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In the line of fire: firearm violence in Europe

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Citation

Krüsselmann, K. (2024, November 21). *In the line of fire: firearm violence in Europe*. Retrieved from <https://hdl.handle.net/1887/4170856>

Version: Publisher's Version

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Note: To cite this publication please use the final published version (if applicable).

In the line of fire:
Firearm violence in Europe

Katharina Krüselmann

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This doctoral research has partially been funded through a project commissioned by the European Commission Directorate-General for Migration and Home Affairs (Grant number 867477). The funders had no role in study design, data collection and analysis.

Printing: Ridderprint, [ridderprint.nl](https://www.ridderprint.nl)

Layout and design: Anna Bleeker, persoonlijkproefschrift.nl

In the line of fire: Firearm violence in Europe

Proefschrift

Ter verkrijging van

De graad van doctor aan de Universiteit Leiden,

Op gezag van rector magnificus prof.dr.ir. H. Bijl,

Volgens besluit van het college van promoties

Ter verdedigen op donderdag 21 November 2024

Klokke 13.00 uur

Door

Katharina Krüsselmann

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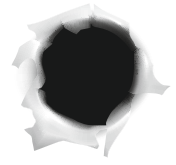
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Chapter 1

Introduction

Background

‘Shooting oneself in the foot’, ‘a shot in the dark’, or ‘standing in the line of fire’ – the English language knows several sayings that refer directly or indirectly to firearms. Most of these sayings have negative connotations: ‘standing in the line of fire’, for example, insinuates that someone is being criticized or otherwise (verbally) attacked. In the poem ‘The Opposite Game’ by Brendan Constantine a teacher asks their students for the opposite word of a gun; they start arguing ‘which positive word is correct; “Flower, says one. No, Book, says another. That’s stupid, cried a third, the opposite of a gun is a pillow. Or maybe a hug [...]”. At the end of the poem, the teacher says “The opposite of a gun is wherever you point it”. In other words, firearms seem intrinsically linked with fear and violence.

Developed as a weapon for warfare in the 14th century (Chase, 2003), it is unsurprising that firearms are linguistically associated with negative concepts of interpersonal conflicts, violence or even death. Although their use has expanded to non-warfare contexts over the years, such as sport-shooting or hunting, firearms continue to be symbols of violence or death (Goldsmith et al., 2022; Overton, 2016). This symbolic association is also supported by statistics, linking firearms to lethal violence. In Europe, almost 8000 individuals committed suicide with a firearm in 2019, which translates to almost one individual per 100.000 population (see Figure 1.1). In addition, more than three thousand individuals were killed with a firearm in the context of a homicide, that are 0.4 individuals per 100.000 population. In the Netherland – on which parts of this dissertation focuses more in depth – 0.2 individuals per 100.000 population died due to gunshots inflicted in the context of suicide and homicide each.

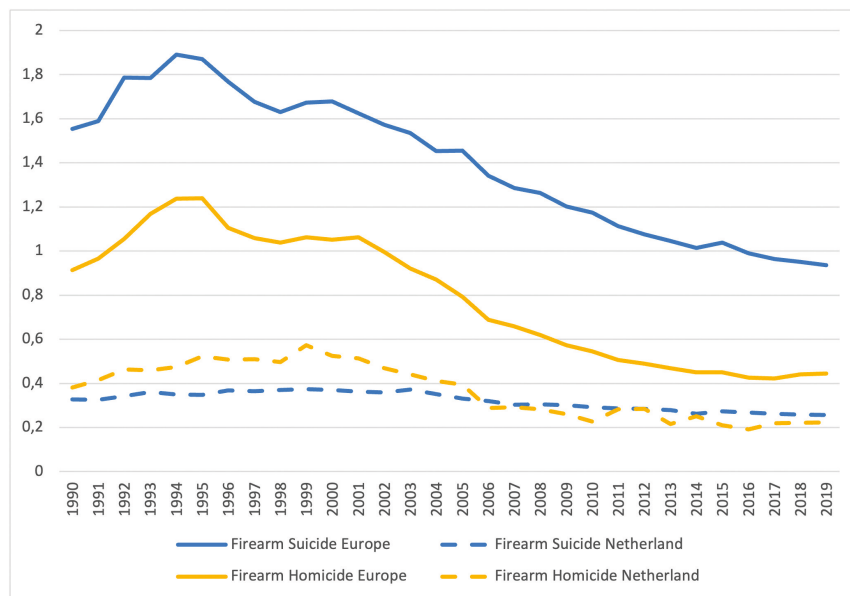


Figure 1.1: Firearm suicide and -homicide rates per 100.000 population in Europe and the Netherland, 1990-2019 (Global Burden of Disease Collaborative Network, 2020).

Two Paradigms of Firearm Violence

With firearms being deemed a significant cause of death, it is no surprise that firearm violence is also a prominent topic in academic research. Academic scholars have approached firearm violence through two dominant paradigms: (1) the criminal justice and criminology paradigm, and (2) the public health paradigm. Within the paradigm of criminal justice and criminology, firearm violence is approached as a type of crime; individuals involved in acts of firearm violence are labelled as perpetrators and victims; prevention and interventions to firearm violence take place in the criminal justice system. Within this paradigm, firearms are regarded as facilitators to (violent) crimes, including homicides and other types, such as “domestic violence that may escalate into homicide [...], terrorism, illicit drugs trafficking, trafficking of human beings, smuggling of migrants, maritime piracy, counterfeiting, environmental crime, or organised property crime” (European Commission Directorate-General for Migration and Home Affairs, 2020). Thus, firearms play an important role in both lethal and non-lethal, violent and non-violent crimes in Europe and on the global scale. However, what is considered relevant for criminologists and criminal justice researchers may differ across legal constitutions. For example, what constitutes a firearm – what parts or what types of objects with the appearance of a firearm – can be defined differently across national laws and thus impact how firearm violence is defined. In addition, researchers in this paradigm focus their attention on the crime itself – the perpetrators and victims – as well as the response to crime, yet rarely on the outcomes and long-term impacts on the victims (Alzheimer et al., 2019).

Firearm violence may also be approached as a “critical public health issue”, as stated by the American Medical Association’s Council (1989). In this approach, deaths or injuries caused by gunshots are considered an infectious disease (Slutkin et al., 2018), an adverse health condition that may impact mortality rates. Individuals involved in firearm violence are considered part of at-risk populations rather than labelled victims and perpetrators (Wintemute, 2015). Consequently, harm reduction efforts involve a diverse set of stakeholders, including medical physicians, social services or population-led initiatives that aim to change social norms regarding the carrying and use of weapons (Braga, 2022; Hemenway, 2017; Hemenway & Miller, 2013). Yet, although promising, the public health approach to firearm violence is most established in the United States, less so in other geographical areas, such as Europe as of now. In addition, scholars such as Anthony Braga (2022) have called for a close cooperation between academics and practitioners working in both the crime and public health paradigms. Such a cooperation would bring together expertise on both reactive (criminal justice) as well as preventative (public health) responses to firearm violence, broaden the understanding of the causes and open up the discourse on firearm violence to a broader audience. Yet, Braga also noted the lack of joined approaches so far due to a lack of communication and recognition of each other’s work and the long way ahead for truly combined efforts.

Why Focus on Firearms?

Regardless of the paradigm, a number of characteristics specific to firearms make them particularly relevant to the study of violence: First, compared to other weapons commonly used in non-combat violent encounters, firearms have almost no other practical purpose than to inflict (potentially lethal) physical harm to or to coerce compliance from an individual. They were specifically produced for use in warfare. Other weapons have other primary purposes; knives, for example, are used in everyday chores, to prepare meals or open letters. Second, firearms are more lethal than other weapons commonly used in violent encounters between (groups of) individuals (Christensen et al., 2008; Harris et al., 2002; Libby, 2009). In a seminal study, Zimring (1967) found that firearm assaults in Chicago were more than five times as lethal than assaults with knives by comparing fractions of lethal outcomes in firearm and knife assaults. Third, firearms can fire potentially lethal shots from a long distance to the victim as well as bystanders, thereby enabling new types of violent encounters, such as drive-by or long-distance shootings. Finally, firearms have the ability to fire several rounds of potentially lethal shots in a very short amount of time, thus providing the means for mass-shootings such as in the 2011 shooting in Alphen aan den Rijn in the Netherlands, in which more than a hundred shots were fired in just a few minutes by the perpetrator, killing six victims and the perpetrator himself (Duquet et al., 2019). These abilities of the firearm highlight its intrinsic connection with violence which warrants further academic attention. Thus, the relation between firearms with both the prevalence as well as nature of violence is central to this dissertation's aims, which are further elaborated in the following section.

Objectives of this Dissertation

This dissertation broadly aims to understand the relation between firearms and both the prevalence and nature of violence. With regards to the relation between firearms and prevalence of violence, this dissertation aims to

1. Describe the prevalence of lethal firearm violence cross-nationally in the European context.
2. Examine the impact of firearm availability on the prevalence of lethal interpersonal violence in Europe.

With regards to the relation between firearms and the nature of violence, this dissertation aims to

3. Compare characteristics of lethal firearm violence cross-nationally in the European context.
4. Compare characteristics of lethal firearm violence to lethal violence committed by other means in the European context.
5. Examine and compare the nature of lethal in relation to non-lethal firearm violence, using European, more specifically Dutch, data.
6. Empirically test existing assumptions about the impact of a firearm's lethality on weapon use in lethal violence, using European, more specifically Dutch, data.

Compared to previous studies on firearm violence, this dissertation aims to put the firearm central – not just as one of many types of weapons that can facilitate violence, but as an object that has the potential to impact both the prevalence and nature of violence more so than any other weapon commonly used in interpersonal violent encounters.

Relevance of this Dissertation

That firearm violence is of societal and academic relevance to study seems evident based on the previous paragraphs. A search of the multidisciplinary platform Web of Science using terms such as “firearm violence”, “gun violence” or “firearm homicide” results in more than 11.000 scientific articles, book chapters and other scientific outputs written about this phenomenon. In addition, almost 600 doctoral theses carry these or similar terms in their description, according to a search in the multidisciplinary global database ProQuest. The question thus arises what this dissertation can add to the empirical and theoretical academic literature on interpersonal violence, and firearm-perpetrated violence in particular, as well as societal debates surrounding the phenomenon and its prevention.

Relevance to the Study of Violence

Interpersonal violence is a subject of study in various disciplines, ranging from criminology to sociology, biology, public health, psychology and more. Central topics across these disciplines are (explanations for) cross-national differences in the prevalence of (lethal) violence (Kivivuori et al., 2022; Pridemore, 2011; Suonpää et al., 2024), characteristics of victims (Gartner, 1990; Kuhns et al., 2011), or situational risk factors for interpersonal violence (Sampson & Lauritsen, 1994; Wikström & Treiber, 2009), to name just a few. However, neither the empirical nor theoretical literature on interpersonal violence focuses much on the *modi operandi* of said violence, and the various effects that these *modi* can have on the prevalence or nature of violence. Instead, weapons, or firearms in particular, are rather considered one of many sub-types of crime (in the disciplines of criminology and sociology) or facilitators to aggressive behaviour (in the discipline of psychology). As put by Obert and colleagues: “(...) much of this scholarship in violence focuses on its etiology or effects, rather than the various modes of its production” (2018, p. 3). The authors further elaborate on the usefulness of putting the firearm central, stating that “focusing analytic attention on the relationship between the agency of the gun and the acts of violence, intimidation, joy, and allure they create offers us a new way to think about the problem of firearms [...]” (p.69). This dissertation puts the firearm and its relation to violence central, thereby addressing the relative shortage of academic literature on the production of violence, in particular in the European context.

Relevance to the Study of Firearm Violence

Within the limited academic field that focuses on violence perpetrated with firearms, this dissertation has added (1) geographical, (2) theoretical and (3) empirical value.

First, from a geographical point of view, the vast majority of theoretical and empirical literature on firearm violence originated from the United States, a context in which both legal and illegal firearm availability and lethal violence is high compared to many other regions in the world (Karp, 2018; Stroebe, 2013; United Nations Office on Drugs and Crime, 2023). Whilst this geographically concentrated knowledge regarding firearm violence in the United States is certainly valuable and has shaped the existing empirical and theoretical landscape of firearm violence research, its generalizability to other global regions has rarely been assessed. Europe is an interesting and relevant region to expand research on firearm violence to. As many European countries are members of the European Union, they adhere to very similar if not the same EU umbrella-policies – the so-called Firearm Directives – which define what constitutes a firearm and legal firearm ownership (European Council of the European Union, 1991, 2017, 2021). Although certain national differences exist with regards to firearm laws, a general shared understanding of legal and illegal uses of firearms provide a strong ground for comparative research. Yet, most studies on firearm-perpetrated violence in the European context have remained focused on particular national contexts (Dressler, 2021; Gjertsen et al., 2014; Junuzovic et al., 2019), due to a lack of comparative and detailed data of violent encounters. Using a harmonized data collection instrument (the European Homicide Monitor which is further introduced in the following sections), this dissertation provides a first truly comparative analysis of firearm violence across several European countries that goes beyond the comparison of aggregated homicide rates.

In addition to a cross-national focus, this dissertation uses the Netherlands as a case study for further in-depth analysis of firearm violence. Although the number of firearms and firearm homicide rate in the Netherlands is low compared to many other European countries (Karp, 2018), the misuse of firearms by organized crime groups is documented well across the national borders (Duquet & Vanden Auweele, 2021; United Nations Office on Drugs and Crime, 2023). Just in the last few years, the public shootings of a lawyer and journalists have made global headlines (BBC, 2021; Al Jazeera, 2019). For the study of firearm violence, the Netherlands is particularly suited due to the availability of high-quality data on shootings (as discussed in a following section). In addition, as some of the following analyses will show, there are grounds to claim that findings from the Dutch context may also be applicable to other European countries, such as Sweden.

Secondly, this dissertation is theoretically relevant as it adds a test to the prevailing theoretical approaches to firearm violence with European data. For example, certain hypotheses suggest that a high availability of firearms is associated with high levels of lethal violence [Weapon Lethality Hypothesis, Weapon Facilitation Hypothesis, Weapon-as-Primes Hypothesis] while other hypotheses suggest an association between high availability and low levels of lethal violence [Deterrence Hypothesis]. US research generally finds support for the former, showing positive correlations between firearm availability

and homicide rates on the national, regional or local level (Hepburn & Hemenway, 2004), as well as a negative correlation between restrictions to firearm availability and homicide rates (Lee et al., 2017; Reeping et al., 2019). However, a handful of studies have consistently categorized the US as an outlier with regards to firearm availability and lethal violence (Hemenway et al., 2002; Killias & Markwalder, 2012), thus prompting the question about the validity of these assumptions in the European context. Equally, hypotheses surrounding the impact of firearms on the nature of violence, such as the Physical Strength Hypothesis (Heide, 1993), have rarely, if ever, been empirically assessed with non-US data. To what extent any of the assumptions brought forward in the US are valid in the European context, or whether European scholars need to establish their own theoretical framework to approach weapon- and firearm use in violent encounters remains untested. As such, this dissertation adds to theoretical discussions around firearm violence by providing a critical assessment, highlighting both valid arguments as well as shortcomings, which in return may be used to enhance existing approaches or develop new ones.

Thirdly, this dissertation adds to the empirical patchwork of studies on firearm violence in Europe. Unfortunately, although research on firearm violence in Europe has increased in recent years, it has not followed a systematic research agenda and suffered from empirical shortcomings. Specifically, existing studies are limited to either aggregate level descriptions of firearm violence rates (Khoshnood, 2019; Sturup et al., 2019), or descriptions of only one national or even more local context that do not allow for cross-national comparison (Dressler, 2021; Frei et al., 2006). A combination of these isolated studies is insufficient to provide a comprehensive overview not just of the prevalence, but also the nature of firearm violence in Europe. This dissertation addresses said shortcomings, by combining individual-level data from several European countries and providing cross-national accounts of the phenomenon.

Another shortcoming in the study of firearm violence in Europe and elsewhere is the overreliance on empirical data of lethal firearm violence, partially due to the lack of reliable data of non-lethal firearm violence. Non-lethal firearm violence needs to be included in empirical assessments of firearm violence, not only to grasp the phenomenon more comprehensively – national crime statistics suggest that the majority of firearm violence remains non-lethal (Bundeskriminalamt (Austria); Bundeskriminalamt (Germany); Polisen) –, but also to understand the role of a firearm's lethality. Until now, firearm homicides are used as an indicator, for example to evaluate the effect of legislations restricting access to firearms (Gjertsen et al., 2014; König et al., 2018), to describe the prevalence of the phenomenon in the European context (Duquet & Van Alstein, 2015; Sturup et al., 2019), or to describe profiles of perpetrators of firearm violence (Khoshnood et al., 2023). However, whether firearm homicides can actually be used as an indicator for non-lethal firearm violence has not been empirically assessed yet. Therefore, the empirical data on lethal and non-lethal firearm violence in this dissertation provides a comprehensive approach to the phenomenon which enhances the understanding of firearm violence more broadly and showcases the importance of inclusion of non-lethal data for future research endeavours.

What is Firearm Violence? A Short Note on its Terminology

The Firearm

In the most recent Firearm Directive – the umbrella-regulation by the European Commission that defines and regulates firearm ownership and related subjects throughout EU member states – a firearm is defined as:

“any portable barrelled weapon that expels, is designed to expel or may be converted to expel a shot, bullet or projectile by the action of a combustible propellant [...]. An object shall be considered to be capable of being converted to expel a shot, bullet or projectile by the action of a combustible propellant if: (a) it has the appearance of a firearm; and (b) as a result of its construction or the material from which it is made, it can be so converted [...]”. (European Council of the European Union, 2021)

This definition includes short handguns, such as pistols or revolvers, as well as long firearms, such as rifles or shotguns. Interestingly, the definition also includes objects that have the appearance of a firearm or can be converted as such, for example acoustic weapons made for firing blanks or firearms that are (partially) 3D-printed. Furthermore, European directives classify various types of firearms into four categories, which are linked to differing regulations regarding legal possession (European Council of the European Union, 2021). Regardless of this coherent legislation, variations exist across European members states as to whether specific types of firearms, such as soft air pistols used for sports or hobby, fall within this legal realm, depending on the interpretation of the given definition. For the sake of this dissertation, firearms are defined following the definition by the most recent European Firearm Directives.

Firearm Violence

Before taking a closer look at the theoretical approaches to firearm use in violent encounters in the next chapter, a definition of violence used throughout this dissertation needs to be established.

This dissertation will discuss violence in the realm of physical interpersonal violence, thereby excluding self-directed violence, such as suicides, or state- and political violence, such as in the context of (civil) wars or terrorism. This choice for a definition of violence may exclude acts that other would still consider violence, as the definition of violence is inherently debated and dependent on context, cultural norms, academic disciplines and many other factors (De Haan, 2009). Most recently, there are emerging debates over what counts as violence at the lower boundaries (Kivivuori, 2014): for example, should acts of verbal aggression, threats or discrimination be included in the definition of violence? Or does discrimination based on one's gender or ethnicity fall within the realm of violence? A recent multi-disciplinary workshop on the future of violence studies also raised the question to what extent the definition of violence is ever evolving through changes in

cultural norms and that the conceptualization of the concept and continuum of violence in itself deserves a place on the research agenda (van Breen et al., forthcoming).

Applying this discussion to the topic of this dissertation, firearm violence may be approached as a continuum of various expressions of violence that can be perpetrated with or otherwise impacted by firearms (see Figure 1.2). On the most extreme end of the continuum are homicides committed with firearms, or other types of assaults leading to the death of an individual. On the other end of the spectrum, one could consider the use of firearms in (threatening) figurative speech a form of firearm violence. Although such speech may not cause direct physical harm to an individual, it may incite more extreme forms of violence. For example, the deadly shootings of four young Swedish music artists have been linked to conflicts in the Swedish drill rap scene, in which lyrics regularly include metaphors of or references to firearms (Krüsselmann, 2023). Between these two most extreme ends of the continuum lie a number of other types of firearm violence, including threats with firearms or objects that have the appearance of a firearm, shots fired at objects, such as private houses, and shots fired at individuals that may or may not result in physical harm to that individual.

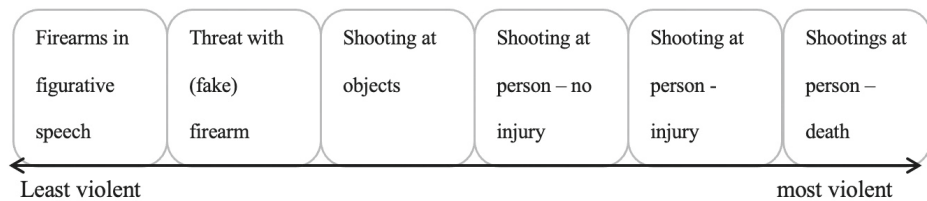


Figure 1.2: Continuum of violence perpetrated with firearms.

In other words, firearm violence has various manifestations. In this dissertation, the focus mainly lies on the most extreme types of firearm violence: shootings directed at individuals. That is not to discount the harm caused by non-physical manifestations, such as threats. Research indicates that being confronted with a weapon can increase the risk of developing PTSD (Montgomerie et al., 2015; Zondeka & Barkhuizen, 2017). The considerations for the focus on shootings in this dissertation rather lie in the empirical possibilities of measuring firearm violence, which will be further discussed in the following section.

Furthermore, this dissertation mainly approaches firearm violence as a criminological phenomenon rather than as a public health issue. Again, this choice is grounded in the availability of data sources related to the criminal justice system, e.g. the Dutch National Police, as opposed to the lack of accessible sources related to the public health domain. Another consideration is the European focus on criminal justice approaches to intervene and prevent firearm violence. Thus, adopting a criminological approach hopefully increases the relevance of this dissertation for law enforcement agencies and other practitioners in the European context.

Firearm

“any portable barrelled weapon that expels, is designed to expel or may be converted to expel a shot, bullet or projectile by the action of a combustible propellant” (European Council of the European Union, 2021)

Firearm Homicide

Adapted from the WHO definition of homicide, a firearm homicide is the killing of a person by another with intent to cause death or serious injury by means of a firearm. Excluded are killings due to legal interventions by firearms or firearm deaths in the context of war.

Firearm Violence

Firearm violence is defined as lethal or non-lethal willful violence directed at another person by means of firing shots from a firearm. Excluded is violence due to legal interventions by firearms or firearm violence in the context of war.

Figure 1.3: Definitions of firearm, firearm homicide and firearm violence used in this dissertation.

Doing Research on Firearm Violence in Europe

One challenge in the study of firearm violence in Europe is the lack of detailed, reliable and comparable data or significant shortcomings in existing data sources (for an overview, see Table 1.1).

Two widely used cross-national databases to study violence include data on firearm homicides: the WHO’s Mortality Database (World Health Organization, 2023) and the UNODC’s Intentional Homicide database (United Nations Office on Drugs and Crime, 2022). The WHO’s Detailed Mortality Database is built on information from official death registrations, mainly medical death certificates (Rogers & Pridemore, 2023). The International Classification of Death, which is used as a basis for the WHO Mortality Database, includes categories for firearms generally, as well as for handguns and long firearms, or undetermined type of firearms, disaggregated by the victim’s gender and age. A number of limitations have been noted on the WHO database: First, not all countries report rigorously about death registrations. Rogers and Pridemore (2023), for example, note a regional bias in the systematic reporting of detailed and complete information. For example, for some countries, the fraction of undetermined death – meaning that the medical examination could not determine the cause of death as either homicidal, accidental or suicidal – is relatively high, thereby lowering the reliability of the data (Bhalla et al., 2010; Värnik et al., 2011). Others have noted the inconsistent registration of the firearm type as a serious obstacle to in-depth analyses of firearm homicides based on this source (Duquet & Vanden Auweele, 2021).

Table 1.1: Overview of relevant data sources on Firearm Violence in Europe

Source	Prevalence of Firearm Homicide	Prevalence of non-lethal firearm violence	Detailed victim information	Detailed offender information	Detailed contextual information	Coverage
WHO Mortality Database	x		x			All European countries, varying dates
UNODC Intentional Homicide Database	x					All European countries, varying dates
Armed Violence Monitoring Platform	x	x	x	x	x	Albania, Bosnia & Herzegovina, Kosovo, Moldova, Montenegro, North Macedonia, Serbia; 2014-2023
European Homicide Monitor	x		x	x	x	Denmark, Finland, France, the Netherlands, Sweden, Switzerland; 1992-2016
Dutch Firearm Violence Monitor	x	x	x	x	x	The Netherlands; 2018-2022

As a comparison, the UNODC's database on homicide (United Nations Office on Drugs and Crime, 2022) uses crime data, mainly originating from national law enforcement agencies that report to the United Nations Crime Trend Survey. The advantage of this data over mortality statistics is that crime data are compiled after investigation on the cause of death, meaning that the fraction of undetermined death should be significantly lower. As a result, the average global homicide rate reported by the UNODC is slightly higher than the one reported by the WHO (Rogers & Pridemore, 2023). However, cross-national variations of the legal definition of homicide and reporting thereof may lower the comparability of homicide statistics from the UNODC Intentional Homicide database. In addition, the UNODC only report the counts and rates for homicides committed with firearms, without additional data on victim- or perpetrator characteristics.

Next to these two main data sources on homicides, there are a number of sources particularly on firearm-related violence in the European context. Most notably, the Armed Violence Monitoring Platform curated by the Southeastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons (South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons, 2023) registers detailed data on the context, victims, perpetrators and firearms of firearm-related incidents in seven European countries in that region. The registration is mainly based on media articles, which could negatively impact both completeness and reliability of the registrations. Nonetheless, reports based on said registrations offer valuable insights about the uses of firearms in threats, homicides, injurious shootings, accidental shootings, or for particular contexts, such as domestic violence or organized crime. Unfortunately, the platform does not allow for a disaggregation based on the lethality of the incident, and some statistics also include the use of explosives, as well as the seizure and theft of firearms. Such an amalgamation of violent and non-violent crimes related to firearms and other weapons may cloud in-depth studies into the intrinsic relation between firearms and violence in particular.

Most recently, a joint EU-financed project lead by the Flemish Peace Institute aimed to systematically collect and code relevant media articles on firearm violence in all 27 EU member states, using artificial intelligence (AI) (Gunviolence.eu, 2023). Through recognition of pre-defined keywords, information regarding the victim, perpetrator, situational context and types of firearms and ammunition have been extracted from news articles by the trained AI and important to an overarching database. The resulting open-access database offers an invaluable tool for researchers and policymakers alike. However, similar to SEESAC's Armed Violence Monitoring Platform, the reliability and completeness of data based on news articles can be questioned, as well as the capabilities of AI to determine each of the relevant indicators correctly across different languages and types of sources.

Although the previously discussed data sources are all valuable for the research of firearm violence, the central data sources in this dissertation are the European Homicide Monitor, the Dutch Homicide Monitor and the Dutch Firearm Violence Monitor. These databases distinguish themselves due to their completeness, level of disaggregation of the data, cross-national comparability (in the case of the European Homicide Monitor), as well as their compatibility.

European Homicide Monitor & Dutch Homicide Monitor

In an effort to overcome the shortcomings of incomparability and high levels of aggregation of existing sources on homicide, the European Homicide Monitor (EHM) was established in 2009. Under the lead of researchers from Finland, the Netherlands and Sweden, a data collection instrument was developed that allowed the capturing of detailed information on the situational contexts, victims, and perpetrators of homicides (Granath et al., 2011). Data collection method and sources for the EHM may vary across countries but include public sources such as media articles or public court documents, as well as non-public data from

law enforcement offices, forensic psychiatric assessments, or autopsy reports (for a detailed overview, see Granath et al., 2011; Liem et al., 2013). To allow for comparability across these countries, the definition of homicide and all variables for which information needs to be collected are clearly operationalized and shared across the countries' data collectors. Therefore, the respective Finnish, Dutch and Swedish homicide monitors are truly comparable and allow for detailed disaggregated analyses of various types of homicides (Liem et al., 2013; Suonpää et al., 2024), for various victim populations (Suonpää et al., 2024) and – most relevant for this dissertation – the different *modi operandi*, including firearm homicides. Since the establishment of the EHM, other countries have joined the data collection effort. Currently, comparative data is available not just in Finland, the Netherlands and Sweden, but also Denmark, France and Switzerland.

Overall, then, the European Homicide Monitor offers a valuable source of detailed information on firearm homicides. Chapters 4 is based on data from the European Homicide Monitor.

The Dutch Homicide Monitor (DHM) is a sub-dataset of the EHM, which includes homicides committed in the Netherlands between 1992-2022. Data on homicides in the Netherlands included in the Dutch Homicide Monitor stems from news articles, including an annual overview of homicides by the news magazine Elsevier, data from the Dutch National Police, public court documents and data provided by the public prosecution office, such as mental health records of the perpetrators or criminal records. Data from the Dutch Homicide Monitor is used in chapters 5 and 6.

Dutch Firearm Violence Monitor

The main disadvantages of the European Homicide Monitor for the study of firearm violence overall are its limited coverage of only a few (West) European countries and the lack of variables on forensic information regarding the firearm, such as firearm type or number of shots fired. In addition, non-lethal violence with firearms is not captured in this source. To address these shortcomings, for the purpose of this dissertation, the Dutch Firearm Violence Monitor (DFVM) was established to register all lethal and non-lethal shootings in the Netherlands, specifically registering (1) firearm homicides, (2) non-lethal shootings directed at a person leading to physical injury, (3) non-lethal shootings directed at a person not leading to physical injuries, (4) non-lethal shootings at objects, and (5) non-lethal shootings without a specific target. The data collection instrument of the DFVM is largely based on the EHM, meaning that – whenever possible – definitions and operationalizations of variables, such as the type of crime scene or context of the shooting – have been copied directly into the DFVM. The main adjustments made in the DFVM are additional variables to allow for the differentiation between lethal and non-lethal shootings, adaption of variable names to capture not only homicides, but also non-lethal violence and additional variables to capture forensic information regarding the firearm, such as type, number of shots fired, or the type of injury sustained from a gunshot.

Data for the DFVM was triangulated from five sources. First, a list of annual shootings (2018-2021) from the Dutch National Police based on their Firearm Dashboard¹. This dashboard consists of - mostly spatial - information from initial reports about shootings registered with the police. Therefore, the degree of completeness of the Dashboard and thereby the DFVM is high. Unfortunately, the Dashboard does not systematically include detailed information about the context of the shootings, and individuals involved as presumed victims and perpetrators. Hence, additional information was gathered from news articles, as well as public court decisions, with the latter being deemed more reliable than the former. Details of firearm homicides were verified with the Dutch Homicide Monitor. Finally, forensic information for some of the firearms used in shootings (2018-2019) was acquired from the Dutch Forensic Institute. In total, the DFVM captures detailed situational-, victim-, perpetrator-, and firearm-information of 2889 lethal and non-lethal shootings at individuals, objects and non-specific targets committed between 2018 and 2021.

Structure of this Dissertation

The following chapters will address the aims of this dissertation in more detail (see Table 1.2 for an overview).

Chapter 2 critically reviews the current landscape of theoretical approaches to violence and discusses how those approaches may not be sufficient to understand the production of violence through firearms or other means, for that matter. Therefore, the second part of this chapter zooms in further to specific hypotheses developed to understand the impact of firearms on the prevalence as well as the nature of (lethal) violence. These hypotheses provide a backbone for the following empirical chapters.

Chapter 3² addresses the need for a closer look at the relationship between the availability of firearms and prevalence of lethal violence. Through a systematic review, all recent empirical studies examining said relation using European data are gathered, compared and critically examined. It addresses the pre-established assumptions of the Weapon Lethality Hypothesis that a high availability of firearms is associated with high levels of lethal violence, due to a firearm's unique lethality compared to other weapons.

Chapter 4 is a detailed description of the prevalence and nature of firearm homicides – their victims, perpetrators, and situational context – in five European countries, making use of European Homicide Monitor data. In addition, characteristics of firearm homicides are compared to non-firearm homicides to establish whether the firearm impacts the nature of homicides in a way that makes them a distinct phenomenon.

1 Approval for the use of this data was acquired through Dutch Public Prosecution Office (Nr. PaG/BJZ/55333) and the Ethical Committee at Leiden University (Nr.2023-006-ISGA-Krüsselmann)

2 Chapter 3 to 7 have been or will soon be published as peer-reviewed articles in journals, as indicated on the title page of each chapter. Small adaptations may have been made for purposes of coherence or structure.

Chapter 5 examines whether the firearm's lethality impacts weapon use, using data from the Dutch Homicide Monitor. The detailed nature of that data allows for an empirical test of some of the few existing theoretical hypotheses related to firearms: the Adversary Effects Hypothesis, Physical Strength Hypothesis and Social Distance Hypothesis and an assessment of their validity for the Dutch context.

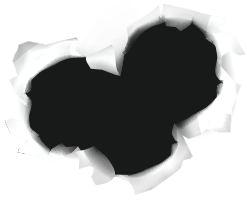
Chapter 6 broadens the scope of this dissertation from lethal firearm homicides to including non-lethal firearm violence. Using data from the Dutch Firearm Violence Monitor, data-driven typologies of shootings are established. By drawing these typologies on both lethal and non-lethal firearm violence, this chapter is a unique contribution to a more comprehensive understanding on European firearm violence and to the discussion on the impact of a firearm's lethality on the outcome of violent encounters.

Chapter 7 concludes this dissertation with a summary and further discussion of the findings from the previous chapters and their implication for the theoretical approaches to firearm violence and firearm violence prevention efforts. In addition, it provides suggestions on how to move research on firearm violence in Europe forward in the upcoming years or decades.

Table 1.2: Overview of empirical studies, data sources and objectives presented in this dissertation.

Chapter + Title	Data Source	Related Objectives
3: The relation between firearm availability and prevalence of (lethal) firearm violence	Secondary literature	1, 2
4: The nature and prevalence of firearm homicides in Europe	European Homicide Monitor	1, 2, 3, 4
5: The role of lethality in weapon use – a theoretical assessment	Dutch Homicide Monitor	4, 6
6: Missing the mark? Typologies of firearm violence	Dutch Firearm Violence Monitor, Dutch Homicide Monitor	5, 6





Chapter 2

Theoretical
Approaches to
Firearm Violence



This chapter aims to review the theoretical knowledge on firearm use in violent encounters and reflect on scientific theories that could explain the use of firearms in violent encounters, as well as the prevalence and nature of firearm violence.

First, this chapter reviews the state of art of scientific theories on violence to evaluate whether those theoretical endeavors include explanations for the use of particular types of weapons in violent encounters. In addition, the idea whether the most dominant theories on violence could be merged into a general theory of violence is explored more in-depth to see whether such a theory is viable and relevant for the study of firearm violence in particular. In the second part, the chapter turns to more specific hypotheses developed about the impact of firearms on the prevalence and nature of violence.

The Theoretical Landscape of Violence

Searching through handbooks of criminology and violence reveals an array of theoretical approaches (see for example Liem & Pridemore, 2012; Piquero, 2015; Zahn et al., 2004). Some of these theories approach violence and violent behavior as a particular type of crime or behavior, such as Strain Theory as coined by Robert Agnew. Strain Theory argues that individuals experience strain when they perceive a discrepancy between their goals and the means to achieve them, with violent behavior being considered a coping mechanism for strains causing negative emotions (Agnew, 1992, 2014). Other theories are general crime theories that are commonly applied to violent crime, such as Routine Activities Theory, which states that crime only occurs when a suitable target, motivated offender and absence of capable guardians converge in time and space (Cohen & Felson, 1979). This theory has been applied to various forms of violence, such as domestic violence (Krishnakumar & Verma, 2021), homicide (Boudreaux et al., 2001; Messner & Tardiff, 1985) or robberies (Ceccato & Oberwittler, 2008). Another example of a dominant crime theory applied to violence is the macro-sociological Social Disorganization Theory (Shaw & McKay, 1942), which states that crime results from the breakdown of social institutions and community structures responsible for developing and enforcing social norms. Social disorganization, commonly measured through rates of poverty, residential instability, ethnic heterogeneity, and family structures, has empirically been used to explain spatial variance in the rates of homicide (Mares, 2010; Vilalta et al., 2021) and other forms of violent crime (Oberwittler, 2004). Given the abundance of crime theories, many other examples could be listed here, which begs the question why such a variety of theoretical approaches is needed or at least applied by violence researchers. There are several reasons:

Existing theories are grounded in a variety of paradigms. The (neo)classical paradigm of crime, for example, emphasizes the free will of each individual, arguing that crime occurs when the incentives of committing a crime are higher than the perceived costs (Beccaria, [1764] 1963; Rock, 2002). Theories such as the Rational Choice Theory (Clarke & Cornish, 1985; Cornish & Clarke, 1986) are grounded in this paradigm: Rational Choice Theory posits that crime occurs when it is in the interest of the perpetrator and when the costs, such as potential imprisonment, do not outweigh the benefits. Other paradigms put less

emphasis on the individual and their actions but instead argue that the (mis)functioning of social structures and institutions shape individual behaviors and thus explain involvement in (violent) crimes. The previously discussed Social Disorganization Theory is one example of a theory that fits with this paradigm. Strain Theory (Merton, 1968), Anomie Theory or Control Theory (Hirschi, 1969), are other examples of crime theories embedded in this paradigm. Yet another paradigm, the critical paradigm in criminology, regards the roots of crime and violence in structural injustices, social inequality and unequal power dynamics in society (Bonger, 1916; Quinney, 1970).

Paradigms such as the ones presented here guide the underlying assumptions of theories on violence. As paradigms differ, so do their related theories, for example in their different key explanatory factors for the occurrence of violence and patterns of offending and victimization. In some theories, such as Rational Action Theory, the perpetrator's behavior is central, whereas other focus on the victim's perspective, situational context in violence occurs or macro-level sociocultural factors facilitating or motivating the use of violence. Yet, those are only paradigms from the disciplines of criminology and sociology. Other disciplines – each with their own paradigms and assumptions – equally study the phenomenon of violence and contribute other theoretical approaches. Neurobiological theories, for example, focus on biological predispositions to violence (Raine, 2002; Siever, 2008), whereas social psychological theories aim to understand how human behavior and social interactions may contribute to aggression or violence (Anderson & Bushman, 2002; Duke et al., 2018). Similarly, other disciplines such as cultural anthropology or pedagogy bring in their own approaches, thereby adding to the theoretical landscape of violence.

Although the sheer number of theoretical approaches to violence suggests an adequate theoretical field, not everyone agrees that the current landscape is sufficient in order to explain why and how violent crime or violent behavior more generally occurs. Some state that existing approaches are insufficient to understand why *violence* occurs, rather than other forms of non-violent crimes or aggression. Randall Collins (2008), for example, criticizes existing theoretical approaches for focusing solely on background factors that may explain why conflicts between people arise or why someone may be motivated to commit violence. Collins maintains that violence is hard and that most people resort to non-violent means to solve conflicts. In other words, none of these existing theories explain the use of violence as a means to an end in itself. In a similar line of reasoning, Jackson and colleagues (2004) condemn that only very few of the dominant theories approach violence as a behavior in itself, but instead see it as an extension of anti-social behavior or a type of crime. Yet another criticism is the mono-disciplinary nature of most dominant violence- and crime theories, meaning that the various disciplinary approaches to violence are not integrated well with each other, but remain separate across disciplines (Liem, 2022; van Breen et al., forthcoming).

Overall, then, the current theoretical landscape on violence may be plentiful but also diffused; a patchwork of theories that individually make relevant contributions to the field, but largely remain separate due to their differences in underlying assumptions or disciplinary perspectives.

Towards a General Theory of Violence?

In 2009, Manuel Eisner and Susanne Karstedt asked the question “Is a General Theory of Violence possible?”, in a guest-edited issue of the *International Journal of Conflict and Violence*. Is it possible to develop a theory that comprehensively encompasses the wide array of types of violence – from bullying to self-harm, bar fights, homicides or even state-level conflict and genocide – and the various approaches to violence – from violence as a type of crime, to a type of behavior or expression of power? The conclusion: there may be some promising integrative approaches but not *one* comprehensive theory of violence. Nonetheless, some scholars have explicitly attempted to develop such a general theory of violence. To give just one example, Randall Collins (2008, 2013) claims that his mainly conceptual and theoretical approach to violence is a general theory that addresses all types of violence – from violence committed by soldiers in the context of war, to robbery homicides or to fist fights between two drunks in a bar. According to Collins, who argues from a micro-sociological perspective, conflicts and the anticipation of violence may lead to confrontational tension and fear. For violence to occur, individuals need to find ways to circumvent this confrontational tension and fear, which may hinder someone from a successful attack due to physiological impacts such as a high heart rate. Collins further differentiates between different types of violence as different pathways to overcome this confrontational tension and fear, such as the pathway to target the weakest victim, or to launch a violent attack from a distance, with a weapon (Collins, 2013). Whilst Collins’ theory addresses several of the criticisms on existing theories of crime and violence, it also received criticism: Thomas (2022), for example, argues that Collins’ theory may explain micro-situational dynamics leading to violence, but that it does not account for variance of violence across time or space. Others have argued that Collins’ theory is too narrowed in its situational approach, thereby neglecting motivations and other precursors to violent events (Wieviorka, 2014).

Other theoretical approaches may not claim to explain all facets of violence, but integrate various approaches, thereby bridging gaps between individual-, circumstantial- and more structural explanatory factors. One example of such an approach is Per-Olaf H. Wikström’s Situational Action Theory (Wikström & Treiber, 2009). This framework combines insights and draws on theories from various disciplines, such as individual psychological or biological predispositions to violence, sociological studies of social control and criminological theories. Central to the Situational Action Theory is the idea that criminal behavior is explained by an *interaction* of individual characteristics, the immediate situational environment and the broader societal context which shape opportunities for crime (Wikström, 2014). Although not established to study violent crime specifically, Situational Action Theory has been empirically applied to violence (Trivedi-Bateman, 2021; Wikström & Treiber, 2009). As such, Situation Action Theory may be regarded as an integrative multi-level framework that bridges some, but not all of the shortcomings of mono-disciplinary theoretical approaches to violence. In conclusion then, academics from various disciplines have not produced a theory that can explain the occurrence of all types of violence, across time and space, from the macro- to the micro-level. Several scholars

therefore argue that such a theory may be impossible to develop, and that violence scholars should strive for meta-frameworks that incorporate and generalize existing theories that are currently bound to specific localities or mechanisms (Black, 2004; Eisner, 2009).

Applicability of Theoretical Approaches of Violence to Firearm Violence

To what extent then can current theoretical approaches to violence explain violence perpetrated with firearm in particular? Empirical studies certainly showcase the general applicability of dominant violence theories to firearm violence: Jesenia Pizarro and colleagues (2021), for example, made use of the well-known Rational Choice Theory (Clarke & Cornish, 1985; Cornish & Clarke, 1986) to explain why firearms are used over other weapons in certain circumstances. Similarly, Schildkraut and colleagues (2019) argue that mass shootings (and law enforcement responses to them) can be understood with Cohen and Felson's (1979) Routine Activities Approach. Sociologists may equally argue that certain theoretical approaches about sociological processes and their effects on crime may also apply to firearm violence, such as Social Disorganization Theory (Kubrin & Weitzer, 2003; Shaw & McKay, 1942) or ideas of Collective Efficacy (Sampson et al., 1997) that have been applied to understand varying rates of shootings across street segments (Dalve et al., 2021; Magee, 2020).

However, the explanatory power of these theories for the link between violence and weapons is limited. Currently existing theories on violence rarely focus on *how* violence is produced; there seems to be an underlying assumption that the various means of violence – pure physical power, blunt objects, knives, firearms and so forth – produce no difference in the occurrence and nature of violence. This is in contrast with empirical studies that underline that the absence or use of particular types of weapons matter for the initiation, sequences and outcomes of violent incidents (Phillips & Maume, 2007; Wells & Horney, 2002). Similarly, studies show distinct profiles of perpetrators, victims and circumstances of firearm violence (Pizarro et al., 2021; Schwab-Reese & Peek-Asa, 2019). In other words, the occurrence of violence (or perpetration or victimization thereof) is the dependent variable in theoretical approaches, not how violence is produced, not the use of weapons or a particular type of weapon. Therefore, for a future meta-framework of violence to address not only why, how, by whom and against whom violence is committed, but also how said violence is produced, the theoretical lacunae on the link between weapons and violence and violence production more generally needs to be addressed first.

Eight Hypotheses on Firearm Violence

The theoretical lacunae on the link between weapons and violence may not be filled with broader dominant theories on violence or violent crime. However, some scholars have attempted to address the topics of weapon use through subordinate and less abstract hypotheses. Specifically, eight hypotheses directly discuss the link between firearms and violence. The first five hypotheses discuss the link between firearms and the *prevalence* of violence (see also Table 2.1):

1. Weapon Lethality Hypothesis
2. Weapon Facilitation Hypothesis
3. Weapon Deterrence Hypothesis
4. Weapon Substitution Hypothesis
5. Triggering Hypothesis

The final three hypotheses relate to the impact of firearms on the *nature* of violence:

1. Adversary Effects Hypothesis
2. Physical Strength Hypothesis
3. Social Distance Hypothesis

Not all these hypotheses are well-established, or well-tested, especially regarding geographical or social-cultural contexts other than the United States. Yet, given the overall lacunae of theoretical ideas, these eight stand out from the largely empirical literature on firearm violence. One challenge in reviewing these hypotheses and their connection to the larger body of work is that the names (and to a certain extent, the ideas) of the hypotheses are not well-established yet, meaning that their names are used interchangeably, or that the ideas of these hypotheses are only implicitly studied. This is particularly the case with the Weapon Lethality and Weapon Facilitation Hypotheses (Alzheimer & Boswell, 2012; Zimring, 1967). Although both hypotheses link wide availability of firearms to high levels of violence due to technical properties of a firearm, one does based on medical arguments, whereas the other argues that technical properties extend the types of violence that can be committed. Yet, some empirical studies merge both ideas as a comprehensive explanation for the link between firearms and levels of violence (Hepburn & Hemenway, 2004; Hoskin, 2001). To avoid ambiguity in the following chapters of this dissertation, the next sections will elaborate further on the distinctiveness between each hypothesis, as well as their underlying assumptions and ideas. In general, the names of the hypotheses are adapted from the studies who coined them, unless stated otherwise.

Weapon Lethality/Instrumentality Hypothesis

Firearms are objects that have the ability to inflict lethal injuries to individuals, possibly more so than knives, clubs or other types of weapons. In other words, one gunshot to the abdomen leads to a more serious, if not lethal, bodily injury than one stab with a knife or blow with a blunt object to the same body part. In line with this argumentation, researchers have posited the use of a weapon – and a firearm particularly – as an important determinant of the outcome of a violent assault, in particular in assaults in which the lethal outcome or bodily injury of the victim was not premeditated (Braga & Cook, 2018; Zimring, 1967). Zimring (1967) was the first to study the weapon's lethality from a criminological perspective, showing that in Chicago, the firearm lethality rate per 100 assaults was five times as high as the knife lethality rate per 100 assaults. Since then, both criminological and medical research has confirmed the high lethality of firearms in assaults compared to other weapons (Braga et al., 2021; Felson & Messner, 1996; Saltzman et al., 1992).

With the high lethality of firearms established, researchers have conceptually linked the legal (or illegal) availability of firearms on the local, regional or national level with a high prevalence of – in particular – lethal violence (Hepburn & Hemenway, 2004; Zimring, 1967). Under the assumption that widespread availability of a particular weapon is associated with frequent use of said weapon in assaults, high availability of highly lethal firearms should be reflected in high rates of lethal violence. In contrast, in contexts in which firearms are generally less available to civilians, for example due to restrictive regulations, and perpetrators of assaults have to rely on less lethal weapons, the rate of lethal violence should be lower.

The validity of this hypothesis has been found in research that has focused on correlations between firearm availability and (inter)national homicide rates (Alzheimer & Boswell, 2012; Hemenway & Miller, 2000; Hepburn & Hemenway, 2004). Studies from the US context generally provide support for the idea that the widespread availability of firearms is correlated with a high prevalence of lethal violence, on the local (Yu et al., 2020) and national level (Monuteaux et al., 2015; Siegel et al., 2013), as well as an increased risk of homicide at the individual level (Anglemyer et al., 2014). However, research has also produced results that warrant a more nuanced look at the relationship between prevalence of firearms and levels of (lethal) violence: for example, domestic homicides are mostly related to legal ownership of firearms, but not illegal ownership (Stansfield et al., 2021).

Unfortunately, less is known about the validity of the Weapon Lethality Hypothesis outside of the US context. In the late 1990s and early 2000s, several studies conducted cross-national analyses across high-income or developed countries, mostly the US, Canada and a number of European countries (Hemenway & Miller, 2000; Hemenway et al., 2002; Killias, 1993; Killias et al., 2001). Consistently, they find a positive association between firearm availability and (firearm) homicide levels yet recognize the United States as an outlier in this analysis. Eliminating the United States from the analysis usually revealed mixed results: Hemenway and Miller (2000), for example, find a positive correlation depends on the measurement of firearm availability once the United States are eliminated from a list of 26 high-income countries. Killias and colleagues (2001) find a positive association between firearm availability and female homicide victimization, but not male victimization. In a more recent analysis, Alzheimer and Boswell (2012) find regional variations. Specifically, in Eastern European countries³, a higher availability of firearm availability was associated with lower firearm homicide and overall homicide rates. Thus, cross-national studies show conflicting results. As such, the applicability of the Weapon Lethality Hypothesis needs to be addressed cautiously for geographical contexts other than the US.

3 Countries included in the category of Eastern Europe are Croatia, Czech Republic, Estonia, Hungary, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Slovakia and Slovenia.

Weapon Facilitation Hypothesis

The Weapon Facilitation Hypothesis is closely linked to the previously discussed Weapon Lethality Hypothesis in that it holds the assumption that a high availability of firearms should be associated with high levels of (lethal) violence. However, instead of focusing on the firearm's lethality compared to other weapons, the Weapon Facilitation Hypothesis entails the idea that the firearm's unique characteristics create new opportunities for (lethal) violent encounters. Specifically, firearms enable perpetrators to inflict (lethal) injury over long distance and to inflict said injury on multiple victims in a short amount of time, as in the case of mass shootings (Lankford, 2016). No other weapon commonly used in interpersonal violent encounters can create similar violence. In addition, these characteristics can enable new types of perpetrators, specifically perpetrators who would otherwise not engage in a physical confrontation with their victims, be it unarmed or with a type of weapon that would require close distance to the victim (Alzheimer & Boswell, 2012; Kleck & McElrath, 1991). With new opportunities for (lethal) violence and new perpetrators, the expectation underlying the Weapon Facilitation Hypothesis is that a high availability of firearms should lead to a higher prevalence of lethal violence, compared to (geographical) contexts with lower firearm availability.

Although the ideas of the Weapon Facilitation Hypothesis are implicitly integrated in many theoretical and empirical articles about firearm violence (Hepburn & Hemenway, 2004; Hoskin, 2001), the hypothesis as such is barely mentioned or empirically tested in the academic literature.

Weapon Substitution Hypothesis

The above two hypotheses argue that the firearm's lethality is essential in the outcome of an assault and – in line with this argument – related to the overall homicide rate. However, opponents of the Weapon Lethality Hypothesis contend that it is not the lethality of the weapon at hand, but rather the intent of the perpetrator to (lethally) harm the victim that is the most important determinant (Wolfgang, 1958). Thus, perpetrators who have the intention to kill another individual will do so with or without access to firearms, by substituting the firearm with another kind of weapon (Wolfgang, 1958). As such, the prevalence of firearms should not be the determining factor in explaining the prevalence of (lethal) violence, but rather the intent. Following this reasoning, countries with relative high homicide rates may have low availability of firearms, but a significant number of highly motivated perpetrators. Here, the firearm is given less agency in the violent incident than in the Weapon Lethality Hypothesis. The debate whether the weapon or the perpetrator's intent is more important is also mirrored in the well-known slogan “Guns don't kill people, people kill people”, which is often used by pro-gun activists and organizations to argue for lenient firearm legislation.

Only few empirical studies have applied the ideas of the Weapon Substitution Hypothesis. The exact origin of this hypothesis is unclear, as it likely emerged gradually from debates amongst scholars and policymakers during since the late 1950s. One of the earliest studies linked to the Weapon Substitution Hypothesis is by Marvin Wolfgang (1958), who compared

observations from two cities in the 1920s that had similarly high homicide rates, yet large differences in the availability of firearms. Although the ideas of this hypothesis have influenced discussions surrounding firearm regulation, they are also subject of debate due to conflicting empirical evidence. For example, Killias (1993) found no dependency between firearm ownership rates and homicides by means other than a firearm across 14 Western countries, which he considers evidence against the Weapon Substitution Hypothesis. Yet, a causal relationship between perpetrator intent and levels of (lethal) violence have not been established in either of these studies. In fact, only few studies have been able to weigh the use of a firearm against the intent of the perpetrator, mainly because the latter is hard to measure and extract as one of several factors influencing the process and outcome of a violent assault. Two studies have used interviews with perpetrators as a method to understand the role of intent compared to the effects of a firearm on escalations of conflicts (Phillips & Maume, 2007; Wells & Horney, 2002). Both studies have similar findings, namely that the perpetrator's intent is the strongest determinant for the escalation of a conflict, yet the possession of a firearm still has a significant influence on its own. Interestingly, Wells and Horney (2002) also find that although the chances of an escalation increase when the attacker possesses a firearm, the chances of an injurious conflict decrease, meaning that the use of a firearm may decrease further escalation after the initial attack. Taking together, both studies are situated in the middle ground between the Weapon Lethality- and Weapon Substitution Hypotheses, arguing that both intent and firearms matter.

Weighing the empirical evidence for the Weapon Substitution Hypothesis with the Weapon Lethality Hypothesis then, it appears that there is both more and better substantiated evidence for the important role of firearms in explaining the prevalence of (lethal) violence.

Weapon Deterrence Hypothesis

Another criticism to the previously discussed hypotheses is formulated as the Weapon Deterrence Hypothesis. Like the Weapon Substitution Hypothesis, the Weapon Deterrence Hypothesis emerged from debates and discussions about firearm regulation and crime control in the United States, rather than certain theoretical or empirical studies. According to the Weapon Deterrence Hypothesis, a firearm's high lethality should have a deterrent effect on potential perpetrators when confronted with a victim that may also be carrying an equally lethal firearm (Cook & Ludwig, 2006; Kleck & McElrath, 1991).

The underlying assumption made in the Weapon Deterrence Hypothesis is that individuals make rational choices with regards to their actions. In 1986, Cornish and Clarke formulated these assumptions into the Rational Choice Theory, which has been discussed in a previous section. To reiterate, the Rational Choice Theory regards the individual to be free and rational with the ability to make conscious choices, within the boundaries of a given situation (Beccaria, [1764] 1963; Rock, 2002). In the context of crime, Rational Choice Theory proposes that the decision of individuals to engage in crime is based on a cost-benefit analysis (Cornish & Clarke, 1986). In the case of the Weapon Deterrence Hypothesis, perpetrators would make the rational decision not to engage in a violent assault, as the

(potentially lethal) costs of being shot by an opponent who also carries a firearm is too high compared to the benefits. With less lethal weapons, however, the costs may not be high enough to deter the perpetrator from engaging in a violent conflict. Thus, whereas the Weapon Lethality Hypothesis implies that once violence occurs, it is more lethal when committed with a firearm, the Deterrence Hypothesis implies that perpetrators would choose non-violent options to resolve conflicts out of fear of engaging with an opponent who carries a firearm. In other words, violent encounters are less likely to take place altogether. Concretely, this means that a high availability of firearms should be associated with relatively low prevalence of lethal violence or violence altogether.

Similar to the Weapon Substitution Hypothesis, a causal analysis of the Weapon Deterrence Hypothesis would require the measurement of individual cost-benefit analyses and their influence on weapon choice and the considerations made before (not) engaging in a conflict. Such in-depth analyses have yet to be conducted. In certain states of the US, the ideas of the Weapon Deterrence Effect have been incorporated in so-called concealed carry laws, which allow citizens to carry legally obtained concealed firearms in public spaces. These laws have been implemented with the conviction that the deterrent effect of firearms may overshadow negative effects of firearm ownership (Barati, 2016). Empirical studies have evaluated the effects of these laws on rates of (violent) crime to determine whether deterrent effects are stronger than (violent) crime-inducing effects of firearms. Results across these studies vary, depending on type of crime examined and measurements used for both crime rates and concealed carry laws (Barati, 2016; Gius, 2019). Yet, most studies focusing on violent crime seem to find no significant effect of these laws on violent crime rates (Barati, 2016; Dezhbakhsh & Rubin, 1998; Gius, 2019; Hamill et al., 2019; Ludwig, 1998; Nicholas et al., 2020).

The lack of evidence for the Weapon Deterrence Hypothesis may be explained with the faulty assumption that perpetrators make a rational cost-benefit analysis (Barati, 2016). This holds true in particular for violent crimes in which perpetrators may be more likely to act in the heat of the moment, without considering whether their opponents may also carry a firearm or another weapon. Thus, the underlying assumption of (bounded) rational choice may apply less to violent crimes than more pre-meditated forms of crimes, such as theft, rendering the ideas of the Weapon Deterrence Hypothesis not necessarily faulty in itself, but less relevant for violent crimes, at least in the context of the United States. Outside of the United States, similar studies do not exist that evaluate possible deterrent effects of firearm ownership, possibly due to large variations in firearm-related laws that do not compare to those of the United States.

Weapon-as-Primes/Triggering Hypothesis

The previous hypotheses on the link between firearms and the prevalence of (lethal) violence are mostly grounded in the disciplines of sociology or criminology. The Weapon-as-primes Hypothesis – also known as the Triggering Hypothesis – is grounded in the discipline of psychology. One of the underlying assumptions of the hypotheses discussed so far is that firearms facilitate perpetrators to commit violence. However, the Triggering

Hypothesis states that firearms not only indirectly facilitate violence, but that they have a causal impact on the actions taken by perpetrators. Or, as psychologist Leonard Berkowitz argues: “Guns not only permit violence, but they can also stimulate it as well. The finger pulls the trigger, but the trigger may also be pulling the finger” (Berkowitz, 1968, p. 22).

The underlying assumption of this hypothesis is that our brains connect concepts with each other based on our experiences (Benjamin & Bushman, 2016; Berkowitz, 1990; Todorov & Bargh, 2002). In the context of gun violence, the concept of firearms can be linked in the semantic memory with aggression- or violence-related concepts, due to events that pair both concepts, such as news about public shootings, movies that depict firearm violence, video games or personal experience. In 1967, Berkowitz and LePage published the results of what is considered the first experiment on the so-called weapon effect. The main question that is addressed by Berkowitz and LePage is whether the presence of a weapon increases aggressive thoughts, feelings and possibly behavior. Berkowitz and LePage, and many other researchers after them, have found empirical support for this hypothesis and the weapon-effect is a generally accepted term in modern psychology today (Benjamin et al., 2018). Based on the findings of 78 studies, a meta-analysis concludes that seeing weapons (that includes firearms, knives and other weapons, both pictures and real weapons) activates aggressive thoughts in most participants, which in return can lead to more aggressive behavior (Benjamin et al., 2018).

Consequently, it can be stated that the presence of a firearm might be enough to activate aggressive thoughts, which can lead to aggressive feelings and possibly behavior, meaning that the firearm itself is (one of) the causal mechanism(s) behind the violence committed with it.

Table 2.1: Overview of theoretical approaches to the impact of firearm on prevalence of violence

	Weapon Lethality	Weapon Facilitation	Weapon Substitution	Weapon Deterrence	Weapon- as-Prime/ Triggering
High availability = high prevalence	x	x			x
High availability = low prevalence				x	
No impact of availability of prevalence			x		

Whereas these hypotheses all relate to the question how firearms may impact the prevalence of (lethal) violence, other approaches relate more to the impact of firearms on the nature of violence that occurs. As such, the following hypotheses are not disputing or counterarguing the impact of a firearm on the lethal outcome of a violent encounter, but rather discuss under which circumstances a firearm is more likely to be used.

Adversary Effects Hypothesis

The Adversary Effects Hypothesis rests on the ideas of the Rational Choice Theory (see previous section) and the Social Interactionist Approach. The Social Interactionist Approach to violent crime emphasizes that individual behavior is shaped by social interactions, for example between victims and perpetrators, and the social environment in which it occurs (Felson, 2018; Felson & Tedeschi, 1993). It has been proposed that violence has three main functions within these social interactions: to ensure compliance from the victim, to punish the victim for perceived injustices or for the perpetrator's social status (Berg & Felson, 2019; Felson, 2018). Next to these motives, physical or verbal interactions between victim and perpetrator may determine the use of (certain) types of violence. In other words, violence is purposive.

The Adversary Effects Hypothesis is built on both of the above approaches, arguing that perpetrators (more or less) rationally calculate the adversary's coercive power in relation to their own power and adapt their tactics when engaging in violent conflicts (Felson & Hullenaar, 2021; Felson & Painter-Davis, 2012; Felson & Pare, 2010). Specifically, Felson and Hullenaar (2021) argue that the adversary's perceived power may impact target choice, the intent to kill the adversary to avoid possible retaliation, the use of allies in the conflict and – most relevant to this dissertation – the use of weapons. Specifically, the Adversary Effects Hypothesis holds that the use of a weapon generally and firearm in particular is more likely when the perpetrator perceives weapon use necessary to overpower the adversary, for example to avoid physical resistance during the violent encounter. Thus, the firearm is a tool to equalize or turn disadvantageous power relations into a favorable position for the perpetrator. Furthermore, weapon use is based on a rational calculation of the firearm's additive power to the power balance between perpetrator and adversary. As such, the ideas of the Adversary Effects Hypothesis are closely related to the Weapon Facilitation Hypothesis, which argue that firearms enable perpetrators to commit violence they would not commit without the use of a firearm.

In practice, what follows from this hypothesis is the expectations that firearm use is more likely in violent encounters in which the perpetrator's adversary displays certain characteristics that are threatening to the perpetrator, such as their gender, other personal attributes, a habit of weapon-carrying, a history of retaliations and more (Felson & Hullenaar, 2021; Pelletier & Pizarro, 2019). Empirically, power relations between the perpetrator and adversary are difficult to measure on the level of each violent encounter (Felson & Painter-Davis, 2012). Thus, the few empirical studies that assessed weapon use in the context of the Adversary Effects Hypothesis mainly used victim characteristics as a proxy for the adversary's power, such as their gender (Alzheimer et al., 2019; Felson & Hullenaar, 2021), race (Alzheimer et al., 2019; Felson & Pare, 2010), or criminal propensity of an adversary, e.g. due to affiliation with a gang (Alzheimer et al., 2019). Findings of these studies are generally consistent with the predictions of the Adversary Effects Hypothesis in that perpetrators were more likely to use firearms than no weapons in assaults and homicides when the victim is male or Black (Felson & Hullenaar, 2021; Felson & Pare, 2010). In addition, a disproportionate amount of shots fired were more likely when the

victim also had a weapon, which could have been perceived as a threat by the perpetrator (Alzheimer et al., 2019).

Other empirical studies, although not explicitly empirically testing the Adversary Effects Hypothesis, also support the notion that certain victim characteristics are more likely to be associated with violence committed with a firearm than any other weapon. These studies consistently find that firearm use over no or another type of weapon is more likely when the adversary is male (Fox & Allen, 2014; Libby, 2009), Black (Libby, 2009; Pelletier & Pizarro, 2019) and has an indication for a criminal past (Pelletier & Pizarro, 2019). The age of the victim has not yielded consistent results, with various age groups across studies showing increased risks of being attacked or fatally shot with a firearm (Allen & Fox, 2013; Libby, 2009; Pelletier & Pizarro, 2019).

Overall, although not tested widely, the Adversary Effects Hypothesis finds empirical support in studies in the context of the United States. Like the previous hypotheses, the Adversary Effects Hypothesis has not been applied to empirical contexts outside of the United States so far. The question remains whether certain dynamics proposed in the hypothesis – such as the role of race – are equally applicable elsewhere, or whether those ideas are context-dependent. Equally context-dependent may be the accessibility of firearms which is taken as a given in both theoretical and empirical studies on this hypothesis.

Physical Strength Hypothesis

Closely related to the Adversary Effects Hypothesis is the Physical Strength Hypothesis, as coined by Heide (1993) and implicitly by Wolfgang (1958). The Physical Strength Hypothesis entails that a weapon – and firearm in particular – enable perpetrators with less physical power than their opponent to engage in non-physical violence from a distance. Thus, similar to the Adversary Effects Hypothesis, the firearm is seen as a tool to rebalance power-relations between victim and perpetrator, yet with the Physical Strength Hypothesis, the physical power and the firearm's particular ability to inflict violence from a distance lie at the core of the argument.

To test the Physical Strength Hypothesis empirically, one requires detailed information on the physical strength, such as height and weight, of victim and perpetrator, as well as the decision-making process leading up to weapon use. As such detailed and disaggregated data is rarely available, physical strength has mainly been operationalized through gender- and age-differences between victims and perpetrators. Specifically, Heide (1993) tested the assumptions of the Physical Strength Hypothesis first in the context of parricides, arguing that fathers, due to being male and older, should be more likely to be assaulted or killed with a firearm than mothers and that younger perpetrators should be more likely to use a firearm.

These assumptions are supported in empirical studies: Young perpetrators are more likely to use a firearm to kill their (step)fathers compared to their (step)mothers (Heide, 1993). Furthermore, young perpetrators are more likely to use a firearm compared to their adult counterparts. Similar support for the hypothesis is found in other studies on domestic violence (Heide & Petee, 2007), as well as sexual homicides (Chan & Beauregard, 2016; Chan et al., 2019). Yet, critical voices have pointed out the reliance on ideas of rational

choice, that weapon use in spontaneous violent encounters may be driven by situational availability, rather than a conscious evaluation of the opponent's physical strength (Shon, 2010). In addition, one may question the operationalization of physical strength through gender and age, as physical strength within each gender or age group can vary widely.

Social Distance Hypothesis

The Social Distance Hypothesis is similar to the Adversary Effects and Physical Strength Hypotheses in that it focuses on the question in what circumstances a firearm is used over another type of weapon, or no weapon at all. However, opposed to those hypotheses, Social Distance Hypothesis is not grounded in the paradigm of rational choice, but pure sociology.

Pure sociology, as developed by Donald Black (1979), is a paradigm that does not put the individual, a group or even state as the unit of analysis, but social life and interaction in itself. In this paradigm, social life takes place in a multidimensional space in which the dimensions consist of the extent of social interactions, inequality of resources, the degree of organization of social life, culture and, finally, social control and norms (Black, 1976). Each social interaction can thus be placed across these dimensions in the space. Following this reasoning, violence – as a form of social interaction – may thus take on varying forms, depending on its position within the geometrical space. For example, violent interactions between individuals from different cultures and that hold different norms would show different characteristics than violent interactions between family members who share similar cultural and normative beliefs.

Building on the ideas of pure sociology, Donald Black (1993, 2004) argued that the prevalence and seriousness of retaliatory violence increases with relational and cultural distance between victim and perpetrator. Relational distance relates to familiarity, for example family members, acquaintances, or strangers. Cultural distance refers to the similarity in cultural and moral values, linguistics, religious beliefs and more. The combination of relational and cultural distance is referred to as social distance. Black later applied this idea to weapon lethality (2004), arguing that more lethal weapons are used in retaliatory violence between individuals or groups who are more socially distant to each other. In other words, close friends are more likely to use physical violence, such as their fists, whereas strangers are more likely to use firearms. Initially, Black's arguments focused on violent interactions as a form of social control, such as retaliatory violence; he used mostly anecdotal ethnographic accounts from conflicts from medieval Europe to modern-day tribal societies to support his theory. Cooney (2006) later expanded these ideas to predatory violence – violence committed for the sake of exploitation of a person or for financial gains. Finally, Rennsion and colleagues (2011) brought together the ideas of Black and Cooney, simplifying their assumptions in relation to weapon lethality to the following hypothesis: "Weapon lethality increases as the social distance between offender and victim increases" (p.584).

Empirically, this hypothesis has not received much attention in relation to weapon lethality. Rennsion and colleagues (2010) only found mixed support for their hypothesis that firearm use was more likely in conflicts between socially distant individuals. Other

studies – without intentionally testing the Social Distance Hypothesis – support the notion that firearms are used more often in (lethal) violence between strangers, compared to family members or other acquaintances (Fox & Allen, 2014; Pelletier & Pizarro, 2019; Pizarro et al., 2019; Thomas et al., 2011; Trojan & Krull, 2012). However, the idea that cultural distance between victim and perpetrator – measured through difference in race – determines weapon use has found no support, neither in the study by Rennison and colleagues (2010), nor in other studies empirically examining weapon use and race-dyads (Caines & Brown, 2023; Jacques & Rennison, 2013).

Next to varying degrees of empirical support for the Social Distance Hypothesis, the underlying premises of pure sociology have been embraced by some (Cooney, 2009; Michalski, 2008), as well as criticized harshly by others. Marshall (2008), for example, critiqued Donald Black's demands for a 'pure' sociological paradigm that ignores individual-level psychological aspects. From the perspective of weapon use, one could indeed question whether Black's paradigm of pure sociology can fully capture aspects found to be relevant in explaining weapon-carrying and weapon use, such as individual perceptions of danger and fear (Brennan & Moore, 2009).

Conclusion

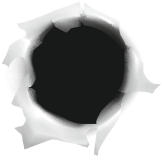
This chapter has reviewed several theoretical approaches to violence, as well as specific hypotheses related to the prevalence and nature of violence committed with firearms. However, the current state of theoretical knowledge is far from satisfactory when confronted with the task of studying firearm violence in Europe. Theories related to violence more generally, as reviewed in the first part of this chapter, rarely embed the modes and means through which violence is produced in their ideas and assumptions. Thus, they answer questions such as *Who commits violence for what reason?* or *When and where is violence most likely to occur?*, but not *Why is violence sometimes committed with a firearm rather than another weapon?*, or *How does the use of a firearm change the nature of violence?* Whilst still relevant and applicable to firearm violence, the firearm itself is not the focus of any of these theories, but rather seen as an interchangeable object.

Specific hypotheses regarding violence perpetrated with firearms have their own caveats. Although relatively few in number, these hypotheses are barely integrated with each other, or theoretically well-developed. On the one hand, this may be due to the difference in paradigms: the Social Distance Hypothesis, for example, builds on the ideas of pure sociology and violent structures, whereas the other hypotheses are more or less implicitly based on ideas of rational choice with a focus on the individual. At the same time, however, there are few explicit connections made to broader theories on violence or violent crime, which could be used as a backbone to integrate these hypotheses. In addition, ideas from these hypotheses may be incorporated in many empirical studies on firearm violence, but rarely explicitly tested. The Adversary Effects Hypothesis, for example, has almost exclusively been tested by the researchers from whom this hypothesis originates (Felson & Hullenaar, 2021; Felson & Painter-Davis, 2012; Felson & Pare, 2010). The hypotheses'

validity for the context for which they were created – firearm violence in the United States – thus remains questionable in some instances.

Another dilemma is the broader generalizability of these hypotheses to other geographical and cultural contexts. All of them have been developed and tested in the context of the United States, which in the context of firearm violence and -availability has been dubbed an outlier when compared to other geographical and socio-political contexts (Hemenway et al., 2002; Killias & Markwalder, 2012). Similar applications of these hypotheses to contexts outside the United States are almost non-existent, which raises questions over the overall validity and generalizability.

The following chapters include empirical observations of firearm violence in the European, and particularly the Dutch, context. Chapter three and five explicitly pick up on the hypotheses presented in this theoretical chapter, to evaluate their useability for explaining relationship between firearms and the prevalence and nature of (lethal) violence in Europe and the Netherlands. The final chapter further includes a broader discussion about the theoretical ideas presented in this chapter in the light of the empirical findings of this dissertation.



Chapter 3



The Relation Between Firearm Availability and Prevalence of (Lethal) Firearm Violence

This chapter is based on Krüsselmann, K., Aarten, P., & Liem, M. (2021). Firearms and violence in Europe – A systematic review. *PloS One*, 16(4), e0248955.



Abstract

Higher availability of firearms has been connected to higher rates of interpersonal violence in previous studies. Yet, those studies have focused mainly on the United States, or used aggregated international data to study firearm violence. Whether those aggregated findings are applicable to understanding the phenomenon in continental Europe specifically remains unclear. The aim of this systematic review is to bring together all studies that exclusively use European data. Nine databases were searched, resulting in more than 1900 individual studies. These studies were assessed on relevance and eligibility for this study, based on their title, abstract and full text. Information on study characteristics, operationalizations of main concepts and study results were extracted from the six eligible studies. Four studies assessed the impact of firearm restrictive regulations on the rate of firearm homicides. Two other studies correlated rates of firearm availability and -violence. Results vary: some studies show a clear decline once availability of firearms is restricted, while others indicate a limited effect on only a very specific subgroup, such as female victims, or national guards with weapons at home. Moreover, studies used various operationalizations for firearm availability, thereby decreasing the comparability of findings. Empirical research exclusively using European data is still lacking. To increase comparability of future studies, methodological inconsistencies and regional gaps need to be overcome. Assessing how firearm availability can be measured with reliable and valid proxies across countries will be a crucial first step to improve future research on the link between firearms and firearm violence.

Introduction

It is estimated that around 7000 people (0.9 per 100.000 population) die of gunshot wounds each year in continental Europe, including suicides, unintentional accidents involving firearms, and criminal homicides (Duquet & Van Alstein, 2015). Although many types of weapons can cause death or bodily harm, firearms are of specific interest when studying violence, due to their high lethality, widespread use on a global scale and value for criminals (Stroebe, 2013). How firearms are linked specifically to violent death has been studied extensively, but existing studies heavily focus on the US context, where more than 12 people per 100.000 population die of gunshot wounds each year (Hoskin, 2001; Monuteaux et al., 2015). Most research to date focuses on the firearm availability hypothesis, which assumes that an increase in firearm availability leads to an increase in violent crime (Anglemyer et al., 2014; Hepburn & Hemenway, 2004; Zimring, 1967). Yet, even with these existing studies, as causal links between the prevalence of firearms and violence remain unclear, heated discussions on the connection between the two phenomena continue both in academia and beyond (Pierre, 2019)

The question arises whether findings from US-based studies are applicable to other global regions, such as Europe, given variations in existing gun cultures and firearm legislations. In contrast to the US, where the right to own firearms is implemented in the Constitution under the Second Amendment, European countries have strict regulations that mostly ban civilians from bearing guns, with only few exceptions. Member states of the European Union follow the same framework of regulations regarding civilian access to firearms, which leaves room for proportionate national variations between the member states (Eigel, 1995; Kirst, 2019). Such national variations between member states seem irreconcilable, given the difference in gun culture not just on a global scale, but also amongst European countries, as exemplified by the challenging approval of the 2017 Firearm Directive in the European Council in which Poland and the Czech Republic voted against the amendment for being too strict, whereas Luxembourg wished for harsher restrictions (Kirst, 2019). In addition, Europe does not only differ significantly from the US in terms of existing gun cultures and firearms legislation (Squires, 2012), but also in terms of other cultural and socio-economic factors, such as the overall crime rate or levels of inequality (Elgar & Aitken, 2011). Such factors have been found to act as moderators in violent crime rates (Aebi & Linde, 2010; Wolf et al., 2014). As these factors vary across countries, the validity of findings from US studies for the European context could be questioned. Therefore, a review of empirical studies testing a potential link exclusively based on European data is required.

With this systematic review, we aim to inspect existing studies that empirically examine the link between firearm availability and firearm-enabled interpersonal violence in Europe, since such an assessment does not yet exist to the best of our knowledge. To increase comparability of studies and their findings, we focus particularly on criminal forms of interpersonal violence, thus excluding firearm-enabled suicides or accidental fatal and non-fatal injuries. With the findings of our study, we seek to inform researchers, practitioners and policymakers in the domains of public health and criminal justice about

the current state of knowledge regarding the association between firearm availability and violence. Furthermore, we aim to identify the lacunae of knowledge and the methodological challenges which can be addressed by future research.

Methods

This study made use of PRISMA guidelines for conducting systematic review (Moher et al., 2009).

Eligibility Criteria

For this systematic review, we included studies that empirically examined a potential link between firearm availability and firearm enabled crimes, including homicide, non-fatal assaults or robberies. Studies that focused on the relationship between firearm enabled crimes and other factors, such as mental illness, but included a measurement for firearm availability were eligible as well. We excluded non-criminal forms of violence, such as suicide by gunshot or accidental shootings as we expected that those forms of violence could have underlying explanatory variables that are different to criminal forms of violence and should therefore be studied separately. Furthermore, we excluded studies that did not examine the link between measurements of those two main concepts in a statistical manner to eliminate potential subjectivity from our synthesis of findings. Studies that did not explicitly differentiate firearms from other types of weapons (e.g. knives) were also excluded to enhance comparability of the eligible studies, but when a clear differentiation was provided, we included the studies.

Concerning our geographical focus, we only included studies that are based on continental Europe (excluding Turkey and Russia, which are countries situated on two continents). US-based studies and studies that combined data from non-European and European origin, which inhibited us to assess data sources independently, were not further examined. When we were able to isolate the results of European data from non-European data, we included the studies.

All studies published after 1991 were selected, as 1991 marks the year the first European directive in firearm acquisition and possession was introduced in the European Union (European Council of the European Union, 1991). This cut-off was chosen as it can be expected that most countries on the European continent would have been following similar definitions of and regulations for firearm restrictions since then. Our expectations were that this directive might have led to empirical cross-national studies relevant for this research. Studies were excluded when they were published before 1991 or when they used data only from years before 1991. Included studies had to be written in English, German or Dutch, due to the researchers' capabilities of understanding those languages.

Data Sources

Peer-reviewed academic articles, books, book chapters, and (unpublished) doctoral dissertations were included. We searched seven databases that cover academic studies in the relevant disciplines of public health, sociology and criminology: Criminal Justice Abstracts, Embase, MedLine, PsyInfo, PubMed, Sociological Abstracts and Web of Science. In addition, we searched ProQuest and EThOS for relevant (unpublished) doctoral dissertations. If results from a dissertation were also published in the form of an academic article, the latter was chosen. Additional records were found by searching the bibliographies of relevant studies. To overcome the danger of publication bias, we emailed relevant researchers in the field and conducted a web search using Google and Google Scholar search engines on 21 April 2020 to find grey literature, such as research reports. The results of those searches were filtered based on the eligibility criteria.

Search Process

The search queries used to find relevant studies include terms concerning firearms, their prevalence, and firearm violence. Previous published systematic reviews on firearm availability in the non-European context served as an inspiration for the chosen search terms (Anglemyer et al., 2014; Stroebe, 2013). In particular, three specific search queries were used in each of the nine databases:

- firearm AND availability AND violen*
- (firearm OR gun) AND (availability OR access) AND (violen* OR homicide)
- (firearm OR gun) AND (availability OR access) AND (violen* OR crim*)

Study Selection

Databases were searched between February and April 2020, using the three search queries. As shown in Fig 1, a total of 8,179 studies in the nine databases were found and reduced to 238 studies by elimination of duplicates and screening of titles and abstracts on relevance. The full texts of the remaining 238 studies were assessed on relevance using the eligibility criteria. Authors of studies missing full text were emailed with the question to provide full access to their study, resulting in ten additional studies that were included in the assessment. For 23 studies, the author did not respond, or no contact details were available or found online. In total, 232 studies were excluded during that process because they missed full-text (n=23), discussed irrelevant topics (n=14), did not focus exclusively on Europe (n=107), missed empirical data (n=45), or data measuring either firearm-enabled crimes (n=13) or firearm availability (n=30). As a result, six studies were included in the synthesis of results for this systematic review (Figure 3.1).

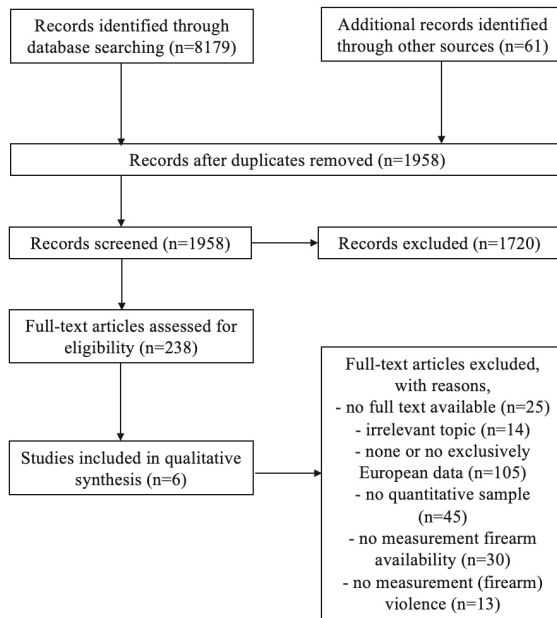


Figure 3.1: Flow chart of systematic search

The quality of each eligible study was assessed based on six factors which have been used in a previous, similar systematic review about firearm laws and firearm homicides in the US (Lee et al., 2017). Next to the study design, the authors of that review evaluated studies based on five additional measurements:

- (1) Were appropriate data source(s) and outcomemeasure(s) used for the study question?
- (2) Was the time frame studied adequate (eg, sufficient surveillance before and after a law)?
- (3) Were appropriate statistical tests used?
- (4) Were the results robust to variations in the variables and analyses?
- (5) Were the disaggregated data and results of control variables consistent with the literature?" (Lee et al., 2017, p.108).

A study's quality was qualified as *good* when they scored high on all those elements, and as *fair* when they scored high on three to four of the factors. Studies were considered *poor* if they scored on only two or less factors. We have followed the same quality assessment.

Results

Study Characteristics

In total, only six studies remained eligible for this study. The background information on each of those studies can be found in Table 3.1.

Table 3.1: Characteristics of Included Studies, including study locations, time frame studied, study design, sample, quality and type of study

Study	Location	Time Frame	Self-reported Study Design & Sample	Quality Assessment	Type
Duquet & van Alstein (2015) 'Firearms and violent death in Europe'	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, FYR Macedonia, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, United Kingdom	2007	Cross-sectional correlational design; 33 European Nations	Fair	Report
Gjertsen et al. (2014) 'Mixed impact of firearms restrictions on fatal firearm injuries in males: a national observational study'	Norway	1969-2009	Cross-sectional time series design; 434 cases of male accidental and homicidal deaths caused by firearms	Fair	Journal Article
Hurka & Knill (2018) 'Does regulation matter? A cross-national analysis of the impact of gun policies on homicide and suicide rates'	Austria, Belgium, England and Wales, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland	1980-2010	Cross-sectional time series design; 16 West European Nations	Good	Journal Article
Kapusta et al. (2007) 'Firearm legislation reform in the European Union: impact on firearm availability, firearm suicide and homicide rates in Austria'	Austria	1985-2005	Longitudinal time series design; Firearm homicide rate 1985-2005	Fair	Journal Article

Table 3.1: Continued

Study	Location	Time Frame	Self-reported Study Design & Sample	Quality Assessment	Type
Killias & Haas (2002) 'The role of weapons in violent acts: Some results of a Swiss national cohort study'	Switzerland	1997	Cross-sectional correlational design, 21.315 surveys by Swiss male soldiers	Fair	Journal Article
König et al. (2018) 'Austrian firearm legislation and its effects on suicide and homicide mortality: A natural quasi-experiment amidst the global economic crisis'	Austria	1985-2016	Cross-sectional time series design; firearm homicide rate 1985-2016	Fair	Journal Article

Five studies were published in peer-reviewed journals (Gjertsen et al., 2014; Hurka & Knill, 2020; Kapusta et al., 2007; Killias & Haas, 2002; König et al., 2018) and one report was published by researchers associated with the Flemish Peace Institute in Belgium (Duquet & Van Alstein, 2015). Two studies were published between 2000 and 2010 (Kapusta et al., 2007; Killias & Haas, 2002). Four studies were published between 2010 and 2020 (Duquet & Van Alstein, 2015; Gjertsen et al., 2014; Hurka & Knill, 2020; König et al., 2018). Four of the six studies limit their research to examining the link between access to firearms and firearm-enabled violence to one country (Gjertsen et al., 2014; Kapusta et al., 2007; Killias & Haas, 2002; König et al., 2018). Those studies originate from Austria (n=2) (Kapusta et al., 2007; König et al., 2018), Norway (n=1) (Gjertsen et al., 2014) and Switzerland (n=1) (Killias & Haas, 2002). The other studies include data from 16 (Hurka & Knill, 2020) up to 33 countries (Duquet & Van Alstein, 2015). Four studies use non-aggregated data (Gjertsen et al., 2014; Kapusta et al., 2007; Killias & Haas, 2002; König et al., 2018), whereas the two other studies rely on aggregated data from the national level, namely national homicide rates (Duquet & Van Alstein, 2015; Hurka & Knill, 2020). All studies have scored as either fair or good in the study quality assessment.

Outcomes

An overview of the operationalizations used for firearm availability and violence, as well as the outcomes of each of the studies can be found in Table 3.2. The outcomes are presented in three subsections: results from national studies on the impact of firearm legislation of -violence, cross-national studies regarding such an impact and correlational studies.

Table 3.2: Study design, level of analysis, operationalizations for gun violence and availability and outcome of included studies.

Study	Study Design	Level of Analysis	Operationalization (Gun Violence)	Operationalization (Gun Availability)	Outcome
Duquet & van Alstein (2015)	Cross-sectional, correlational analysis	Cross-National, aggregated data	Gun related homicide according to WHO codes	Civilian firearm ownership rate	The higher the availability of firearms, the more women are killed by firearms; other relationships statistically insignificant
Gjertsen et al. (2014)	Cross-sectional time series analysis	National, non-aggregated data	Accidental + homicide firearm related deaths according to WHO codes	Firearm restricting regulations	Removing firearms from private homes of National Guards associated with reduced firearm homicides
Hurka & Knill (2018)	Cross-sectional time series analysis	Cross-National, aggregated data	Gun related homicide according to WHO codes	Firearm restricting regulations	Stricter firearm policies associated with less firearm- and non-firearm homicides
Kapusta et al. (2007)	Cross-sectional time series analysis	National, non-aggregated data	Gun related homicides	Number of firearm licences	Stricter firearm policies is associated with a decrease of firearm licenses and gun homicides in Austria
Killias & Haas (2002)	Cross-sectional multivariate regression analysis	National, non-aggregated data	Self-reported purposeful infliction of injury to another person	Number of handguns owned; Number of rifles owned; Frequency of carrying a weapon	Both owning and carrying a firearm increased the risk of injuring another person intentionally.
König et al. (2018)	Cross-sectional time series analysis	National, non-aggregated data	Gun related homicides	Number of firearm licences	Stricter firearm policies is associated with a decrease of firearm licenses and gun homicides in Austria

National Studies on the Impact of Firearm Legislation on Violence

Of the six included studies, four discuss the impact of legislations that restrict or limit the access to firearms on firearm-related violence on a national level (Gjertsen et al., 2014; Kapusta et al., 2007; Killias & Haas, 2002; König et al., 2018). Two studies (Kapusta et al., 2007; König et al., 2018) assess the impact of a singular law: a 1997 law adapted in Austria, that introduced stricter controlling mechanisms, such as background checks and mental health checks, the process of obtaining a firearm, as well as safe storage regulations. Both studies use official statistics as data sources and operationalize the measurements of availability of firearms and firearm-enabled violence using the same proxies: number of licenses for firearms and homicide by gunshot respectively. Consequently, the outcome of the studies regarding the impact of the law after 1997 on national firearm homicide rates are similar: both studies report a decline of firearm homicides post-regulation ranging from 9,6% (König et al., 2018) for the period of 1998 to 2008 to 9,9% (Kapusta et al., 2007) between 1998 and 2005. The change in rates is statistically significant in both of the studies. Additionally, König et al. (2018) examine the percentage of firearm enabled homicides in relation to the total number of homicides and found a decrease from 9% in 1998 to 2,6% in 2008. After 2008, the authors see the decline reversed into an increase of firearm homicides. They ascribe this rise to the economic crisis, which in turn led to an influx of migrants and an increase of issues of firearm licenses. Kapusta and colleagues (2007) also report a decline in firearm licenses after 1998. As none of the confounding variables used in both studies – unemployment rate, alcohol consumption and proportion of young men – show any significant effects, authors of these two studies cautiously provide support for the theory that higher availability of firearms is connected to increased violence.

Gjertsen et al. (2014) examine the impact of four different singular laws in Norway that were implemented between 1986 until 2003, aimed at regulating access to firearms by implementing new tests for hunters, permissions by police as a requirement for obtaining a shotgun, safe storage regulations and the removal of military firearms from private homes. Because of a low incidence of female victims in relation to firearm deaths, the authors examined only male firearm deaths (N=276) between 1969 and 2009. The only significant findings in relation to firearm homicides are found after the implementation of the latest firearm restricting regulation in 2003, that removed military firearms from private homes. After the implementation of the regulation, firearm homicides decreased by 64%. Rates of non-firearm homicides show no significant changes in the same period. The authors warn that their findings should not be overinterpreted, as the law under investigation targeted a very specific subgroup of Norwegian National Guards storing their weapons at home, and other factors not included in the analysis, such as changes in perceptions and behaviour regarding gun safety could have had an additional effect on fatal firearm violence in Norway.

Cross-National Study on the Impact of Firearm Legislation on Violence

Hurka and Knill (2020) assess a potential impact of firearm regulations regarding availability and firearm enabled violence. They examine firearm homicide in 16 Western European countries over a timespan of thirty years. In contrast with the previously discussed studies, Hurka and Knill (2020) created an index to assess the level of restrictiveness in firearm regulations across the 16 countries included in the sample, thereby using an aggregated measure of firearm control policies, rather than assessments of individual regulations. Through a cross-sectional time-series analysis, the authors conclude that the higher the level of restrictiveness regarding firearm control, the fewer firearm and non-firearm enabled homicides take place. They further specify that a difference of one value on their firearm control index (ranging from one to three) makes a difference of 0.2 homicides per 100.000 citizens a year. The control variables unemployment and urban population showed an increasing (0.01) and decreasing (-0.0) effect on firearm homicides respectively. Finally, they not only conclude that more restrictive firearm policies are associated with fewer homicides committed with firearms, but also that it is not likely that potential homicide offenders would switch to a different kind of weapon, given that stricter gun policies also appeared to have a decreasing effect on the overall homicide rate.

(Cross-)National Correlational Study

The remaining studies that fit our eligibility criteria do not assess the impact of firearm regulations but use a proxy for firearm availability to assess its effect on firearm-enabled violence using correlational analyses. Duquet and van Alstein (2015) include data from 2007 for a broad sample of 33 European nations. Data on firearm homicides are derived from the WHO's Detailed Mortality Database, whereas estimates for civilian firearm ownership from the Small Arms Survey serve as a proxy for firearm availability. The correlational analysis between civilian firearm ownership and firearm homicides reveals a moderate positive, yet statistically insignificant, relationship – both for firearm homicides and the overall homicide rate. Only when distinguishing between gender of firearm homicide victims, a significant moderate relation exists, suggesting that the greater the availability of firearms, the more women are killed by firearms within the countries under study. The authors (2015) suggest that this shows a specific effect of firearm availability on fatal domestic violence. Other explanatory variables that could affect firearm homicides were not included in the analysis.

Killias and Haas (2002), on the other hand, used confidential survey responses from a Swiss sample of male army recruits to assess whether owning a handgun or rifle, and carrying a weapon on a regular basis had an impact on committing a violent act against another person. The descriptive results indicate that participants in the survey who own a handgun have injured (10,7%) and shot at other people (4,4%) more often than non-owners of handguns (2,1%; 0%). Logistic regression analysis further supports the hypothesis that an increased number of handguns owned significantly increases the likelihood of inflicting injury on someone else intentionally (OR=1,024). Analyses also reveal that every additional handgun owned raises the risk for violent incidents by 60 percent. Again, similar to previous studies presented in this review, the authors suggest that restricting access to firearms might lead to an overall decrease of violence committed with this type of weapon.

Conclusion and Discussion

This systematic review sought to assess all studies that statistically examine a potential link between the prevalence and availability of firearms with criminal forms of violence committed with firearms. A search of nine relevant databases revealed six studies that matched all eligibility criteria for this review. Four of these studies examined the impact of firearm-restricting regulations on the rate of firearm homicides, and two others used proxies for firearm availability to conduct correlational analyses with rates of firearm and non-firearm homicides.

Findings differ: whereas a firearm restricting regulation in Austria was associated with a decrease of almost 10 percent in firearm homicides in the following 10 years (Kapusta et al., 2007; König et al., 2018), Norwegian scholars concluded that similar laws had little to no significant effect on a specific target group of male National Guards who stored their firearms at home (Gjertsen et al., 2014). Hurka and Knill's (2020) comparative analysis of Western European nations show that more restrictive regulations concurred with less firearm homicides, as well as a lower homicide rate overall. In a correlational study, Duquet and van Alstein (2015) found no significant correlations between those two variables, except for female victims with fatal gunshot wounds. Similar results were found by Killias et al. (2001) who sought to correlate homicide data with ownership rates of firearms from European and other nations. Yet, the study by Killias and Haas (2002) reveal that owning a handgun significantly increases the risk of committing violent offences. Even more so, their data show that owning several handguns further elevates the risk by 60 percent per handgun owned.

One explanation for these varying results lies in the lack of comparability between the studies. International frameworks for firearm legislations, such as the firearm directives set out by the European Union (2017), do exist. However, differences in implementations of those regulations on a national level, as well as cultural- and socio-economic backgrounds with regards to the use of firearms and crime in general lead to incongruent legislations across nations in Europe (Hellenbach et al., 2018). Another factor inhibiting the comparability of these studies is the range of operationalizations for availability of firearms. Even though various firearm directives by the EU encouraged all Member States to file and register civilian firearm ownership, European nations do not have identical systems to register legal firearm possession by civilians (European Commission Directorate-General for Enterprise and Industry, 2014). Moreover, in cases where reliable national registers exist, the prevalence of illegal firearms is not accounted for. Therefore, cross-national studies have diverted to using different proxies for firearm ownership and availability, such as survey data from the International Crime Victims Survey (Killias et al., 2001; Stevens et al., 2011; Van Kesteren, 2014), firearm suicide rates (Hemenway et al., 2002; Lester, 1991), accidental firearm death rates (Lester, 1988, 1991), or the often-cited Cook's Index, which uses the average of the percentages of US suicides and homicides committed with firearms to estimate levels of ownership (Cook, 1979; Killias, 1993). In the two cross-national correlational studies included in this systematic review, three different proxies for firearm availability were used: accidental firearms deaths, suicides by gunshot

and rate of civilian firearm ownership as reported by the Small Arms Survey, which in turn is based on multiple sources such as national registries, population surveys and expert estimates (Karp, 2018). Although these three proxies have been used by previous published studies, it should nonetheless be noted that the validity of many proxies for firearm prevalence has been questioned due to limitations of each proxy (for an overview, see Kleck, 2004). As such measurement biases might have impacted the results, they need to be considered, especially when these studies are used by policymakers and practitioners to address the public health issue of firearm-related violence.

Overall, this systematic review highlights a lack of available studies based exclusively on European data. That is, however, not to say that the link between firearm prevalence and firearm violence has not been addressed in academic literature at all. There are number of widely cited cross-national correlational studies that include European data (Alzheimer & Boswell, 2012; Bangalore & Messerli, 2013; Hemenway & Miller, 2000; Hemenway et al., 2002; Killias, 1993; Killias et al., 2001; Van Kesteren, 2014). Yet, those studies also include data from other non-European nations, often the US, Canada, Japan or Australia, in their statistical correlational analysis, which makes it impossible to reveal findings based on European data only. Data from other included non-European countries might influence the overall results, considering cross-national large differences in firearm legislations and gun cultures (Kleck, 2004). Moreover, these studies show similar methodological weaknesses in terms of operationalizations and a lack of control for other factors influencing homicide rates (Hepburn & Hemenway, 2004; Stroebe, 2013). Based on this assessment, a systematic review including these cross-national studies with non-European data would encounter similar limitations regarding comparability of studies.

Nonetheless, a few results from relevant global studies should be discussed, in particular in relation to the findings of the six included studies. Similar to results presented in Duquet and van Alstein's (2015) study, Killias and colleagues (2001) found a strong positive correlation between firearm availability – operationalized as gun ownership according to the international victimization survey – and female gun homicide victimization, even when outliers are removed (Estonia, Malta, USA). In addition, both studies found no such significant correlation between firearm availability and male firearm homicide victimization (Duquet & Van Alstein, 2015; Killias et al., 2001). Other global studies have not differentiated between the gender of the victims of gun violence. Moreover, similar to the European findings discussed above, global studies show no conclusive, but varying results, ranging from no significant (Killias et al., 2001), to positive (Van Kesteren, 2014) as well as negative correlational (Konty & Schaefer, 2012) links between firearm availability and violent death by firearms. Although we have not conducted a systematic review of all global studies investigating the link between firearm availability and firearm violence, these varying results in the European context and beyond underline the importance of conducting in-depth, rigorous research that also include other factors relating to socio-economic and cultural factors that determine the context in which firearm violence takes place.

Next to international studies using non-European data, the findings of this systematic review can be complemented with other studies addressing the link between firearms and violence with a descriptive non-statistical approach. In doing so, several studies have

linked an increase of (mostly illegal) firearms on the national level to an increase of firearm homicides or other types of crimes (Khoshnood, 2018; Sturup et al., 2019). In Sweden, for example, the percentage of firearm homicides in relation to other homicides has increased significantly, and a number of Swedish researchers have associated this increase with the rise of motorcycle- and other types of gangs who not only commit the crime, but also bring more weapons into the country (Khoshnood, 2018, 2019; Sturup et al., 2018). In Switzerland, on the other hand, many firearm homicides take place in the private home in the context of domestic disputes. Killias and Markwalder relate this trend to a Swiss law that allowed (former) soldiers to keep their weapons after service at home (Killias & Markwalder, 2012). Unfortunately, a small sample size did not allow the researchers to assess whether changes to the size of the army and therefore number of guns stored in private homes affected the homicide rate.

Even though such descriptive studies offer valuable insights into the context in which firearm violence takes place, they cannot sufficiently address the lack of insights into the association between firearm prevalence and – victimization. The main finding of our systematic review regarding firearm availability and – interpersonal violence in Europe is that empirical studies are still rare and existing studies lack comparability due to both a national focus and to variations in measurements of firearm availability. Future empirical research should not only address this research gap but should also critically engage with the identified methodological difficulties, for example by evaluating various proxies and their reliability for measuring firearm availability based on European data. Moreover, future research should overcome some of the limitations of this systematic review. For example, we could only include studies that were published in English, German or Dutch. We cannot rule out that there are studies in other languages that would have been relevant for this review. Another limitation concerns the indirect publication bias present in this systematic review, as we only included published studies. To address this issue, we decided to include grey literature as well. Future research examining the link between firearm availability and violence should further pay specific attention to Eastern-European countries, which are now grossly underreported, as well as to types of violence other than homicide, such as non-fatal assaults, or robberies. More specifically, such research would benefit from addressing the methodological shortcomings of existing research by empirically testing the assumption that availability of firearms is associated with forms of firearm violence rather than relying on descriptive statistics. Furthermore, they can take socio-economic and cultural factors into account. In addition, an empirical examination of the validity of proxies used to measure firearm availability, following the example of Cook's index (Cook, 1979), could form the basis for above proposed empirical research and also increase comparability across studies. Only if those challenges and gaps are addressed will future studies become more comparable and valuable for public health and criminal justice researchers, policymakers and practitioners alike.

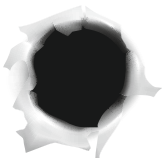




Chapter 4

The Nature and Prevalence of Firearm Homicides in Europe

This chapter is based on Krüsselmann, K., Aarten, P., Granath, S., Kivivuori, J., Markwalder, N., Suonpää, K., Thomsen, A.H., Walser, S., & Liem, M. (2023). Firearm Homicides in Europe: A Comparison with Non-Firearm Homicides in Five European Countries, *Global Crime*, 24(2), pp.145-167



Abstract

Detailed, comparative research on firearm violence in Europe is rare. Using data from the European Homicide Monitor, this paper presents the prevalence and characteristics of firearm homicides in Denmark, Finland, the Netherlands, Sweden and Switzerland between 2001 and 2016. Furthermore, we compare firearm to non-firearm homicides to assess the degree of uniqueness of firearms as *modus operandi*. We find that the firearm homicide rate varies across our sample of countries. We also identify two country profiles: in Denmark, the Netherlands and Sweden, most firearm homicides take place in public and urban areas, involving male victims and perpetrators. In these countries, the use of firearms in homicides is largely concentrated in the criminal milieu. In Finland and Switzerland, firearms are mostly used in domestic homicides, with a higher share of female victims. We explore these findings in relation to firearm availability in each country.

Introduction

Continental European countries experience a relatively low rate of firearm homicide (0.3 per 100.000 population) compared with the global average (3.1 per 100.000 population) (United Nations Office on Drugs and Crime, 2019) and other global areas such as the Americas (13.2 per 100.000 population), Africa (3.1 per 100.000 population), with rates close to Asia (0.6 per 100.000 population), and somewhat higher than in Oceania (0.1 per 100.000 population)⁴ (United Nations Office on Drugs and Crime, 2022). It is possibly due to those low rates that firearm homicides have received relatively little scholarly attention in Europe – a region with a strong record of homicide research (Eisner, 2001; Getoš Kalac & Liem, 2021; Kivivuori et al., 2022; Kivivuori et al., 2014). Yet, the use of weapons, and specifically firearms, has only been touched tangentially, for example to explain differences in homicide clearance rates (Granath & Sturup, 2018; Liem et al., 2019), in the context of firearms trafficking (Savona & Mancuso, 2017), or levels of homicides in relation to firearm ownership (Killias, 1993; Killias & Markwalder, 2012; Lester, 1991).

As a result, there is a lacuna of information, specifically concerning the characteristics of firearm homicides. In addition, there are two main shortcomings of existing studies: First, the few existing European studies mainly focus only on one particular national context (Frei et al., 2006; Solarino et al., 2007; Sturup et al., 2018). Due to varying data sources and definitions, such studies are often not comparable cross-nationally (Krüsselmann et al., 2021). Second, so far, European studies on firearms have mostly used aggregated data, whilst previous studies have shown that disaggregating homicide can provide invaluable insights to understand broader (counter-) trends of homicides (P. G. Aarten & M. C. Liem, 2023; Aebi & Linde, 2014; Caman et al., 2017; Stamatel, 2018; Suonpää et al., 2024). Up until now, no empirical study with a focus on Europe specifically, has collected detailed and comparable empirical firearm homicide data.

In this study, the aim is to examine and compare the prevalence and characteristics of firearm homicides with non-firearm homicides in Europe. For academic purposes, this study can form the empirical basis for further work on firearm violence in Europe. Such an empirical basis is needed to extent our knowledge beyond the United States; for future studies that test the applicability of theoretical approaches to firearm violence developed in the United States to other geographical, societal, and political contexts, such as Europe. From a policy perspective, an empirical basis is necessary for informed, evidence-based interventions against firearm violence, particularly in the light of the emergence of new potential security threats related to weapons, such as 3D printed (components of) firearms (Florquin, 2021). This study will address these demands by presenting the trends and

⁴ Based on judicial data, the UNODC database on homicide per mechanism does not include data on all countries, e.g. the firearm homicide rate for Africa is based only on entries for only eleven countries. Rates are calculated using the last available rate for firearm homicides (2016 for most countries), <https://dataunodc.un.org/data/homicide/Homicide%20rate%20by%20mechanisms>

characteristics of firearm homicides in five European countries (Denmark, Finland, the Netherlands, Sweden and Switzerland) and by comparing them to non-firearm homicides.

In the following sections, prior research on firearm homicides in Europe is addressed and the context of this research – specifically the homicide rate and firearm availability – laid out. In the methodology, the data sources, definitions, and types of analyses are discussed before presenting the findings. In the final section, we draw comparative conclusions based on our findings and discuss them in relation to firearm availability.

Prior Research on Firearm Homicides in Europe

For most European countries, annual counts of firearm homicides are available through various international databases (Rogers & Pridemore, 2023). For example, the WHO Mortality Database reports on cause-of-death statistics, including firearm homicides and -suicides (World Health Organization, 2022). Similarly, the UNODC differentiates between homicides committed with firearms, sharp objects and other mechanisms. Based on these data sources, it is estimated that between 1000 and 1500 individuals are killed with a firearm in Europe each year, equaling a firearm homicide rate of around 0.3 per 100.000 population (United Nations Office on Drugs and Crime, 2022). Yet, significant differences exist when comparing firearm homicide rates across European countries, with several countries reporting a rate equal to or lower than 0.1 per 100.000 population (e.g. Poland, Germany, or Spain), whilst others have firearm homicide rates four (e.g. in Bosnia or Sweden) to 15 times (Albania) higher (United Nations Office on Drugs and Crime, 2022). What is similar across almost all European countries, however, is that the firearm homicide rate has been steadily declining or stagnating since the 1990s, as indicated by a comparative study of WHO data (Duquet & Vanden Auweele, 2021), including in Switzerland (Killias & Markwalder, 2012), Serbia (Rancic et al., 2013), and Denmark (Thomsen et al., 2021). An exception is Sweden, where the firearm homicide rate has more than doubled since 2000 (0.2 per 100.000 population; Duquet & Vanden Auweele, 2021). With this increase, the Swedish firearm homicide rate in 2019 (0.44 per 100.000 population) remains above the European average, yet well below some other European countries (Hradilova Selin, 2021).

The same international data sources provide little information about the victims of firearm homicides. This information is mainly found in national studies. A common finding is that most firearm homicide victims are men. The proportion of male victims varies between 70 percent in Denmark (Thomsen et al., 2021) to around 80 percent in Sweden (Granath, 2015). Sturup and colleagues (2019) note that male firearm homicide victimization in Sweden increased between the 1990s and 2015, particularly for younger men aged 15 to 29; this age group is shot (both lethally and non-lethally) four times as often as victims aged 30 or older in recent years. This increase of lethal gun violence amongst men may also be the driving force behind the overall increase of the national firearm homicide rate.

Most firearm homicides involve male perpetrators. For example, in Italy (Preti & Macciò, 2011) and Denmark (Thomsen et al., 2021), around nine out of ten firearm homicide

perpetrators are male. Other studies show that the share of male firearm homicide perpetrators is higher compared to female firearm homicide perpetrators (Trägårdh et al., 2016) and overall homicide perpetrators (Granath & Sturup, 2018; Khoshnood et al., 2023). Through latent class analysis of (almost) lethal firearm violence perpetrators in Sweden, Khoshnood and colleagues (2023) show that perpetrators tend to be young, in their late 20s, socially deprived, and with prior convictions for violent or property crimes.

When firearms are discussed in homicide studies, it is often in relation to the context in which they are used as a weapon to kill. Prior studies in Switzerland (Killias & Markwalder, 2012), the Netherlands (Liem et al., 2013) and Sweden (Gerell et al., 2021; Khoshnood, 2017) showed that firearms are mostly used in criminal milieu homicides. Similarly, in Denmark, most recent firearm homicides are perpetrated in the criminal milieu context, since domestic homicides committed with hunting weapons have declined rapidly since the 1990s (Thomsen et al., 2021). In Scotland, on the other hand, firearms are used predominantly in rivalry homicides, which are motivated by disputes amongst – often young – men (Skott, 2019).

Existing studies illustrate the fragmented landscape of data on firearm homicides – or firearm-perpetrated violence in general – in the European context. Generally, studies rarely disaggregate by homicide mechanism, obstructing conclusions about firearm homicides specifically. The findings derived from national studies hint at slight differences across countries with regards to the use of firearms in lethal violence. Yet, no study so far has used comparable, detailed data sources to not only report on the prevalence of firearm homicides, but also the nature of such homicides across several European countries.

Aim of This Study

This study aims to explore the prevalence, trends and characteristics of firearm homicides, making use of detailed and comparable homicide data of five European countries: Denmark, Finland, the Netherlands, Sweden and Switzerland for the years 2001 to 2016. We present the firearm homicide rate and characteristics of incidents, victims and offenders, compared to non-firearm homicides. Finally, we will discuss the findings in relation to firearm availability and their academic and policy implications.

Research Context

The aim of this research demands the use of detailed homicide data disaggregated by *modus operandi*. In the individual national contexts conducive environments for the (illegal) use of firearms in violence need to be considered, such as the presence of criminal groups or gangs, hunting cultures or the levels of firearms trafficking (Florquin, 2021). In this cross-national comparative approach, firearm homicide rates and characteristics are discussed in relation to the overall homicide rate, as well as the availability of firearms.

All homicide rates of the included countries fall well below the global homicide rate (5.61 per 100.000 population) as well as the European rate (2.56; United Nations Office on Drugs and Crime, 2019). Based on homicide data from the European Homicide Monitor and

population sizes as calculated by Eurostat (2022), Finland and Sweden record the highest homicide rate, with 1.35 and 1.02 homicides per 100.000 population in 2016, followed by Denmark with 0.93 homicides. Significantly lower homicides rates are reported by the Netherlands (0.54 per 100.000 population in 2016) and Switzerland (0.33 per 100.000 population in 2014) (see Table 4.1).

A common predictor of firearm homicide is firearm availability – a concept difficult to measure. Previous studies have used various proxies, including firearm suicides (Hemenway et al., 2002; Lester, 1991), a combination of firearm suicides and firearm homicides, also known as Cook's index (Cook, 1979; Killias, 1993), or data from the International Crime Victim Survey (Killias et al., 2001; Van Kesteren, 2014). In 2018, the Small Arms Survey published a report with an estimation for civilian firearm holdings in the world for the year 2017 (Karp, 2018). This estimation is based on legal firearm ownership, estimations of illegal firearm ownership, survey data, firearm seizure statistics, and expert estimations. According to the Small Arms Survey's estimations, the overall estimated firearm ownership in Finland (32.4 firearms per 100 individuals), Switzerland (27.6 firearms) and Sweden (23.1 firearms) is relatively higher than in the other two countries (see 4.1). One explanation for this high (legal and overall) ownership rate is the presence of a hunting culture in both Finland as well as in Sweden (Junuzovic et al., 2019; Mattila et al., 2006). On the other hand, the widespread availability of firearms in Swiss civilian households can be linked to mandatory military service, which requires young men to store their army weapon at home (Ajdacic-Gross et al., 2010; Liem et al., 2011). Furthermore, after the end of conscription, firearms may be bought for a small fee and kept in private possession. Denmark and the Netherlands report significantly lower rates of firearm ownership with 9.9 and 2.6 firearms per 100 population respectively. Interestingly, in the Netherlands, the estimated number of available firearms is more than two times higher than the legally registered number of firearms, meaning that there are more illegal than legally registered firearms in the country (Karp, 2018).

Table 4.1: Homicide rate per 100.000 population (2016), number of legally registered and overall estimated firearms per 100 population (2017) in Denmark, Finland, the Netherlands, Sweden and Switzerland

	Denmark	Finland	Netherlands	Sweden	Switzerland
Homicide Rate ^a	0.93	1.35	0.54	1.02	0.33
Firearm homicide rate ^a	0.19	0.16	0.16	0.3	0.07
Registered civilian firearms per 100 individuals ^b	6	27.8	1.2	19.7	9.4
Estimated civilian firearms per 100 individuals ^{b,c}	9.9	32.4	2.6	23.1	27.6

^a Source: European Homicide Monitor, (firearm) homicide rate Switzerland for 2014

^b Source: Karp, 2018

^c This estimation is based on a combination of survey data, expert estimations, and firearm seizure statistics

Methods

Data Sources

Conventional data sources for homicides range from public health resources, such as the WHO, to criminal justice systems (Rogers & Pridemore, 2023). Yet, common cause of death statistics rarely include any other details on homicide events beyond the count of homicides and a few characteristics of victims, whilst registrations of homicide in the criminal justice system differ significantly per country and are thus incomparable (Aebi & Linde, 2014; Smit et al., 2011). In an effort to overcome these shortcomings, the European Homicide Monitor (EHM) was established as a joint homicide database. Five countries take part in this study, based on their availability of comparable data: Denmark, Finland, the Netherlands, Sweden and Switzerland (for a detailed overview of the EHM, see Granath et al., 2011; Liem et al., 2013). In the EHM, homicide is defined as an intentional criminal act of violence by one or more human beings resulting in the death of one or more human beings. Cases of involuntary manslaughter, attempted homicides, suicides or abortions are not covered by the EHM and thus not included in the following analyses.

In Denmark, data on homicides are based on autopsy reports, initial police reports, crime scene photos, and other documents that accompanied the overall autopsy files. False positives were removed from the dataset, and cases with suspicions of false negatives reviewed based on autopsy photos, in addition to being verified by police and court data, as well as media reports. Given these data sources, detailed information is available on the incidents, and victims but only partially offenders. Next to murder, manslaughter and infanticide, the Danish homicide dataset also includes rare cases of legitimate self-defense and assaults leading to death. Danish homicide data is available for the years 1992 to 2016 and registered at the Department of Forensic Medicine, Aarhus University.

In Finland, information regarding victims, offenders and homicide incidents are gathered through the electronic questionnaires completed by the initial police investigator of each homicide case. In addition to murder, manslaughter, killing and infanticides, assaults leading to death are included in the Finnish Homicide Monitor, which follows the EHM framework. The dataset used in this study was created jointly by the Institute of Criminology and Legal Policy (University of Helsinki), the National Police Board, and the Police University College, and covers the years 2003 to 2016.

In the Netherlands, researchers at the Institute of Security and Global Affairs at Leiden University triangulate homicide data from police data, and court files, which may include forensic psychiatric reports and police interviews, and media reports, which are based on an annual list compiled by Elsevier magazine, a weekly news magazine. The Dutch Homicide Monitor includes homicides committed between 1992 and 2016 that apply to the legal codes of murder, manslaughter and infanticide, but not assaults leading to death or legally justified killings, such as lethal shootings by police officers on duty.

Swedish research data on homicide is curated by the Swedish National Council for Crime Prevention, and available for the years 1990 to 2017. Data homicide sources include police reports, court files and psychiatric examination reports, if available. In addition to murder,

manslaughter and infanticide, the Swedish data also covers the legal code of assault leading to death.

Finally, the Swiss Homicide Monitor at the University of St. Gallen gathers information on Swiss homicide cases through the cantonal public prosecution offices and court files. Cases are included if they apply to the legal codes of intentional homicide, murder, manslaughter, homicide at the request of the victim and infanticide. Rare cases of legitimate killings (such as cases of self-defense) are included, whereas assaults leading to death are excluded. Detailed and disaggregated data on homicide incidents, victims, and perpetrators are available from 1990 to 2014.

Slight variations exist in the available data per country and on varying homicide data sources. However, through the use of shared definitions and an extensive codebook (publicly accessible⁵), variations in the data gathering and coding are kept to a minimum. The inclusion or exclusion of assaults leading to death should not meaningfully impact this analysis, as lethal shootings cannot fall in this category.

Operationalizations

The EHM consists of 85 variables, which describe the homicide incidents, - victims, and - perpetrators. In this article, we will focus on the following ten variables.

Modus. The EHM follows the categorization of causes of death based on external causes of morbidity according to the WHO ICD 10 list of 'Assaults'. Firearm homicides include homicides committed with various types of firearms, including handguns, shotguns or any other type of firearm causing lethal wounds. The category of non-firearm homicides includes both homicides committed with other types of weapons, such as knives or blunt objects, as well as unarmed homicides, e.g. homicide by asphyxiation or drowning. For the sake of this paper, we have recoded these categories into a binary variable, in which homicides committed with firearms form one category and all other homicides form the other category.

Gender. The EHM differentiates between male and female victims and perpetrators, based on the assigned gender during birth.

Age. For the purposes of this research, we report the average age of victims and perpetrators at the time of the homicide, as well as the standard deviation.

Birth country. The birth country for victims and perpetrators is categorized as either the country in which the homicide took place, another European country (continental Europe, excluding Russia and Turkey), or a non-European country. Reporting on the birth country is preferred over the citizenship, as the information regarding the former is more reliable.

Number of perpetrators. Our analyses include all suspected and/or charged perpetrators involved in the case, except the Finnish dataset, that contains information on the main perpetrator of each case only. Any case with two or more suspected perpetrators are considered cases with multiple perpetrators.

5 <https://www.universiteitleiden.nl/en/research/research-projects/governance-and-global-affairs/european-homicide-monitor#tab-1>

Number of victims. A victim is defined as any person who is a victim of lethal violence. Individuals that are non-lethally injured in the same incident are not included. Any case with two or more lethally injured victims are considered cases with multiple victims. This may include cases in which one of the victims was lethally shot, whereas the other victim may be killed using a different *modus operandi*. In such rare cases, the case was coded according to the most severe method, mainly firearms. In addition, the Dutch Homicide Monitor allows to code the *modus operandi* for each victim separately, thus ensuring that the victim count per *modus operandi* is correct.

Clearance. In the EHM, a homicide is considered solved if the police considered the case cleared by arrest of the suspect, or considered it as exceptionally cleared (Liem et al., 2019). Exceptionally cleared cases involve a suspect or perpetrator who is known to the police, but for some reason cannot be (lawfully) arrested. Examples of exceptionally cleared cases include charges being rejected by the prosecutor, perpetrators who committed suicide or perpetrators who left the country and therefore the jurisdiction area (Maguire et al., 2010; Riedel & Boulahanis, 2007).

Crime Scene. The EHM differentiates between more than ten different types of crime scenes. For the purposes of this paper, we have collated these types into private and public crime scenes. Private crime scenes include homicides committed in private homes of the victim, perpetrator or another person, and institutions such as homeless shelters or hospitals and hotels. On the other hand, we consider homicides occurring in cars, parks, forests, shops, bars and restaurants, the streets, public transportation or in workplaces to be public crime scenes.

Urban/Rural. Due to large variations in population density per country – a factor commonly used to measure the degree of urbanization of a specific location – the categorization of crime scenes into urban or rural is difficult in cross-national comparison. Thus, researchers in each country make such a distinction relative per country, based on national statistic agencies (e.g. the Central Bureau of Statistics in the Netherlands). As a result, this categorization is not comparable cross-nationally which is why we have only used it in the description of national contexts.

Homicide Types. In line with previous research (P. G. Aarten & M. C. Liem, 2023; Pizarro, 2008), homicides are categorized into intimate partner homicides (IPH), other domestic homicide (child and other family killing), criminal milieu homicides (rip deals, narcotics affairs), robbery killings (commercial businesses, private robberies and street robberies), homicides in the context of nightlife violence, sexual homicides and other homicides, which are largely dispute-related homicides that do not fall in any other category. The type of homicide is determined based on the relationship between victim and perpetrator, motive and context of the incident.

Analyses

The prevalence of firearm homicide is presented as a three-year moving average rate. The use of the moving average minimized the impact from random variations – for example caused by individual events, such as mass shootings. To assess whether the characteristics

of cases, victims and perpetrators differed between firearm and non-firearm homicides within countries, we conducted chi-square and ANOVA tests for each country sample for the period 2001-2016; for Switzerland for 2001-2014 and Finland for 2003-2016.

Limitations to the Data Used

The detailed nature of homicide data collected through the EHM framework allows this study to fill a gap of knowledge on the nature of firearm homicide. Furthermore, it addresses shortcomings of previous studies, mainly the overreliance on highly aggregated trend data from secondary sources. Nonetheless, our study suffers from several limitations. First, although we aim to minimize differences in data collection through the use of a validated coding book, slight differences exist between countries. Specifically, three out of the five countries in our analysis include assaults leading to death in their respective homicide datasets. As this type of legal code usually implies the use of physical force or an object that leads to the death of a victim (Smit et al., 2011), not the lethal shooting with a firearm, we expect no significant impact on the characteristics of firearm homicides. A second shortcoming is the share of unknowns. Tables 4.2-4.4 present percentages of known cases. Yet, detailed information regarding victims and perpetrators was not always available, in particular in countries with a relatively high prevalence of uncleared firearm homicide cases. For example, 614 out of the 2499 homicide incidents that occurred in the Netherlands between 2001 and 2016 could not be categorized into a specific homicide typology and were thus not included in our analysis. Furthermore, we excluded variables from the analysis, such as the use of alcohol and drug, due to very high shares of unknowns. Also, in relation to the EHM is that data is not continuously updated. Therefore, the current clearance rate of firearm homicides could be higher than displayed in this table, as the data collection system needs manual updates when arrests are made or perpetrators prosecuted.

The other important data source for the interpretation of our findings – the registered and estimated rates of firearm ownership as compiled by the Small Arms Survey in 2018 – should be reviewed critically as well. As pointed out by Karp (2018, p. 10), “with much of civilian ownership concealed or hard to identify, gun ownership numbers can only approximate reality or reveal only part of it”. The relative unreliability of estimates is caused by several factors, including a lack of registration of legally owned firearms by global law enforcements, continuous legal and illegal production of firearms that never enter any registration system, and illicit trafficking of firearms across countries.

Finally, there are several limits to the generalization of our findings. Our conclusions are based on observational data from five Western and Northern European countries. As such, they are not representative for European areas, where data availability is much lower, including Eastern or Southern European countries. Nonetheless, using comparable data on firearm homicides allows for pointing out significant differences in the scope and nature of firearm homicides across these countries – differences that other studies have previously alluded to without the availability of such detailed data (Alzheimer & Boswell, 2012; Duquet & Vanden Auweele, 2021; Sturup et al., 2019).

Results

Figure 4.1 presents the three-year moving average of the overall homicide and firearm-homicide rate per 100.000 population for Denmark, the Netherlands and Sweden (1992-2016), Switzerland (1992-2014) and Finland (2003-2016). Case-, victim- and perpetrator details of firearm and non-firearm homicides are presented in Tables 4.2-4.4.

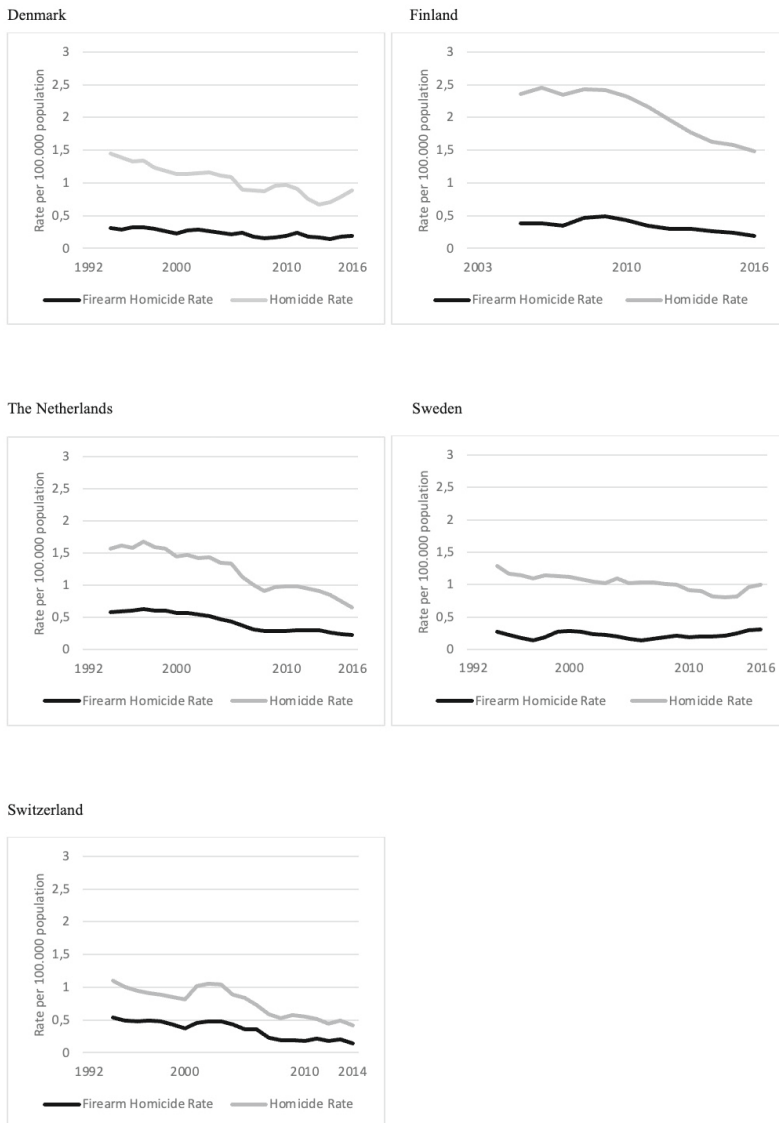


Figure 4.1: Moving 3-Year Average of Firearm Homicide Rate and Homicide Rate in Denmark, the Netherlands and Sweden 1992-2016, Finland 2003-2016, and Switzerland 1992-2014

Source: European Homicide Monitor

Denmark

From 1992 onwards, Denmark has experienced a decrease in the homicide- and firearm homicide rate with a slight uptick since 2010. Yet, the overall firearm homicide rate decreased by around 13 percent between 1992 (0.31 per 100.000 population) and 2016 (0.27). In total, 315 homicide victims died by gunshot, which equals 23 percent of all homicide victims.

Between 2001 and 2016, 179 firearm homicides took place, representing 22 percent of all homicides. Firearm homicides victims are mostly male (76%) and on average 34.8 years old ($SD=18.8$). Most firearm homicides involve only one victim, but in 24 percent, several victims were killed in one homicide incident. Homicides committed with firearms are distributed almost equally between public (47%) spaces and private (53%) homes. A little over a third of firearm homicides are categorized as being related to dispute homicides (37%) and 27 percent to criminal milieu homicides. The remaining firearm homicides take place in the domestic sphere, between (ex-) intimate partners (19%) or otherwise related individuals (14%). Over the years, the share of firearm homicides committed in the domestic sphere decreased, whereas criminal milieu and dispute firearm homicides became relatively more prevalent.

Comparing Danish firearm homicide to non-firearm homicides, the former shows several statistically significant differences to the latter. Specifically, males are overrepresented as victims in firearm homicides $\chi^2(1, 800)=12.736, p=.00$. They tend to be younger than victims of non-firearm homicides. Furthermore, firearm homicides involve more cases with multiple lethal victims, $\chi^2(1, 800)=39.944, p=.00$, occur more often in public spaces, $\chi^2(1, 780)=25.253, p=.00$, and are concentrated more in the criminal milieu $\chi^2(6, 778)=123.321, p=.00$, than non-firearm homicides.

Finland

Finland recorded a decrease of 50 percent of the firearm homicide rate between 2003 (0.38 per 100.000 population) and 2016 (0.19). The overall homicide rate decreased equally strong during those years. A slight increase in the firearm homicide rate between 2007 and 2009 may be explained with the occurrence of three mass shootings: in 2007, eight pupils were shot and killed during the Jokela school shooting, followed by another ten pupils that died by gunshot less than a year after, during the Kauhajoki school shooting. In 2009, a gunman lethally shot his ex-girlfriend and four employees of a mall in Espoo.

Including these 23 victims of mass shootings, in total 251 homicides victim were killed with firearms between 2003 and 2016. This accounts for 17 percent of all homicide victims. Of the 251 firearm homicide victims, 58 percent are male. Only a little over five percent of victims are not born in Finland. Perpetrators are almost exclusively (96%) male, and mostly born in Finland (97%). The average age of firearm homicide victims and perpetrators is similar, with 40.2 ($SD=17.2$) and 41.9 ($SD=15.8$) years, respectively. Most firearm homicides involved only one lethal victim (72%) and one perpetrator (91%). Firearm homicides in Finland are somewhat concentrated around urban areas (74%). Furthermore, the majority (71%) takes place in private locations. Half of all firearm homicides (51%) are related to

disputes and a little less than one third of firearm homicides (30%) occurs between (ex-) intimate partners. The share of firearm homicides related to disputes increased over the years, whereas domestic firearm homicides decreased. Fewer homicides committed with firearms are related to other domestic settings (11%), the criminal milieu (6%) or nightlife violence (2%). All 251 firearm homicides between 2003 and 2016 were solved by the police.

Finnish firearm homicides are different from other homicides. The share of female victims is higher in firearm homicides $\chi^2(1, 1523)=20.260, p=.00$, and victims are on average three years younger. No statistical difference exists with regards to the birth country of homicide victims, $\chi^2(2, 1520)=1.721, p=.42$. On the other hand, perpetrators of firearm homicides are more often male $\chi^2(1, 1412)=13.043, p=.00$, and older than perpetrators of non-firearm homicides. Compared to non-firearm homicides, firearm homicides take place more often in public spaces $\chi^2(1, 1513)=19.099, p=.00$, and rural areas, $\chi^2(1, 1513)=14.408, p=.00$. Multiple victims are more common in firearm homicides $\chi^2(1, 1521)=96.346, p=.00$, as are incidents that only involve a single perpetrator, $\chi^2(1, 1504)=9.089, p=.00$. In addition, the social setting of the firearm homicides differs from non-firearm homicides, $\chi^2(6, 1498)=19.321, p=.00$. They are also cleared more often by the police, $\chi^2(1, 1523)=4.202, p=.04$.

The Netherlands

In the Netherlands, 35 percent of all homicide victims in between 1992 and 2016 were killed with a firearm, which amounts to 1706 firearm homicide victims. The firearm homicide rate decreased by 62 percent during these years, from 0.58 firearm homicides per 100.000 population in 1992 to 0.22 in 2016. As the overall homicide rate also decreased, the share of homicides committed with firearms remained relatively stable. One mass shooting took place in 2011: a gunman killed six visitors of a mall in Alphen aan den Rijn.

Focusing on the years 2001 to 2016, the victims of firearm homicides are mostly male (85%) and on average 36.4 years old ($SD=12.65$). Half of all firearm homicide victims are not born in the Netherlands (51%). The share of male perpetrators is even higher, at 95 percent. Perpetrators are on average slightly younger than victims, with 32.2 years ($SD=10.6$). Similar to the victims, half of all firearm homicide perpetrators are not born in the Netherlands, with 42 percent born outside Europe, e.g. the Dutch Antilles. Although most firearm homicides only involve one lethal victim (93%), more than half (57%) involved more than one perpetrator. This included not only the shooter, but also those involved in the preparation or the execution of the lethal shooting. Firearm homicide incidents in the Netherlands mostly take place in urban areas (81%), as well as in public spaces (67%). Most firearm homicides (44%) are connected to activities and conflicts within the criminal milieu. Around 19.6 percent of firearm homicides are connected to conflicts in the domestic sphere, 24 percent to disputes between non-related individuals and nine percent to robberies. Between 2001 and 2016, homicides committed with firearms continuously concentrated more and more in the criminal milieu, whereas the share of domestic and dispute related homicides decreased. Three quarter (76%) of firearm homicides between 2001 and 2016 are solved by the police.

The use of firearms in homicides in the Netherlands is largely concentrated in the criminal milieu, whereas homicides with other weapons or unarmed homicides tend to

be mostly domestic or dispute related, $\chi^2(6, 2108)=544.884$, $p=.00$. Possibly due to this fact, firearm homicides take place significantly more often in public places $\chi^2(1, 2430)=235.885$, $p=.00$, in urban areas $\chi^2(1, 2490)=37.866$, $p=.00$. Furthermore, they involve more multiple victims $\chi^2(1, 2499)=8.996$, $p=.00$, and perpetrators $\chi^2(1, 2499)=275.192$, $p=.00$. The share of male victims $\chi^2(1, 2630)=172.703$, $p=.00$, and perpetrators $\chi^2(1, 3210)=52.978$, $p=.00$, is higher in firearm homicides. Compared to non-firearm homicides, victims $\chi^2(2, 1873)=79.985$, $p=.00$, and perpetrators $\chi^2(2, 2922)=50.031$, $p=.00$, are born more often outside of the Netherlands.

Sweden

Sweden is the only country in which the firearm homicide rate is higher at the most recent recording in 2016 (0.31 per 100.000 population) than in 1992 (0.27). This 13 percent increase is the result of a slow decline and a recent increase in the rate. The 509 victims of firearm homicides represent 22 percent of all homicide victims during those years. Eleven firearm homicide victims were killed across two mass shootings, in 1994.

Victims are mostly male (81%) and on average 34.7 years old ($SD=15.7$). More than half (56%) of all Swedish firearm homicide victims are born outside of Sweden. The share of perpetrators that are male is even higher (98%). The average age of firearm homicide perpetrators in Sweden is with 36.5 ($SD=16.9$) years slightly higher than that of their victims. More than 60 percent of firearm homicides perpetrators are born in Sweden. As in most other countries presented here, the vast majority (90%) of firearm homicides involve only one lethal victim. Firearm homicides are concentrated in urban areas (81%) and more than half take place in public locations (59%), as opposed to private ones (41%). A concentration is also visible with regards to the context of Swedish firearm homicides, with two thirds (57%) related to the criminal milieu, and 23 percent committed in the domestic sphere. Over the years, firearm homicides increasingly concentrated in the criminal milieu. Interestingly, almost half of the firearm homicides remain unsolved (44%) at the time of data registration.

Similarly to the Netherlands, firearm homicides in Sweden differ from non-firearm homicides. They take place more often in public $\chi^2(1, 1321)=83.067$, $p=.00$, and urban areas $\chi^2(1, 761)=8.094$, $p=.00$ than non-firearm homicides. Furthermore, homicide committed with firearms involve more multiple victims $\chi^2(1, 1337)=5.799$, $p=.02$, and are less likely to be solved $\chi^2(1, 1331)=179.157$, $p=.00$, whilst highly concentrated in the criminal milieu $\chi^2(6, 1203)=393.594$, $p=.00$. Most non-firearm homicides, however, take place in the domestic sphere (43.2%) or in the context of disputes (33.2%). Compared to non-firearm homicides, victims of firearm homicides are more often male $\chi^2(1, 1426)=38.022$, $p=.00$, on average seven years younger, and not born in Sweden $\chi^2(2, 1082)=75.999$, $p=.00$. Interestingly, the same differences are not visible for perpetrators of firearm homicides compared to non-firearm homicides. Although the share of male perpetrators is significantly higher in firearm homicides $\chi^2(1, 1211)=12.311$, $p=.00$, they tend to be slightly older than perpetrators of non-firearm homicides. The distribution of the birth countries of perpetrators is similar for firearm and non-firearm homicides $\chi^2(1, 2)=0.234$, $p=.88$.

Switzerland

Finally, in Switzerland, the firearm homicide rate decreased significantly by 74 percent from 0.53 firearm homicides per 100.000 population in 1992 to 0.14 in 2014. In total, 45 percent of homicides victims were killed with a firearm in these years, which amounts to a total of 583 firearm homicide victims. One mass shooting was committed in this period, which took place in a local parliament in 2001, resulting in 14 deaths. Another well-known spree-shooting in 1992 claimed the life of six individuals.

Characteristics of victims, perpetrators and incidents of firearm homicides are presented for the years 2001 to 2014: Switzerland is the only country in this analysis for which the share of female firearm homicide victims is slightly higher (50%) than for male victims (49.6%). Victims are on average 43.3 years (SD=21.1) old at the time of their death. Almost 40 percent of firearm homicides victims are not born in Switzerland, but in other European (30%) or non-European countries (8%). Almost all perpetrators of firearm homicides, however, are male (95%) and on average 45.4 years (SD=18.9) old. The share of non-Swiss firearm homicides perpetrators (44). The majority of firearm homicides has only one lethal victim (86%) and one perpetrator (96%). Incidents of firearm homicide in Switzerland are largely concentrated in rural areas (70%) and take place in private spaces (64%). The majority of all firearm homicides are related to domestic conflicts, between current or former intimate partners (45%) or otherwise related individuals (12%). The remaining firearm homicides are mainly attributed to disputes between unrelated individuals (35%). Over the years, the use of firearms in criminal milieu homicides became almost non-existent, thus increasing the share of domestic and dispute homicides committed with firearms. Unrelated to the context of the homicides, almost all (93%) are solved by the police.

In Switzerland, firearm and non-firearm homicides share many characteristics. Both categories of homicides tend to take place in private spaces $\chi^2(2, 577)=0.004$, $p=.95$, involve relatively few cases with multiple perpetrators $\chi^2(1, 508)=0.736$, $p=.39$, and involve a relatively high share above 50 percent of female victims $\chi^2(1, 697)=0.654$, $p=.42$. Still, some significant differences exist. Specifically, firearms are used more often as a modus operandi in homicides in rural areas $\chi^2(1, 356)=11.698$, $p=.00$, and more often in domestic homicides, particularly between intimate partners $\chi^2(6, 591)=20.631$, $p=.00$. Multiple victims are also more common in firearm homicides $\chi^2(1, 591)=8.503$, $p=.00$. Victims and perpetrators are on average respectively three and a half and nine years older than their counterparts in non-firearm homicides, and more likely to have been born in Switzerland, $\chi^2(2, 526)=14.652$, $p=.00$ (victims), $\chi^2(2, 483)=19.867$, $p=.00$ (perpetrators).

Table 4.2: Case characteristics of firearm homicides and non-firearm homicides in Denmark, Finland (2003-2016), the Netherlands (2001-2016), Sweden (2001-2016) and Switzerland (2001-2014); % of known cases

	Denmark		Finland		Netherlands		Sweden		Switzerland	
	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm
Location										
Public	46.6	26.6	29.1	17.2	66.9	33.8	59.1	30.3	35.6	33.2
Private	53.4	73.4	70.9	82.8	33.1	66.2	40.9	69.7	64.4	66.8
N Missing	20		10		292		20		50	
Significance	***		***		***		***			
Area										
Urban			73.6	83.7	81.2	69.5	80.9	70.8	30.1	49.4
Rural			26.4	16.3	18.8	30.5	19.1	29.2	69.9	50.6
N Missing			10		232		580		271	
Significance			***		***		**		***	
Number Victims										
Single	76	92.7	72.1	92.9	92.9	95.7	89.8	93.8	85.6	92.9
Multiple	24	7.3	27.9	7.1	7.1	4.3	10.2	6.2	14.4	7.1
N Missing	0		2		223		4		36	
Significance	***		***		**		*		**	
Number Perpetrators										
Single			91.2	83.8	43.5	77.1			95.8	94
Multiple			8.8	16.2	56.5	22.9			4.2	6
N Missing			19		223				119	
Significance			**		***					

Table 4.2: Continued

	Denmark		Finland		Netherlands		Sweden		Switzerland	
	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm
Type Homicide										
IPH	19	24.8	29.9	20.4	13.2	27.3	16.7	26.8	45	32.2
Other	13.8	20.5	11.2	12.7	6.4	19.7	5.9	16.4	12.2	17.1
Domestic										
Criminal	27	2.5	5.6	2.6	43.9	4.5	57	5.5	7.7	8.4
Milieu										
Robbery	1.1	6.4	0.4	1.6	8.9	8.6	1.9	6.4	0.5	3.3
Nightlife	1.7	5.8	2.4	1.6	3.8	2.2	1.5	8.9	0	4.3
Sexual	0	2.6	0	0.7	0.3	3.2	0	1.1	0	1.1
Dispute	37.4	37.4	50.5	60.4	23.5	34.5	17	33.2	34.6	33.6
N Missing	22		25		614		138		36	
Significance	***		**		***		***		**	
Solved										
Solved			100	98.3	75.5	95.4	56.1	89.7	92.5	93.3
Not Solved			0	1.7	24.5	4.9	43.9	10.3	7.5	6.7
N Missing			0		223		138		53	
Significance			*		***		***			
TOTAL N	179	621	251	1272	804	1695	306	1035	222	369

* p<0.05

** p<0.01

***p<0.001

Table 4.3: Victim characteristics of firearm homicides and non-firearm homicides in Denmark, Finland (2003-2016), the Netherlands (2001-2016), Sweden (2001-2016) and Switzerland (2001-2014); % of known cases

	Denmark		Finland		Netherlands		Sweden		Switzerland	
	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm
Gender										
Male	76	61.5	58.2	72.4	84.9	59.5	81.2	62.9	49.6	46.5
Female	24	38.5	41.8	27.6	15.1	40.5	18.8	37.1	50.4	53.5
N Missing	0		0		239		0		39	
Significance	***		***		***		***			
Age										
Mean	34.82	40.78	40.2	43.3	36.37	38.55	34.7	41.4	43.28	39.71
Standard Deviation	18.84	20.10	17.2	18.6	12.65	20.63	15.7	20	21.1	20.18
N Missing	0		0		327		153		65	
Birth Country										
Born in Country			94.4	95	49.3	68.9	44.3	72.9	62.2	57.6
Born in Other European Country			4	2.7	10.5	9.6	10.1	8	29.5	22.3
Born in Non-European Country			1.6	2.3	40.2	21.5	45.6	19.1	8.3	20.1
N Missing			3		1023		344		210	
Significance			***		***		***		***	
TOTAL N	179	621	251	1272	880	1787	325	1101	289	441

* p<0.05
** p<0.01
***p<0.001

Table 4.4: Perpetrator characteristics of firearm homicides and non-firearm homicides in Finland (2003-2016), the Netherlands, Sweden and Switzerland (2001-2014), 2001-2016; % of known cases

	Finland		Netherlands		Sweden		Switzerland	
	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm	Firearm	Non-Firearm
Gender								
Male	95.6	86.8	94.6	86.1	98	90.3	95.1	87.3
Female	4.4	13.2	5.4	13.9	2	9.7	4.9	12.7
N Missing	16		268		16		75	
Significance	***		***		***		**	
Age								
Mean	41.98	36.8	32.16	33.52	36.5	34.6	45.4	36.1
Standard Deviation	15.81	13.85	10.58	13.13	16.9	14.2	18.9	14.06
N Missing	18		675		62		89	
Birth Country								
Born in Country	96.6	92.8	47.8	59.8	62.3	62.8	56.3	54.7
Born in Other European Country	3.4	3.9	9.9	11	9.4	10.4	36.1	23.7
Born in Non-European Country	0	3.3	42.3	29.2	28.3	26.8	7.6	21.6
N Missing	35		839		227			
Significance			***				***	
TOTAL N	206	1222	1292	2201	199	1024	223	379

* p<0.05

** p<0.01

***p<0.001

Note: data for Denmark is missing, due to limited data availability of perpetrator characteristics in the Danish dataset; see methodology

Discussion

The aim of this study was at least twofold: to describe the prevalence and characteristics of firearm homicides across five European countries and to explore whether firearm homicides may be considered a unique phenomenon, by comparing them with non-firearm homicides in the same countries. Making use of detailed homicide data collected through the European Homicide Monitor framework, we found that: (1) the prevalence of firearm homicide varies across the countries, (2) the characteristics of firearm homicide vary across the countries and (3) the degree to which firearm homicides display unique characteristics compared to non-firearm homicides varies across the countries.

First, regarding the prevalence, in all but one country, the firearm homicide rate decreased consistently between 1992 and 2016. Only in Sweden did the firearm homicide rate decline slowly, before increasing again, thereby resulting in a higher firearm homicide rate at the end of data recording in 2016. In the same year, Switzerland and Finland report the lowest firearm homicide rates, with 0.14 and 0.19 firearm homicides per 100.000 population respectively. Sweden (0.31 per 100.000 population), Denmark (0.27) and the Netherlands (0.22) report higher firearm homicide rates.

Secondly, the results point to two different country patterns: Finland and Switzerland on one hand, and Denmark, the Netherlands and Sweden on the other. Firearm homicides in Finland and Switzerland share similar characteristics: they occur relatively often in rural areas and in private spaces, such as the home of the victim and/or perpetrator, in hotels or other institutions. Firearms in both countries were a common *modus operandi* in domestic-related homicides: around 40 percent of Finnish and more than 60 percent of Swiss firearm homicides fall in this category. Regarding Switzerland, this share is higher than the estimations in previous studies (Frei et al., 2006; Killias & Markwalder, 2012), possibly due to a decrease of criminal milieu homicides since these publications. This overrepresentation of firearms in domestic homicides may also explain why Finland and Switzerland share a relatively high percentage of female victims of firearm homicides, with 42 and 50 percent respectively. As pointed out by previous research (Liem et al., 2019; Riedel & Boulahanis, 2007), this large share of domestic homicides can also account for the exceptionally high clearance rate of firearm homicides of 100 percent in Finland, and 93 percent in Switzerland.

On the other hand, Denmark, the Netherlands and Sweden share a different profile that is similar across the three countries. In the Netherlands and Sweden, the vast majority of firearm homicides (67% and 59% respectively) are committed in public spaces, such as public streets, in bars and restaurants, recreational spaces or otherwise publicly accessible locations. In Denmark, a little less than half (47%) of firearm homicides is committed in public. Furthermore, firearm homicides may be classified as largely 'urban violence' in the Netherlands and Sweden, relative to the different national contexts. Also, in all three countries firearm homicides tend to be connected to dispute homicides and activities in the criminal milieu, such as the trafficking or distribution of narcotics. In the Netherlands and Sweden, around half (44% and 57% respectively) fall in this latter category. Firearm

homicides in the Netherlands and Sweden exhibit a significantly lower clearance rate than in Finland and Switzerland, with 25 percent of Dutch firearm homicides and 44 percent of Swedish firearm homicides remaining unsolved at the time of data collection. This finding is in line with previous studies from the Dutch and Swedish context that correlate the use of firearms with lower clearance rates – possibly due to the firearm homicides in the criminal milieu, which are often well-prepared and in which the perpetrator and victim are not necessarily known to each other (Bijleveld & Smit, 2006; Kuznecova et al., 2021; Sturup et al., 2015). With regards to the characteristics of victims, the share of male victims in firearm homicides is much higher and victims are younger compared to Finland and Switzerland. The share of male perpetrators is high in firearm homicides in both Sweden and the Netherlands and perpetrators tend to be on average younger than perpetrators in other countries, below the age of 40.

Thirdly, findings suggests that the degree to which firearm homicides are unique compared to non-firearm homicides varies between countries. In Denmark, the Netherlands and Sweden, almost all covariates of firearm homicides differed with statistical significance from non-firearm homicides. In Finland, firearms also display unique characteristics, yet are different from those in Denmark, the Netherlands and Sweden. The unique attributes in Denmark, the Netherlands and Sweden support the profile based on firearm homicides sketched in the previous paragraph. In Switzerland, firearm and non-firearm homicides share relatively many similar characteristics, indicating that the degree of uniqueness is smaller there than in the other countries.

The two country profiles are particularly interesting in relation to firearm availability: in Finland and Switzerland, which form one profile, the registered and estimated firearm availability is relatively high, whilst the prevalence of firearm homicide is low. Firearm homicide resemble other armed or unarmed homicides. In the other profile, the registered and estimated availability of firearms is generally low, yet the firearm homicide rate is high and firearm homicides display unique characteristics. Denmark and the Netherlands form the basis of this profile. Sweden shares similar firearm homicide traits, but the estimated legal and illegal availability of firearms is relatively high. In these three countries, firearm homicide is connected to disputes and incidents in the criminal milieu, resembling US patterns (Savolainen et al., 2000) in the absence of widespread gun availability.

One common factor used in international academic literature to explain variations in firearm homicides is the availability of firearms to the civilian population. Taking together, our findings contradict the general notion – commonly based on international or US studies (Anglemyer et al., 2014; Hemenway & Miller, 2000; Hepburn & Hemenway, 2004) – that a higher rate of firearm availability is correlated with higher firearm homicide rate. Our findings do not support a correlation between firearm availability and firearm homicide prevalence. Specifically, of the five countries included in this study, the two countries with the highest estimated civilian firearm availability – Finland and Switzerland – report the lowest firearm homicide rate. On the contrary, and relative to their low legal firearm availability, Denmark and the Netherlands report high firearm homicide rates. Sweden has both a high firearm availability, as well as a high firearm homicide rate. These findings

support previous studies and question the applicability of the availability hypothesis to the European context (Duquet & Van Alstein, 2015; Krüsselmann et al., 2021).

In the European context, firearm availability does not seem to determine the prevalence of lethal firearm violence, according to our findings. Yet, the degree to which firearms are legally available may determine the characteristics of firearm homicides within a country. In the Netherlands and Denmark, the legal availability of firearms is relatively low. In these countries, firearm homicides mostly occur in the criminal milieu – a context in which illegal firearms are common. In Finland and Switzerland, the legal availability of firearms is relatively high, possibly due to a longstanding hunting culture in Finland, and mandatory military service in Switzerland (Killias & Markwalder, 2012). Here, we see that firearms are used not just in one specific, but various contexts, from domestic violence to disputes and organized crime activities. Thus, the more widespread legal firearm ownership, the more similar the characteristics of firearm homicides will be to homicides committed with other weapons that are evenly readily available, such as knives or blunt objects. Specifically, as legal firearms are mainly kept in private homes, it is to be expected that the share of domestic homicides committed with firearms is higher in countries with high legal availability. This suggestion is supported by our findings in Finland and Switzerland.

Sweden represents an interesting outlier to the two profiles illustrated in this discussion so far. The legal firearm availability amongst the Swedish population is relatively high (19.7 per 100 population), yet firearm homicides are highly concentrated in the criminal milieu. As such, Sweden represents a mixed profile. One explanation for this relates to the types of firearms that are legally available: relatively heavy hunting guns, which are rarely used in criminal activities. As such, it is to be expected that most firearms used in homicides in Sweden are smaller handguns bought or acquired illegally by the perpetrators. In addition, Swedish studies on firearm violence argue that the current increase of firearm violence is connected to an increase in activities from gangs and criminal groups that have easy access to illegal firearms through illegal trafficking of firearms (Khoshnood, 2017; Sturup et al., 2018).

Similar in-depth analyses of correlates of firearm violence for the other countries are mostly missing, although each peculiar national context brings its own conducive environment for firearm violence. For example: the high firearm availability but relatively low firearm homicide rate in Switzerland may be connected to mandatory military service for the male population with the option to keep the military firearms for a small fee after the end of service (Reisch et al., 2013). No other European country has a similar process. In the Netherlands, on the other hand, conflicts between criminal groups engaged in the illegal trafficking of cocaine through the ports of Rotterdam or Antwerp, in Belgium, fueled a so-called weapon-race in recent years, which may explain the characteristics of victims and offenders observed in this study (Liem & Krüsselmann, 2021). Further detailed studies for each national context are required to provide a better understanding for each peculiar national context, in particular with regards to the question in which situations legal or illegal firearms are used.

Conclusion

This is the first study to explore not just the trends but also the nature of firearm homicides in Europe, through the use of detailed, disaggregated data collected in the European Homicide Monitor framework. From our findings, two profiles of firearm homicides in Europe emerge, indicating that firearm homicides in Europe are not a homogenous phenomenon: in Finland and Switzerland, firearm availability is high, yet the prevalence of firearm homicide is relatively low in these countries compared to Europe overall. In these countries, firearms are used in various contexts, ranging from domestic violence to disputes. Homicides committed with firearms are largely similar to homicides committed with other or no weapons. In Denmark and the Netherlands, on the other hand, firearm availability is low whilst the firearm homicide rate is higher than in Finland or Switzerland. Here, firearms are mainly used in homicides connected to the criminal milieu. As such, firearm homicides display unique characteristics compared to non-firearm homicides. Sweden displays a mixed profile, with high legal availability but a concentration of firearm homicides in the criminal milieu.

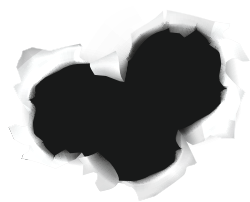
The inclusion of only five countries in this study already asks for further research on the causes of the cross-national differences encountered in this descriptive study, including the availability of legal and illegal firearms or other socio-cultural factors. Altheimer and Boswell's (2012) study set in the United States indicates that firearm homicides and homicides overall may be influenced by different mechanisms, such as urbanization or deprivation. Some of their findings contradict commonly accepted explanations for homicide rates overall when applied to firearm homicides specifically. As their analysis was based on broader global regions, their findings can thus only partly be used in the European context. Still, they warrant the need for similar research in Europe. Together with the inclusion of Eastern- and Southern European in cross-national comparative research and data collection on non-lethal shootings, such explanatory research on cross-national differences together could add to the long-overdue improvement of our understanding of firearm violence in Europe. This descriptive and exploratory study proves the need for detailed, disaggregated, and comparative data on the subject and serves as the basis for any future explanatory approaches to lethal firearm violence.

Next to enabling future explanatory research on firearm violence for academic researchers, this study can help to inform policies that address the illegal use and trafficking of firearms. In the 2020-2025 EU action plan on firearms trafficking, building an improved intelligence picture is one of the priorities to combat the trafficking and illegal use of firearms in the European Union (European Commission Directorate-General for Migration and Home Affairs, 2020). A detailed and comparable data collection of lethal or non-lethal firearm violence is currently lacking (Duquet & Vanden Auweele, 2021). Yet, past research has found positive effects of targeted gun control policies, for example directed at firearm storage in private homes in several European countries (Krüsselmann et al., 2021). Disaggregated studies like the present one are necessary to unveil the nature of firearm violence in each national context for such targeted interventions.

Given the overall low quantity of academic studies on firearm violence findings should encourage other researchers to explore this phenomenon more thoroughly in the future. Specifically, more systematic gathering of comparable data on firearm homicide and non-lethal shootings is required to fully understand the nature of firearm violence in Europe. The European Homicide Monitor is an example of a framework for data collection that could be applied in other countries.

Acknowledgements

We would like to thank Dr. Martti Lehti (1963-2021) and research assistant Linda Anning for their work with the Finnish Homicide Monitor.



Chapter 5

The Role of Lethality in Weapon Use – a Theoretical Assessment

This chapter is based on Krüsselmann, K., Aarten, P., & Liem, M. (2024).
Never bring a knife to a gunfight?: Lethality of weapon use in Dutch homicides.
European Journal of Criminology, advance online publication.



Abstract

Firearm violence is a serious issue in Europe, yet the validity of existing theoretical approaches to weapon use in violent encounters have not been explicitly tested in the European context. This study tested only existing hypothesis on weapon use and -lethality – the Adversary Effects Hypothesis, the Physical Strength Hypothesis and the Social Distance Hypothesis – on homicide data from the Netherlands, where detailed data on weapon use in homicide is available. Based on these hypotheses, we expected victim characteristics and the social distance between victim and perpetrator to affect the *modus operandi*. However, our results do not align with these expectations when situational control variables are included. We conclude that existing studies on weapon lethality have a limited generalizability due to their assumption of free weapon choice. This is only met in contexts in which legal availability of firearms is high, which is not the case in the Netherlands. In addition, the hypotheses have a too narrow focus on victim-characteristics, without accounting for the situational factors influencing violent encounters. Based on these insights, we provide suggestions for theoretical and empirical improvements on firearm violence research.

Introduction

Some weapons are more lethal than other weapons, independent from the intent of the perpetrator. To this day, medical and criminological studies on the lethality of assault show that injuries caused by gunshot wounds result in a higher mortality than other weapons, such as knives (Christensen et al., 2008; Harris et al., 2002; Libby, 2009; Saltzman et al., 1992; Zimring, 1967). Furthermore, firearms can inflict potentially lethal wounds over long distance, such as in drive-by shootings, and on several victims in a short period of time compared to other weapons (Alzheimer & Boswell, 2012).

Some studies have addressed weapon lethality in relation to levels of violence, such as the question whether widespread availability of firearms correlates with high homicide rates, also known as the Weapon Lethality Hypothesis (Braga et al., 2021; Krüsselmann et al., 2021). Other studies focus on the impact of weapon lethality on the nature of violence, such as the perpetrator's decision-making before and during a violent encounter. Presuming that the difference in lethality across weapons is known to the perpetrator, to what extent does that affect the perpetrator's choice for a weapon? Although weapon use has been the subject of a series of criminological studies (Fox & Allen, 2014; Pelletier & Pizarro, 2019; Pizarro et al., 2021), research connecting weapon lethality to weapon choice is rare. Yet, from the few studies that have been done, a number of hypotheses have emerged that put forward the idea that certain characteristics of the victim of a violent encounter can lead the perpetrator to implicitly or explicitly choose a firearm – as the most lethal option – over a knife or other weapon (Felson & Hullenaar, 2021; Felson & Painter-Davis, 2012; Felson & Pare, 2010; Heide, 1993; Rennison et al., 2011).

These hypotheses – the Adversary Effects Hypothesis, the Physical Strength Hypothesis and the Social Distance Hypothesis – are central to this study which tests their validity on Dutch homicide cases. The first reason for using the Dutch context is the availability of disaggregated and detailed homicide data through the Dutch Homicide Monitor. Secondly, findings from the Dutch context may also be applicable to other West-European countries, given the comparability in homicide and weapon use (Liem et al., 2013; Suonpää et al., 2024). Finally, and most importantly, the weapon lethality hypotheses have been developed and empirically tested mainly in the context of the United States (Brennan & Moore, 2009), where the legal availability of firearms is high compared to other global regions (Karp, 2018). So far, the generalizability of these hypotheses remains untested in other contexts, such as in Western Europe, in which the most lethal type of weapon, a firearm, is generally not legally accessible to most citizens.

In addition, this study addresses the validity of these hypotheses in light of other theoretical and empirical research on violence. Through various lenses, all three of the hypotheses central to this study focus specifically on characteristics related to the victim. However, theoretical and empirical research suggests that violent encounters do not take place in a vacuum and that situational factors, such as the direct surroundings in which violence takes place, or structural may impact how violence is carried out (Pridemore, 2002;

Wikström & Treiber, 2015). Therefore, this study critically tests whether the emphasis of victim-characteristics in the explanation for weapon use is warranted.

Overall, this research has two goals: to test the validity of the weapon lethality hypotheses on Dutch homicide cases and discuss the lessons that can be drawn for the theoretical development of weapon-related violence in Europe. To address these goals, three main questions will be answered: (1) To what extent do victim- and situational factors differ between homicides committed with firearms and homicides committed with other weapons? (2) Which factors related to the victim and situational context of a homicide explain the type of weapon used? (3) To what extent can and should these hypotheses shape European research on weapon-related violence?

Weapon Lethality and Perpetrator's Use of Weapon

Before discussing in detail the aforementioned weapon lethality hypotheses, it is important to understand their underlying theoretical paradigms to highlight their similarities and differences. Some of the hypotheses directly or indirectly rest on the assumption that perpetrators make a rational choice for a specific weapon. Rational Choice Theory states that perpetrators only commit a crime if the perceived benefits outweigh the perceived costs of a crime, such as retaliation or imprisonment (Cornish & Clarke, 1986). Yet, the rationality behind a decision to engage in a crime is individually based and bounded by several factors, such as previous experiences, self-control or individual characteristics of the potential perpetrator. Furthermore, Cornish and Clarke (1986) state that some choices are not made after extensive planning or elaboration about options, but in a very short time – even just seconds – during the crime itself. Thus, weapon choice may refer to an explicit, conscious decision prior to engaging in a violent encounter, as well as momentary impulses based on contextual factors. Due to these ambiguous meanings of the word 'choice' and the difficulty of empirically measuring intentions or considerations made by perpetrators (Phillips & Maume, 2007; Wells & Horney, 2002), some studies prefer to focus on 'weapon use' instead.

Adversary Effects Hypothesis

Leaning on the premise of rational choice and the social interactionist approach, the Adversary Effects Hypothesis, established by Felson and colleagues (Felson & Hullenaar, 2021; Felson & Painter-Davis, 2012; Felson & Pare, 2010) rests on the assumption that the perpetrator considers characteristics of the adversary as a risk to a successful commission of a (violent) crime when determining targets, the intent to kill, the use of allies and – most important in the context of this study – the use of weapons. In other words, weapon use should be more likely in lethal or non-lethal assaults in which the perpetrator deems weapon use to be essential for a successful attack. Firearms in particular are regarded as more lethal than other weapons, and may thus be used in specific types of assaults, e.g. assaults in which the perpetrator wants to avoid any physical confrontation with the victim.

Empirically, this hypothesis has been directly assessed in a handful of studies carried out by the researchers who initially coined said hypothesis (Felson & Hullenaar, 2021;

Felson & Painter-Davis, 2012; Felson & Pare, 2010). In these studies, gender and race have been brought forward as potential factors influencing weapon use by the perpetrators (Felson & Painter-Davis, 2012). Both male and female perpetrators were respectively 2.5 and almost two times more likely to use a firearm when confronted with a male victim than no weapon at all (Felson & Hullenaar, 2021). The importance of the victim's gender is also found in other studies, not directly testing the Adversary Effects Hypothesis (Fox & Allen, 2014; Libby, 2009). With regards to race, Felson and Painter-Davies (2012) found that the likelihood for homicide perpetrator using a weapon, and specifically a firearm, was higher when the victim was black compared to white victims which is supported in other US-based studies (Libby, 2009; Pelletier & Pizarro, 2019).

Other studies have – without an explicit link to the Adversary Effects Hypothesis – brought forward other victim-related factors that may influence weapon choice. US studies with varying local samples noted an effect of the victim's age on weapon use, although results differ, with some studies reporting that older victims are more likely to be killed with a weapon or firearm in particular (Allen & Fox, 2013; Libby, 2009; Mize et al., 2011), whilst another study reports a higher likelihood of knives or blunt objects in homicides with older victims (Pelletier & Pizarro, 2019). Finally, a victim's criminal or violent history may lead the perpetrator to use a weapon with a high likelihood of lethality in fear of retaliation. For example, Pelletier and Pizarro (2019) found that homicide victims with a history of drug dealing or gang membership were 97% more likely to use a firearm.

Physical Strength Hypothesis

Closely related to the Adversary Effects Hypothesis is the Physical Strength Hypothesis, as developed by Heide (1993). Instead of arguing that retaliation is the main motivation for choosing a weapon with high lethality, the Physical Strength Hypothesis states that physical superiority of the victim, in contrast to the perpetrator, necessitates a weapon that can equalize or turn the power imbalance in favor of the perpetrator (Heide, 1993). In her seminal study of American parricides, Heide (1993) found that (step)fathers were more likely to be killed with a firearm than (step)mothers. At the same time, juvenile perpetrators were more likely than adult perpetrators to kill their (step)parents with a firearm. She argued that younger perpetrators might not have the necessary physical strength to kill a parent with a knife, a blunt object or no weapon at all. Several studies have found support that physical strength (im)balance – typically measured in age and gender differences between victim(s) and perpetrator(s) – impacts weapon use, not just in the context of domestic violence (Heide & Petee, 2007), but also in sexually motivated homicides (Chan & Beauregard, 2016; Chan et al., 2019).

Social Distance Hypothesis

A third perspective that can be used to better understand weapon use is the Social Distance Hypothesis, which states that weapon use is influenced by the relationship between victim and perpetrator (Black, 2004; Cooney, 2009; Rennison et al., 2011). Specifically, violent encounters involve more lethal weapons among perpetrators and victims with a higher

social distance; who are (1) less acquainted (relational distance), and (2) less familiar in their ideas and forms of expression (cultural distance). The Social Distance Hypothesis was first coined by Rennison and colleagues (2011), who synthesized previous work by Black (2004) and Cooney (2009) that focused on retaliatory and predatory violence, respectively. According to the Social Distance Hypothesis, higher relational distance between victims and perpetrators is associated with more lethal weapons. The hypothesis itself is rarely directly assessed in empirical studies, yet the victim-perpetrator social or cultural relationship have been the focus in studies on weapon use. US studies found that stranger homicides are more likely to involve a firearm than homicides between family members or (ex)intimate partners (Allen & Fox, 2013; Pelletier & Pizarro, 2019). On the other hand, the few non-US studies that investigate the relationship between weapon use and victim-perpetrator-relationship show different results: For example, neither the use of firearms nor knives was a significant predictor of victim-perpetrator relationship in Taiwan (Cao et al., 2008). The second premise, cultural distance – usually measured through similarities in race between victim and perpetrator (Jacques & Rennison, 2013) – is rarely discussed in relation to weapon use and lethality (Black, 2004; Rennison et al., 2011). Rennison and colleagues (2010) found that violence between a victim and perpetrator of different ethnicities or races was more likely to involve a more lethal weapon, when comparing weapons such as knives and firearms. Yet, whether this hypothesis can be supported with other proxies than race remains largely untested. Other proxies than race have so far not been included. Thus, overall, empirical support for both elements of the Social Distance Hypothesis remains inconclusive.

Situational Factors Influencing Weapon Use in Homicide

The previously discussed hypotheses are the only theoretical approaches that specifically address weapon use in violent encounters. All three put emphasis on the importance of victim characteristics as explanations for weapon use in violent encounters. Yet, criminological research on violence has affirmed both theoretically and empirically the importance of situational and contextual factors (Pridemore, 2002; Wikström & Treiber, 2009; Wikström & Treiber, 2015). For firearm violence in particular, empirical studies have found several situational characteristics, such as the type of location, time of day and substance use, associated with the use of a firearm that have not been considered in the previously discussed hypotheses. Specifically, violent lethal encounters in public locations increased the likelihood of weapon use generally (Libby, 2009), and firearms in particular (Pizarro et al., 2019). In addition, daytime as opposed to nighttime increased the likelihood of firearm use, whereas intoxication decreased said chances (Libby, 2009).

With the insights from these empirical studies, one may question the somewhat isolated focus on victim characteristics as sole explanatory factors for weapon use as presented in the previous hypotheses. Yet, to date, no studies have both empirically and theoretically brought individual victim and perpetrator - as well as situational characteristics together to explain weapon use.

Hypotheses

Together, these approaches lead to the following testable hypotheses:

- 1) The more “adverse” characteristics of the victim, the more lethal the weapon [related to Adversary Effects Hypothesis]
 - a) Male victims are more likely to be killed with a firearm than female victims.
 - b) Non-elderly victims are more likely to be killed with a firearm than elderly victims.
 - c) Victims with a criminal/violent history are more likely to be killed with a firearm than victims without a criminal history.
 - d) Victims who are older than the perpetrator are more likely to be killed with a firearm than younger victims.
- 2) The higher the physical superiority of the victim in contrast to the perpetrator, the more lethal the weapon [related to Physical Strength Hypothesis]
 - a) Male victims are more likely to be killed with a firearm than female victims.
 - b) Victims who are older than the perpetrator are more likely to be killed with a firearm than victims younger than the perpetrator.
- 3) The higher the social distance between perpetrator and victim, the more lethal the weapon [related to Social Distance Hypothesis]
 - a) Relational distance: Victims who are strangers to the perpetrator are more likely to be killed with a firearm than victims who are acquainted to or have a familial/intimate relationship to the perpetrator.
 - b) Cultural distance: Victims with a different ethnicity than the perpetrator are more likely to be killed with a firearm than victims with a close cultural distance to the perpetrator.
- 4) Situational factors influence weapon use in homicide.
 - a) Homicides committed in public places have a higher likelihood to be committed with a knife or blunt object and less likely to be committed with a firearm than homicides committed in non-public locations.
 - b) Victims under the influence of alcohol or drugs are less likely to be killed with a firearm than victims not under the influence.
 - c) Homicides committed during the day are less likely to involve a knife or blunt object, but more likely to involve a firearm than homicides committed during nighttime.
 - d) Homicides with multiple victims are more likely to be committed with a firearm than homicides with a single victim.
 - e) Situational variables impact the importance of victim characteristics as sole explanators for weapon use.

Methodology

Data

To test the hypotheses derived from the literature on weapon lethality, we make use of the Dutch Homicide Monitor. This dataset is administered by the authors and based on a validated instrument for homicide data collection, the European Homicide Monitor (Granath et al., 2011; Liem et al., 2013). Homicides are defined as intentional killings, which includes cases that fall under the Dutch legal codes of murder, manslaughter, and infanticide. Assaults leading to death and legitimate killings, e.g. through police force, are excluded. Detailed case-, victim- and perpetrator-information is collected from several sources, including publicly accessible news articles and court decisions, as well as non-public court files, police data and forensic reports. The Dutch Homicide Monitor currently incorporates all homicide cases that took place in the Netherlands between 1992 and 2021. For this analysis, we included homicides committed between 2000 and 2020, due to completeness and richness of the data for these years. In these years 3412 homicide cases have been registered; however, for 303 homicide cases, the *modus operandi* was unknown. Furthermore, in an additional 834 cases, *modus operandi* other than firearms, knives, blunt objects or physical violence were used and therefore excluded for the purpose of this study. As a result, the analysis is based on 2275 homicide cases.

Study Context

In the Netherlands, between 2000 and 2020, on average 148 cases of homicide took place annually, with an average 157 victims per year. With a population of around 17.5 million, the average homicide rate for these years is 0.9 per 100.000 population. In the most recent years, the homicide rate is stable at around 0.6 per 100.000 population. Most common are homicides in the domestic sphere (40%), between (ex-)partners or other types of family members, followed by homicides in the criminal milieu (17%) and dispute homicides (16%). Robbery homicides (8%) and sexual homicides (2%) are less common. Around half of Dutch homicides (51%) involve male victims that are killed by male perpetrators; a quarter (27%) involve female victims killed by male perpetrators (Dutch Homicide Monitor, 2023).

Sharp objects, such as knives, are the *modus operandi* used in 35 percent of homicides for which the cause of death could be determined. Firearms are used in a third (33%) of all homicides between 2000 and 2022. Physical violence, through hitting, kicking or asphyxiation, caused the victim's death in around 18 percent of homicides. The use of blunt objects (5%) is less common.

It is noteworthy that firearms are used in a third of all homicides, although firearm ownership by civilians is heavily regulated in the Netherlands. In principle, as constituted in regulations by the European Union (Council of the European Union, 2021) and national laws, civilians are not allowed to own firearms, with exception for specifically authorized collectors, firearm dealers, sport shooters or hunters. Moreover, in the Netherlands, legally acquiring a firearm is subject to a lengthy procedure, including security screenings, which can take several months or up to a year. For 2017, the Small Arms Survey (Karp, 2018)

reports a little over 200.000 legally registered firearms for the Netherlands. In addition, however, around 230.000 illegally owned and thus unregulated firearms are estimated to circulate in the country. Taken together, one can estimate that there are three firearms for every 100 citizens in the Netherlands. This estimation is low, compared to other non-European countries – with 120 firearms in the United States, 10 in South Africa, and 5 in India -, as well as other European countries, with an estimated 23 firearms per 100 citizens in Sweden and 14 firearms in Croatia and Italy (Karp, 2018).

Variables/Operationalizations

Modus Operandi. Following the World Health Organization's International Classification of Diseases (ICD-10) categorization of causes of death through assault, the Dutch Homicide Monitor differentiates between hands-on physical violence (e.g. hitting, kicking, strangulation), blunt objects (e.g. baseball bats, hammers), sharp objects (e.g. knives, spears) and firearms (handguns, long guns). Due to the relatively rare use of blunt objects and physical force in Dutch homicides, multivariate analyses using these four categories of weapons were unreliable due to low Ns. In the end, we collided the *modi operandi* into a binary variable: firearms and other weapons, including physical force.

Homicide victim and perpetrator. A victim is defined as any lethal victim of a homicide case. Other individuals that obtained non-lethal injuries during the same violent incident are not counted as homicide victims in this study. Homicide cases with multiple victims thus refer to incidents in which two or more individuals were lethally injured. Although some homicide cases (N=111, 4.9%) included multiple lethal victims, the following analyses are case-based analyses and therefore only include information from the main victim and perpetrator of each case, as defined in the coding manual of the European Homicide Monitor.

Adversary effects: victim variables. Potential victim characteristics that could influence the use of homicide weapon due to its lethality found in previous studies are the gender, age, age difference between victim and perpetrator, and the violent or criminal history of the victim. Gender is a dichotomous variable, differentiating between male and female (reference category) victims, based on the gender assigned at birth. Age is divided into four categories: child (0-14), young adult (15-29), adult (30-64, reference category) and elderly victims (65+; reference category). Using these categories, age difference alludes to whether the victim is younger, the same age, or older as the perpetrator (reference category). A victim's criminal history is coded as a binary variable (yes/no). No criminal history (reference category) includes unknown cases, meaning that no indication of a criminal history was found.

Social distance variables. Social distance is the combination between relational and cultural distance between victim and perpetrator. Relational distance is measured by the relationship between victim and perpetrator. The Dutch Homicide Monitor differentiates between 33 types of relationships. In this study, we collated those types and differentiate between intimate relations ((ex-)intimate partners, family), acquaintances (e.g., neighbors, friends, work-relationships), and strangers (reference category), following previously used definitions in homicide research (Bijleveld & Smit, 2006; Häkkänen-Nyholm et al., 2009; Getoš Kalac,

2021). In previous US-based studies, cultural distance has been measured using race as an indicator (Rennison et al., 2011; Zimmerman et al., 2021). However, such a differentiation does not fit the cultural constellation of the Netherlands (Statistics Netherlands, 2021). Instead, we follow previous work by our colleagues (Bijleveld & Smit, 2006; Kivivuori et al., 2022; Liem et al., 2019) who used the individual's (parents') country of birth as a measurement for ethnicity. This results in a dichotomous variable, distinguishing individuals born in the same continent from individuals born in different continents.

Situational variables. The number of victims, the degree to which the crime scene is public, the time of the day and the victim's substance use, amongst other variables, have been identified as potential situational factors that influence the perpetrator's weapon use. The Dutch Homicide Monitor recognizes twelve types of crime scenes, which have been collated into a dichotomous variable for the sake of this research. Public crime scenes include public streets, forests, bars, restaurants, public transportations and workplaces. Private crime scenes (reference category) include private homes of victims, perpetrators or other individuals, hotels, and institutions. The time of day is a dichotomous variable: daytime lasts from 6am to 6pm, nighttime from 6pm to 6am. Substance use by the victim is a dichotomous variable (yes/no). Substance use by the victim (reference category) means that there are confirmed or unconfirmed indications that the victim could have been under the influence of alcohol and/or drugs or is addicted to alcohol and/or drugs.

Analyses

To address the first and second research question, descriptive statistics and bivariate tests of significance in the form of chi-square tests are conducted. Multivariate analyses in the form of binary logistic regression follow, as all conditions for this type of analysis have been met. The first model (N=2232) includes the relevant variables related to victim-characteristics to test the Adversary Effects hypothesis. Model 2 (N=1925) tests the association between weapon use and victim-characteristics related to the Physical Strength Hypothesis. Model 3 (N=1175) addresses the Social Distance Hypothesis. Model 4 (N=1900) combines the closely related variables associated with the Adversary Effects- and Physical Strength hypotheses. Combining both assumptions into one model aids in understanding the possible distinction or conceptual overlap of those two hypotheses. Finally, model 5 (N=673) combines the victim-related variables associated with the Adversary Effects-, Physical Strength- and Social Distance Hypotheses with situational factors found relevant in previous empirical studies. Incorporating relevant variables from each hypothesis with situational variables not only allows an evaluation of the explanatory strength for each individual hypothesis, but also an overall evaluation of the importance of victim characteristics in explaining weapon use in homicide.

Results

Descriptive Statistics

Descriptive statistics and results of chi-square analyses comparing homicides committed with firearms and other weapons are displayed in Table 5.1. Firearm homicides involved significantly more male victims ($\chi^2(1, 2267)=133.633, p=.00$) and victims below the age of 65 ($\chi^2(3, 2233)=49.603, p=.00$) compared to other homicides. Related, victims of firearm homicides tended to be younger than or as old as the perpetrator, whereas homicides committed with other weapons involved more victims that were older than the perpetrator ($\chi^2(2, 1933)=8.340, p=.02$). Furthermore, for homicides committed with firearms, there were fewer indications that the victim had been under the influence of alcohol or drugs during the crime ($\chi^2(1, 2275)=21.181, p=.00$). Victims of firearm homicides tended to be an acquaintance or stranger rather than an intimate partner or family member to the perpetrator more often compared to homicides committed with other weapons or physical force ($\chi^2(2, 1400)=42.812, p=.00$). Finally, firearm homicides occurred more often in public spaces ($\chi^2(1, 2216)=238.810, p=.00$) and involved more often multiple lethal victims ($\chi^2(1, 2275)=16.453, p=.00$). No statistically significant differences between firearm homicides and homicides committed with other weapons are found for the victim's criminal history, ethnic differences between victim and perpetrator and the time of day in which the homicide was committed.

Table 5.1: Chi-Square analysis of characteristics of firearm homicides and homicides committed with other weapons

	Firearm (N=1009)	Other weapon (N=1266)	
	%	%	
Victim Gender			***
Male	87	65.9	
Female	13	34.1	
Missing (N)	8		
Victim Age			***
0-14	0.8	1.6	
15-29	30.3	27.9	
30-64	67.1	62	
65+	1.8	8.4	
Missing (N)	42		
Victim Criminal History			
Indications	1.8	1.7	
No indications	98.2	98.3	
Age Difference			*
Victim younger than perpetrator	15.1	14.4	

Table 5.1: Continued

	Firearm (N=1009)	Other weapon (N=1266)
	%	%
Victim as old as perpetrator	64.2	59.1
Victim older than perpetrator	20.8	26.5
Missing (N)	342	
Number victims		***
Single victim	93	96.7
Multiple victims	7	3.3

*p<0.05, **p<0.01, ***p<0.001

Regression Analyses

Table 5.2 presents the results of the binary logistic regression analyses. Model 1 tests the predicting effect of victim characteristics on the weapon use of the perpetrator, as considered in the Adversary Effects hypothesis. The results reveal that the victim's gender and age have a significant effect on the likelihood of a firearm being used as a modus operandi. Compared to the victim being female, the likelihood of a firearm being used increased by 3.352 when the victim was male ($\beta=1.210$, $p=.00$). The victim being a young adult ($\beta=1.486$, $p=.00$) or adult ($\beta=1.494$, $p=.00$) also increased the likelihood of a firearm as modus operandi by 4.418 and 4.453 times, respectively. The victim being a young child ($\beta=.949$, $p=.06$) or having a criminal history ($\beta=.218$, $p=.521$) had no statistically significant predicting power for the modus operandi. The results are mostly in line with hypothesis 1a – the victim's gender was confirmed as a significant predictor of firearm use – and hypothesis 1b – younger adults and adults are more likely than elderly to be killed with a firearm. Yet, compared to elderly victims, very young children were not significantly more likely to be killed with a firearm. In addition, the results are in contrast with hypotheses 1c, as criminal history of the victim had no predicting effect on the weapon used. The overall predictive power of the model is significant, with around 10.5 percent of weapon use explained by the included variables ($\chi^2(5)=$, $p=.00$, Nagelkerke R^2 .105).

Model 2 includes the relevant victim-related variables associated with the Physical Strength Hypothesis: victim gender and age difference between victim and perpetrator. All included variables have a statistically significant association with weapon use. The victim being male increased the odds of firearm use 2.997 times ($\beta=1.098$, $p=.00$), whilst the victim being younger or around the same age as the perpetrator increased the odds of firearm use 1.576 and 1.446 times respectively ($\beta=.455$, $p=.00$; $\beta=.369$, $p=.023$). Overall, then, the assumptions of the Physical Strength Hypothesis represented in hypotheses 2a and 2b are supported. The model overall explains seven percent of weapon use in Dutch homicides ($\chi^2(3)=$, $p=.00$, Nagelkerke R^2 .070).

Model 3 addresses the Social Distance Hypothesis by testing the effect of the relationship between victim and perpetrator and their cultural distance in terms of difference in

ethnicity on the use of a particular weapon. The results show that the victim being an acquaintance to the perpetrator increased the likelihood of a firearm as modus operandi by 1.726 times ($\beta=.546$, $p=.00$); the victim being a stranger by 2.573 times ($\beta=.945$, $p=.00$), compared to the victim being an (ex-)intimate partner of family member. These findings are in line with the hypothesis 4a – that social distance between victim and perpetrator increases the chances for a more lethal weapon. However, ethnic differences between victim and perpetrator had no statistically significant predictive power ($\beta=.110$, $p=.420$), which is in contrast with hypothesis 4b – that cultural distance increases the chances for a more lethal weapon. The predictive power of these variables combined is statistically significant, but low – relationship and ethnic difference explain about 3.6 percent of the variance in weapon use in Dutch homicides ($\chi^2(3)=p=.00$, Nagelkerke $R^2 .036$).

Model 4 combines victim-related variables of the Adversary Effects- and Physical Strength hypotheses, with the victim's gender being the overlapping variable between both approaches. In the combined model, the significant variables from model 1 remained significant: male victims are 2.811 times more likely to be killed with a firearm ($\beta=1.033$, $p=.00$), as are young adults and adults, 3.905 and 3.522 times respectively ($\beta=1.362$, $p=.00$; $\beta=1.259$, $p=.00$). The victim being a young child and having a criminal history remained insignificant. Interestingly, the age difference between victim and perpetrator predicted by the Physical Strength Hypothesis renders insignificant in the combined model ($\beta=.225$, $p=.088$ for same age; $\beta=1.07$, $p=.622$ for younger victim). The combined model explains 8.5 percent of weapon use in Dutch homicides ($\chi^2(7)=p=.00$, Nagelkerke $R^2 .085$), which is lower than the explanatory power of the variables included in model 1 alone, but higher than the power of model 2.

Finally, model 5 combines all victim-focused variables from model 1-3, as well as the situational variables. Compared to the combined model 4 (the combined Adversary Effects- and Physical Strength Hypotheses) no indicative changes are observed: the victim being male ($\beta=.523$, $p=.043$), a young adult ($\beta=1.397$, $p=0.37$) or an adult ($\beta=1.548$, $p=.013$) all increased the likelihood of firearm use by 1.687, 4.042 and 4.701 times respectively. At the same time, the victim being a child ($\beta=.662$, $p=.503$), having a criminal history ($\beta=.965$, $p=.056$), and being the same age ($\beta=.051$, $p=.856$) or younger ($\beta=.324$, $p=.442$) as the perpetrator had no significant effects. The variables related to the Social Distance Hypotheses become insignificant in this final model: neither the relationship between the victim and perpetrator ($\beta=-.144$, $p=.576$ for acquaintances; $\beta=.068$, $p=.838$ for strangers) nor the cultural distance ($\beta=.100$, $p=.627$) have predictive power for weapon use. On the other hand, three of the four situational variables have significant associations with weapon use: the presence of multiple victims ($\beta=1.240$, $p=.00$), violent encounters in public spaces ($\beta=1.255$, $p=.00$), and no indications of substance (ab)use of the victim ($\beta=1.515$, $p=.00$) all increased the likelihood of firearm use by 3.455, 3.403 and 4.551 times respectively, thereby confirming hypotheses 4a, 4b and 4d. The time of the day, on the other hand, had no significant association ($\beta=.089$, $p=.651$) with weapon use, against the expectations expressed in hypothesis 4c. Overall, the final model including situational variables has the highest explanatory power, accounting for almost 22 percent of weapon use in Dutch homicides ($\chi^2(14)=p=.00$, Nagelkerke $R^2 .218$).

Table 5.2: Binary Logistic Regression Results

	Model 1: Adversary Effects Hypothesis		Model 2: Physical Strength Hypothesis		Model 3: Social Distance Hypothesis		Model 4: Combined victim characteristics		Model 5: joined Model with situational control variables	
	Exp(b)	S.E.	Exp(b)	S.E.	Exp(b)	S.E.	Exp(b)	S.E.	Exp(b)	S.E.
Victim characteristics										
Young Child (0-14)	2.584	.504					2.851	.560	1.938	.987
Young Adult (15-29)	4.418	.272***					3.905	.331***	4.042	.671*
Adult (30-64)	4.453	.265***					3.522	.306***	4.701	.623*
Criminal History	1.244	.340					1.132	.370	2.625	.506
Male Victim	3.352	.113***	2.997	.119***			2.811	.121***	1.687	.258*
Victim same age as perpetrator			1.576	.118***			1.252	.132	1.052	.279
Victim younger than perpetrator			1.446	.162*			1.113	.217	1.383	.421
Social distance										
Acquaintances					1.726	.139***			.866	.257
Strangers					2.573	.189***			1.070	.330
Same ethnicity					1.116	.136			1.106	.206
Situational Control Variables										
Multiple victims									3.455	.373***
Nighttime									1.093	.196
Public crime scene									3.403	.210***
No Substance use									4.551	.437***
N	2232		1925		1175		1900		608	
Nagelkerke R Square	.105		.070		.036		.085		.218	
Significance	***		***		***		***		***	

*p<0.05, **p<0.01, ***p<0.001
reference categories: female victim; elderly victim; no criminal history or unknown; homicide committed during the day; private crime scene; victim drug or alcohol use or known addiction; single victim; victim and perpetrators are (ex) intimate partners or family; different ethnicity

Discussion

The first goal of this study was to test the validity of the Adversary Effects Hypothesis, the Physical Strength Hypothesis, and the Social Distance Hypothesis on Dutch homicide cases. We tested the validity of each hypothesis individually, and evaluated whether the focus on victim characteristics as predictors of weapon use across the hypotheses is sufficient by testing them in a combined model with situational factors. Our findings underline the importance of situational factors in explaining weapon use: In the combined model, victim age and gender remain significant victim characteristics, yet all other victim-focused variables are statistically insignificant. On the other hand, multiple victims, public crime scenes and no indications of victim substance use appear as significant predictors for firearm use. Thus, when combined, situational characteristics have a stronger explanatory power than victim characteristics.

This is also somewhat reflected in the individual models for each hypothesis, which provide varying support: according to the Adversary Effects Hypothesis, the victim being male, at a young age, and having a criminal history should lead the perpetrator to use a more lethal weapon – a firearm – out of fear of retaliation and to increase the perpetrator's coercive power. In our study, the victim's gender and age had the expected effect, yet their criminal history was no significant predictor for firearm use. When measured independently from other factors, our findings support the Physical Strength Hypothesis, which assumes that the victim's physical superiority – measured through gender and age difference to the perpetrator – are predictive of firearm use. And finally, the Social Distance Hypothesis is partially supported through our findings, as greater relational distance to the victim increased the likelihood of firearm use in homicide, yet cultural distance between victim and perpetrator had no predicting effect. In addition to testing each hypothesis separately, we also combined the victim-focused Adversary Effects- and Physical Strength Hypothesis in a model. When combined, the age and gender of the victim remain significant predictors of firearm use, yet age difference to the perpetrator loses statistical significance. This finding indicates that it is not the age difference but rather the victim's age independent from the perpetrator's that matters in weapon use.

The question arises: why were none of the hypotheses related to weapon lethality fully supported by our Dutch homicide data, in particular when situational factors are considered? We hypothesize that there are two reasons: First, we propose that the two main assumptions underlying the Adversary Effects Hypothesis, the Physical Strength Hypothesis and Social Distance Hypothesis are not met. The first assumption at the heart of the hypotheses, particularly the Adversary Effects Hypothesis and the Physical Strength Hypothesis, is the rational choice paradigm. Both hypotheses assume that the perpetrator makes a rational choice for a more or less lethal weapon, based on the physical or otherwise coercive power of the victim. Previous studies have indeed suggested a correlation between premeditation and planning of a violent crime and weapon use: Pizarro and colleagues (2021) found that premeditation of a violent crime in New Jersey, US, increased the likelihood of firearm use compared to other weapons by 4.75, when controlling for

characteristics of perpetrators and their relationship to the victim. However, research also suggests that many homicides are committed in affect rather than through instrumental calculations and extensive planning (Adjorlolo & Chan, 2017; Thijssen & de Ruiter, 2011). Thus, the rationality behind weapon use in lethal violent encounters may be bound by other situational factors, such as the perpetrator's self-control, or the presence of third parties (Pelletier & Pizarro, 2019). Indeed, in the final model of our analyses, situational factors rather than victim characteristics remain significant and strong predictors of firearm use compared to other weapons.

The second assumption that all of the tested hypotheses rest upon is weapon choice. However, restricted access to specific weapons may be a confounding factor affecting the generalizability of the hypotheses. On a macro level, the general availability of specific weapons to potential perpetrators needs to be considered: In the United States, where all hypotheses were developed, even the most lethal type of weapon – a firearm – is not heavily regulated and accessible to the general public (Bureau of Alcohol Tobacco Firearms and Explosives, 2023). As mentioned previously, it is estimated that there are 120 firearms for every 100 citizens in the United States (Karp, 2018). In other societal contexts, such as the Netherlands, firearms are more heavily regulated than in the United States and only legally accessible to a small and specific population. Here, it is estimated that there are three firearms for every 100 Dutch citizen (Karp, 2018). Thus, it can be assumed that the weapon choice of Dutch homicide perpetrators is fundamentally more restricted, which violates the basic assumption of the hypotheses tested in this study and may explain the deviation from our results to previous empirical studies. Without the ability for further testing, our study suggests that the generalizability of the Adversary Effects Hypothesis, the Physical Strength Hypothesis and the Social Distance Hypothesis, and therefore common explanations for firearm use in homicides, is limited as their underlying assumption of weapon choice is dependent upon societal context.

A second explanation for why the tested hypotheses do not find support in our data lies in their narrow focus on victim-characteristics, which does not align with dominant theories on violence that highlight the relevance of a multitude of individual, situational and structural factors (Pridemore, 2002; Sampson & Lauritsen, 1994). The inclusion of situational control variables and subsequent loss of significance of several victim-related variables in our findings reinforces the notion that violent encounters are complex and do not occur in a vacuum between individuals. The hypotheses tested in this study, however, do not account for such factors in explaining weapon use. Empirically, situational or structural factors have not been included as potential mediating variables in the few existing assessments of these hypotheses. Theoretically, the hypotheses lack integration into broader theories on violence, or violent crime in particular. In their current forms, they seem disconnected – a patchwork of theoretical ideas that follow the same underlying question of how weapon lethality impacts weapon use, but do not seem to be integrated with each other, nor with other dominant theories on violence. As such, the hypotheses may be able to explain weapon use in certain contexts, such as parricides in the case of

the Physical Strength Hypothesis, but are combined not sufficient to comprehensively address the question.

These conclusions beg the question: do we need a new theory of firearm violence in Europe if existing ones cannot accurately and comprehensively capture the phenomenon of weapon use across geographical contexts? A critical evaluation of the current diffused theoretical and empirical landscape would suggest that adding theories would only extent and disperse the field further, rather than solve the main problems with existing approaches. Empirically, current hypotheses lack empirical validation. Almost all the hypotheses presented in this paper here have exclusively been tested by the researchers who also coined said hypotheses and who used the same, or similar empirical data to empirically support their ideas across several studies (see for example Felson & Hullenaar, 2021; Felson & Painter-Davis, 2012; Felson & Pare, 2010). Although this fact does not diminish the potential of each of these hypotheses, it demands more scrutiny to establish validity, reliability and a broader overall scientific credibility. An obstacle to extensive empirical validation is the lack of availability of detailed data on violent assaults and weapon use. A new theoretical approach targeted towards the European context would most likely suffer from similar problems, given the existing gaps of knowledge on firearm- or otherwise weapon-related violence in Europe (Duquet & Vanden Auweele, 2021).

A first step to enhance current theoretical ideas related to weapon lethality is to integrate existing approaches (of which some are presented in this study) into theoretically and empirically well-established theories on violence that incorporate individual, situational, and structural factors in their explanation for the occurrence of violence. Some of these theories already show overlap with the ideas presented in this study's central hypotheses: For example, Situational Action Theory (Wikström & Treiber, 2009; Wikström, 2014) emphasizes the role of environmental influences, and individual perceptions of action alternatives in a given environment in shaping criminal or specifically violent behavior. The idea that one's actions are guided by one's perception of the given setting aligns closely with the ideas of the hypotheses discussed in this study that weapon use is a reaction to being confronted with a certain opponent. Yet, where these hypotheses focus only on one factor in the environment, the opponent – Situational Action Theory – allows for a broader interpretation of the environment, that includes other situational factors, such as the geographical place. Whilst Situational Action Theory in itself may be too broad to understand weapon use in violent encounters in particular, given that it focuses on (violent and non-violent) criminal behavior in general, it could offer a theoretical backdrop to some of the hypotheses on weapon use. A theoretical and empirical exploration whether weapon lethality hypotheses can be integrated with the Situational Action Theory in particular would have gone beyond the scope of this present study, but could be a starting point to move theoretical firearm violence research further.

Overall, we believe that the integration of specific firearm hypotheses with broader violence theories and their associated paradigms could offer new theoretical avenues. For firearm violence in particular, an integration would strengthen the theoretical foundation of empirical research and make explicit the underlying assumptions and paradigms that

empirical research is built on. However, violence research in itself may also benefit from such an integration. In their current state, most dominant violence theories focus on factors of (violent) crime causation, providing an abundance of macro-, meso- and micro-level factors, from structural societal to individual biological factors (Eisner, 2009; Piquero, 2015). Yet, what is commonly neglected in these approaches to violence is the question *how* violence is produced (Obert et al., 2018), which in return is provided by the specific firearm hypotheses presented in this study. An integration would expand violence theories beyond the *why* of violence to the *how*.

In order to realize these theoretical explorations, European research also needs to address the existing empirical gaps. Disaggregated and detailed data on violent encounters, including reliable information on the *modus operandi*, is a necessity to enhance weapon-related research in Europe. Few instruments already exist that address parts of these needs: The European Homicide Monitor is an established instrument across several European countries for the collection of such data on lethal violence. Yet, given the relatively low number of homicides in most European countries, any analysis using homicide data only captures the minority of weapon-related assaults (Krüsselmann, 2023). On the other hand, firearm-specific databases, such as SEESAC's Armed Violence Monitoring Platform (South Eastern and Eastern Europe Clearinghouse for the Control of Small Arms and Light Weapons, 2023) or the Dutch Firearm Violence Monitor (2022) capture both lethal and non-lethal assaults, but do not allow for comparisons across different types of weapons. Ideally, a comprehensive account of weapon use in violent encounters would include detailed data that captures individual, situational and structural factors for both lethal and non-lethal incidents to inform theoretical innovations in the field.

Limitations

This is the first study to test the applicability of common hypotheses related to weapon lethality in a different societal context. Despite these first steps, there are several shortcomings to these studies that future studies need to address. First, the sample used to assess the influence of weapon lethality on a perpetrator's weapon use only analyzed cases in which the violent encounter ended in the death of the victim. However, researchers have previously stated that the higher weapon lethality of firearms may also deter the perpetrator from engaging in a violent encounter all together, seeing the risk that the use of such a weapon could bring (Kleck & McElrath, 1991; Phillips & Maume, 2007). To fully understand the effect of weapon lethality on the perpetrator's choice of a weapon and subsequent behavior, non-lethal assaults and threats committed with weapons that did not escalate to violence need to be considered and compared to the homicide sample. Such a comparison could disentangle the complicated nature between weapon lethality and violent encounters better. Equally detailed data on non-lethal assaults and threats with weapons is not available in the Netherlands, or elsewhere yet.

In addition, research has indicated that not only the type of weapon overall, but even the type of firearm and associated caliber size impact the lethality of violent encounters, with higher caliber weapons having a higher lethality (Braga & Cook, 2018; Libby & Corzine,

2007). To unveil the relation between caliber size and lethality and other more detailed layers of weapon use and lethality, reliable and complete data on firearms are a necessity. Yet, such data is unavailable in the Netherlands, due to the lack of a national registration point of legal and illegal firearms. Instead, such information is dispersed over several sources, such as the National Police and forensic institutes.

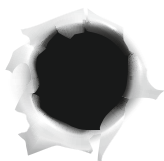
Finally, some limitations of this study relate to the data availability and variable construction. The dependent variable – the weapon used – is coded as a binary variable, indicating whether a firearm or other weapon was used. However, such a binary variable may not reflect the continuum of weapon lethality. Ideally, this research would have followed previous studies (Rennison et al., 2011) in disaggregating the type of weapon further, to see whether, for example, similar differences exist between knives and the next less lethal weapon – a blunt object. Yet, running multinominal regression with modus operandi disaggregated into the continuum – firearms, sharp objects, blunt objects, physical violence – yielded unreliable results, due to the small number of homicides, in particular homicides committed with blunt objects and physical force. Thus, a bivariate distinction into firearms and other weapons is deemed more reliable in the context of this study.

Missing information about the modus operandi is one of the reasons that affected the low number of homicide cases eligible for this study, and it also impacted specific variables, in particular variables about the victim's country of birth, substance use and criminal history. Although the DHM handles strict definitions, to overcome the problem of missing data, we interpreted missing information as no indications for the presence of substance use and criminal history. This may have resulted in an overestimation of cases labelled with no indications.

Conclusion

Despite these shortcomings, this research adds to the empirical and theoretical literature on weapon lethality. We found that common hypotheses explaining the use of firearm in relation to its lethality have a limited generalizability outside a US context due to their assumption of free weapon choice, which is only met in societal contexts in which legal firearm availability is high. In addition, we argue that the hypotheses are too narrowly focused on victim-related factors and as such do not align with dominant theories on violence emphasizing the importance of situational factors. We suggest that future (European) empirical and theoretical work on weapon lethality should more rigorously empirically test for the underlying assumptions of the current hypotheses and embed their research into broader violence theories. However, such an approach requires detailed, reliable, and comparable data on armed violent crimes, which is relatively rare in criminological studies, in Europe and elsewhere (Hellenbach et al., 2018; Liem et al., 2013; Strom & Smith, 2017). In addition, future research could benefit from qualitative approaches to understanding weapon use in homicides or other crimes. Previous qualitative studies have proven insightful to understanding the complex nature of weapon use and the intent of perpetrators (Phillips & Maume, 2007; Wells & Horney, 2002). Some studies have highlighted factors related to cultural learning of weapon use, for example how offenders

were introduced to or incentivized to use a certain type of weapon by parental figures or peers (Marano, 2015; Wilkinson et al., 2009). Such an approach may complement the rational choice approach by the Adversary Effects- and Physical Strength Hypothesis and aid the integration of single hypotheses into broader theories. In addition, through interviews with perpetrators, the rationality or randomness of weapon use and other contributing situational factors can be explored further and with more detail.



Chapter 6



A Typology of Lethal and Non-Lethal Firearm Violence

This chapter is based on Krüsselmann, K., Aarten, P., & Liem, M. (2024).
Missing the Mark? A Typology of Lethal and Non-Lethal Firearm Violence
in the Netherlands. *Crime & Delinquency*. advance online publication

Abstract

Firearm violence in Europe is a complex phenomenon; it manifests itself in various contexts and circumstances, involving different types of victims and perpetrators. Yet, previous research does not account for this complexity and focuses mainly on lethal firearm violence alone. In this study, we use 243 cases of lethal shootings (2015-2021) and 807 cases of non-lethal shootings in the Netherlands (2018-2021) to build typologies of firearm violence using agglomerative hierarchical clustering. The analysis results show five distinct types: urban lethal shootings, urban injurious shootings, and urban non-injurious shootings, as well as suburban and rural shootings. Those categories differ mainly in the lethality, urbanity, context and location of the shootings. We conclude that the inclusion of non-lethal firearm violence is necessary in understanding and act upon this multifaceted problem.

Introduction

Firearms are considered the most lethal type of weapon commonly used in interpersonal violent encounters. Recent years have witnessed a substantial growth in empirical studies on firearm violence in Europe. These studies have explored the temporal and geographical trends of firearm homicides for particular populations (Frei et al., 2006; Sturup et al., 2019), the differences between firearm homicides compared to non-firearm homicides (Krüsselmann et al., 2023) and the links between firearms trafficking and firearm homicides (Duquet & Vanden Auweele, 2021; Florquin, 2021). What these studies also underline is the heterogeneous nature of firearm homicides, cross-nationally and compared to other weapons (Killias & Markwalder, 2012; Krüsselmann et al., 2023).

One aspect largely neglected in European studies on firearm violence is non-lethal firearm violence (Khoshnood et al., 2023; Sturup et al., 2018; Sturup et al., 2019). This lack of inclusion of non-lethal firearm violence data is problematic, for conceptual, empirical as well as practical reasons. On a conceptual level, it has been argued that (firearm) homicides may be used as an indicator for underlying non-lethal (firearm) violence (Liem, 2022; van Breen et al., 2023). Yet, the underlying assumption that homicides – and firearm homicides specifically – are homogeneous in nature to non-lethal shootings remains untested. Empirically, a focus on firearm homicides is problematic as it ignores the majority of firearm violence (Krüsselmann, 2023). Yet, there is a relative scarcity of publicly accessible statistics on non-lethal firearm violence, both on the national as well as regional level in Europe (Duquet & Vanden Auweele, 2021) and elsewhere (Hipple, 2022). The little accessible data is further diffused across various sources, including police files, medical data, or courts (Duquet & Vanden Auweele, 2021; Hipple, 2022; Kaufman & Delgado, 2022; Naik-Mathuria et al., 2021), making the process of obtaining relevant data complex and long. Finally, for practical reasons, the inclusion of non-lethal firearm violence data could help to inform and evaluate the effectiveness of prevention efforts against firearm-related violence. Currently, policy-briefings, reports and studies on the prevention of or interventions against firearm violence tend to use firearm homicides to describe the prevalence and importance of the issue or to evaluate certain countermeasures (European Commission Directorate-General for Enterprise and Industry, 2014; European Commission Directorate-General for Migration and Home Affairs, 2020; König et al., 2018). But if the majority of firearm violence is neglected, to what extent can we move forward in the quest for effective prevention and intervention efforts to reduce firearm violence?

The Heterogeneous Nature of Firearm Homicide

Firearm violence is a complex phenomenon. Both national and cross-national accounts show the various facets and characteristics of firearm homicides in Europe. These largely descriptive studies show how profiles of victims and offenders, context and motivations, situational factors of firearm homicides and the role of firearm availability vary (Duquet & Vanden Auweele, 2021; Khoshnood et al., 2023; Killias & Markwalder, 2012). For example,

in countries such as Finland and Switzerland, firearms are predominantly used in domestic homicides, whereas in countries such as Sweden and the Netherlands, firearm homicides are linked mostly to activities by organized crime groups or drug-related conflicts (Krüsselmann et al., 2023). In addition to cross-national variations, studies report various manifestations of firearm violence and profiles of victims or perpetrators within a country (Dressler, 2021; Khoshnood et al., 2023). Overall, this observed heterogeneity of firearm violence is not only observed in Europe, but other geographical regions as well (Dare et al., 2019).

In describing various types of firearm homicides, researchers tend to categorize firearm homicides based on the pre-established categories of the context in which they occur, for example domestic firearm homicides compared to robbery homicides, or drugs-related shootings (Cook et al., 2019; Krüsselmann et al., 2023; Pelletier & Pizarro, 2019). Yet, to the best of our knowledge, no study thus far has classified firearm homicides into data-driven types that fully account for the varieties of characteristics of firearm homicides even within a specific context.

Lethal and Non-Lethal Firearm Violence

Mostly omitted from the criminological literature on firearm violence in Europe are accounts of non-lethal firearm violence. This is problematic for the understanding of the broader phenomenon of firearm violence, that includes both lethal and non-lethal types of violence. In addition, research based on US-data found that lethal and non-lethal firearm violence incidents differ on victim characteristics, situational context of the shootings, types of firearms and medical factors (Alzheimer et al., 2019; Grommon & Rydberg, 2015; Hipple & Magee, 2017). For example, scholars seem to agree that the context of a shooting matters for the outcome, with shootings related to drug-crimes being associated with a higher likelihood for lethal outcomes (Alzheimer et al., 2019; Hipple & Magee, 2017). In one of the US-based studies, the shooting being drug-related increased the odds for a lethal outcome by 23 times, even when controlling for injury severity and victim characteristics (Hipple & Magee, 2017). On the other hand, shootings in the context of domestic violence increased the odds of the victim's death by almost ten and seven times, respectively.

More attention for and empirical data on non-lethal firearm violence can be found in public health studies, where data is commonly sourced from registers of injuries from emergency departments (Moore et al., 2013; Naik-Mathuria et al., 2021). From these sources, a number of health variables have been found relevant for the outcome of shootings, such as the number of gunshot wounds, the location of the gunshot wound, as well as medical response time (Crandall et al., 2013; Hipple & Magee, 2017). The location of the gunshot injury is considered one of the strongest predictor of a lethal outcome, with shots to vital parts of the body such as the head or chest increasing the odds of the victim's death by up to 130 times (Alzheimer et al., 2019; Cripps et al., 2009; Hipple & Magee, 2017). Although the relevance of the public health perspective to the study of firearm violence is recognized amongst (mainly US) criminologists, only few studies to date have empirically combined relevant factors to firearm lethality.

In the European context, studies comparing lethal to non-lethal firearm violence from either discipline are scarce at best. The few existing findings are mostly in line with findings from the context of the US, in that the context of firearm violence matters. Lethal firearm violence seems more common in the context of drug-related violence and domestic conflict, whereas robberies and drug-related extortions committed with a firearm commonly do not result in the death of a victim (Dressler, 2021; Liem & Krüsselmann, 2021). Whilst existing work provides valuable insights and hint at potential differences in the characteristics of firearm violence between lethal and non-lethal incidents, studies so far emphasize the scarcity of data on non-lethal firearm violence.

Thus, in conclusion, although empirical studies comparing lethal with non-lethal firearm violence are rare, they have identified several factors associated with either lethal or non-lethal firearm violence. This suggests that the broader phenomenon of firearm violence becomes even more complex when accounting for firearm homicides as well as non-lethal firearm violence incidents. Therefore, in this study, we aim to identify types of firearm violence that are not just based on firearm homicides but extend to non-lethal violent firearm incidents.

Goal of This Study

In this study, our aim is twofold: first, we seek to identify distinct types of shootings based on individual-level data for both lethal and non-lethal shootings. Second, in building a data-driven typology, we aim to address the question whether firearm homicides and non-lethal firearm violence are distinct typologies or whether the assumption that firearm homicides can be used as an indicator for non-lethal firearm violence is supported. The answer to this question has implications for future theoretical and empirical research and the conceptualization of firearm violence in the European context.

Methodology

Data

This study makes use of two related data sources: the Dutch Firearm Violence Monitor and the Dutch Homicide Monitor whose data collection instruments share compatible key features. The Dutch Firearm Violence Monitor contains detailed information on all police-registered shootings in the Netherlands between 2018 and 2021. Initial registrations of shootings from the *Basisvoorziening Handhaving Register* – a registration system of crimes – by the Dutch National Police form the base of the Dutch Firearm Violence Monitor. The registration makes distinctions between the following types of shootings relevant for this study: (1) lethal shootings, (2) shootings resulting in physical injuries, and (3) shootings at individuals that do not result in physical injuries. Threats with firearms in which no shot is fired are not included. To fill gaps of information from the police registrations, additional information from public court decisions, media articles and ballistic information from the Dutch Forensic Institute

have been manually matched to incidents (based on location and date of the incident), and then incorporated into the Dutch Firearm Violence Monitor where possible.

The second data source for this study is the Dutch Homicide Monitor. The Dutch Homicide Monitor contains all homicides – including firearm homicides – committed between 1992 and 2021 that fall under the legal codes of murder, manslaughter and infanticide. Not included are assaults leading to death or legitimate killings, such as lethal shootings by police officers on duty. Detailed information on the homicide cases, victims and perpetrators is gathered through a number of public sources – news articles, court decisions – and non-publicly accessible sources, such as police and court files, as well as forensic reports. For this study, only firearm homicides from the Dutch Homicide Monitor are extracted and used in the analyses.

For this study, data from the Dutch Firearm Violence Monitor and Dutch Homicide Monitor have been merged into one dataset. This is possible due to the overlap in the data collection instruments. For the Dutch Homicide Monitor, detailed data on case-, victim- and perpetrator characteristics is collected following the validated framework of the European Homicide Monitor (Granath et al., 2011). The data collection instrument of the Dutch Firearm Violence Monitor follows the same structure and definitions of the Dutch Homicide Monitor whilst also allowing for aspects of non-lethal violence to be captured.

Although studies indicate that animals or objects could be considered proxies for individuals (Newberry, 2017), the information available to us did not allow for a reliable classification of such shootings as proxies. Therefore, accidental shootings, and suicide(attempts) were excluded in the analysis. Around 50 shootings at individuals for which the non-lethal outcome was unclear were excluded as well. Following this criterium, 126 cases of lethal shootings, 488 injurious shootings and 319 non-injurious shootings at a person between 2018 and 2021 from the Dutch Firearm Violence Monitor are included in the analysis. Due to the relatively small number of annual firearm homicides compared to non-lethal shootings in that period, we expanded the timeframe for firearm homicides to 2015-2021, so that in total the analysis is based on 243 cases of lethal and 807 cases of non-lethal shootings.

Variables

Based on the existing literature, several variables regarding victim characteristics, situational context and injury factors have been selected for inclusion in the analysis.

Victim characteristics: This study includes two variables related to the victim. The victim's gender is a binary variable, indicating the gender as assigned during birth as either male or female. In addition, the relationship between victim and perpetrator is indicated by three categories, commonly used in previous studies (Fox & Allen, 2014; Pizarro et al., 2019): Family or (ex-)partners, acquaintances, and strangers.

Situational context: Four variables indicate the situational context of the shootings. The context of the shootings is identified through three categories: domestic shootings (shootings directed at (ex-)partners, (step)kids, or other family members), shootings related to robberies (of private homes, businesses or street robberies) or criminal milieus

(e.g. rip deals, assassinations) and, finally, other contexts – a category which mainly includes disputes unrelated to the criminal milieu, such as disputes between neighbors, (ex-)business partners etc. These categories are typically used to categorize lethal firearm shootings, but are yet to be tested on non-lethal firearm violence (Krüsselmann et al., 2023; Pelletier & Pizarro, 2019). We further distinguished between urban, suburban and rural areas within the Netherlands, following classifications of the European statistical agency (Eurostat, 2023). In addition, we captured the type of crime scene, differentiating between private locations (homes, hotels or institutions), public recreational locations outside (parks, forests, etc.), public recreational locations inside (bars, restaurants, clubs etc) and streets, roads and public transportation that are not linked to recreational. Finally, suicide attempts and suicides were combined into one category, indicating whether the suspect of the shooting attempted to commit suicide after the shooting.

Injury variables: First, a binary variable indicates whether the shooting resulted in a lethal or non-lethal outcome. In shootings that resulted both in non-lethal as well as lethal injuries to several victims, the shooting was classified as lethal. We differentiate between shootings committed with handguns (pistols, revolvers, converted gas/alarm pistols, unknown types of handguns), long guns (rifles, shotguns, machine guns, unknown types of long guns) and other types of guns (alarm pistol, gas pistol, combination gun, Flaubert, air gun etc). The position of the gunshot wound is divided into three categories: injuries at the head or neck, at the chest, abdomen or back and at other locations, such as the extremities.

Analyses

To meet our first aim, we performed hierarchical cluster analysis. Hierarchical cluster analysis requires distance measures as a unit of analyses. Consequently, the originally categorical dataset had to be transformed through Multiple Correspondence Analysis (further discussed and results presented in Supplementary Material). Multiple Correspondence places each of the variable categories into a two- or higher dimensional space, based on their principal component (Le Roux & Rouanet, 2010). The closer the proximity of categories in this space, the closer their multivariate relationship – in other words, the more often they occur together in individuals, or, in the case of this study, shootings. Multiple Correspondence Analysis thus quantifies variable categories by associating them with coordinates – the distance measure necessary for cluster analysis. For the cluster analysis, we used agglomerative hierarchical clustering following Ward's method which is suitable for the type of our data. In this type of agglomerative clustering, each case – shootings in this study – starts off as its own cluster which are then progressively merged further based on their similarity to each other (Miyamoto, 2022). There are various methods to merge clusters; Ward's linkage method of clusters aims to minimize the variance within each cluster. For the clustering, we used the *HCPC* function of the *FactoMineR* package (Lê et al., 2008).

To meet our second aim, we present descriptive statistics of the included shootings, differentiated by lethal and non-lethal outcome. We ran Chi-Square tests on frequencies, for statistical significance. These analyses provide an overview of the characteristics of

shootings in the Netherlands and a preliminary answer to the question whether lethal and non-lethal shootings differ from one another in those characteristics. Therefore, they are presented first in the following result section. Throughout the results, we present percentages of known cases. Specific frequencies are not displayed in the tables to adhere to ethical agreements made with providers of the data and the authors' affiliated institute.

Results

Descriptive Statistics

Focusing on the four most recent years for which a differentiation between lethal, injurious and non-injurious categories was possible, on average 230 shootings at individuals took place annually. Between 35 and 55 percent of these shootings resulted in non-lethal injuries; between twelve and 17 percent in lethal injuries (see Table 6.1). That means that for every lethal shooting, there were 3.8 shootings resulting in non-lethal injuries and 6.3 non-lethal shootings overall.

Table 6.1: Number and distribution of shootings by type of outcome in the Netherlands, 2018-2021 (Dutch Firearm Violence Monitor)

	N total shootings at individuals	Non-injurious	Non-lethal injury^a	Lethal injury
2018	269	111 (41.2%)	120 (44.6%)	33 (12.3%)
2019	247	92 (37.2%)	132 (53.4%)	30 (12.1%)
2020	221	59 (26.7%)	133 (35.4%)	31 (14%)
2021	186	57 (30.6%)	103 (55.4%)	32 (17%)

^a data derived from Dutch National Police

Lethal Compared to Injurious and Non-Injurious Shootings

A first descriptive comparison of the relevant variables for lethal, non-lethal injurious and non-injurious shootings reveals significant differences on all but three of the variables (see Table 6.2). Amongst lethal shootings, shootings in private and recreational locations, and rural areas are more common. Equally, shootings committed with long guns and injuries to vital parts of the body, such as head, neck, abdomen, or chest are most prevalent in this category. In addition, suicide(attempts) by the perpetrator following the shooting are only associated with lethal shootings. Distinct features of non-lethal injurious shootings are the low fraction of shootings in the domestic context and relatively many dispute-related shootings, few shootings in rural locations and no injurious shootings in which the perpetrator attempted to or succeeded in committing suicide. In addition, injuries to non-vital parts of the body and relatively few shootings with long guns set injurious shootings apart from lethal and non-injurious outcomes. Finally, non-injurious shootings are associated with relatively many domestic conflicts and fewer shootings in the criminal

milieu, the use of firearms other than handguns and long guns and no registered (attempts of) suicides by the perpetrator. In addition, there are relatively few non-injurious shootings in urban areas and in private locations, but more so in public streets.

Table 6.2: Descriptive statistics of lethal (2015-2021) and non-lethal injurious and non-injurious shootings (2018-2021) in the Netherlands; % of known cases & chi-square results

	Lethal	Non-lethal injurious	Non-injurious
Victim Gender	$\chi^2=2.0376$, $p=0.361$		
Male	89.2%	93.1%	91.5%
Female	10.8%	6.9%	8.5%
Missing	14	239	226
Victim-Perpetrator Relationship	$\chi^2=6.2513$, $p=0.181$		
(Ex-)Partner & Family	22.5%	10.9%	17.3%
Acquaintances	46.5%	58.4%	50%
Strangers	31%	17.3%	32.7%
Missing	84	354	256
Context Violence	Fisher's exact, $p=0.014$		
Domestic	20.8%	13%	34.5%
Criminal Milieu/ Robbery	74.5%	71.4%	58.6%
Dispute	4.7%	15.6%	6.9%
Missing	77	378	279
Crime Scene	$\chi^2=99.443$, $p=0.000$		
Public – recreational outside	20.1%	4%	5.1%
Public – recreational inside	9.6%	6.5%	4.7%
Public – streets & public transport	44%	74.8%	81.6%
Private	26.3%	14.7%	8.6%
Missing	27	102	52
Type Firearm	$\chi^2=24.273$, $p=0.000$		
Handgun	73.7%	75.8%	64.9%
Long Gun	21.2%	8.3%	11.7%
Other Firearm	5.1%	15.9%	23.4%
Missing	70	323	231
Injury	$\chi^2=522.14$, $p=0.000$		
Head/Neck	55.4%	10.7%	0%
Chest/Abdomen/ Back	43.8%	23.3%	0%
Other bodypart	0.8%	63%	0%
No injury	0%	0%	100%
Missing	105	305	202

Table 6.2: Continued

	Lethal	Non-lethal injurious	Non-injurious
Urbanization	$\chi^2=10.291$, $p=0.036$		
Urban	77.9%	75.8%	70.8%
Suburban	13.7%	19.6%	22.7%
Rural	8.4%	4.6%	6.5%
Missing	0	0	0
Perpetrator Suicide	Fisher's Exact: $p=0.000$		
(Attempted) suicide	8.3%	0%	0%
No (attempted) suicide	91.7%	0%	0%
Missing	57	300	234
Time of Shooting	$\chi^2=4.5191$, $p=0.104$		
Daytime (6am-6pm)	36.7%	29.4%	35.1%
Nighttime (6pm-6am)	63.3%	70.6%	64.9%
Missing	11	10	6
N Total	243	488	319

Typologies of Shootings

All non-injurious (N=319) and injurious (N=488) shootings between 2018 and 2021 and lethal shootings (N=243) committed between 2015 and 2021 were clustered based on their principal components. In total, five clusters – that is typologies of shootings – were identified (see Table 6.3). The lethality, urbanity of the location and type of injury associated with the shootings are the three most important variables differentiating the clusters overall. In the following section, for each cluster, the defining characteristics specific to that cluster, as well as on overall description with percentages of known cases (thus excluding missing cases) are presented.

Table 6.3: Cluster descriptions; % of known cases & chi-square test results; ordered by contribution to creation of typologies.

	CLUSTER 1 Lethal urban shootings	CLUSTER 2 Injurious urban shootings	CLUSTER 3 Non- injurious urban shootings	CLUSTER 4 Suburban shootings	CLUSTER 5 Rural shootings
Lethality	$\chi^2=1540.5$, $p=0.000$				
Lethal	98.5%	0%	0%	8.6%	31.7%
Non-lethal injurious	1.5%	100%	0%	51.1%	35%
Non-injurious	0%	0%	100%	40.2%	33.3%
Missing	0	0	0	0	0

Table 6.3: Continued

	CLUSTER 1 Lethal urban shootings	CLUSTER 2 Injurious urban shootings	CLUSTER 3 Non- injurious urban shootings	CLUSTER 4 Suburban shootings	CLUSTER 5 Rural shootings
Urbanization	Fisher's Exact p=0.000				
Urban	91.8%	100%	100%	0%	0%
Suburban	8.2%	0%	0%	100%	0%
Rural	0%	0%	0%	0%	100%
Missing	0	2	0	0	0
Injury	Fisher's Exact p=0.000				
Head/Neck	57.9%	13.4%	0%	0%	31.6%
Chest/Abdomen/Back	39.3%	19.6%	0%	29.8%	36.8%
Other bodypart	1.9%	64.3%	0%	29.8%	21.1%
No injury	0.9%	2.7%	100%	40.4%	10.5%
Missing	88	240	136	118	42
Context Violence	Fisher's Exact p=0.042				
Domestic	20.8%	8.3%	31.8%	25.8%	29.4%
Criminal Milieu/ Robbery	74.4%	75%	63.6%	64.5%	64.7%
Disputes/Other	4.8%	16.7%	4.6%	9.7%	5.9%
Missing	70	292	196	144	44
Victim Gender	Fisher's Exact p=0.046				
Male	89.6%	91.9%	89.2%	98.6%	82.1%
Female	10.4%	8.1%	10.8%	1.4%	17.9%
Missing	13	180	153	106	33
Perpetrator Suicide	Fisher's Exact p=0.000				
Suicide(attempt)	7.7%	0%	0%	0%	13%
No suicide(attempt)	92.3%	100%	100%	100%	87%
Missing	53	236	162	114	38
Type Firearm	Fisher's Exact p=0.011				
Handgun	72.5%	73.7%	67.2%	75.9%	75%
Long Gun	21.7%	8.4%	13.8%	7.4%	15%
Other firearm	5.8%	17.9%	19%	16.7%	10%
Missing	57	257	160	121	41
Crime Scene	Fisher's Exact p=0.000				
Public – recreational outside	19.9%	2.2%	5.2%	4.5%	26.2%

Table 6.3: Continued

	CLUSTER 1 Lethal urban shootings	CLUSTER 2 Injurious urban shootings	CLUSTER 3 Non- injurious urban shootings	CLUSTER 4 Suburban shootings	CLUSTER 5 Rural shootings
Public – recreational inside	9.9%	6.7%	3.6%	5.3%	11.9%
Public – streets & public transport	44.8%	77%	82.8%	72.2%	50%
Private	25.4%	14.1%	8.3%	18%	11.9%
Missing	14	82	26	42	19
Victim-Perpetrator Relationship	Fisher's Exact p=0.103				
(Ex-)Partner/ Family	21.7%	8.3%	17.9%	14.6%	37.5%
Acquaintances	44.2%	59.7%	51.3%	56.2%	50%
Strangers	34.1%	32%	30.8%	29.2%	12.5%
Missing	75	280	179	127	45
Time of shooting	$\chi^2=4.9031$, p=0.297				
Daytime (6am-6pm)	35.5%	28.3%	35.2%	35.3%	35.1%
Nighttime (6pm-6am)	64.5%	71.7%	64.8%	64.7%	64.9%
Missing	5	16	5	5	4
N Total	195	368	232	193	62

Type I – *Urban lethal shootings* – includes 195 shootings. Most shootings in this category have a lethal outcome (98.5%, v-test=27.4), are committed against male victims (89.6%, v-test=11.74) and result in injuries to the head or neck (57.9%, v-test=11.51). Overall, there are relatively few missings in this type of shooting.

Shootings of this type occur almost exclusively in urban centres of the Netherlands and are more likely to take in private spaces (25.4%) and outside recreational spaces (19.9%), whereas shootings in the streets are less common (45%) compared to other types. Around two thirds of the shootings take place at night (64.5%). Here, most shootings occur in the context of the criminal milieu (74.4%) or in domestic conflicts (20.8%). The share of stranger homicides (34.1%) in this category is comparatively high. Further, although handguns are still used in most of these shootings, the relatively high frequency of long guns (21.7%), such as automatic rifles, stands out. Finally, a small yet distinguishing fraction of the shootings were followed by the suicide(attempt) of the perpetrator (7.7%).

Type II – *Urban injurious shootings*– includes 368 shootings and is as such the type with the largest fraction of shootings. All resulted in non-lethal injuries (100%, v-test=26.18) and all took place in an urban environment (100%; v-test=15.45). Compared to all shootings

taken together, relatively much information regarding the victims and situational context of the shootings in this type remains unknown.

Shootings in this category mostly occur at night (71.7%) and in the streets (77%). Similar to other typologies, the largest fraction of urban injurious shootings are related to organized crime groups or robberies, yet the relatively low fraction of domestic conflicts (8.3%) and high fraction of dispute-related shootings (16.7%) differentiates this type of shooting from the others. More than 90 percent of these injurious shootings occur amongst acquaintances (59.7%) or strangers (32%). Victims are mostly male (91.9%) and wounded in non-vital body parts (64.3%), such as their limbs. The use of non-traditional firearms (17.9%), such as converted alarm- or gas-pistols, is setting this type apart from others. Finally, no suicides or attempts thereof are registered for any of the urban injurious shootings.

Type III – *Urban non-injurious shootings* – (N=218) is the second biggest category. None of the shootings of this type resulted in any physical injury (lethality: 100%, v-test=25.87; injury: 100%, v-test=12.50), and all took place in urban areas (100%, v-test=11.90).

Based on available data, the share of shootings taking place in streets outside of recreational places is high (82.8%) compared to the other types, whilst shootings in private homes are relatively rare (8.3%). The majority of shootings (63.6%) in this category is associated with the criminal milieu or robberies, and about half (51.3%) of involve acquaintances. About 90 percent of victims are male, and none of the perpetrators identified in this category is known to have committed or attempted suicide.

Type IV – *Suburban shootings* – includes 193 shootings and is characterized almost exclusively by taking place in smaller cities or towns that do not qualify as either urban nor rural (100%, v-test=28.43).

Within these suburban locations, most shootings take place on the streets (72%), although a comparatively high percentage occurs in private locations (18%). Similar to the other types, around two thirds of suburban shootings take place between 6pm-6am and the majority of these shootings can be linked to organized crime activities or robberies (64.5%). Around a quarter of the shootings are the result of domestic disputes (25.8%). With half of the shootings involving acquaintances and about 30 percent strangers, the victim-perpetrator relationship is not significantly different from the other typologies. What sets this type apart are victim- and firearm-characteristics, with significantly more male victims (98.6%) and fewer long guns (7.4%) involved. A little over half of the shootings resulted in nonlethal injuries, and less than ten percent (8.6%) in lethal injuries. There are no known cases of injuries to the head, but around thirty percent to the chest, abdomen or back and equally thirty percent to non-vital body parts.

Finally, 62 shootings constitute the base of the fifth type, *Rural shootings*. As the label of the type already indicates, these shootings exclusively take place in rural areas (100%; v-test=21.14). In this category a relatively large fraction takes place in recreational spaces (recreational outside, 26.2%; recreational inside, 11.9%). The majority of shootings (64.7%) in rural areas is connected to organized crime activities or robberies; about 30 percent to domestic conflicts. The fraction of shootings involving acquaintances (50%) is similar to the other typologies, but the share of (ex)partners or family members is higher (37.5%), and

shootings amongst strangers lower (12.5%). Victim- and firearm-related characteristics also differ from other categories, with rural shootings involving comparably fewer male victims (82.1%) and a relatively high share of long guns (15%). Finally, the outcome of these shootings was proportionally divided into lethal (32%), injurious (35%) and non-injurious (33%), in spite of the fact that about two thirds of the shootings were to vital parts of the body (31.6% head/neck; 36.8% chest/abdomen/back). With thirteen percent, rural shootings have the highest share of (attempted) suicides by the perpetrator.

Discussion

This study had two aims: First, we aimed to develop types of lethal and non-lethal shootings through hierarchical cluster analysis using detailed information regarding victims, situational contexts, and medical factors. In light of our first aim, our results indicate the existence of five distinct types of firearm violence in the Netherlands, which are most significantly differentiated by the outcome and space: *urban lethal shootings*, *urban injurious shootings*, *urban non-injurious shootings*, *suburban shootings* and *rural shootings*.

Together, this new data-driven typology of shootings provides a unique, in-depth picture of firearm violence in the Netherlands. Some of these types match with profiles of shootings sketched in previous studies or reports (Dressler, 2021; Hipple & Magee, 2017; Weaver et al., 2004). For example, *urban lethal shootings* fit the profile of targeted assassinations, which are instigated by organized crime groups to retaliate or 'solve' a conflict outside of the legal system. On average 20 to 30 of such contract killings take place each year in the Netherlands; they are typically committed by a hired hand who does not have a relation with the victim, with fully automatic firearms that can fire multiple shots in a short amount of time (Van Gestel & Kouwenberg, 2021). In addition, shootings included align with studies on domestic homicide, which usually include a high share of female victims (Chopra et al., 2022; Stöckl et al., 2013), take place in private spaces (Cussen & Bryant, 2015), and are strongly associated with (attempted) suicide by the perpetrator (Liem & Koenraadt, 2018).

Our findings are also in line with previous studies on the nature of firearm violence. For example, we find across the types of shootings that domestic conflicts and conflicts between (ex-) partners or other family members rarely lead to injuries, but either lethal or non-injurious outcomes, a finding in line with studies on firearm use and the lethality of domestic assaults (Dressler, 2021; Hipple & Magee, 2017; Weaver et al., 2004). In another example, our findings emphasize the importance of health-related factors and their association with lethality of shootings: 98 percent of lethal shootings recording injuries to vital areas of the body, such as head, neck, chest, abdomen or back. In contrast, in only around 33 percent of injurious shootings, gunshots to these areas were registered, which is in line with previous studies on health-related predictors of lethal shootings (Alzheimer et al., 2019; Hipple & Magee, 2017). The two most distinguishing factors of all types – urbanization and lethality – deserve further examination. As our findings show, the vast majority of shootings in the Netherlands take place in urban centres, such as Amsterdam, Rotterdam and The Hague. Such a concentration of gun violence is mirrored in both

European countries (Gerell et al., 2021; Krüsselmann et al., 2023), and in the United States (Branas et al., 2004). Studies suggest that such a concentration occurs across degrees of urbanity and on a local level within urban centres, associated with illegal activities, such as drug-related crimes (Contreras & Hipp, 2020; Gerell et al., 2021; Silveira Neto et al., 2023). Our findings are in line with this observation, given that most shootings overall are also related to activities by organized crime groups or robberies. In the Netherlands, violence associated with these activities is commonly linked to cocaine-trafficking through the port of Rotterdam and subsequent trafficking within the country and across borders (Liem & Krüsselmann, 2021). Suburban and rural areas may experience less of such systemic drug-related firearm violence.

The strongest contributing factor to the establishment of the clusters, however, was the lethality of the shootings. As our findings show, lethal, injurious, and non-injurious shootings differ across their context, the urbanity, type of crime scene, and other factors. In other words, firearm homicides in the Netherlands are structurally different from non-lethal firearm shootings. This finding contradicts previous US-studies arguing that “[...] fatal and nonfatal [shootings], are statistically indistinguishable with respect to circumstances, with the sole exception of whether the shooting was indoors or outdoors” (Cook et al., 2019, p. 526). The characteristics of lethal shootings in the US come closest to the characteristics of in the cluster of *urban lethal shootings*, such as the (disproportionate) use of long guns with high caliber bullets (Braga & Cook, 2018; Zimring, 1972), or gunshot wounds to the head, chest, abdomen or back (Alzheimer et al., 2019; Hipple & Magee, 2017).

Coming back to our second aim, we need to address the assumption that firearm homicides may be used as an indicator for underlying non-lethal firearm violence. At least for the Dutch context, this assumption is not supported, as victim- and contextual characteristics differed across the outcome of shootings and lethality was a defining factor for the creation of the different typologies.

This conclusion implies that we should take a critical look at current theoretical approaches to firearm violence and empirical research, which mostly fail to address such heterogeneity. As most existing theoretical approaches to firearm violence focus on lethal cases alone (Heide, 1993; Krüsselmann et al., forthcoming (Chapter 5); Rennison et al., 2011), one may question to what extent these approaches are applicable to and hold explanatory power over non-lethal firearm violence. Future research on theoretical approaches to firearms need to address this gap, by accounting for non-lethal firearm violence, as well as lethal violence. Our findings have similar implications for future empirical work seeking to inform policymaking related to firearm violence, such as evaluations of prevention and intervention methods. When such methods are designed to tackle firearm violence overall – thus including non-lethal shootings – an evaluation solely based on firearm homicide data, as is currently the norm in the European context (Gjertsen et al., 2014; Hurka & Knill, 2020), is insufficient. Should future prevention strategies only be based on and informed by research on firearm homicide, their effectiveness may be limited only to the small fraction of lethal shootings, instead of addressing the majority of non-lethal firearm violence. Thus, systematic registration of non-lethal firearm violence by

law enforcement and inclusion in criminological research is necessary not just to improve the criminological understanding of firearm violence in Europe and elsewhere, but also to enhance policymaking tackling firearm violence.

Limitations

The findings presented in the previous section must be interpreted in the light of their limitations. The most significant limitation may be the low number of shootings overall. With a little over a thousand shootings, this study includes all shootings in the Netherlands which (a) are directed at an individual and (b) for which the outcome is known. However, disaggregating these shootings across their outcomes and several other variables results in relatively small clusters, such as the category of rural shootings which is based only on 61 shootings. A bigger population would ensure a more reliable clustering and, consequently, strengthen the generalizability of our findings. One way to increase the population of shootings would be to include threats against individuals in which no shots are fired, which was not possible in this study due to a lack of uniform registration of such incidents on the national level. A second option would be to consider proxies of individuals, such as objects or animals who are targeted to threaten or intimate a victim (Newberry, 2017). This approach was deemed too unreliable for this study, as the available information did not allow for proxies to be defined, yet should be considered for future studies.

Another shortcoming is the large fraction of missing information, in particular in non-lethal shootings. Some of the missing information may be due to the lack of available and reliable sources to the authors of this study. Yet, another part of the missing data may be non-random, because perpetrator information is not available for unsolved shootings or because victims may not report to the police when involved in criminal activities themselves (Cook et al., 2019; Hipple et al., 2019). However, there are reasons to believe that part of the missing information is linked to shortcomings in the data sources used for this study. Data registration of non-lethal shootings in particular is poor; data received from law enforcement was restricted in detail, forcing the researchers to use public sources, such as court decisions or media articles as substitutes. However, compared to lethal shootings, such public sources on non-lethal shootings contain relatively little and reliable details about victims, perpetrators or specific technical information about the firearm used. As a consequence, the validity of the categories to the extent that they are constructed based on missing data – in particular types II-IV – may be questioned. This study underscores the need for better registration of non-lethal shootings at the level of law enforcements to enable better data quality for future studies.

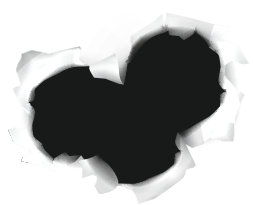
Another limitation is the geographical context. This study only includes lethal and non-lethal shootings that occurred in the Netherlands. As a recent previous study found, characteristics of firearm homicides differ across European countries (Krüsselmann et al., 2023): firearm homicides in the Netherlands are closely connected to often drug-related activities by organized crime groups and disputes between criminals, whereas firearm homicides in Switzerland or Finland, for example, took place mainly in the context of domestic violence. It can be assumed then that similar exploration of differences between lethal and non-lethal shootings may equally differ across countries. In the US, for example, lethal and non-lethal shootings show

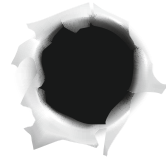
significant overlap (Cook et al., 2019). In addition, trends in firearm violence over time may change the characteristics of typologies presented in this study. Unfortunately, the lack of registration of non-lethal firearm violence and a common framework for collecting such data currently inhibits cross-national comparative and longitudinal research that includes non-lethal violence. To overcome this problem, the adaption of a common detailed data collection instrument, such as the Dutch Firearm Violence Monitor, that allows for cross-national cultural variations, as well as variations in the availability of data sources is needed.

Conclusion and Future Directions

This study explored typologies of lethal and non-lethal shootings in the Netherlands. Results of the hierarchical cluster analysis revealed five different clusters, which differ in lethality, degree of urbanization, type of gunshot injury, context of the shooting and situational characteristics such as location of the crime scene. In spite of its limitations, these clusters add another layer to our understanding of firearm violence: Previous research already indicated the heterogenous nature of (a) firearm homicides compared to homicides committed with other weapons and (b) the characteristics of firearm homicides when compared cross-nationally (Duquet & Vanden Auweele, 2021; Killias & Markwalder, 2012; Krüsselmann et al., 2023). In this study, we show that firearm violence in itself is also heterogenous. The findings further support the necessity for the inclusion of public health factors in future studies on lethality of shootings, which has been noted by previous studies in the United States (Grommon & Rydberg, 2015; Magee et al., 2021). Although the inclusion of injury variables in this study was limited, more factors associated with lethality of assaults should be taken into account in the future, such as medical response time and type of (specialised) trauma intervention (Circo & Wheeler, 2021; Crandall et al., 2013).

Above all, this study calls for further exploration of non-lethal firearm violence. Due to limited data availability and lack of common definitions of non-lethal firearm violence, non-lethal shootings or threats with firearms are rarely included in empirical studies, with the consequence that the majority of knowledge on firearm violence is built on the smallest fraction – lethal firearm violence. This study emphasizes the usefulness to explore non-lethal firearm violence further; for example, geographically, by examining near-repeat patterns of lethal and non-lethal shootings (Sturup et al., 2018) or by assessing whether policies targeted at firearm violence have the same impact on lethal and non-lethal violence. Improved registration of non-lethal firearm violence is essential to this goal. Following examples from the United States, European firearm violence researchers should consider the exploration of public health data to cover the void of existing accessible statistics and gaps in criminal justice data (Kaufman & Delgado, 2022; Naik-Mathuria et al., 2021). Better registration also requires a detailed collection instrument. The Dutch Firearm Violence Monitor is a first attempt of developing such a data collection instrument, with this study serving as a proof-of-concept of its usefulness. Hopefully, the Dutch Firearm Violence Monitor will be used to guide and enable future studies that include much needed non-lethal firearm violence data, thereby improving a better understanding of firearm violence as a whole and reshape future conceptualizations of firearm violence.





Chapter 7

Conclusion & Discussion

Ideas from this chapter are also presented in Krüsselmann, K. (2024).
Triggering Violence? The Impact of Firearms on the Nature
and Lethality of Violent Encounters: A European Perspective.
Journal of Contemporary Criminal Justice, 40(3), pp.543-545



Firearm violence is an understudied phenomenon in Europe despite the impact that firearm violence has on individual persons, neighborhoods, and the criminal justice system. Therefore, this dissertation has set out to improve the understanding of firearm violence in Europe, following two overarching, and six specific aims.

The first overarching aim was to understand the relation between firearms and the prevalence of violence by (1) describing the prevalence of lethal firearm violence cross-nationally in the European context and (2) examining the theoretical assumption about the impact of firearm availability on the prevalence of lethal interpersonal violence in Europe.

The second overarching aim was to understand the relation between firearms and the nature of violence. Specific aims were to (3) compare characteristics of lethal firearm violence cross-nationally in the European context, to (4) compare characteristics of lethal firearm violence to lethal violence committed by other means in the European context, to (5) examine and compare the nature of lethal in relation to non-lethal firearm violence with European, specifically Dutch, data and, finally, to (6) empirical test existing assumptions about the impact of a firearm's lethality on weapon use in lethal violence with Dutch data.

This chapter summarizes the findings for each of these aims, discusses the theoretical, empirical and policy-relevant implications of the findings and provides an agenda for future research, to further improve the understanding of firearm violence in the European context.

Firearms and the Prevalence of Lethal Violence in Europe

The role of firearms in rates of lethal violence in Europe varies significantly, as a comparison of data from the European Homicide Monitor shows (Chapter 4). First, the firearm homicide rate has a large range, between 0.07 per 100.000 population in Switzerland to 0.3 per 100.000 in Sweden. Denmark (0.19), Finland (0.16) and the Netherlands (0.16) fall within this range. In almost all countries, the firearm homicide rate has been declining since 1992, with Sweden seeing a recent steep increase. Equally, the fractions of homicides committed with firearms differs, ranging between 17 percent in Finland and 45 percent in Switzerland. Given the varying prevalence of lethal firearm violence in only those five countries, the question arises: what impact does firearm availability have on firearm homicide rates and can varying degrees of availability explain this range in the prevalence and use of firearms?

To assess the existing knowledge on the impact of firearm availability on the prevalence of firearm homicides, relevant studies were gathered, summarized and critically reviewed in a systematic literature review (Chapter 3). Only five empirical studies – four academic articles and one report – assessed the relation between firearm availability and lethal firearm violence with recent explicitly European data. Cross-national correlational studies of firearm availability and homicide rates across Europe show no significance, except for female firearm homicide victimization (Duquet & Van Alstein, 2015; Killias et al., 2001). Similarly, studies on the rules and regulations restricting firearm availability show varying effects: according to Hurka and Knill (2020), European countries highest on their index of restrictiveness in firearm regulations have the lowest (firearm) homicide rates; two evaluations of a law in Austria found that a decrease in firearm availability was paired

with a decrease in (firearm) homicide (Kapusta et al., 2007; König et al., 2018); a similar Norwegian study on the effect of stricter rules of firearm availability amongst National Guards, however, found no effect of that regulation on the prevalence of lethal violence (Gjertsen et al., 2014).

The empirical data presented in this dissertation concur with this diverging pattern from the assumption that a higher firearm availability is associated with higher (firearm) homicide rates (Chapter 4). In particular, the two countries with the highest estimated civilian firearm availability – Finland (32.4 per 100 population) and Switzerland (27.6 per 100 population) (Karp, 2018) – had the lowest firearm homicide rate in this sample of five countries; 0.16 and 0.07 per 100.000 population respectively.

What follows from this is that the findings of this dissertation show little support for the Weapon Lethality- and Weapon Facilitation Hypotheses, which posit that widespread availability of firearms should be associated with high levels of (lethal) violence. Instead of a positive correlation, European data suggests that there is no clear directional relationship between firearm availability and the prevalence of violence. Neither do these findings support the opposite assumptions of the Weapon Deterrence Hypothesis, that a high firearm availability is associated with low homicide rates. The following section on theoretical implications will further discuss possible explanations for these diverging observations.

Firearms and the Nature of (Lethal) Violence in Europe

Diverse Patterns of Firearm Violence

In addition to understanding the prevalence of firearm violence through aggregated rates, detailed individual-level data from the European Homicide Monitor, the Dutch Homicide Monitor and Dutch Firearm Violence Monitor further allowed for a detailed description of the impact of firearms on the nature of violence.

The first conclusion drawn from these sources is that there is no standard profile of lethal firearm violence in Europe, but rather various patterns (Chapter 4). Two profiles of firearm homicides emerged from the data based on a quantitative comparison: in Finland and Switzerland, firearm homicides predominantly take place in the context of domestic killings, between (ex-) partners or other family members, in rural areas and in private spaces, such as homes. The share of female victims in this profile is relatively high, at 42 and 50 percent. In the other profile – based on firearm homicide characteristics in Denmark, the Netherlands and Sweden – firearm homicides are more public in nature, and mostly an urban phenomenon. They take place predominantly in the context of the criminal milieu – in the form of criminal assassinations, rip deals, or retaliations – and involve mostly male victims and almost exclusively male perpetrators.

The second conclusion is that the degree of uniqueness of lethal firearm violence compared to non-firearm homicides also differed across the five countries under study. In Denmark, the Netherlands and Sweden, almost all characteristics of firearm homicides diverge with statistical significance from non-firearm homicides, for example with regards to the contexts in which firearms are used over other weapons, the share of male victims

or the type of crime scene. Firearm homicides in Finland are also unique and differ from non-firearm homicides, but in ways that are not similar to Denmark, the Netherlands and Sweden. In Switzerland, on the other hand, firearm homicides do not have a unique character compared to non-firearm homicides. Overall, thus, there is a heterogeneity in the prevalence, characteristics and degree of uniqueness of lethal firearm violence in this sample of five European countries.

Non-Lethal Firearm Violence

Thirdly, this dissertation aimed to compare the nature of lethal to non-lethal firearm violence, which previous European studies have largely neglected, due to a lack of detailed data on non-lethal violence (Chapter 6). In addition, it is sometimes assumed that (firearm) homicides can be used as an indicator for non-lethal violence (Liem, 2022; van Breen et al., 2023), although said assumption has rarely been tested so far, and never for firearm violence in Europe in particular. To examine the nature of firearm violence as a whole, clusters were formed based on the characteristics of lethal and non-lethal shootings in the Netherlands, using data from the Dutch Firearm Violence Monitor. Five clusters emerged: Urban lethal shootings (cluster 1) involves almost exclusively lethal shootings, that are predominantly related to conflicts in the criminal milieu or robberies, and to a lesser extent domestic disputes. Those shootings take place in urban areas and public spaces, although the share of shootings in private spaces is relatively high compared to the other clusters. Victims are predominantly male and injured to vital parts of the body such as the head or neck. The use of long guns is relatively more common in this cluster. The second cluster with urban injurious shootings is the largest of these clusters and involves shootings that occur most often at night and in the streets. Here again, the largest fraction of shootings is related to organized crime groups or robberies. Most victims are male, knew the perpetrator and were injured in non-vital body parts, such as the limbs. The use of non-traditional firearms is relatively more common in this cluster. The third cluster – urban non-injurious shootings – is the second biggest cluster, involving shootings that take place in outside recreational areas in the context of the criminal milieu or robberies. The fourth cluster consists of suburban shootings, of which a little over half result in non-lethal injurious and less than ten percent in lethal injuries. Around a quarter of the shootings in this cluster are the result of domestic disputes, but the majority remains associated with organized crime groups or robberies. The final cluster is defined as rural shootings, of which a third result in lethal, injurious and non-injurious outcomes respectively. Female victims and attempted suicides by the perpetrator are relatively more common in this cluster than the others.

In addition, bivariate analyses revealed significant differences in the characteristics of lethal, non-lethal injurious and non-injurious shootings, with lethal shootings involving more conflicts in the criminal milieu, shootings in private spaces, recreational locations, and rural areas, more (attempted) suicides by the perpetrator and the more frequent use of long guns as well as injuries to vital parts of the body. Injurious shootings are more likely to be related to non-criminal disputes, the use of handguns, and injuries to the extremities. Finally, non-injurious shootings involve significantly more domestic disputes, shootings

in public streets and non-traditional firearms, such as air guns. Based on the results from this comparison and the cluster analysis, it can be concluded that firearm homicides should not be used as an indicator for non-lethal firearm violence, as they display significantly different characteristics.

Little Support for Theoretical Explanations for Firearm Use in Violence

A final aim of this dissertation was to test the existing theoretical assumptions on the impact of a firearm's lethality on weapon use in lethal violence. In other words, does a firearm's unique lethality determine when, how, by and against whom it is used in a violent encounter? The few existing hypotheses have been developed and so-far mainly tested in the United States, thereby limiting their validity and generalizability. The findings of this dissertation thus have important theoretical implications, which are discussed in a following section.

To assess the validity and generalizability of the Adversary Effects-, Physical Strength and Social Distance Hypotheses, multivariate analyses were conducted on detailed data of Dutch homicides with firearms and other weapons (Chapter 5). To reiterate, according to the Adversary Effects Hypothesis (Felson & Hullenaar, 2021; Felson & Painter-Davis, 2012; Felson & Pare, 2010), firearms are more often used in homicides in which perpetrators have to fear retaliation or resistance by the victim and thus prefer the use of a lethal weapon. For the same reason, the Physical Strength Hypothesis (Heide, 1993; Wolfgang, 1958) assumes that perpetrators who are physically inferior to the victim, for example due to their gender or age, are more likely to use a firearm. Finally, the Social Distance Hypothesis states that the greater the relational and cultural distance between perpetrator and victim, the more likely is the use of a firearm, rather than hands-on weapons or physical means, as tactics during violent conflicts should reflect distance between victim and perpetrator (Black, 2004; Cooney, 2009; Rennison et al., 2011). What all three of these hypotheses have in common is their focus on victim-characteristics as explanatory factors for weapon use.

The results of the analyses on Dutch homicide data, however, underline the importance of situational variables over victim-characteristics. When combined in one model, situational factors have stronger predictive power over victim characteristics and most victim characteristics only become significant predictors of weapon use when situational variables are not accounted for. When each hypothesis is assessed individually, the findings show (1) support for the Physical Strength Hypothesis, as male and younger victims increased the chances of firearm use over other weapons, (2) limited support for the Adversary Effects Hypothesis – with only the victim's gender and certain age groups showing significant association with firearm use over other weapons –, and (3) limited support for the Social Distance Hypothesis, with victim-perpetrator relationship showing the expected association with weapon use, but measures of social distance had no predictive power over weapon use. Of all these victim characteristics, only the victim's gender and age remained statistically significant in the combined model with situational factors. Overall, then, the generalizability and validity of these theoretical approaches to the Dutch, and potentially broader European, context should be questioned.

Theoretical Implications

The studies presented in this dissertation have several theoretical implications. The second chapter concluded that there are number of dominant theories that propose various structural-, situational-, or individual-level factors for why and when crime, or specifically violent crime, occurs. However, none of these theories explicitly incorporate explanations for how violence is produced, and the role that weapons, and firearms in particular, play in acts of violence. The most potential to explain the impact of firearms on the prevalence and nature of violence lies in a few specific hypotheses. Yet, these hypotheses come with their own shortcomings, such a too narrow focus on individual victim-related factors. Findings of this dissertation – as summarized in the previous section also indicate that the generalizability of these specific firearm violence hypotheses to the European context is limited. Two questions arise from these findings: What may explain the limited applicability of these theoretical approaches to the European context? And, how could these hypotheses be adapted to increase their validity both in general as well as for the European context in particular? The following sections reflect on those questions separately for hypotheses related to the prevalence and nature of violence.

Theory Meets Practice: Firearms and the Prevalence of Lethal Violence

To begin with, this dissertation finds no unambiguous support for either the Weapon Lethality- or Weapon Facilitation-, or the opposing Weapon Deterrence Hypotheses related to the link between firearms and the prevalence of (lethal) violence. This is in line with earlier studies and reports (Duquet & Van Alstein, 2015; Killias et al., 2001). There are two possible explanations why European studies thus far have not found clear associations – either positively or negatively – between firearm availability and rates of lethal violence: (1) the lack of comparability of European studies and (2) the low prevalence of (firearm) homicides in Europe. First, existing studies about the link between firearm availability and lethal violence in Europe make use of various data sources, in particular for measuring firearm availability. For example, Duquet and Van Alstein (2015) use an estimation of civilian firearm ownership made by the Small Arms Survey (2014), which is based on legal firearm ownership rates, expert estimations and self-reporting surveys, whereas Kapusta and König with colleagues (Kapusta et al., 2007; König et al., 2018) use the number of legal firearm licenses, which again differ from the number of firearms used as a measurement in Killias and colleagues' (2001) study. To a certain extent, varying results from these studies on the link between firearm availability and lethal violence may thus stem from differences in measurement. In the United States, a number of studies explored the validity of various measures of firearm availability, such as firearm suicides, subscriptions to firearm magazines, or the well-known Cook's index (Azrael et al., 2004; Cook, 1979; Schell et al., 2020). Yet, comparable studies do not yet exist for the European context.

Second, the low number of firearm homicides overall and – in many European countries – low fraction of homicides committed with firearms compared to the homicide total may be hindering meaningful statistical analysis of the association between firearm availability

and (lethal) firearm violence. The low number and fraction of firearm homicides is not just underlined in the cross-national analysis of firearm homicides in five European countries in Chapter 4 and the theoretical discussion in Chapter 5 of this dissertation, but also by other sources (United Nations Office on Drugs and Crime, 2023). For example, the most recent Global Study on Homicide by the UNODC (United Nations Office on Drugs and Crime, 2023) estimates that firearms are used in around 17 percent of homicides in Europe, which is far below the global average of 48 percent. As a result, small changes in the availability of firearms – for example through changes in the European or national legislations – may lead to changes in the firearm homicide rate that are too small to impact the overall homicide rate. Thus, studies searching for associations between firearm availability and the overall homicide rate, of which a few are presented in Chapter 3, may not pick up such minimal changes to the firearm homicide rate in particular. At the same time, studies searching for correlations between changes in firearm availability and changes in firearm homicide may be confronted with the issue that small coincidental differences in the annual number of firearm homicides may impact the firearm homicide rate without there being a direct association to firearm availability. Thus, a link between a widespread increase in the availability of firearms and the (firearm) homicide rate may only be visible once the overall number of firearm homicide increases and the majority of homicides is committed with firearms. Sweden, as one of the very few European countries with an increasing firearm homicide rate provides an interesting case study for this idea, with a rise of firearm homicides leading to the distribution of homicides committed with firearms surpassing homicides committed by other means and impacting the overall homicide rate (Hradilova Selin et al., 2024).

Given these measurement issues, theoretical approaches on the prevalence of lethal violence and firearm availability should not be considered falsified. Medical studies from the European context still support the idea brought forward by Zimring (1967) that assaults with a firearm have a higher lethality compared to knife assaults (Christensen et al., 2008). Yet, the impact that this lethality has on the overall prevalence is significantly smaller, due to the very limited availability of and lethal violence committed with firearms. These nuances are not properly captured by the Weapon Lethality- or Weapon Facilitation Hypotheses originating from the United States, a context in which the legal and illegal firearm availability is considered a given. However, for the European context, these nuances are important to understand the link between firearm availability and prevalence of lethal violence.

Thus, the conceptualizations of firearm availability and potentially even firearm violence need to be adapted to fit the contextual circumstances of the European context. With the current extent of lethal firearm violence in Europe and the difficulties in measuring firearm availability, the premises of the Weapon Lethality Hypothesis cannot be accurately validated through quantitative criminological research that uses aggregate measures. However, the assumptions of the Weapon Facilitation Hypothesis, that firearms enable perpetrators to commit violence they would not have committed without the use of a firearm, are less bound to measurements of lethal firearm violence only. It would be worthwhile to consider a broader measurement of firearm violence that includes non-lethal

firearm violence, such as non-lethal shootings or threats, for the purpose of an empirical validation of said hypothesis.

Theory Meets Practice: Firearms and the Nature of Lethal Violence

The Physical Strength –, Weapon Facilitation – and Adversary Effects Hypotheses suggest that firearms are more likely to be used by perpetrators and in contexts that require the most lethal type of weapon, to overcome physical inferiority to the victim, to prevent resistance or retaliation from the victim or to express social distance to the victim. Yet, the findings presented in this dissertation (Chapter 5) do not seem to support these theoretical ideas fully. Again, there are numerous factors that may explain why the findings diverge from the expectations.

The issue of firearm availability continues to play a role. Firearms in Europe are not generally available to civilians due to strict legislation. For comparison, the Small Arms Survey estimates 120 legal and illegal firearms for every 100 population in the United States (Karp, 2018). For European countries, this estimate ranges between 39 firearms in Montenegro and Serbia and 2.5 in Poland, Romania and the Netherlands for their respective populations. In addition, legal firearms may only be available to certain populations, such as hunters, professional firearm users, or sport shooters. Even those populations are further restricted in their situational access to firearms, through rules regulating the storage of such weapons. Yet, the Adversary Effects –, Physical Strength – and Social Distance Hypotheses all implicitly assume firearms to be accessible to individuals engaging in violent encounters; in Europe, this assumption cannot be made. Here, perpetrators may have the intent to harm their victim in situations in which they are confronted with a physically strong victim, a victim they expect to retaliate or a socially distant victim, but their choice for the most lethal weapon is bound by situational access. For most Europeans, this means that the most lethal available weapon may be a kitchen knife, an everyday blunt object, such as a hammer, or even the physical power of the perpetrator's own body, rather than a firearm.

Similar to the previous section, these findings do not necessarily mean that the theoretical ideas behind these hypotheses should be disregarded completely. For the Dutch context, the Adversary Effects-, Physical Strength- and Social Distance hypotheses with their focus on victim characteristics hold little explanatory power for the use of firearms in homicides, in particular when situational characteristics are included as potentially impacting factors as well. It is reasonable to assume that the findings for the Dutch context may also be generalizable to other (West)European countries, given the similarity in homicide trends (Granath et al., 2011; Liem et al., 2013). However, in certain national contexts, the presented hypotheses may hold more explanatory power than in the Netherlands. In countries with relatively high situational access of legal (hunting) firearms in private homes, the underlying assumption of firearm availability may not be violated thus increasing the validity of certain hypotheses. In Finland, for example, where the legal ownership of hunting firearms is comparatively high, a study on parricides in which the modus operandi was taken into account found support for the Physical Strength Hypothesis (Liettu et al., 2012). Thus, due to the heterogeneity of firearm homicides in Europe and

national nuances in the situational access to firearms, the validity of each hypothesis may differ across national contexts in Europe.

Before fully disqualifying the hypotheses on the nature of firearm violence, more empirical testing is necessary. As discussed in chapter 2 and 5 of this dissertation, the overall number of studies that explicitly empirically test the validity of firearm hypotheses is small in the context of the United States, and virtually non-existent in the European context. Next to the total number of studies, the sample sizes of each of these studies, including the study presented in Chapter 5, are small, as these hypotheses are almost exclusively tested on lethal firearm violence only. With the limited number of firearm homicides in the Netherlands, as well as homicides by other means, the sample size may affect the findings and thus the interpretation of only limited applicability of the firearm-related hypotheses. An expansion of the scope from firearm homicides to firearm violence more broadly may provide deviating views on the validity of these hypotheses.

Are Existing Theoretical Approaches Inclusive of Non-Lethal Firearm Violence?

An expansion of the scope from firearm homicide to firearm violence that includes both lethal and non-lethal acts could improve empirical assessments of the theoretical approaches to firearm violence. This suggestion may seem counter-intuitive given that almost all of the firearm-related hypotheses discussed in Chapter 2 build on one of the firearm's unique characteristics: its high lethality. This could explain why so far, all hypotheses have been empirically assessed using lethal firearm violence. In the context of the United States, it may be argued that conclusion drawn from assessments on firearm homicides may be generalized to non-lethal firearm violence, as lethal and non-lethal shootings share structural characteristics (Cook et al., 2019). The same may not be argued for the European, or specifically Dutch context, as findings presented in Chapter 6 indicate that lethal, injurious and non-injurious shootings structurally differ on a number of relevant characteristics. Therefore, in the European context, it cannot be assumed that theoretical approaches finding support in data on either lethal or non-lethal shooting also hold explanatory power for the other. Consequently, whether any of the theoretical approaches on lethal firearm violence are valid to explain the prevalence and nature of non-lethal firearm violence is yet to be empirically tested with European data.

Towards a Theory of Firearm Violence in Europe?

The question remains whether it is time for new theoretical approaches to firearm violence that are inclusive of more socio-political contexts other than the US. Based on the theoretical review of Chapter 2, the empirical findings and discussion so far, one could simply argue that existing firearm-related hypotheses are inadequate for the European or specifically the Dutch context and begin the process of developing new hypotheses and eventually theories based on empirical data from Europe. However, several arguments against this pathway can be made.

The first reason for not expanding the number of firearm violence hypotheses with European-based approaches is that any European approach would lack empirical scrutiny

at this point in time. Despite the growing number of European studies on firearm violence and related subjects such as the trafficking of firearms, current gaps of knowledge are too extensive to build a new theoretical foundation on. The development and empirical examination of theoretical ideas requires detailed data on lethal and non-lethal firearm violence, as well as on the firearms used. And although the European Homicide Monitor and Dutch Firearm Violence Monitor offer valuable collection instruments for these types of information, they are currently only implemented in a small number of Western and Northern European countries. The availability and accessibility of the required data from secondary sources, such as the police, is another hurdle that hinder further in-depth research on firearm violence in Europe. As a result, the research agenda on firearm violence in Europe is still in its infancy. To move towards a potentially new and improved theoretical approach to firearm violence based on European empirical data, more and better cross-nationally integrated empirical studies need to examine the phenomenon from various (geographical) angles.

Second, and arguably more important, the existing landscape of theoretical approaches towards firearm violence could already be described as a diffused patchwork of hypotheses. This diffusion is evident in a number of ways: For example, the Weapon Lethality- and Weapon Facilitation Hypotheses provide different arguments for why firearm availability may impact the prevalence of firearm violence, yet their names and arguments are frequently merged or used interchangeably in empirical studies (Hepburn & Hemenway, 2004; Hoskin, 2001). Other hypotheses, such as the Adversary Effects- and Physical Strength Hypotheses seem to be leaning on the same premises of Rational Choice Theory and focusing on similar aspects, yet neither is acknowledged as a related approach by the other. As a result, existing hypotheses on firearm violence seem to exist in isolation and do not collectively address firearm violence. Adding more hypotheses based in the European experience would add to the already extant diffusion of theoretical approaches to firearm violence, rather than solve the existing issues.

Thus, instead of adding to theoretical approaches on firearm violence, existing ones need to be critically reviewed and further developed. The previous chapters, in particular Chapter 5, have already indicated two main suggestions that could improve the current theoretical landscape on firearm violence, namely a re-conceptualization of firearm availability and other relevant context-dependent concepts and an integration of firearm-specific hypotheses with broader theories and paradigms on violence.

Firearm availability is not just a dependent variable of the Weapon Lethality-, Weapon Facilitation- and Weapon Deterrence Hypotheses, but also an underlying assumption of the other hypotheses discussed in this dissertation. In its current conceptualization, firearm availability as (estimations of) the number of firearms in a given geographical unit is not inclusive of varying legal and socio-cultural contexts that permit or prohibit the ownership of firearm by civilians. A more contextually independent conceptualization would be to consider situational access to firearms in a potentially violent encounter. Such a conceptualization would not have to rely on aggregate estimates of legal or illegal firearm ownership, but rather focus on the situational dynamics of firearms in violent

conflicts. However, such a conceptualization also requires in-depth information from lethal and non-lethal violent encounters which may not be broadly obtainable. Equally, other conceptualizations, such as 'cultural distance' in the Social Distance Hypothesis which heavily relies on race-differences between victim and perpetrator, require critical evaluation and potential adaptations for broader applicability in future studies.

The second proposed improvement would be to strengthen the theoretical foundations of firearm-specific hypotheses by integrating them with dominant and well-established theories on violence. A first step to integrating firearm hypotheses into the landscape of violence theories is to find similarities in the paradigms and assumptions underlying them. For most of the firearm hypotheses presented in this dissertation, the underlying assumptions remain implicit rather than explicit, partially because they have been developed from empirical insights rather than built on theoretical paradigms. The Physical Strength Hypothesis, for example, is derived from empirical studies on parricides in the United States (Heide, 1993; Heide & Petee, 2007). Although the hypothesis implies that individuals choose a weapon based on the perceived need when confronted with a physically strong opponent, the underlying assumption of (bounded) rational choice is not mentioned in any of the key studies related to the hypothesis. Exploring the key assumptions underpinning firearm specific hypotheses could help to uncover the extent to which these hypotheses could be embedded into broader theories, thereby strengthening their theoretical backbone.

Chapter 5 shortly reflected on the possibility of integrating the Adversary Effects Hypothesis with the Situational Action Theory by Per-Olof H. Wikström and colleagues (Wikström & Treiber, 2009; Wikström, 2014; Wikström & Treiber, 2015). Both of these theoretical ideas are based on the micro-sociological paradigm of social interactionism, which posits that individual (violent) criminal behavior is shaped by social contexts, social interactions and social environments and ideas of rational decision-making. Yet, whereas the Adversary Effects Hypothesis places sole emphasis on the social interaction between victim and perpetrator, the Situational Action Theory also accounts for the immediate environment. Only when both individual and situational factors are conducive for crime, the victim will engage in criminal behavior (Wikström, 2014). Within the Situational Action Theory, the Adversary Effects Hypothesis may be regarded as a subsidiary idea specifically explaining one of the factors. Such a conceptualization allows for a broadening of the focus on victims to a more encompassing idea on factors shaping violent behavior with firearms. The findings from Chapter 5 that situational factors have a stronger explanatory power than victim characteristics for weapon use in Dutch homicides already provides enough empirical support to explore the theoretical alignments between the Adversary Effects Hypothesis and Situational Action Theory further. Similarly, it may be possible to broaden akin theories on violence to the other hypotheses presented in this dissertation, providing them with a stronger theoretical backbone and allowing for new empirical validation of their assumptions.

The re-conceptualization and theoretical integration are two specific suggestions for improving the existing theoretical landscape on firearm violence. More broadly speaking,

the modes through which violence is produced – whether it is through firearms or weapons more generally – deserves more attention from theoretical exercises in the disciplines of criminology, sociology, epidemiology, psychology and other related disciplines. Although existing theories from these disciplines are regularly applied successfully to firearm violence as a type of violence (see for example Pizarro et al., 2019; Schildkraut et al., 2019), the general topic of production of and means to violence has received surprisingly little attention amongst violence researchers (Braga, 2022). As of now, there are no dominant theories that focus on the production of violence, rather than its causes. Yet, the empirical and theoretical findings in this dissertation underscore that theoretical ideas on this topic are worthwhile to explore.

Prevention of Firearm Violence

This dissertation aimed at putting the firearm and its link to violence central. Naturally, the question arises about the relevance of this dissertation's findings to the fight against firearm violence in Europe. Prevention efforts targeted at reducing firearm violence can take on many forms, from reducing individual-level risk factors for violence perpetrated with firearms through mental health treatments (Rozel & Mulvey, 2017), to local citizen-led initiatives educating youngsters about the dangers of weapon-carrying or policies restricting the access to legal firearms and preventing illicit firearms trafficking. All of these efforts target various risk factors associated with firearm violence and are therefore equally important in the fight against firearm violence. In this section, three specific implications for the prevention of firearm violence derived from findings of this dissertation are highlighted: (1) the need for limited firearm availability for civilian use, (2) the need for tailored (national) prevention efforts and (3) the need for a better intelligence picture on non-lethal firearm violence.

First, the need for limited availability for civilian use. The findings presented in Chapter 3 and 4 suggest no unambiguous link between firearm availability and the prevalence of lethal violence overall. Yet, research on European firearm violence and legislation also emphasizes the need to continue to limit civilian access to firearms and prevent illegal trafficking of firearms, both for the prevention of violence, as well as for suicide. Austrian studies, for example, found that the implementation of the European Council Directive 91/477/ECC on the control of the acquisition and possession of weapons lead to an annual decrease of two percent in the firearm homicide rate and a six percent decrease in the fraction of homicides committed with firearms in the years following the implementation (Kapusta et al., 2007; König et al., 2018). And even relatively small regulations, such as storage laws for private homes of law enforcement officers (Gjertsen et al., 2014) or additional exams for hunters (Junuzovic & Eriksson, 2012), may prevent intentional or accidental deaths by firearms. Also, Austrian (König et al., 2018), Norwegian (Gjertsen et al., 2014), and Swiss (Ajdacic-Gross et al., 2010; Reisch et al., 2013) studies found a clear negative impact of restrictive firearm legislation and thus reduced household access to firearms on (firearm) suicide rates. Thus, although the effects of preventative efforts on

lethal firearm violence may be too small to have an effect on the overall national or European homicide rate, restrictive legislations can still be effective in preventing deaths by firearm.

Secondly, the findings in this dissertation also underline the need for tailored (national) prevention efforts. A comparison of firearm homicides in only five European countries reveals the heterogeneous nature of lethal firearm violence in Europe, with misuse of firearms in some countries predominantly occurring in domestic conflicts taking place in private homes and in other countries in the realm of organized crime and in public spaces. Thus, the same legislation may have divergent effects in those two contexts. For example, it is plausible to assume that legislations targeting safe storage of firearms in private homes may have more effect on potential homicides that take place in these homes, such as domestic homicides or other conflicts between acquaintances. On the other hand, increased efforts to undermine the illicit trafficking of firearms across European borders may be more visible in the reduction of firearm homicides committed by criminals, for example during drug-related feuds or robberies. In other words, targeted prevention efforts are key in order to tackle firearm violence. Evidence from the United States show that very specifically targeted interventions that restrict firearm access for high-risk individuals could prevent violent encounters with firearms that may turn lethal (Abt, 2019; Webster & Wintemute, 2015). In Europe, the current Firearm Directives implemented in member states of the European Union offer a comprehensive framework that defines standard legislation to ensure the safe and legal use of firearms. Yet, further national distinctions seem necessary to fully target the various manifestations of firearm violence present in a particular national or local context. In order to create and properly assess these prevention efforts, detailed information about the context of firearm violence, characteristics of perpetrators and victims and associated risk factors are crucial.

Thirdly, this information, however, should not only focus on lethal firearm violence, as is currently often the case. Of the few European studies evaluating the impact of prevention efforts, none have taken into account the effects on non-lethal firearm violence, such as shootings or threats with firearms. That is (presumably) not caused by a neglect of the studies' authors, but by the lack of publicly accessible, reliable and detailed data on non-lethal firearm violence that would enable such an evaluation. Interviews with Dutch law enforcement experts on European firearm violence and –trafficking reveals that the issue is not in the availability of that information to the public, but in the registration of these incidents within law enforcement agencies (Liem & Krüsselmann, 2021). The Dutch National Police is a frontrunner on this topic: they developed a so-called Firearm Dashboard including all registration of lethal and non-lethal shootings that form the basis of the Dutch Firearm Violence Monitor created in the context of this dissertation. However, this Dashboard is unique within the European context. Hopefully, the development of National Firearms Focal Points within member states of the European Union will bring change to this; these Focal Points are tasked to “gather, analyse and improve the information flow regarding the criminal use and illicit trafficking of firearms into and within the Member State and across into the EU [...] by means of a coordinated collection and sharing of information” (Empact Firearms & European Firearms Experts, n.d.). Improving data

collection efforts on non-lethal firearm violence could help to focus policing efforts, to allow for evidence-based and targeted prevention strategies and a more holistic understanding of firearm violence as a whole.

Moving Firearm Violence Research in Europe Forward

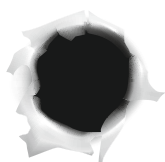
Much is left to be uncovered to fully understand the role of firearms – and weapons more generally – in violent encounters and to advance both empirical and theoretical approaches to armed violence. Concretely, future research needs to focus on (1) establishing reliable data sources on firearm violence, (2) broaden the scope to non-lethal firearm violence and (3) approach firearm violence from an interdisciplinary or multidisciplinary angle.

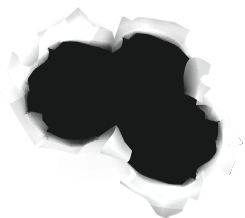
First, reliable, detailed and comparative data sources need to be established that include relevant information on firearms and weapons more generally. Current data sources are too limited to further firearm violence research. Mortality statistics and crime statistics that include information on weapons, such as the WHO's Mortality Database or UNODC's data on intentional homicide, are often highly aggregated, outdated, incomplete or focus on either victim or perpetrators, but rarely both (Duquet & Vanden Auweele, 2021). The European Homicide Monitor allows for such cross-national comparisons and includes detailed information on victims, perpetrators and *modi operandi*, but little ballistic information on the firearms used and is currently only applied in a limited number of countries. Other databases, such as SEESAC's Armed Violence Monitoring Platform or the Flemish Peace Institute's Gun Violence Monitor focus specifically on lethal and non-lethal firearm incidents but rely mainly on public newspaper articles which may be deemed less reliable than non-public law enforcement or forensic data. To further our understanding of firearm violence on a European level in the future, the gathering of reliable and comparative data on violence is necessary that includes detailed information on weapons, including firearms. In the context of this dissertation, the Dutch Firearm Violence Monitor was established as a proof-of-concept that triangulation of reliable and detailed information from law enforcement data, open sources and forensic authorities can provide new and relevant insights into the phenomenon of firearm violence. Hopefully, this initiative will be adapted and improved in other European national contexts in the years to follow.

Second, although homicides are regarded widely as the most reliable measurement for violent crime, future research should broaden the scope and include non-lethal firearm violence. So far, firearm homicides are used as a measure for firearm violence overall, yet whether lethal and non-lethal shootings share similar characteristics is underexplored – on a global scale, as well as the European context specifically. The findings presented in Chapter 6 point to significant differences between lethal and non-lethal firearm violence, which need to be accounted for in future studies. In addition, with numbers of firearm homicides in Europe so low that they may prevent proper analytical assessments (Killias et al., 2001), the inclusion of non-lethal firearm violence may open up new possibilities to assess existing hypotheses or develop new theoretical conceptualizations of firearm violence.

Third, putting the firearm central to research requires a multi- or interdisciplinary approach. In the US, researchers from the disciplines of criminology (Pelletier & Pizarro, 2019), sociology (Obert et al., 2018), anthropology (Springwood, 2007) and public health (Grommon & Rydberg, 2015) have all contributed both empirically and conceptually to research on firearm violence. Combining these insights displays the variety of situational, medical and forensic factors impact the outcome and characteristics of shootings (Grommon & Rydberg, 2015). Similar multi-faceted approaches do not yet exist from a European point of view, although their insights could be valuable. For example, qualitative approaches to understanding firearm ownership and use could add to the discussion to what extent a firearm's lethality impacts the outcome of a shooting independent from the perpetrator's intent (Phillips & Maume, 2007). Furthermore, qualitative studies could shed more light on attitudes and practices of legal firearm use across Europe, explaining the impact of such practices on illegal use of firearms in violent encounters. Hopefully, the current increase in studies on firearm violence will broaden to include various disciplinary methods, approaches to and insights on firearm violence. Such broad disciplinary approaches are also a necessity when working towards advances in theoretical approaches to firearm violence.

Altogether, improved data availability and approaches from various disciplinary point of views should not just enhance our understanding of the prevalence and nature of firearm homicides, but also further theoretical conceptualizations. So far, most of the focus of theoretical approaches to violent crimes focus on causes and outcomes of violent encounters and how situational or social and structural determinants impact violent crimes. However, as Obert and colleagues (2018, p. 33) eloquently asked: "But what of the guns themselves? What if guns are not merely the carriers of action, but also actors themselves? How might this affect our theories of the causes and consequences of violence?". So far, these questions cannot be answered due to the lack of focus on the modes of production of violence. To move firearm homicide research in Europe forward, we need to take firearms seriously and put them central in future research efforts.





Chapter

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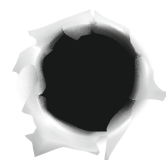
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Chapter

Appendices



Dutch Summary

Samenvatting

In de vuurlinie: Vuurwapengeweld in Europe

Doel en Structuur van dit Proefschrift

Vuurwapens werden in de 14e eeuw ontwikkeld voor oorlogsvoering en symboliseren tot op de dag van vandaag geweld, oorlog en dood. In Europa worden jaarlijks ongeveer 3000 mensen vermoord met een vuurwapen. Vuurwapens onderscheiden zich van andere wapens, zoals messen, doordat ze dodelijker zijn en nieuwe vormen van dodelijk geweld mogelijk maken, zoals drive-by shootings, schoten over lange afstanden of massamoorden.

Ondanks deze sterke link tussen vuurwapens en geweld, besteedt de empirische en theoretische literatuur over geweld weinig aandacht aan het gebruik van wapens in gewelddadige confrontaties, noch aan de verschillende effecten die wapens kunnen hebben op de prevalentie of aard van geweld. Dit proefschrift stelt daarom het vuurwapen centraal – niet alleen als een van de vele wapens die geweld kunnen faciliteren, maar als een object dat mogelijk meer invloed heeft op zowel de prevalentie als de aard van geweld dan andere veelgebruikte wapens in gewelddadige conflicten. De centrale vraag in dit proefschrift is dan ook: hoe beïnvloeden vuurwapens de prevalentie en aard van geweld in de Europese context?

Deze vraag wordt beantwoord in vier empirische studies, die de kern van dit proefschrift vormen. De eerste studie omvat een systematische literatuurstudie over de relatie tussen vuurwapenbeschikbaarheid en (dodelijk) geweld in Europa. De tweede studie vergelijkt op basis van de European Homicide Monitor de prevalentie en kenmerken van vuurwapenmoorden en niet-vuurwapenmoorden in vijf Noord- en West-Europese landen. De derde studie test empirisch de veronderstellingen over de dodelijkheid van vuurwapens bij geweld met gegevens uit de Dutch Homicide Monitor. Ten slotte presenteert de vierde studie typologieën van schietincidenten in Nederland, gebaseerd op de Dutch Firearm Violence Monitor, waarmee de kenmerken van dodelijk en niet-dodelijk vuurwapengeweld worden vergeleken. Deze studies bieden samen nieuwe en waardevolle inzichten in de relatie tussen vuurwapens en zowel de prevalentie als de aard van geweld.

Vuurwapens en de Prevalentie van Geweld

De rol van vuurwapens in de mate van dodelijk geweld in Europa varieert aanzienlijk, zoals blijkt uit een vergelijking van gegevens van de European Homicide Monitor in vijf landen. Ten eerste verschilt het aantal vuurwapenmoorden sterk, van 0,07 per 100.000 inwoners in Zwitserland tot 0,3 per 100.000 in Zweden. In bijna alle landen is het aantal vuurwapenmoorden sinds 1992 gedaald, hoewel Zweden recent een scherpe stijging laat zien. Ten tweede varieert het percentage moorden gepleegd met vuurwapens, van 17 procent in Finland tot 45 procent in Zwitserland. Gezien de uiteenlopende prevalentie

van dodelijk vuurwapengeweld in deze vijf landen, rijst de vraag: welke invloed heeft de beschikbaarheid van vuurwapens op het aantal vuurwapenmoorden? En kan de variërende mate van beschikbaarheid deze verschillen in het gebruik van vuurwapens verklaren?

Uit de empirische gegevens die in dit proefschrift zijn geanalyseerd, evenals de systematische literatuurstudie van bestaande Europese onderzoeken, blijkt dat een hogere (legale) beschikbaarheid van vuurwapens niet samenhangt met hogere niveaus van (dodelijk) geweld in het algemeen. De enige correlatie die werd gevonden, betreft de relatie tussen vuurwapenbeschikbaarheid en vrouwelijke slachtoffers van vuurwapenmoorden, wat mogelijk te verklaren is door het gebruik van (legale) vuurwapens bij huiselijk geweld. Bovendien hadden wetten en regels die de legale beschikbaarheid van vuurwapens beperkten wisselende effecten: sommige maatregelen gingen gepaard met een daling in vuurwapenmoorden, terwijl andere geen meetbaar effect hadden.

De bevindingen uit dit proefschrift bieden dan ook weinig steun voor de Weapon Lethality en Weapon Facilitation hypotheses, die stellen dat een brede beschikbaarheid van vuurwapens zou leiden tot hogere niveaus van (dodelijk) geweld. In plaats van een positieve correlatie suggereert de Europese data dat er geen duidelijke richting is in de relatie tussen vuurwapenbeschikbaarheid en de prevalentie van geweld. Evenmin ondersteunen deze bevindingen de tegenovergestelde aanname van de “Weapon Deterrence Hypothese”, dat een hoge vuurwapenbeschikbaarheid gepaard zou gaan met lagere moordcijfers.

Vuurwapens en de Aard van Geweld

Wat betreft de relatie tussen vuurwapens en de aard van geweld, komt dit proefschrift tot de conclusie dat dodelijk vuurwapengeweld in Europa geen uniform patroon volgt, maar varieert tussen landen. Uit de vergelijkende studie met behulp van de European Homicide Monitor komen twee verschillende profielen van vuurwapenmoorden naar voren: in Finland en Zwitserland komen deze misdaden vaak voor in een huiselijke setting, tussen familieleden of (ex-)partners, in landelijke gebieden en privéwoningen, met een aanzienlijk aandeel vrouwelijke slachtoffers (42-50%). In tegenstelling hiermee zijn vuurwapenmoorden in Denemarken, Nederland en Zweden meer publiek en stedelijk van aard, en zijn ze vaak verbonden met criminele activiteiten zoals moorden of wraakacties binnen georganiseerde misdaadgroepen, met overwegend mannelijke slachtoffers en daders.

De tweede bevinding is dat de distinctiviteit van vuurwapenmoorden in vergelijking met niet-vuurwapenmoorden tussen landen varieert. In Denemarken, Nederland en Zweden verschillen vuurwapenmoorden significant van niet-vuurwapenmoorden, vooral wat betreft de context van de misdaad, het geslacht van de slachtoffers en de plaats delict. Vuurwapenmoorden in Finland vertonen ook unieke kenmerken, hoewel deze verschillen van die in de andere landen. In Zwitserland is er echter geen significant verschil tussen vuurwapen- en niet-vuurwapenmoorden. Al met al benadrukt de studie de diversiteit in de aard, prevalentie en uniekheid van vuurwapengerelateerde geweldsdelicten in de vijf bestudeerde Europese landen.

Ten derde had dit proefschrift als doel dodelijk en niet-dodelijk vuurwapengeweld te vergelijken, wat in Europese studies grotendeels over het hoofd is gezien vanwege beperkte

gegevens over niet-dodelijke geweldsincidenten met vuurwapens. Sommige onderzoekers veronderstellen dat vuurwapenmoorden als indicatoren voor niet-dodelijk geweld kunnen dienen, hoewel dit zelden is getest, vooral niet in Europa. Met gegevens van de Dutch Firearm Violence Monitor identificeerde de studie vijf clusters van vuurwapengeweld op basis van de kenmerken van schietincidenten in Nederland. Cluster 1 omvat stedelijke dodelijke schietpartijen, meestal gerelateerd aan criminele conflicten of overvallen, waarbij de slachtoffers vaak mannelijk zijn en in vitale gebieden worden geraakt. Cluster 2, de grootste, richt zich op stedelijke gewelddadige schietpartijen, ook gerelateerd aan criminaliteit, maar met niet-vitale verwondingen. Cluster 3 betreft stedelijke niet-gewelddadige schietpartijen, die typisch plaatsvinden in recreatiegebieden en verband houden met criminaliteit of overvallen. Cluster 4 omvat voorstedelijke schietpartijen, waarvan de meerderheid niet-dodelijk is, maar waarbij sommige wel gerelateerd zijn aan huiselijke conflicten. Cluster 5 betreft landelijke schietpartijen, waar vrouwelijke slachtoffers en zelfmoordpogingen vaker voorkomen.

Ook onthulde de studie significante verschillen tussen dodelijke, niet-dodelijk gewelddadige en niet-gewelddadige schietpartijen. Dodelijke schietpartijen zijn verbonden met criminele conflicten, privéruimtes en landelijke gebieden, terwijl niet-dodelijke schietpartijen betrekking hebben op niet-criminele geschillen en minder ernstige verwondingen. De bevindingen suggereren dat vuurwapenmoorden niet als indicatoren voor niet-dodelijk vuurwapengeweld moeten worden gebruikt vanwege deze verschillen.

Een laatste doel van dit proefschrift was om de bestaande theoretische aannames over de impact van de dodelijke aard van vuurwapens op het gebruik van wapens in gewelddadige conflicten te testen. Met andere woorden, bepaalt de unieke dodelijke aard van een vuurwapen wanneer, hoe, door en tegen wie het vuurwapen wordt gebruikt in een gewelddadige confrontatie? Bestaande hypothesen over dit onderwerp, die grotendeels in de VS zijn ontwikkeld, omvatten de Adversary Effects, Physical Strength en Social Distance Hypotheses, die zich richten op de kenmerken van slachtoffers om het gebruik van vuurwapens te verklaren. De geanalyseerde Nederlandse moordgegevens in dit proefschrift tonen echter aan dat situationele factoren voorspellender zijn voor wapengebruik dan de kenmerken van slachtoffers. De Physical Strength Hypothese ontving enige steun, waarbij mannelijke en jongere – en dus vermoedelijk fysiek sterkere – slachtoffers waarschijnlijker met een vuurwapen worden gedood dan met een ander wapen of zonder wapen. De steun voor de Adversary Effects en Social Distance Hypotheses was echter beperkt. Al met al dagen de bevindingen van dit proefschrift de generaliseerbaarheid van deze theorieën naar de Nederlandse of bredere Europese context uit en suggereren ze dat situationele variabelen belangrijker zijn.

Theoretische implicaties van de bevindingen

De bevindingen die in dit proefschrift worden gepresenteerd, bekritisieren en bevragen de toepasbaarheid van verschillende prominente hypothesen over vuurwapengeweld, die voornamelijk in de VS zijn ontwikkeld, zoals de hypothesen van wapenlethaliteit, wapenfacilitatie en adversaire effecten. Deze hypothesen blijken beperkte

verklaringskracht te hebben als het gaat om vuurwapengerelateerd geweld in Europa. Een mogelijke verklaring voor hun beperkte toepasbaarheid in de Europese context is dat deze hypothesen aannemen dat daders van geweld doorgaans brede toegang hebben tot diverse wapens, waaronder vuurwapens. In Europa is de legale beschikbaarheid van vuurwapens echter sterk beperkt, en illegale vuurwapens zijn moeilijk te verkrijgen. Hierdoor is de onderliggende aanname over wapenkeuze minder relevant in Europa, wat de verklarende kracht van de hypothesen over vuurwapengeweld verder beperkt.

Het proefschrift stelt twee belangrijke verbeteringen voor aan bestaande theorieën. Ten eerste pleit het voor een herconceptualisering van vuurwapenbeschikbaarheid, waarbij rekening wordt gehouden met situationele toegang tot vuurwapens in plaats van uitsluitend te vertrouwen op aggregaten van eigendomsdata. Ten tweede roept het op tot het integreren van vuurwapenspecifieke hypothesen met bredere theorieën over geweld, zoals de Situational Action Theory. Deze integratie zou de theoretische fundamenteën kunnen versterken door de rol van situationele factoren in gewelddadige confrontaties te benadrukken. Al met al onderstreept het proefschrift de noodzaak van contextueel aangepaste theorieën om vuurwapengeweld in Europa te verklaren.

Praktische implicaties van de bevindingen

De bevindingen van dit proefschrift hebben ook belangrijke implicaties voor de bestrijding en preventie van vuurwapengeweld in Europa. Drie belangrijke preventieve implicaties komen naar voren: het beperken van de beschikbaarheid van vuurwapens voor burgers, het afstemmen van nationale preventie-inspanningen en het verbeteren van de inlichtingen over niet-dodelijk vuurwapengeweld.

Ten eerste is het cruciaal om de toegang tot vuurwapens voor burgers te beperken. De Europese cijfers voor dodelijk vuurwapengeweld zijn laag in vergelijking met andere wereldregio's, en de strikte Europese wetgeving omtrent vuurwapens vermindert zowel vuurwapengerelateerde moorden als zelfmoorden. Bovendien kunnen wetten voor veilige opslag van vuurwapens of aanvullende examens het aantal vuurwapengerelateerde doden verder verminderen, hoewel de impact op de nationale moordcijfers mogelijk niet direct zichtbaar is.

Ten tweede moeten preventiemaatregelen worden afgestemd op de specifieke aard van vuurwapengeweld in elk land. In sommige landen komen vuurwapenmoorden bijvoorbeeld vaker voor in huiselijke situaties, terwijl ze in andere landen geassocieerd worden met georganiseerde criminaliteit. Daarom kunnen wetten voor veilige opslag effectief zijn in het verminderen van huiselijk geweld, terwijl het bestrijden van illegale vuurwapenhandel het aantal schietincidenten gerelateerd aan criminaliteit kan verminderen. Het afstemmen van interventies, zoals het beperken van de toegang tot vuurwapens voor hoogrisico-individueën, is essentieel om de diversiteit van vuurwapengeweld in Europa aan te pakken.

Tot slot wordt de behoefte aan betere gegevens over niet-dodelijk vuurwapengeweld benadrukt. De meeste huidige inspanningen richten zich op dodelijk geweld, terwijl niet-dodelijke incidenten zoals schietpartijen en bedreigingen vaak ondergerapporteerd worden. Betere gegevensverzameling kan de politie- en preventiestrategieën verbeteren. Het ontwikkelen van nationale vuurwapenfocuspunten in heel Europa zou de gegevensuitwisseling

kunnen bevorderen, wat leidt tot een uitgebreidere kennis van vuurwapengeweld en het mogelijk maakt om op bewijs gebaseerde preventiestrategieën te ontwikkelen.

Toekomstig Onderzoek naar Vuurwapengeweld

Om het onderzoek naar vuurwapengeweld in Europa vooruit te helpen, moeten verschillende belangrijke gebieden aandacht krijgen. Ten eerste moeten betrouwbare en gedetailleerde gegevens over vuurwapens en gewelddadige incidenten worden verzameld. Bestaande databases zijn vaak verouderd, onvolledig of te geaggregeerd. Hoewel de Europese Homicide Monitor enkele gedetailleerde informatie biedt, mist deze belangrijke ballistische gegevens. Andere databases zijn afhankelijk van openbare nieuwsberichten, die vaak minder betrouwbaar zijn dan gegevens van wetshandhaving of forensisch onderzoek. Initiatieven zoals de Nederlandse Vuurwapengeweld Monitor tonen aan hoe de combinatie van gegevens van wetshandhaving, forensisch onderzoek en open bronnen kan leiden tot diepere inzichten, en zouden in heel Europa verder moeten worden uitgebreid.

Ten tweede moet het onderzoek verder reiken dan alleen vuurwapenmoorden en ook niet-dodelijk vuurwapengeweld omvatten. Huidige studies beschouwen vuurwapenmoorden vaak als synoniem voor algemeen vuurwapengeweld, terwijl de bevindingen aanzienlijke verschillen suggereren tussen dodelijke en niet-dodelijke incidenten. Gezien de lage aantallen vuurwapenmoorden in Europa zou het opnemen van niet-dodelijke gevallen ons begrip van en de theoretische modellering van vuurwapengeweld verbeteren.

Ten derde moet het onderzoek interdisciplinair worden benaderd, zoals in de VS, waar criminologie, sociologie, antropologie en publieke gezondheidszorg diverse perspectieven bieden op vuurwapengeweld. Deze benaderingen kunnen Europese studies verrijken door de dodelijkheid van vuurwapens, het bezit en gebruikspatronen te onderzoeken, wat bijdraagt aan meer uitgebreide theoretische modellen van vuurwapengeweld.

Al met al zou verbeterde gegevensbeschikbaarheid en een aanpak vanuit verschillende disciplinaire perspectieven ons begrip van de prevalentie en aard van vuurwapenmoorden niet alleen vergroten, maar ook leiden tot verdere theoretische conceptualisering. Tot nu toe ligt de focus van de meeste theoretische benaderingen van gewelddaden op de oorzaken en gevolgen van gewelddadige ontmoetingen en op hoe situationele, sociale en structurele determinanten van invloed zijn op gewelddaden. Maar wat betreft de vuurwapens zelf? Tot nu toe kunnen deze vragen niet worden beantwoord vanwege het gebrek aan focus op hoe en met welke wapens geweld wordt geproduceerd. Om het onderzoek naar vuurwapenmoorden in Europa vooruit te helpen, moeten we vuurwapens serieus nemen en ze centraal stellen in toekomstige onderzoeksinspanningen.

Acknowledgements

Before starting the position as PhD candidate, I was advised to prepare myself for a long, tedious and sometimes lonely process that would end in a dissertation no one would ever read. I don't know about the latter, but I do know that I could have continued for another four years, that I was never bored and – most importantly – never felt lonely. For that, I need to express my gratitude to many people, only some of which I mention here.

Most evidently, my supervisors Marieke and Pauline. Marieke, you took a chance on me and have created endless opportunities for me from the moment I stepped into your office. You have guided me through all the steps of this research and academic life in general. Thank you for that. Pauline, I would not have finished this dissertation without your moral support and constant reminder that it is all about the process, not about the output. The two of you have shaped me the most, as a researcher and teacher. I am immensely grateful that I got to learn from the best of the best.

I am also indebted to my co-authors and other people that I worked together with over the years. Nora Markwalder, Karoliina Suonpää, Simone Walser, Klara Hradilova-Selin, Sven Granath, Janne Kivivuori and Asser-Hedegaard Thomsen from the European Homicide Group: working with such a large group of experts seemed daunting at first, but your feedback has been invaluable and always encouraging. To Nils Duquet and Astrid de Schutter at the Flemish Peace Institute: working with you on TARGET and INSIGHT has been a welcome challenge to leave the academic bubble and learn about the impact that research actually should have. And to Richard Martens at the Dutch National Police: your passion for the fight against firearm violence and trafficking has been contagious. I hope we get to work together and dance some more flamenco in the future.

Although their names might not appear as co-authors anywhere in this dissertation, there are several colleagues that sustained and inspired me along the way, too many to name them all here. First of all, the current and former members of the Violence and Violence Intervention group: Jolien, Leah, Olga, Layla, Laura and Arnaldo. Thank you for the encouragement along the way, the fruitful discussions, the much-needed coffee breaks and laughter. There have also been many other colleagues at the Institute of Security and Global Affairs that knowingly or unknowingly contributed to this dissertation and that deserve a mention. Tommy, thank you for your no-nonsense advice and for keeping me healthy through our many walks in the Haagse Bos. Daan, for always keeping an eye out and getting me to enjoy doing research in the first place. Ramesh, for the constant reminder that doing a PhD is also just a job, not an identity, which kept me sane more than once. Yannick, for the shared love for 3D-printers, and belief that someone's value for academia is not defined by their experience. And many other (former) colleagues at the institute, for welcoming with open arms as an intern, and supporting me throughout the last 6 years.

I am most grateful, however, for the friends and family who love and support me regardless of what I produce at work. Ben, Thijs, Tessel, Jasper, Hilal, Laura: thank you for your friendship. And of course, my family. Mama, Papa, Laura, you have always supported me no matter what; never asked: 'did you submit your thesis already?'; never doubted that I would find my way. Thank you. And Jordy, for creating our own little Dutch family with me, for always believing in me and us and reminding me what truly matters.

Curriculum Vitae

After finishing secondary education at the Konrad-Heresbach-Gymnasium in Mettmann (Germany), Katharina obtained a BSc in Cultural Anthropology and Development Sociology at Radboud University in Nijmegen in 2016, followed by a MSc in Crisis- and Security Management at Leiden University in 2018. After graduation, Katharina continued to work as a junior lecturer at the Institute of Security and Global Affairs in the Bachelor Security Studies until starting a position as Doctoral Candidate with the research group Violence and Violence Interventions in 2020.

Next to her doctoral research, Katharina has been involved in a variety of research projects, including EU-funded project TARGET and INSIGHT (both under lead of the Flemish Peace Institute) which aimed to improve the intelligence picture of firearm violence in Europe to aid policymaking, a project on the intergenerational transmission of extremist ideologies, left-wing radicalization, and the criminal use of explosives in the Netherlands. With the idea that research should always be relevant for scientific and societal purpose, Katharina has closely collaborated with practitioners throughout her projects and engaged with the open science community.

