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Drug-Related Homicides in the Netherlands (1992-2016): A Spatial Analysis

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ABSTRACT

Drug-related homicides (DRH) constitute an important part of all homicides in the Netherlands. DRH are not randomly spatially distributed but tend to cluster around specific areas. Understanding where and why is important to fully comprehend homicides themselves. This study aims at describing the spatial distribution of drug related homicides in the Netherlands, while also identifying the factors that determine such spatial disposition. DRH appear to be urban phenomenon: of the 482 cases of drug related homicides between 1992 and 2016, almost half of them occurred in the country's 4 large cities. Furthermore, DRH present very similar spatial distributions compared to specific other types of homicides, in particular Criminal Milieu homicides. At a micro level, however, there are no "hotspots" in any of the cities, even if there are small clusters in some specific neighborhoods (operationalized as postcode areas). Moreover, postcode areas where DRH occurred tend to show higher levels of other types of non-homicidal crimes, although with differences between Amsterdam and Rotterdam. This study also indicates that DRH tend to occur in neighborhoods with lower income level per household but that are located in cities where overall there is high concentration of wealth. There is in fact some evidence suggesting that DRH tend to happen in specific part of cities and areas with high inequality levels (measured in GINI coefficient).

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1. INTRODUCTION

Drug-related homicides (DRH) is an old phenomenon that has occurred, and keeps occurring, in many parts of the globe (Varano & Kuhns, 2017). In 2016, DRH cases represented more than a third of all homicides cases in the Netherlands: out of 103 total homicides cases, 31 were classified as drug-related (Dutch Homicide Monitor). Although, the overall homicide rates in the country are in line with most of other Western states' and have slightly decreased since the mid 90s (Ganpat & Liem 2012), factors related to the consumption and distribution of drugs still play an important role in the country's overall homicide rate. For instance, between 1998 and 2004 approximately 15% of perpetrators of homicides were addicted to drugs, while between 1992 and 2001 one third of killings related to the criminal milieu were drug related (EMCDDA, 2018, p. 16). Thus, DRH constitute an important part of the lethal violence in the Netherlands.

Drug-related homicides, however, do not affect the whole country equally. Homicides are not randomly or homogenously distributed but rather tend to concentrate in specific areas (Felson & Clarke, 1998) and this is also the case of DRH in the Netherlands. Where do DRH occurr more frequently and what are the factors that determine such distribution are some of the question that this study will attempt at answering.

This work relies on data gathered by the Dutch Homicide Monitor, a database part of a larger European project (the European Homicide Monitor) that contains detailed information and data of every single homicide in the Netherlands since 1992 until 2016.

After briefly introducing the subject of this study and its relevance in Chapter 1, Chapter 2 provides a literature review, and it is divided in to two main sections. The first part is an analysis of the main theories that have analyzed the relationship between drugs and violence, and between crime and space. Various elements from different theoretical traditions will be considered in order to provide a theoretical framework to understand the issue of DRH and its spatial distribution. The second part of the chapter gives an overview of the main empirical studies conducted on DRH in the last 15 years, assessing how this study can add to the existing body of research. Chapter 3 describes the methodology used, while chapter 4 presents the results of the analysis, that will be later discussed in chapter 5. Chapter 5 states the limitations of this research and recommendations regarding future research directions.

1.1.Societal Relevance

Homicides are considered the most extreme type of violence and among the gravest crimes that can be committed. These can have far reaching deleterious consequences for the communities where they occur as they generate "a violent environment that has a negative impact on society, the economy and government institutions" (UNODC 2019, p. 9). For this reason, studying and understanding homicides appears pivotal.

In recent years, the Netherlands has become one of the main centers in Europe for drug-related activities, from production (mostly synthetic drugs), to processing, distribution and consumption (Tops et al. 2018), to the extent that a recent report from the Dutch Police Association has emphatically warned that the Netherlands increasingly resembles a *narco* state (Boffey 2018).

The increased presence of drug markets operating in the Netherlands is due to different factors: the logistically strategic position of the country and the presence of Europe's biggest port, Rotterdam (EMCDDA & Europol, 2019), the relative low price and availability of substances used for the production and processing of drugs and the relative tolerance of Dutch legal system towards drugs compared to other major countries (Tops et al 2018; van Gelder 2018). For instance, Dr. Pieter Tops states that "it's beyond question that the Netherlands plays a major role in the production and spread of illicit drugs" (*citation in* van Gelder, 2018). In fact, according to Tops, the Netherlands has one of the largest illicit drug markets in the world and Dutch synthetic drugs generated 18.9 billion euros in 2017 (Tops et al. 2018. p. 7). Moreover, recent years has seen an increase in the level of consumption of amphetamine and cocaine among adults, and of cocaine among the general population (EMCDDA 2019, p. 7).

This situation has raised alarms in terms of the possible political, economic and social consequences of illicit drug markets. The United Nations Office for Drug and Crime (UNODC) states that "there are strong inter-linkages between drug trafficking and the spread of crime, corruption, drug use, drug use disorders and HIV infection" (UNODC 2017, p. 18).

In terms of crime, the increase in of illicit drug markets activity can result in the rise of violence and in higher risks of criminal victimization. Drug markets, in fact, often "act as cross-cutting facilitators for all types of violence" (Liem 2017, p. 6) and they have been associated to high levels of criminality, including homicide rates. In certain countries, for instance in Colombia or Mexico, the extremely high violent crime rates are linked to the activity of gangs that are directly involved in the production and trafficking of drugs (Durán-Martínez, 2015). Drugs *per se,* however, are not responsible for an increased level of violence. They rather constitute an element around which other elements that are generally linked to increased levels

of violence tend to revolve: gangs, criminal organizations and, very important, firearms. To understand how drug circulation can create high levels of crime and violence, it is extremely important to focus on the violent aspects of it and identify what are the factors that allow violent crime to thrive. The problem of drug related violence, of which drug related homicides is the most extreme version, needs to be tackled by focusing on the elements that generate violence and not with a general all out war against drugs (Abt 2019). Only by focusing on the specific violent dimension of drug markets . One of this factos are the "places" of drug related lethal violence.

Understanding the spatial dimension of DRH appears of pivotal importance. On one hand, it can allow policing institutions to tailor their intervention and better utilize their resources in order to lower the possibility of victiomization of certain areas that show a comparative higher risks. On the other hands, DRH can also give valid indication of illegal drug markets activity, that often fuction as catalysers of other types of crimes. DRH could potentially constitute a valid indicator of broader drug crimes and dynamics of drug markets (Schönberger & Liem, 2019). Understanding DRH spatial pattern can thus provide invaluable indication of illegal drug market presence in specific areas**.**

1.2. Academic Relevance

There is limited academic research on DRH in the Netherlands, and virtually no previous study has been conducted on the spatial dimension of this type of homicide. By describing spatial patterns, and providing the relative maps, this study can furnish valuable information about an important aspect of lethal violence in the Netherlands. Such effort has the potential to deepen our general understanding of the homicides in a high income developed northern European country, as well as the role played by drugs in lethal violence.

Moreover, by studying a specific subtype of homicides, this work goes in line with the current trend, specifically in European criminology, that is focusing in sub-categories of homicides rather that in homicides as a whole (Kivivuori et al. 2014). Analyzing homicides by different types can provide a better understanding of the phenomenon and allows to better discover the mechanisms and "complexities surrounding the homicide event" (Aarten 2019). Moreover, analyzing spatial patterns of DRH and compare them to that of other types of crimes can unveil specificities and/or communalities between different types of lethal crimes.

Also, this work can complement existing theoretical understanding of how lethal crime relates to the territories where they occur, an understudied aspect when it comes to homicides in Europe. By, testing the main theories used in spatial analysis of crime (mostly structural

theories and opportunity theories), this study can reveal their validity in studying a very specific type of lethal violence (DRH), in a European context.

By using categories, concepts and even epistemologies from different theoretical traditions in criminology, this research follows the established trend in European criminological research of relying on eclectic theoretical frameworks (Kivivuori et al. 2014). Nevertheless, this study draws categories and analytical concepts also from opportunity theories, while European research on homicides tends to focus mostly on structural strain/anomie theories and more recently on civilization theories (Kivivuori et al. 2012; Kivivuori et al. 2014). In this sense, this research complements existing approaches, introducing a still under studied subject.

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2. LITERATURE REVIEW

This chapter is divided into 3 sections: after introducing an overview of homicides in the Netherlands, it dedicates its second section to the theories that can explain the relationship between drugs and (lethal) violence, and its spatial distribution. The third section, on the other hand, provides a review of recent empirical studies conducted on DRH.

2.1. Homicides in The Netherlands

Homicides rates in the Netherlands have decreased in the last couple of decades, a pattern similar to other Western countries, dropping from 1.7 per 100,000 inhabitants in the early 90's, to 0.9 per 100,000 inhabitants in 2007 (Ganpat & Liem 2012) and 0.5 per 100,000 inhabitants in 2016 ((Schönberger & Liem, 2019). The majority of these homicides belong to the category "homicide in the context of an argument or altercation between friends, acquaintances, or strangers." This type does not include cases were victims and offenders are related or involved in the criminal world (Ganpat & Liem, 2012, p. 333). Furthermore, like in many other countries, the majority of homicides in the Netherlands correspond to men killing other men. Most of the perpetrators are aged between 20 and 25, and the overwhelming majority (considering men and women) are aged between 18 and 40 (77% of all homicides). The percentage of young people in the Netherlands who belong to delinquent young groups[1] is approximately 3,1% (Gatti et al. 2011). This is an important variable as membership to delinquent groups (in the US tradition called gangs) is one of the main factors that account for propensity to commit crime (Esbensen & Weerman, 2005). Gun circulation and availability of firearms is another strong factor in creating violence (Miron, 2001). Although the Netherlands has a relatively strict arms legislation compared to other western countries, and only around 5% of all households possess an arm (Schönberger & Liem, 2019), between 1992 and 2016 more than a third of the total number of homicides were caused by a firearm (Ganpat & Liem, 2012; Schonberg & Liem 2019). This figure varies significantly when the sex of the victim is considered: 46% of men were killed with a firearm, while the majority of women victims died by wounds inflicted with sharp objects (35%) or strangulation (25%) (Ganpat & Liem, 2012). Ethnicity is another important variable when studying homicides in the Netherlands as roughly half of the homicides between 1992 and 2009, victims and perpetrators were of non-Dutch ethnicity (mostly Dutch Antillean, Surinamese, Turkish, or North African); while only16% of

[1] Young delinquent groups are defined as ''any durable street-oriented youth group whose involvement in illegal activity is part of their group identity''(Klein et al. 2001 cited in Gatti et al. 2011, p. 210). This is the same definition adopted by the Eurogang network.

the perpetrator and 19% of the victims were of other Western European countries (Ganpat & Liem, 2012, p. 336). Between 2012 and 2016 the proportion of victims and perpetrators that were born outside Europe (those for whom this information is available) was around 30% (Schonberg & Liem 2016).

Historical patterns of homicide rates in the Netherlands have followed similar trends as other Western European countries. In fact, similar to other countries, homicide rates in the Netherlands rose steadily from the 60's to the 90's (Aebi & Linde, 2014). Since then, levels of lethal violence have shown a sustained decreased (Aebi & Linde, 2014). Similarities with other Western European countries in terms of homicide rates date back to the Middle Ages. Like countries such as Belgium , England or Sweden, since the Middle Ages homicides rates have diminished in the Netherlands. For the 14th and 15th centuries estimates, place homicides rates between 30 and 60 per 100,000 inhabitants. This number declined decisively to approximately 11 during the 17th century, reaching approximately 2 in the early 19th century and 1 in the 20th, reaching a low 0.6 by the 1950s, before the period 60s-90s when the rate rose again (Eisner, 2001). There were differences between Dutch cities, that although tended to converge they presented differences based on specific aspects such as culture, political institutions, economic development, policing institutions and individual values.

2.2. Theoretical Background

The aim of this section is to introduce the theories that will be utilized to explain spatial DRH patterns in the Netherlands. Initially, a general model for the nexus between drug and violence will be presented: Goldstein's (1985) tripartite model. This will be complemented with other theories that provide further insight into crime, including lethal violence, and its spatial characteristics. Thus, the review will be centered mainly on the structuralist theories and on the opportunity theories, including Broken Windows Theory, as these two theoretical traditions are the dominant spatial theories of crime (Andresen, 2006; Hipp 2007; Piscitelli & Doherty 2018; Smith et al. 2000).

2.2.1. Goldstein's Tripartite Framework

For the context of this study, the tripartite framework proposed by Goldstein (1985) will be used to partly explain this nexus. Goldstein suggests 3 different models in which drugs are responsible for the generation of violence: the psychopharmacological, the economically compulsive, and the systemic models.

Psychopharmacological

The psychopharmacological model points to the effects of the drugs on the person as a cause for violence. Drug consumption can dramatically alter the perception of reality, producing on certain individuals a state of excitement, irascibility and even irrationality that sometimes can lead to violent acts. Some substances, in particular cocaine, amphetamines and benzodiazepines, have been found responsible for causing violent behavior (EMCDDA, 2018). For long time, only this conceptualization was used to explain the nexus between drugs and crime, but this has been largely discredited. (Goldstein, 1985). Psychopharmacological factors can, however, have a stronger influence in the possibility of being victimized, as altered states can lead to a lower risk perception and increase reckless behavior.

Economic compulsive

The second model is the Economic Compulsive model. This model suggests that people can incur in criminal acts, such as robbery or stealing, in order to obtain money to acquire drugs, in particular the expensive ones such as cocaine or heroin (EMCDDA, 2018). In certain occasions these acts can even degenerate into lethal violence, although. further research has showed that when possible drug addicts tend to avoid violent acts, and most of the crimes committed for economic compulsive reasons are of non-violent type, for example "shop-lifting, prostitution, drug selling, etc." (Goldstein, 1985).

Systemic violence

Finally, the last model is the Systemic Violence model. Goldstein points at the inextricability of violence from illicit substances. Drugs production, distribution and consumption generate violent dynamics such as territory disputes between dealers, robberies of drug dealers and the violent subsequent punishments, punishment for selling phony drugs, homicides of informants, cancellation of debt by punishment, etc. (Goldstein, 1985). This model implies that victims, or even perpetrators, can also be people that are not directly involved in the use or trafficking of drugs, but are part of that sort of eco-systems that is generated by the presence of drugs in certain communities. This could be what Blumstein (1995) refers to as the 4th model, or the *community disorganization* effect of drugs.

4th Model

By 4th model, Blumstein refers to the "manner by which the norms and behaviors within the drug industry, which can become an important activity within some communities, influences the behavior of others who have no direct connection to the drug industry" (Blumstein, Youth Violence, Guns, and the Illicit-Drug Industry, 1995, p. 27). The effects can be dramatic for the community as whole, especially if firearms are involved . This is because the widespread use of firearms among drug sellers "may stimulate others in the community to similarly arm themselves for self-defense, to settle their own disputes that have nothing to do with drugs, or to gain" (Blumstein 1995, p. 27). Again, it is not the presence, or the possession, of arms tout court that increases the risk of violence, but rather the illegal carrying of guns in public spaces that accounts for higher rates of violent crimes and homicides (Abt 2019).

2.2.2. Drugs and Violence: Recent trends

"An inextricable link between drugs and lethal violence has been part of the backdrop of the discourse on drug policy for generations" (Varano & Kuhns, 2017, p. 89). Lethal violence and drug circulation can seem intuitively interrelated, the causal mechanisms that link these two variables are not straightforward and remain partly unclear. There is in fact a lack of consensus when it comes to the effects of drugs on a person's propensity to commit violent acts. Results seem to indicate that this greatly vary according to the type of drug and that in any case alcohol consumption seem to be more linked to criminal offending (Granath et al. 2011). Drug consumption could be more easily linked to risk of victimization. A meta-analysis of various toxicology studies found that up to 11 % of homicide victims tested positive for cocaine, and 6 % for marijuana and opiates, underlining the role of drugs in homicide victimization (Kuhns et al. 2009).

The necessity to acquire drugs is another factor that link drugs and crime, as it can lead to users to commit theft or assaults. It is documented, that some criminal acts, such as robberies, or thefts in private properties that might result in homicides, have been committed by drug users in order to obtain money (Schonberg & Liem 2019). This, however, results mostly in minor crimes and rarely in violent or lethal acts.

There seems to be more consensus on the drugs-violence nexus when it comes to the systemic effects of drugs markets. The increases in homicide rates during the 80's in many American cities was by many academics and policy makers linked to the rapid diffusion of hard drugs such as cocaine, heroin and crack (Abt 2019; Blumstein& Rosenfeld 1998; Reuter 2009). Particularly disturbing was the growing involvement of young people in violent crimes

and homicides during the 80s, a trend that was again linked to the crack epidemic and the increase in handguns circulation (Blumstein & Rosenfeld, 1998). The entering of young people into the cocaine and crack drug markets, and the diffusion of guns among this population, resulted in a sort of "arms race", where more and more young people acquired guns for self-protection, and with increasing risks of using them to resolve any tensions or even regular skirmishes typical of teenage male interactions (Blumstein 1995, p. 10). In the following decade, however, violence levels decreased across the western world much more sharply compared to crack consumption, although this "did not change the impression that the sale of crack was ineluctably associated with high levels of market violence" (Reuter 2009, p.276).

Nonetheless, the relationship between drugs and violence is not linear and also highly depends on the type of drug involved (EMCDDA, 2018). Sometimes high volumes of drug circulation can be accompanied by low levels of violence, in particular when these markets are undisturbed, a situation that can however experience a recrudescence once the competition increases and new players intervene in the market (Lappi-Seppälä & Lehti, 2014, p.157). Thus, it is not drug circulation *per se* that seems to correlate with higher levels of violence and criminality, but rather *violent* drug markets (Abt 2019). Since the 1990s until today, homicide rates have declined in the US, as well as in Europe, even if drug consumption has not seemed to have dropped commensurately. Moreover, in addition to cocaine, crack, heroin, today also synthetic drugs (i.e. methamphetamines or LSD) play a major role in illicit drug markets, in particular in certain places, including the Netherlands. In any case, the nexus between drugs and violence is not linear and depends on the historic contexts, as well as on the type of drug market and on the characteristics of its participants. Nevertheless, there are some valid and systematic theoretical explanations of the nexus between drugs and violence.

Still, the crack epidemic shifted the discourse around the nexus between drugs and lethal violence and moved the issue at the top of the national policy agendas. In the Netherlands, already in the 90s, organized crime linked to drug markets became an important public safety concern (van Duyne 1996). Again in the Netherlands, between 1998 and 2004 approximately 15% of perpetrators of homicides were addicted to drugs, while between 1992 and 2001 one third of killings related to the criminal milieu were drug-related (EMCDDA, 2018, p. 16). These figures might not even reflect the real dimension of the problem as they only consider those cases for which there was information about the perpetrator in order to assess the motives (Granath el al. 2011). Recently, agencies such as Europol and the EMCDDA have warned of the alarming increase of illegal activities of Organized Criminal Groups (OCGs), mostly active in illicit drug markets, in European soil (EMCDDA& Europol 2016). Illicit drug market is a profitable business and it is estimated that Europeans spend

approximately 30 billion per year on illegal drugs. (EMCDDA & Europol 2019). The trafficking of cocaine in Europe, traditionally attributed to Colombian and Italian OCGs, involves today also other European groups, such as British, Dutch, French, Irish and Spanish, a situation that is fuelling competition within a notorious violent market and thus increasing violence within the EU (EMCDDA & Europol 2019, p. 17). This could lead to future increases of drug related violence and DRH. Understand in which areas this might occur appear pivotal.

2.2.3. Crime and territory

The interaction between territory and crime has been studied for long time and the interconnection between criminology and geography "are old and well established, going back to the 19th century" (Althausen & Mieczkowski, 2001, p. 368). What are the characteristics of specific geographical areas that can impact the rate of homicides is an issue that for long has interested researchers of homicides (Nieuwbeerta et al. 2008). Analyzing the geographical distribution of homicides within a specific territory can reveal linkages between levels of lethal violence and structural socio-economic and cultural characteristics of a territory and its population. Moreover, it can allow to identify whether homicides tend to be randomly distributed or, more likely, whether it tends to concentrate in specific areas. As Abt (2018) states "there is clear and convincing evidence that violent crime clusters in and around locations known as hot spots… If these hot spots can be cooled, the temperature of the entire city will fall" (p. 116). Once found these areas, it is possible to individuate what are the salient structural characteristics that function as receptor for the creation and propagation of habits. As such, identifying "The specific places where crime occurs should become a key focus of crime prevention and indeed criminology" (Weisburd 2012, p. 217)

Hence, the spatial dimension of homicides plays a very important role. Geographic analysis can provide the conceptual tools to study the relationship between the territory and crime (Zanotelli 2001). It has been noted that crimes cluster at specific places and the characteristics of these same places allow for the duration and longevity of criminogenic acts (Caplan, Kennedy, & Piza, 2013). It ensues from this consideration that the risk of crime victimization and crime offending is not randomly dispersed, and the geography and spatial dimension has an important impact in its distribution (Blumstein, 1995). For instance, hot spots are very small geographic unit with disproportionately high levels of crime (Weisburd & Telep 2014). Neither is deadly violence evenly distributed, but rather tend to concentrate in "problematic" neighborhoods, and sometimes even in specific streets or blocks within those neighborhoods.

Identifying clusters of crime it's quintessential to curb violence within urban centers as "Crime prevention effectiveness is maximized when police focus their resources on these micro-units of geography." (Weisburd & Telep 2014, p. 201). However, most criminology research that focuses on micro areas tend to disregard the structural characteristics of the hot spots, focusing mostly on opportunity theories and often ignoring social structural theories, such as strain or social disorganization theory as these are mostly applied to broader geographic units (Weisburd 2012). Yet, disregarding social and cultural structural components of clusters can be detrimental to understand the relation between places and crime. Abt sustains, in fact, that "Hot spots are not simply geographic locations; they are also social settings" (Abt 2019, p. 129). As such, even microgeographic units can be considered "small scale social systems" or "behavioral settings" (Wicker 1987 p. 614 cited in Weisburd 2012). In this study, both opportunity theories and structural theories will be adopted, complemented with Broken Windows Theory, as this is also one of most widely used theoretical traditions to explain the spatial characteristics of crime, and it is also believed that these theoretical traditions can integrate each other.

2.2.4. Structural Theories of Crime

The interplay of structural conditions and crime has been widely studied by many social scientists and "is among the most widely held assumptions in criminology" (Savolainen, 2010 cited in Kivivuori, Savolainen, & Danielsson, 2012, p. 97). Classic theories in the criminological tradition, such as Social Disorganization theory (SDT), and Strain Theory bring valuable insight as to why violent and lethal crime levels differ among different places and communities. In fact, structuralist approaches center their analysis on social characteristics such a social cohesion, socio-economic indicators and urbanity level as the main explanatory variable of crime distribution. Thus, in these theories spatial aspects of crime assumes extreme importance, as the socio-economic structural characteristics of certain areas (i.e. level of economic deprivation and marginalization of counties, cities, neighborhoods, etc.) determine propensity of its inhabitants to commit crimes. Based on these theories, crime and violence, including homicides, will happen mostly in socio-economic disadvantaged areas, such as segregated neighborhoods (Nieuwbeerta et al. 2008), relatively poorer cities (McCall & Nieuwbeerta 2007) or in countries where the population is less protected by welfare systems (Savolainen, 2000).

Anomie and Strain Theory

The notion of anomie, that lies at the roots of strain theories, refers to the absence of norms. A society can become anomic when social norms and rules that regulate behavior cease to be followed by the participants to that specific society (Siegel 2015). According to Durkheim, this state is normally the result of dramatic changes or crisis, such as the historical process that saw western nations moving from pre-industrial to post-industrial societies (Pridemore & Kim, 2006). Norms and modes of social cohesion become obsolete, as they do not reflect the new reality. Before a new moral and behavioral code can be established, there is a transition period characterized by uncertainty and turmoil, resulting in higher levels of violence and crime. This formulation of the theory of anomie could help understand the high homicide rates of post-soviet countries, such as Lithuania or Russia (Liem 2017). From this general concept of anomie, Robert Merton (1938) built his theory of anomie, which is part of the general Strain theory tradition in sociology and criminology. According to Merton, criminal behavior is the result of a discrepancy between culturally induced goals (ideas of success and what people should aspire to) and the means to obtain these. In most societies, people tend to accept, and to incorporate in their worldview and in their behavior, both culturally constructed aspirations and ways to achieve these. However, for certain people the impossibility of obtaining those goals due structural reasons (poverty, racial segregation, lack of social or cultural capital) can create frustration, resentment and even aggressive behavior (Nieuwbeerta et al. 2008). Thus, these individuals could pursue the goals through alternative not socially responsible means, such as "theft, violence or drug-trafficking" (Siegel 2015, p. 187). In this way, social structures (culturally and socially established ideas of success and self-worth) can lead people to assume a non-conformist conduct rather than a conformist one, resulting in social anomie (Merton, 1938). For Merton, social structures can generate anti-social behavior "precisely because of differential emphases on goals and regulations" (Merton 1938, p. 674).

Strain theory can also explain violent crime and homicides, including DRH. Analysing social characteristics of homicide offenders and victims in Finland, between 1965 and 2000, Kivivuori and Lehti (2006) concluded that there is a negative correlation between class and serious violent crime, and that most of offenders and victims of homicides pertain to the lower classes. Under these assumptions, crime rates, including drug related crimes and homicides, will likely concentrate in poor and segregated areas. For instance, at the city macro level, McCall and Nieuwbeerta (2007) conducted a European cross-national city study, concluding that cities with higher levels of economic deprivation correlate positively with homicide rates. This is also valid at a smaller level. Based on strain theory, poor and marginalized

neighbourhoods will experience higher homicide rates (Nieuwbeerta et al. 2008) and drug-related violence (Lum 2011).

Thus, in those geographic areas that experience economic decline, individuals that have already a criminal predisposition could be marginalized to an extent that social bonds deteriorate even further, resulting in the disappearance of law-abiding restraints resulting from those social bonds (McCall & Nieuwbeerta, 2007). As such, homicides tend to concentrate in disadvantaged areas with prevalence of population pertaining to lower classes.

Social Disorganization Theory

A similar theoretical tradition part of the structuralist approach is the Social Disorganization theory (SDT), Social Disorganization refers to the "inability of local communities to realize the common values of their residents or solve commonly experienced problems" (Bursik, 1988, p. 521), and many of its main concepts derive from the work of Shaw and McKay (1942).. It indicates that the capacity of a community to display formal and informal social control mechanisms, and thus to control crime, can deteriorate following structural changes that result in the withering of group solidarity. Social disintegration it is followed by the lowering, or disappearance, of social control within the community. It results that crime will more likely happen in areas, such as neighborhoods, characterized "by low income, ethnic heterogeneity and residential instability" (Smith et al. 2000, p. 490), as these are the factor deemed responsible for social disorganization. Also, geographic areas with high level of unemployment, poverty and marginalization will present higher propensity to criminal victimization, as well as criminal offending. Shaw and McKay found that crime in Chicago in the 1930s was concentrated in specific socio-economic disadvantaged areas. These findings were replicated more recently in European context for homicide rates. For instance, in order to explain variations in homicide rates among different neighborhoods in the Netherlands, Nieuwbeerta et al. (2008) identified 3 main variables: socio-economic deprivation, ethnic heterogeneity and residential mobility. They concluded that these indicators directly impact homicides rates. Low level of social cohesion is related to higher crime rates, and that neighborhoods in the Netherlands with lower levels of social cohesion show higher homicide rates (Nieuwbeerta et al. 2008).

Spatial analysis has been at the core of Social Disorganization Theory. Shaw and McKay (1942) complemented their study by drawing maps of juvenile delinquency in Chicago, with the purpose to show where crime was concentrated. In the 1990s a similar exercise was carried out again in Chicago by the Project on Human Development in Chicago Neighborhoods (PHDCN). This project analyzed data of adult and juvenile crime by surveying more than

27000 blocks and confirming the validity of the Shaw and McKay's findings after almost six decades since their original study (Piscitelli & Doherty, 2018).

Level of urbanism, furthermore, is another variable linking SDT and spatial analysis, as high levels or urbanism of certain cities or neighborhoods (for instance, population density), can result in urban anonymity, which weakens social controls, and results in higher homicide rates (McCallan & Nieuwbeerta 2007). Stickley and Pridemore (2007) also used population density, together with population change and family instability, to assess the level of social disintegration in Russia in the beginning of the 20th century and compared it to homicide rates. In this case, however, they concluded that population density was inversely correlated to homicide levels (Stickley & Pridemore 2007). Nevertheless, SDT is one of the most recurrent theories in explaining spatial characteristics of various types of crimes, and thus can offer solid insights also in understanding DRH.

2.2.5. Opportunity Theories

If Structural Theories convincingly point out that most that criminal activity tends to concentrate within areas socio-economically disadvantaged, it does not explain why still most of the people from lower classes do not commit crime. Starting from its premises that social behavior is mainly dictated by structural exogenous factors and where individual agency is very limited, most people under the same condition would behave identically. Moreover, the decades between the 1960s and the 1990s saw a steady increase in crime in Europe and the US, even if the general socio-economic conditions (GDP per capita, employment, etc.) improved through the western world (Aebi & Linde, 2014; Cohen & Felson, 1979; Siegel 2015). Structuralist theories failed to explain such trend (Aebi & Linde, 2014). In response to this, a new approach consolidated. Starting from the premise that individuals are rational agents capable (and aware) of taking decisions, they will seek to maximize their benefit. This was a sort of paradigmatic shift that involved not only criminology and the governance of crime, but political, public policy and economic as well, resulting in the neo liberal turn that started in the 1980s, particularly in Great Britain with the Thatcher government, and in the US with the Reagan administration (Trebilcock & Luneke 2018).

According to opportunity theories approach, criminal activity is thus the result of calculated strategic considerations of individuals that choose to commit certain actions following their interest (Garland 1996). In these theories, the spatial component of criminal activity is essential. Crime rates, including homicide, would happen in those areas where the perpetrator will consider that has more chances to succeed without being caught, therefore in places where there are targets that can provide benefits in the proximity, and places he/she is

familiar with as they can provide areas to hide, coverage, and good escaping/hiding routes (Smith et al. 2000).

Routine Activities Theory, Lifestyle, Habits and Crime Pattern Theory

Routine Activities Theory (RAT) was introduced by Cohen and Felson (1979) at the end of the 1970s. Closely associated with Rational Choice Theory, RAT states that crime is the result of a strategic calculation in which committing a crime would grant benefits that surpass the risk of breaking the law. Crime, including homicides, happens where there is "convergence in time and space" (Felson & Clarke, 1998) of 3 factors that are considered the main variables accountable for predatory violations: motivated offenders, suitable targets and absence of capable guardians (Cohen & Felson, 1979). For RAT, suitable targets and absence of capable guardians increases the benefits of potential offenders and motivates them to commit crime. The absence/presence and concentration of these elements in certain places can explain spatial patterns of crimes. As such, "RAT is widely accepted as a useful framework for offering theoretical explanations about why crime occurs in a specific location." (Piscitelli & Doherty, 2018, p. 591)

RAT adopts the point of view of the offender and explores what are the elements that can induce to commit crime. The main one is the values of the target as offenders "will only be interested in targets that they value , for whatever reason." (Felson & Clarke, 1998, p. 5). Other important elements are the *inertia*, *visibility* and *access* of the target (Cohen & Felson, 1979).

In line with the paradigmatic shift in policing, economic and political thought of the end of the 1970s-beginning of the 1980s, it adopts a perspective where men and women are individualistic, rational actors and will pursue the maximization of their benefits, even at the extent of breaking the law and committing crimes (Garland 1996). In line with this perspective, it follows that to reduce crime it would be necessary to reduce the advantages of committing crimes (rather than trying to rehabilitate deviant behaviors). This type of approach will lead to what has been defined as *post-crime* approach in crime governance (Zedner 2007). Under this perspective, homicide will occur when entails a calculated benefit, meaning when certain that lowers the risk of being arrested converge in space and time.

Based on the main explanatory mechanisms of RAT, the spatial dimension assumes a central importance. In fact, for crime to occur, motivated offenders need to be able to interact with suitable targets in areas where there is no guardianship (Smith et al. 2000). Under this perspective, therefore, homicides will tend to concentrate in areas where potential offenders and targets are in proximity to each other and interact in their routines.

Related to RAT is the notion of "lifestyle". Lifestyle refers to the series of activities which responds to group or individual needs (Gottfredson, 1981) and it can be useful to study how drugs generate sort of ecosystems within which there is a higher risk of violence and homicide offending and victimization. According to Lifestyle theory, certain factors increase the risk of victimization such as association with young men, frequent public places late night and residing in cities (Siegel 2015, p.74). It follows that risk of victimization and the advantages of perpetrating crime are not randomly distributed but vary according to place, the type of persons presents in those places (male, young, etc.) and time. On the other hand, for Massey and Jerome (1985), an important aspect of lifestyle that can have a direct impact on homicide rates is the amount of free time people spend outside their houses. (Massey & Jerome, 1985). The idea is that more a lifestyle/routine of a community entails interactions with strangers in public open spaces, the greater the risk of victimization. Statistically speaking, the population with the highest propensity to participate in violent crime, as victims or offenders, are young, single men, mostly from lower income families. The fact that this is the group with highest risks of lethal violence victimization seems to corroborate these assumptions.

Similarly, Thomas Abt (2019) states that "Homicides occur in predictable places, driven by identifiable people, and triggered by well-understood behaviors" (Abt 2019, p. 32), and defines these elements as "hot spots", "hot people" and "hot habits" (p.36). Abt integrates the concept of behavior with three elements that are key in creating the sort of hot ecosystem that is highly prone to violent crime: guns, gangs and drugs. For Abt, in fact to analyze "things that drive violence- guns, gangs, and drugs… we must analyze them as behaviors, not objects" (Abt 2019, 133). Great importance assumes the "place" factor as the probability of victimization depends, hence, on the amount of interactions of people considered at high risk (Gottfredson, 1981). Geographic proximity increases the possibility of interactions, and thus augments the risks of victimization. It is a very simple proposition, as being at a particular place where there are illicit activities can increase the risk of being victimized, even for someone who is not taking part in those activities. Lifestyles are "localized" and not randomly distributed. As Massey and Jerome (1985) claim, "This assumption is, of course, fundamental to an ecological understanding of city life" (Massey & Jerome, 1985, p. 419).

Crime Pattern Theory is another theory relevant for the spatial analysis of crime. This theory, considered part of opportunity theories, is based in the work of Brantingham & Brantingham (1993). Crime Pattern Theory centres its analysis on how interaction between people and the environment impacts crime. How people move across places and times influences crime patterns, including violent crimes and homicides (Felson & Clarke, 1998). The main concepts

for this theory are nodes, paths and edges. Nodes refer to those places with high circulation of people (bars, stations, schools clubs, etc.) and around which crime tends to have a higher rate of victimization and offending. Path refer to the spatial trajectories used by people to move from node to node (which also depends on the time of the day). Crime Pattern Theory can be also applied to homicides, including DRH, and helps understanding why homicide cluster.

Some studies, although limited, have used RAT , Lifestyle theory and Pattern Theory to explain the spatial patterns of homicides, including DRH. Some of these works have found that crimes, including homicides, happen in proximity to both the offender and victim place of residence (Caywood 1998; Groff & McEwen 2006; Messner & Tardiff 1985). However, the distance varies depending on the actual type of homicides (Groff & McEwan 2006; Pizarro et al. 2007; Tita & Griffiths 2005). For instance, even if DRH tend to happen in proximity of the perpetrators and victims' homes, it is one of the types of homicide that on average occur furthest from the residence (Groff & McEwan 2006). These theories, together with some concepts from Crime Pattern Theory, offer an extremely solid conceptual framework to understand clusters of crime, including DRH.

Broken Windows Theory

Broken Windows Theory is another theory that contributes to the general understanding of the spatial dimension of crime at specific locations (Piscitelli & Doherty, 2018). Formulated by Wilson and Kelly (1982), it states that "disorder and crime are inextricably linked, in a kind of developmental sequence, so that "that if a window in a building is broken and is left unrepaired, all the rest of the windows will soon be broken" (p. 3). The idea is that a small crime and physical degradation of a neighbourhood could indicate that people do not care, and this would lead others to continue committing act of disorder and resulting in urban decay. This would signal a destruction of community controls and overtime these areas would become "more vulnerable to criminal invasion" (p.4), with the arriving of all type of crimes, even violent ones. Thus, various small acts of public vandalism within a small area can result in serious crime as it would contribute to destroy social control (Felson & Clarke, 1998). In these areas, small crime can lead to more serious crimes, even homicides. Areas of urban decay are ideal for proliferation of criminal activities, in particular illicit drug dealing. Areas characterized by urban decay and high rates of small crimes, offer lower guardianship as people stop using public spaces because of the perception of insecurity (Wilson & Kelly 1982). Moreover, communities in these areas have higher distrust for the police, becoming ideal places to establish drug markets. Circulation of drugs increases the chances of DRH being committed.

If opportunity theories (lifestyle, routine activities theory and crime pattern) can help explain the perpetuation and consolidation of criminal activities, including homicides, in certain specific areas and among certain communities, it cannot account for why members of these communities initially started to engage in criminal activities in first place. For this purpose, the social structural theories, can be useful to explain the variation of propensity to commit lethal violence more convincingly than opportunity theories. On the other hand, theories, Strain theory and SDT fail to explain why crime, and homicides tend to happen in the same areas where lower classes reside. In other words, it fails to account for the conceptual importance of the proximity factor, which is key in opportunity theories.

2.3. Empirical Research

Most of the existing empirical studies that focus on the link between drugs and crime (including homicides), have been conducted outside of Europe, and empirical research on DRH in the Netherlands is somehow limited. For this reason, this section includes studies from other European countries non-European countries. The sources reviewed in this section were retrieved snowballing from other articles and using Leiden University Catalogue, Google Scholar, Web of Science. The results were found introducing words such as "drug related homicides in the Netherlands", "drug related homicides in Europe", "drug homicides", "drug killings", "drug markets homicides", "drug and violence", "drugs and crime".

The phenomenon of drug-related homicide has been gaining attention from European scholars, also thanks to the support of European institutions in particular the EMCDDA in an effort to deepen the understanding of this problem. For instance, in a pilot study for the EMCDDA, Schönberger and Liem (2019) provided a thoroughly description of DRH in the Netherlands, Sweden and Finland between 2012 and 2016. The study analyzed data of the European Homicide Monitor relative to the 3 countries and provided details on various characteristics of DRH, including location, modus and information regarding victims and perpetrators (gender, age, nationality, etc.). It also underlined differences between these three states, in particular, in the case of the Netherlands it examined 168 drug-related homicides for the period 2012-2016, providing data on the characteristics of the DRH cases, as well as on the victims and perpetrators. Interestingly, DRH committed in the Netherlands resulted overwhelmingly of the systemic type, while those for other two Scandinavian countries, were predominantly psychopharmacological. Another recent report of the EMCDDA (2018) carried out a critical

review of existing European data sources on DRH. The study draws from both open and closed or semi closed sources and provide data on DRH for various European countries, including the Netherlands. For instance, the study reveals that approximately 15% of all perpetrators of lethal violence in the Netherlands were found to be addicted to some sort of drug (EMCDDA, 2018).

The illegality of drugs markets as a causal mechanism for the violent crime has attracted the attention of various scholars. Jacques et al. (2016) assessed the impact of the criminalization of certain drugs on the levels of violence of retaliations. The authors conducted a series of interviews (150) in Amsterdam among legal alcohol sellers (cafés), de-criminalized marijuana sellers (coffee shops) and illicit drugs sellers. The findings of the research indicated that participants of illegal drug markets have the highest rate of violent retaliation and victimization. This conclusion confirmed previous findings put forward by Moeller and Hesse (2013) who studied the relation between drug enforcement and serious violence in Copenhagen, including homicides between 2000 and 2009 (N= 2110). These authors concluded that the police crackdown on the previously stable marijuana market increased the levels of homicides and serious violence as it disrupted existing hierarchies and exacerbated competition among delinquent groups. Werb et al. (2011), also explored the linked between legality of drugs and violence, by presenting a systematic review of various works (written in English) that assess the impact of drug enforcement policies on drug markets-related violence. The authors selected 15 studies (both quantitative and qualitative) and concluded that evidence suggests a negative correlation between levels of drug enforcement and drug market violence.

The impact of drug market and related OCGs on the levels of violence, is another recurrent theme in many studies. Ousey and Lee (2007) analyzed the decline in homicides in the US and linked it to changes in the drug markets. The authors studied homicides in a sample of 132 US cities over a period of 20 years (1980-2000) and conclude that the decline in homicides linked to drug activities during the 90s can be attributed partly to a decrease in the markets activities, but also to changes within the drug markets themselves, in particular the aging of drug market participants and a different culture that resulted in "kinder and gentler" markets, more adverse to the use of violence. In Sweden, however, criminal groups active in the trafficking of drugs have been found responsible for the recent increase of violence involving firearms. Sturup et al. (2018), in fact, found that large part of the 1048 shootings they analyzed in Sweden's three largest cities tended to happen where illegal drugs were sold as a result conflict settlement among criminal gangs (that lack legal ways to resolve disputes).

Drug-related violence is not only the result of organized criminal groups directly active in drug markets s. Some studies have focused on the actions of drug users and their participation

to crime. For instance, Oteo et al. (2014) found that among crack users in the Netherlands, it was fairly common being involved in other types of crimes, such as small drug dealing, property violations and violent crimes. Using a sample of 1,039 frequent crack users, they concluded that a large part of the them (41%) had engaged in criminal activity in the last month, although only 9% violent crimes. Seffrin and Domahidi (2014) analyzed the nexus between drug dealing and violent crimes (including homicides) among adolescent drug dealers. The authors examined the impact of drug dealing and drug use in the behavior of 1148 adolescents and concluded that drug dealing, more than drug use, is strongly linked to violent behavior. The authors also pointed out that drug dealing augment the average levels of delinquency among the respondents' peers as well.

The connection between drug-related crime and criminal markets has led various authors to investigate whether crimes in certain areas can be used to indicate the presence of drug markets. a Schönberger and Liem (2019), for instance, stated that DRH can be used as indicator of the presence of illicit drug markets. Focusing on non-homicidal crimes, McCord and Ratcliffe (2007) carry out a "micro-spatial analysis" of the criminogenic environment of drugs markets in the city of Philadelphia. Using data from block group census and addresses of drug arrests between 2002 and 2003 (N= 13,499) They apply social disorganization theories and routine activity theory. The authors conclude that drug related crimes are spatially correlated to indicators of social disorganization and these can help predict the spatial distribution of drugs markets in city. In a similar line, Lum (2008) explores the relationship between street level drug activity and violence employing spatial analysis techniques to study the relationship between place, drugs and violence. The author analyses data from the Seattle Police Department regarding criminal activity related to drugs in the city of Seattle between 1999 and 2002 (in total 105,447 records of 911calls). The analysis confirmed the existence of a relationship between drugs and violence approximately half of all census tracts in Seattle. However, the relationship does not appear so linear and not always the places with high drugs activity experience high levels of violence as it would be generally expected.

Drug markets and OCGs role in homicides in Mexico is a subject that for its actuality and magnitude, has drawn the attention of scholars. For instance, Ajzeman et al. (2015) concluded the dramatic increase in DRH in Mexico, consequence of drug trafficking organizations' (DTOs) fragmentation and a consequent struggle for territorial control, coincided with a decrease in housing prices and, therefore, a loss of wealth for many households. Interestingly, they argue that only poor areas experienced this type of trend, showing the importance of socio-economic factors in the general distribution of lethal violence associated to drugs. Ajzeman et al. pointed out how drug homicides dramatically increase the perception of insecurity of the

areas where it occurs, a theme also explored by Gutierrez-Romero (2015). IN her study, Gutierrez-Romero explored the impact of drug-related homicides on general crime and security perception. By analyzing surveys conducted on 117,859 participants, the author concluded that areas with high levels of DRH tend to have higher level of other crimes, in particular extortion and thefts, and these are consequences of the decline in the perception of security.

2.4. Research Question

As noted, most of the recent empirical literature on DRH focuses on areas outside the Netherlands and Europe. Although, they can offer invaluable insight on their specific dynamics and relation between socio-economic and cultural variables and homicides, these realities are very different from that of a high income, industrialized and stable European country. In addition, the existing literature on DRH in the Netherlands focuses only marginally on the spatial distribution of this phenomenon. This study, thus, aims at filling this gap by answering the following main research question:

- ***To what extent DRH in the Netherlands are clustered and what factors and theories can explain this?***

3. METHODOLOGY

3.1. Definitions

Homicides

At the national level, and according to different international organizations, there are some differences in defining what is homicide. UNODC's International Classification of Crime for Statistical Purposes (ICCS) defines homicide as "unlawful death inflicted upon a person with the intent to cause death or serious injury" (UNODC 2015, p. 17). This definition is expanded by the Dutch Homicide Monitor and by the European Homicide Monitor, defining homicide as "an intentional criminal act of violence by one or more human beings resulting in the deaths of one or more human beings" (Leiden University, 2019). Regardless of the differences, these definition contain the following common elements: an offender, a killed person and the offender's intention to kill that person (Smit et al., 2012, p. 8). As this study relies on data provided by the Dutch Homicide Monitor, it will be adopted its definition of homicide. Thus, euthanasia, abortion and cases of involuntary manslaughter are not included in this definition and will not be analyzed here.

Drug Related Homicides (DRH)

For the purpose of this work, drug related homicide will be considered every homicide case that responds to the aforementioned Goldstein's (1985) 3 models: Psychopharmacological violence, Economic-compulsive violence and systemic violence. Goldstein's classification has been widely used in criminological studies (Schönberger & Liem 2019; Blumstein 1995; Varano & Kuhns 2012; Copes, Hochstetler, and Sandberg 2015) and it's a sort "standard-bearer" when analygzing the nexus between drugs and violence and has influence an entire generation of criminologist (Dickinson, 2015).

Drugs

In this anlysis, the EMCDDA (2018) definition of drugs will be adopted, which includes *"*narcotics (heroin, morphine, etc.), stimulants (cocaine, amphetamine, etc.), hallucinogens (LSD, tryptamines, etc.) and legally prescribed drugs used in excess (i.e. more than prescribed).*" (p.4*). Alcohol is thus not included in this definition, therefore lethal violence related to the use of this substance will be excluded from this work.

3.2.Data Sources

Dutch Homicide Monitor (DHM)

The principal data source for this study will be the Dutch Homicide Monitor (DHM) (Leiden University 2019). The DHM collects documented homicides in the Netherlands from 1992 to 2016. It contains approximately 4890 cases with exhaustive information regarding the victim, perpetrator, motives, weapons used, location, etc. The DHM is part of the European Homicide Monitor (EHM) a conjoint European between the Netherlands, Finland and Sweden, to create a joint database. The DHM uses data mainly from 6 different sources:

- *Elsevier Annual Report*

  This is a yearly report of the weekly magazine Elsevier that publish the list of all homicides taking place in the Netherlands within a year. The information is based on articles from the Netherlands National News Agency (ANP) and from police files (EMCDDA, 2018)
- *Information from the National Police.*

  The police provides information regarding the case and in the arrest such as when the arrest too place or whether the suspect was arrested
- *Data from the Public Prosecution Office (OMDATA).*

  These multiples sources allow to create a realiable overview and exhaustive overview of all homicides in the Netherlands since 1992, providing a plethora of information, that is subsequently validated (and complemented) using other sources, including:
- *Criminal justice case files*
- *Legal Services Department*

  Particularly useful for information regarding the eventual detention period)
- *Criminal records from the Research and Documentation Centre*
- *Statistics Netherlands (CBS)*

Statistics Netherlands (Centraal Bureau voor de Statistiek, CBS)

Created in 1899, Statistics Netherlands (CBS) is the Dutch national statistical office which provides official and reliable data “to produce insight into social issues” (CBS, s.d.). CBS provides also data on socio-economic characteristics, such as average income, unemployment, racial heterogeneity. This study uses CBS open sources provided by CBS’s Statline. From this source, the following data was retrieved:

- *Non homicidal crimes (violent, theft and vandalism) in 2018 by zip code area*
- *Spendable standardized household income for the years 2004- 2014*

- *Population by province and city area (to calculate DRH rates) for the years 1992-2016*
- *GINI coefficient by cities and provinces for the year 2017*
- *Age and gender of population by zip code area for year 2018*

3.3. Operationalization

3.3.1. Operationalization of variables

All DRH in the Netherlands will be analyzed. Due to the relative small N, 482, all homicides since 1992 until today will be part of the study. Considering the scope of this work, and its geographic focus, particular emphasis will be placed on those DRH cases that respond to the systemic violence model as" the systemic approach is especially informative for a geographic understanding of the drug-violence relationship." (Lum 2008, p. 180). As previously noted, DRH that pertain to the systemic violence model are all those cases of lethal violence that occurred in the broader context of market drugs and the violent dynamics it generates. These can be homicides resulting from rivalries between drug smugglers, punishments for thefts of drugs or for selling fake substance, homicides of informants, etc. (Goldstein, 1985) In the context of the DHM, DRH are identifiable under the variable "HOM_drug". Moreover, the DRH gives information on the type of DRH (using the Goldstein's' tripartite model). In this study, all DRH will be considered, regardless of the specific type of homicide (variable TYPEHOM) which refers to "relationship, motive and situation between the perpetrator and the victim" (Leiden University), hence those cases that were predefined as DRH in the DHM.

Regarding the geographic units, the analysis will be carried out at various levels: nationwide, regions, provinces, cities and neighborhoods. Regions are registered in the DHM under the variable NUTS 1, provinces are registered as NUTS 2, while NUTS 3 refers to Corop Regions (although this is very limited used in this work). Neighborhoods are operationalized in terms of zip code areas of where the homicide case occurred, as this represents"the best nationwide classification of neighbourhoods in the Netherlands" (Nieuwbeerta et al. 2008, p. 96). The Dutch Homicide Monitors includes addresses and zip codes, although it is not available for all cases. I expect the large majority of DRH to be concentrated in Netherlands 3 major cities: Amsterdam, Rotterdam and the Hague. Being large cities, with pronounced socio-economic differences within its population and districts, analysis at the neighborhood level is more adequate to identify patterns between socio-economic characteristics and DRH. Neighborhoods, however, are not the only small geographic units considered. As previously stated, hot spots often can be located within specific streets or blocks. Hot spots can be

identified using GIS software (in this study Tableau, QGIS and ArcGIS) and representing in a map the position of each homicide case, using the geocoordinates of the address. As not all DRH are registered with complete addresses, geocoordinates are available for roughly 356 cases. However, the lack of unequivocal definition of what is a hotspot (how many cases needed to be defined a hotspot and over what area) allows for flexibility in terms of proportion of homicides and size of an area for defining a hot spot. Yet, when graphically represented by simply utilizing cluster maps, it is normally possible to intuitively recognize if there are hot spots (Caplan, Kennedy, & Piza, 2013).

Considering the abundance of data available in the DHM, many descriptive analyses of drug-related homicides can be conducted, also by analyzing other variables such as age, sex and race of the victims and perpetrators. This will allow to identify patterns and the level of correlations between these variables. Of particular importance will be including the weapon used in the homicides (MODUS) as a variable. As previously stated, firearms play a crucial in crime diffusion related to the illegal drug industry (Miron, 2001).

3.3.2. Operationalization of theories

Strain and Social Disorganization Theory

To apply these theories, indicators such as standardized disposable average income per household, and inequality level measured in GINI coefficient will be used (this data is publicly available on Statline.com). The data used, however, does not refer at the specific living conditions (home address/residence) of either the victim/s or perpetrator/s, but rather of the territory where the homicide was committed, in this way centering the analysis on the characteristics of the *place*. When available, data is used aggregated at the post code level (which is the case for standardized disposable average income per household), as well as at the city and province level (data for cities and provinces is normally provided publicly by CBS, while data for postcode areas is not publicly available for every indicator). For GINI coefficient, as well as for standardized disposable average income per household, data aggregated at the city and province level is used. It is expected that areas with lower standardized average income per household will present higher levels of DRH. Conversely, DRH should positively correlate with inequality levels (measured in GINI coefficient).

RAT, Lifestyle Theory and Pattern Theory

To explain spatial distribution of DRH using RAT and Lifestyle theory, (absence of) capable guardians, likely offender and suitable target will be measured using proxy indicators, mostly time of incidents and proportion of young male aged 20-35. DRH should be higher where the proportion of young male subjects is higher and during hours where there is little guardianship (mostly dark hours). Proximity, an important element for both RAT and Lifestyle theory, and it will be assessed by the level of clustering of drug-related cases and by elements where potential victims can interact with potential offenders.

Broken Windows Theory

Broken windows theory will be tested by comparing DRH with rate of other minor crimes in the same area. Statistics Netherlands provides data of *theft of private houses*, *destruction of public spaces* (*vandalism)*, and *violent& sexual crimes*, all these per zip-code area. DRH is expected to be higher in areas with higher rates of other minor crimes.

3.4. Analytical Strategy

Data Visualization: Maps

As part of the objectives of this work will be to analyze the territorial distribution of drug-related lethal violence, the primary methodology that will be adopted would be data visualization, mostly through the use of maps at different geographic levels of analysis. Visualizing data can bring very valuable insight and sometimes can be more effective in suggesting patterns and relations than advanced statistical analysis (Aebi & Linde, 2014). Moreover, plotting the data permits allows the necessary flexibility for the data tell a story, from which one can generate new ideas and hypothesis rather than simply testing existing one (Maltz 2010).

Drug-related homicides will be georeferenced by adding the GPS coordinates of each case. These coordinates can be found by inserting the addresses (of where the homicide occurred) into Google Maps, QGIS' plugin "MMQGIS" or using websites such as "Batch geocoder for journalists" (for batching). Georeferencing homicides will allow to project the homicides into maps by using software such as QGIS or Tableau.

As previously stated, the spatial distribution of DRH (numbers and rates) will be conducted on various levels of aggregation: at the country level, at the region and provinces level (NUTS), at city level, at the postcode area level and at the street map level. At the city / street map level, predominantly maps of the Netherlands' 2 major cities (Amsterdam and

Rotterdam) as these two urban centers contains by far the highest number of DRH cases, and the highest DRH rates. Organizing the data by neighborhood it's important as these territorial/administrative units have been often overlooked in the study of homicides (Nieuwbeerta, McCall, Elffers, & Wittebrood, 2008). Neighborhoods also allow to compare homicide rates with small units of aggregated data of socio -economic indicators (these are divided by zip codes). These indicators are believed to be responsible for a "strong spatial connection between violence and drug activity" (Lum 2011, p. 2715).

Therefore, various types of maps will be produced with the purpose to assess if there is a pattern in the territorial distribution of the DRH in the Netherlands, if there are clusters and hotspots, or other spatial patterns, if DRH are spatially correlated to specific structural socio-economic characteristics, to other type of types of non-homicidal crimes and to other type of homicides too. Table 1 provides a summary of the maps, with the technique and software used.

The principal aim of the maps, however, will be to display whether there is intensity as this is normally the starting point when analyzing spatial patterns of crime (Lum 2008).

The main type of map used to compare areas (regions, provinces) against each other will be Choropleth maps (or more commonly known as filled maps). These maps are useful to compare aggregate data, normally attributing different colors to the areas compared. These types of maps will be done using Tableau.

For socio-economic indicators, as well as for maps that display other non-homicidal crimes rates, and percentage of young population (all analyzed at the zip code level), again choropleth maps will be used, as these allow to display and compare data by areas. These maps can be compared to DRH events by projecting onto the same maps the geocoordinates of the DRH cases in order to analyze to what extent there is spatial coincidence. In these maps, areas of analysis (land, provinces, neighborhoods) are differently colored according to the intensity of the variable showed. In this study, mostly two types of coloring will be used: gradual and centered. In the gradual ones, areas will be colored with different shades of the same color to indicate the level of intensity. On the other hand, the centered maps use two very different colors to fill the areas according to whether the variable showed is above or below average (those above average will have a different color than those below average with the intensity of the color depending on how much they differ from the average point). The centered maps will be used mostly to compare DRH with other variables such as standardized income level and other minor crimes, by projecting the geocoordinates (as dots) on the raster maps. Most of the raster maps will be executed using Tableau, as it allows for a better graphic quality. Moreover,

Tableau's maps contain various layers, including zip code area base layers. For QGIS most layer maps, especially those with administrative divisions, need to be retrieved from other online sources, and some of them (for instance zip code area layers) are not publicly available.

General dot distribution maps (each dot representing an event, in this case mostly a DRH or another homicide) will be added, as these can be used to assess the spatial relations between single homicide acts, between various types of homicides a to show relationships of distances also with other elements such as pubs, nightclubs or public transport stations. These will allow to create cluster maps and identify hotspots (Sherman, 1995). Dot maps will be used to compare distribution patterns between DRH and rest of homicides (excluding DRH). This will allow to assess whether DRH are relatively more clustered and where this clustering occurs. I expect DRH to show a higher degree of spatial concentration and to be mostly concentrated in cities. Most of the dot maps will be created using QGIS as it allows for geo-batching geocoordinates and it is more flexible when uploading long lists of geocodes and allows to add various separated lists of geocoordinates that can be projected on the same base map with different characteristics (in terms of color, size and shape of the dots). Thus, when comparing geocoded events of different categories, such as different types of homicides, QGIS appears more suitable.

Another type of comparison will be between DRH and homicides carried out with firearms (excluding DRH). As noted, the wide circulation of guns within the drug industry is one of the principal factors that links drug markets and increase levels of violent crime and homicides (Blumstein,1995; Miron, 2001; Ousey&Lee, 2007; Abt, 2019). The use of firearms within the illicit drug industry has systemic effects on the whole community where they operate and create strong incentives to carry guns for people who are not related to drug markets in any way (Blumstein 1995). Thus, I expect DRH and firearm killings to have similar spatial distribution. For the reasons explained above, these maps will be created using QGIS.

Density maps, or heatmaps, will also be used as these are commonly used to visualize crime data. In this study it will be used a kernel density analysis which has the advantage of providing an intuitive visual representation, allowing for "a visual display of a smoother, more continuous illustration of intensity." (Lum 2008, p. 185). Kernel calculates the density of dots (in this case homicide events) for each output raster cell (esri, s.d.). In this study, the heatmap is automatically created using both Tableau and QGIS. Heatmaps showing the entire distribution of homicides in the whole country are created using Tableau (for graphic reasons), while heatmaps showing DRH in Amsterdam and Rotterdam are created using QGIS as it allows for better zoomed views at the street level.

Another type of density map are cluster maps. Clustering measures both distance (dependence) and intensity (Lum 2008) and in this study will be used mostly at the city/street map level to determine clusters within specific distances between events (for this study a distance of 500m). QGIS provides a point cluster renderer that allows to aggregate points close to each other (the distance can be customized) and displays the number of points that have been aggregated.

Data on inequality level in the Netherlands is provided by Statistics Netherlands at the province, city and neighborhood level for the year 2016 (Statistics Netherlands, 2019). GINI coefficient ranges from 0 to 1, where 0 indicates perfect equality and 1 maximal inequality and is widely recognized and used as indicator for inequality levels. Map showing GINI by city areas is directly taken from a CBS publication (Statistics Netherlands 201X). Terrain level raster maps for cities (area maps) are not publicly available and Tableau provides this option only for the US. Thus, in order to compare DRH events with GINI at the city level (which is a smaller aggregation compared to provinces, and thus more relevant in this study), the "static map" taken from the CBS publication was geocoded using QGIS. This technique allows to georeference plain images (photos, scanned images, screen shots etc.) by manually attributing geocoordinates to specific areas points on the map. This operation enables to project on the map geocoordinates, such as DRH cases.

Table 1 : List of maps, with description and software

Maps	Description /Technique	Software
figures 19&23	Heatmap	Tableau
figure 20,21, 26	Choropleth Maps (thematic map) of NUTS	Tableau
figures 22, 24	Symbol maps for cities, representing dimensions (percentage of DRH)	Tableau
figures 27, 28, 29, 30, 31	Dot maps (DRH and other types of homicide)	QGIS
figures 32	Dot map (DRH and firearms killings, street view)	
figure 33	Dot maps DRH by years	Tableau
figures 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46	Choropleth maps (crime rates by postcode) w/ DRH geo-projected (dots)	Tableau
figures 37	"Static" map georeferenced (GINI map by *gemeente*) with DRH projected (dots)	QGIS
figures 47, 48	Heatmaps Amsterdam and Rotterdam (street map view)	QGIS
figures 49, 51	Cluster maps Amsterdam and Rotterdam (street map view)	QGIS
figures 50, 52	Dot maps Amsterdam and Rotterdam (with urban elements)	QGIS

Spatial Geometry

Subsequently, spatial geometry tools, such as distance matrix, Average Nearest Neighbor analysis for spatial randomness as these can help to assess whether there is dependence between homicides types and if the distribution of points are significantly clustered (Caplan, Kennedy, & Piza, 2013).

Average Nearest Neighbor is the average of all the distances between the locations of each event (dot) with its nearest event. When the average distance is smaller than that of a hypothetical random distribution, then it can be said that the elements analyzed are clustered. On the other hand, if the average distance is bigger than that of a hypothetical random distribution then the elements can be considered dispersed. From this calculation the average nearest neighbor ratio can be derived by dividing the actual average distance and the expected distance (meaning that of a hypothetical random distribution) (Esri, s.d.). Average Nearest Neighbor can be calculated using the specific Nearest Neighbor tool on QGIS.

The distance matrix tool (on QGIS) allows to find what features are closest to a specified other feature, providing also the distance between each dot/event of one group (i.e. DRH) and the closest dot/event of another group (i.e. Partner Killings or another type of homicides). Averaging the distances one can assess what other type of homicides are on average spatially closer to DRH.

Regression Analysis

To assess whether there is a significant correlation between DRH and socio-economic factors or other type of crimes, and considering the non-normality of the distributions, a Spearman rank correlation analysis will be used. In the case of socio-economic indicators, a negative correlation between DRH and standardized average disposable household income is expected. On the other hand, a positive correlation between DRH and GINI coefficient at the city level is expected. Bivariate regression analysis will be carried out also to assess the relationship between proportion of male population aged 20-35 and number of DRH at the zip code level. Based on Lifestyle Theory and RAT, a positive correlation is expected.

Data regarding household standardized average disposable income is publicly available at the zip code area level on Statistics Netherlands webpage. This provides data from 2004 until 2014 and thus the average for each zip code areas of the 10 years period will be used in the study. The standardized version will be chosen rather than the absolute household income as it accounts for the size and composition of the household

In the case of the comparisons with other type of crimes (violent crimes, vandalism (destruction of public spaces) and theft), a Mann Whitney U test will be executed for each category. A Mann-Whitney U Test allows to compare the crime levels within the postcode areas where DRH occurred, with the crime levels in the postcode areas with no DRH cases, in order to test two opposing hypotheses:

H_0 *The average number of non-homicide crimes DOES NOT differ among postal codes in the Netherlands where drug-related homicides (total DRH) occurred (YES) and those were there were no DRH (NO)*

H_1 *The average number of violent and sexual crimes DIFFERS between postal codes where*

Based on the Broken Windows theory, H_0 is expected to be rejected.

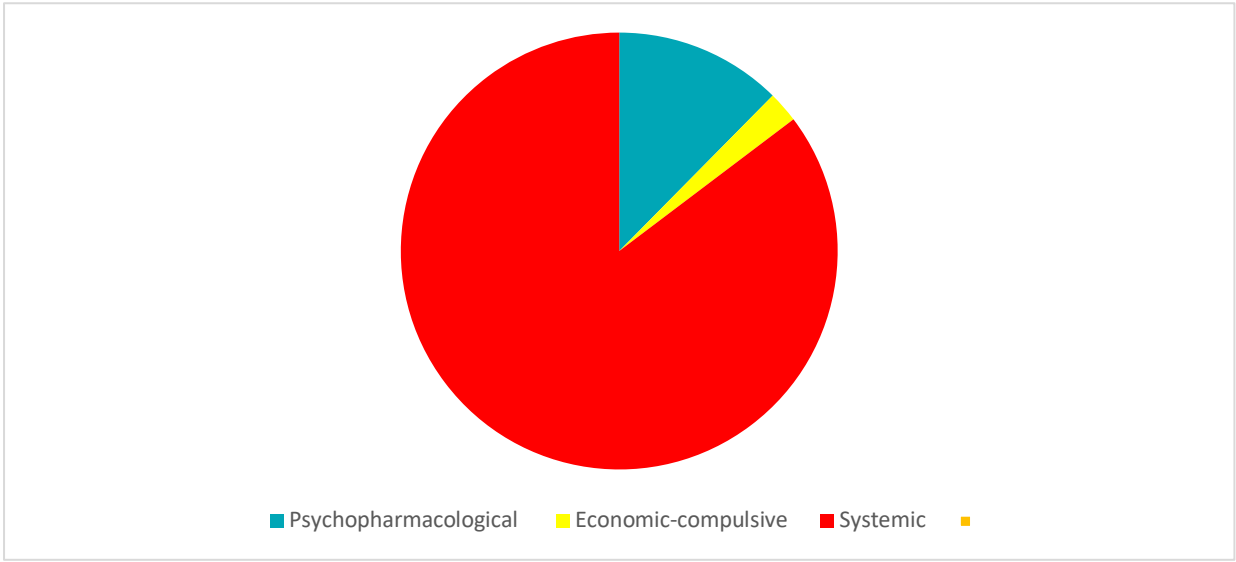
4. RESULTS

This chapter, which introduces the analysis of the data, is divided in two parts. The first part presents a descriptive analysis of DRH, while the second part contains the spatial analysis. Both parts are divided in various sections. In the general descriptive analysis, data regarding temporal pattern, age and gender composition of both victims and perpetrators, and information regarding the number of victims per case will be provided, using the tripartite classification suggested by Goldstein (1985). In the second part, DRH territorial distribution will be displayed through various maps, and using different territorial levels. This part also contains an explanatory section, where DRH are compared to the territorial distribution of socio-economic indicators and other crimes.

4.1.DRH: General Characteristics

Between 1992 and 2016, there were 4892 homicide incidents in the Netherlands, of which 482 (or 9.8% of the total) are confirmed to be drug related homicides. This figure does not represent the "real" number of drug-related homicides, but only those where the cases were resolved, and the drug nexus was confirmed. There are other cases still unresolved that could pertain to drug-related category but in this study only those already confirmed will be considered. Of the all the DRH, the large majority belong to the Systemic type, 411 (or 85.30 % of all DRH). Of the remaining 71 cases, 60 (or 12.4%, N=482) belong to the Psychopharmacological type, while only 12 (2.3% of the total DRH) were categorized as economic compulsive. Figure 1 shows the distribution of the 3 types of DRH by percentage:

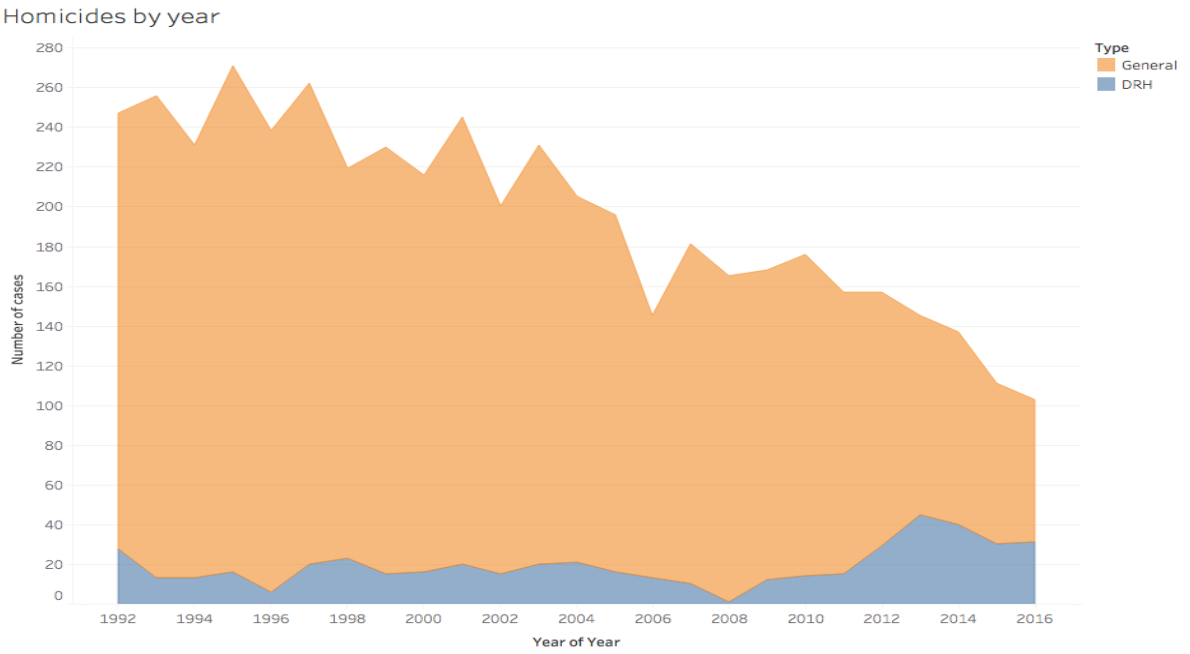
Figure 1: Drug-Related Homicide by Goldstein's (1985) Three Subtypes, in the Netherlands 1992-2016



4.1.1. DRH in the Netherlands: General Trends

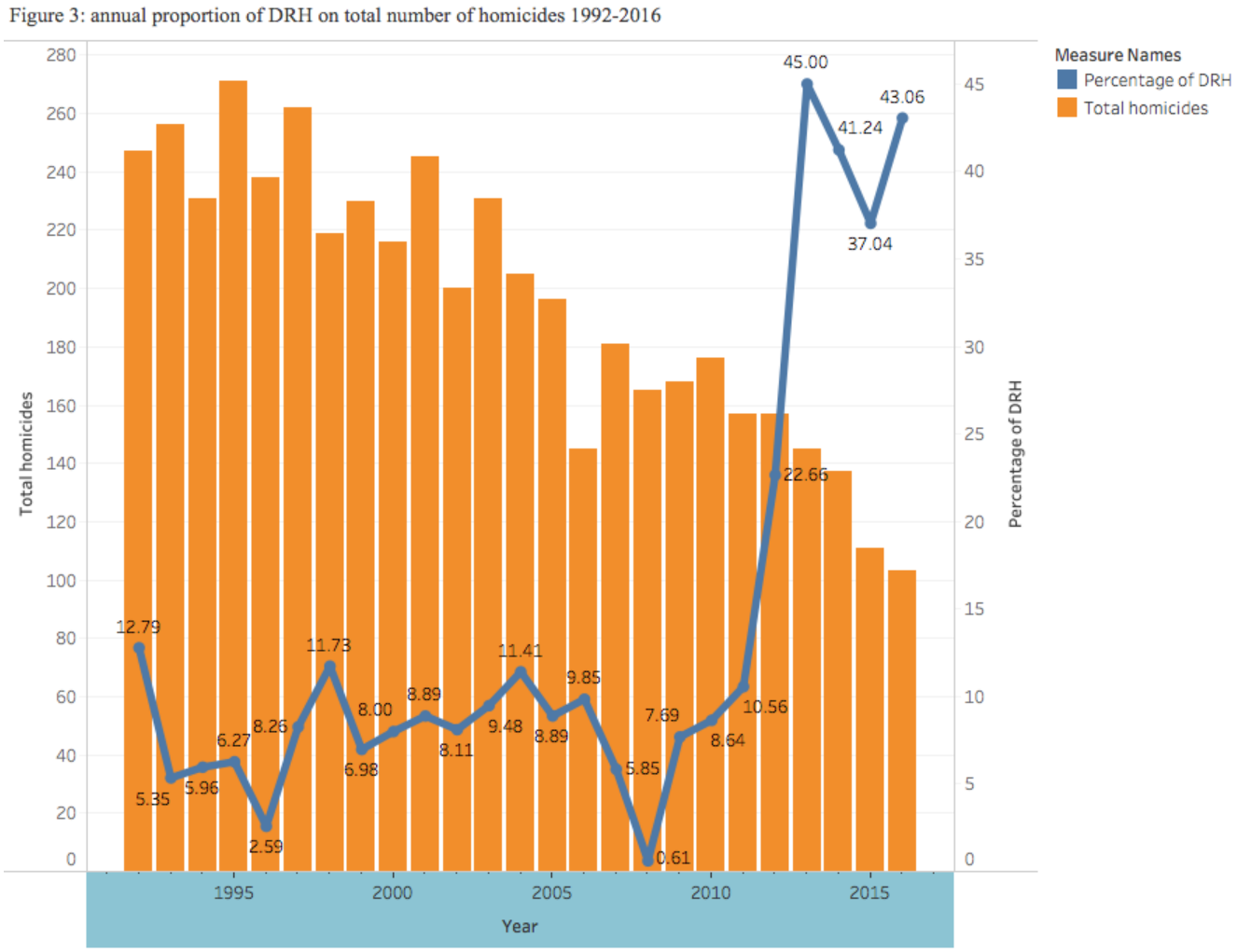
In the period considered, the number of drug-related homicides has followed an irregular pattern. The number of DRH in the Netherlands started at a high of 28 cases in 1992.Then between 1993 and 2006 the number of cases dropped, although intermittently but staying between 13 and 23 homicides each year (with a low point in 1996 when there were just 6 DRH). In 2008 reached the lowest point, with only 1 case, and then suddenly rose, reaching its peaks in 2013 and 2014 with 45 and 40 cases respectively. Subsequently, it dropped again to 31 cases in 2016. Conversely, when considering all types of homicides together including DRH, during the same period there has been a steady decline in the total number in the Netherlands. After an initial peak in 1995 at 271 homicides, it gradually declined, going below 200 cases per year since 2005 and reaching a low of 103 homicides in 2016.

Figure 2: DRH cases and total homicides cases in the Netherlands between 1992 and 2016



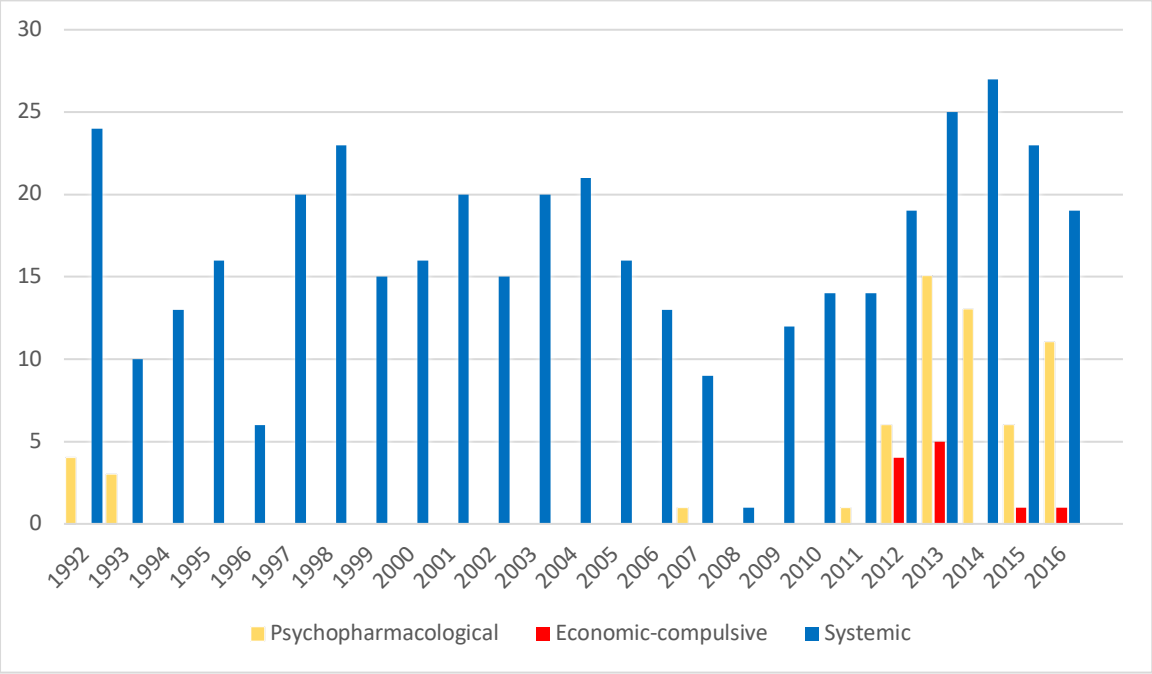
Over the years, the proportion of DRH on the total number of homicides has increased. In 1992 DRH represented 12.8% of all homicides. The proportion of DRH dropped in the following years, touching 2.59% in 1996. Subsequently the percentage oscillated between 8% and 11%, dropping to 0.61% in 2008 and then skyrocketed in the next years, reaching 45% of all homicides in 2014. In 2016, DRH accounted for more than one third of the total homicides: 43%. The reasons why DRH did not follow the overall trend in homicides and gradually declined are not certain. However, it appears that DRH are immune to those social and policy changes that determined the decrease of the general homicide rates. Figure 3 compares the percentage of DRH to general homicide.

Figure 3: Annual proportion of DRH on total number of homicides



On the other hand, when disaggregating drug-related homicides by the three types, as shown in figure 4, it can be noticed that prior to 2012 there were no known homicides that could be classified as Economic-compulsive. Between 1994 and 2006 there were no known psychopharmacological homicides registered. However, since 2011 the number has increased: in 2012 there were 6, 15 in 2013 and 13 in 2014. In 2016 there were 11 psychopharmacological homicides, which represent 35% of all DRH. Figure 4 shows the different types of DRH by year.

Figure 4: Annual number of DRH by Goldstein's' (1985) three subtypes in the Netherlands, 1992-2016



Most of the drug-related homicides were committed in January (61 cases), while August is the month were the least number of DRH occurred (22 cases). The following graph gives more details regarding the distribution of DRH by month. Of the DRH were the time when it the homicides was committed is known (N=249), most of them happened in the evening, meaning between 18:00 and 24:00 (99, or 40%), while the morning (between 6:00 and 12:00) appears to be the moment where fewer homicides happened (32, or 12.5%). When considering also the month, DRH most occurred during the evening in the month of December (N=16), followed by evening in April and January (N=14 and 11, respectively).

Figure 5: total DRH cases per month and time of the day in the Netherlands, 1992-2016

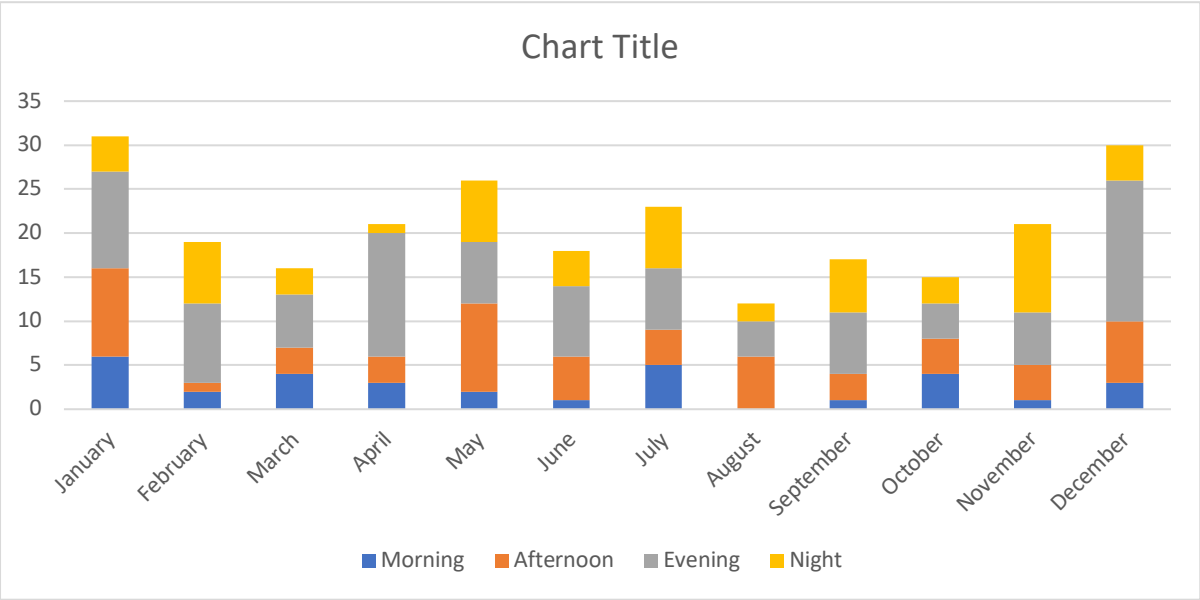
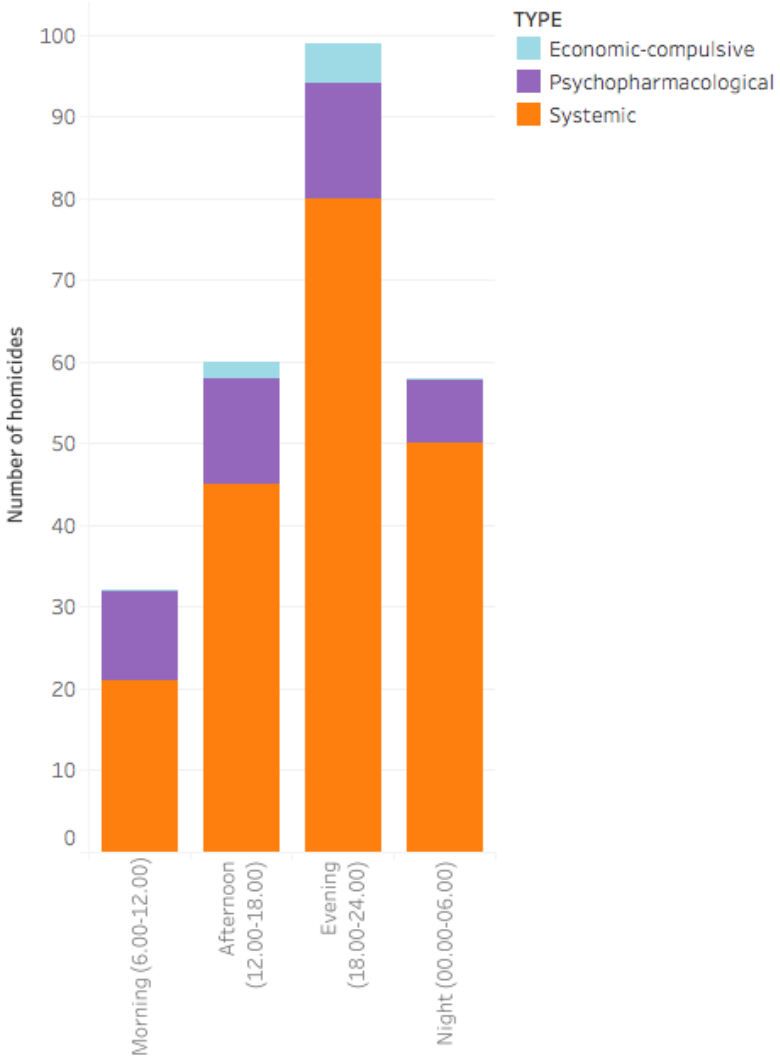


Figure 6: DRH cases by Goldstein's (1985) types per time of the day in the Netherlands, 1992-2016



Crime scene

The majority of drug-related homicides incidents were committed in private residences (171, or 35,5%), followed closely by public spaces (144, or 29.9 %), private vehicles (49/ 10.2%), shops and other amusement areas (28/ 5.8%). Table 2 shows in detail the various locations of the all DRH.

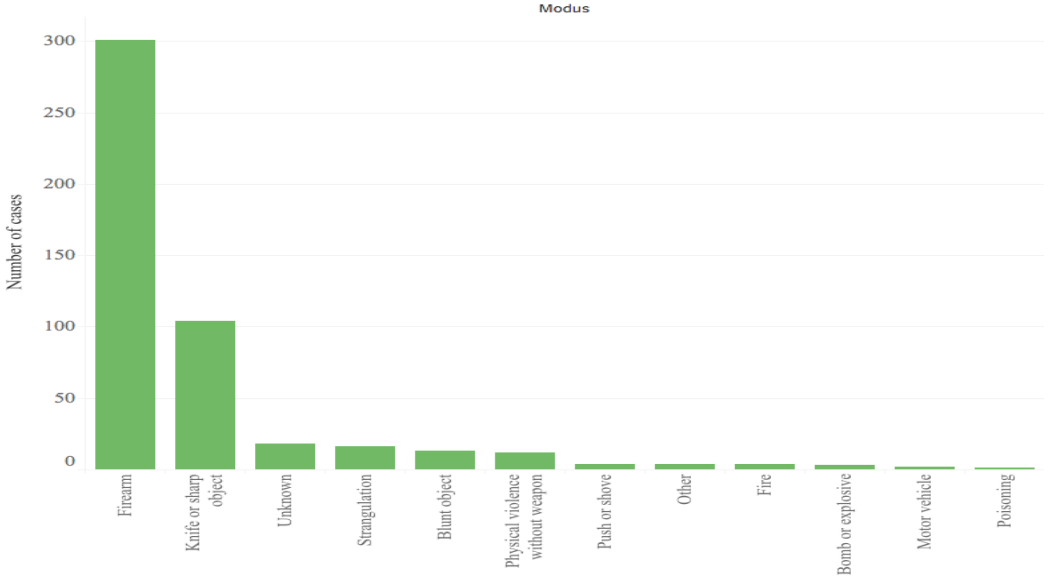
Table 2: Crime scene of DRH

Place	Number of Cases	Valid Percentage
Private residence	171	38,1
Private vehicle	49	10,9
Park, forest, recreational area	14	3,1
Shop, restaurant, bar, etc.	28	6,2
Street, road, public transportation or other public place	144	32,1
Workplace	14	3,1
Other	26	5,8
Total	449	100,0

Modus

As figure 7 shows, the large majority of DRH incidents were carried out using guns: 301 cases, or 62.4% of the total (482). The second most frequent modus used was knife of a sharp object (21.6%), followed by blunt object and strangulation. The least common modus appears to be poisoning (0.2%).

Figure 7: Number of DRH cases in the Netherlands (1992-2016) by modus.

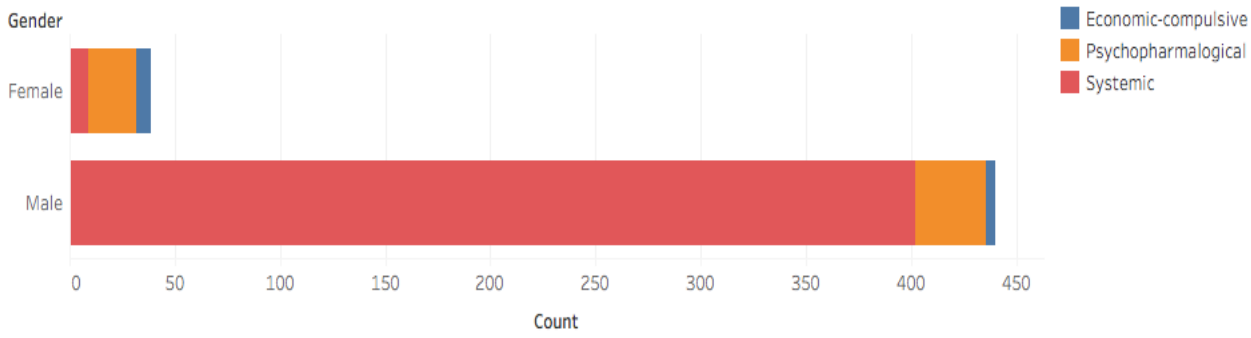


However, looking into the 3 types of DRH the data shows a different distribution. Firearms are still the most frequent modus in systemic DRH, with 300 out of the 411 systemic DRH committed using this type of weapons. Yet, when considering only the economic-compulsive type, firearms were used in zero instances. Instead, strangulation, and knife or sharp object/weapon" represent the majority of the modus for the economic-compulsive DRH (both 45.5%, N 12). Knives and sharp objects are the most used instruments in Psychopharmacological homicides: 35 out of 60 cases (or 58,3%) were carried out using these objects, followed by suffocation (15% , N 60).

Gender of victims and perpetrators

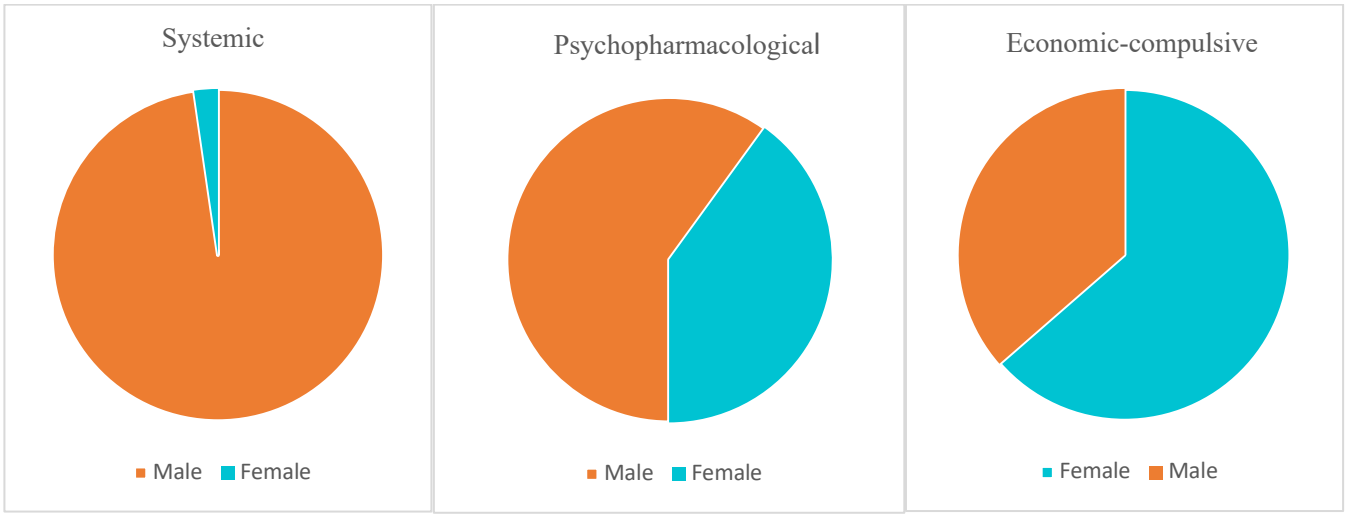
Overall, the overwhelming majority of victims of DRH were identified as male: among the principal victims, 442 (or 91.7%) were male, while just 40 (8.3%, N 482) of the victims were identified as female. When disaggregating these figures by type of DRH, the situation changes quite drastically: if in the case of Systemic DRH male account for 97.9% (N 411) of the all the systemic DRH, for the psychopharmacological type the distribution appears to be more balanced: 60 % male and 40 % female (N 60). Conversely, in the majority of the Economic-compulsive DRH female were the victims (63.6%, N 12).

Figure 8: DRH principal victims by gender and by Goldstein's (1985) types in the Netherlands, 1992-2016



The following figure shows how the proportion of male and female principal victims strongly varies among the 3 models of DRH.

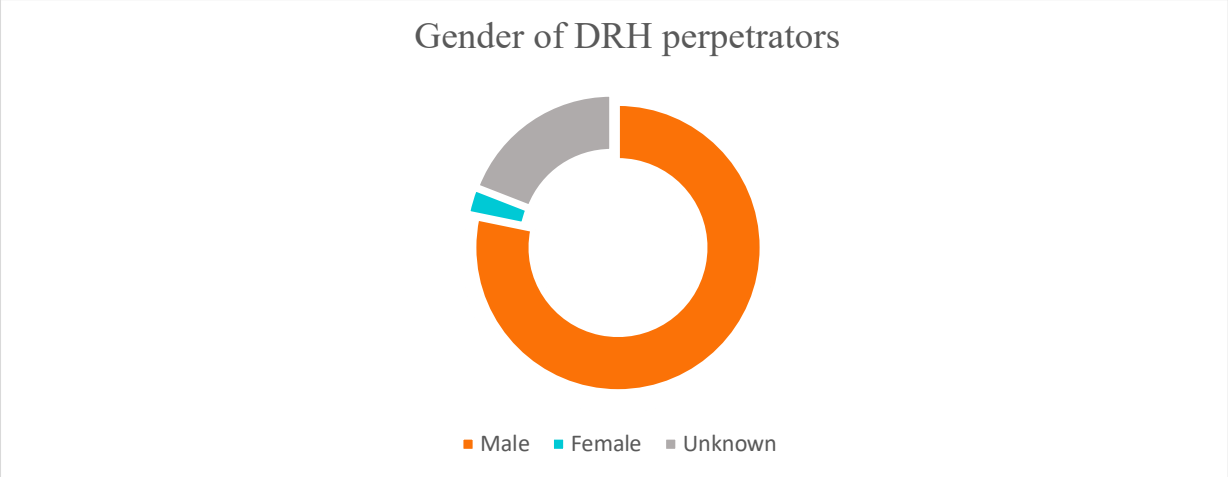
Figure 9 : Proportion of male and female principal DRH victims by Goldstein's (1985) three subtypes in the Netherland, 1992-2016



When considering all victims, the proportions are quite similar: of 543 total victims, 492 (90.6%) were male and just 51 (9.4%) were female. When considering the overall victims by type of DRH, again the proportions appear very similar to those of the principal victims: of the 62 psychopharmacological type, 60% (37 victims) were male and 40 % (25 victims) female, the same distribution as when considering only the principal victim; for the economic-compulsive type, 36% (4 victims) were male and 64% (N=7) female, and for the systemic type, again, male victims were overwhelmingly represented with 95% (451 victims) compared to only 5% (N=19) female victims.

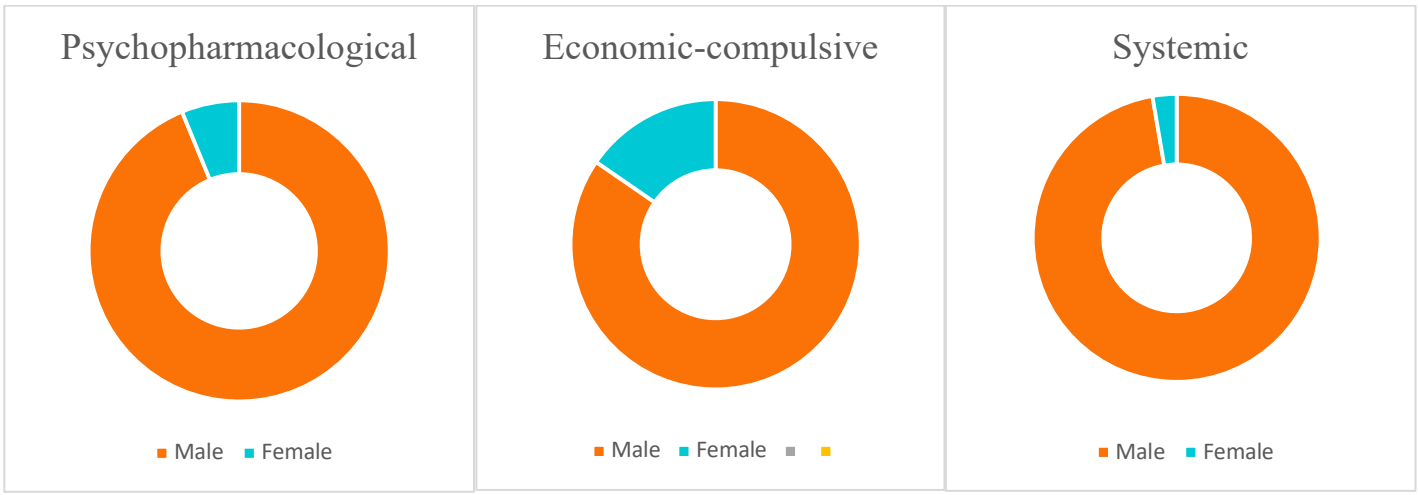
Figure 10 shows the gender composition of all (known) perpetrators. Again, the large majority are male individuals: 616, or 78.3% (N=787). Female perpetrators, on the other hand, represent just 2.7% of the total (N=21). For 19.1 % of the perpetrators the gender results as unknown.

Figure 10 Gender of perpetrators of DRH in the Netherlands, 1992- 2016



When disaggregating DRH by type, the gender composition of perpetrators remains relatively the same with male perpetrators outnumbering by fare female perpetrators in every type (unlike the case of victims).

Figure 11 ; Gender of DRH perpetrators by Goldstein's (1985) tripartite model in the Netherlands, 1992-2016



Most of DRH where the gender of both the victim and perpetrator is known were committed by male against other male, 289 cases out of 482 (60%). There is also a conspicuous number of cases (144, or 30%) where the principal victims were male, but the gender of the perpetrator was unknown. Cases where the principal victim was female and perpetrator was male constitute just 6.6% of all cases (N 482), while cases where the perpetrator were female and the victim were male, or another female represent a very tiny proportion (1.2% and 0.4% respectively). The following table shows the dyad *victim-perpetrator* by gender.

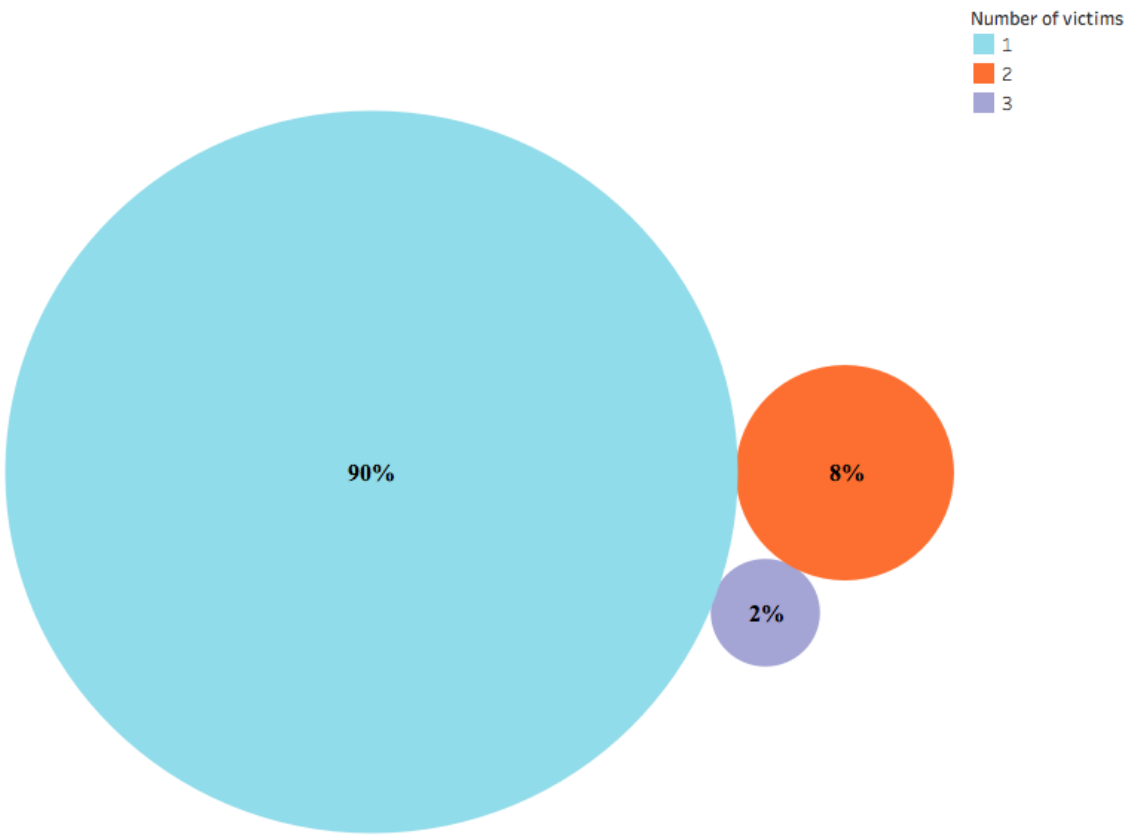
Table 3: Dyad victim-perpetrator of DRH in the Netherlands, 1992-2016

Dyad	**Number of Cases**	**Valid Percentage**
Male Victim, Male Perpetrator	289	60.3%
Male Victim, Perpetrator unknown	144	30.1%
Female Victim, Male Perpetrator	32	6.7%
Male Victim, Female Perpetrator	6	1.3%
Female Victim, Unknown Perpetrator	6	1.3%
Female Victim, Female Perpetrator	2	0.4%

Number of Victims per case

The 482 DRH caused in total 548 victims. In 433 cases (or 89%, N 482) the acts resulted in one death, 38 instances in 2 lethal victims, 10cases in 3 victims, while only in one case there were more than 3 victims (representing less than .2%). Figure 12 reflects the proportions.

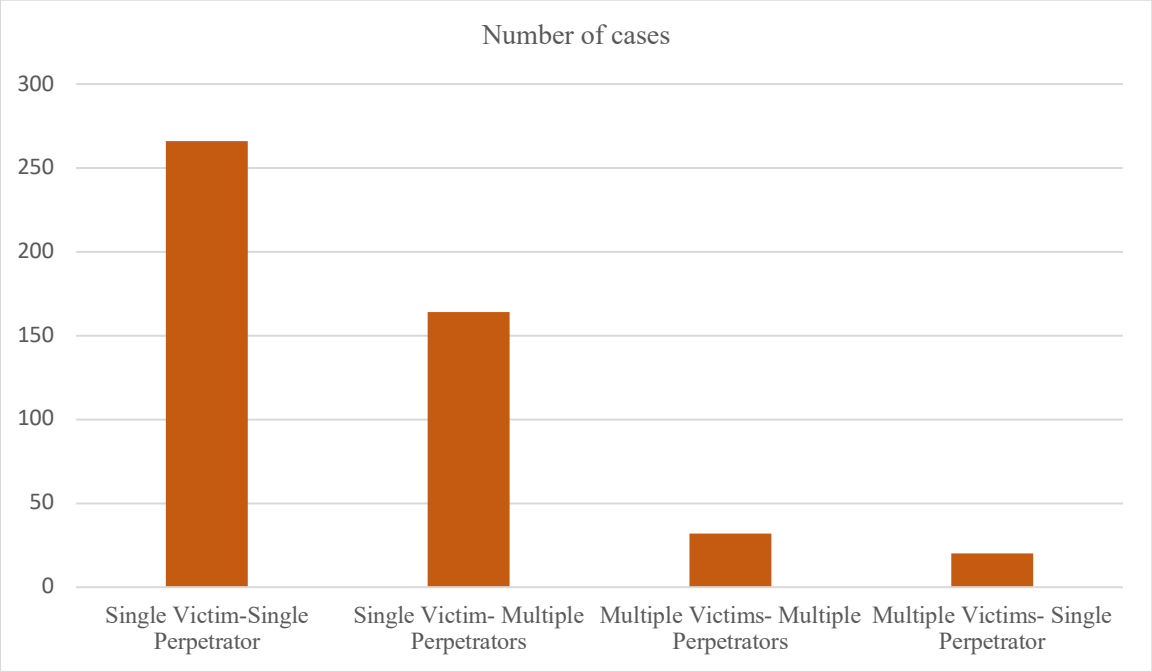
Figure 12 : Number of victims per DRH incident (in percentages) in the Netherlands, 1992- 2016



In all but two cases, the homicides resulting in more than one victim belong to the systemic model. The two exceptions belong to the psychopharmacological model and both had two victims. On the other hand, all the 11 economic-compulsive type caused just one victim. In average, DRH resulted in 1.14 victims.

Figure 13 provides information regarding the combination of number of victims and number of perpetrators per case.

Figure 13: Dyad of number of victims/perpetrators of DRH, 1992-2016

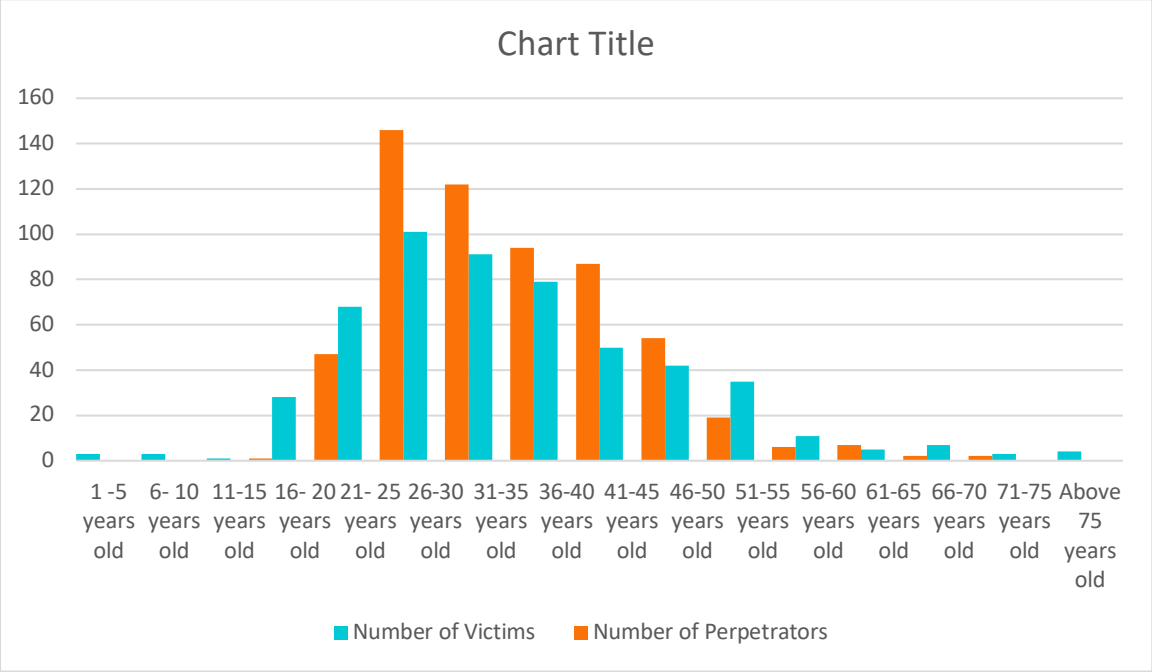


The large majority of cases consist of a single victim and a single perpetrator: 55.2%, or 266 cases. The case of a single victim and multiple perpetrators represents an important part of the 482 cases: 164, or 34%. Conversely, cases involving multiple victims and a single perpetrator are the least numerous, with just 20 cases (4.1%).

Age

The average age of the principal victims of drug-related homicides is 35.6, while the average age of the perpetrators appears slightly lower: 31.19. The distribution, however, seems highly skewed to the right, and the mean and mode differ quite substantially. In the case of perpetrators, the mode is 25 years old, while for victims the mode is 27 years old. The following figure shows the distribution by age of all the victims and perpetrators.

Figure 14: Age distribution of DRH victims and perpetrators, 1992 -2016

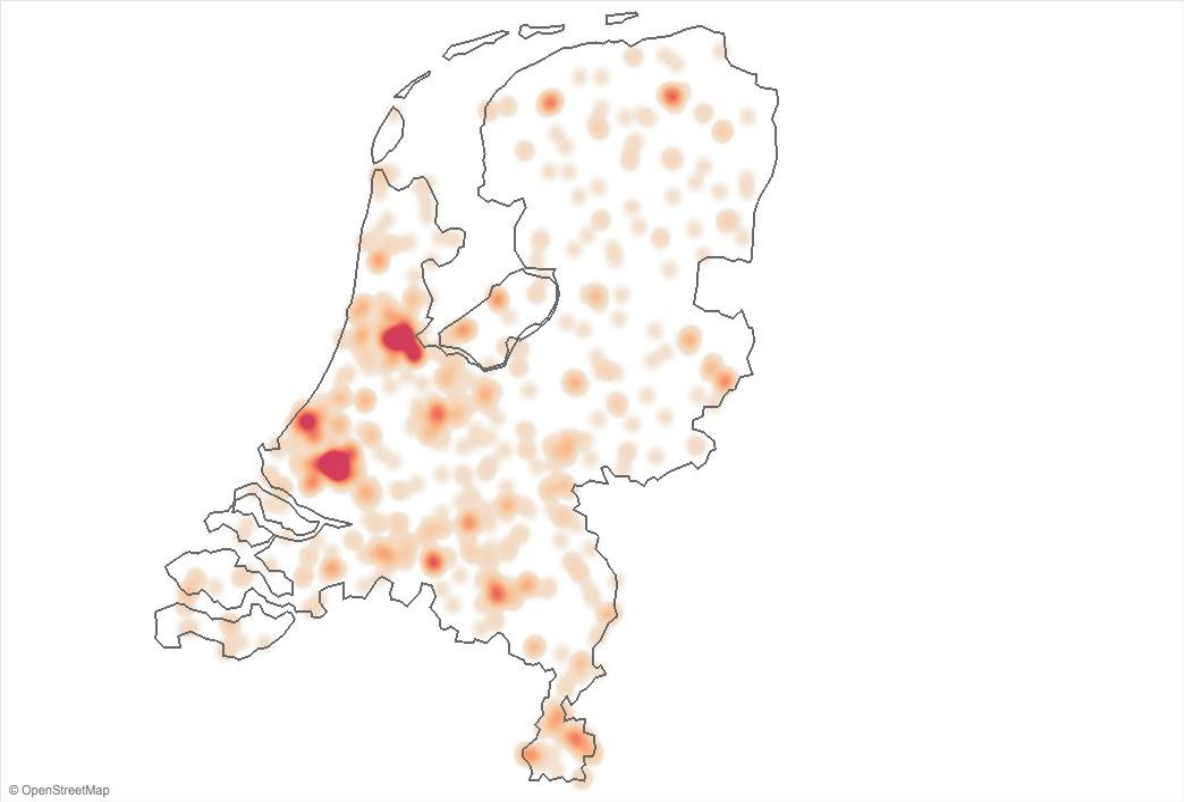


4.2.Spatial Analyses

The following section will provide a description of the spatial distribution of DRH in the Netherlands between 1992 and 2016. The first part will give an overview of the general spatial patterns of all homicides in the Netherlands. Subsequently, the study will focus on DRH: initially, an overall overview of the geography of DRH in the Netherlands will be provided, utilizing again the same administrative/geographic units (NUTS 1, 2, 3 and cities). The next sub-section compares DRH with other types of homicides and analyses different territorial distributions and patterns. Then, DRH will be compared to various indicators: average household income (per zip-code area), inequality levels (by city) and percentage of male population between 20 and 35 years old. Subsequently, DRH will be also compared to other non-homicide crimes (at the zip code level), such as violent crimes, theft of private houses and destruction of public property (vandalism). The final subsection, shows more in detail DRH in Amsterdam and Rotterdam, comparing them other elements such as pubs and nightclubs. The objective is to explore the distribution of this type of homicides within the spatial reality of a city.

4.2.1. Spatial Distribution of All Homicides

Figure 15: Heatmap of total number of homicide cases in the Netherlands, 1992-2016



As the heatmap (or density map) illustrated in figure 15 shows, the large majority of homicide cases that occurred in the Netherlands between 1992 and 2016 are concentrated in the country's three main cities (the G3): Amsterdam, Rotterdam and The Hague. These are the areas that in the map appear more intensely colored. Aside from these 3 cities, it is possible to visualize a high occurrence of homicides in the southerner part of the country, in particular close to the southern border, in the area surrounding Maastricht (which is enclosed both by Belgium and Germany) and in center of the country where the city of Utrecht is located.

Using the European NUTS (in French *Nomenclature des Unités Territoriales Statistiques,* or Nomenclature for Territorial Units for Statistics), once again homicides clearly appear unevenly distributed. Figure 16 shows the number of homicides cases by NUTS 3, NUTS 2 and NUTS 1. Considering the NUTS 1 Administrative level, almost 60 % of the entire homicides in the Netherlands are concentrated in the West-Nederland region, followed by Zuid-Nederland (19,58%). Netherlands' three major cities (plus Utrecht) are located in this area, and this is where most of homicides are concentrated. In terms of Provinces (NUTS 2), Zuid-Holland presents the highest concentration of homicides: 27.21%. It is closely followed

by Noord Holland (where Amsterdam is located), with 25.78% of all cases. North Brabant follows, with 12.49% of homicides, while Zeeland reports the lowest number of cases among all provinces, with only 1.8% of cases concentrated in this province.

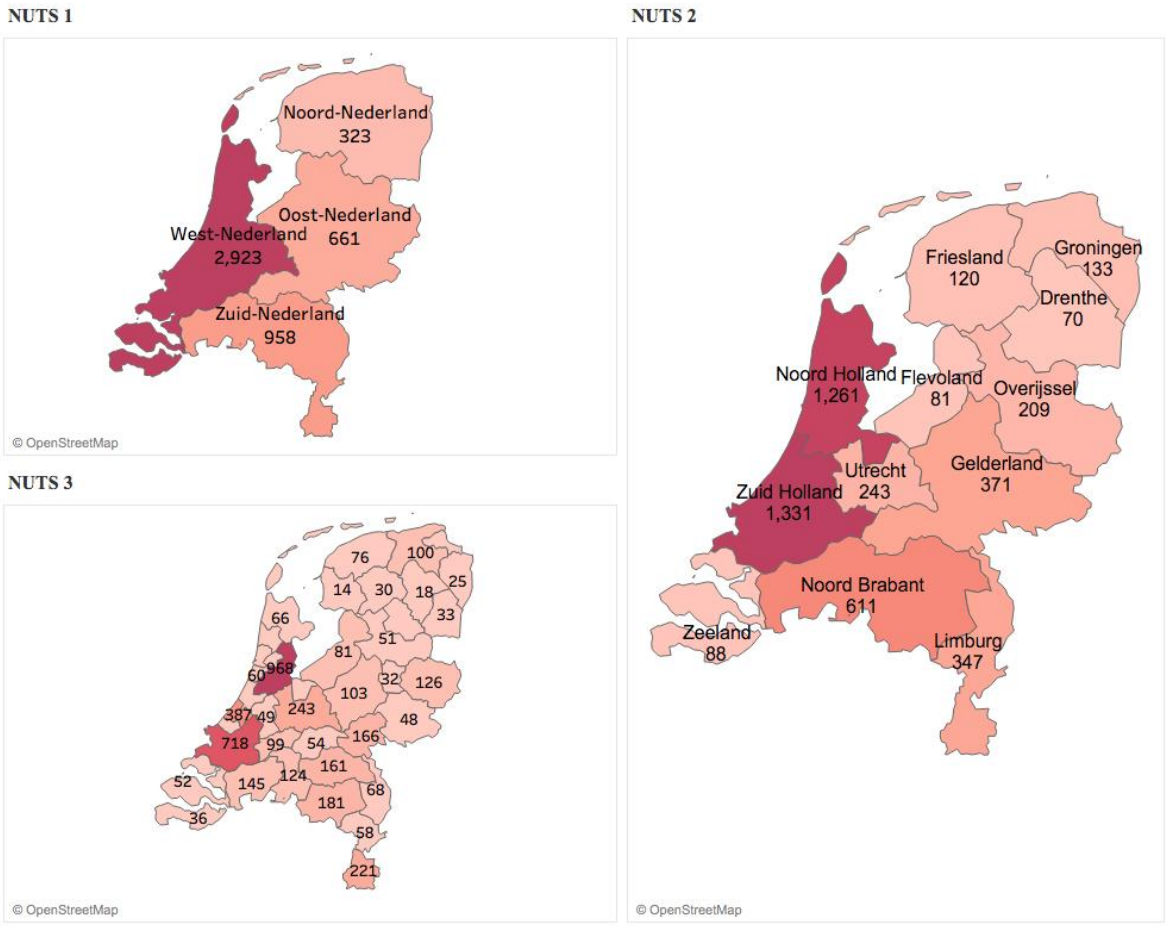


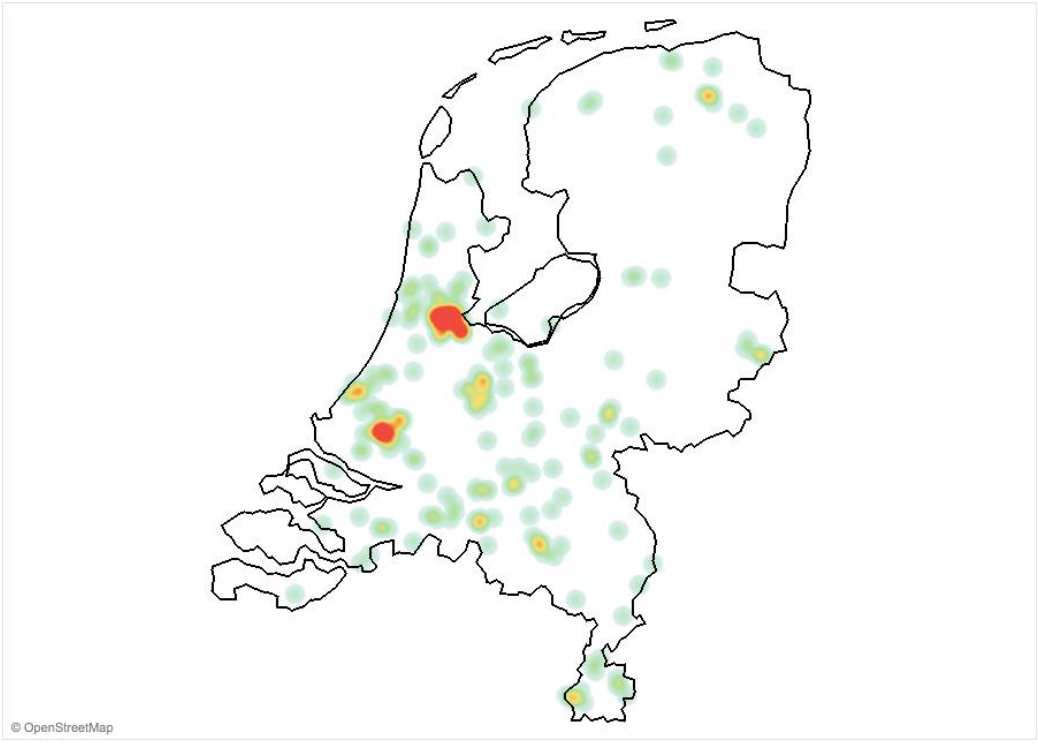
Figure 16: Total number of homicides between 1992 and 2016 by NUTS areas in the Netherlands

Focusing on the city level, 797 cases (or 16.6 %) occurred in Amsterdam alone, followed by Rotterdam (552 cases, or 11.3%) and The Hague (309 cases, or 6.3%). Other cities with an important number of cases of lethal violence are Utrecht (99 cases, or 2%) and Tilburg (73 cases, or 1.5% of the total) Figure 17 illustrates the distribution of homicides in the first 10 cities. The following map shows the 10 first cities by percentage of overall homicides.

Figure 17: 10 first cities by homicide cases in the Netherlands, 1992-2016

4.2.2. Spatial Distribution of drug-related homicides

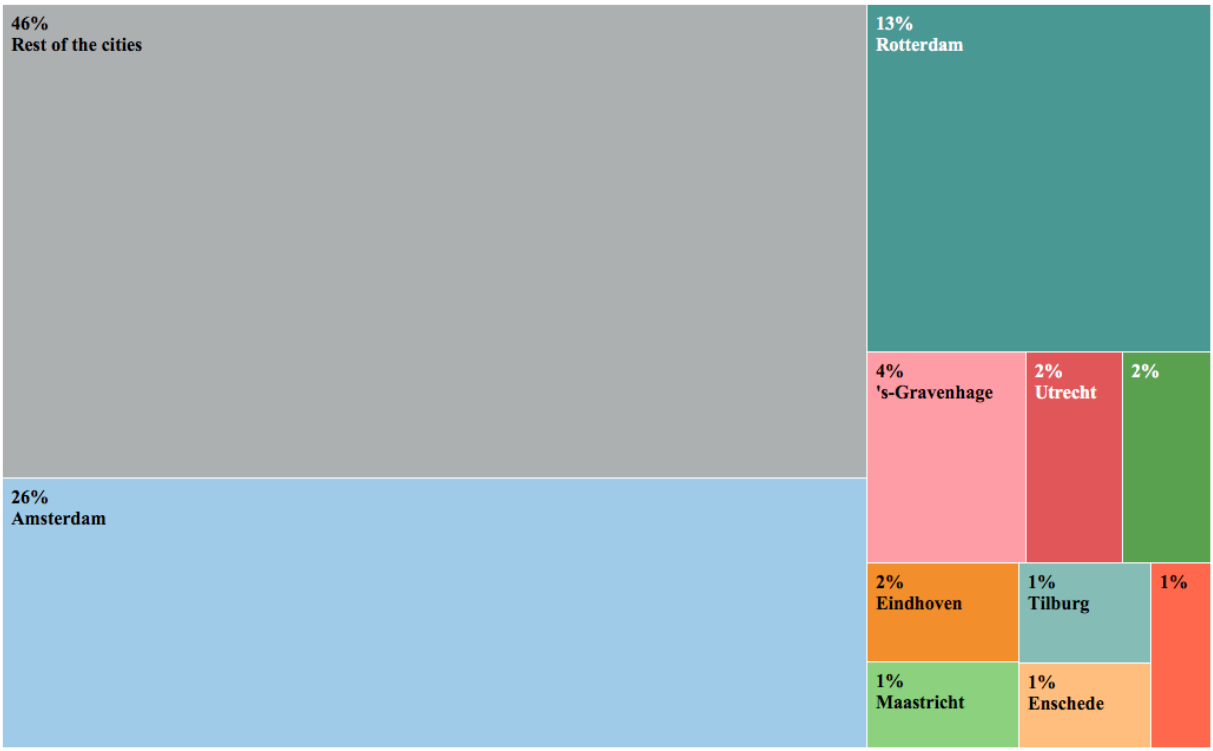
Figure 18: Heatmap of DRH cases in the Netherlands, 1992- 2016



Compared to overall homicides, drug-related homicides follow a similar spatial pattern distribution as it can be seen in figure heatmap above (figure 18). Again, the majority of cases (42.9% of the total 482 DRH) are concentrated in the G3: 125 cases (or 25.9%) occurred in Amsterdam, 64 (13.3%) in Rotterdam and 18 (3.7 %) in The Hague. The 10 cities with the highest number of cases account for 54.4% of all cases. The observed mean distance between DRH is indeed smaller than the expected mean distance (which would be in the case of a random distribution of the frequencies) : Figure 19 shows the 10 cities with the highest number of DRH cases, in which the disproportionate weight of Amsterdam and Rotterdam can be seen, while figure 20 compares the percentages of these 10 cities compared to rest.

Figure 19: Cities with highest number of DRH cases (first 10)

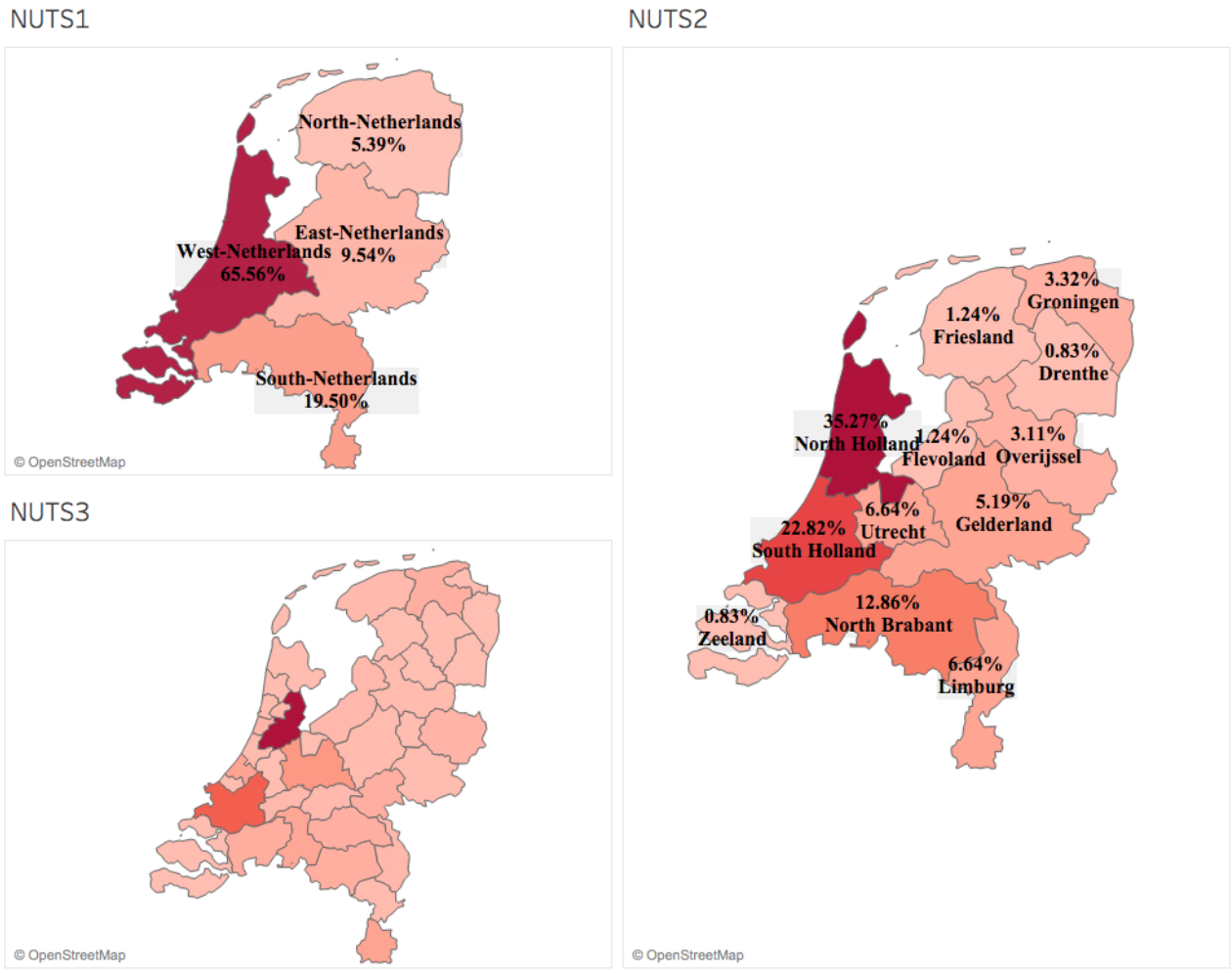
Figure 20: Distribution of DRH by cities (proportion of the first 10 and the rest of the cities) in the Netherlands, 1992, 2016



In terms of DRH rates (per 100,000 inhabitants), again Amsterdam and Rotterdam come first and second, with a rate of 16.5 and 10.7 respectively. However, when considering the population, Maastricht (5.8), Groningen and Dordrecht (4.23) show higher rates of DRH than Utrecht (3.9) and The Hague (3.8).

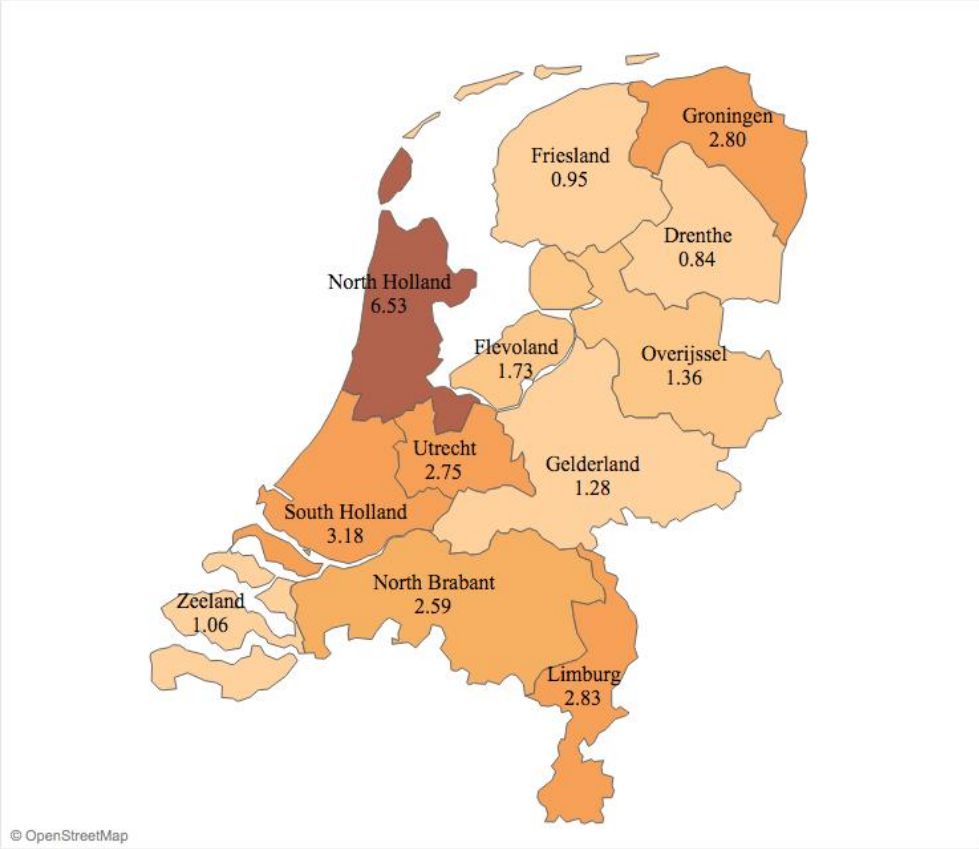
Considering the various NUTS subdivisions, in the NUTS 1 West-Nederland alone accounts for 65.56% of all DRH cases, followed by Zuid Nederland, where 19.50% of DRH occurred, and by Oost-Nederland and Nord-Nederland, with 9.54% and 5.39% respectively. Looking at the Provinces level (NUTS 2), Nord Holland is the region with the highest percentage of DRH, 35.27%, followed by Zuid Holland with 22.82%, and Noord Brabant, with 12.86%. This distribution is even more clustered compared to overall homicides. Moreover, in the case of DRH, most of the cases occurred in Nord Holland, while Zuid Holland is the region with more homicides in the Netherlands. Figure 21 shows the percentage of DRH incidents according to the NUTS administrative subdivision.

Figure 21: Number of drug-related homicides incidents in the Netherlands between 1992 and 2007 by NUTS



When considering DRH rates (per 100,000 inhabitants), the outlook changes slightly. Figure 22 shows that North Holland and South Holland are the provinces with the highest DRH-rate. When accounting for the population however, Limburg places higher than North Brabant.

Figure 22: DRH- rates (per 100.000 inhabitants) between 1992 and 2016 by provinces

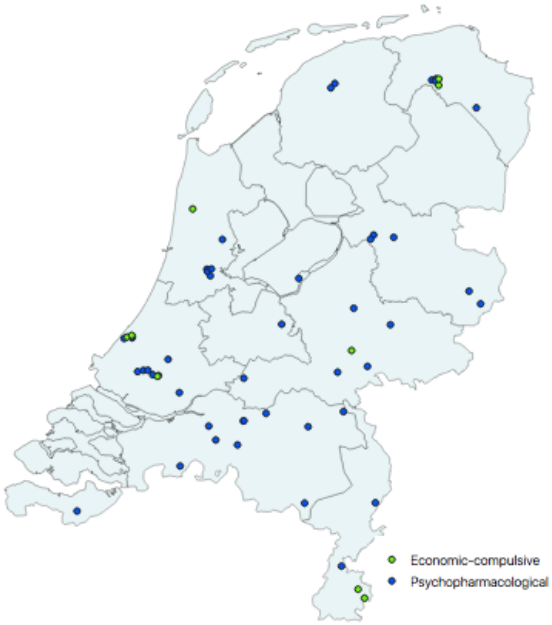


When comparing the spatial distribution of DRH by Goldstein's (1985) type, the systemic type shows a higher tendency to occur in the large urban centers and to cluster, as shown in figure 23. It is important, however, to bear in mind that psychopharmacological & economic-compulsive reflect an undercount due to classification and registration inaccuracies. Nevertheless, the cases registered of psychopharmacological and economic-compulsive DRH seem to be more dispersed across the territory.

Figure 23: Systemic DRH and Psychopharmacological & Economic-compulsive DRH in the Netherlands, 1992- 2016

Systemic DRH

Psychopharmacological & Economic-compulsive DRH



4.2.3. Comparisons DRH and other Homicides

Comparison 1: DRH (N 482)/Overall Homicides minus DRH (N 4410) in the Netherlands, 1992-2016

Figure 24: DRH and General homicides (minus DRH) in the Netherlands, 1992-2016

DRH

General homicides (minus DRH)

When considering the spatial distribution of overall homicides, excluding DRH, the same regional and local patterns are still valid: At the provinces level (or NUTS 2), Zuid Holland is again the region with highest percentage of lethal violence cases: 27.7% (N 4410). The province that follows is Noord Holland, with 24.7% of the cases, and at a distant third place Noord Brabant with 12.4 % of the considered homicides, while the province with fewer cases is Drenthe, with just 1.5%. Conversely, when considering only DRH, Noord-Holland becomes the province with the highest percentage of cases, followed by Zuid-Holland and Noord Brabant (with 35.3%, 22.8% and 12.9 %). In the case of drug-related homicide, Drenthe and Zeeland represent the least affected areas, with just 0.8% each. Thus, in the case of DRH, the first 3 region alone (Noord Holland, Zuid Holland and Noord Brabant) account for 71% of total cases, while in the case of all homicides (excluding DRH) the first 3 regions (which coincide with those of when considering only DRH) account for 64% of the total cases. It seems, therefore, that DRH tend to be more spatially clustered than the rest of homicides taken together.

When considering the spatial distribution of both groups at the city level, in both cases the cities with more events are the country's 3 major cities: Amsterdam, Rotterdam and The Hague. Yet, the percentages vary quite significantly between both groups. For general homicides (excluding DRH), the percentages are the following: 15.2% of the cases occurred in Amsterdam, 11.1 % in Rotterdam and 6.6% in The Hague. On the other hand, for DRH once again there is a higher spatial concentration: 25.7% occurred in Amsterdam, 13.3 % in Rotterdam and 3.7% in The Hague. In the case of DRH, 50% of all cases fall within the first 7 cities (50.2%), while for the overall homicides excluding DRH group, half of the cases occurred in the first 17 cities (50.2%). The following map shows the distribution of DRH compared to that of the rest of homicides.

Comparison 2: DRH (N 482) – Overall Homicides 2nd Group (Excl. DRH, Excl. Criminal Milieu killings, Excl. Other/ Unknown, N 3162)

When comparing the spatial distribution of the DRH and the rest of homicides, excluding those cases where it is unknown whether there were drugs involved, and those classified as criminal milieu type, and those where there is no information of the type (unknown), DRH's tendency to concentrate in the two main big urban centers is even more (comparatively) pronounced.

Overall-non drugs homicides occurred 12% of the times in Amsterdam, 9.3 % in Rotterdam, while remains relatively the same in The Hague (6.8%). In this group, the G3 account together for 28.1% of all cases, while when considering DRH alone, the G3 account for 42.7% of all DRH. In the Overall 2nd group of homicides, 50% of the cases can be found in

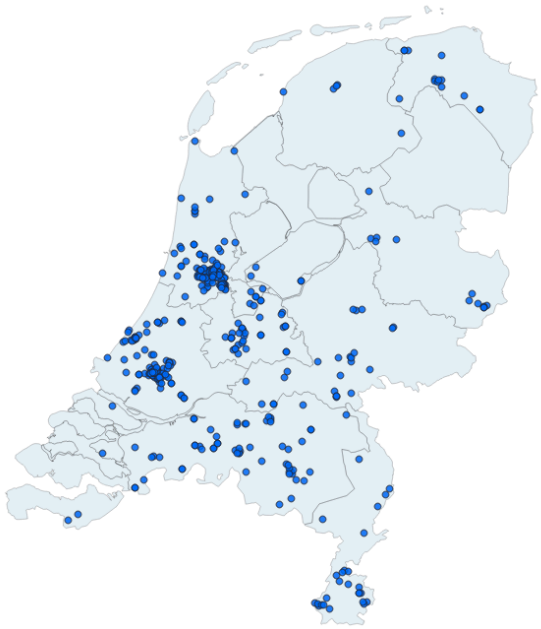
the first 20 cities, a lower degree concentration compared to DRH (where just the first 7 cities account for 50.2%).

Comparison 3: DRH + Criminal Milieu (n 664) – Overall homicides

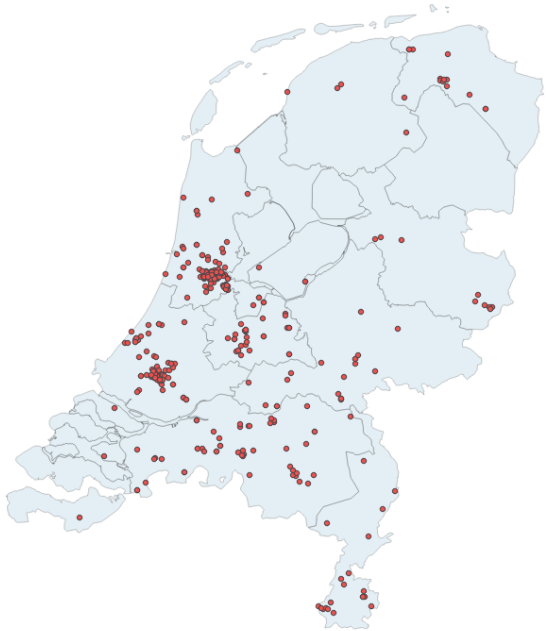
When considering DRH together with homicides classified as criminal milieu (excluded those already in the DRH category), there is even stronger indication of a higher concentration of cases in the main cities. 28.8% occurred in Amsterdam, 13.4 in Rotterdam and 4.7 in the Hague (G3= 46.9% of all cases). Considering also Utrecht (2%) and Groningen (1.8%), plus the G3, these 5 cities account alone for 50.8% of all cases. In fact, there seems to be a very similar distribution between DRH and criminal milieu homicides as shown in figure 25.

Figure 25: Criminal milieu killings (excluding DRH) and DRH in the Netherlands, 1992-2016

Non-DRH criminal milieu killings & DRH



DRH



A Distance Matrix was conducted on QGIS to assess the between DRH and every single other type of homicides. On average, commercial robbery killings and criminal milieu killing appear to be the nearest to DRH. The most distant, conversely, appears to be intimate partner killings and robbery to private houses killings. Following the table with the various average distances (in meters):

Table 4: Average distances of various types of homicides to DRH

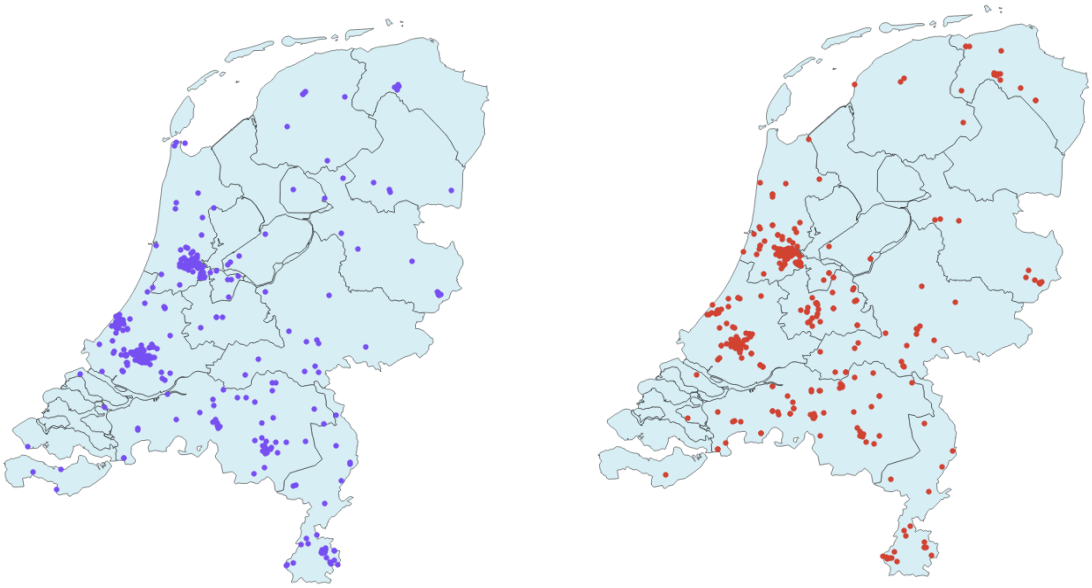
Type of Homicide	Average Distance (in meters)
Commercial Robbery	2154.580314
Criminal milieu	2336.712018
sexual killings	2688.443686
Type Unknown	3761.581524
Nightlife killing	4669.79361
Other non-criminal milieu	4872.705395
Partner killings	5021.765978
other familial killings	5037.788216
Robbery Private house	7633.760024

Comparison 4: DRH & Firearms

When comparing DRH and killings that have been carried out with firearms (excluding DRH), a tendency of these two group to spatially coincide can be observed. There is a strong link between firearms and systemic drug-related crime, including homicides. In fact, 73% percent of all systemic DRH. In average, the distance between DRH and firearm killings is approximately of 3771.612m, which is closer than most other type of homicides.

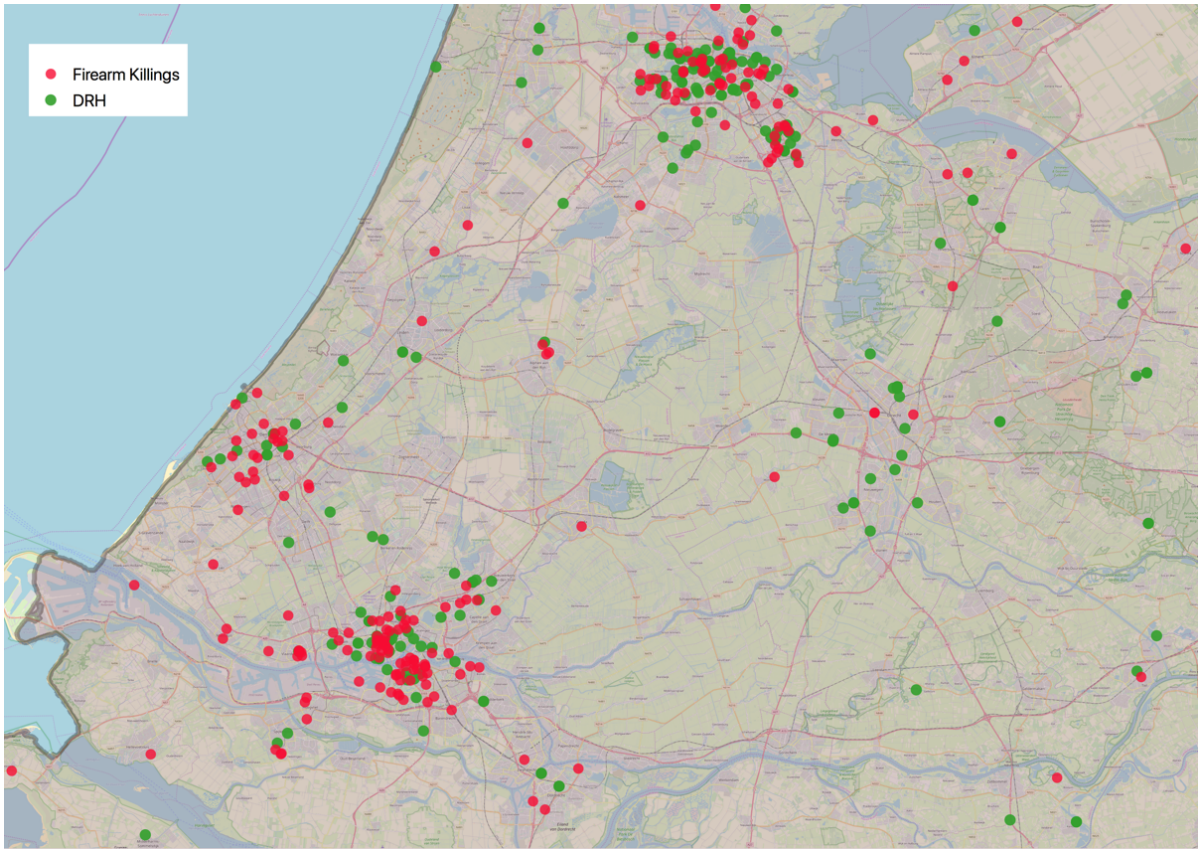
Figure 26: Firearm killings (excluding DRH) and DRH in the Netherlands, 1992-2016

Firearm killings *DRH*



And the following map, figure 27 shows the distribution of firearm killings and DRH in the G3.

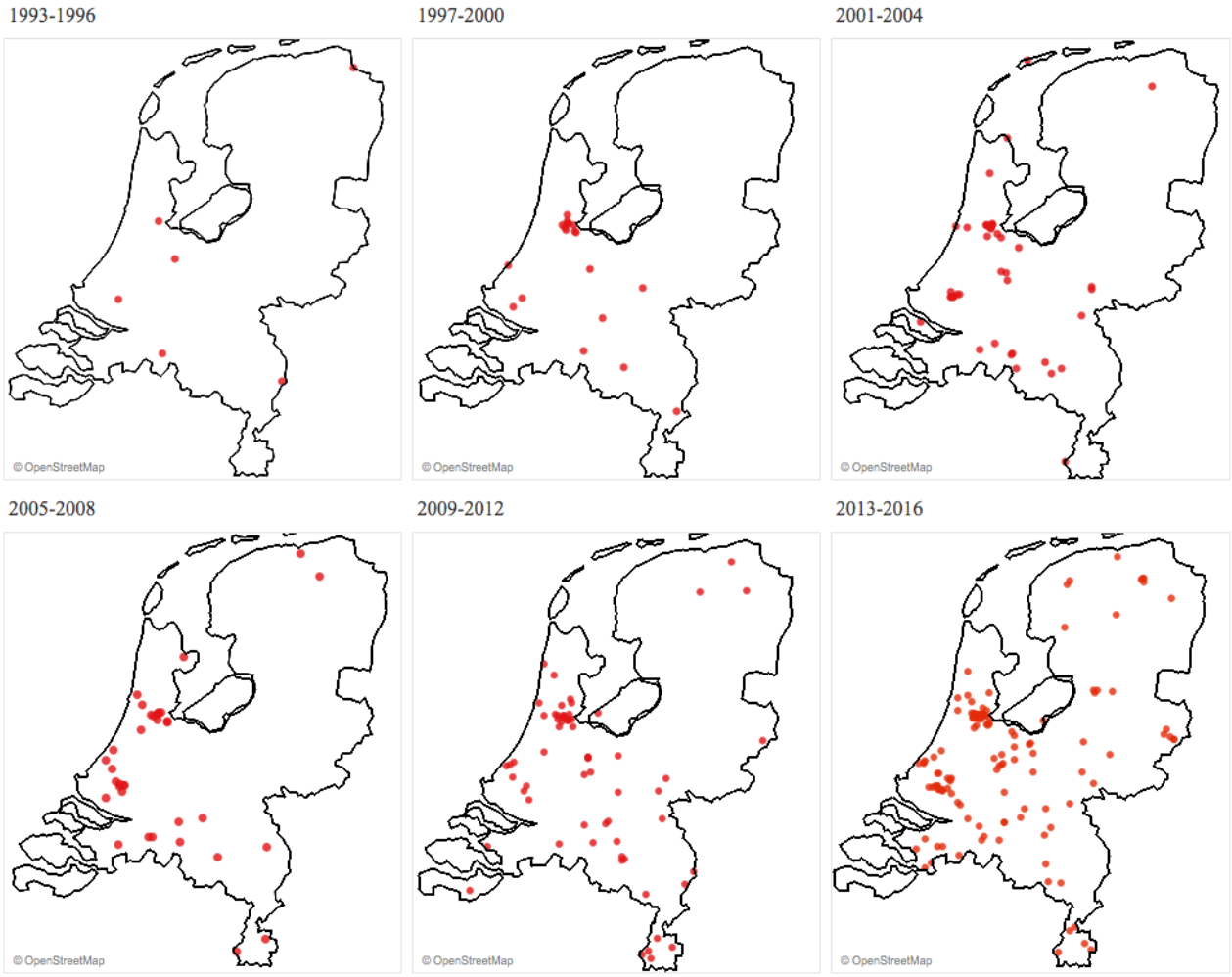
Figure 27: Firearm killings and DRH in the G3, 1992-2016



4.2.4. Time and Territorial Patterns

Figure 28 shows DRH between 1993 and 2016 in different periods grouped every 4 years, mostly for graphic reasons. It can be noticed that the first two periods show a very small number of cases. This is due to registration issues, as the address is available for only few cases before 2001. However, in all the periods considered it can be noticed the tendency to concentrate in the Amsterdam and Rotterdam areas. It can also be noticed how the large majority for DRH in the Maastricht area occurred after 2009. Also, for the regions of North Netherlands and East Netherlands, most DRH cases were committed between 2009 and 2016.

Figure 28: DRH in the Netherlands by time period, 1992-2016



4.3.Explanatory results

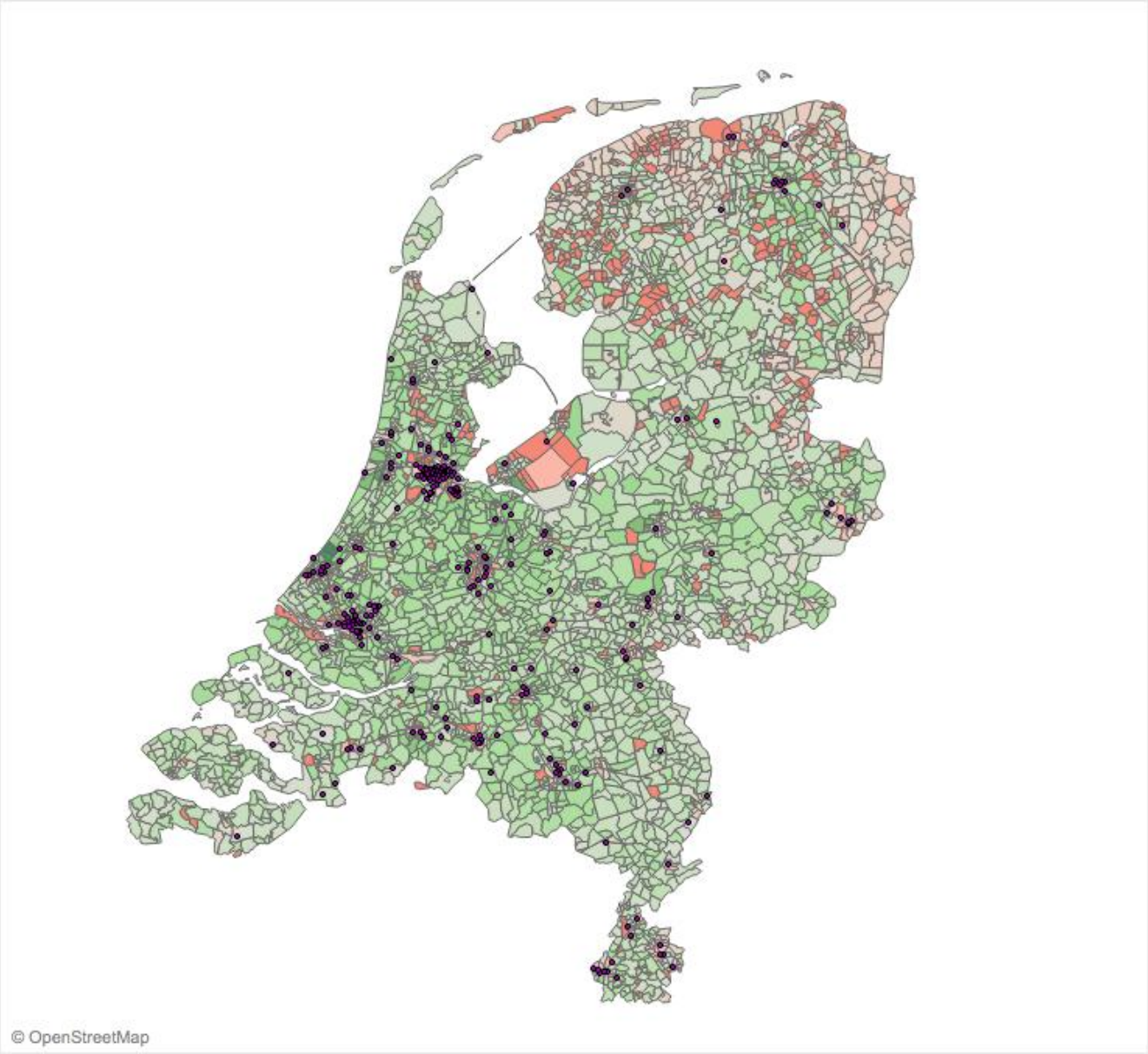
4.3.1. Socio Economic Deprivation

Average Income

To analyze the relationship between socio-economic deprivation and DRH, the standardized average income per household was used as indicator. Statistics Netherlands provides data of the standardized average income per household from 2004 to 2014 per postcode areas. The total number of DRH between 1992 and 2016 was compared to the average standardized income for the 10 years the data is available, and a Spearman Rank correlation test was performed. There is a very feeble negative correlation between income and number of DRH per postcode area (r_s = -.159, p = .01 significant at the 0.01 level). On the contrary, when considering the provinces level, there seems to be a stronger positive correlation between average income and number of drug-related homicides (r_s =0.57), although this is not

statistically significant (p= 0.054). The type of correlation, therefore, changes according to the territorial/administrative level considered. Figure 29 shows DRH and standardized average income per household by postcode areas in the Netherlands.

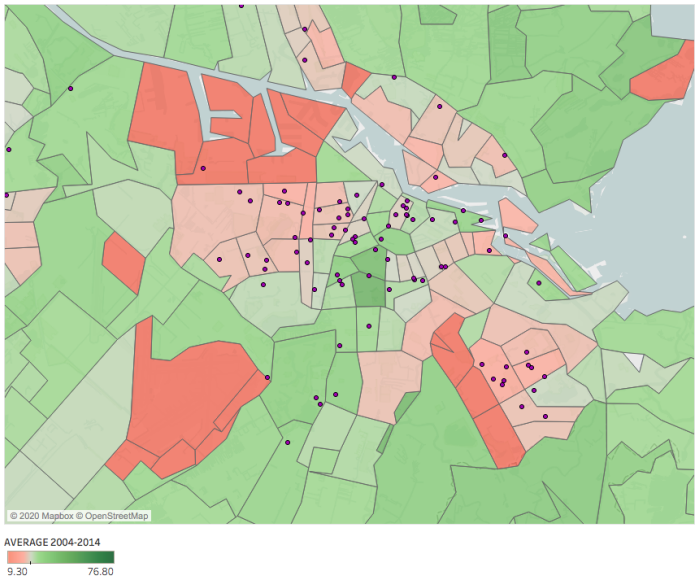
Figure 29: DRH cases (1992- 2016) and standardized average household income (2004-2014) by postcode area



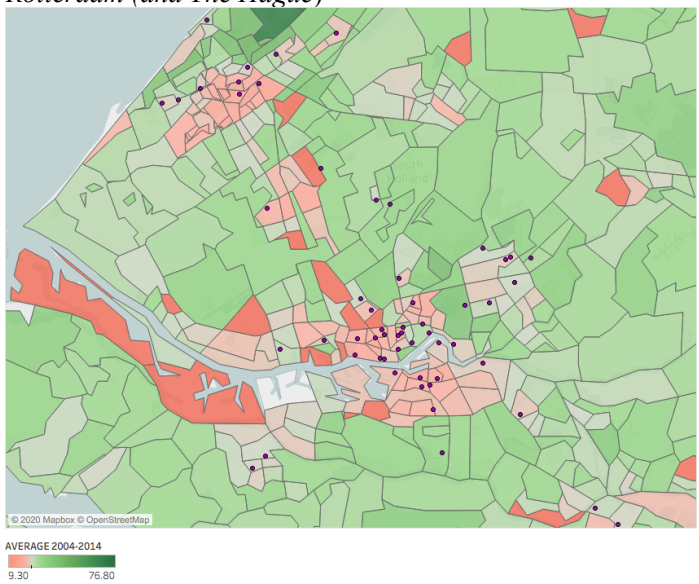
As the map shows, DRH tend to occur in those post code areas with standardized income below the overall average (areas in red). This is particularly evident in the case of Amsterdam and Rotterdam, the cities where most of the DRH occurred. Following, two maps show a zoom view of Amsterdam and Rotterdam:

Figure 30: DRH cases and standardized household income (2004-2014) by postcode in Amsterdam and Rotterdam

Amsterdam



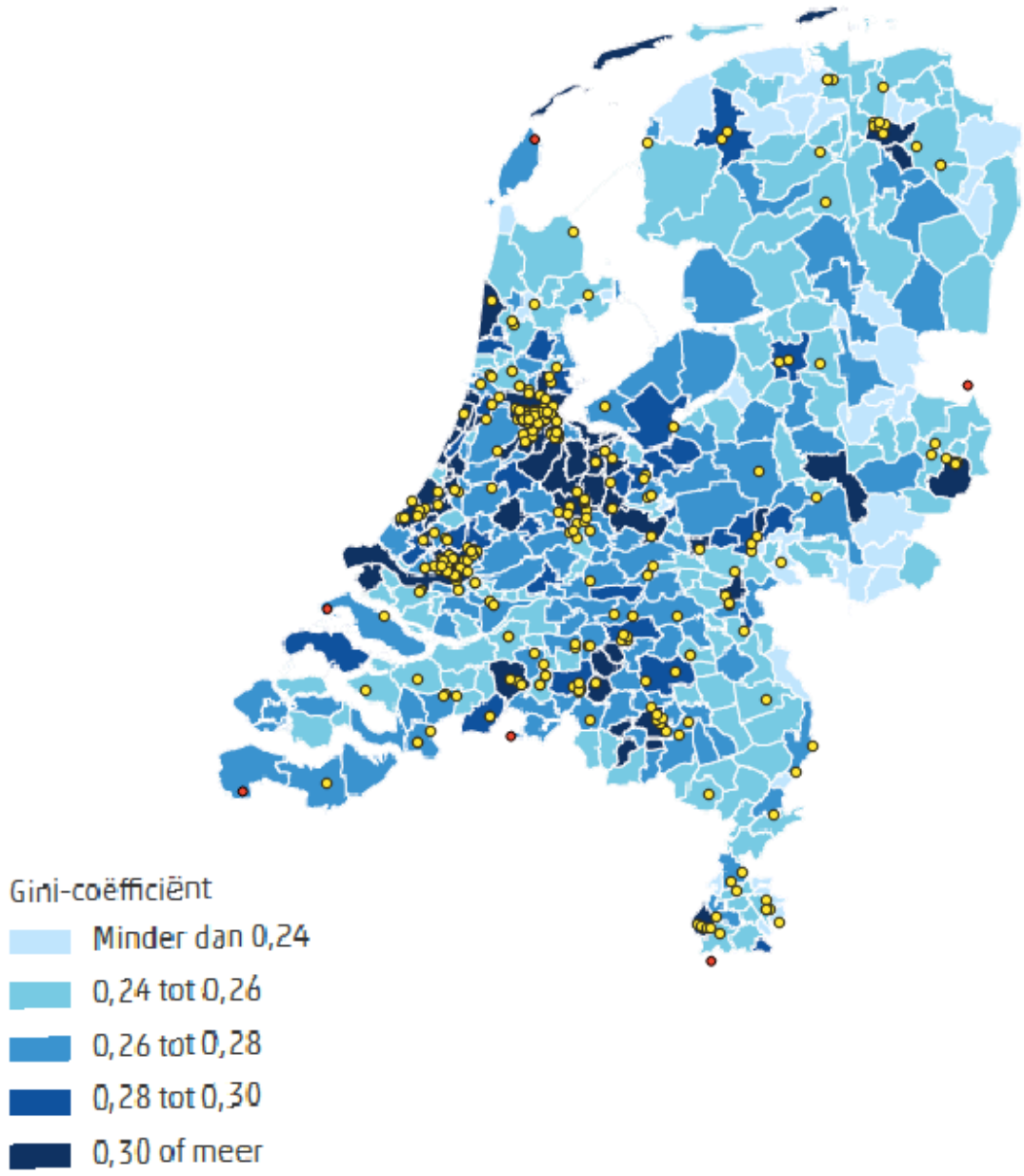
Rotterdam (and The Hague)



Inequality

A Spearman rank order correlation test was conducting comparing inequality levels (using Gini coefficient as an indicator) and number of DRH at the city level. The result indicates a positive (but weak) correlation between the Gini coefficient level and the number of DRH, as r_s = .187 (p= *.00)*. The following figure (the background layer is provided by Statistics Netherlands) represents the inequality levels (measured in Gini coefficient) in the Netherlands (by city area). From the image appears that the areas with the highest Gini coefficient coincide with the areas with highest numbers of DRH.

Figure 31: Inequality levels in the Netherlands expressed in GINI (2017) by municipality and DRH (1992, 2016)



4.3.2. DRH And Other Non-Homicidal Crimes

To assess whether there is a correlation between DRH and other type of crimes (non-lethal), data for non-lethal crimes was compared with numbers of DRH at the Postcode level. Statistics Netherlands provides data at the postcode level (per 1000 inhabitants) on 3 types of crimes: Violent crimes, Theft and Destruction of Public Property. The data refer to the year 2018.

Violent and Sexual Crimes

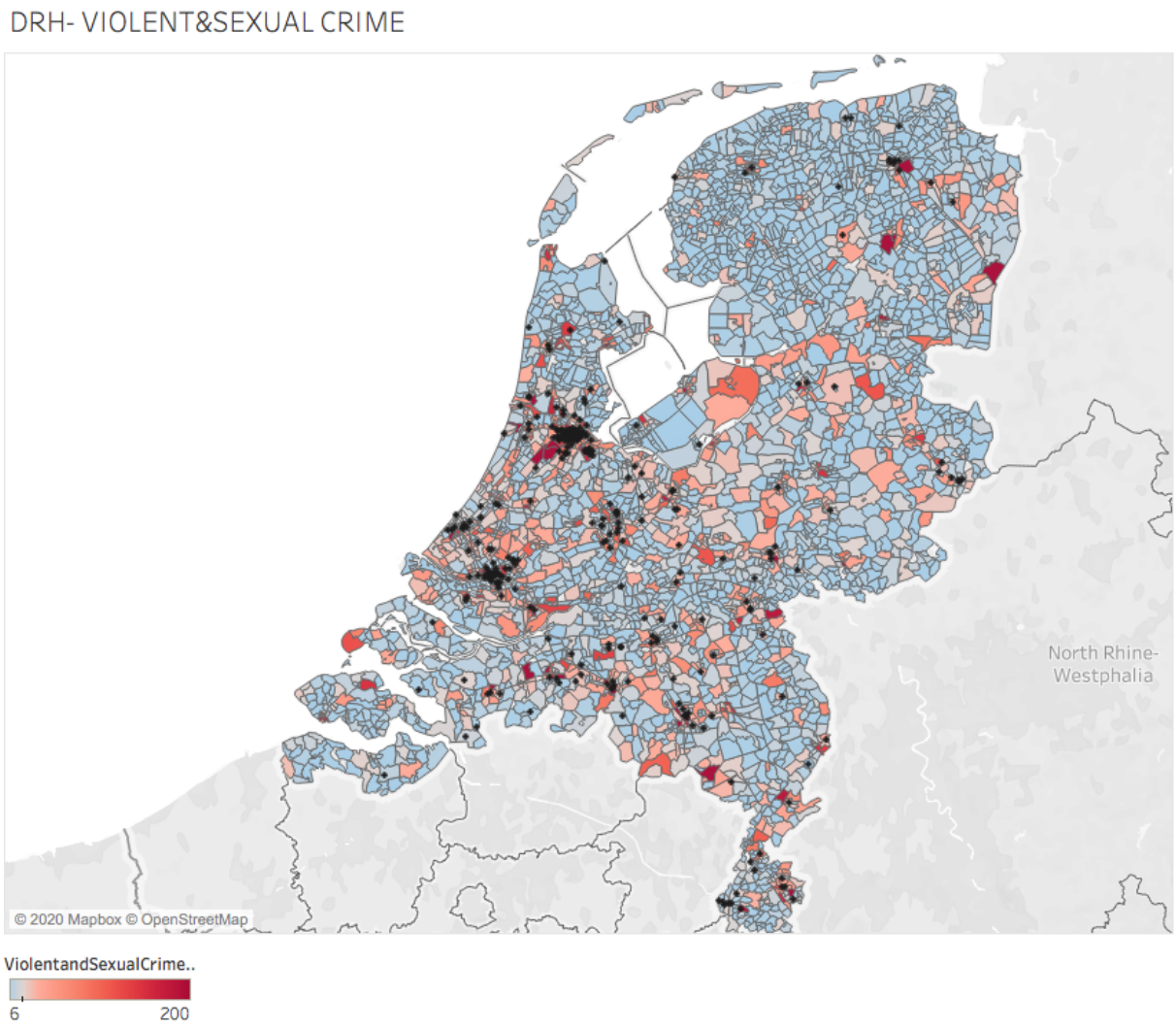
Table 4: Mann-Whitney U test: DRH numbers (1992- 2016) per zip-code area and rates of violent crimes (per 1000 inhabitants) in 2018

	DRH occurred in zip code area (yes/no)	**N**	**Mean rank**	**Sum of ranks**
Total violent and sexual crimes per 1000 inhabitants per zip code area	Yes	275	680.74	*737202.50*
	No	3500	1825.71	*6389997.50*
	Total	3775		

Test Statistics	**Violent and Sexual per 1000 inhabitants per zip code area** [2]
Mann-Whitney U	263247.500
Wilcoxon W	6389997.500
Z	-12.553
Significance (2-tailed)	.000

In the case of violent crimes, the test indicates that the average of this type of crimes was significantly higher in those postcode areas where DRH occurred compared to those where there were not DRH registered. A Spearman rank order correlation analysis suggests that there is a weak positive correlation between violent crime rates and number of DRH (r_s=.205, p =.00). Figure 32 shows that the postcodes where the rates of violent crime was above the overall overage tend to coincide with the same postcode areas where DRH were recorded.

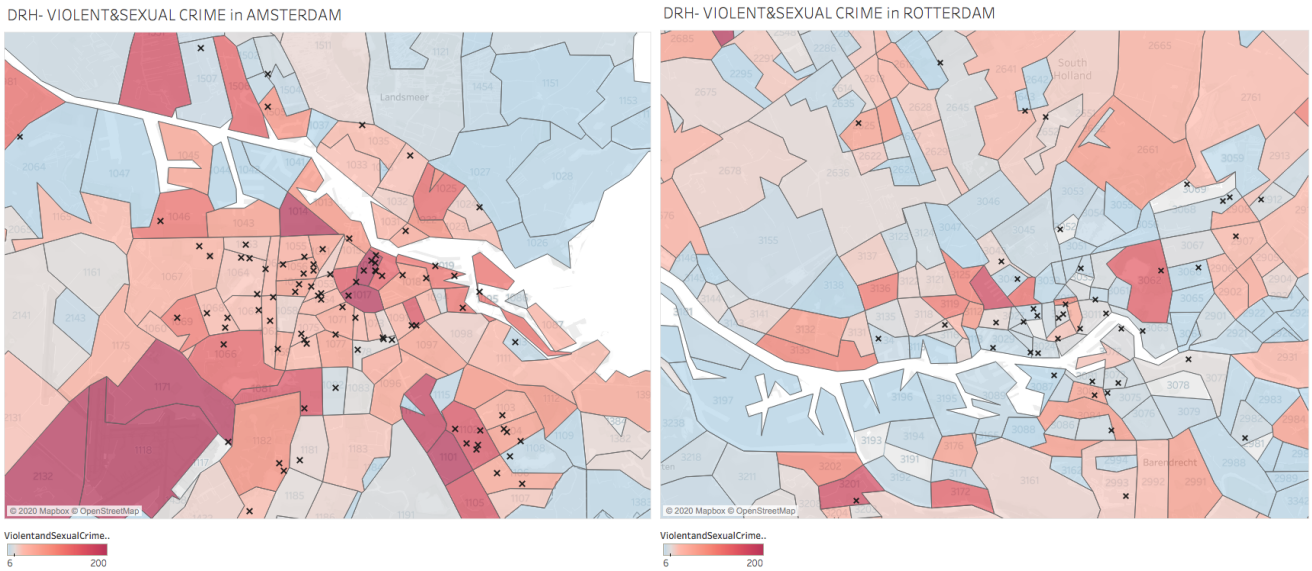
Figure 32: DRH (1992-2016) and violent crimes (per 1,000 inhabitants) by zip-code (2018) area in the Netherlands



There is, however, a difference between Amsterdam and Rotterdam. In Amsterdam, in fact, the correlation between DRH and the areas with higher rates of violent crimes is very evident. In Rotterdam, however, the majority of DRH did not occur in zip code areas with higher than average v rates of violent crimes. The following two maps that show in detail DRH and rates of violent crime in Amsterdam and Rotterdam.

Figure 33: DRH (1992 -2016) and violent crimes (per 1,000 inhabitants) by zip-code area (2018) in Amsterdam and Rotterdam

Amsterdam *Rotterdam*



Theft in private houses

When comparing DRH and theft in private homes per 1000 inhabitants by postcode area, a Mann-Whitney U test was similarly conducted. The mean rank for theft in private homes rate in decisively higher in those areas where a DRH occurred compared to those areas that did not register any DRH. The following test table provides more details.

Table 5: Mann-Whitney U test: DRH numbers (1992- 2016) per zip-code area and rates of theft of private homes (per 1000 inhabitants) in 2018

	DRH occurred in zip code area (yes/no)	**N**	**Mean rank**	**Sum of ranks**
Total home thefts per 1000 inhabitants per zip code area	Yes	264	2296.57	606295.50
	No	3509	1856.19	6513355.50
	Total	3773		

Test Statistics	**Total home thefts per 1000 inhabitants per zip code area** [3]
Mann-Whitney U	355060.500
Wilcoxon W	6513355.500
Z	-6.351
Significance (2-tailed)	.000

[3] Grouping variable: DRH in PC4 (yes/no)

A Spearman rank correlation test was executed between the number of DRH per postcode and the number of thefts in private homes was conducted. The results indicate a very weak correlation (r_s = .104, p =.00).

In the following figure 34, the postcode areas have been coloured according the crime rates that occurred. The colour scheme has been centred at the mean level (11.61) so that the areas below average are coloured in blue and those with levels above average appear in yellow.

Figure 34: : DRH (1992-2016) and theft crime (per 1,000 inhabitants) by zip-code area (2018) in the Netherlands

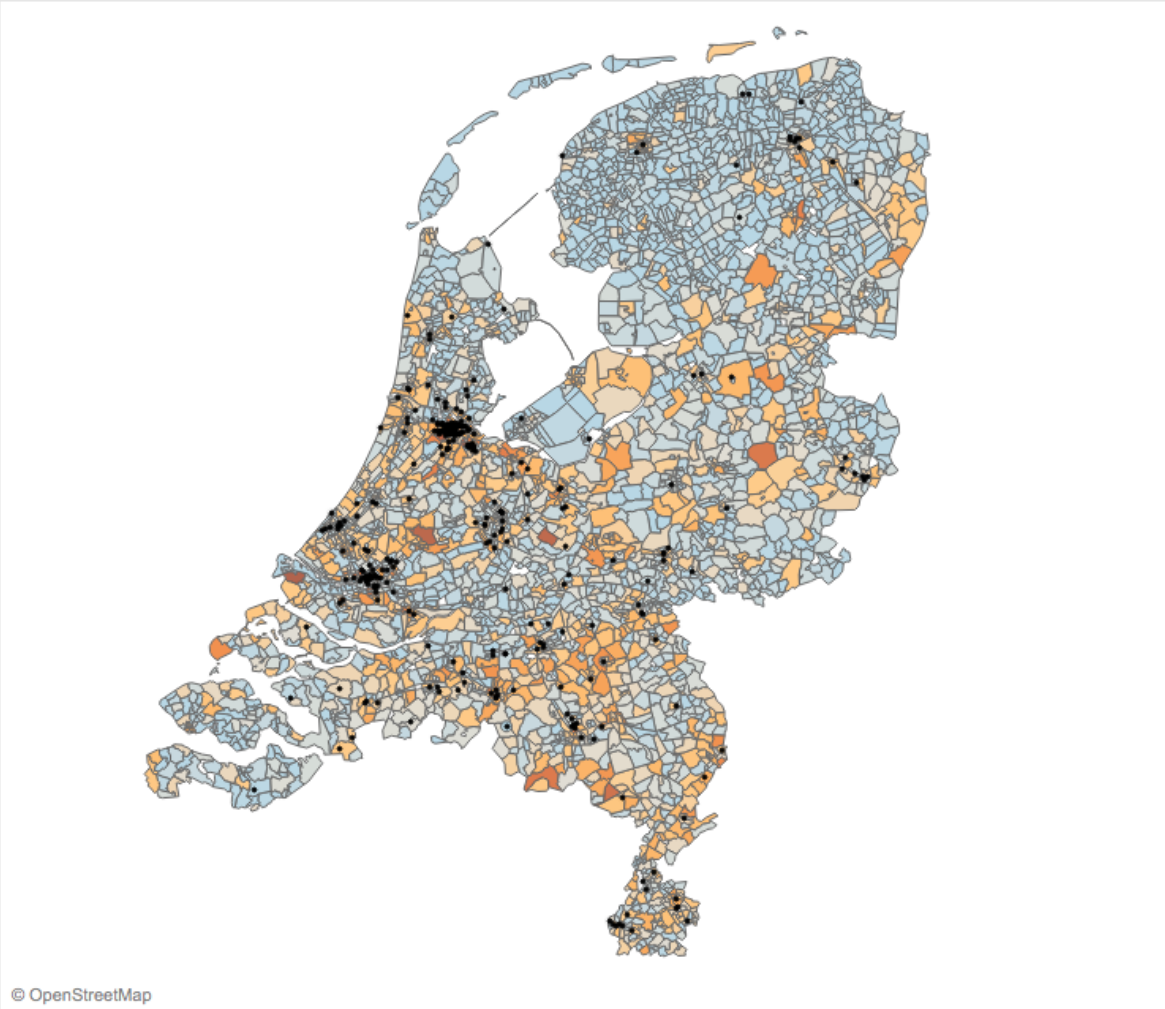
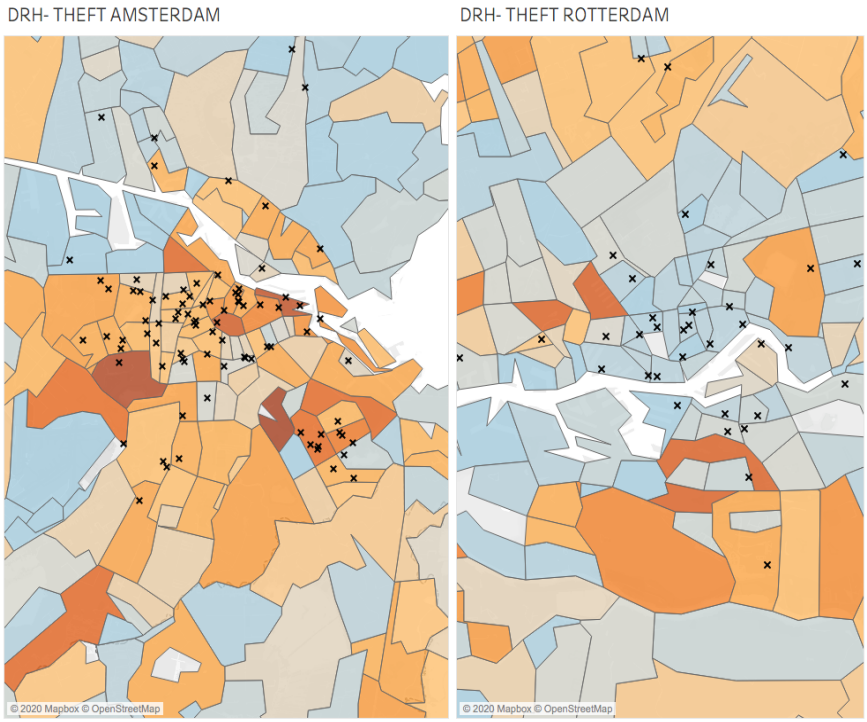


Figure 34 also suggests that DRH are located more frequently where figures for theft in private houses are higher than average. In this case, there is a marked difference again between Amsterdam and Rotterdam, with Rotterdam presenting overall low rate for theft in private houses in almost all the central postcode areas, which is where most of the DRH are concentrated. Figure 35 shows the difference between the two cities.

Figure 35: DRH (1992-2016) and theft crime (per 1,000 inhabitants) by zip-code area (2018) in Amsterdam and Rotterdam



Destruction of public spaces (vandalism)

To assess whether there is a correlation between DRH and the occurrence of crime as destruction of public spaces, a Mann Whitney U test was conducted, again comparing the postcode level of such crime between the postcode areas where DRH were registered, and those where there were not. The following table indicate the results:

Table 6; Mann-Whitney U test: DRH numbers (1992- 2016) per zip-code area and rates of vandalism (per 1000 inhabitants) in 2018

	DRH occurred in zip code area (yes/no)	**N**	**Mean rank**	**Sum of ranks**
Total Destruction per 1000 inhabitants per zip code area	Yes	265	2396.32	635023.50
	No	3510	1849.62	6492176.50
	Total	3775		

Test Statistics	Total Destruction per 1000 inhabitants per zip code area [4]
Mann-Whitney U	330371.500
Wilcoxon W	6492176.500
Z	-7.892
Significance (2-tailed)	.000

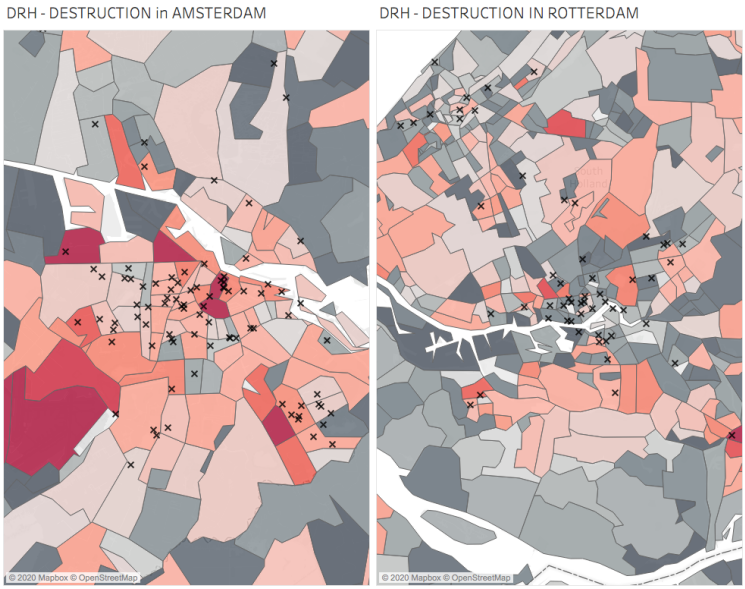
A Spearman rank correlation was conducted between the number of drug-related homicides and the rates of criminal acts of destruction of spaces. The results indicate a very weak positive correlation ($r_{s=}$ .129, p= .00). In the following map, DRH are plotted against a map divided at the postcode level, with every postcode area coloured according to level of crime under analysis. The colour scale is centred to the mean level (15.83).

Figure 36: DRH (1992-2016) and destruction of public property crime (per 1,000 inhabitants) by zip-code area (2018)

As shown in the map, at the national level DRH tend to be more frequently located in the areas with crime rates higher than the average (red areas). Again, the situation differs quite significantly between Amsterdam and Rotterdam, as illustrated in figure 37.

[4] Grouping variable: DRH in PC4 (yes/no)

Figure 37: DRH and vandalism crime (per 1,000 inhabitants) by zip-code area (2018) in Amsterdam and Rotterdam

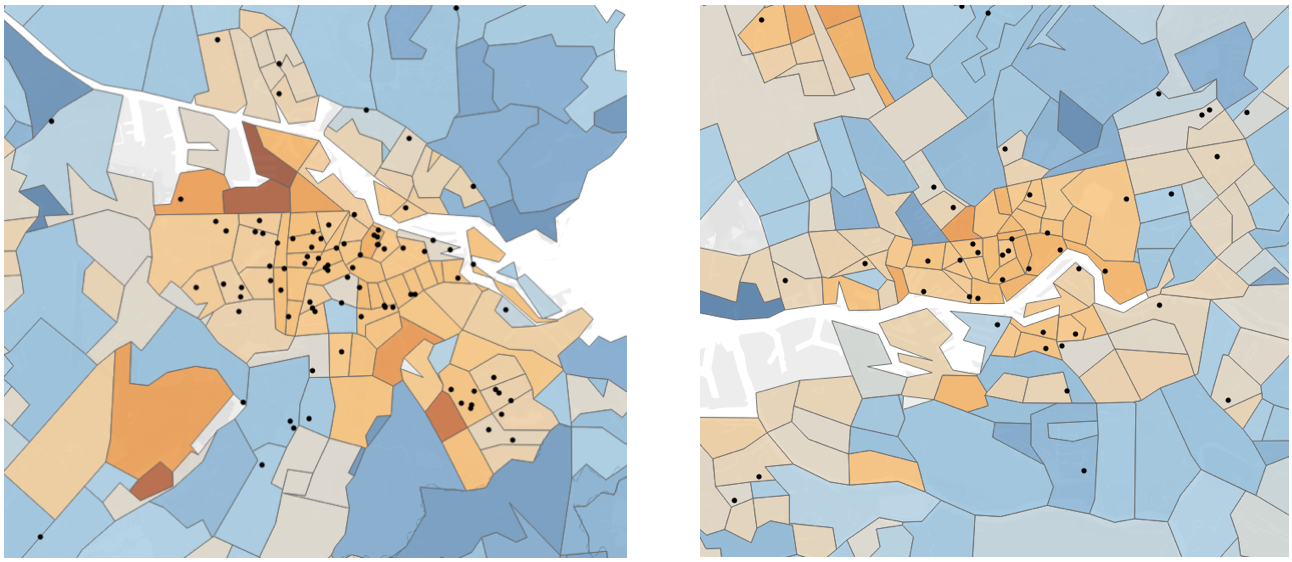


4.3.3. DRH and Young Male Population

A Spearman rank order correlation test between number of DRH and percentage of male population between 20 and 35 years old in each zip-code area was conducted. The results show a positive, yet weak, correlation between the two variables (r_s= .185, p= .00). However, as figure 38 shows, for both Amsterdam and Rotterdam the zip code areas where almost all DRH occurred have a percentage of male population aged 20-35 higher than average.

Figure 38: DRH (1992- 2016) and percentage of population aged 20- 35 by zip-code area (2018) in Amsterdam and Rotterdam

Amsterdam *Rotterdam*

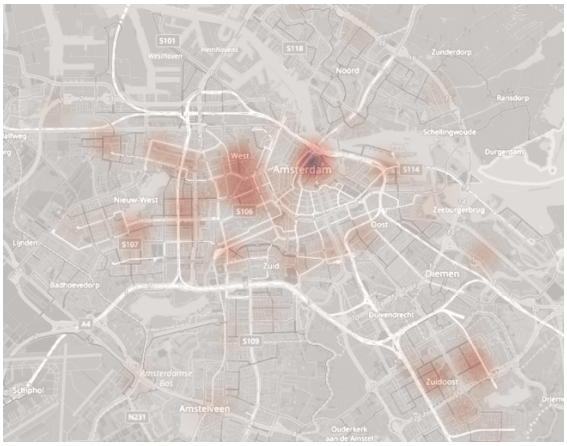


4.4.Neighborhood analysis Amsterdam and Rotterdam

Most of homicides, including DRH, are concentrated in Amsterdam and Rotterdam. However, the distribution of homicides within those cities themselves is not even and certain areas appear to be more at risk of lethal crime victimization.

Figure 39: DRH heatmap of Amsterdam and Rotterdam (1992-2016)

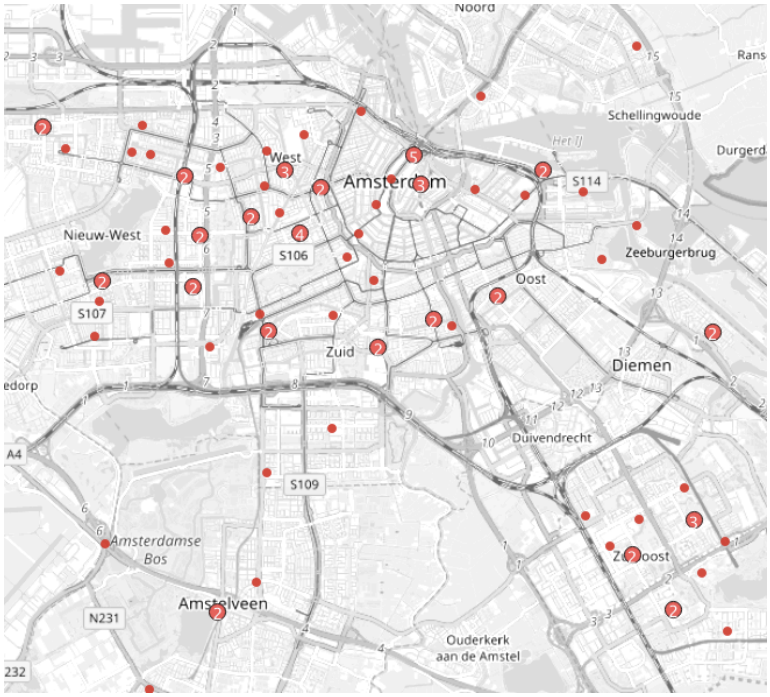
Amsterdam



Rotterdam

When looking at DRH only, there are areas in both cities where drug-related homicides are more concentrated. In Amsterdam, for instance, the central area shows the highest number of DRH. In fact, using cluster maps (clustering by a distance of 500m) as shown in figure 40, it can be observed that there are couple of areas in the capital that have more than 2 DRH cases.

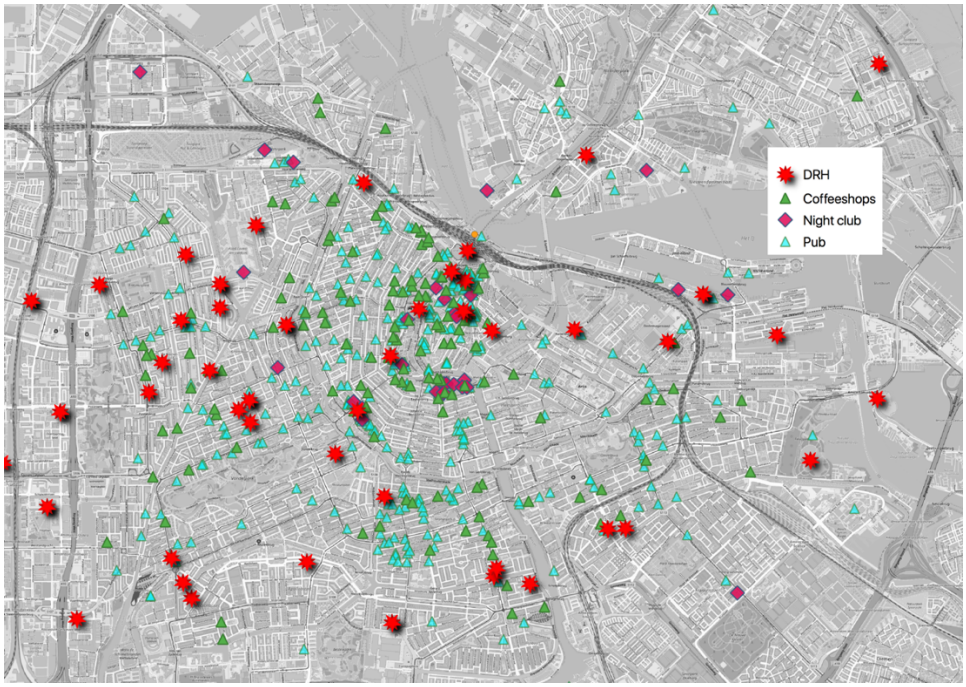
Figure 40: Cluster map of DRH in Amsterdam (max. distance of aggregation of 500m), 1992-2016



This is also an area where other homicides tend to concentrate, in particular criminal milieu killings, and coincides with zip code 1012, which is the zip-code area with the highest numbers of DRH nationwide (8). Other postcode areas in Amsterdam with a high concentration of DRH are post code area1056, with 5 homicides drug-related, and postcode area 1102 (5 DRH), which is located at the outskirts of Amsterdam.

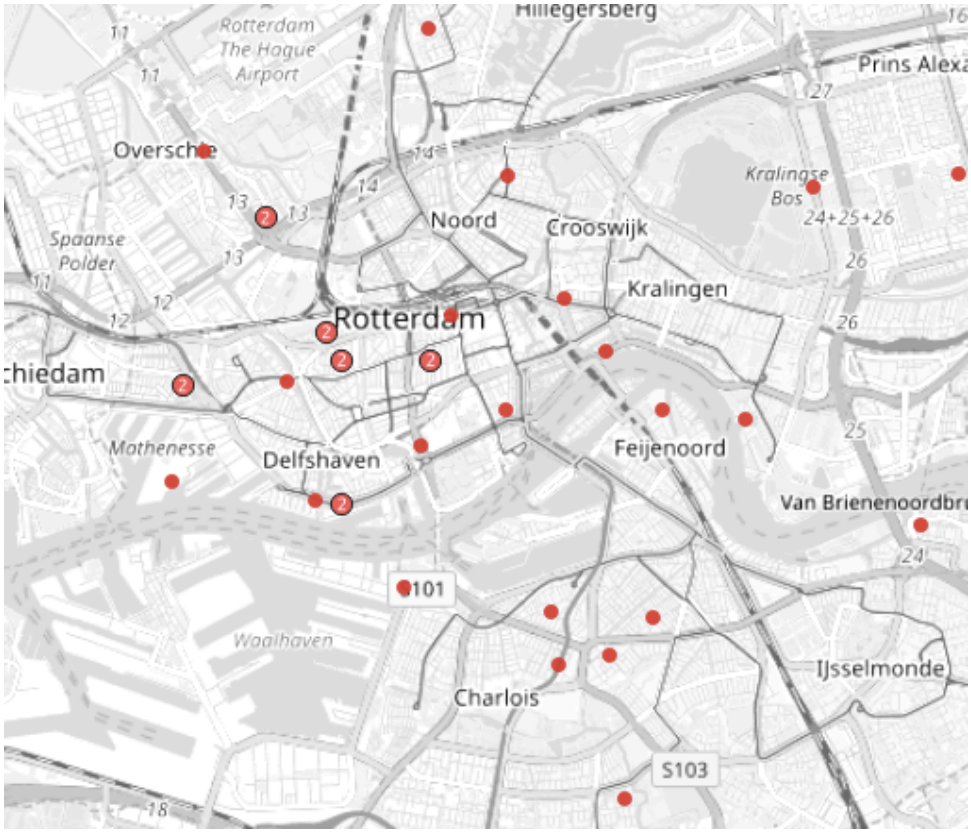
Comparing those areas with other spatial/topographic elements, it can be seen that in the central area of Amsterdam there is also a very high concentration of nightclubs, coffeeshops and pubs (and presumably other elements indicating a high degree of urbanity, such as café, restaurants, museums, etc.). Most of the DRH occurred in these areas

Figure 41: DRH (1992-2016), Pubs, Coffeeshops and Nightclubs in Amsterdam.



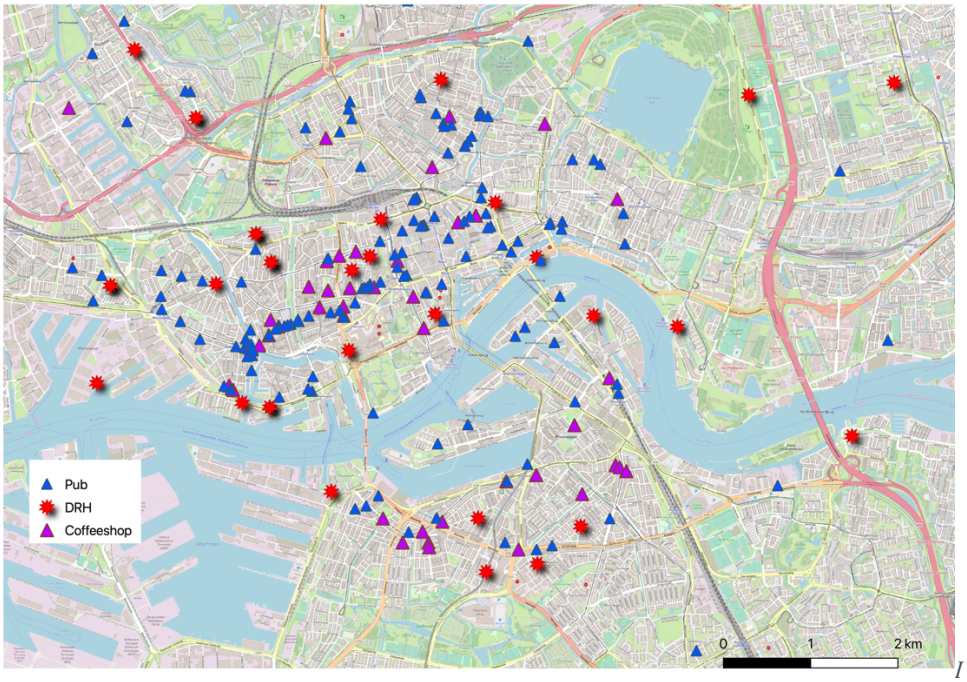
In the case of Rotterdam, DRH seem to be more dispersed compared to Amsterdam. There are certainly lesser areas with high concentration. Figure 42 show DRH clusters in Rotterdam.

Figure 42: Cluster map of DRH in Rotterdam (max. distance of aggregation of 500m), 1992-2016



Again, DRH seem to be areas with a high degree of urbanity.

Figure 43: DRH (1992-2016), Pubs, Coffeeshops in Rotterdam



In the case of Rotterdam, the large majority of DRH cases are within a buffer zone of approximately 250-300m radius from either a pub or a coffee shop.

5. DISCUSSION

5.1. Conclusions

5.1.1. General considerations

The majority of victims and perpetrators of DRH in the Netherlands are young males, aged between 20 and 30. This finding falls in line with what is generally known about drug-related violence (Blumstein 1995; EMCDDA, 2018; Granath et al. 2011; Schönberger & Liem, 2019) and about violent crime and homicides in general (Ganpat & Liem, 2012; Siegel 2015). When disaggregating DRH into the 3 types suggested by Goldstein's (1985) the age composition of victims and perpetrators changes. Systemic DRH, which represents the large majority of DRH in the Netherlands, keeps showing the same characteristics: majority of young male victims and young male perpetrators. The psychopharmacological and economic-compulsive model, however, present different features, especially regarding the gender composition of the victims, which is much more equal between male and female. Yet, these two models represent just a small portion of all DRH and thus the whole category disproportionately reflects the characteristics of the systemic type. Nevertheless, these stark differences show the importance of categorizing the type of DRH, as suggested by Schönberger & Liem (2019).

Moreover, confirming the findings of various studies that have linked drug-related violence and firearms (Abt 2019; Miron, 2001; Blumstein 1995), the large majority of DRH in the Netherlands were committed with firearms (62%). When disaggregating by Goldstein's (1985) types, this figure increases for systemic DRH (72%), while for psychopharmacological and economic-compulsive types, knives (or sharp objects) are the most common weapon used.

Regarding temporal dimensions, DRH in the Netherlands happen relatively more often in December and January, and in the evening. The same happens with general levels of homicides that tend occur more frequently during those same months, probably as it gets darker sooner and there are less people outside (Siegel 2015). It can be inferred, therefore, that DRH tend to happen when is dark, which could indicate absence of guardians, as well as less probability of being seen or recognized.

When considering annual trends of DRH and general levels of homicides during the period studied, it becomes immediately visible how drug-related homicides' percentage on the general homicide levels has increased dramatically (from roughly 12% to over 40%). This trend, however, in reality could be the result of changes and improvements in the registration and classification methods. Official figures could reflect and undercount of drug-related

homicides and the actual figures of DRH, in particular for earl years, could be higher. challenges in collecting and reporting data accurately when it comes to classifying information regarding the relationship between drugs and crime (Schönberger & Liem 2019). In general, it has been noted that correctly classifying the role played by drugs in a homicide case present many challenges to the point that their role can being omitted *tout court* when registering a homicide (de Bont & Liem 2017). Classification issues could also explain, for instance, why there were no economic-compulsive homicides before 2012, and why for almost 18 years, from 1994 to 2012 no psychopharmacological homicides (except for one in 2007) is reported. It is highly unlikely that psychopharmacological and economic-compulsive did not occur at all before a specific date, while it probably indicates important improvements in the registration and classification methods of the nexus between drugs and lethal violence.

However, the increase proportion of DRH on the overall homicides cases could also indicate that DRH are more "immune" to the dynamics and forces that have lowered overall homicide rates in the last two decades. Such trend could be linked to a similar phenomenon experienced in other Northern European countries, such as Sweden, where levels of violence linked to criminal group activity have increased in recent years, whereas almost all other types of violence have decreased (Sturup et al. 2019). This would go in line with the recent increased activity of illicit drug markets in the Netherlands, that offset the dynamics that have curbed the levels of lethal violence in general.

5.1.2. Descriptive Spatial analysis

As expected, drug-related homicides in the Netherlands appear to be spatially clustered, a feature common to many types of crime (Abt 2019; Andresen 2006; Blumstein 1995; Smith et al. 2000). As the analysis suggests, DRH are spatially clustered at various geographic-administrative levels of analysis. At the region level, DRH are concentrated in the west and south parts of the country (West-Netherlands and South-Netherlands together account for 85.06% of all DRH), while at the province level 3 out of 12 provinces North Holland, South Holland and North Brabant, represent at 70.95% of all DRH cases. At the city level, again, a large proportion of drug-related homicides cases between 1992 and 2016 were concentrated in the country's three biggest cities: Amsterdam, Rotterdam and The Hague. Compared to the rest of homicides, DRH in the Netherlands present a higher level of "urbanization". Looking within the cities, there are not evident *hotspots*, in the sense that there is no a specific street, or block, that concentrate a large number of drug-related homicides. This stand in contrast with the US,

where most of homicide cases, including drug-related, tend to be very localized, occurring mostly in a street or a buildings block located in marginalized neighborhoods (Abt 2019).

Yet, DRH are still clustered in small groups within the cities and in any case are not homogenously distributed. Looking at Amsterdam, the postcode area with a higher number of DRH is the central part of the city (postcode 1012), with 8 DRH, 5 of which occurred within a distance not superior to 500m. This area also presents a central station and a high concentration of pubs and night clubs, which could support the crime pattern theory (Brantingham & Brantingham 1993) and the notion of *nodes,* although they could just indicate that DRH occur more frequently in areas with high degree of urbanity (meaning crowded areas, with high circulation of people and many leisure venues) which could be an indicator of social disintegration instead (McCall & Nieuwbeerta 2007). Nevertheless, these areas (for instance postocode 1012) present all the characteristics that indicated higher chances of DRH, meaning lower income level, higher GINI, higher than average non-homicidal crime rates and higher percentage of male population aged between 20 and 35.

Although DRH present a very similar spatial pattern compared to all the homicides considered, it tends to be more clustered in the big cities and along the southern part of the country, close to the Belgian border. This might be an indication of the high activity of synthetic drug markets in the southern region near the Belgium border (De Middeleer et al. 2018). Also, spatially speaking DRH occurred on average closer to certain types of homicides such as commercial robbery killings and criminal milieu killings.

When looking at the differences in spatial distribution between different time periods (figure 28), the tendency of DRH to concentrate in the big cities (in particular Amsterdam) is noticeable in the various periods. However, there are differences in the spatial patterns according to the years. For instance, it can be noticed that the majority DRH in the Maastricht area occurred after the period 2009-2012. Same for the regions of North Netherlands and East Netherlands (which includes Enschede, the city in that area with most DRH cases), where the majority of DRH happened during 2009-2012 and in particular during the 2013-2016 period. Again, this could reflect registration issues, as the information necessary to obtain geocoordinates was often omitted in the first years (as it can be noticed by the very few dots for the periods 1993-1996 and 1997-2000). However, after 2001the large majority of registered DRH contain this information, and yet the discussed patterns are valid.

5.1.3. Explanatory Results

In this analysis, various theories were tested, and all indicated a potential, although partial, explanatory effect. It does not seem that a single theory could explain the complexity of the spatial characteristics DRH in the Netherlands. However, income and wealth inequality seems to be a promising indicator, in particular, it can allow a synthesis between various theoretical traditions that could have solid potential as a conceptual explanatory mechanism of spatial patterns of DRH.

RAT and Lifestyle Theory

There is a positive correlation between percentage of young male population and number of DRH by zip code (r_s= .185, p= .00). This indicates that neighborhoods with a higher percentage of young male population (which is the group to which most DRH perpetrators and victims pertain) tend to have experienced more DRH. Considering that this group as potentially where most *motivated offenders* and *suitable targets* can be found, this finding could be in line with RAT, but also with Lifestyle theory as both potential victims and potential aggressor would have more possibility to spatially interact in their daily routines. That most DRH occurred when is dark, could be another evidence of the validity of RAT theory, as it could indicate absence of guardianship, although this could simply indicate that when there is no light the chances of not being recognized and of successfully escaping increase.

The fact that DRH show a tendency to occur in areas in proximity of night life leisure elements, such as night clubs and pubs, could indicate on one hand support RAT theory as it would indicate more suitable targets as well as an increased presence of other elements that can induce to perpetuate crime (or increase the possibility of victimization), such as alcohol consumption (Pereira et al. 2015). On the other hand, however, it can also produce more guardianship (even during the night), an element that would counter RAT. Yet, assuming that these are areas where there is a possible high consumption of drugs, sellers and participant to drug markets (which constitute both possible victims and possible aggressors) would have a high probability to interact in these areas, increasing the potential for victimization. These conclusions would support RAT and Lifestyle Theory, although they are not fully conclusive and remain open to interpretation.

In general, RAT can offer some valid conceptual elements to understand DRH spatial distribution, although it might appear more suitable to explain predatory crime, rather than violent and lethal crime (Miethe et al. 1987). Some of the key concepts of RAT, such as Value,

Inertia, Visibility and Access seem of dubious conceptual validity to generally explain cases of lethal violence, as well as difficult to test in homicide cases. RAT, for instance, assumes that all acts are premeditated and strategically chosen, while homicides (including DRH) are relatively rare, and sometimes situational and spontaneous acts of extreme violence (Miethe el al. 1987, p. 192). Moreover, Lifestyle theory and RAT can be useful to understand why DRH cluster, but it does not explain conclusively why initially occurs in specific areas. Better said, following the assumption of opportunity theories that crime usually happen in the proximity of where potential offenders and victims carry out their daily activities, these theories do not explain why in certain areas there are more potential offenders than in other, something that structuralist theories are better suited at.

Broken windows theory

When comparing DRH with the 3 non-homicide crimes (violent & sexual crimes, destruction of public spaces and theft), in all 3 cases the Mann Whitney U test results allow us to reject H_0. It means that for the 3 cases, the postcode areas where DRH occurred tend to show higher levels of those 3 crimes. This seems to partly corroborate Broken windows theory, which in sustains that "proliferation of minor crime can serve to destroy a neighbourhood" (Felson & Clarke 1998, p. 19) to the extent that many small crimes can destroy social control and lead to more serious and violent crimes. There is, on the other hand, a marked difference between Amsterdam and Rotterdam. In Amsterdam, the city with the highest number of DRH, it is visible that drug-related homicides occurred in those neighbourhoods with highest crime rate. In Rotterdam, however, it does not appear that way. This could be due, on one hand, to the fact that for the 3 types of (non -homicide) crimes considered, the data available refers to 2018, a year that the crime figures went drastically down in Rotterdam, as a result of the city effort to reduce crime (which included the deployment of special officers and the provision of prevention trainings to potential victims), especially property crimes that have halved since 2012 (Security Management 2019). Moreover, the projections of the geocoordinates sometimes suffer from approximation as for various addresses the exact street number was not available, and the centre of the street had to be used (and this could lead to DRH showing in a different postcode area than the one when it actually occurred).

Methodologically, for the scope of this study BWT poses a challenge. Assessing the moment wwhen the minor crimes started, meaning those acts such as vandalism acts that based on BWT subsequently should lead social disintegration and to more serious grave crimes, appears to be a very arduous task. In fact, the direction of causality in broken windows theory is that small

acts of crime can lead to serious violent crimes (such as DRH), meaning that one occur *before* than the other, while in this study it was assessed that DRH are more likely to occur where other minor crimes also occur, without paying attention the temporal sequence.
What broken windows fail to explain is that why homicide cases are so few compared to other minor crimes as vandalism and theft? If small crimes create a crescendo of criminal activity, both in quantity (more crimes) and quality (more serious crimes), then why in these areas same DRH are still so relatively rare compared to the rest of minor crimes? Thus, to apply BTW to DRH it might be necessary to link DRH to other more frequent type of crime, such as illicit drug trafficking and drug markets activity. In this sense, DRH would not be the direct consequence of many small minor crimes but the most visible consequence of many criminal acts linked to drugs markets. Broken windows, in fact, can help to understand is that in areas with lower social controls, where people will likely distrust the police, criminal groups will find advantageous to establish illegal drug markets. Drug markets activities in turn can increase the possibility of frictions and disputes between its participants, that in some instances can culminate in acts of extreme violence such as homicides that subsequently will cluster as "Acts of violence may instigate a sequence of events that leads to further violence in a spatially channelled way" (Morenoff et al 2001, p. 522)

Nevertheless, considering these limitations, BTW offers some interesting results that seem to prove the spatial coexistence of DRH with other minor crimes.

Structuralist theories

Structuralist theories, such as theory of anomie, economic strain and social disorganization can partly explain DRH spatial distribution. Yet, the correlation between number of DRH and average standardized disposable income is not univocal. At the provinces level, the correlation is positive (although not statistically significant), a result that goes against a basic assumption of the economic strain and social disorganization theories., which is that crime concentrate in poorer areas (Braithwaite 1979). However, when shifting the analysis at the postcode area level, the correlation between average standardized disposable income results negative, a finding that would confirm the assumptions of structuralist theories. This is also evident looking at figures 31 and 32, where it is visible that most of DRH are located in postcode areas with average standardized income below average. One limitation of structuralist theories is that they cannot explain why only certain poor areas present high levels of crime, while others do not. The northern part of the Netherlands, for instance, the provinces of Friesland and Drenthe show lower standardized household income than the national average, but also present very

few DRH, in terms of numbers and rates. In this sense, the social disorganization and economic strain theories fail to explain DRH spatial pattern.

Interestingly, looking closely at the same figures, one can see that many DRH happen in poorer neighbourhoods that are however in proximity of "wealthy" ones, rather than in areas that are homogenously disadvantaged. Looking at the relation between inequality levels and DRH, in fact, seem to confirm this. As figure 33 illustrates, the areas with higher level of inequality (expressed in GINI coefficient) tend to concentrate DRH, even in regions (like in the north) where there are few cases of drug-related homicides. This is confirmed by the positive correlation between DRH cases and GINI coefficient (r_s = .187*).* Inequality in fact, could be a factor that contributes to strain more than absolute low-income levels, as "by being unequal, serves as a cause for frustration and aggression. Therefore, violence is more common generally in more unequal societies" (Beyer 2014, p. 51). This result is in line with various authors that point at inequality levels as driver of crime, especially violent crimes and homicides (Morenoff et al 2001; Savolainen 2000; Wilkinson & Pickett. 2010).

Structuralist theories can explain where criminals are but not necessarily where criminal acts actually occur. There is maybe an underlying assumption that crime will tend to happen where there are more potential criminals. That crime occurs in the same areas (or in proximity of) where potential criminals reside can be better explained using opportunity theories such as RAT and Lifestyle Theory.

Nevertheless, inequality can be a catalyser of violent crime not only as a generator of strain, but also under the framework of opportunity theories. For instance, a highly inequal city could indicate an urban area where some people with very high income reside, as well as people with low income levels. Differences in wealth is a structural determinant of residential patterns (Sampson & Wilson 2005), which leads to the fact that inequality level will likely translate in differences in where socio-economic classes are located Wealth and income are strong determinants of the type of area, or neighbourhood, where people choose to live (for housing prices, services, etc.). Therefore, an inequal city normally translates in an alternance between poor and rich neighbourhoods., with the consequence that "macrosocial patterns of residential inequality give rise to the social isolation and ecological concentration of the truly disadvantaged which … undermine social organization and hence the control of crime" (Sampson & Wilson 2005, p. 178). *)*. People, especially young male individuals, have indicated "money" as the primary reason to enter illicit drug markets. It is not the absolute value of money, however, that is pursued but rather the possibility of buying what is promoted as the material symbols of personal success (Irwin-Rogers 2019), which reflect the status of the most

affluent classes. As such, “the allure of money and material rewards is more than sufficient to motivate most young people’s involvement in drug distribution.” (Irwin-Rogers 2019, p. 603). Entering drug market can offer fast money and status.

An essential part of any market, including illicit drug market, is the availability of end users, or clients. When considering, for instance, the high price of cocaine (an illegal drug often linked to increased levels of violence), it is likely that the main consumers of this drug will have high income and thus probably reside in wealthy neighbourhoods. Due to the illegality of this drug, it can’t be assessed with certainty who consumes certain drugs (Stevens 2011), although their price can be an indication of who has more access to them.
Consequently, a synthesis between structuralist and opportunity theories could be that a drug seller, or *motivated offender* that for strain reasons would likely come from a poorer area, will seek in rich neighbourhoods his/her end users (*suitable targets* that High income areas (and their residents) in fact, constitute attractive targets for criminal activity (Hipp 2007). RAT theory could thus explain why drug markets can be spatially located in areas, i.e. cities, where there is concentration of wealth, as it allows drug sellers to maximize their profits (more clients with high purchasing possibilities). This would mirror the recognized international dynamic at the macro level, where poor countries produce and export drugs to wealthy nations where more people have “the time and money to spend on drugs” (Stevens 2011, p. 140). One example is looking at national levels of cocaine consumption. Between 2015 and 2016 in Colombia, a country popularly linked to cocaine and the world biggest producer of this substance, only 0.7 of its citizens use the drug (34th place in the world), while in Scotland 2.34 and England 2.25, respectively 2nd and 4th countries by cocaine use worldwide (Smith 2017). At the macro level, therefore, demand and supply of drugs is driven by wealth inequality (Stevens 2011). It is not unimaginable that income inequality within cities can also determine the location of illicit drug markets. Subsequently, drug markets activity can increase the possibility of homicide victimization, as they bring various elements responsible for high levels of violence, as explained in paragraph 2.2.

Thus, both opportunity theories and structural theories contribute to explain why DRH tend to cluster in areas with high inequality levels. Theories of anomie indicate why likely offenders come mostly from poor (or relatively poor) areas and why levels of inequality can motivate potential offenders. Areas marked by relative poverty will show higher levels of frustration and social anxiety as it is the lack of possibility for structural reasons compared to those who do have those possibilities that create resentment and even violent behaviour (Wilkinson &

Pickett. 2010). Opportunity theory, on the other hand, explain why DRH cluster and why it happens where there are both wealthy and economic deprived areas. Hence, inequality can represent a causal mechanism to spatial patterns of drug-related violence, and an element that bring together the two main theoretical traditions that explain spatial patterns of crime.

5.2. Limitations

One of the main limitations of this study is the small N that restricted the range of spatial analyses that could be conducted. The small number impact the results of the statistical analysis at the zip code level due to the lack of variance in the distribution of the data. Most of the cases (postcodes areas) in fact, present either 0 or 1 DRH, with only a very tiny portion more than 1 DRH. Also, the majority of DRH that occurred prior to 1998 lack information regarding the address where the homicide happened (consequence of registration and classification inaccuracies), meaning that in the dot map, more recent DRH are overrepresented.

Moreover, although in a very limited in number compared to other crimes, unrecorded homicides still exist (Granath et al. 2011). Dark figures can impact the data, especially considering the small N of this study. In addition, police data often lacks information on whether the perpetrator was under the effect of drugs (Schonberg & Liem 2019), an issue which could make it difficult to correctly categorize psychopharmacological DRH. Furthermore, the fact that firearms is the prevalent weapon used in systemic drug-related homicides increases the possibility that perpetrators remain unknown, and thus that the motive cannot finally be assessed (Schonberg & Liem 2019). Understanding the role of drugs in cases of lethal violence seems to be difficult to assess, an issue that often leads to errors in categorizing the role played by drugs, that sometimes is even omitted *tout court* (Granath et al. 2011). Thus, official numbers regarding DRH often underrepresent the real dimension of the phenomenon.

Another limitation is the relative scarcity of European literature dealing with DRH and its spatial characteristics. This creates an over reliance on American sources,

More available data at the postcode level would also be necessary: Statistics Netherlands provides a plethora of data, but not all of it is available at the postcode area level (for instance, data on crime related to drugs that is available only at the national level). This limits the scope and quality of statistical analysis that can be executed when analysing geographical micro units. In addition, some historical data at the neighbourhood level is not openly available. For instance, for other non-homicidal crimes, data for the whole 1992-2016

was not available and thus data relative to 2018 was utilized. This limitation can impact the results of the analysis, as the characteristics of the postcode areas might have been very different at the time when the drug-related homicide occurred (especially for the oldest cases). Nevertheless, it can provide some general indication as crime tends to remain spatially stable over the time.

Another methodological limitation is the difficulty to obtain the data necessary to fully test some theories. For instance, in the case of RAT, Lifestyle and Crime Pattern theory the personal addresses (address of residence) of both of victims and perpetrators to fully assess the validity of the theories and increase our understanding of the spatial behaviour of DRH acts. A difficulty in testing RAT comes when measuring the level of guardianship, a central element in RAT. Guardianship could be any element, from presence to patrolling police, to private security guards, presence of CCTVs, private citizens. Measuring these elements at the neighborhood level and for the time period covered in this study appears methodologically impossible and outside the scope of this work.

Finally, a more subjective limitation is the language barrier as I do not speak Dutch. This certainly limited the range and variety of sources that I could rely on.

5.3. Recommendations

Further research on the spatial dimension of homicides in Europe, and in particular of DRH, should be promoted. Being mostly an urban phenomenon, in depth analysis of drug-related homicides should be carried out for the main cities such as Amsterdam and Rotterdam, focusing on those areas where with higher concentration of cases and thus enact targeted interventions to reduce violent crime rates. Understanding the socio economic and urbanistic characteristics of these areas can help us understand DRH more in depth, and thus curb it. Moreover, similar spatial analysis or DRH in other countries, for instance in those participating in the EHM, can bring useful insightful. Considering that in Sweden and Finland most of DRH are of the psychopharmacological type (a type that in the Netherlands represent just a limited number of cases), could be extremely useful to understand the spatial differences between the types of drug-related homicides.

As DRH could be a possible indicator of illicit drug market activity, data regarding drug related crimes, especially for the areas where DRH cluster, should be analysed and triangulated with data on drug related homicides. Future research on the links between DRH and other crimes related to drugs should be expanded. In particular, comparing to DRH to spatial data

regarding drugs requisitions, or other minor drug related criminal activity (recorded for instance through 911 calls) could help identify spatial patterns of illicit and violent drug markets.

Moreover, future research should focus on the relation between inequality levels, drug markets and drug-related homicides. Yet, inequality should not be considered only in its aggregated form, but rather in its spatial configuration within urban centers (alternance of wealthy and deprived areas). This could be a powerful tool to understand the location of drug markets. Moreover, inequality should also be considered not only for its economic consequences but also for its security implications. Policies aimed at reducing drug related delinquency should also tackle the issue of inequality, aiming also at studying the role played by the upper classes in fostering drug-related crime.

Qualitative research on drug-related crimes and drug-related homicides should be promoted. For instance, interviews with perpetrators of DRH could provide very useful insights on the perpetrators' relations with the [mostly urban] territory, with drug markets, and with the communities involved.

The DHM should include the geocoordinates for the places where DRH occur in order to facilitate future spatial studies on homicides. In this sense, it would be beneficial to improve the quality of the spatial information when it comes to registering and classifying homicides. For instance, registering the exact street number of where a homicide happened could allow to improve the accuracy of future analysis specially those conducted at the neighbourhood or street level. Moreover, for older cases (before 2000) more spatial information should be looked for and registered. For cases when the address is not available but the zip code, or neighbourhood, is still present it should be decided how to georeference them (a random point within the area? the centre of the area?). The same for those cases that occurred in small towns and cities where there are not enough DRH so that no artificial hot spots or clusters are created when representing the cases on a map.

This should also be valid for other European countries that participate to the European Homicide Monitor as comparing spatial analysis between countries and cities could enormously benefit the degree of understanding of homicides in general, and of DRH in particular.

Finally, it could help if descriptions of cases in the DHM would be provided in English as well, as it would increase the level of understanding of non-Dutch students and researchers that are

interested in working with this extremely rich and insightful database, while increasing the comparability of it with other monitors.

Bibliography

Aarten, P. (2019, March 25). *The Many Faces of Homicide: A 25-Year Trend Analysis of the Types of Homicides in the Netherlands* . Retrieved from Leiden Security and Global Affairs Blog: https://leidensecurityandglobalaffairs.nl/articles/the-many-faces-of-homicide-a-25-year-trend-analysis-of-the-types-of-homicid

Abt, T. (2019). *Bleeding Out: The Devastating Consequences of Urban Violence- And a Bold New Plan for Peace in the Streets.* New York: Basic Books.

Aebi, M. F., & Linde, A. (2014). The persistence of lifestyles: Rates and correlates of homicide in Western Europe from 1960 to 2010. *European Journal of Criminology, 11*(5).

Althausen, J. D., & Mieczkowski, T. M. (2001). The merging of criminology and geography into a course on spatial crime analysis. *Journal of Criminal Justice Education*, 12 (2), 367-383.

Andresen, M. (2006). Crime Measure and the Spatial Analysis of Criminal Activity. *British Journal of Criminology, 46*.

Beyer, A. C. (2014). *Inequality and Violence : A Re-appraisal of Man, the State and War.* (ebook, Ed.) London: Routledge.

Bijleveld, C. (2006). Homicide in the Netherlands On the Structuring of Homicide Typologies. *Homicide Studies, 10*(3).

Blumstein, A. (1995). Youth Violence, Guns, and the Illicit-Drug Industry. *The Journal of Criminal Law and Criminology*, Vol. 86, No. 1. 10-36.

Blumstein, A., & Rosenfeld, R. (1998). Explaining recent trends in US homicide rates. *The Journal of Criminal Law and Criminology, 88*(4).

Boffey, D. (2018, February 20). *Netherlands becoming a narco-state, warn Dutch police*. Retrieved January 2020, from The Guardian: https://www.theguardian.com/world/2018/feb/20/netherlands-becoming-a-narco-state-warn-dutch-police

Braithwaite, J. (1979). *Inequality, crime, and public policy.* London: Routledge.

Brantingham, P. &. (1993). Nodes, paths, and edges: Considerations on the complexity of crime and the physical environment. *Journal of Environmental Psychology, 13*(1).

Bursik, R. J. (1988). Social Disorganization and Theories of Crime and Delinquency: Problems and Prospects. *Criminology*, 26(4), 519-552.

Caplan, J. M., Kennedy, L. W., & Piza, E. L. (2013). Joint Utility of Event- Dependent and Environmental Crime Analysis Techniques for Violent Crime Forecasting. *Crime & Delinquency*, 59(2) 243– 270.

Caywood, T. (1998). Routine Activities and Urban Homicides: A Tale of Two Cities. *Homicide Studies, 2*(1).

CBS. (2019, September 26). *Deaths; murder and manslaughter, crime scene in The Netherlands*. Retrieved from StatLine: https://opendata.cbs.nl/statline/#/CBS/en/dataset/81453ENG/table?fromstatweb

CBS. (n.d.). *Organisation*. Retrieved January 2020, from CBS: https://www.cbs.nl/en-gb/about-us/organisation

Cohen, J., & Tita, G. (1999). Diffusion in Homicide: Exploring a General Method for Detecting Spatial Diffusion Processes. *Journal of Quantitative Criminology*, 451-493.

Cohen, L. E., & Felson, M. (1979). Social Change and Crime Rate Trends: A Routine Activity Approach. *American Sociological Review*, Vol. 44, No. 4, 588-608.

Copes, H., Hochstetler, A., & Sandberg, S. (2015, November). Using a Narrative Framework to Understand the Drugs and Violence Nexus. *Criminal Justice Review, 40*(1).

de Bont, R., & Liem, M. (2017). *Drug-Related Homicide in Europe.* Istitute of Security and Global Affairs (ISGA). Leiden University.

De Middeleer, F., Van Nimwegen, S., Ceulen, R., Gerbrands, S., & Roevens, E. (2018). *Illegal drug markets in Belgium and the Netherlands: Communicating vessels?* Belspo.
Dickinson, T. (2015). Exploring the Drugs/Violence Nexus Among Active Offenders: Contributions From the St. Louis School. *Criminal Justice Review, 40*(1).
Durán-Martínez, A. (2015). Drugs Around the Corner: Domestic Drug Markets and Violence in Colombia and Mexico. *Latin American Politics and Society, 57*(3), 122-146.
Eisner, M. (2001). Modernization, Self-Control and Lethal Violence: the Long-term Dynamics of European Homicide Rates in Theoretical Perspective. *The British Journal of Criminology, 41*(4).
EMCDDA & Europol. (2016). *EU Drug Markets Report: In-depth Analysis.* Retrieved March 2020, from Publications Office of the EU: https://op.europa.eu/en/publication-detail/-/publication/a8dfa4da-6391-4e53-8384-df89c351a1f6/language-en
EMCDDA & Europol. (2019). *EU Drug Markets Report.* Luxembourg: Publications Offi ce of the European Union.
EMCDDA. (2018). *Drug-related homicide in Europe: a first review of the data and literature.* European Monitoring Centre for Drugs and Drug Addiction. Luxembourg: EMCDDA.
EMCDDA. (2019). *Netherlands Country Drugs Report 2019.* European Monitoring Centre for Drugs and Drug Addiction.
Esbensen, F.-A., & Weerman, F. M. (2005). Youth Gangs and Troublesome Youth Groups in the United States and the Netherlands A Cross-National Comparison. *European Journal of Criminology, 2*(1).
Esri. (n.d.). *How Average Nearest Neighbor works*. (Esri) Retrieved March 2019, from https://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/h-how-average-nearest-neighbor-distance-spatial-st.htm
esri. (n.d.). *How Kernel Density works*. Retrieved from https://desktop.arcgis.com/en/arcmap/latest/tools/spatial-analyst-toolbox/how-kernel-density-works.htm
Felson, M., & Clarke, R. V. (1998). *Opportunity Makes the Thief Practical theory for crime prevention.* Policing and Reducing Crime Unit. London: Research Development Statistics.
Ganpat, S. M. (2017). Comparing Characteristics of Homicides in Finland, the Netherlands, and Sweden. In F. Brookman, E. R. Maguire, & M. Maguire, *The Handbook of Homicide.* New York: John Wiley & Sons, Inc.
Ganpat, S. M., & Liem, M. C. (2012). Homicide in the Netherlands. In M. Liem, & P. W.A., *Handbook of European Homicide Research: Patterns, Explanations and Country Studies* (pp. 329-341). New York: Springer.
Garland, D. (1996). The Limits of the Sovereign State: Strategies of Crime Control in Contemporary Society. *British Journal of Criminology, 36*(4).
Gatti, U., Haymoz, S., & Schadee, H. M. (2011). Deviant Youth Groups in 30 Countries: Results From the Second International Self-Report Delinquency Study. *International Criminal Justice Review*, 21(3) 208-224.
Goldstein, P. J. (1985). The Drugs/Violence Nexus: A Tripartite Conceptual Framework. *Journal of Drug Issues*, Vol. 39, 143-174.
Gottfredson, M. R. (1981). On the Etiology of Criminal Victimization. *The Journal of Criminal Law and Criminology*, Vol. 72, No. 2 (Summer,1981), 714-726.
Granath, S. H. (2011). *Homicide in Finland, the Netherlands and Sweden A First Study on the European Homicide Monitor Data.* Edita Norstedts Västerås. Retrieved from https://helda.helsinki.fi/bitstream/handle/10138/152494/259_Granath_et_al_2011.pdf
Groff, E., & McEwen, T. (2006). *Exploring the Spatial Configuration of Places Related to Homicide Events: Final Report.* Alexandria, Virginia: Institute for Law and Justice.

Gutierrez-Romero, R. (2016). Estimating the impact of Mexican drug cartels and drug-related homicides on crime and perceptions of safety. *Journal of Economic Geography, 16*, 941–973.
Hipp, J. R. (2007). Block, Tract, and Levels of Aggregation: Neighborhood Structure and Crime and Disorder as a Case in Point. *American Sociological Review, 72*, 659–680.
Irwin-Rogers, K. (2019). Illicit Drug Markets, Consumer Capitalism and the Rise of Social Media: A Toxic Trap for Young People. *Critical Criminology, 27*.
Jacques, S., Rosenfeld, R., Wright, R., & van Gemert, F. (2016). Effects of Prohibition and Decriminalization on Drug Market Conflict: Comparing Street Dealers, Coffeeshops, and Cafes in Amsterdam. *American Society of Criminology, 15*(3).
Kivivuori, J., Lehti, & Martti. (2006). The Social Composition of Homicide in Finland, 1960–2000. *Acta Sociologica, 49*(1).
Kivivuori, J., Savolainen, J., & Danielsson, P. (2012). Theory and Explanation in Contemporary European Homicide Research. In M. C. Liem, & W. A. Pridemore, *Handbook of European Homicide Research: Patterns, Explanations and Country Studies* (pp. 95-109). New York: Springer.
Kivivuori, J., Suonpää, K., & Lehti, M. (2014). Patterns and theories of European homicide research. *European Journal of Criminology, 11* (5), 530– 551.
Klinenberg, E. (2018, August 23). *The Other Side of "Broken Windows"*. Retrieved April 2020, from The New Yorker: https://www.newyorker.com/books/page-turner/the-other-side-of-broken-windows
Kuhns, J. B., Wilson, D. B., Maguire, E. R., Ainsworth, S. A., & Clodfelter, T. A. (2009). A meta-analysis of marijuana, cocaine and opiate toxicology study findings among homicide victims. *Addiction*.
Lappi-Seppälä, T., & Lehti, M. (2014). Cross-comparative perspectives on global homicide trends. *Crime and Justice, 43*, 135-230.
Leiden University. (2019, September). The Dutch Homicide Monitor: Background Information.
Leiden University. (n.d.). The Dutch Homicide Monitor: Coding Manual. The Hague.
Liem, M. (2017). Homicide in Europe. In F. Brookman, E. R. Maguire, & M. Maguire, *The Handbook of Homicide.* John Wiley & Sons.
Lum, C. (2008). The Geography of Drug Activity and Violence: Analyzing Spatial Relationships of Non- Homogenous Crime Event Types. *Substance Use & Misuse, 43*(2), 179-201.
Lum, C. (2011). Violence, Drug Markets and Racial Composition: Challenging Stereotypes through Spatial Analysis. *Urban Studies, 48*(13), 2715–2732.
Maltz, M. (2010). Look Before You Analyze: Visualizing Data in Criminal Justice. In A. Piquero, & D. Weisburd, *Handbook of Quantitative Criminology* (pp. 25–52). New York: Springer.
Massey, C. R., & Jerome, M. (1985). The social ecology of homicide: A modified lifestyle/routine activities perspective. *Journal of Criminal Justice*, Vol. 13, 417-428.
McCall, P., & Nieuwbeerta, P. (2007). Structural Covariates of Homicide Rates A European City Cross-National Comparative Analysis. *Homicide Studies, 11*(3).
McCord, E. S., & Ratcliffe, J. H. (2007). A Micro-Spatial Analysis of the Demographic and Criminogenic Environment of Drug Markets in Philadelphia. *The Australian and New Zealand Journal of Criminology, 40*(1).
Merton, R. K. (1938). Social Structure and Anomie. *American Sociological Review*, Vol. 3, No. 5, 672-682.
Miethe, D., T., Stafford, C, M., & Long, J. S. (1987). Social Differentiation in Criminal Victimization: A Test of Routine Activities/LifestyleTheories. *American Sociological Review, 52*(2).

Miron, J. A. (2001). VIOLENCE, GUNS, AND DRUGS: A CROSS-COUNTRY ANALYSIS. *The Journal of Law and Economics*, Vol. 44, No. S2, 615-633 .
Moeller, K., & Hesse, M. (2013). Drug market disruption and systemic violence: Cannabis markets in Copenhagen. *European Journal of Criminology, 10*(2).
Morenoff, J., Sampson, R., & Raudenbush, S. (2001). Neighborhood Inequality: Collective Efficacy and the Spatial Dynamics of Urban Violence. *Criminology, 39*(3).
Nieuwbeerta, P., McCall, P. L., Elffers, H., & Wittebrood, K. (2008). Neighborhood Characteristics and Individual Homicide Risks. *Homicide Studies*, 90-116.
O'Brien, K., Daffern, M., Meng Chu, C., & Thomas, S. D. (2013). Youth gang affiliation, violence, and criminal activities: A review of motivational, risk, and protective factors. *Aggression and Violent Behavior*, 18, 417–425.
Oteo Perez, A., Benschop, A., Blanken, P., & Korf, D. J. (2014, November 14). Criminal Involvement and Crime Specialization Among Crack Users in the Netherlands. *European Addiction Research*.
Ousey, G. C., & Lee, M. R. (2007). Homicide Trends and Illicit Drug Markets: Exploring Differences Across Time. *Justice Quarterly, 24*(1), 48-79.
Pereira, D., Andresen, M., & Mota, C. (2015). A temporal and spatial analysis of homicides. *Journal of Environmental Psychology*.
Piscitelli, A., & Doherty, S. (2018). Connecting social disorganization to broken windows and routine activities.
Pizarro, J. M., Corsaro, N., & Yu, S.-s. V. (2007). Journey to Crime and Victimization: An Application of Routine Activities Theory and Environmental Criminology to Homicide. *Victims and Offenders, 2*.
Pridemore, W., & Kim, S.-W. (2006). Democratization and political change as threats to collective sentiments: Testing Durkheim in Russia. *Annals of the American Academy of Political and Social Science, 605*(1).
Reuter, P. (2009). Systemic violence in drug markets. *Systemic violence in drug markets, 52*, 275–284.
Savolainen, J. (2000). Inequality, welfare state, and homicide: Further support for the institutional anomie theory. *Criminology, 38*(4).
Schönberger, H., & Liem, M. (2019, November 26). *EMCDDA pilot study of drug-related homicide in Finland, the Netherlands and Sweden.* Retrieved from Publications Office of the EU: https://op.europa.eu/en/publication-detail/-/publication/8fecc1f8-10e3-11ea-8c1f-01aa75ed71a1/language-en
Security Management. (2019, February 19). *Criminaliteit in Rotterdam opnieuw gedaald*. Retrieved from Security Management: https://www.securitymanagement.nl/criminaliteit-in-rotterdam-opnieuw-gedaald/
Seffrin, P. M., & Domahidi, B. I. (2014). The Drugs–Violence Nexus: A Systematic Comparison of Adolescent Drug Dealers and Drug Users. *Journal of Drug Issues, 44*(4).
Sherman, L. (1995). *Hot Spots of Crime and Criminal Careers of Places.* Police Executive Research Forum, Washington, DC.
Siegel, L. J. (2015). *Criminology: Theories, Patterns and Typologies.* Boston: Cengage Learning.
Smith, O. (2017, October 19). Mapped: The world according to cocaine consumption. *The Telegraph Online*.
Smith, W., Glave Frazee, S., & Davison, E. L. (2000). Furthering the Integration of Routine Activity and Social Disorganization Theories: Small Units of Analysis and the Study of Street Robbery as a Diffusion Process. *Criminology, 38*(2).
Statistic Netherlands. (2020). *Kerncijfers wijken en buurten 2018*. Retrieved February 2020, from Statline: https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84286NED/table?ts=1582068736071

Statistics Netherlands. (2017, 18 4). *Besteedbaar inkomen per postcodegebied, 2004-2014*. Retrieved from Centraal Bureau voor de Statistiek: https://www.cbs.nl/nl-nl/maatwerk/2017/15/besteedbaar-inkomen-per-postc

Statistics Netherlands. (2018, December 6). *Bevolking en huishoudens; 4-cijferige postcode 1-1-2018*. Retrieved from Statline: https://www.cbs.nl/nl-nl/maatwerk/2018/49/bevolking-en-huishoudens-4-cijferige-postcode-1-1-2018

Statistics Netherlands. (2019, 2 14). *Inkomensongelijkheid naar wijk/buurt, 2016*. Retrieved from https://www.cbs.nl/nl-nl/maatwerk/2019/07/inkomensongelijkheid-naar-wijk-buurt-2016

Statistics Netherlands. (2019, September 6). *Population dynamics; birth, death and migration per region*. Retrieved March 2020, from Statline: https://opendata.cbs.nl/statline/#/CBS/en/dataset/37259eng/table?ts=1586600275263

Stevens, A. (2011). *Drugs, Crime and Public Health: The Political Economy of Drug Policy.* New York: Routledge.

Stickley, A., & Pridemore, W. A. (2007). The socialstructural correlates of homicide in late-tsarist Russia. *British Journal of Criminology, 47*.

Sturup, J., Gerell, M., & Rostami, A. (2019). Explosive violence: A near-repeat study of hand grenade detonations and shootings in urban Sweden. *European Journal of Criminology*.

Thomson, N. D. (2020). An Exploratory Study of Female Psychopathy and Drug-Related Violent Crime. *Journal of Interpersonal Violence, 35*.

Tita, G., & Griffiths, E. (2005). Traveling to violence: The case for a mobility-based spatial typology of homicide. *Journal of Research of Crime and Delinquency, 42*(3).

Tops, P., van Valkenhoef, J., van der Torre, E., & van Spijk, L. (2018). *The Netherlands and Synthetic Drugs: An inconvenient Truth.* The Hague: Eleven International Publishing.

Trebilcock, M. P., & Luneke, A. (2018). Crime Prevention and the Coproduction of Security Outcomes of Citizen Participation at the Neighborhood Level in Neoliberal Chile. *Latin American Perspectives*.

UNODC. (2015). *International Classification of Crime for Statistical Purposes (ICCS).* Vienna : UNODC.

UNODC. (2017). *Annual Report.* Vienna.

UNODC. (n.d.). *UNODC Global Homicide Statistics*. Retrieved November 2019, from The Humanitarian Data Exchange: https://data.humdata.org/dataset/unodc-global-homicide-statistics

UNODC. (Vienna). *Global Homicide Study- Homicide trends, patterns and criminal justice response.* 2019.

van den Brakel, M., & Pouwels-Urlings, N. (2019). *Ongelijkheid in inkomen en vermogen.* Statistics Netherlands.

van Duyne, P. (1996). The Phantom and Threat of Organized Crime. *Crime, Law & Social Change, 24*.

van Gelder, L. (2018, October 09). *Why drug criminals are headquartered in the Netherlands.* Retrieved from Univers: https://universonline.nl/2018/10/09/drug-criminals-headquartered-netherlands

Varano, S. P., & Kuhns, J. B. (2017). Drug-Related Homicide. In F. Brookman, E. R. Maguire, & M. Maguire, *The Handbook of Homicide* (pp. 89-104). John Wiley & Sons, Inc.

Weisburd, D. (2012). Bringing Social Context Back Into the Equation: The Importance of Social Characteristics of Places in the Prevention of Crime. *Criminology & Public Policy, 11*(2).

Weisburd, D., & Telep, C. W. (2014). Hot Spots Policing: What We Know and What We Need to Know. *Journal of Contemporary Criminal Justice, 30*(2), 200-220.

Werb, D., Greg, R., Guyatt, G., Kerr, T., Montaner, J., & Wood, E. (2011). Effect of drug law enforcement on drug market violence: A systematic review. *International Journal of Drug Policy, 22*.

Wilkinson, R., & Pickett, K. (2010). *The Spirit Level: Why Equality is Better for Everyone.* London: Penguin.

Wilson, J. Q., & Kelling, G. L. (1982, March). Broken windows: The police and neighborhood safety. *The Atlantic*.

Zanotelli, C. (2001). Rio de Janeiro: Bertrand Brasil, 2000. 368p. ZANOTELLI, Cláudio Luiz. Elementos para compreender os territórios do crime e as paisagens da violência da Aglomeração de Vitória – Espírito Santo/ Brasil. *ENCUENTRO DE GEOGRAFOS DE AMERICA LATINA*.

Zedner, L. (2007). Pre-crime and post criminology? *Theoretical Criminology, 11*.

Zepeda Gil, R. (2018). Violence in Tierra Caliente: inequality, development and education rates in the mexican drug war. *Estudios Sociologicos XXXVI*.