequent age group was 20–29 years (Quispe et al., 2023). Using the IPV mortality data set developed by the Injury Surveillance Program at the Massachusetts Department of Public Health, approximately 36% of femicides were committed by the victim’s current boyfriend, 36% of them were by their husband, 14% were by an ex-boyfriend, 9% was by an ex-husband, and 2% were by the father of the victim’s children (Azziz-Baumgartner et al., 2010). Women between the ages of 18–20 were more likely to be killed by an ex-partner than a current one (Glass et al., 2008). Seventy-two percent of femicide victims were white, 17% were Black, 15% were Hispanic, 2% were Asian, and 1% were Native American (Azziz-Baumgartner et al., 2010). Perpetrators were disproportionately members of an ethnic minority group (Campbell et al., 2009). Children may also perish in these femicide cases, as 324 were killed during a femicide event and an additional 253 were present when the murder occurred, but were not killed from 2003–2017 (Lyons et al., 2021). If a perpetrator has a history of suicidal behavior, prior rape of an intimate partner, presence of a non-biological child of the perpetrator living in the home, and job stressors, the odds of a child being killed in a femicide case increased (Logan et al., 2013). The most frequent femicide cases were firearm murders (Azziz-Baumgartner et al., 2010; Messing et al., 2021; Violence Policy Center, 2020). Information from the FBI’s Supplementary Homicide Report shows that approximately 56% of femicides were committed with firearms, 19% with knives and

other cutting instruments, 10% bodily force, and 6% by a blunt object. 69% of all firearm femicides involved handguns (Violence Policy Center, 2020). As such, femicides are often perpetrated with firearms, and it is important to understand the impact that firearm ownership and domestic violence services have on these cases.

### **Firearm Availability**

Firearms are the most used weapon in femicide cases (Sinauer et al., 1999; Sorenson, 2017; Violence Policy Center, 2020). Their availability is highly debated in terms of whether restrictions, like preventing IPV perpetrators from owning a firearm, will decrease overall violence rates. To understand whether or not gun availability impacts femicide rates, the prevalence of gun violence in both femicide and IPV cases must be explored. Females are more likely to be murdered by their intimate partner with a firearm than knives and other cutting objects, bodily force, or blunt object combined (Violence Policy Center, 2020). A study done using the North Carolina State Medical Examiner System (1999) found that the types of guns used varied depending on rural and urban areas. In rural areas, long guns were more than likely to be used, while handguns were common in intermediate and urban counties. They also found that white victims living in intermediate counties were more likely to die from firearm injuries than those living in urban or rural counties. This could be attributed to economic and cultural differences that make gun ownership more common (Sinauer et al., 1999). Another study (2017) used data that was compiled from forms police were mandated to fill out when on scene at all IPV incidents in Philadelphia throughout 2013. These results concluded that a gun or multiple guns were present at two-thirds of all gun-involved incidents. Guns were most common when the offender was male, had a history of substance abuse, was on probation, when the victim was non-Hispanic Black or Hispanic, the relationship had ended, witnesses were present, and there

was a history of IPV. They were less common if a restraining order had been issued. Officers were likely to provide the same amount of information on resources to the victim, whether a weapon was present or not (Sorenson, 2017). Through research, the majority of femicide cases involve a firearm, which makes the discussion of firearm availability and restrictions of extreme importance.

Gun violence in both femicide and IPV cases is very common, which shows that the availability to obtain a firearm may cause increases in both types of cases. Two studies found that legal availability to obtain a firearm does increase femicide rates (Gollub & Gardner, 2018; Stansfield et al., 2021). A study released in 2021 used licensed firearm dealers' data from the Bureau of Alcohol, Tobacco, Firearms, and Explosives to determine whether the legal availability of determining a firearm had an influence on femicide rates (Stansfield et al., 2021). This research determined that the legal availability of firearms is positively associated with intimate partner homicides, especially in states that had lower-than-average gun ownership. This shows that many perpetrators may have bought a gun through legal means primarily for it to be used against their intimate partner. Using the National Violent Death Reporting System (NVDRS), another study (2018) found that in areas with lower firearm provisions, female intimate partner homicides that involved a gun were more likely than non-firearm homicides in places that had fewer firearm restrictions. The evidence supported the idea that the availability of firearms is extremely important to femicide rates, especially because other means of homicide in these low-restriction areas were low as well (Gollub & Gardner, 2018). Particular firearm restrictions may require more evidence to understand whether they can help to decrease femicide rates. A study (2020) conducted on 15 nations, including the United States, found conflicting results on the banning of guns for perpetrators of domestic violence. The United States restricts

perpetrators who have a current domestic violence restraining order on them and anyone who has been convicted of domestic violence from purchasing or owning a firearm. Within this analysis, Turkey was the only other nation that had laws specifically restricting domestic violence perpetrators from owning a firearm. Both the United States and Turkey were two of the nations where firearms were most frequently used, as well as Portugal and Antalya (Zeoli et al., 2020). This is an example of why more research must be conducted on specific restrictions and whether overall gun restrictions are more effective in decreasing femicide rates.

### **Domestic Violence Services**

Domestic violence service geographical availability and its effect on both domestic violence and femicide rates provide mixed results. To better examine these mixed results, this section must be broken down into two categories: availability of resources and utilization of resources. Starting with the availability of resources, it is known that rural areas house fewer domestic violence services and shelters (Hetling & Zhang, 2010; Peek-Asa et al., 2011; Sinauer et al., 1999; Toohy et al., 2023). Living in rural areas poses a threat to the increase in severity from IPV to femicide because they cover more counties at a time, have fewer places to house victims, and have a lower total capacity for shelter (Peek-Asa et al., 2011). This limits the already limited access to services due to living in rural areas. A survey of 1,478 women focused on the prevalence of IPV within their lives in the past year. Prevalence, frequency, and severity of IPV were all higher among women living in rural areas, which could equate to the lack of services (Peek-Asa et al., 2011). Service access requires extensive travel in rural locations. Urban area women, on average, had to drive approximately less than 10 miles to reach the closest domestic violence service, while rural victims had to drive on average more than 25 miles to access one (Peek-Asa et al., 2011). The increased amount of travel needed to access services

further exacerbates the risks posed to rural women, but it is not the only risk. The physical isolation and lack of economic opportunity are also factors that could increase the rate of femicide in rural areas (Madkour et al., 2010; Peek-Asa et al., 2011; Sinauer et al., 1999; Toohy et al., 2023). A study using the North Carolina State Medical Examiner system (1999) found that rural counties. While these studies show that rural areas suffer higher rates of intimate partner violence and femicide rates, results become mixed when exploring exactly whether domestic violence services within a city affect both IPV and femicide rates.

Some research has found that having domestic violence services within a city or town limits increases or does not influence IPV and femicide rates (Hetling & Zhang, 2010; Madkour et al., 2010; Montanez et al., 2023). Montanez's study (2023) conducted on 67 counties in Florida found that while the presence of a domestic violence shelter was not associated with femicide rates, community-coordinated response efforts did help lower femicide rates by developing a victim-oriented response. Community coordinated response efforts usually help to connect high-risk victims with local domestic violence shelters. There is also research on the fact that having a domestic violence service within a town increases IPV (Montanez et al., 2023). This could be because more resources are available to victims to be able to report these assaults occurring compared to cities without services, since IPV is very underreported.

Alternatively, there is evidence that domestic violence services decrease IPV and femicide rates (Dugan et al., 2003; Koppa, 2023; Toohy et al., 2023; Wells et al., 2010). Toohy's (2023) research found that having a rape or sexual assault service within a county increased femicide, while having a domestic violence-specific service decreased the femicide rate by a factor of .45, meaning having a domestic violence-specific service decreases the femicide rate by 45%. They concluded that rurality was the most significant variable to explain femicide rates due

to the lack of domestic violence-specific services in rural areas. With each one-unit increase in the county's population living in a rural area, femicide rates increased by a factor of 6.75 (Toohy et al., 2023). The Lethality Assessment Program (LAP) has also been found to have a positive impact on preventing femicide when committed by boyfriends (Koppa, 2023). The LAP program is introduced into police intervention to help law enforcement officers determine whether or not a victim is considered high-risk. If they are considered high-risk, they are connected to the local domestic hotline, and a safety plan is created. A safety plan may include visiting a local domestic violence shelter or participating in domestic violence services. As it is made evident, domestic violence services' availability poses some mixed results, but it is evident that rural areas, which usually house fewer domestic violence services, have higher rates of femicide compared to urban areas. The argument that many hold is that the availability does not necessarily equate to the usage of these services, which leads to the next section: utilization.

Certain factors lead a victim to be more likely to seek help and utilize domestic violence shelters. These factors include when the violence is more severe (Cho et al., 2020; Puente-Martínez et al., 2025), the victims have children (Puente-Martínez et al., 2025), the victims have low income, and they are experiencing more mental health issues (Ford-Gilboe et al., 2015). The utilization of services has been found to have an important impact on the likelihood of future violence as it is a protective factor against re-victimization (Casteel & Sadowski, 2010; Eckhardt et al., 2013; Goodman-Williams et al., 2023; Parker et al., 2014; Puente-Martínez et al., 2023; Wells et al., 2010). Several studies explore the effectiveness of different types of services available at domestic violence centers for the victim specifically and whether they help to reduce IPV and femicide rates. One systematic review (2009) focused on several different interventions that may be available at domestic violence centers and whether they were helpful to victims and

the overall rates. Advocacy was found to be more effective at reducing threats and rates of physical violence within two months, and effective for 24 months at improving the quality of life for women living in shelters. Cognitive trauma therapy was found to be effective in reducing PTSD and depression symptoms. Cognitive behavioral counseling was found to be effective at decreasing all types of partner violence. Shelters were more effective in reducing violence. Career counseling and safety planning were found to be effective in building techniques that helped victims reduce their exposure to violence and improve their quality of life overall (Casteel & Sadowski, 2010; Eckhardt et al., 2013; Parker et al., 2014). Domestic violence housing has also been found effective in improving rates and safety and mental health for victims (Goodman-Williams et al., 2023). Overall, many services are helpful to the victim personally, which in turn could equate to rates of IPV and femicide within an area. The relationship between domestic violence service availability and the femicide rate may be difficult to ascertain, meaning it may be more helpful to study future victimization of IPV victims by researching each on a case study basis.

Overall, there are mixed results on the relationship between domestic violence service geographical availability and its effect on both domestic violence and femicide rates. The location of domestic violence services is important, but so are the services available at these locations. Shelters and services may have some limitations when it comes to availability, finances, education to provide the best care, language barriers, and the lack of a relationship with other local and legal systems. Through research, most of the time, rural shelters usually experience the most limitations compared to urban areas, where multiple domestic violence shelters may exist. To better visualize how rural and urban areas differ in service availability, crime mapping may be used.

## **Crime Mapping**

Before crime mapping can be utilized, the history of this visual analysis must be explored to provide a better context for how crime mapping can be helpful in the majority of crimes.

Crime mapping originated in the 1800s, when European researchers began exploring the relationship between geographic regions, sociological factors, and various crimes. From 1825-1827, researchers such as Andre-Michel Guerry and Adolphe Quetelet found that areas with high levels of property crimes had a low incidence of person crimes. Higher numbers of educated people lived in areas with more property crime (Santos, 2023). In Europe, maps were also developed to find correlations between crime, transportation routes, educational levels, and cultural differences. These maps are significant as they were the first examples of crime mapping in Europe. They set in motion the ability to visualize correlations that could not be visualized or understood previously.

Spatial analysis and crime mapping began in the United States in the 1920s and 1930s by urban sociologists located in Chicago (Kindynis, 2014; Santos, 2023). These sociologists, including Clifford Shaw and Henry McKay, were focused on linking crime and delinquency to social disorganization and poverty in Chicago. These maps became one of the most popular examples of crime mapping in the first half of the 20th century. Crime mapping was a vital piece for Shaw and McKay's concentric zone model. This model was tested within Chicago, finding that gangs and crimes were more prevalent in parts of the city that they considered zones in transition, where social control was weak and social disorganization was high. Through crime mapping and spatial analysis, they believed that it was not specifically the individual, but rather their location and surroundings that influenced crime rates.

The 1960s brought large computer systems and new methods of conducting spatial analysis in relation to crime (Santos, 2023). Due to these advancements in technology, researchers in England, Canada, and the United States began working on spatial analysis in the 1960s that focused on the crime itself and its context. Wilkins and colleagues were focused on the physical and social environments around the location where the crime occurred to understand what created the opportunities for these crimes (Santos, 2023). They found that crime was not randomly distributed; instead, it would cluster in areas where poverty levels, population density, and social disorganization were the highest. Starting in the early to mid-1990s, computer technology became even more advanced. Geographic Information System (GIS) software became available for desktop computers, dispatch centers switched mostly to online systems to track crimes, and the U.S. federal government began to advocate for crime mapping (Kindynis, 2014; Santos, 2023). Al Gore headed a government initiative that provided funding to police agencies to obtain crime mapping technology and create programs to assist agencies in implementing this new technology. In 1997, the Crime Mapping Research Center (later renamed Mapping and Analysis for Public Safety) was created within the Department of Justice's National Institute of Justice. Annual conferences are held to discuss new research and techniques. The National Institute of Justice funded the Crime Mapping and Analysis Program (CMAP) from 1998-2007 to provide different levels of training to police agencies using crime mapping and GIS (Santos, 2023). The history of crime mapping matters extensively when working within this field because we must understand how crime mapping started and how far advancements have brought researchers over time. Studying the history of crime mapping also provides us with the foundational theories associated with mapping and spatial analysis, including social disorganization theory.

## **Aim of the Study**

This study aims to provide and analyze crime maps for femicide cases around the United States. Analyzing these crime maps will require identifying femicide hot spots at the city, county, state, and regional levels and determining possible crime patterns. This spatial analysis can, in turn, help state social services better allocate resources in cities or rural areas where hot spots are located, while comparing them to cities that are considered cool spots. Law enforcement agencies can also benefit from crime mapping by comparing local femicide rates to other cities, states, or regions. Law enforcement agencies may not always communicate well, so seeing local femicide rates in their city and neighboring cities can provide an opportunity for departments to communicate better to help decrease femicide rates. This study also aims to study how domestic violence services and firearm availability within a city could impact the rate of femicide in rural and urban areas by overlapping the maps with 2018 femicide cases to better visualize whether an impact could be possible. By examining the availability of services and firearms on femicide rates, resources can also be allocated in ways that could prove more helpful in lowering femicide rates.

## **Chapter 3 - Theory**

Many theories have been used to explain femicide and mapping, but rarely have they been studied simultaneously. Due to this, different theories used for femicide, and mapping must be explored separately. Critical feminist perspectives provide a framework for understanding the power relationships present in femicide cases. Social disorganization theory and routine activities theory will then be used to conceptualize femicide and explore spatial analysis. Routine activities theory will be used to create a framework for developing the relationship between femicide rates, firearm availability, and domestic violence services.

### **Critical Feminist Theories**

Critical feminist theories have been used extensively in femicide research to explore how struggles for power and control within a relationship lead to the escalation of violence. These critical perspectives explore how patriarchal systems, gender inequalities, and discrimination can be used to explain the phenomena of femicide and attempt to lead to transformations in cultural structures and social institutions to decrease femicide rates (Braithwaite & Schrod, 2015). According to critical feminist perspectives, patriarchal societies create a foundation in which women and minorities are subordinate to men. Men are in positions of power at disproportionate rates compared to women, which contributes to the idea of men being superior to women (Braithwaite & Schrod, 2015; Caetano et al., 2008; Corradi et al., 2016; Garcia-Vergara et al., 2022). These beliefs may have a foundation built in a patriarchal system in which they do not want to lose their power. To transform these perceptions, critical feminist theories must develop ways to completely change the social structures in place. Critical feminist theories are only one approach used in understand femicide; social disorganization theory has also been studied to explore this phenomenon.

## **Social Disorganization Theory**

Social disorganization theory was first developed through the Chicago School by Park and Burgess to explain how urbanization, industrialization, and immigration affect social organization in Chicago. This theory was not connected to crime until 1942, but Shaw and McKay, who researched Chicago neighborhoods, specifically examined juvenile delinquents and the concentration of crimes around the city. Their analysis suggested that poverty, residential mobility, and racial/ethnic heterogeneity were positively correlated with how disorganized a community was (Kurbin, 2009; Shaw & McKay, 1942). These factors did not directly cause crime, but rather indirectly decreased the organization of the community, which reduced informal social control and in turn, increased crime rates. Social disorganization theory has been expanded to explore several crimes, including IPV and femicide. Research on social disorganization theory and IPV is more extensive than femicide; both are extremely important in understanding how social disorganization theory could be used to explain violence against women (Goodson & Bouffard, 2017; McDowell & Reinhard, 2022; Pinchevsky & Wright, 2012; Treves-Kagan et al., 2022).

All types of assault, including IPV, are positively correlated with ethnic heterogeneity (Goodson & Bouffard, 2017) and concentrated disadvantage (Goodson & Bouffard, 2017; McDowell & Reinhard, 2022). Residential instability significantly predicts both stranger assault and IPV (Goodson & Bouffard, 2017). Social disorganization has been found to strongly correlate with all forms of IPV, including emotional, physical, and sexual, compared to neighborhoods that are organized (Pinchevsky & Wright, 2012; Treves-Kagan et al., 2022). In contrast, more community cohesion has been found to protect against IPV (Treves-Kagan et al.,

2022). The correlation between social disorganization theory and IPV is quite strong, but connecting this theory to femicide provides mixed empirical evidence.

Social disorganization theory has been utilized in research involving spatial analysis for many decades, and empirical evidence is still mixed. The abundance of spatial analysis research finds partial support for social disorganization theory. Social disorganization theory has been used to research many crimes including (but not limited to) IPV (Kothari et al., 2022; McDowell & Reinhard, 2022; Muluneh et al., 2022), homicide (Kawachi et al., 1999; Nivette & Peres, 2022; Thompson, 2014), property crimes, juvenile delinquency (Law & Quick, 2013), and hate crimes (Ciobanu, 2019), while also exploring crime distribution as a whole (Jones & Pridemore, 2018; Nogueira de Melo et al., 2016). Muluneh (2022) found that IPV was most common for women who lived in rural areas, had a poor wealth index, did not hold much decision-making power, and blamed the violence on the victim. These could be strong indicators of a femicide occurring, as both IPV and femicide are common in rural areas.

Empirical support for the relationship between femicide and social disorganization theory is clearly mixed, and more research is needed to understand whether social disorganization factors, geographic location, and accessibility to services have a relationship to one another and in what direction this relationship occurs. Research that focuses on the distribution of all crimes found mixed results for social disorganization theory and suggests that more than one theory is needed to describe all crime distribution, including IPV and femicide (Jones & Pridemore, 2018; Nogueira de Melo et al., 2016). These two forms of violence against women have been researched extensively using social disorganization theory, but one theory that is rarely used and has not been used to explore femicide and crime mapping together is routine activities theory.

## **Routine Activities Theory**

Routine activities theory has been used to examine crime at the spatial level since Cohen and Felson first developed it in 1979 (Nogueira de Melo et al., 2018), with few studies focusing on violence against women. The theory focuses on how individuals' routine activities could affect how, when, and where crime occurs. The three elements that are necessary for crime to occur are motivated offenders, suitable targets, and a lack of a capable guardian (Smith et al., 2000). In the case of femicide, motivated offenders would be considered the perpetrators of the murder. The majority of these perpetrators have an alleged history of domestic violence, receiving little to no legal punishment, which could help to explain why perpetrators are motivated, as they believe punishment may not follow the crime. Suitable targets are, in this case, the female being murdered by their intimate partner. In past research, suitable victims have been studied as places where interaction between victims and offenders occurs (Jones & Pridemore, 2018), behavior that is done by victims out in the public (Mustaine & Tewksbury, 1999), lack of access to resources (Krishnakumar & Verma, 2021), social disconnection (Woerner & Sullivan, 2019) and a lack of economic or political status (Xie et al., 2012). Capable guardians are people or places that can prevent crime by increasing the probability of them witnessing the crime occurring (Jones & Pridemore, 2018).

Capable guardians when focusing on femicide are the domestic violence services available to the victim. A study conducted in India during COVID-19 found that 4 of the 23 cases they reviewed mentioned the lack of police availability, irregular functioning courts, and the lack of support services available during the lockdown, showing a lack of a capable guardian, in which IPV occurred frequently (Krishnakumar & Verma, 2021). Support for this theory has also been found in stalking cases (Mustaine & Tewksbury, 1999). Women who exhibit lifestyle behaviors that increase an individual's exposure to possible offenders and who are more likely to

be alone and not surrounded by potential and capable guardians face a higher risk for being stalked. Overall, many studies have examined the relationship between violence against women and routine activities theory, and both fields will benefit from viewing femicide through this lens as well. While the theory may not create a perfect framework for femicide, it creates a foundation that can be built with future research as the two fields have rarely been explored prior.

Routine activities theory has been used to examine several different crimes, specifically robbery (Smith et al., 2000), IPV (Krishnakumar & Verma, 2021; Woerner & Sullivan, 2019; Xie et al., 2012), and stalking (Mustaine & Tewksbury, 1999). These studies find support for different aspects of the theory, which could be important when examining femicide cases. Some studies may not necessarily align with every part of routine activities theory, but many find partial support, especially in relation to guardianship (Jones & Pridmore, 2018; Mustaine & Tewksbury, 1999; Smith et al., 2000). The current study will consider the capable guardians in terms of the availability of domestic violence services, as this has not been explored previously. This study will also examine how firearm availability could be another motivator for offenders of femicide. These theoretical frameworks will help to guide this current study to create crime maps of femicide and analyze whether both domestic violence services and firearm availability have an impact on the murder rates.

## **Chapter 4 - Methods**

Data for this study is derived from the Women Count U.S.A. database. Women Count USA is an extensive database that uses Google alerts and news stories to document femicide cases throughout the United States. Dawn Wilcox, a registered nurse from Texas, created Women Count USA, became interested in how many women were killed by men and boys each year in the United States (Women Count USA, 2016). Before establishing her dataset, she found through her own research that femicide statistics differed across many different federal organizations, so it was hard to establish an actual yearly estimate. Beginning in early 2017, Wilcox curated a dataset containing approximately 74 years of data, from the 1950s through 2024. Each case includes as much information as Wilcox can locate online, including victim contextual information (e.g., names, photos, race), contextual crime information (e.g., crime date, location of crime), and perpetrator information (e.g., relationship between victim and offender, name). These databases are continuously updated and are in various stages of completion, as new information is consistently identified through media sources or email submissions. Each female receives an entire row of information specific to them and their case, and information on their perpetrator. Not all rows are entirely complete, as information can be difficult to find for each case.

The following variables from the Women Count U.S.A. database will be included in the crime maps: Name, multi/serial/single femicide, date, age, city, state, relationship, cause/features of death, death details and post-mortem injuries/actions, sexually motivated/related actions and history, murder-suicide/familicide/suspect death, additional victims in the same incident, child-related/custody issues, and additional details. All of this information is included in each pop-up when each case is selected in the mapping software.

Firearm availability and ownership were obtained through the research conducted by the RAND Corporation. This research organization developed the Gun Policy in America initiative in 2016 for policymakers and the public to understand the effects of the policies in place on firearms. As state-level firearm ownership data only exist from 2001-2004, the RAND Corporation created their State-Level Firearm Ownership Database as a place to hold estimates on state-level firearm ownership. There are four databases that RAND starts their research with, the Behavioral Risk Factor Surveillance System (BRFSS), Gallup, the GSS, and Pew Research Center. Surveys are distributed throughout the United States and are created to be a nationally representative sample. To develop state-level data from national data, multi-level regression with poststratification (MRP). MRP takes individual and state characteristics from the survey respondents to create estimates of firearm ownership at the state level. Once this data was developed, they were then combined with proxy measures to create an even more accurate estimate. Data for firearm availability is developed based on household self-reporting data, while the Women Count Data is based on the individual level, a data discrepancy that should be noted. The state-level estimates of the average household firearm ownership rate from 1980 to 2016 is used for these analyses.

Data for the domestic violence services are derived from the Domestic Shelters official website, operated by Alliance for HOPE International. This website is the first and largest searchable directory of domestic violence services within both the United States and Canada and provides tools for identifying abuse, getting help, healing from a domestic violence situation, and resources for professionals. Within this database, each state is listed separately and must be clicked on to view each city's domestic violence programs. Each domestic violence service, if the information has been updated, includes extensive information, but the information that will

be included in the crime maps is as follows (if available): the name of the program, city and state, number of emergency services, counseling services, housing services, support services, and community educational services that each location offers. All of this information is included in each pop-up when each case is selected in the mapping software. There are 2,326 domestic violence services available within the United States that are listed on the Domestic Shelters website.

The data used to determine population density was made available on ArcGIS Online, the mapping software used within this study, as a map layer. This map layer contains the 2020 U.S. Census Demographic and Housing Characteristics. The two categories within this data are urban populations and rural populations. The most urban populations are colored in a darker shade of green, while the most rural populations are a lighter shade of green. The shades lighten and darken depending on the population within that county compared to the most densely populated counties. This data is used as another layer on the Women Count U.S.A. map and the domestic violence services map.

### **Data Entries**

Data for the domestic violence services available within the United States that are listed on the Domestic Shelters website Women Count U.S.A. data, domestic violence services data, and firearm ownership data were taken and entered into separate spreadsheets. This created a space to organize data and input the proper information needed to upload the data to the mapping software, ArcGIS Online. To map each case and service within the mapping software, coordinates must be used. Coordinates were found for each city using Apple Maps, as it is one of the only applications where hundreds of cities and states can be searched for in a short amount of time without a fee. Domestic violence service coordinates were increased by 0.003 for both the

latitude and longitude (prior to the longitude being considered negative), so Women Count data and domestic violence service locations did not overlap and could be analyzed using a heat map. This change is small enough to keep the DV service within its specific city, while also creating enough space for analyses to be conducted. The firearm ownership data used the coordinates for each state and were not changed due to the firearm ownership being a density map rather than a heat map.

### **ArcGIS Online**

ArcGIS Online was used to create crime maps within this study. ArcGIS Online is a collaborative website that allows users to build 2D and 3D interactive maps, analyze data through their analysis tools, collaborate with other users on a map, and share maps and apps with the public. ArcGIS Online provides several tools for mapping, including basemaps, map layers, and several different ways to analyze map data. The data for this study is imported to ArcGIS Online through CSV files. ArcGIS recognizes the coordinate points and plots each specific set of coordinates on the map, along with all the information included in the file, which is accessible through a pop-up table that appears when each map point is selected. The Women Count USA and domestic violence services data are entered and the style of the plotted points is changed to a heat map. The heat map shows the areas of higher activity (more plot points) with colors that glow ‘hotter’ on the basemap. This creates the visualization of the relationship between femicide rates and domestic violence services within any given area, as well as identifying hot spot locations. Firearm ownership is developed into a ‘counts and amounts’ map, which is a density map, rather than a heat map. This is because firearm data is collected at the state level, rather than the individual level, like Women Count and the domestic violence services. Prior to uploading firearm data, the feature layer titled, “USA States Generalized Boundaries” is added to

the basemap. This map layer is a polygon layer that provides 2020 U.S. Census population information, as well as the generalized state boundaries of the 50 states and the District of Columbia. Not only do the state boundaries have to be added, the analysis tool ‘join features’ must also be conducted so the ‘counts and amounts’ maps style will respect the state boundaries. The ‘join features’ analysis tool combines two map layers into one. In this study, the target layer is the state boundaries, and the join layer is the firearm ownership data. These layers are joined using the spatial relationship with a ‘join one to one’ join operation, this allows for these maps to combine so plot points are representative of each state allowing the ‘counts and amounts’ map style to work accordingly. The ‘counts and amounts’ map style allows for different colors to represent data. In this case, the high-to-low theme is used, meaning the darker shades of the chosen color are the states that have a higher average household firearm ownership rate. The color lightens as this number decreases. Each state also contains a pop-up when selected upon; that provides the ownership rate for that specific state. The firearm map also includes a legend to explain what the different shades of the map are showing. Each CSV file can be added to a new basemap, so analysis of each can be performed.

## **Chapter 5 - Results**

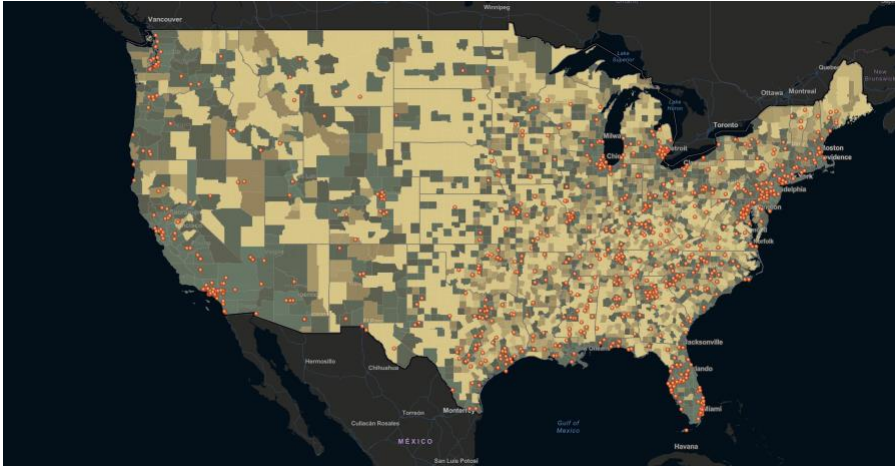
Before maps are overlayed with one another, they are first analyzed separately to determine where hot spots are found for both femicide cases and domestic violence services. These cases also contain the population density layer to show which areas are considered rural and urban. Firearm availability is formatted differently, as these results are located at the state level rather than individual plot points. The following results were found using the maps created.

### **Women Count U.S.A. Data**

Figures 5-1 through 5-4 show the maps of all femicide cases in 2018 documented through Women Count U.S.A and geocoded to display in the city where the femicide occurred. Each map point displays a femicide case, but for femicide cases that occurred in the same city, only one plot point will show as they overlap one another. Figure 5-1 through 5-4 provides a visual image of all the femicides that occurred within the United States, while Figures 5-5 through 5-8 provide the geospatial map for the Women Count data, where hot spot areas are ‘glowing’ more than cooler areas. Figures 5-1 through 5.8 present the 2018 femicide cases documented using media-based data collection methods, in which 1,135 cases were documented in total. 379 of these murders were committed by the victim’s boyfriend/domestic partner, 104 by their estranged husband, 197 by their ex-boyfriend, 30 by their ex-husband, 18 by their fiancé/ex-fiancé, and 407 by the victim’s husband. Texas saw the most femicide cases in 2018, with a total of 132 cases, while Florida had 98 documented cases of femicide. Washington, D.C. had no cases documented for 2018, while Alaska and Wyoming had 1 case each, and North Dakota and South Dakota had 2 each. In relation to population density, the majority of femicide cases occurred in rural counties. The region that housed the most rural cases seemed to be in the northeast area. Maine held 4 cases in rural counties, while only 2 cases in urban areas. Hot spot locations for these

cases glow a hotter red color with a purple border. Hot spot locations were found only in urban areas, while the rural area cases usually only have one case per county and do not create any hot spots.

**Figure 5-1. Contiguous U.S. Women Count Data (Plot Points)**



**Figure 5-2. Alaska Women Count Data (Plot Points)**



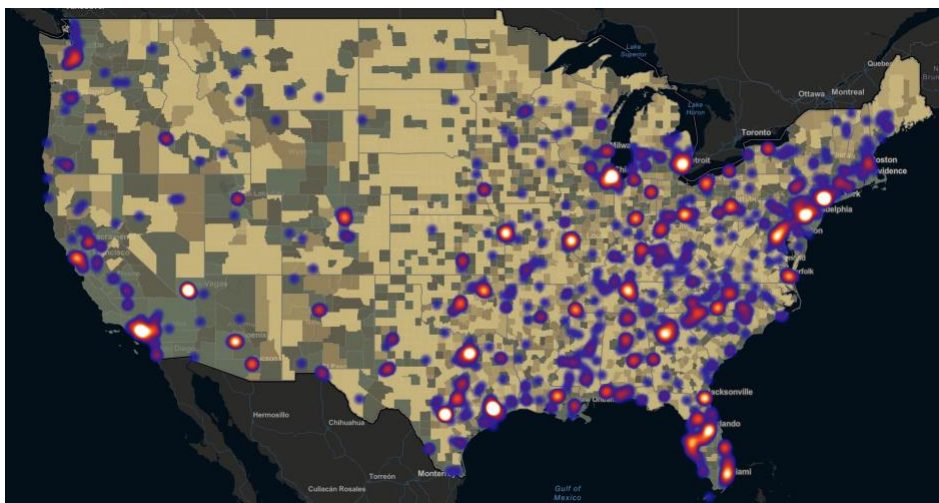
**Figure 5-3. Hawaii Women Count Data (Plot Points)**



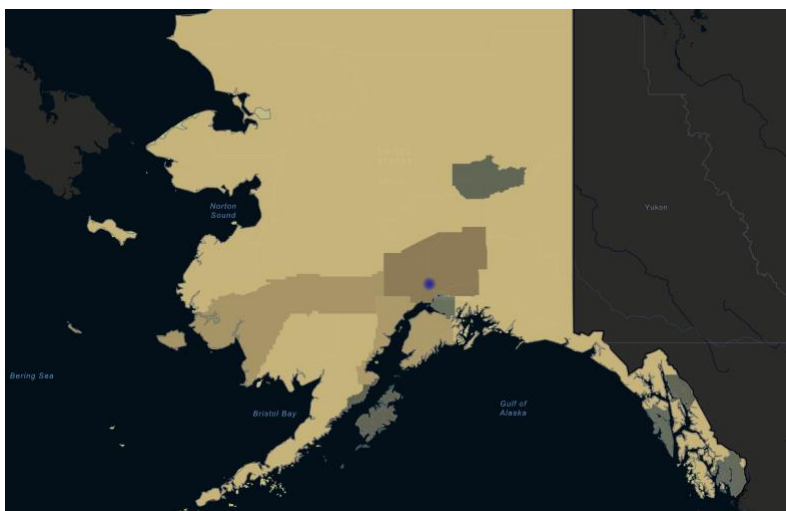
**Figure 5-4. Puerto Rico Women Count Data (Plot Points)**



**Figure 5-5. Contiguous U.S. Women Count Data (Geospatial Map)**



**Figure 5-6. Alaska Women Count Data (Geospatial Map)**



**Figure 5-7. Hawaii Women Count Data (Geospatial Map)**



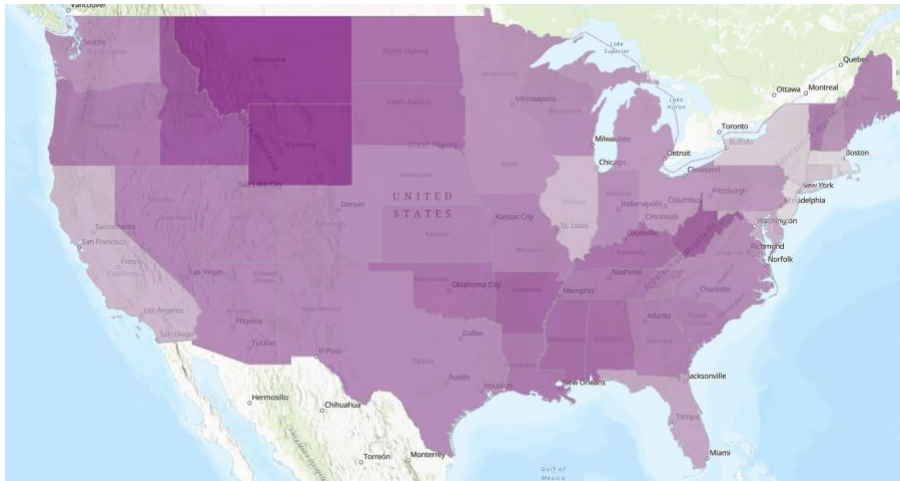
**Figure 5-8. Puerto Rico Women Count Data (Geospatial Map)**



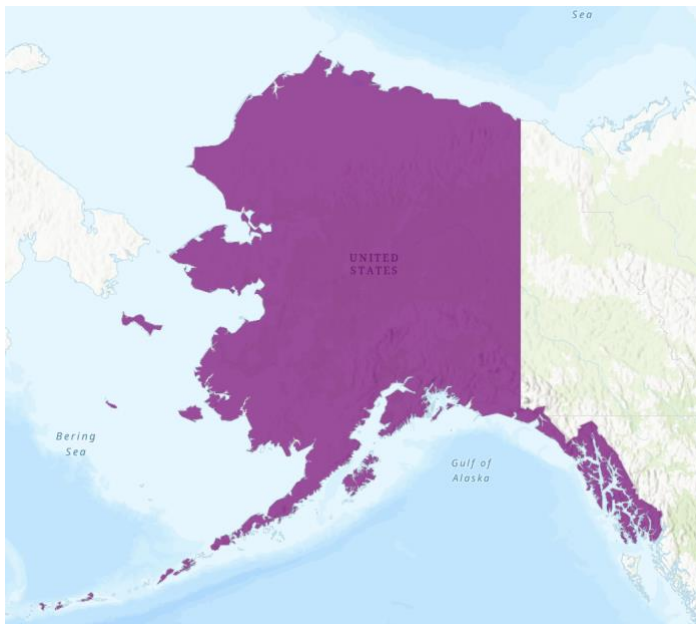
## **Firearm Ownership**

Figures 5-9 through 5-11 are density maps by state, highlighting each state-level estimate of the average household firearm ownership rates from 1980-2016. Montana comes in with the highest estimate of 66.3% (0.663), Wyoming following closely behind at 66.2% (0.662), and Alaska taking the third spot with 64.5% (0.645). The three lowest estimates are Rhode Island at 14.8% (0.148) and New Jersey and Massachusetts both at 14.7% (0.147). Each state is shown in a different shade of purple; the darker the shade the higher the estimate of the average household firearm ownership rate is.

**Figure 5-9. Contiguous U.S. Firearm Ownership (Density Map)**



**Figure 5-10. Alaska Firearm Ownership (Density Map)**



**Figure 5-11. Hawaii Firearm Ownership (Density Map)**

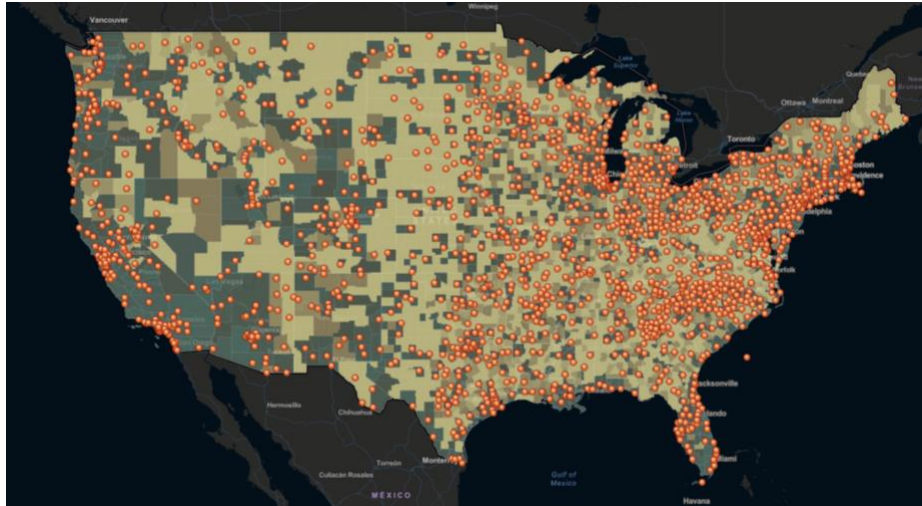


### **Domestic Violence Service Availability**

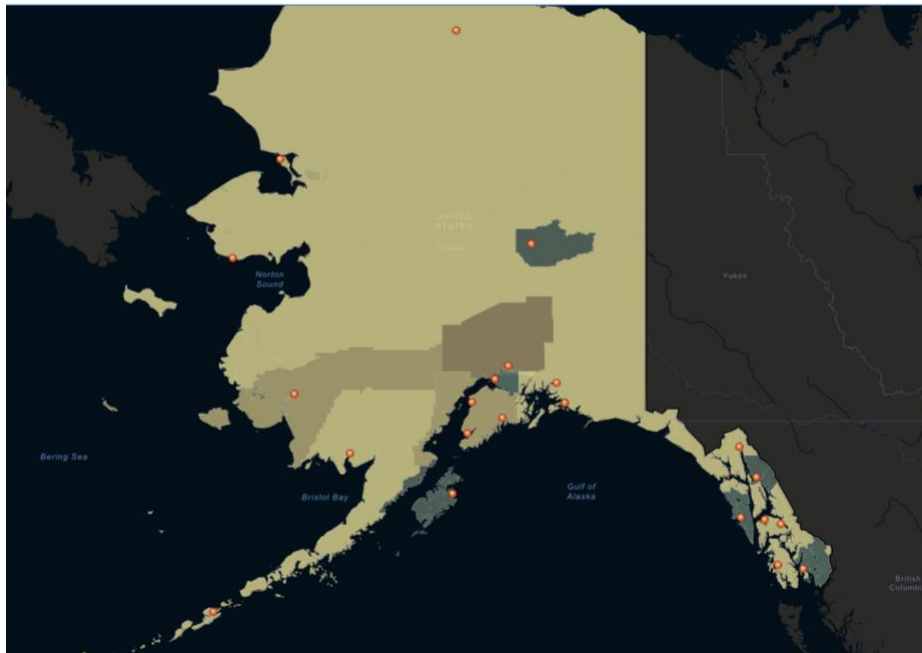
Figures 5-12 through 5-15 show the map of all the domestic violence services available within the United States that are listed on the Domestic Shelters website. Similar to Figure 5-1 through 5-4, if more than one domestic violence service is available within one city, only one map point will show as the services are overlapping. Figures 5-16 through 5-19 provide the geospatial map for the domestic violence service availability throughout the United States, with hot spots highlighted in yellow. Based on the data available on the Domestic Shelters website, there are 2,326 domestic violence services scattered throughout the United States. California houses the most services with 163 within their boundaries while Texas holds 148. Delaware, Puerto Rico, and Rhode Island all hold 8 each, the lowest number of services in the states. New York City provides the most services, with 20 different services available. Washington D.C. follows close behind with 16, and Chicago with 14. Seattle, WA, Boston, MA, Denver, CO, Los Angeles, CA, and Phoenix, AZ, all house ten shelters. This shows that the most populated states house the most domestic violence services, while less populated states hold fewer. Domestic violence services are scattered throughout urban and rural counties, with hot spots being in urban areas only, similar to how the femicide rates are dispersed. When the two maps are placed

together and analyzed, seeing how both state and city domestic violence service availability affects the rate of femicide will be determined.

**Figure 5-12. Contiguous U.S. Domestic Violence Services (Plot Points)**

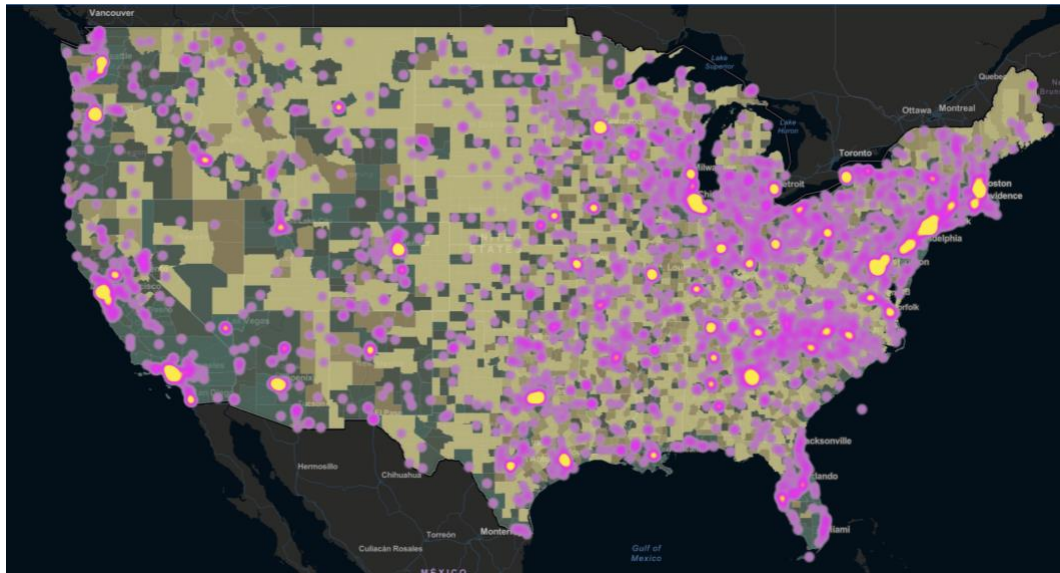


**Figure 5-13. Alaska Domestic Violence Services (Plot Points)**

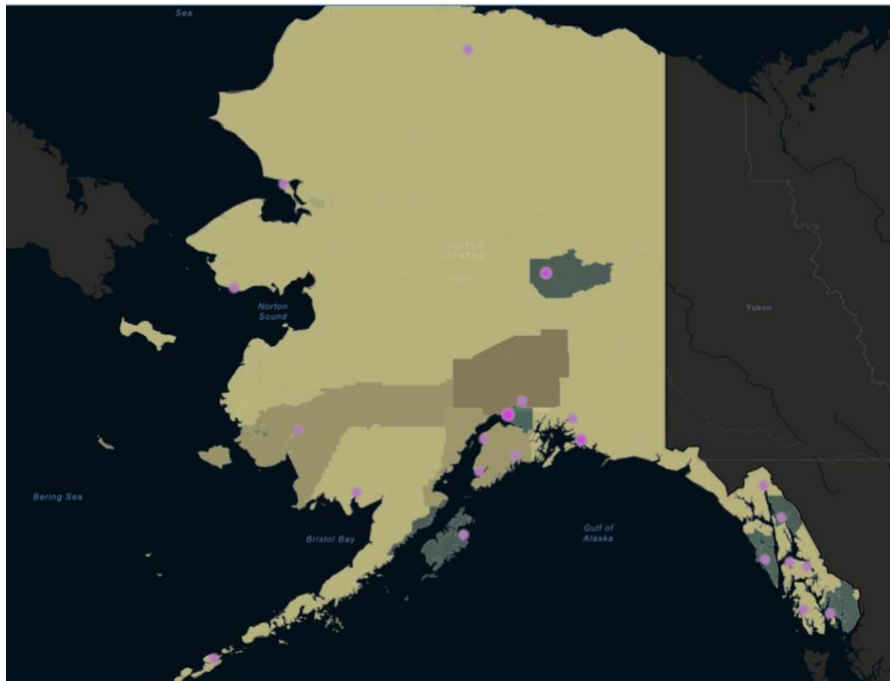




**Figure 5-16. Contiguous U.S. Domestic Violence Services (Geospatial Map)**



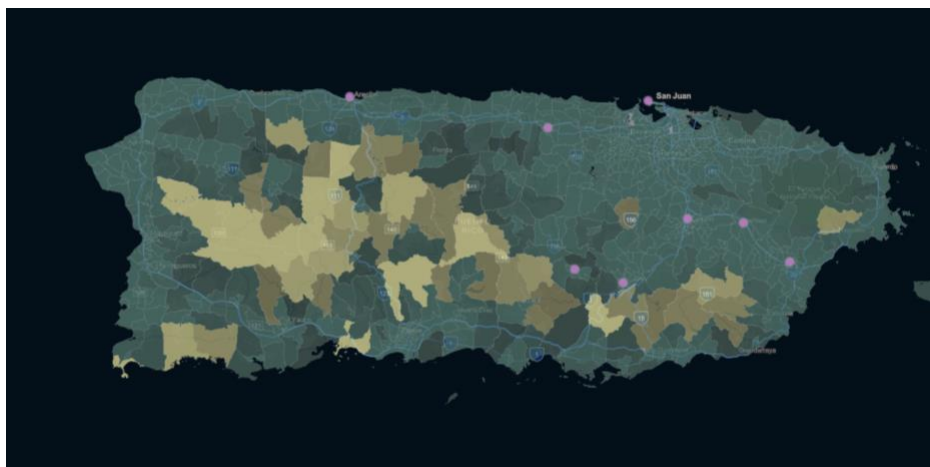
**Figure 5-17. Alaska Domestic Violence Services (Geospatial Map)**



**Figure 5-18. Hawaii Domestic Violence Services (Geospatial Map)**



**Figure 5-19. Puerto Rico Domestic Violence Services (Geospatial Map)**

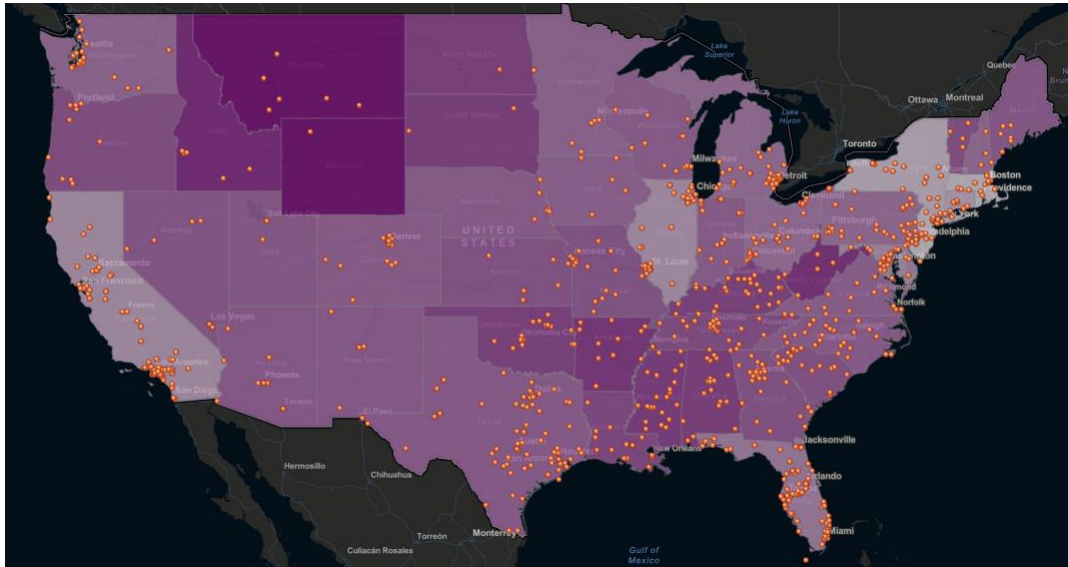


### **Women Count U.S.A. and Firearm Ownership**

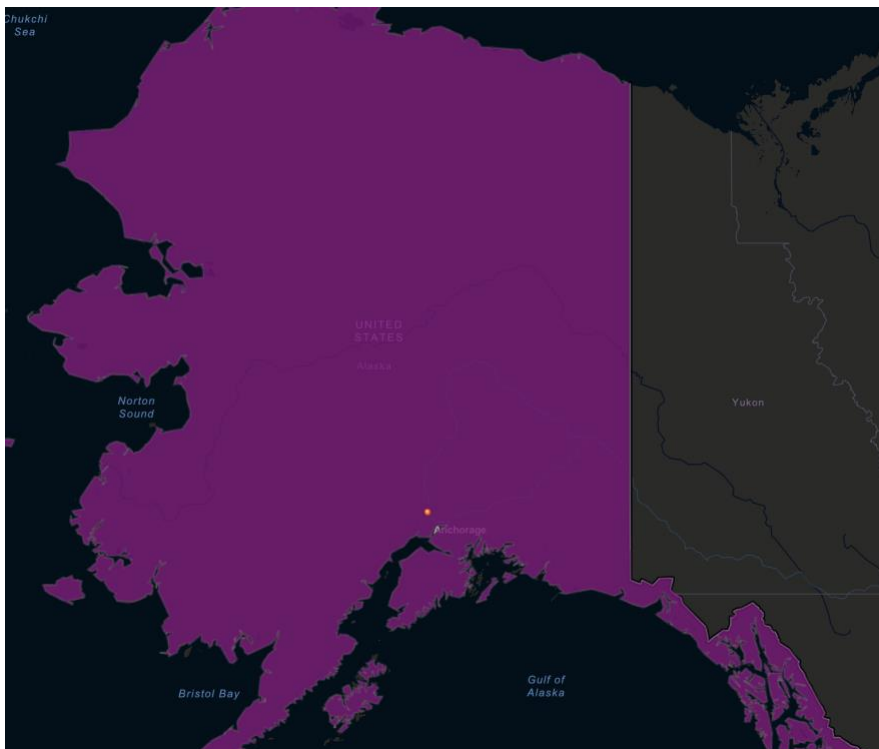
Figures 5.20 through 5.22 show the geospatial heat map of the Women Count documented cases overlaying the density map of the state-level estimates of the average household firearm ownership rate to showcase how firearm availability and ownership affect femicide rates throughout the United States. It must be noted that it is difficult to draw any

conclusions comparing state-level estimates of firearm ownership by household and individual femicide cases. State population and number of households are not considered, so conclusions here must be understood very cautiously as this is a sizeable limitation in exploring this relationship. Three states with the highest household firearm ownership estimates held some of the lowest femicide rates. Montana (66.3%) had 6 cases; Wyoming (66.2%) and Alaska (64.5%) had 1 femicide case documented each for the entire year. The lowest state held a higher femicide rate than all three of the states with the highest firearm ownership rates combined. Massachusetts (14.7%) had 12 cases; New Jersey (14.7%) had 19 cases, and Rhode Island (14.8%) accounted for 3 cases of femicide in 2018. The states with lower firearm ownership rates may have higher rates of illegal firearm ownership, which could help to explain how prior research has found a relationship between firearms and femicide rates (Gollub & Gardner, 2018; Stansfield et al., 2021). Firearm ownership was not estimated for Puerto Rico. These results must be interpreted cautiously, as mentioned before, because firearm ownership is being drawn by household, while femicide is being drawn at the individual level.

**Figure 5-20. Contiguous U.S. Women Count Data (Plot Points) and Firearm Ownership (Density Map)**



**Figure 5-21. Alaska Women Count Data (Plot Points) and Firearm Ownership (Density Map)**



**Figure 5-22. Hawaii Women Count Data (Plot Points) and Firearm Ownership (Density Map)**

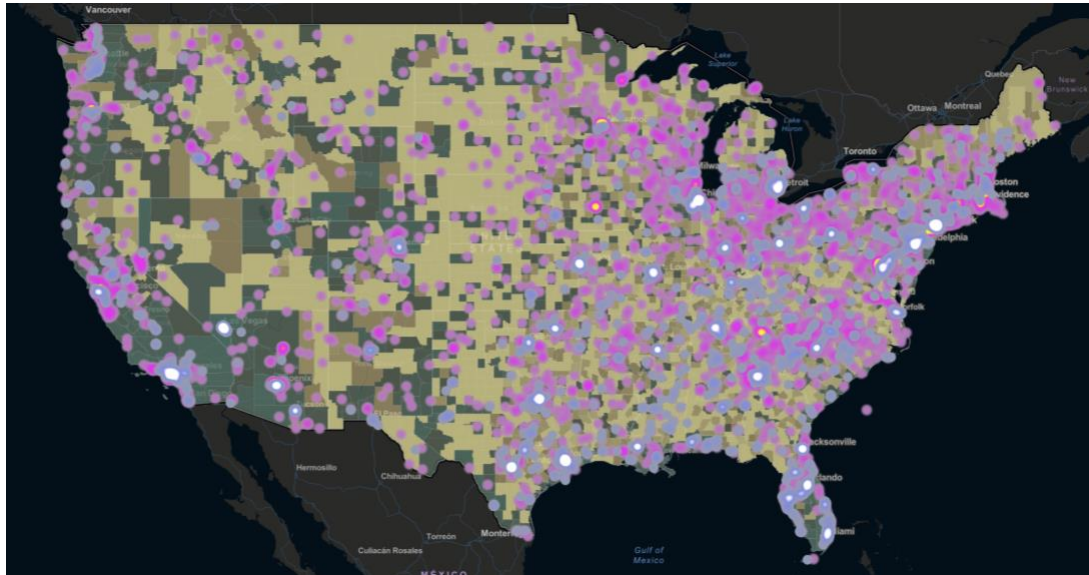


### **Women Count U.S.A. and Domestic Violence Service Availability**

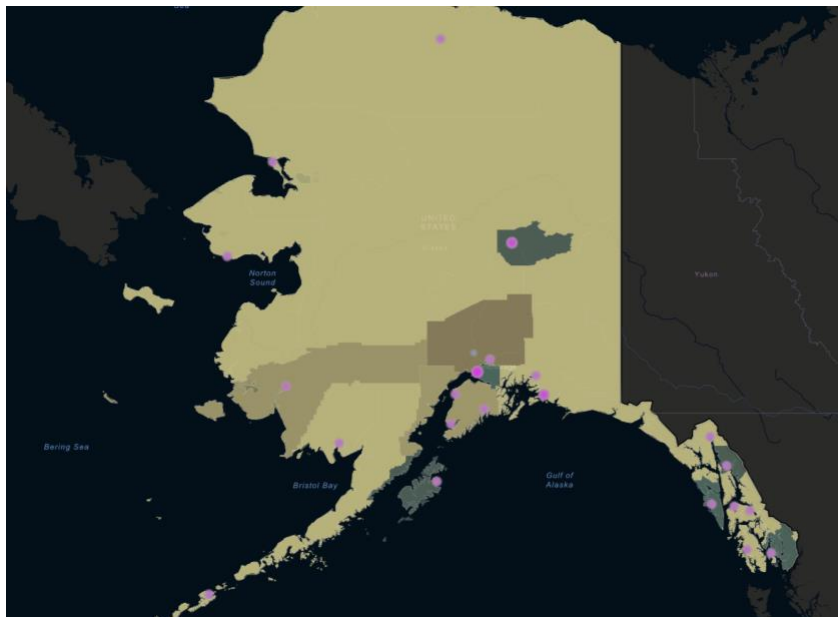
Figure 5-23 through 5-26 combines the heat maps of the Women Count data and the domestic violence services, outlined in different colors. Domestic violence services show in pink, while femicide cases are blue to properly visualize how both of their hot spots correlate with one another. Hot spots of domestic violence services are in yellow, while femicide hot spots are in white. To reiterate, the following states hold the highest rates of femicide: Texas, with 132 cases, and Florida, with 98 cases. Overall, Texas has 148 domestic violence services available, and Florida has 58 services. Wyoming had one femicide case and 23 services available. North Dakota and South Dakota had 2 cases each, but North Dakota has 20 domestic violence services, while South Dakota houses 31. With this data, it seems as though the states with a significant number of services also had a significant number of femicides, while there are also states that have abundantly fewer domestic violence services with little to no cases of femicide.

Focusing on cities, New York City had the most domestic violence services with 20 and had no cases of femicide documented through Women Count in 2018. Similarly, Washington, D.C. followed with 16 services, and they also had no cases of femicide documented. Chicago held the third most services at 14, while also having 14 cases of femicide. Seattle, Boston, Denver, Los Angeles, and Phoenix all have 10 domestic violence services each, but hold different rates of femicide. Seattle, WA, and Boston, MA have 1 documented case each; Denver, CO, and Los Angeles, CA both have 3 cases of femicide, and Phoenix, AZ has the most of all the states with 10 services at 8 documented cases of femicide for 2018. This data can be interpreted to show that at the city level, domestic violence service availability usually does have a protective impact on femicide occurrences.

**Figure 5-23: Contiguous U.S. Women Count Data and Domestic Violence Services (heat map)**



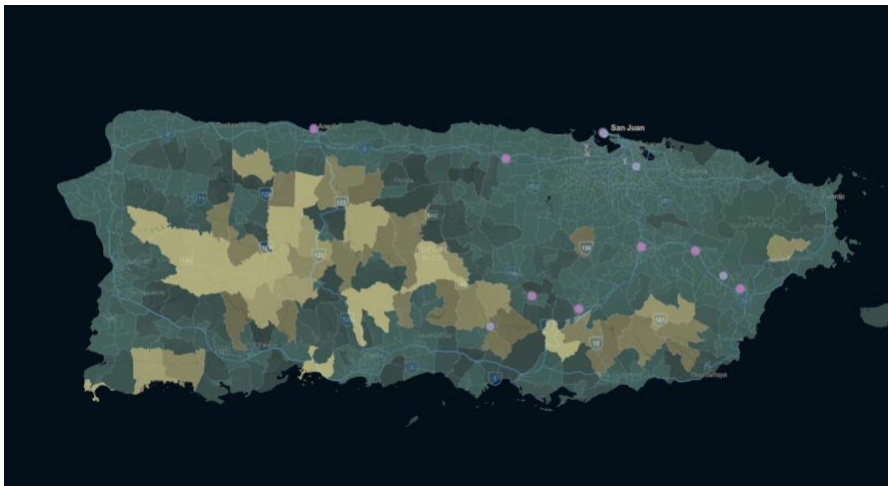
**Figure 5-24: Alaska Women Count Data and Domestic Violence Services (heat map)**



**Figure 5-25: Hawaii Women Count Data and Domestic Violence Services (heat map)**



**Figure 5-26: Puerto Rico Women Count Data and Domestic Violence Services (heat map)**



## **Chapter 6 - Discussion**

This study examined the co-occurrence of firearm ownership and domestic violence service availability with femicide rates in the year 2018 within the United States using geospatial data. Results from the overlay of femicide rates and firearm ownership, at first glance, seemed to contradict prior research (Sinauer et al., 1999; Sorenson, 2017; Stansfield et al., 2021; Violence Policy Center, 2020). States with the highest rates of firearm ownership held the lowest rates of femicide, while states with the lowest rates of firearm ownership held higher rates of femicide. These results must be interpreted cautiously, as mentioned before, because firearm ownership is being drawn by household, while femicide is being drawn at the individual level.

Domestic violence service availability did aid in decreasing femicide at the city level, but domestic violence service availability at the entire state level varied. Some states had lower rates of femicide when they had more domestic violence services, while others still had a high rate of femicide. The cities with the most services tended to have very few or no cases of femicide, besides a few outlier cities that showed services did not have an impact.

Prior research has found that firearm ownership increases femicide rates, which, at first glance, appears to contradict the maps generated in the present study (Gollub & Gardner, 2018; Stansfield et al., 2021). This contradictory evidence could have been developed in part due to the media-based data collection for femicide cases. A media-based data collection method had not been previously analyzed in a study on femicide. This is important because it opens a new door to trying different forms of data collection beyond federal statistics. The firearm ownership estimates themselves have their own limitation, as the ownership rate is being estimated at the household level in each state, while femicide is being measured as each occurrence. Since the exact rate of illegal firearm ownership is unknown, it is difficult to determine how many

femicide cases were committed with an illegal firearm compared to a legal one. Another possibility for the contradiction is a lack of specific national statistics on state-level firearm ownership, which requires researchers to rely on self-report surveys as data sources. Thus, the mapping findings in the present study should be interpreted with extreme caution.

In relation to critical feminist theory, the Women Count U.S.A. data does include details on if IPV was present before the murder, and several of them did include this. A connection could be made here that the struggles for power and control within a relationship could lead to this escalation of violence, accounting for why so many of these victims experienced IPV previously (Braithwaite & Schrod, 2015). This study seems to contradict prior data found in relation to social disorganization theory and rural areas (Muluneh, 2022). The current study found that hot spots of femicide were in urban areas. Rural areas did not house any hot spots, but cases were widespread throughout all rural counties. Turning to domestic violence services, the present study partially supports prior research, in which rural areas with less service availability were at an increased risk of femicide (Hetling & Zhang, 2010; Peek-Asa et al., 2011; Sinauer et al., 1999; Toohy et al., 2023). This study found that rural cases did occur in places where domestic violence services were unavailable, but these cases were scattered throughout all rural counties. Routine activities theory helped to explain why cities with more domestic violence services had lower rates of femicide. As these services are viewed in this capacity as capable guardians, results show that the more capable guardians there are, the less likely it is for a femicide to occur. Hot spots presented themselves in urban areas, rather than in rural areas with no domestic violence service availability.

Overall, femicide is a worldwide issue that affects many women. Understanding and being able to visualize how firearm ownership and domestic violence services affect

the rate of femicide can help lead to more research on these two fields. Visualizing how these variables interact with one another can allow law enforcement and social service agencies to identify hot spots of cases, in which services, whether that be domestic violence or firearm-related, can be increased in these areas. This research advances the fields of both spatial analysis and femicide for it has not been done prior. It explores how media-based data collection can be very helpful and provides extensive detail for each case, but it comes with its limitations as cases may not specifically make it to the media because of a lack of media coverage in rural areas or an abundance of cases in urban areas, where each case cannot be covered fully. This research and the review of past literature show the need for better documented femicide and state-level gun ownership statistics, especially at the federal level. Policy implications regarding the availability of domestic violence services should be examined to better implement services in rural areas. The United States does not have a system that documents femicide cases separately from other homicides, making it very difficult for data analysis to occur. Data analysis must occur on femicide cases so prevention and intervention efforts can be tailored to address the unique precursors to femicide. This study does open new doors for research and provides support for certain policies, but it is not without its limitations.

This study and its design have strengths and limitations. It provided an addition to better visualize femicide, firearm ownership, and domestic violence services at the geographical level by creating crime maps. Using a new, different way of data collection by focusing on the media provided a more victim-centered approach, rather than overall statistics. Each case provided extensive data on the case, the victim, and the perpetrator. Using a different form of data collection creates its own barrier, as it is difficult to document each case of femicide with as

much information as Women Count U.S.A. provides. Also, not every femicide case may make it into the news media, meaning if cases are not directly emailed to Dawn Wilcox, with Women Count U.S.A., or make it to the news, then they may be missed. Spatial analysis within this study was also only done at the city and state level, as addresses are not usually provided for these crimes, as well as for some domestic violence services. Exploring neighborhood characteristics could provide more support for social disorganization theory.

The issues addressed earlier; lack of a connection between femicide and crime mapping, lack of spatial analysis research on femicide, the difficulty in analyzing results for firearms as the data is being measured at different levels, and the lack of statistics and contradicting numbers provided by federal organizations are all problems that are significant in this field of research. This study helped to bridge that gap between femicide and crime mapping by conducting spatial analysis research and also providing another form of data-collection that differs from federal organizations. As these problems cannot all be fixed in one study, it does provide a gateway to more research using new methods of data collection and opening the door to femicide and crime mapping. There are several opportunities for future research in all of these areas, as well as exploring how illegal firearm ownership affects femicide rates, exploring new forms of data collection alongside victim surveys and police data, and using crime mapping to identify hotspots of femicide at the neighborhood, regional, or worldwide levels. Each level can provide important information that could back current spatial analysis and influence theoretical orientations that help explain violence against women.

As we know, femicide is a global phenomenon that could affect anyone at any point. Bridging the fields of femicide and spatial analysis creates a new opportunity in exploring how these cases can be prevented, and rates can be lowered. Using crime mapping specifically

provides the visual aspect that may be needed to understand just how widely this crime affects the United States. Overlaying femicide rates to firearm ownership and domestic violence services are just two opportunities for research presented within this study. Future research can examine how different variables may affect femicide prevalence, and now with the addition of crime mapping. Overall, this study examined how firearm ownership and domestic violence services affect femicide rates and even though some of these results differ from prior research, new data collection methods can be explored to understand how they differ from one another. Policy implications must also be made in order to help decrease rates of femicide and help to prevent both intimate partner violence and femicide by bringing awareness to the likelihood of IPV to escalate to femicide.

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