Master Thesis:

Systemic Drug-Related Homicides & Assassinations in the Netherlands (1992-2017)

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Abstract

Systemic drug-related homicides and assassinations are homicides committed as a consequence of the aggressive patterns in drug trade. In the Netherlands, not many studies have researched these drug-related homicides and assassinations during a long time period. The aim of this study is to gain insight into the spatial and temporal patterns of this type of homicides in the Netherlands during 1992-2017. 431 cases of drug-related homicides and assassinations were identified in the Netherlands between 1992-2017. The rate of systemic drug-related homicides (drug-related homicides, (drug-related) assassinations, and other (drug-related) homicides) per 1.000.000 inhabitants varies from 0.35-1.58 in the period under study. The main finding from this study is that social cohesion seems to be lower for postal codes in which a drug-related homicide and/or assassination have occurred, compared to postal codes in which no drug-related homicide and/or assassinations have taken place.

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1. Introduction

In the Netherlands, approximately 1 out of 5 homicides between 2003 and 2006 were committed within a criminal milieu (Liem, et al., 2013). Often these homicides are connected to illegal drug trade and drug markets (van de Port, 2001). In 2004, 16% of all homicides in the Netherlands were related to drug deals (Smit & Nieuwbeerta, 2007). Hence, systemic drug-related homicides comprise a substantive portion of lethal violence committed in the Netherlands.

This study study applies a definition for systemic drug-related homicide based on the definition of systemic violence by Goldstein (1985). A systemic drug-related homicide is "a homicide as a consequence of the traditionally aggressive patterns of interaction within the system of drug distribution and use" (Goldstein, 1985, p. 497). Furthermore, a systemic drug-related assassination can be defined as "a homicide, committed by or on behalf of members of a drug (trade) organization to obtain, persist or strengthen their position in the drug trade" [1]. The main difference between drug-related homicides and drug-related assassinations is that drug-related assassinations are planned, while drug-related homicides are not planned.

Examples of systemic drug-related lethal violence (both homicides and assassinations) include: 'drug deals gone wrong', enforcement of normative codes, robberies of drug dealers, retaliation by their dealers or their bosses, elimination of informers, punishment for selling phony drugs, and failing to pay one's debts (Goldstein, 1985; Goldstein, 1986).

These systemic drug-related homicides and assassinations have become more violent and are often executed in public domain, endangering public order and safety (de Korte, 2017). According to a recent publication by the Dutch Police Union (Nederlandse Politiebond), the Netherlands fulfils some of the characteristics of a narco state. A Dutch detective stated that: "The Netherlands has become a narco state in the last thirty years. What we do not see, is not there. Well, underground it has increased" (Nederlandse Politiebond, 2018, p. 7).

This study will focus on spatial and temporal patterns of systemic drug-related homicides and assassinations in order to answer the following questions: When and where did systemic drug-related homicides take place? Have these homicides occurred in waves or episodes? Are these homicides concentrated in specific locations? Furthermore, this study will also delve into possible explanations for the occurrence of these homicides by addressing the

[1] Original definition of (general) assassination (Slot 2009, as quoted in WODC, 2017, p. 11)

illegal drug market in the Netherlands and social phenomena such as migration and social cohesion.

1.1. Academic Relevance

General homicide research has focussed on the distributions of homicides, victims and offenders, next to relationships between victim and offender, motive and sentencing of offenders (UNODC, 2013; Ganpat & Liem, 2012). Specialized research into sub-types of homicides has been increasing compared to general homicide research for some time (Kivivuori, Suonpää, & Lehti, 2014). This study will follow this trend by looking more closely into a sub-type of homicide, namely systemic drug-related homicides and assassinations.

Previous research on drug-related homicides has primarily focussed on testing Goldstein's tripartite framework and evaluating the three types of drug-related violence on the country level: psychopharmacological, economic-compulsive, and systemic (Goldstein, 1985; Goldstein, Brownstein, & Ryan, 1992). Several studies have addressed systemic drug-related homicide in the Netherlands, however, these studies have focussed on short time frames of several years and have become rather dated. Excluding the research by Liem & Leissner (2016), which stated that 19% of homicides were homicides in the criminal milieu, and mostly were related to drugs (2009-2014).

Previous research has addressed systemic drug-related assassinations to some extent. Van de Port (2001) has analysed assassinations in the Netherlands on a qualitative basis, however, spatial patterns of assassinations were only addressed within a short time frame (1993-1997). Van Gestel & Verhoeven (2017b) have elaborated on the locations of assassinations on a province level (2013-2016). Next to that, the publication of the Research and Documentation Centre[2] of the Ministry of Justice and Security has focussed on assassinations related to drug trade on the basis of professionalization and motives behind these assassinations (WODC, 2017).

Though, spatial and temporal patterns have not been addressed extensively in previous research on both systemic drug-related homicides and assassinations. This study will address these patterns in order to create a clearer picture of this type of violence in the Netherlands. Spatio-temporal analysis is an important tool for crime analysis and these characteristics can be distinct for different types of crimes. Academic literature can benefit from this research as

[2] In Dutch: Wetenschappelijk Onderzoek- en Documentatiecentrum (WODC)

it can deepen understanding of criminogenic processes, such as additional information about the nature of the crime, the perpetrator, etcetera (Grubesic & Mack, 2008). In the case of systemic drug-related homicides and assassinations, this could provide academia with additional knowledge about these crimes in the Dutch context.

1.2. Societal Relevance

In general, homicides have a profound impact on public safety. Next to the loss of human life, it could result in a climate of fear, insecurity, and disruption of community life (Collins, 1990; UNODC, 2013). However, systemic drug-related homicides tend to have more serious consequences compared to general homicides. Victims of these homicides are often other drug traders or actors within the criminal circuit. However, within systemic drug-related homicides, homicide of innocent victims also occurs, in this case, the perpetrator has mistaken the innocent victim for a criminal target (Vugts & Kras, 2017). The chief of police in Rotterdam, Frank Paauw stated: "the fact that innocent persons get hit or killed is a horror thought" (Algemeen Dagblad, 2017).

These mistaken identity assassinations have been widely present in the Dutch context, since 2014 at least 9 mistaken identity assassinations have taken place in Amsterdam and Utrecht (Van Weezel, 2018). A well-known example is the assassination of DJ Djordy Latumahina in 2016, which resulted in a bullet rain in a parking garage in Amsterdam. The DJ happened to live in the same flat and drive the same car as a well-known drug dealer (Stoker, 2018). So, these assassinations tend to seriously endanger the safety of innocent citizens.

Next to that, systemic drug-related homicides and assassinations can seriously undermine the criminal justice system. Victimized illicit drug traders will choose informal justice rather than formal justice due to the illegality of their activities (Jacques & Allen, 2015). Drug traders often take matters into their own hands and resort to forms of informal justice to settle their disputes. In modern societies, this form of self-help undermines public order and safety, as self-help can be dangerous, unfair and imbalanced (Black & Baumgartner, 1980).

This study will provide the police with greater understanding of the phenomenon of systemic drug-related homicides and assassinations, as mapping of crime is an effective method to communicate crime hotspots to law enforcement (Ratcliffe, 2002). This study into the spatial and temporal patterns of these homicides and assassinations could reveal certain hot spots and 'hot times'.

1.3. (Sub-)Research Questions

According to the European Monitoring Centre for Drugs and Drug Addiction, the Netherlands is the main producer of MDMA/ecstasy, and (herbal) cannabis and the key distribution hub for cocaine (EMCDDA, 2016). Additionally, the number of people involved in drug trafficking in the Netherlands seems to grow (van Gestel & Verhoeven, 2017a). So, the Netherlands seems to have a key location in the European drug market, and according to Reuter: "drug market violence is restricted in time and space" (Reuter, 2009, p. 283).

This restriction in time and space can be analysed by looking into spatial and temporal or 'spatio-temporal' clustering, which can be defined as: "a process of grouping objects based on their spatial and temporal similarity" (Kisilevieh, Mansmann, Nanni, & Rinzivillo, 2010, p. 855). In this study, the spatial dimension focusses on the location where the systemic drug-related homicides have occurred. Next to that, the temporal dimension focusses on different time variables such as year, month, and time period of the homicide. This study will analyse the locations of systemic drug-related homicides in the time period of 1992-2017 and aims to identify whether spatial and temporal clustering is applicable to these acts of violence.

Furthermore, the drug market stability theory (Brownstein, Crimmins & Spunt, 2000) and the social disorganization theory (Shaw & McKay, 1942) will be used to explain spatial and temporal patterns clustering of systemic drug-related homicides. According to Brownstein, Crimmins & Spunt (2000) there is a clear relationship between drug market instability and drug-related violence. Several indicators of the drug market such as drug seizures, drug use among the population, and sewage analysis will be used to explain patterns in systemic drug-related homicides. Additionally, social disorganization theory (Shaw & McKay, 1942) will be used to explain spatial and temporal patterns in systemic drug-related homicide. Several indicators will be addressed such as average disposable household income, immigration, and social cohesion.

This study will focus on when these systemic drug-related homicides took place, whether they occurred in waves or episodes and whether they are concentrated in specific locations. Spatial and temporal clustering of systemic drug-related homicides and assassinations will be analysed based upon the following research question. Next to that, the sub-research questions will address theories that will be applied to explain spatial and temporal patterns of these homicides.

Main research question:

"To what extent does spatial and temporal clustering apply to systemic drug-related homicides and assassinations in the Netherlands during 1992-2017 and how can this be explained?"

Sub-research questions:

- "To what extent can the drug market stability theory by Brownstein, Crimmins & Spunt (2000) explain spatial and temporal patterns in systemic drug-related homicides and assassinations?"
- "To what extent can the social disorganization theory by Shaw & McKay (1942) explain spatial and temporal patterns in systemic drug-related homicides and assassinations?"

In chapter 2, the existing literature will be elaborated on, which will discuss both empirical and theoretical research. The methodology (Chapter 3) will be built upon this literature review and will elaborate more extensively on definitions of the relevant concepts, choice of method, operationalization and relevant data sources: The Dutch Homicide Monitor (data on homicides), Statistics Netherlands (data on drug seizures), the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA – data on drug use – sewage water) the Trimbos Institute (data on drug use), and Statistics Netherlands (data on social disorganization variables).

2. Literature Review

This literature review is based upon academic articles and books retrieved through electronic databases and e-journals, the Internet (Google and Google Scholar), and reference lists of articles and books. The aim of this chapter is to give an overview of the literature, which will be used as the foundation of this study. First, empirical knowledge will be addressed, discussing previous research on spatial and temporal patterns of homicides. Moreover, additional empirical research will be addressed with regards to homicides and drug trade-related assassinations in the Netherlands. Second, theoretical knowledge will be addressed. This section will discuss drug-related homicides and the use of violence within the drug trade circuit. Furthermore, the foundation of clustering and crime mapping in criminological research will be addressed as well as theories that could explain potential clustering of systemic drug-related homicides and assassinations: the drug market stability theory and the social disorganization theory.

2.1. Empirical Research

2.1.1. Spatial Aspects

Previous research has addressed the spatial clustering and spatial aspects of homicides in various countries. There is overall support for (general) homicides to be non-randomly distributed. In the United States, homicides were non-randomly distributed in space between 1960 and 1990, and spatial clusters were identified at the macro level such as regions, cities and states (Baller, Anselin, Messner, Deane, & Hawkins, 2001). Shaw, Tunstall, & Dorling (2005) looked at homicide rates in relation to poverty in areas, which showed that increases in homicide rates were concentrated in the poorest areas of Britain between 1981 and 2000.

Furthermore, drug offenses also tend to be spatially clustered (Weisburd & Green, as cited in Eck & Weisburd, 2015). For example, in Mexico, drug-related violence is concentrated in key drug trafficking areas, nevertheless, it seems to be geographically expanding to other municipalities (Molzahn, Ríos, & Shirk, 2012). Moreover, only a few regions in Mexico showed high concentrations of drug-related homicides. Next to that, large fluctuations between regions were present (Dec. 2006 – Dec. 2010).

Research has addressed the geographical distribution of homicides and assassinations in the Netherlands. According to Ganpat & Liem (2012), the majority of homicides were committed in urban areas, particularly in Amsterdam, Rotterdam, and The Hague (1992 –

2009). Furthermore, van Gestel & Verhoeven (2017b) have elaborated on the number of assassinations per province (or abroad) between 2013 and 2016 (Table 1). Approximately 66% of these assassinations occurred in North Holland, North Brabant and South Holland. These assassinations occurred often in public roads, parks, and parking garages. The assassinations were often related to drug trade, however, the authors did not differentiate between assassinations with connections to different types of organized crime such as drug trade.

Table 1: Assassinations per province in the Netherlands, 2013-2016 [3] (van Gestel & Verhoeven 2017a)

	2013	2014	2015	2016	Total (N)	Total (%)
North Holland	8	14	9	7	38	34.9
North Brabant	3	10	5	2	20	18.4
South Holland	6	3	2	3	14	12.8
Abroad	1	4	1	8	14	12.8
Utrecht	2	3	2	4	11	10.1
Other provinces	1	4	0	3	8	7.3
Limburg	3	0	1	0	4	3.7
Total	**24**	**38**	**20**	**27**	**109**	**100**

To conclude, research into spatial aspects of systemic drug-related homicides in the Netherlands is rather limited, as these spatial aspects have only been assessed for homicides in general or for a limited number of years. With regard to spatial aspects of assassinations, no distinction has been made between systemic drug-related assassinations and other criminal milieu assassinations.

2.1.2. Temporal Aspects

The temporal aspect of homicides has also been addressed in empirical research. Most authors did not find any seasonal fluctuations of homicides, for example in the United States and Canada, and England and Wales (Block, 1984; Rock, Judd, & Hallmayer, 2008). However, Block (1984) notices that sub-types of homicide that occur outdoors or in certain areas of a country could vary with the season. Regarding fluctuations per month, research in the United

[3] These assassinations are connected to the criminal milieu. Nevertheless, van Gestel & Verhoeven (2017a) state that most assassinations are related to drug trade.

States has shown that in July and August relatively more homicides had occurred (Tennenbaum & Fink, 1994).

Furthermore, homicides are clustered at certain days of the week and during certain times. Research in Brazil has shown that most homicides took place during evenings and during weekends, when people are enjoying their free time (Ceccato, 2005). There is overall support for the idea that there is a greater prevalence of homicides during weekends (Abel, Strasburger, & Zeidenberg, 1985; Lester, 1979).

Research on temporal aspects of drug-related homicides has only been executed on a yearly and monthly basis. For example, in Mexico, where there were significant increases in drug-related homicides over time (2008-2011) and these homicides tended to occur relatively dispersed throughout the country (Molzahn, Ríos, & Shirk, 2012).

In the Netherlands, homicides (in general) have been fluctuating per month and year, but a clear pattern or trend is lacking (Ganpat & Liem, 2012; Smit & Nieuwbeerta, 2007). Several authors have addressed the occurrence of criminal milieu homicides and systemic drug-related homicides during certain time periods (Leistra & Nieuwbeerta, 2003; Smit & Nieuwbeerta, 2007). For example, a third of all criminal milieu homicides were systemic drug-related homicides (1992-2001). Though, no attention has been paid to the changes in occurrence of these homicides.

Regarding assassinations in the Netherlands, van de Port (2001) noted that little could be concluded from the time of day in which these assassinations in the Netherlands (1993-1997) took place, as 16 assassinations took place during the day, 19 during the evening, and 12 during the night. Moreover, assassinations in the Netherlands have only been analysed on a yearly basis from 2000-2015 (van Gestel & Verhoeven, 2017a).

2.1.3. Other Aspects

The following section will address prior empirical research on drug-related homicides and assassinations in the Netherlands. First, empirical research will be addressed on the basis of Goldstein's tripartite model (Goldstein, 1985). Second, explanations for the occurrence of systemic drug-related homicide and assassinations will be elaborated on.

Goldstein's tripartite model

Psychopharmacological homicide has been defined as homicide under the influence of drugs (Goldstein, 1985). Interestingly, victims of homicides in the criminal milieu (in 1998 and

2003) tended to be relatively more often addicted to drugs or under influence of drugs than victims of homicide in general (Table 2). Moreover, for homicide cases in 1998 and 2003, offenders of homicides in the criminal milieu tend to be relatively less addicted to drugs or under influence of drugs than offenders of homicide in general (Smit & Nieuwbeerta, 2007).

Table 2: Psychopharmacological homicide in the Netherlands, 1998 and 2003 (Smit & Nieuwbeerta, 2007)

	Offender		**Victim**	
	Addicted	Under Influence	Addicted	Under Influence
General homicide (N = 423)	15%	7%	9%	5%
Homicide in criminal milieu (N = 88)	10%	3%	15%	6%

Economic-compulsive (drug-related) homicide is defined as economically oriented violence in order to support costly drug use (Goldstein, 1985). This type of drug-related violence has not been measured to the same extent as psychopharmacological homicide in the Netherlands. In Europe, only the United Kingdom (England & Wales) has addressed the occurrence of this type of homicide as 3% of homicides was committed with the motive to obtain drugs, and another 3% to obtain drug proceeds (March 2013-March 2015).

Systemic drug-related homicide has been researched on several accounts. During 1992-2001, a third of all homicides within the criminal milieu were considered to be systemic violence related to the drug market (Leistra & Nieuwbeerta, 2003, as cited in Liem & de Bont, 2017). Furthermore, according to Smit & Nieuwbeerta (2007) an average of 8% of homicides were assassinations in the criminal circuit, whereas an average of 10% of homicides were related to drug deals (1998, 2002-2004). In 2003, 6% of homicides were accounted for by a customer killing his drug dealer, whereas 2% of homicides were accounted for by a drug dealer killing his customer.

A recent publication of the Research and Documentation Centre (WODC) was dedicated to the phenomenon of assassinations, in which numerous findings were documented. Van de Port (2001) extensively analysed criminal assassinations in the Netherlands on a qualitative basis. Most of the 55 cases were homicides committed within the drug trade milieu. This research focussed on offender, victim, occupation, place, time, and modus operandi. However, the research has been performed 17 years ago, next to that, relatively little attention has been paid to the place and time of these assassinations.

According to observations of Vugts & Kras (2017) several categories of victims of assassinations in Amsterdam and the corresponding motives could be identified (for the last

several years). First, the assassins were eliminated for knowing too much or because of fear of betrayal. Second, middlemen were assassinated due to fear of knowing or telling too much, but also through revenge by another group. Third, high profile targets were assassinated in order to gain influence or obtain a better strategic position in the market. The last category concerns victims who were killed by mistake.

In the Netherlands, assassinations can usually be connected to drug deals and conflicts within the drug trade (van Gestel & Verhoeven, 2017b). For example, a well-known conflict in the drug trade circuit in the Netherlands is the 'Mocro War'. This dispute originated over a disappeared cocaine shipment of 200 kilos by a Dutch gang in March 2012. The shipment disappeared either through seizure by Belgian customs (at the port of Antwerp) or through theft by criminal parties involved (Reuter, 2016). From 2012 to 2015, this conflict resulted into at least 8 criminal milieu homicides [4] (Meeus, 2014; NOS, 2016; Het Parool, 2016).

Causes of systemic violence

Other empirical research addresses the causes or possible explanations for violence related to drug markets or drug trade. One of the causes of increased violence in drug markets might be related to drug law enforcement. Werb, et al. (2011) conducted a systematic review of all English longitudinal (qualitative) studies on drug market violence and drug law enforcement. According to Werb, et al. (2011), 10 out of the 11 identified longitudinal (qualitative) studies found a significant association between drug law enforcement and drug market violence [5]. A cross-country analysis by Miron (2001) showed that drug seizure rates were positively related to homicide rate (1993-1996). Additionally, an increase in drug enforcement, such as drug seizures, positively influences violent crime as the drug market is disrupted (Rasmussen, Benson, & Sollars, 1993).

Other possible explanations for increased violence in drug markets might be related to demographic or societal trends. According to Nieuwbeerta et al. (2008, p. 109): "lower levels of social cohesion in a neighbourhood significantly increase the probability that inhabitants of these neighbourhoods become victims of all types of homicide – with the exception of being murdered during an argument". Moreover, studies in the United States have found that growth

[4] Homicides connected to the Mocro War: Redouan Boutaka (31, 2012), Najeb Bouhbouh (34, Belgium, 2012), Rida Bennajem (21, 2013), Souhail Laachir (26, 2013), Alexander Gillis (30, 2014), Mohamed el Mayouri (30, 2014), Gwenette Martha (40, 2014), Marchano Pocorni (37, Suriname, 2015)

[5] While the systematic review included of Werb, et al. (2011) inlcuded all English based studies, the 11 identified longitudinal (qualitative) studies were all conducted in the United States

in the foreign born population was associated with a reduction in the rate of homicide. This relation illustrates a protective effect of immigrant populations (Ruther, 2014).

2.2. Theoretical Research

In order to explain spatial and temporal patterns of systemic drug-related homicide in the Netherlands, a comprehensive overview of theoretical knowledge on the subject will be helpful. In the following sections, conceptual and theoretical knowledge will be discussed. First, the concept of drug-related homicide and use of violence within drug trade and drug markets will be addressed. Second, an overview of theories will address place, time and crime research. Third, theories related to explaining spatial and temporal patterns of systemic drug-related homicide will be elaborated on: the drug market stability theory and the social disorganization theory.

2.2.1. Drug-Related Homicides & Use of Violence

Goldstein (1985) created a tripartite conceptual framework covering the possible ways in which drugs and violence seem to be related, and offering an extensive categorisation [6]: psychopharmacological, economic-compulsive, and systemic violence (Goldstein, 1985). This categorisation has been used by many other criminological research to address the relationship between drugs and violence (Alfred, 1995; Ousey & Lee, 2002; Parker & Auerhahn, 1998).

First, psychopharmacological violence occurs when the individual is under influence of drugs. This violence results from individuals becoming excitable, irrational and may act out in a violent manner (Goldstein & Brownstein, 1987). Second, economic-compulsive violence arises when an individual uses violence to sustain their drug use. This violence is economically oriented as violence is used to support one's costly drug use (Goldstein, 1985). For example, a robbery that results in homicide in order to steal drugs or to gain money to buy drugs.

Lastly, systemic violence relates to violence occurring during the sale and distribution of drugs. Systemic violence occurs in areas that: "are socially disorganized; have traditionally high rates of interpersonal violence; and are economically disadvantaged" (Collins, 1990: 266). Systemic violence includes territorial disputes/turf wars, 'drug deals gone wrong', enforcement of normative codes, robberies of drug dealers, retaliation by their dealers or their

[6] These three categories are not mutually exclusive

bosses, elimination of informers, punishment for selling phony drugs or failing to pay one's debts (Goldstein, 1985; Goldstein, 1986). The victims of this type of violence are mostly connected to drug trafficking. Systemic drug-related homicides and assassinations can be categorised as systemic violence as these homicides are the consequence of sale and distribution of drugs.

These systemic drug-related homicides are based on a general tendency in which rivalry is settled with violence. This use of violence is a by-product of the unregulated market conditions in which illegal drug trade is conducted (Fijnaut, 2016; Goldstein, 1986). This by-product is due to the fact that criminal groups cannot depend upon the government to settle their conflicts. The use of violence is the mode, a form of self-help, through which drug trade actors settle their disputes and 'balance the scores'.

Nevertheless, the use of violence related to drug trade could be restrained by the economic interests of actors participating in drug trade. According to van de Port (2001), use of violence could work counterproductive and impose consequences upon current drug trade activities. Violence is 'bad for business', because of attention of police and attraction of potential retaliation (Pearson & Hobbs, 2001).

2.2.2. Place, Time & Crime

In the 1970s, several scholars started to examine why crime happened where it did, this led to certain opportunity theories they had developed such as the routine activity theory by Cohen & Felson (1979) and crime pattern theory by Brantingham & Brantingham (1993). These theories became highly influential in the research that addressed the connection between place, time and crime.

According to Cohen & Felson (1979), one could see the event of crime as some sort of 'alignment of the stars', in which the following variables are to be present at the same time and in the same place, in order for a criminal act to occur: the prospective offender, a suitable target and absence of capable guardians against crime, for example neighbours or watching citizens (Cohen & Felson, 1979). The theory focusses on general patterns of routine activities in society such as spatial and temporal patterns of leisure, work, and family activities.

Brantingham & Brantingham (1993, p. 259) stated that: "each criminal event is an opportune cross-product of law, offender, motivation, and target characteristic arrayed on an environmental backcloth at a particular point in space-time". They believed that crimes occur

at certain places because such places and pathways tend to have a certain familiarity to offenders due to common everyday activities.

Both the routine activity theory (Cohen & Felson, 1979) and the crime pattern theory (Brantingham & Brantingham, 1993) focus on the circumstances or context in which prospective offenders carry out their act and are widely used theories to explain crime rate trends and cycles. These theories (routine activity theory & crime pattern theory) focus on social environments, how these environments shape human activity, and thus crime. Ultimately, the source of explanation of spatial patterns can be found in the interaction between humans and their environment (Groff, Weisburd, & Yang, 2010).

Another theory, that discusses the spatial and temporal aspects of crime, is the lifestyle-exposure theory developed by Hindelang, Gottfredson, and Garofalo (1978), which states that demographic differences in the probability of victimization may be caused by differences in personal lifestyles of victims (Meier & Miethe, 1993). Furthermore, certain lifestyle patterns do expose victims to dangerous places, times, and situations, which in turn increases the risk of victimization (Kennedy & Forde, 1990). Research has shown that the lifestyle of drug dealers makes them more likely to commit violent crime compared to drug users (De Li, Priú, & MacKenzie, 2000). For example, drug dealers might be dealing in close proximity of nightlife such as clubs and bars due to the availability of customers, and potential victims are therefore in greater risk at these places.

The above theories and concepts all addressed the existence of spatial and temporal patterns. These theories all seem to agree that crimes are non-randomly distributed across both time and place (Ratcliffe, 2010). However, Sherman, Gartin, & Buerger (1989, p. 28) cleared the path towards more in-depth examination of geographic concentration of crime by arguing that the study of "variation across space is one of the basic tools of science". Since then, many other researchers have engaged in identifying geographic 'hot spots' of crime (Block & Block, Street Gang Crime in Chicago, 1993; Eck, Chainey, Cameron, Leitner, & Wilson, 2005). More recently, criminologists have extended this hotspot analysis to include temporal aspects (Carcach, 2015; Grubesic & Mack, 2008).

To conclude, the above theories serve as the foundation for spatial and temporal clustering analysis of different crimes. However, certain phenomena or social trends could explain the spatial and temporal patterns of crime, and in this study, systemic drug-related homicides. As these homicides are connected to drug trade, attention needs to be given to the drug market and drug market stability. Furthermore, social phenomena and trends should also be taken into account as they could influence the spatial and temporal patterns of systemic

drug-related homicides. These two concepts are discussed below in ‘Section 3.2.3. Drug Market Stability’ and ‘Section 3.2.4. Social Disorganization Theory’.

2.2.3. Drug Market Stability

The conceptual framework of drug market stability by Brownstein, Crimmins & Spunt (2000) has been based upon the hypothesized relationship between increasing drug market stability and decreasing levels of homicide in US cities (Lattimore, Trudeau, Riley, Leiter, & Edwards, 1997). This relationship would infer that an unstable drug market would lead to drug-related or systemic violence. Brownstein and colleagues describe two measures of drug market stability: structural and interactional.

First, the structural measure differentiates between a business model and a free-lance model. A business model is based on a clear hierarchy of authority and established routines and relationships in which territorial lines are clearly drawn (Brownstein, Crimmins, & Spunt, 2000).. The free-lance model has no clearly defined lines of authority and territory, and roles of dealers and buyers are not sufficiently established (Brownstein, Crimmins, & Spunt, 2000).

Second, the interactional measure distinguishes between internal and external interaction. Internal interaction concerns routine commercial transactions and exchanges between dealers, workers and sellers. Whereas, external interaction is characterized by competing entities in the form of many different suppliers, distributors, and sellers (Brownstein, Crimmins, & Spunt, 2000).

According to this categorization of measures elaborating on the stability of the drug market, a less stable drug market would be characterized by a free-lance structure and prevalence of external interactions. A more stable drug market would be characterized by a business structure and prevalence of internal interactions.

However, this theory is relatively inappropriate for longitudinal research as it does not address changes in drug market stability over longer time periods. An alternative way to measure drug market stability is by analysing the amount of drug seizures (per year). Miron (2001) discovered that drug seizure rates were positively related to the homicide rate. These seizures tend to destabilize the drug market, as they disrupt the current drug market equilibrium (Rasmussen, Benson, & Sollars, 1993). Next to that, drug trade actors cannot rely on the legal system to resolve their disputes as there are cases where drug trade actors retaliate on one another, because they believe that a competitor has stolen their drugs.

Second, one could also look at the drug users of these drug markets, "the supply side", in order to determine drug market stability. According to Thomas, et al. (2012, p. 438), sewage analysis can be used by "analysing biomarkers in sewage to produce objective and updated data on the use of illicit drugs and their market at local, national and international scales". Sewage analysis data can be used alongside normal drug use reports in order to gather information on the local (for Amsterdam, Eindhoven, and Utrecht) drug market. If use of a certain drug is high, value of the markets for i.e. cannabis, cocaine, XTC, etc. increases, making it a potential source of conflict (Harcourt & Ludwig, 2007; Rasmussen, Benson, & Sollars, 1993).

2.2.4. Social Disorganization Theory

The social disorganization theory was originally developed by Shaw & McKay (1942). Clifford Shaw & Henry D. McKay were criminologists from the Chicago School who contributed extensively to social ecology research. Their major contributions were: "the collection of autobiographies of juvenile delinquents, research on geographical distribution of delinquents and, creation of a delinquency prevention programme: the Chicago Area Project" (Snodgrass, 1976, p. 1).

Social disorganization refers to: "the inability of a community to realize the common values of its members and maintain effective social controls" (Kubrin & Wo, 2016, p. 122). Shaw & McKay (1942) examined residential locations of juveniles who had been referred to Chicago courts and found that crime was concentrated in particular areas in Chicago. The high crime areas remained relatively stable over time. Their research has led to the notion that crime and neighbourhood dynamics were connected to one another.

Furthermore, with their publication in 1942, Shaw & McKay started to address which characteristics of neighbourhoods or areas accounted for the changing crime rate. The social disorganization theory mentions three neighbourhood features that characterize socially disorganized neighbourhoods: socio-economic deprivation, ethnic heterogeneity, and residential mobility (Shaw & McKay, 1942).

First, socio-economic deprivation in a neighbourhood could explain crime rates. Socio-economic deprivation leads to ethnic heterogeneity and residential mobility. When social disorganization in a neighbourhood increases, social control decreases. However, neighbourhoods with a low economic status also tend to have less material and cultural

resources, which in turn lowers the level of organization in these neighbourhoods and thus decreases social control (Wittebrood, 2000).

Second, based on the social disorganization theory (Shaw & McKay, 1942), ethnic heterogeneity is hypothesized to negatively influence social integration and social control. The presence of different ethnic groups within a neighbourhood would decreases social control mechanisms due to communication barriers and mistrust (because of cultural differences), which increases the opportunity to commit a crime (Shaw & McKay, 1942). Researchers in the Netherlands have shown that high ethnic heterogeneity within certain neighbourhoods is linked with higher victimization for violence (Tesser, van Praag, van Dugteren, Herweijer, & van der Wouden, 1995).

Third, residential mobility is also connected to crime within neighbourhoods. When residential mobility is high, less social relations will be built between neighbours, and thus, decreasing social cohesion and social control in the neighbourhood (Shaw & McKay, 1942).

These areas, "socially disorganized neighbourhoods", are characterized by socio-economic deprivation and often endure high rates of population turnover due to these areas being undesirable residential locations. These socially disorganized areas are often characterized by a certain inflow of newly arriving immigrants, resulting in ethnic heterogeneity in these areas. So, socio-economically deprived areas tend to have high rates of residential mobility and ethnic heterogeneity (McMurtry & Curling, 2008).

Social disorganization theory claims that low social cohesion, high rates of poverty, ethnic heterogeneity tend to decrease a neighbourhoods' capability to control the behaviour of people in public, which increases the probability of crimes to occur (Kubrin & Weitzer, 2003). The theory assumes that social control shapes crime rates in neighbourhoods, however, there is a clear paradox present with regard to informal social control. Disadvantaged neighbourhoods tend to have higher rates of violence and crime due to less (lawful) informal social control by conventional institutions such as family, schools, and churches. (Ousey & Lee, 2002). Whereas, according to Goldstein (1985), in disadvantaged neighbourhoods, illegal drug markets tend to have higher rates of violence and crime due to an increase of (unlawful) informal social control as a consequence of self-help. Systemic drug-related homicides could be the result of an increase in (unlawful) informal social control by drug trade actors and/or a decrease of (lawful) informal social control by conventional institutions.

To conclude, the above literature review sheds light upon the research related to homicides, and more specifically systemic drug-related homicide and assassinations. First, empirical research has addressed the spatial and temporal aspects of these offences as well as other relevant knowledge regarding systemic drug-related homicide. Second, theoretical research has addressed the underlying concepts of spatial and temporal patterns of crimes. Furthermore, two concepts which could explain spatial and temporal patterns of systemic drug-related homicides were addressed: drug market stability and social disorganization theory.

3. Methodology

3.1. Definitions

Homicide is defined by UNODC as: “the unlawful death purposefully inflicted on a person by another person” (UNODC, 2014, p. 102). In the Dutch context, this includes murder (art. 289 and 291 Dutch Code of the Criminal Law) and manslaughter (art. 287, 288 and 290 Dutch Code of the Criminal Law). The definition of systemic drug-related homicide, which will be applied in this study, is based upon Goldstein’s definition of systemic violence: “the unlawful death purposefully inflicted on a person by another person (homicide) as a consequence of the traditionally aggressive patterns of interaction within the system of drug distribution and sale” (Goldstein, 1985, p. 497). Goldstein’s definition of systemic violence is used in this study, as the tripartite framework has been used relatively often by criminological research (Alfred, 1995; Ousey & Lee, 2002; Parker & Auerhahn, 1998).

According to van de Port (2001), the core of every definition of assassination should be based on the idea that assassinations are homicides between criminals. The main difference between drug-related homicides and assassinations is that an assassination is planned and a drug-related homicide is not. Kleemans, van den Berg & van de Bunt (1998, p. 101) mention an assassination as “the ultimate response to problems within the criminal circuit”. Others mention the strategic aspect of an assassination: to obtain, strengthen or maintain a position within the criminal milieu (Van Veen & De Vogel, 1998, as cited in van de Port, 2001). In this research, the following definition of assassination will be used: “homicide, committed by or on behalf of members of a criminal organization to obtain, persist or strengthen their position in the criminal milieu” (Slot 2009, as quoted in WODC 2017, p. 11). This definition has been widely used within research and reports of assassinations in the Netherlands.

So, in turn, a drug-related assassination is “a homicide, committed by or on behalf of members of a drug (trade) organization to obtain, persist or strengthen their position in the drug trade”. Based upon the definition of United Nations Office on Drugs and Crime, the following unlawful acts are included into the definition of drug trade: distribution (including sale), manufacture, cultivation or production of drugs not in connection with the use or possession of drugs for personal consumption (UNODC, 2015).

A criminal milieu homicide was regarded as a drug-related homicide when the homicide was a consequence of the aggressive patterns of interaction within the illegal drug market. Furthermore, a criminal milieu homicide was regarded as a (drug-related) assassination when the homicide was committed by/on behalf of members of a drug (trade)

organization to obtain, persist or strengthen their position in the drug market. Moreover, a criminal milieu homicides was considered as other drug-related homicide when the homicide had indications of being (systemic) drug-related, but too little was known about the homicide and the motive of the offender to label the homicide as drug-related.

For this analysis, the unknown cases were eliminated in order to create a more representative sample. Unknown cases had some indication of being systemic (drug-related/assassinations/other) homicides, however, too little was known about the homicide to make that judgement.

Definitions:

Drug-related homicide refers to "the unlawful death purposefully inflicted on a person by another person (homicide) as a consequence of the traditionally aggressive patterns of interaction within the system of drug distribution and sale"

Drug-related assassination refers to "homicide, committed by or on behalf of members of a drug (trade) organization to obtain, persist or strengthen their position in the drug trade"

3.2. Method & Operationalization

The goal of this study is to gain a contextualized insight into the spatial and temporal patterns of systemic drug-related homicides and assassinations in the Netherlands during 1992-2017. Quantitative methods will be used to analyse spatial and temporal clustering by using statistical tests (reliability analysis and correlation analyses). Throughout the study, deductive reasoning will be applied by explaining spatial and temporal patterns through the theory of drug market stability (Brownstein, Crimmins, & Spunt, 2000) and the social disorganization theory (Shaw & McKay, 1942). The following sections will discuss the method per (sub-)research question.

3.2.1. Spatial & Temporal Clustering

Research Question: "To what extent does spatial and temporal clustering apply to systemic drug-related homicides and assassinations in the Netherlands during 1992-2017 and how can this be explained?"

In total, 431 systemic drug-related homicides and assassinations were extracted from the Dutch Homicide Monitor (hereafter DHM) based on the following criteria: (1) the homicide was committed in the criminal milieu (Appendix A – Table 1 – TYPEHOM); (2) the

homicide was regarded as systemic drug-related (Appendix A – Table 1 – HOM_drugs); and (3) a distinction was made between: drug-related homicides, (drug-related) assassinations, and other (drug-related) homicides (Appendix A – Table 1 – DRH_HOMCD_c).

The sample size (N = 431) allows for spatial analysis and the extensive time frame (1992-2017) allows for the analysis of spatial and temporal trends for 26 years. Temporal variables are present in the DHM on the basis of years, months, and time period in which the crime occurred (morning, afternoon, evening, night). This temporal analysis allows for the detection of fluctuations, patterns or trends of systemic drug-related homicides. Spatial variables include the crime scene where the homicide was committed, the location, and the postal code of where the crime took place. The relevant temporal and spatial variables from the DHM are presented in Appendix A – Table 2 and 3.

Spatial statistical mapping will be used to gain a better understanding of spatial patterns of systemic drug-related homicides and assassinations (Prasannakumara, Vijitha, Charuthaa, & Geetha, 2011). Furthermore, spatial thinking can be used to identify patterns and give reasons for their occurrence or characteristics. For the mapping of these homicides, ArcGIS, a geographic information software programme will be used. This software allows for the mapping of 'incidents' while taking into account spatial and temporal aspects. Through mapping these 'incidents', hot spots and cold spots can be identified (Scott & Janikas, 2010).

The main objective of this analysis is to obtain more knowledge on spatial patterns of systemic drug-related homicides in the Netherlands. Moreover, systemic drug-related homicides in the Netherlands will be analysed using relevant data that could explain clustering in a certain areas and during certain periods (Section 3.2.2. Drug Market Stability and Section 3.2.3. Social Disorganization Theory).

3.2.2. Drug Market Stability

Sub-Research Question 1: "To what extent can the drug market stability theory by Brownstein, Crimmins & Spunt (2000) explain spatial and temporal patterns in systemic drug-related homicides and assassinations?"

The drug market stability theory of Brownstein, Crimmins & Spunt (2000) will be used to explain the spatial and temporal patterns of systemic drug-related homicides and assassinations. Due to the unavailability of data with regards to measurement of the proposed concepts by Brownstein, Crimmins & Spunt (2000), an alternative to measure drug market stability would be to look at some indirect measures related to the drug market.

First, the amount of drug seizures could indirectly measure drug market stability. These seizures tend to destabilize the drug market, as there are cases where drug trade actors retaliate on one another because they believe that their competitor has stolen the drugs. A discussion paper from Statistics Netherlands has reported on drug seizures per type of drug: heroin and cocaine, XTC and amphetamines, Nederwiet, and Cannabis (excl. Nederwiet) for the period 1995-2008 (Kazemier, Bruil, van de Steeg, & Rensman, 2012). So, the amount of drug seizures is expected to be positively correlated with the number of drug-related homicides.

Second, the number of dismantled production, storage, and waste dumping sites of synthetic drugs for 2007-2016 will be used to explain spatial and temporal patterns of the national drug market and systemic drug-related homicides (Trimbos Institute, 2018).

Third, drug use in local drug market can be analysed to gain more information about the spatial and temporal patterns of drug market(s) and systemic drug-related homicides. Sewage analysis can be used to gain insight into the local drug markets for the period 2011-2017 (EMCDDA, 2018). One would argue that the amount of drugs use positively correlates with the number of drug-related homicides. However, drug use in the national market could not be analysed properly as data available from the Trimbos Institute were only comparable for the period 2014-2016. This was due to the adaptation of measurements of drug use prevalence by the Trimbos Institute (Trimbos Institute, 2018).

3.2.3. Social Disorganization Theory

Sub-Research Question 2: "To what extent can the social disorganization theory by Shaw & McKay (1942) explain spatial and temporal patterns in systemic drug-related homicides and assassinations?"

The social disorganization theory, originally developed by Shaw & McKay (1942), will be used to explain spatial and temporal patterns of systemic drug-related homicides and assassinations. Several social phenomena, related to this theory, will be used to explain spatial and temporal patterns: socio-economic deprivation, ethnic heterogeneity and social cohesion.

First, socio-economic deprivation for G3 (Amsterdam, The Hague, Rotterdam) will be measured using data from Statistics Netherlands on average (standardized) disposable income per household, which are available for 2004-2014 on postal code level (Statistics Netherlands, 2017). The average standardized disposable income per household is the gross income minus paid income transfers (i.e. alimony from the former former spouse(e)), premiums for income insurance policies (i.e. for social insurance, national insurance, and private insurance related

to unemployment, incapacity to work, old-age, and surviving relatives) health insurance premiums, and tax on income and capital (Statistics Netherlands, 2017). This statistic has been standardized to account for differences in size and composition of the household. Expected will be that the average standardized disposable income per household negatively correlates with the number of drug-related homicides.

Second, ethnic heterogeneity will be analysed on a national level with the use of statistics on the percentage of non-western immigrants in the total population, from Statistics Netherlands, in order to explain temporal trends in systemic drug-related homicides. Moreover, ethnic heterogeneity will also be analysed using the percentage of non-western immigrants on a municipality level (Amsterdam, The Hague, Rotterdam) during the period of 1996-2017. The statistics distinguish between 1st and 2nd generation non-western immigrants. First generation non-western immigrants are persons whom have been born in a non-western country. Second generation non-western immigrants are persons from who at least one parent has been born in a non-western country (Statistics Netherlands, 2016). The percentage of non-western immigrants (of the total population) is expected to positively correlate with the number of drug-related homicides.

Third, residential mobility will be analysed on a city level basis for G3 (Amsterdam, The Hague, and Rotterdam) due to absence of data on postal code (PC4) level. Residential mobility will be measured by two statistics: residential mobility [7] (the number of moved persons) and relative residential mobility (per 1000 of the average population) (Statistics Netherlands, 2018). Based on prior academic research, one might expect that high residential mobility is connected to a high number of drug-related homicides.

Final, social cohesion will be analysed for G3: Amsterdam, The Hague, and Rotterdam on postal code level (PC4) in order to explain both spatial and temporal trends in systemic drug-related homicides. This aspect is based upon the relationship between low levels of social cohesion and increased probability of homicide (Nieuwbeerta, McCall, Elffers, & Wittebrood, 2008). In table 3, the available measurement data for social cohesion form the 'Leefbarometer' are shown, these were measured in 2002, 2008, 2012, 2014 and 2016 only (Ministry of the Interior and Kingdom Relations, 2018). Because of the unavailability of this data for other years, social cohesion data for postal codes for one year will apply to a 2-year/6-year time period of systemic drug-related homicides. For example,

[7] Residential mobility (region) is defined as the total of within municipality moved persons in the region plus half the sum of persons moved between municipalities (settlers plus departees) in the region
Residential mobility (Netherlands) is defined as the total of within municipality moved persons and between municipality moved persons

social cohesion data of 2012 will be applied on systemic drug-related homicides from July 1, 2011 until June 30, 2013, a 2-year time period (Table 3).

Table 3: Social cohesion per PC4 (postal code level) & systemic drug-related homicides in G3

Social cohesion PC4	**2012**	**2014**	**2016**
Systemic DRH	July 1, 2011 to June 30, 2013	July 1, 2013 to June 30, 2015	July 1, 2015 to June 30, 2017
Time span	2 years	2 years	2 years
Social cohesion PC4	**2002**	**2008**	**2014**
Systemic DRH	July 1, 1999 to June 30, 2005	July 1, 2005 to June 30, 2011	July 1, 2011 to June 30, 2017
Time span	6 years	6 years	6 years

3.3. Sources

The main source for data on systemic drug-related homicides and assassinations in the Netherlands is the Dutch Homicide Monitor (DHM). The database is part of the European Homicide Monitor (EHM), which currently includes Finland, Sweden, and the Netherlands. The DHM is an ongoing monitoring system, maintained by Leiden University and the Netherlands Institute for the Study of Crime and Law Enforcement (NSCR) (Liem, et al., 2013). The (overlapping) sources for this data on homicides include: national and local newspaper articles, police reports, information from the Public Prosecution Service, and interviews with investigators who were in charge of the homicide incident (Smit, Bijleveld, & van der Zee, 2001). The database offers detailed insight on the homicide, offender, and victim characteristics.

For the period of 1992-2017, all systemic drug-related homicides have been categorised into three categories: drug-related homicides, (drug-related) assassinations, and other (drug-related) homicides (or unknown). The coding manual of Liem & de Bont (2017) was used to gain more information on these systemic drug-related homicides. DRH variables were coded for all criminal milieu homicides, variables such as type of homicide within criminal milieu and relationship between victim and offender (Appendix A – Table 1 – VICOFFREL and CRIMMILTYPE).

Next to the data on homicides provide by the Dutch Homicide Monitor, other relevant data that will be used in this study includes: data on drug seizures by Statistics Netherlands (Kazemier, Bruil, van de Steeg, & Rensman, 2012); data on drug use from sewage water analysis (EMCDDA); data on drug use (the Trimbos Institute); and data on social

disorganization variables: socio-economic deprivation, ethnic heterogeneity, residential mobility, and social cohesion (Statistics Netherlands).

3.4. Reliability & Validity

The study's reliability is ensured by using the coding manuals of the Dutch Homicide Monitor (Granath et al., 2011; Liem & de Bont, 2017). These coding manuals allows for systematic gathering of in-depth knowledge about homicides and more specifically systemic drug-related homicides, such as information about the time and place of the act, the victim, the offender, etc.

The dark figure of crime, which describes the unreported and undiscovered crime, could be influencing the outcome of this study. According to Varano & Kuhns (2017), it can be difficult to measure systemic violence accurately, because this type of violence is often being unreported or misreported. Next to that, offenders of systemic drug-related homicides often remain unknown. Between 1992 and 2017, 32.7% (N = 375) of the total systemic drug-related homicides remained unsolved. This high rate of unsolved cases is especially the case for assassinations, where 59.9% (N = 147) of the assassinations remained unsolved.

4. Results

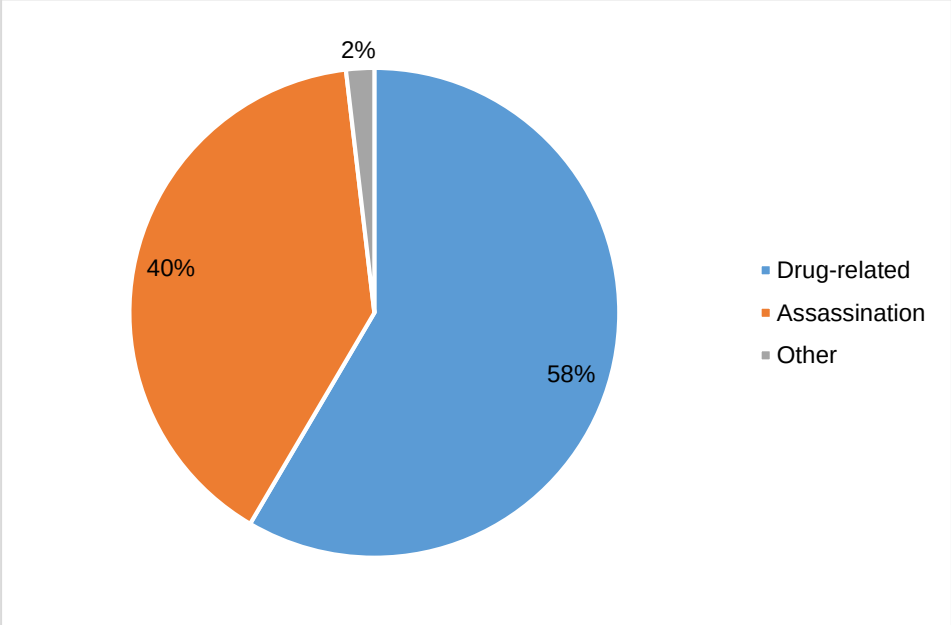
This chapter presents the analysis, which is divided into two parts: descriptive analysis and explanatory analysis. The first part of the chapter will elaborate on spatial and temporal patterns of systemic drug-related homicides in the Netherlands between 1992 and 2017. The second part will describe how the drug market stability theory by Brownstein, Crimmins & Spunt (2000) and the social disorganization theory by Shaw & McKay (1942) could explain spatial and temporal patterns with regard to systemic drug-related homicides.

4.1. Descriptive Results

In total, in the period 1992-2016, 4841 homicides were committed in the Netherlands. Between 1992 and 2016, 404 systemic drug-related homicides (hereafter DRH [8]) were committed in the Netherlands, accounting for 8.35% of all homicides (N = 4841).

With regard to the full period of this study (1992-2017), 431 systemic DRH were committed in the Netherlands. These 431 cases consist of 252 drug-related homicides, 171 (drug-related) assassinations, and 8 other (drug-related) homicides. Figure 1 shows a graphic representation of the distribution between the three categories.

Figure 1: Systemic DRH per category in the Netherlands (N = 431), 1992-2017



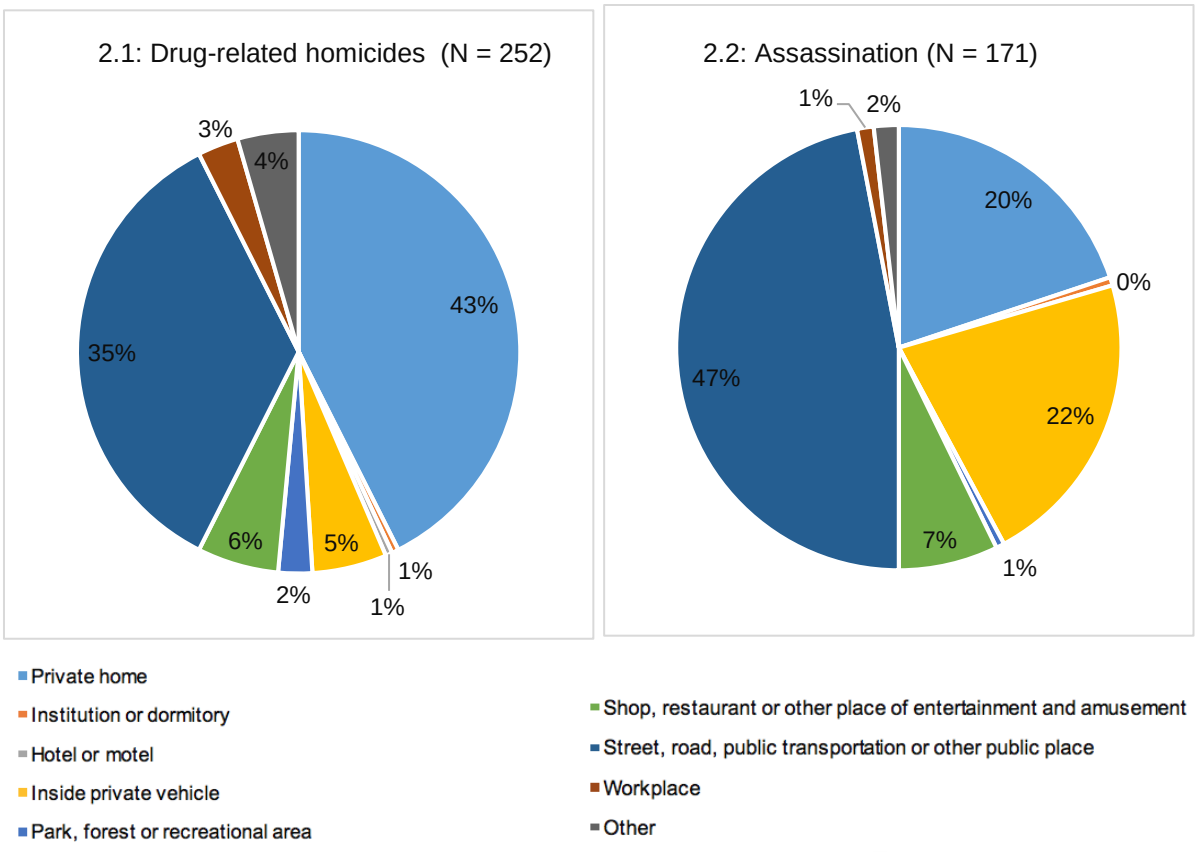
[8] Systemic DRH is comprised of all three categories: drug-related homicides, (drug-related) assassinations, and other (drug-related) homicides

Crime Scene

In total, systemic DRH between 1992-2017 were often committed in public places (N = 431; 40.7%). Next to that, systemic DRH were frequently committed in private homes (N = 431; 31.9%) and inside private vehicles (N = 431; 12.8%).

More specifically, Figure 2.1 illustrates that drug-related homicides were most often committed within private homes (N = 252; 42.6%), followed by public places (N = 252; 35.1%). Figure 2.2 indicates that assassinations (related to drugs) were most frequently committed in public places (N = 171; 47.0%) and inside private vehicles (N = 171; 21.7%). So, whereas drug-related homicides are committed more frequently in private places, assassinations tend to be committed more often in public places.

Figure 2.1 & 2.2: Crime scene per DRH category, 1992-2017 [9]



Type of Violence

According to Table 4, the major type of violence used in all systemic DRH (drug-related, assassination, other) is the use of firearm. More specifically, 63.7% of drug-related homicides (N = 252) were committed using a firearm. Other types of violence frequently used in drug-

[9] Crime scene of DRH category: Other can be found in Appendix B – Descriptive Results – Figure 1

related homicides are: knives or sharp objects/weapons (N = 252; 25.3%), blunt objects (N = 252; 2.5%), and hitting, kicking or other similar physical violence without weapons (N = 252; 2.5%).

The use of firearm is even more frequent in (drug-related) assassinations, as 95.8% (N = 171) was committed using a firearm. Other types of violence used in these assassinations include: knives or sharp objects/weapons (N = 171; 2.4%), bombs or explosives (N = 171; 1.2%), and blunt objects (N = 171; 0.6%).

Table 4: Type of violence used in systemic DRH per category in the Netherlands (N = 431), 1992-2017 [10]

	Drug-related homicides		**(Drug-related) assassinations**		**Other (drug-related) homicides**		**Total DRH**	
	N	**Valid %**	**N**	**Valid %**	**N**	**Valid %**	**N**	**Valid %**
Firearm	151	63.7	160	95.8	6	75.0	317	76.9
Knife or sharp object/weapon	60	25.3	4	2.4	2	25.0	66	16.0
Blunt object	6	2.5	1	0.6			7	1.7
Hitting, kicking or other similar physical violence without weapon	6	2.5					6	1.5
Hanging/Strangulation/ Suffocation	4	1.7					4	1.0
Bomb or explosive	1	0.4	2	1.2			3	0.7
Smoke or fire	3	1.3					3	0.7
Motor vehicle	2	0.8					2	0.5
Poisoning	1	0.4					1	0.2
Push or shove	1	0.4					1	0.2
Other	2	0.8					2	0.5
Total	237	100	167	100	8	100	412	100
Unknown	15		4		0		19	
Total (incl. unknown)	**252**		**171**		**8**		**431**	

Victims & Perpetrators

The results in Table 5 indicate that the average age of the victim was 34.86 years (N = 484), whereas the average age of the perpetrator was lower, which was 31.09 years (N = 477). The youngest perpetrator was 14 years old at the time of the homicide. Furthermore, systemic

[10] Percentages might not add up to 100% due to rounding

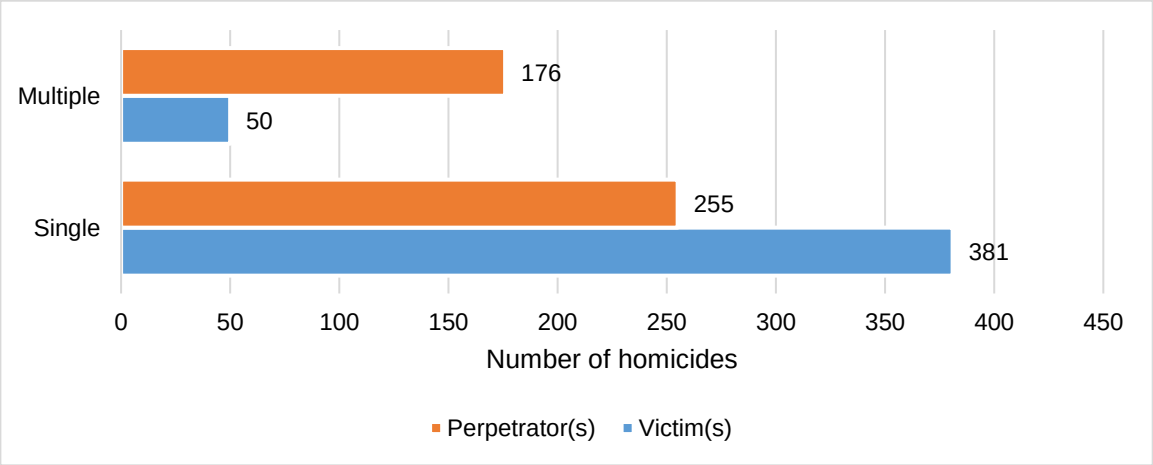
DRH committed in the Netherlands between 1992 and 2017 were mostly committed by men (N = 575, 97.4%) and almost all victims were men (N = 490, 96.1%).

Table 5: Victim & perpetrator characteristics of systemic DRH in the Netherlands (N = 431), 1992-2017

	Victim	N	Perpetrator	N
Mean age in years (standard deviation)	34.86(±10.669)	484	31.09(±8.956)	477
Minimum (age)	6	484	14	477
Maximum (age)	70	484	66	477
Male (valid %)	96.1	490	97.4	575
Female (valid %)	3.9	490	2.6	575

Figure 3 infers that, between 1992 and 2017, 381 out of the 431 systemic DRH cases (N = 431; 88.4%) involved one victim, and 50 out of the 431 systemic DRH cases (N = 431; 11.6%) involved multiple victims. Furthermore, in 255 out of the 431 cases (N = 431; 59.2%) only one perpetrator was involved, and 176 out of the 431 systemic DRH cases (N = 431; 40.8%) involved multiple perpetrators. On average, 1.75 perpetrators were involved per systemic DRH.

Figure 3: Systemic DRH & number of victims and perpetrators in the Netherlands (N = 431), 1992-2017



4.1.1. Spatial Descriptives

National Level

Figure 4 shows all systemic DRH between 1992-2017 based on the location where the homicide was committed. A clear concentration of systemic DRH can be found in south-western part of the Netherlands (with exception of the province Zeeland). This concentration

is especially present in the so-called Randstad [11]: in and around Amsterdam, Rotterdam, and The Hague.

Figure 4: Number of systemic DRH per geographic location in the Netherlands (N = 431), 1992-2017

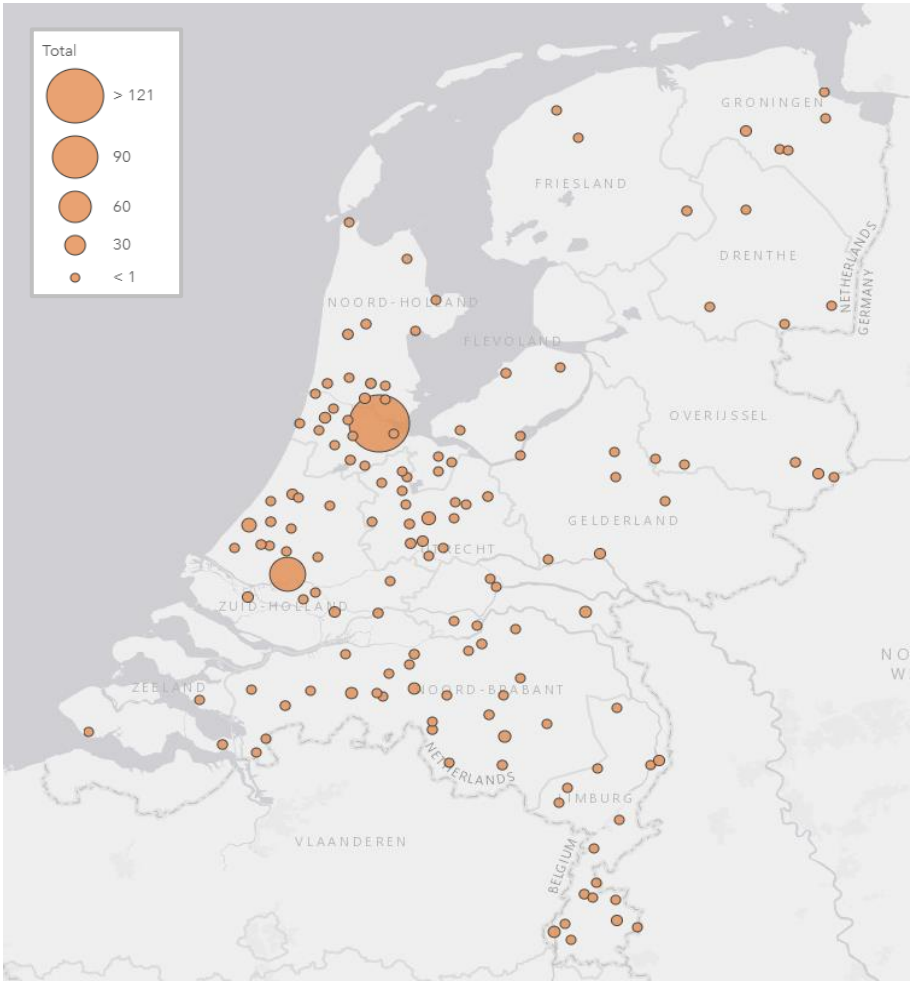


Figure 5 illustrates the number and percentage of systemic DRH per province between 1992 and 2017. North Holland has the highest occurrence of systemic DRH with 38.3%, followed by South Holland with 23.7% and North Brabant with 11.6%. Other provinces with a high incidence of systemic DRH are Utrecht (7.2%), Limburg (7%), and Gelderland (4.4%). In all other provinces (Groningen, Friesland, Drenthe, Flevoland, Overijssel, and Zeeland) less than 10 systemic DRH were committed between 1992-2017. In Appendix B – Descriptive Results – Table 1, the DRH categories are displayed per province.

[11] The 'Randstad' (Randstad Holland) is a concurbation in the Netherlands consisting of a ring of urbanization around a more rural area (het Groene Hart). It consists of the four biggest cities in the Netherlands: Amsterdam, Rotterdam, The Hague, and Utrecht.

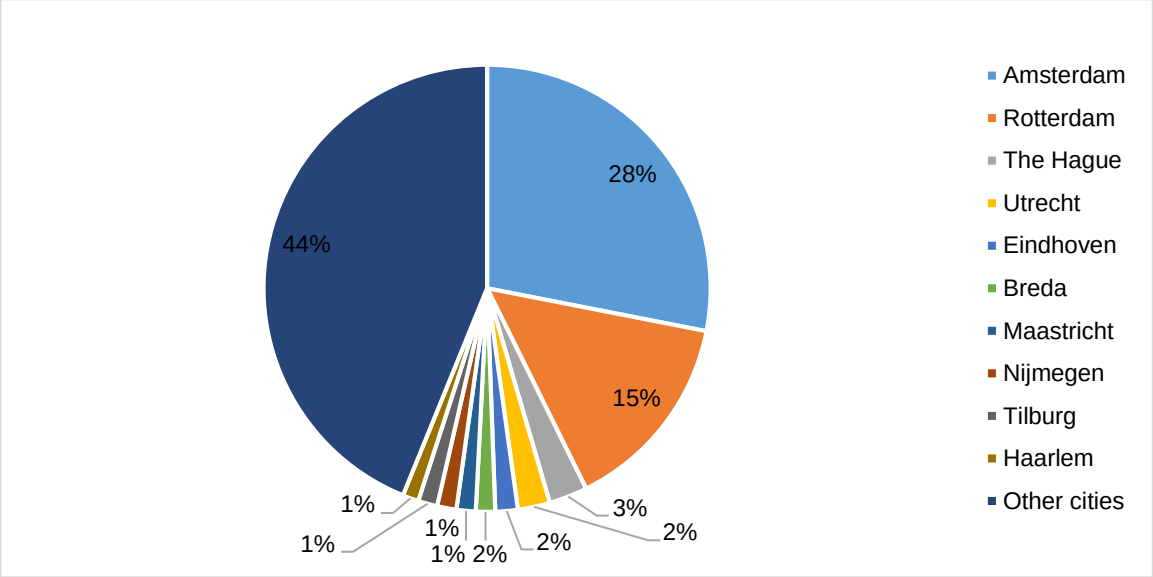
Figure 5: Number & percentage of systemic DRH per province in the Netherlands, 1992-2017

G10

The amount of systemic DRH per city (G10) is shown in Figure 6. Around 46% of all systemic DRH (N = 431) were committed in the G3: Amsterdam, Rotterdam, and The Hague. Approximately 56% of all systemic DRH were committed in the G10 [12]. In Appendix B – Descriptive Results – Table 2, the DRH categories are shown by G10 city.

[12] G10 consists out of the following cities: Amsterdam, Rotterdam, The Hague, Utrecht, Eindhoven, Breda, Maastricht, Nijmegen, Tilburg, and Haarlem

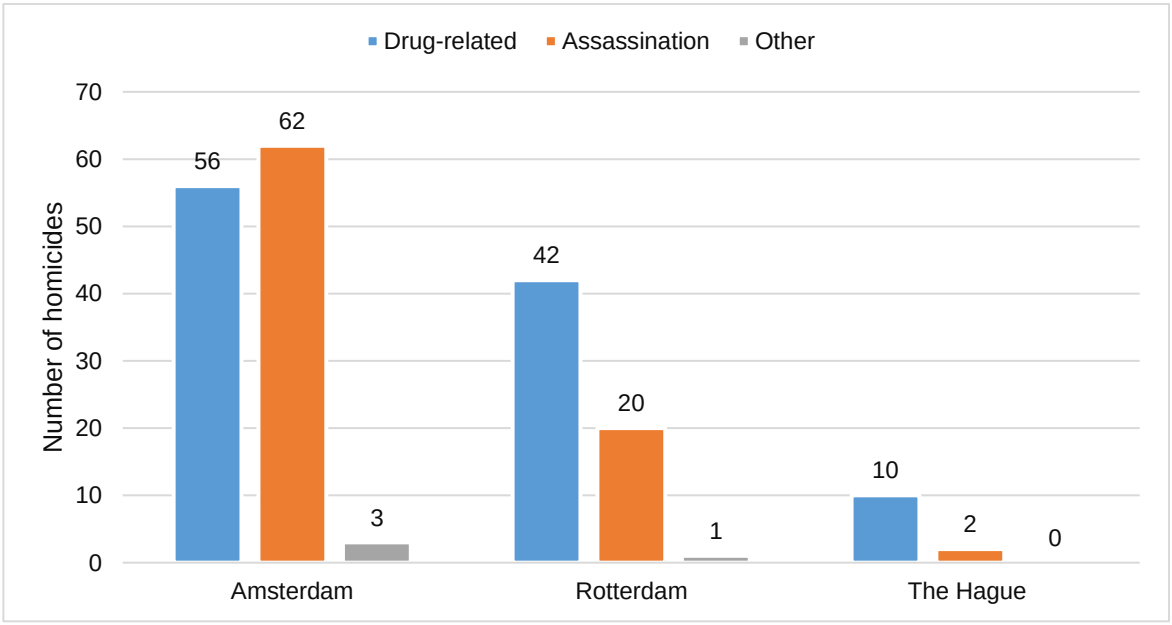
Figure 6: Total systemic DRH per city (G10) in the Netherlands, 1992-2017



G3

Figure 7 displays the categorisation of systemic DRH for G3: drug-related homicides, (drug-related) assassinations, and other (drug-related) homicides. The majority of systemic DRH in Amsterdam between 1992-2017 were (drug-related) assassinations. The majority of systemic DRH in Rotterdam and The Hague were drug-related homicides.

Figure 7: Systemic DRH categories by city (G3) in the Netherlands, 1992-2017



To conclude, 73.6% of all systemic DRH between 1992-2017 were committed in North Holland, South Holland and North Brabant. So, most homicides are clustered in the

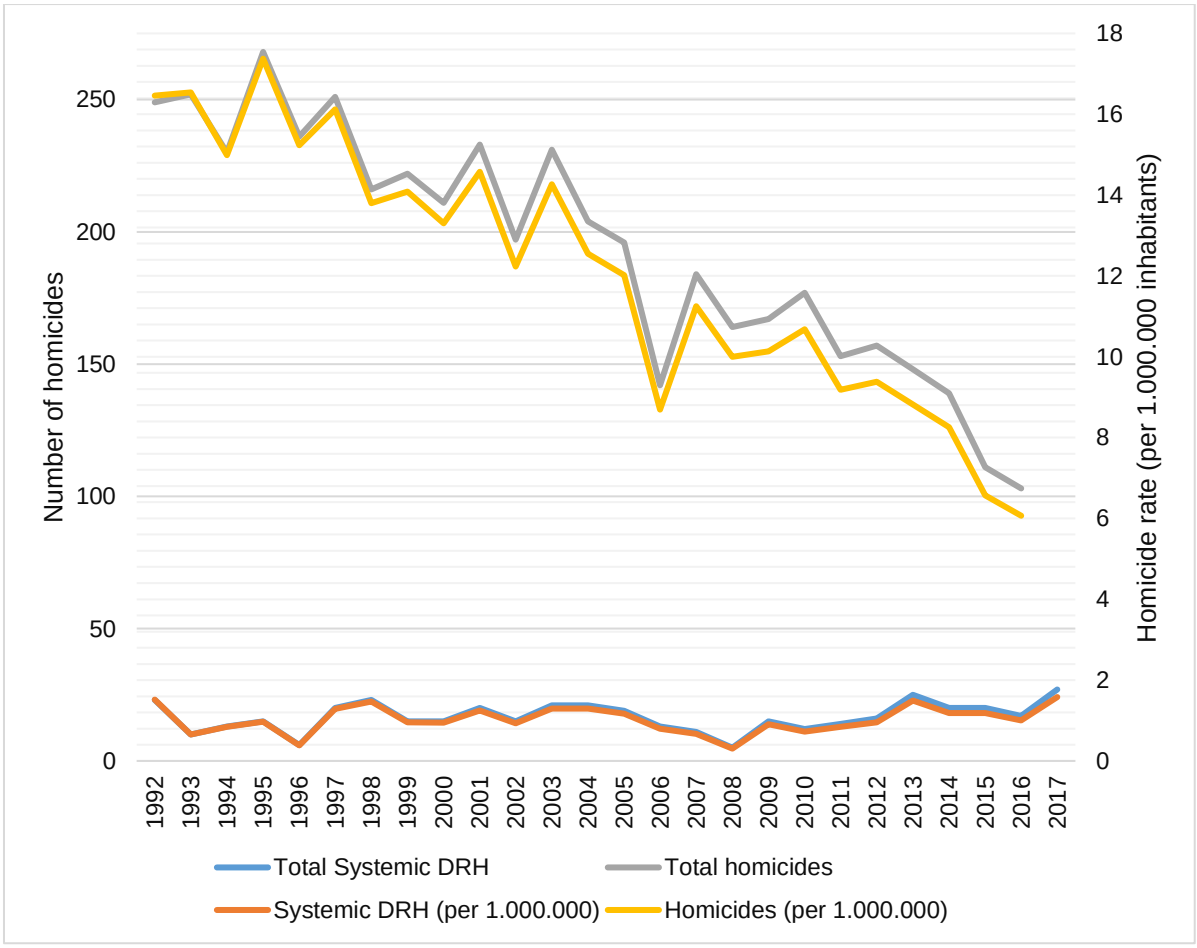
south-western part of the Netherlands (with exception of the province Zeeland). Furthermore, 46% of all systemic DRH were committed in Amsterdam, The Hague and Rotterdam.

4.1.2. Temporal Descriptives

Annual

A graphic representation of the total number and rate (per 1.000.000 inhabitants) of total homicides and systemic DRH is shown in Figure 8. The total number of homicides has been declining rapidly between 1992 and 2016. The total homicide rate per 1.000.000 inhabitants ranges from 6.07-16.54 between 1992 and 2016 [13]. The total number of systemic DRH has not remained stable over the years. The rate of systemic DRH per 1.000.000 inhabitants varies from 0.35-1.58 between 1992 and 2017. Though, an increasing trend in systemic DRH from 2008 until 2017 can be observed.

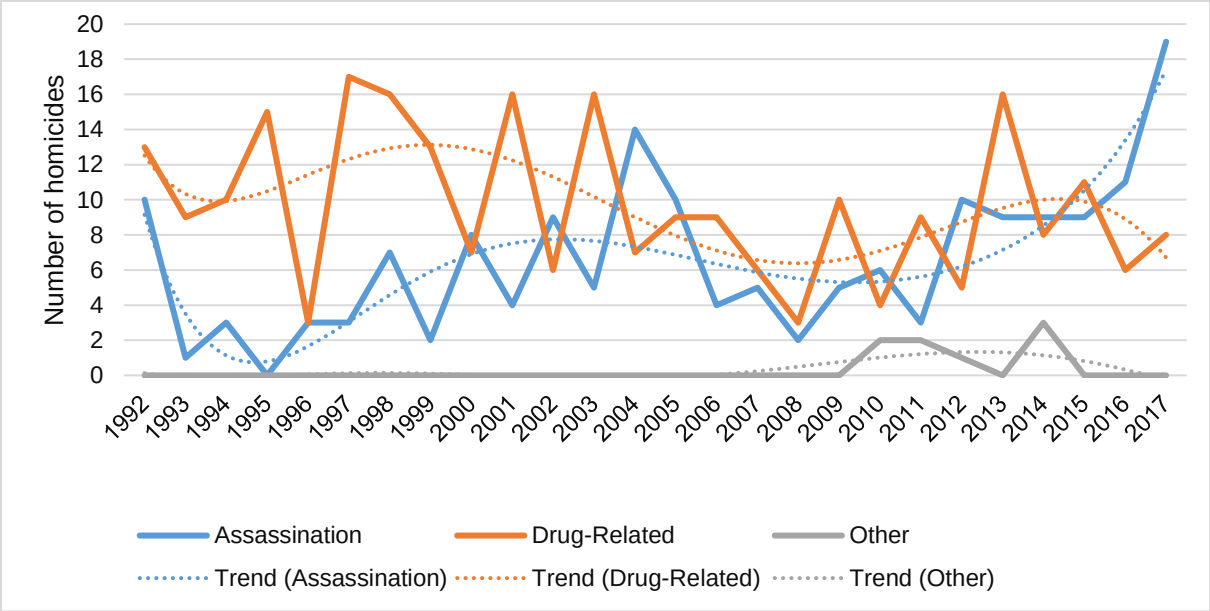
Figure 8: Total homicides & systemic DRH per year in the Netherlands, 1992-2017



[13] The number of overall/total homicide and the accompanying rates (per 1.000.000) might be subject to change as the Dutch Homicide Monitor is updated continuously

For the different categories of systemic DRH, fluctuations can be observed in both the number of drug-related homicides and assassinations over time (Figure 9). Next to that, an increasing trend, corresponding with the increasing trend in total systemic DRH, can be identified for assassinations between 2011-2017. This might possibly be connected to a the 'Mocro War' conflict in the Dutch drug market. During 2012-2015, at least 8 actors involved in this 'Mocro War' were assassinated [14]. However, a closer look needs to be taken to these (and other) assassinations during this time period (2011-2017) to find a conclusive answer.

Figure 9: Systemic DRH categories per year in the Netherlands (N = 431), 1992-2017



Monthly

The results presented in Figure 10 illustrate that most drug-related homicides between 1992 and 2015 were committed in January, whereas most assassination were committed in April and May. The least drug-related homicides were committed in February, August, and October, whereas the least assassinations were committed from June to September. Furthermore, Table 6 suggests that most (total) systemic DRH between 1992-2017 were committed in January and April, whereas the least (total) systemic DRH were committed in August and October.

[14] Homicides connected to the Mocro War: Redouan Boutaka (31, 2012), Najeb Bouhbouh (34, Belgium, 2012), Rida Bennajem (21, 2013), Souhail Laachir (26, 2013), Alexander Gillis (30, 2014), Mohamed el Mayouri (30, 2014), Gwenette Martha (40, 2014), Marchano Pocorni (37, Suriname, 2015)

Figure 10: Monthly distribution of systemic DRH per category in the Netherlands (N = 431), 1992-2017

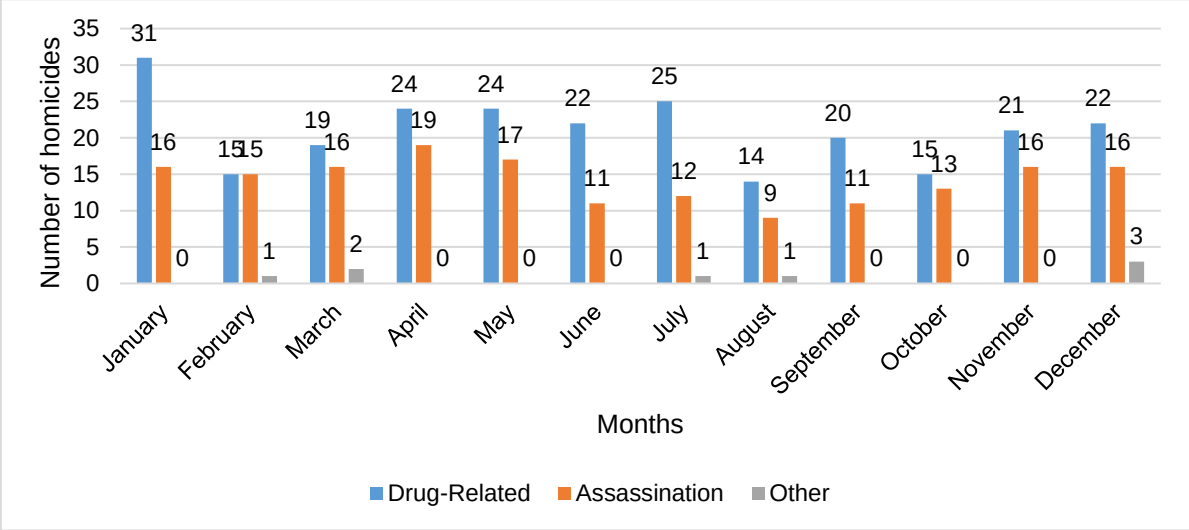


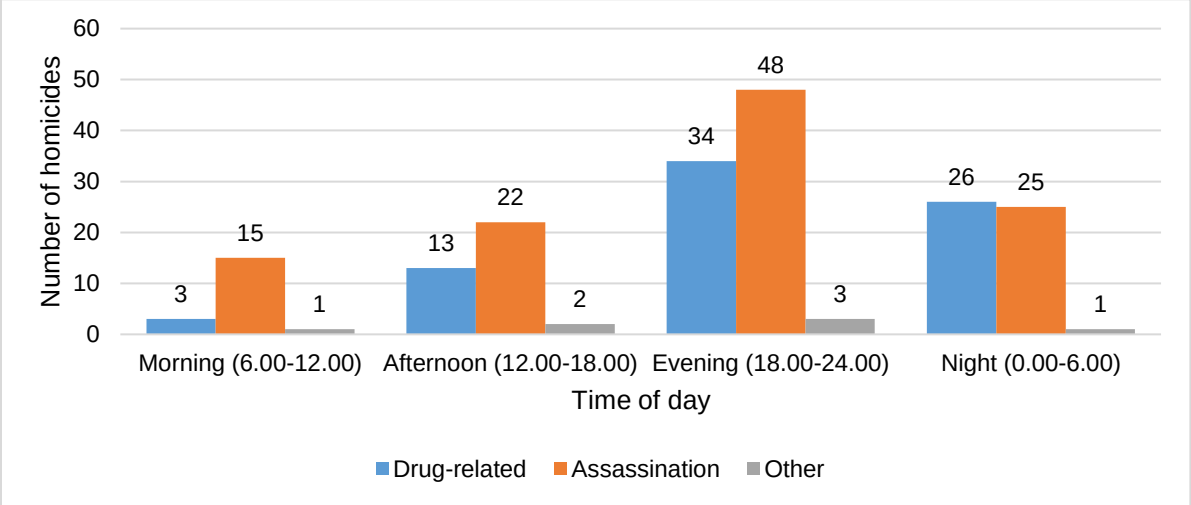
Table 6: Monthly distribution of total systemic DRH in the Netherlands (N = 431), 1992-2017

	January	February	March	April	May	June	July	August	September	October	November	December
Total systemic DRH	47	31	37	43	41	33	38	24	31	28	37	41

Time of Day

For 55.2% (N = 431) of the cases, the time of day the homicide was committed remained unknown. This could be explained by both missing information on the time of day as well as missing information about the homicide itself, i.e. because the body of the victim was found elsewhere or later. From all known times of day, most systemic DRH were committed during the evening (85 cases) and the least DRH were committed during the morning (19 cases). Figure 11 shows that most drug-related homicides were committed during the evening and the night. Most assassinations were also committed during the evening and the night, however assassinations were committed more often in the morning and afternoon compared to drug-related homicides.

Figure 11: Time of day distribution of systemic DRH per category in the Netherlands (N = 76), 1992-2017



To summarize, during 1992-2017, the number of drug-related homicides and (drug-related) assassinations is fluctuating. Nevertheless, in the period 2011-2017, an increasing trend in (drug-related) assassinations can be identified. Drug-related homicides between 1992-2017 occurred mostly in January, whereas (drug-related) assassinations were committed in April and May. In total, most systemic DRH (drug-related homicides and assassinations) were committed in January and April. Furthermore, most drug-related homicides and assassinations were committed in the afternoon and the evening.

4.2. Explanatory Results

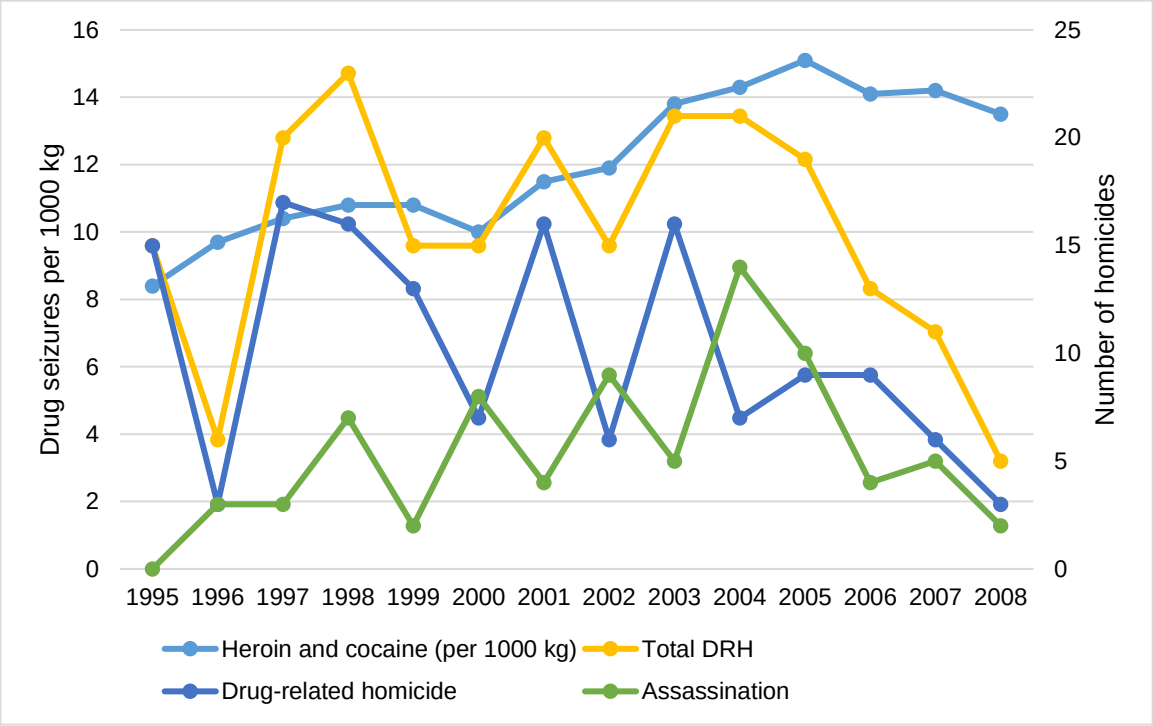
The following sub-chapter will address the spatial and temporal patterns of systemic DRH and use the drug market stability theory (Brownstein, Crimmins, & Spunt, 2000) and the social disorganization theory (Shaw & McKay, 1942) to explain these patterns.

4.2.1. Drug Market Stability

Drug seizures

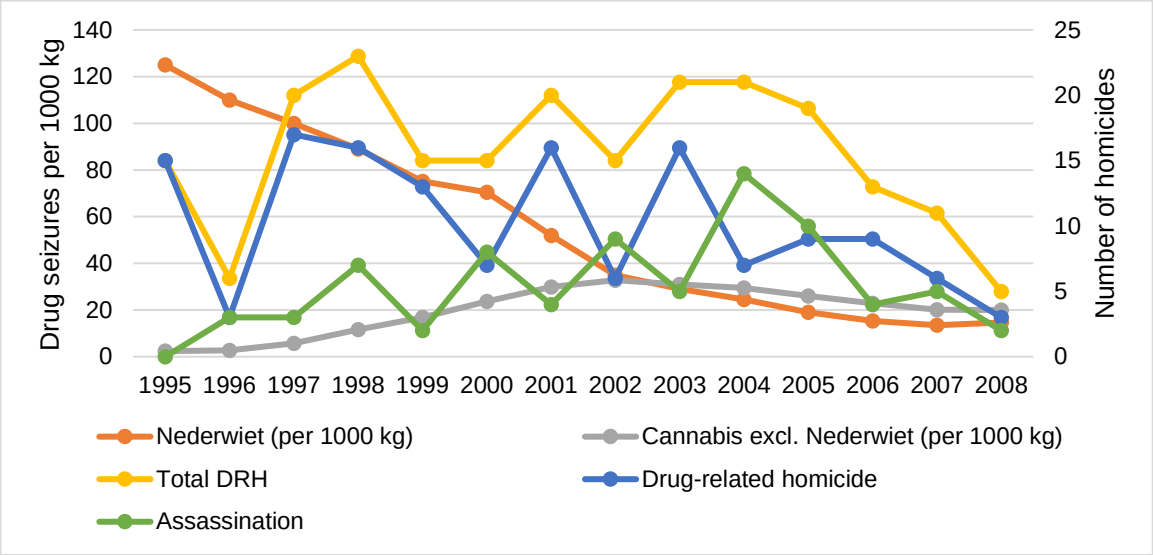
Below, in Figure 12.1, 12.2, and 12.3, the different type of drug seizures and the total systemic DRH, drug-related homicides and (drug-related) assassinations are exhibited. First, Figure 12.1 indicates that when heroin and cocaine seizures were increasing between 2000-2004, drug-related homicides and assassinations fluctuated heavily per year. Furthermore, heroin and cocaine seizures remained relatively stable between 2004-2008, whereas total DRH, drug-related homicides, and assassinations all decreased.

Figure 12.1: Heroin and cocaine seizures (5-years moving average) & DRH categories in the Netherlands, 1995-2008



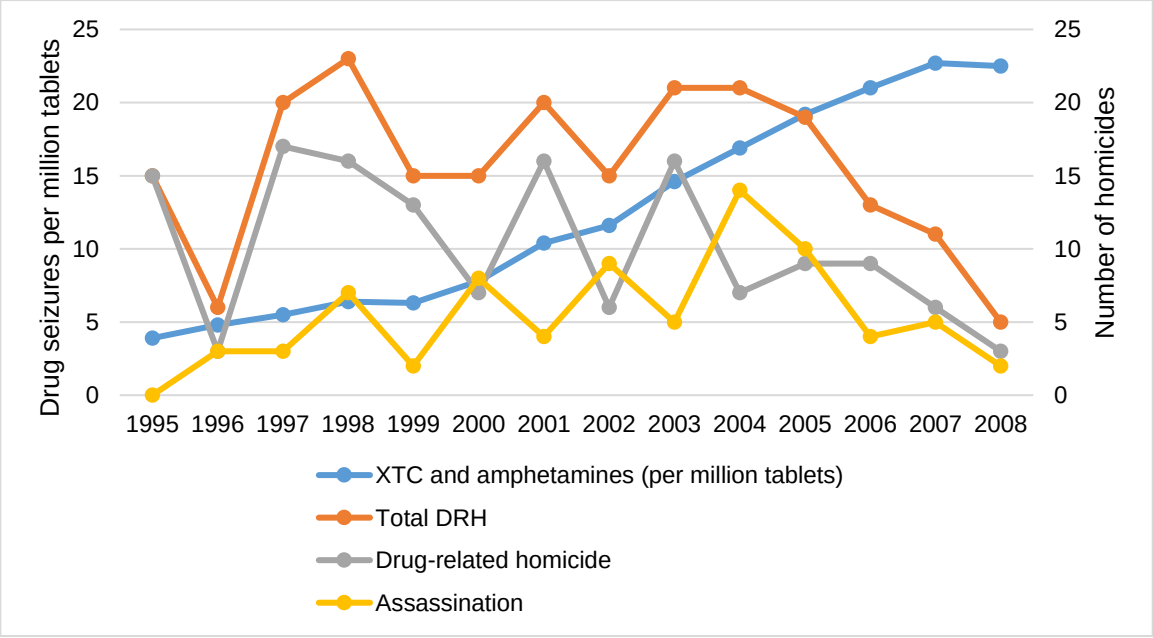
Second, Figure 12.2 illustrates an overall decreasing trend in Nederwiet seizures between 1995-2008, while cannabis (excluding Nederwiet) seizures were increasing up to 2002 and decreasing after 2002. From 2004, a decreasing trend in total systemic DRH is also visible. As Nederwiet and cannabis seizures are decreasing, total systemic DRH decrease as well between 2004-2008. The decrease in total systemic DRH might be connected to a decrease in Nederwiet and cannabis seizures during 2004-2008. As drug seizures decreased in the Netherlands, drug trade actors may have been less prone to retaliate on one another (because relatively less drugs had been seized), which may have resulted in a lower number of total systemic DRH.

Figure 12.2: Nederwiet and cannabis seizures (5-years moving average) & DRH categories in the Netherlands, 1995-2008



Third, Figure 12.3 shows an overall increasing trend in XTC and amphetamines seizures between 1995-2008. In the period 2004-2008, total systemic DRH and (drug-related) assassinations have been decreasing. Before 2004, total systemic DRH, drug-related homicides and assassinations have been fluctuating per year. Nevertheless, the number of assassinations between 1995-2004 shows an increasing (but fluctuating) trend accompanied by an increase in XTC and amphetamines seizures.

Figure 12.3: XTC and amphetamines seizures (5-years moving average) & DRH categories in the Netherlands, 1995-2008



While predicted was that the amount of drug seizures would be positively related to number of total systemic DRH, drug-related homicides, and assassinations, mixed results show otherwise. These mixed results might also be the consequence of different trends between the different types of drug seizures (heroin and cocaine; XTC and amphetamines; Nederwiet; and Cannabis excl. Nederwiet). As it turned out, all different types of drug seizures were found to be correlated, either positively or negatively.

Heroin & cocaine seizures, XTC & amphetamines seizures, and Nederwiet seizures were found to be strong, positively correlated with one another. These 3 variables were summed into one variable, as the Cronbach's Alpha of the reliability analysis [15] was $\alpha = .693$ (N of items = 3). Table 7 indicates that the sum seizures (heroine & cocaine, XTC & amphetamines, and Nederwiet) was found to be positively correlated with the number of (drug-related) assassinations per year (r_s (14) = .699, p <.01). However, due to the small number of observations, the correlation does not have strong statistical power.

On a critical note, as the data on homicides has not reported on the type of drug that was involved in drug-related homicides and assassinations, which makes it is hard to determine the relationship between drug seizures and systemic DRH.

Table 7: Correlations: drug seizures & number of DRH per year in the Netherlands, 1995-2008

Time period: 1995-2008	**Sum seizures (heroin & cocaine, XTC & amphetamines, and Nederwiet)**			**Cannabis excl. Nederwiet seizures**		
	r_s	***p-value***	**N**	***r***	***p-value***	**N**
Total systemic DRH per year	.169	.563	14	.054	.855	14
Drug-related homicides per year	-.191	.514	14	.391	.167	14
(Drug-related) assassinations per year	.699**	<.01	14	-.451	.106	14

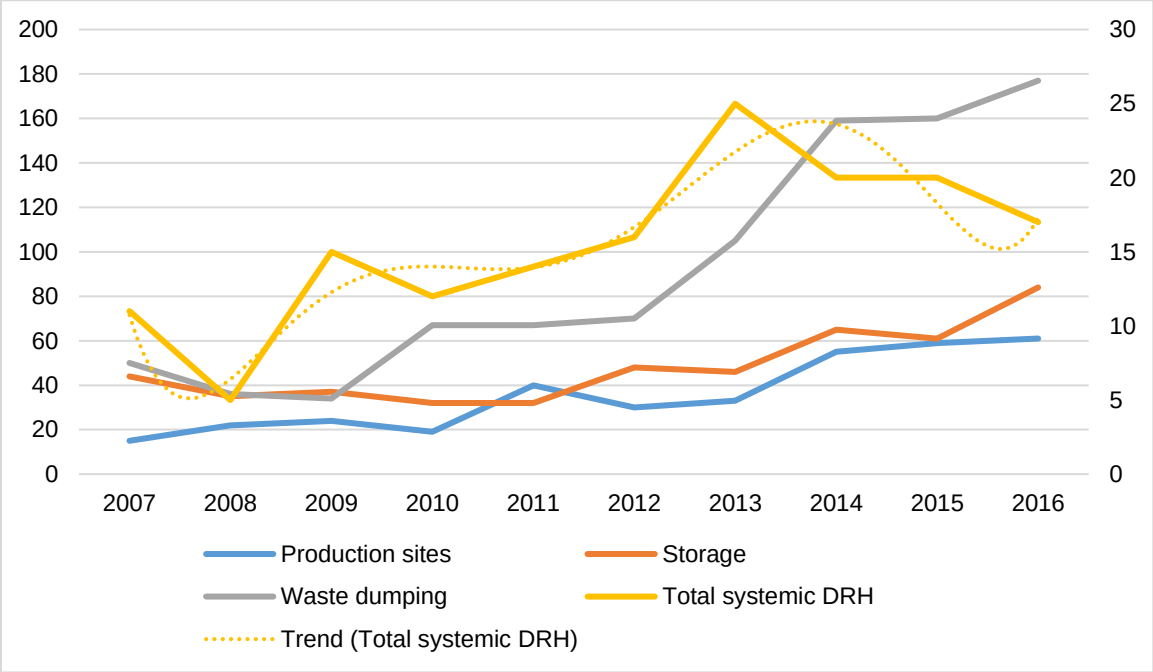
Dismantled synthetic drug sites (production, storage, and waste dumping)

Additionally, the Trimbos Institute has reported the number of dismantled production sites, storage sites, and waste dumping sites in the Netherlands between 2007-2016 (Trimbos Institute, 2018). Figure 13 indicates that the number of dismantlement of production, storage, and waste dumping sites was increasing between 2007 and 2013. The number of systemic

[15] Treshold for summing of variables: $\alpha > .6$

DRH also shows an increasing trend, however, after 2013 the number of systemic DRH seems to drop (note: for 2017, 27 systemic DRH were committed, indicating an increase).

Figure 13: The number of dismantled production sites, storage sites, & waste dumping sites of synthetic drugs &total DRH in the Netherlands, 2007-2016



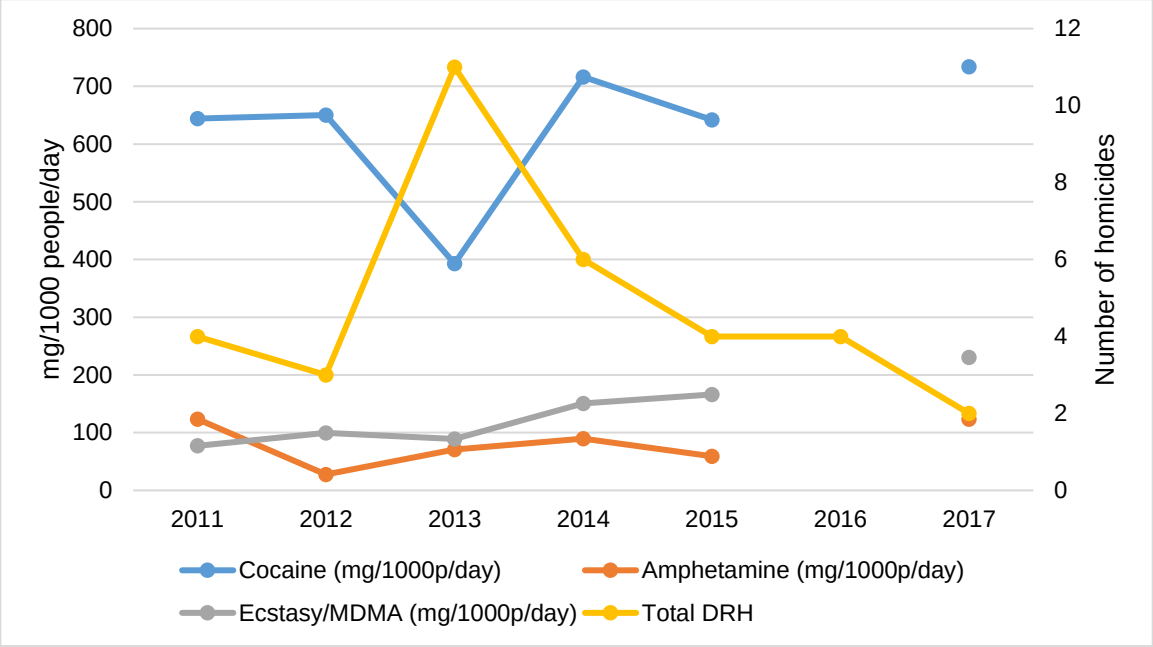
Wastewater

The European Monitoring Centre for Drugs & Drug Addiction (EMCDDA) analyses wastewater at wastewater treatment plants for traces of drugs. This method allows scientists to estimate the drug-taking habits of people living near these wastewater treatment plants (EMCDDA, 2018). In the Netherlands, wastewater analysis has been performed in wastewater treatment plants in Amsterdam, Eindhoven, and Utrecht.

Figure 14 displays the quantities of the different types of drugs: cocaine, amphetamine, and ecstasy/MDMA with the total systemic drug-related homicides in Amsterdam. Figures regarding quantities of drugs inside sewage water and total systemic drug-related homicides in Eindhoven and Utrecht can be found in Appendix C – Explanatory Results – Figure 1 & 2, due to relatively few DRH during 2011-2017 in these cities.

The amount of cocaine (in mg/1000 people/day) seems to negatively influence the number of systemic drug-related homicides in Amsterdam, as total systemic drug-related homicides peaked in 2013, whereas the amount of cocaine in sewage water was at its lowest.

Figure 14: Quantities of drugs inside sewage water & total DRH in Amsterdam, 2011-2017



The relationship between drug seizures and the amount of DRH (drug-related homicides and assassinations) seems to be mixed. For cases of drug-related homicides and assassinations the type of drugs involved that might have been connected to the case was not reported, which made it difficult to distinguish the effects of different types of drug seizures on these homicides. Furthermore, regarding drug use, both in drug use reported by Trimbos and sewage water analysis no clear pattern could be found between drug use and the amount of DRH (drug-related homicides and assassinations).

Together, the sewage water analysis measuring drug use, the number of dismantled (production, storage, and waste dumping) sites, and the amount of drug seizures were used as indirect measures for the concept of drug market stability. However, these indirect measures cannot sufficiently explain spatial and temporal trends in systemic drug-related homicides and assassinations. So, the drug market stability theory cannot be applied sufficiently in the Dutch context due to absence of vital data to compare different types of drug seizures with drug-related homicides and assassinations.

4.2.2. Social Disorganization Theory

Socio-economic deprivation

In this analysis, socio-economic deprivation was measured by the proxy: average standardized disposable income per household. A Spearman rank-order correlation analysis was performed due to non-normality of the variables. The average standardized disposable income per

household (on city level) did not significantly correlate with the number of total drug-related homicides on (r_s (28) = -.291, p = .119), drug-related homicides (r_s (28) = -.096, p = .615) or other homicides (r_s (28) = .009, p = .961) within the G3. There was a moderate, negative correlation between average standardized disposable income per household on city level (G3) and the number of (drug-related) assassinations, which was statistically significant (r_s (28) = -.439, p = .015).

Ethnic heterogeneity

A Spearman rank-order correlation analysis (Table 8) illustrates that the percentage of 1st and 2nd generation non-western immigrants (of the total population) did not correlate with the number of total systemic DRH, drug-related homicides and (drug-related) assassinations per year. So, the percentage of 1st and 2nd generation non-western immigrants in the G3 did not seem to influence the number of total systemic DRH, drug-related homicides, and (drug-related) assassinations in the G3.

Table 8: Spearman rank-order correlations: percentage of 1st & 2nd non-western immigrants & DRH in G3 (city level), 1996-2017

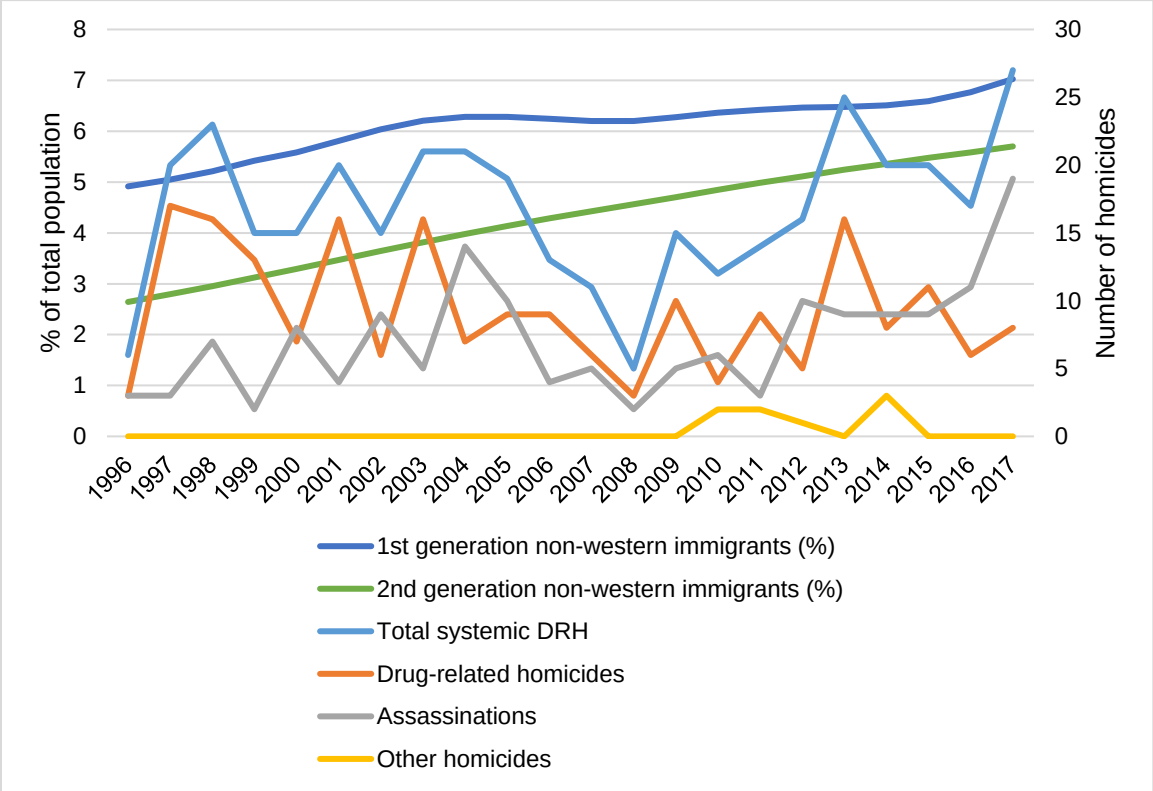
Time period: 1996-2017	**% of 1st generation non-western immigrants (of total population)**			**% 2nd generation non-western immigrants (of total population)**		
	r_s	***p-value***	**N**	***r_s***	***p-value***	**N**
Total systemic DRH per year	.018	.844	66	.140	.263	66
Drug-related homicides per year	.002	.987	66	-.128	.305	66
(Drug-related) assassinations per year	-.006	.965	66	.187	.133	66

However, a Spearman rank-order correlation analysis showed that there was a strong, positive correlation between the number of (drug-related) assassinations committed per year in the Netherlands and the percentage of 1st generation non-western immigrants (r_s (22) = .662, p < .01), and 2nd generation non-western immigrants in the Netherlands (r_s (22) = .521, p = .013), which were statistically significant.

Additionally, Figure 15 indicates that both percentage of 1st and 2nd generation non-western immigrants has been slowly increasing in the Netherlands. The number of assassinations has also been increasing since 2011. However, according to the correlations

analyses performed (on different levels) above, no clear association between the number of the percentage of (1st and 2nd generation) non-western immigrants (of the total population) and total systemic DRH, drug-related homicides, or (drug-related) assassinations was found.

Figure 15: Percentage of non-western immigrants & DRH in the Netherlands, 1996-2017



Residential mobility

Residential mobility was measured using two residential mobility statistics from the CBS (Statistics Netherlands, 2018). These statistics include: residential mobility [16] (the number of moved persons) and relative residential mobility (per 1000 of the average population). Spearman rank-order correlation analyses were conducted in order to determine whether there was any relationship between the number of DRH and residential mobility.

The analysis showed that on city level (G3: Amsterdam, The Hague and Rotterdam), relative residential mobility did not correlate with the number of total systemic DRH, drug-related homicides, (drug-related) assassinations or other homicides per year (Table 9). Nevertheless, residential mobility (number) per year significantly and positively correlated

[16] Residential mobility (region) → total of within municipality moved persons in the region plus half the sum of persons moved between municipalities (settlers plus departees) in the region
Residential mobility (Netherlands) → total of within municipality moved persons and between municipality moved persons

with total systemic DRH, drug-related homicides and (drug-related) assassinations per year. So, cities with high residential mobility (number of moved persons) tend to have a higher rate of systemic DRH (drug-related homicides and assassinations).

Table 9: Spearman rank-order correlations: residential mobility & DRH in the G3 per year, 1992-2017 [17]

Time period: 1992-2017	**Residential mobility (number)**			**Relative residential mobility (per 1000 of the average population)**		
	r_s	***p-value***	**N**	r_s	***p-value***	**N**
Total systemic DRH per year	.714**	<.01	78	.057	.619	78
Drug-related homicides per year	.409**	<.01	78	.097	.398	78
(Drug-related) assassinations per year	.609**	<.01	78	-.017	.880	78

Social Cohesion (2002-2014)

In order to analyse whether social cohesion scores per postal code (for G3) are different for when homicides were committed or not (per postal code), a Mann-Whitney U test was performed with homicide committed (yes/no) on average social cohesion score. The accompanying hypotheses are displayed below.

H_0 *The median social cohesion score (2002-2014) does not differ between postal codes in the G3 where drug-related homicides (total DRH) were committed or not*

H_1 *The median social cohesion score (2002-2014) differs between postal codes in the G3 where drug-related homicides (total DRH) were committed or not*

The test (Table 10.1 & 10.2) indicated a statistically significant group difference: U = 3497.50 p = .039. So, H_0 was rejected and H_1 was accepted. The value of the mean rankings indicates that postal codes (within G3) with drug-related homicides (DRH) had a lower social cohesion score (*MR* = 86.49; *Mdn* = 4) than postal codes (within G3) without drug-related homicides (DRH) (*MR* = 103.89; *Mdn* = 6). This test implies that systemic DRH were committed in postal codes with lower social cohesion.

[17] ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 10.1 & 10.2: Mann-Whitney U test (2002-2014): Social cohesion (PC4) and DRH (yes/no)

(10.1) Time period: 2002-2014	DRH in PC4 (yes/no)	N	Mean rank	Sum of ranks
Average social cohesion per PC4	Yes	66	86.49	5708.50
	No	129	103.89	13401.50
	Total	195		

(10.2) Time period: 2002-2014	Average social cohesion per PC4 [18]
Mann-Whitney U	3497.50
Wilcoxon W	5708.50
Z	-2.066
Significance (2-tailed)	.039

Additionally, a Spearman rank-order correlation analysis was performed (Table 11), which also indicated a small negative, statistically significant, correlation between the average social cohesion score (2002-2014) and total systemic DRH (r_s (195) = -.148, p = .039). This analysis also concludes that postal codes with one (or multiple) systemic DRH have a lower social cohesion score compared to postal codes without systemic DRH.

Table 11: Spearman rank-order correlations: average social cohesion & total DRH per PC4 (G3)

Time period: 2002-2014	Average social cohesion & DRH per PC4 [19]		
	r_s	*p-value*	N
Total systemic DRH	-.148*	.039	195
Drug-related homicides	-.110	.125	195
(Drug-related) assassinations	-.073	.314	195

In Appendix C – Explanatory Results – *Social cohesion (2012-2016)*, a similar Mann-Whitney U test was performed, concluding also that postal codes with systemic drug-related homicides (DRH) had a lower social cohesion score than postal codes (within the G3) without systemic drug-related homicides (DRH).

[18] Grouping variable: DRH in PC4 (yes/no)
[19] ** Correlation is significant at the 0.01 level (2-tailed).
***** Correlation is significant at the 0.05 level (2-tailed).

Ethnic heterogeneity & social cohesion

The two concepts measured in the analysis above, ethnic heterogeneity (the percentage of non-western immigrants of the total population) and social cohesion, also negatively correlate with one another. These relationships were all strong correlations (above r_s = -.846) and statistically significant (p <.01) (Table 12).

Table 12: Spearman rank-order correlations: percentage of non-western immigrants & social cohesion per PC4 (G3) [20]

	Percentage of non-western immigrants (2002, 2008, and 2012)		
	r_s	***p-value***	**N**
Social cohesion 2002	-.854**	<.01	189
Social cohesion 2008	-.846**	<.01	192
Social cohesion 2012	-.851**	<.01	196

Spatio-temporal analysis G3: Amsterdam, The Hague, and Rotterdam

The following spatio-temporal analysis includes 3 time periods on the basis of the following social cohesion scores: 2012 (systemic DRH: July 1, 2011 to June 30, 2013), 2014 (systemic DRH: July 1, 2013 to June 30, 2015), and 2016 (systemic DRH: July 1, 2015 to June 30, 2017). Next to that, the average social cohesion score per PC4 (2012-2016) will be addressed.

The only postal code in which three (drug-related) assassinations were committed is located in Amsterdam (PC: 1068). Next to that, in some postal codes in Amsterdam (1018, 1019, and 1075) and Rotterdam (3022, and 3068), two systemic DRH had occurred between July 1, 2011 and June 30, 2017.

As discussed in the previous section, the average social cohesion score differs for postal codes were systemic DRH were committed and those that were not. Table 13 indicates the difference in average social cohesion and occurrence of DRH in the designated time period. For postal codes with drug-related homicides the average social cohesion score was .58 lower than for postal codes without drug-related homicides. For postal codes with assassinations, this difference is larger. The average social cohesion score for postal codes with (drug-related) assassinations was 1.00 lower compared to postal codes without (drug-related) assassinations.

[20] ** Correlation is significant at the 0.01 level (2-tailed).
***** Correlation is significant at the 0.05 level (2-tailed).

Furthermore, postal codes with multiple DRH between July 1, 2011 and June 30, 2017 were located in Amsterdam and Rotterdam, whereas The Hague had no postal codes with multiple DRH. These postal codes with multiple DRH are shown in Table 14.

Table 13: Difference in social cohesion regarding occurrence of DRH (yes/no)

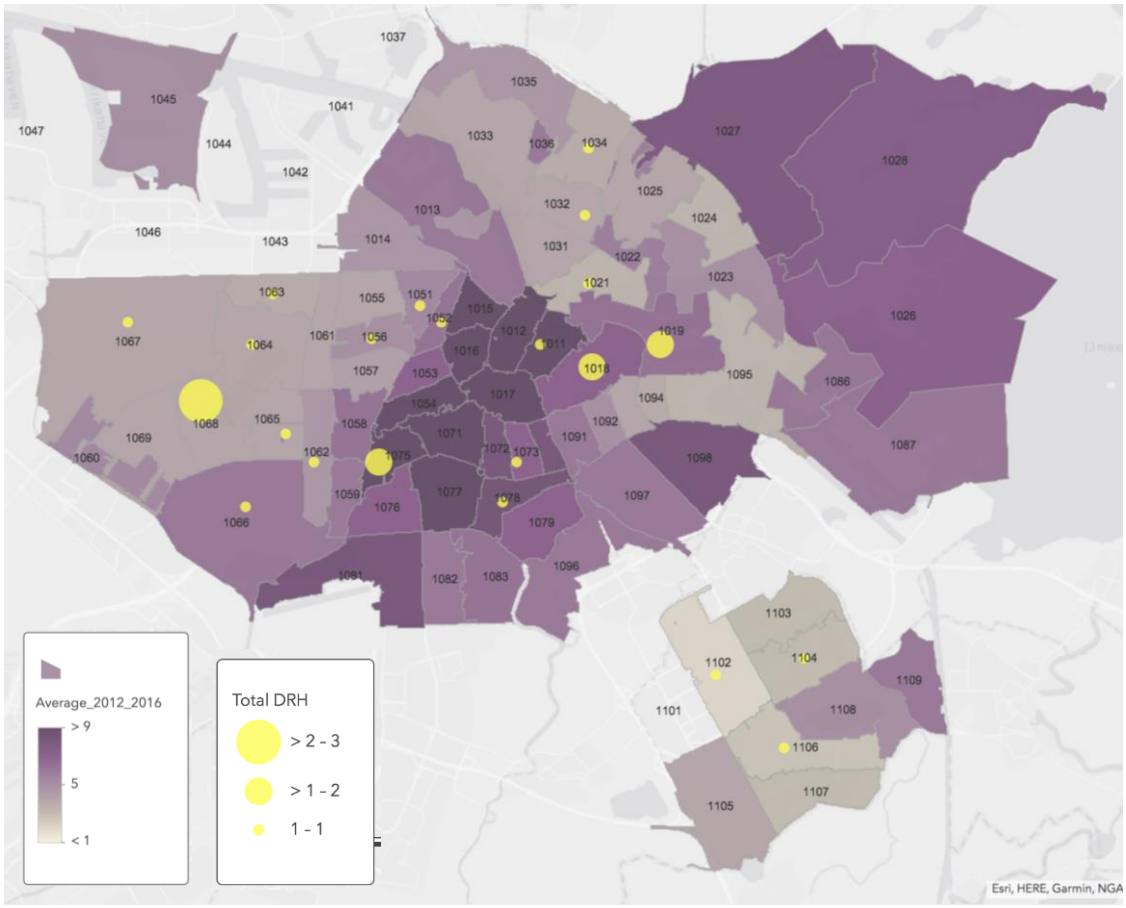
Average social cohesion (2012-2016)			
Total DRH	4.69	No total DRH	5.62
Drug-related	4.92	No drug-related	5.50
Assassination	4.56	No assassination	5.56

Table 14: Multiple DRH per postal code (PC4) in G3, 2012-2016

City	PC4	Average social cohesion 2012-2016	Total DRH	Drug-related	Assassination	Other
Amsterdam	1068	4,00	3	0	3	0
Amsterdam	1018	7,00	2	0	2	0
Amsterdam	1019	6,33	2	0	1	1
Amsterdam	1075	9,00	2	0	2	0
Rotterdam	3022	4,00	2	2	0	0
Rotterdam	3068	4,00	2	1	1	0

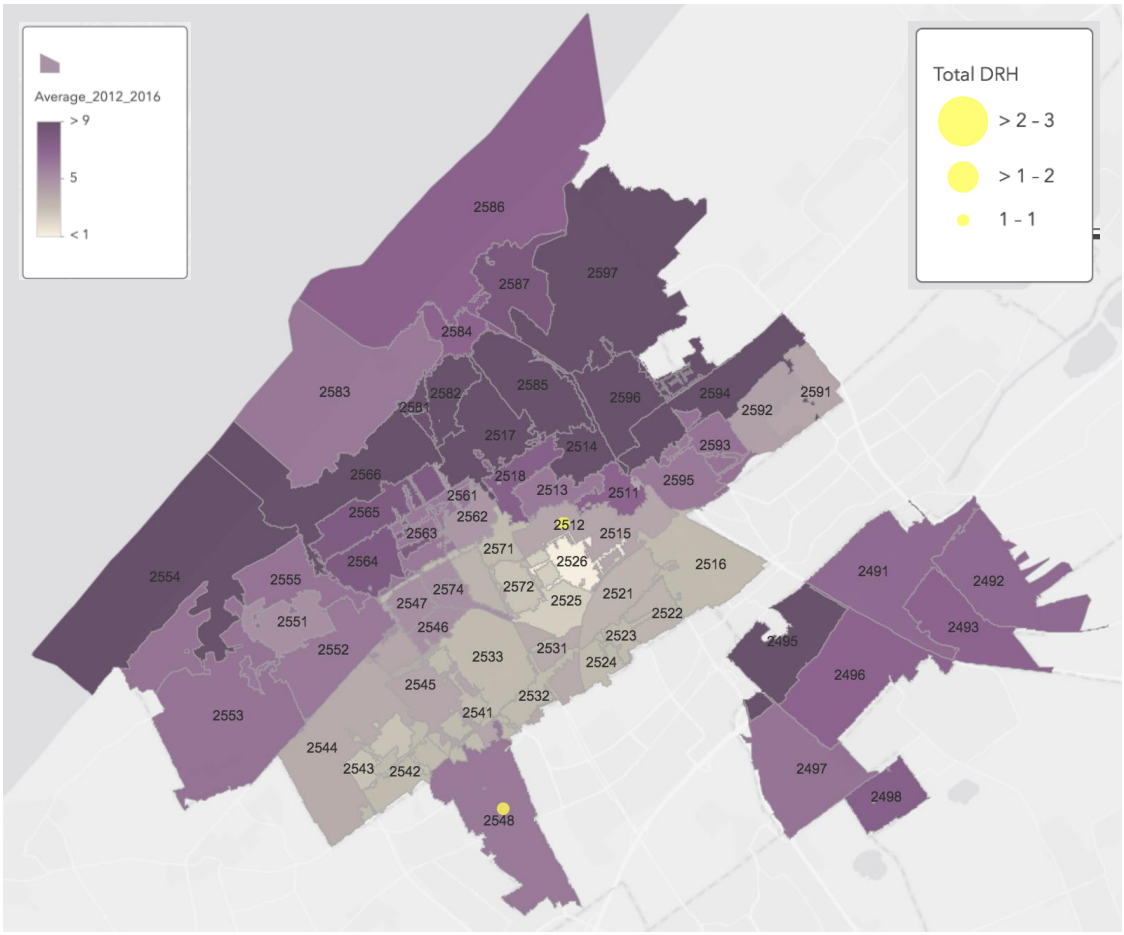
According to the previous section, the average social cohesion score differs for postal codes in which systemic DRH were committed and those in which systemic DRH were not committed. In Amsterdam, the average social cohesion score was 5.45. For postal codes in which no DRH was committed the average social cohesion was 5.96, whereas the score for postal codes in which one or multiple DRH were committed was 4.69. Figure 16 displays the average social cohesion score (2012-2016) with the count of DRH in Amsterdam between July 1, 2011 and June 30, 2017.

Figure 16: Average social cohesion score & number of DRH in Amsterdam, 2012-2016



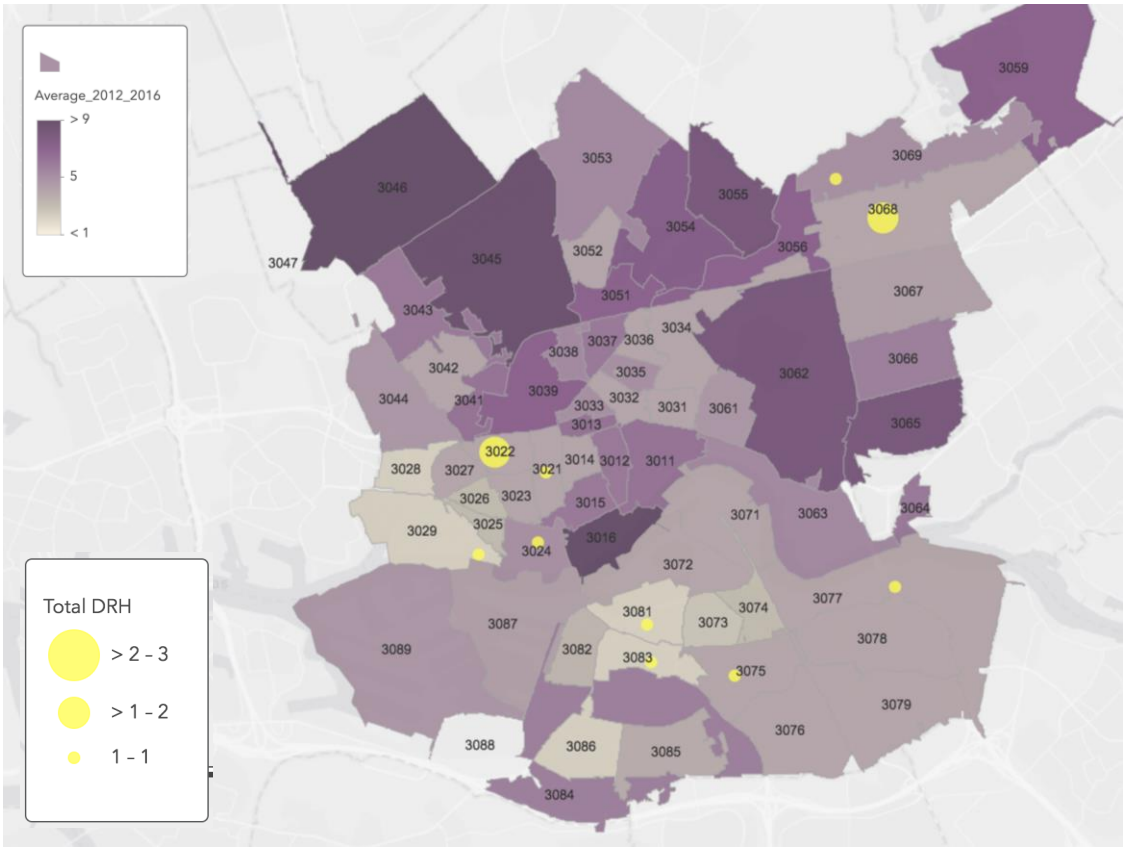
Second, a difference in social cohesion in postal codes with and without DRH is also present in The Hague, where postal codes with DRH score a 4.75 and postal codes without DRH score a 5.72. Furthermore, the average social cohesion score in The Hague was 5.66. Figure 17 displays the average social cohesion score (2012-2016) with the count of DRH in The Hague between July 1, 2011 and June 30, 2017. Only two systemic DRH occurred during this period, one assassination (PC: 2548) and one drug-related homicide (PC: 2512).

Figure 17: Average social cohesion score & number of DRH in The Hague, 2012-2016



Third, the difference in social cohesion on postal code level is also present in Rotterdam. Postal codes with systemic DRH scored a 3.70, whereas postal codes without systemic DRH scored a 5.18. The average social cohesion score in Rotterdam was 4.94. Figure 18 graphically presents the average social cohesion score (2012-2016) with the count of DRH in Rotterdam between July 1, 2011 and June 30, 2017.

Figure 18: Average social cohesion score & number of DRH in Rotterdam, 2012-2016



The concepts addressed in the above section have shown (some) association with the number of total DRH, drug-related homicides, and (drug-related) assassinations (Table 15). First, socio-economic deprivation, measured by the average standardized disposable income per household on city level (G3) and the number of (drug-related) assassinations were negatively correlated (r_s (28) = -.439, p = .015).

Second, ethnic heterogeneity was measured by the percentage of 1st and 2nd generation non-western immigrants (of the total population). The percentagae of 1st and 2nd generation non-western immigrants did not correlate with the total number of systemic DRH, drug-related homicides, and (drug-related) assassinations between 1996-2017 (city level – G3).

Third, residential mobility (number) was positively correlated with total systemic DRH, drug-related homicides and (drug-related) assassinations between 1992-2017 (city level – G3). However, relative residential mobility did not correlate with any of these categories.

Fourth, the analysis on social cohesion concluded that postal codes in which systemic DRH had occurred, were connected to a lower social cohesion score (2002-2014) compared to postal codes in which no systemic DRH had occurred (postal code – G3). Additionally, the spatio-temporal clustering analysis also concluded that social cohesion was higher for postal

codes without total systemic DRH, drug-related homicides and (drug-related) assassinations in Amsterdam, The Hague, and Rotterdam.

To conclude, the indicators identified by the social disorganization theory, originally developed by Shaw & McKay (1942), could explain to some extent the spatial and temporal patterns in systemic drug-related homicides and assassinations. Table 15 gives a systematic overview of the indicators (socio-economic deprivation, ethnic heterogeneity, residential mobility, and social cohesion) and their correlations with total systemic DRH, drug-related homicides and (drug-related) assassinations.

Table 15: Social disorganization theory correlations in G3 (Netherlands), 2006-2017

Concept	Variable	Correlation	Time period	N	Level
Socio-economic deprivation	Average standardized disposable income per household	Moderate negative correlation: number of (drug-related) assassinations – significant	2006-2015	28	City level (G3)
Ethnic heterogeneity	% of 1st generation non-western immigrants	No significant correlations	1996-2017	66	City level (G3)
	% of 2nd generation non-western immigrants	No significant correlations	1996-2017	66	City level (G3)
Residential mobility	Residential mobility (number of moved persons)	1) Strong positive correlation: number of total systemic DRH, and (drug-related) assassinations – significant 2) Moderate positive correlation: number of drug-related homicides – significant	1992-2017	78	City level (G3)
	Relative residential mobility (per 1000 of the average population)	No significant correlations	1992-2017	78	City level (G3)
Social cohesion	Social cohesion (Leefbarometer)	Small negative correlation: number of total systemic DRH – significant	2002-2014	198	PC4 (G3)
	Social cohesion (Leefbarometer)	Small negative correlation: number of total systemic DRH, and (drug-related) assassinations – significant	2012-2016	198	PC4 (G3)

5. Discussion

5.1. Research Question(s)

Spatial and temporal patterns

Drug-related homicides and assassinations are spatial clustered in the south-western part of the Netherlands as 73.6% of all systemic DRH between 1992 and 2017 were committed in the provinces North Holland, South Holland and North Brabant. Systemic DRH seem to be clustered in Amsterdam (121 systemic DRH), Rotterdam (63 systemic DRH) and The Hague (12 systemic DRH) between 1992-2017. The majority of systemic DRH in Amsterdam were (drug-related) assassinations (62 cases), whereas the majority of systemic DRH in both Rotterdam (42 cases) and The Hague (10 cases) were drug-related homicides.

Between 1992-2017, total systemic DRH seem to be fluctuating. Notable is that from 2011 to 2017, the number of (drug-related) assassinations has been increasing. This increase in assassinations might possibly be connected to the 'Mocro War', which started around 2012. Additionally, most drug-related homicides were committed in January, while most assassination were committed in April. However, no large differences in monthly distribution of the total number of systemic DRH in the Netherlands was found. Systemic DRH seem to fluctuate per year and month, which is consistent with the findings for general homicides in the Netherlands, in which no clear pattern or trend was found (Ganpat & Liem, 2012; Smit & Nieuwbeerta, 2007). Moreover, drug-related homicides and assassinations between 1992-2017 were mostly committed during the evening and the night.

So, drug-related homicides and assassinations seem to mostly occur in the Randstad (surrounding Amsterdam, Rotterdam, The Hague, and Utrecht). Nevertheless, no clear temporal pattern can be identified because of fluctuations in the number of drug-related homicides and assassinations per year.

Drug market stability

The drug market stability theory by Brownstein, Crimmins & Spunt (2000) could not effectively explain spatial and temporal patterns in systemic drug-related homicides and assassinations. Partly, this can be attributed to the scarcity of comparable data on drug use. While data on drug use (sewage water analysis) was present for the period 2011-2017, many values for 2016 and 2017 were missing, which made it difficult to identify patterns that could be connected to spatial and temporal patterns of systemic DRH. On a critical note, no information on the type of drug that was found to be connected to the drug-related homicide

was gathered, making it hard to determine the effect of one type of drug on the spatial and temporal patterns of drug-related homicides and assassinations.

Social disorganization

The social disorganization theory (Shaw & McKay, 1942) had been used to explain the spatial and temporal trends of general homicides in prior research. In this analysis, the theory could explain, to some extent, temporal and spatial patterns in both drug-related homicides and (drug-related) assassinations. For the three indicators: socio-economic deprivation, ethnic heterogeneity, and residential mobility, mixed results on city level were found (Table 15). While hypothesized was that socio-economic deprivation (measured: average standardized disposable income per household) would be negatively correlated to the number of drug-related homicides and assassinations, it was only found to be moderately correlated with (drug-related) assassinations. For the relationship between ethnic heterogeneity and the number of drug-related homicides and assassinations no clear association was found. Third, the two variables that measured residential mobility (the number of moved persons and relative residential mobility) resulted in mixed outcomes.

Nevertheless, a negative association between the level of social cohesion per postal code and the number of drug-related homicides and assassinations per postal code was identified. Social cohesion was found to be lower in postal code areas in which drug-related homicides and assassinations had occurred, compared to postal code areas in which no drug-related homicides and assassinations took place. This finding is consistent with the hypothesized relationship in which low social cohesion increases the probability of crime (Kubrin & Weitzer, 2003). The occurrence of drug-related homicides and assassinations in postal codes with lower levels of social cohesion indicate the same relationship as Nieuwbeerta, et al. (2008, p. 91), who indicated that: “low levels of social cohesion in a community are related to high risks of homicide”.

5.2. Limitations

This research has enriched prior research by concluding that, to some extent, the level of social cohesion per postal code is associated to the number of drug-related homicides and assassinations committed within a postal code. However, because of the difficulty to obtain longitudinal data to measure drug market stability, especially prevalence of drug use, and drug use through sewage analysis, no clear patterns in drug-related homicides and assassinations in connection with the drug market were identified.

For many drug-related homicide and assassination cases before 2000, additional information was not available, and the judgement of whether the criminal milieu homicide was related to drugs or not was based only on the case description (and newspaper reports). Next to that, the categorisation of systemic DRH (drug-related homicide, assassination, other) left room for interpretation. Newspaper reports were quick to label a drug-related homicide an assassination, as it attracts the reader's attention. So, conclusions that were drawn from the data on systemic DRH have to be treated with cautiousness.

Future research could focus on drug markets in the Netherlands and how these explain the occurrence of drug-related homicides and assassinations. Additionally, this study into the association between social cohesion and the occurrence of systemic DRH in the G3 on postal code level could be extended to include all systemic DRH in the Netherlands (for which the postal codes are available).

5.3. Recommendations

The Dutch Homicide Monitor could benefit from adding a variable that could account for the type of drug that was found to be connected to the drug-related homicide, for example hard drug vs. soft drug, or more specific: cocaine; heroine; XTC and amphetamines; and cannabis. This could help to discover potential connections between different types drug use, different types of drug seizures and drug-related violence. It could help to answer question such as: To what extent can different types of drug markets explain the variation in (systemic) drug-related violence?

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Appendix A – Variables from the Dutch Homicide Monitor [21]

Table 1: Variables related to systemic DRH (Granath, et al., 2011; Liem & de Bont, 2017)

Variable Name	Explanation	Coding
TYPEHOM	Type of homicide (in broad terms)	1 = Partner killing; 2 = Child killing within family; 3 = Infanticide; 4 = Other familial killing; 5 = Criminal milieu (rip deals, narcotics affairs etc.); 6 = Robbery killing: commercial business (shop, bank, taxi etc.); 7 = Robbery killing: private home; 8 = Robbery killing: street robbery (civilian victim); 9 = Nightlife violence; 10 = Killing by mentally disturbed person (Non-family); 11 = Other in non- criminal milieu; 12 = Killing by children, not family-related; 13 = Child killed by adult, not family-related; 14 = Sexual; 15 = Other; 999 = Unknown
HOM_drugs	Was the homicide drug-related?	0 = No; 1 = Yes: psychopharmacological; 2 = Yes: economic-compulsive; 3 = Yes: systemic; 999 = Unknown
DRH_HOMCD_c	DRH drug-related: homicide category	1 = Drug-Related; 2 = Assassination; 3 = Other; 999 = Unknown
CRIMMILTYPE	If occurred in the criminal milieu: How can the homicide be described?	0 = Rip deal (not drug-related); 1 = **Rip deal (drug-related)**; 2 = Turf war (not drug-related or unknown); 3 = **Turf war (drug-related)**; 4 = Retaliation/revenge (not drug-related or unknown); 5 = **Retaliation/revenge (drug-related)**; 6 = Other feud (not drug-related or unknown); 7 = **Other feud (drug-related)**; 999 = Unknown
VICOFFREL	The victim is the … of the offender	0 = Parent; 1 = Child, 2 = Brother/sister; 3 = (Ex-) husband/wife; 4 = Other family; 5 = Lover; 6 = Friend or acquaintance; 7 = Employer, employee or colleague; 8 = Neighbour; 9 = **Drug customer**; 10 = **Drug dealer**; 11 = **Fellow drug user**; 12 = **Fellow drug dealer;** 13 = Customer (no drugs); 14 = Patient; 15 = Doctor or other medical profession; 16 = Roommate (not family); 17 = Tenant or landlord; 18 = Student; 19 = Teacher; 20 = Other (drug-related); 21 = Other (not drug-related); 999 = Unknown

[21] The code manual of Liem & de Bont (2017) is applicable to Table 1. The code manual of Granath, Kivivuori, Lehti, Ganpat, Liem, & Nieuwbeerta (2011) is applicable to Table 2 & 3

Table 2: Relevant temporal variables of the DHM (Granath, et al., 2011)

Variable Name	Explanation	Coding
YEARCOM	Year the crime was committed	Open variable (numeric) – four digit number i.e. 2012; 9999 = Unknown
MONTH	Month the crime was committed	1 = January; 2 = February; 3 = March; 4 = April; 5 = May; 6 = June; 7 = July; 8 = August; 9 = September; 10 = October; 11 = November; 12 = December; 999 = Unknown
TIME	Time the crime was committed	1 = Morning (6.00-12.00); 2 = Afternoon (12.00-18.00); 3 = Evening (18.00-24.00); 4 = Night (0.00-6.00); 999 = Unknown

Table 3: Relevant spatial variables of the DHM (Granath, et al., 2011)

Variable Name	Explanation	Coding
CRIMESCENE	Crime scene	-4 = Private home, resident unknown; 1 = Private home of victim and perpetrator; 2 = Private home of perpetrator; 3 = Private home of victim; 4 = Private home of other person (not victim or perpetrator); 5 = Institution, dormitory; 6 = Hotel or motel; 7 = Inside a car or other private vehicle; 8 = Park, forest or recreational area; 9 = Shop, restaurant or other place of entertainment and amusement (coffee shop, bar, amusement park, etc.); 10 = Street, road, public transportation or other public place; 11 = Workplace; 12 = Other; 999 = Unknown
HOMLOCATION	Location of where crime took place	Open variable
POSTALCODE CRIME	Postal code of where crime took place (PC4)	Open variable (numeric) – four digit number i.e. 1012

Appendix B – Descriptive Results

Figure 1: Crime scene per DRH category: other in the Netherlands (N = 8), 1992-2017

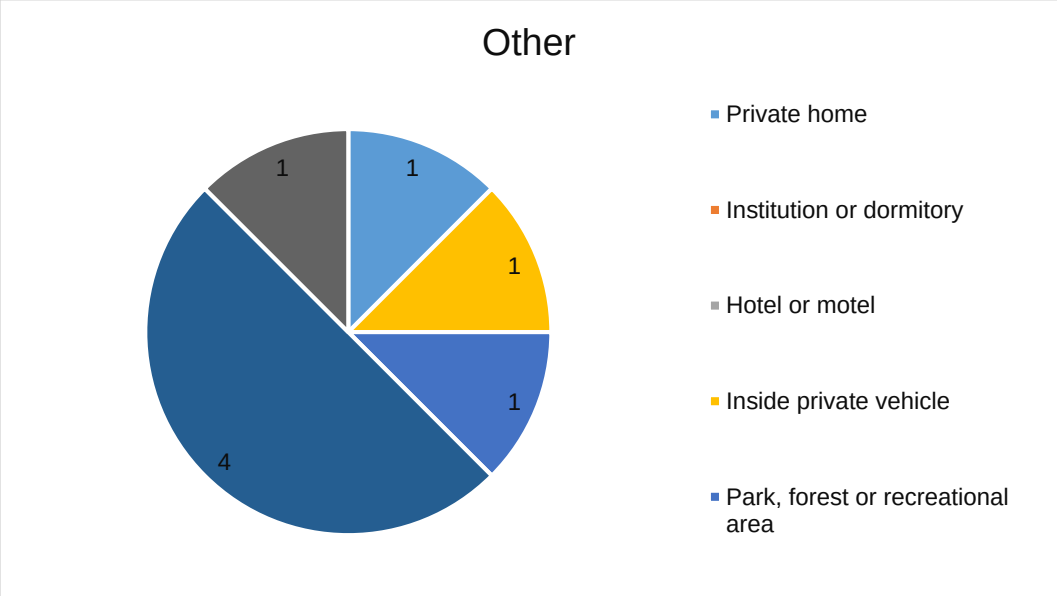


Table 1: Systemic DRH categories per province in the Netherlands, 1992-2017

Province	Drug-related	Assassination	Other	Total DRH	Percentage total DRH [22]
Groningen	7	1	0	8	1.7
Friesland	4	0	0	4	0.9
Drenthe	3	1	0	4	0.9
Overijssel	8	1	0	9	2.1
Flevoland	4	1	0	5	1.2
Gelderland	15	4	0	19	4.4
Utrecht	17	13	1	31	7.2
Noord-Holland	73	88	4	165	38.3
Zuid-Holland	70	30	2	102	23.7
Zeeland	3	1	0	4	0.9
Noord-Brabant	26	23	1	50	11.6
Limburg	22	8	0	30	7.0
Total	**252**	**171**	**8**	**431**	**100**

[22] Percentages might not add up to 100% due to rounding

Table 2: Systemic DRH categories per G10 in the Netherlands, 1992-2017

Location	Drug-Related	Assassination	Other	Total
Amsterdam	56	62	3	121
Rotterdam	42	20	1	63
The Hague	10	2	0	12
Utrecht	6	3	1	10
Eindhoven	3	4	0	7
Breda	3	3	0	6
Maastricht	4	2	0	6
Nijmegen	5	1	0	6
Tilburg	4	2	0	6
Haarlem	4	1	0	5
Total	**137**	**100**	**5**	**242**

Appendix C – Explanatory Results

Figure 1: Quantities of drugs inside sewage water & total DRH in Eindhoven, 2011-2017

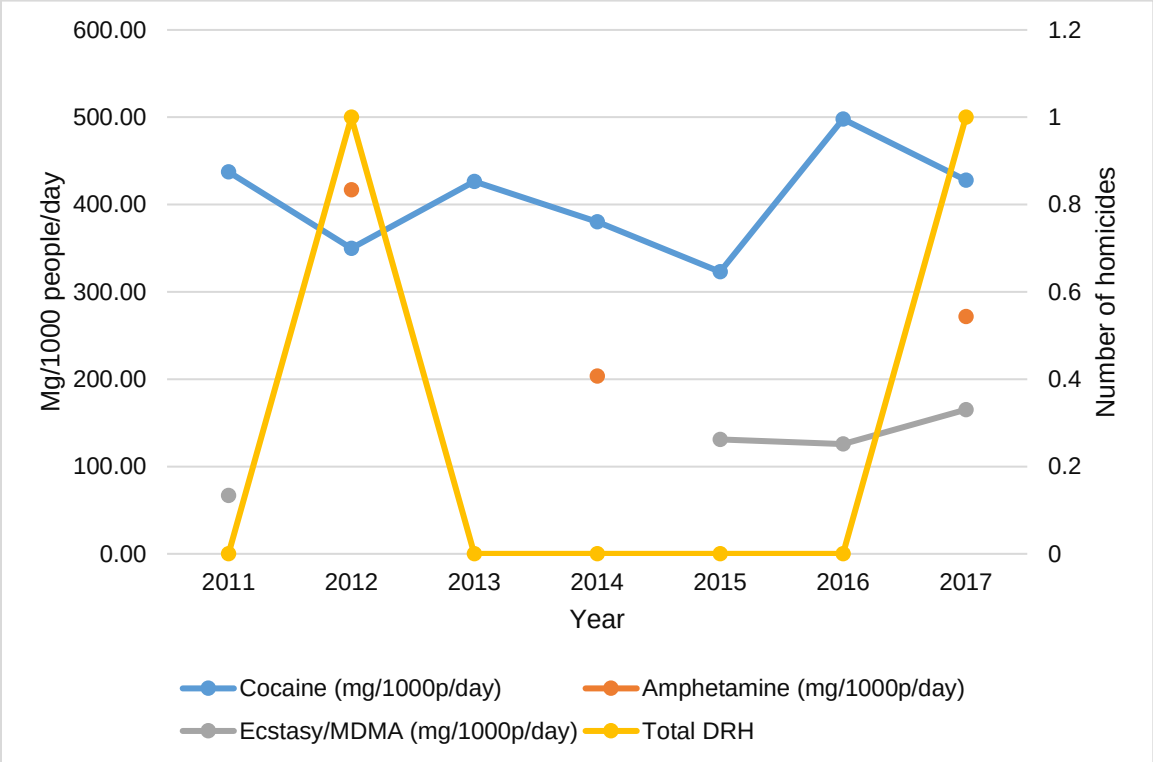
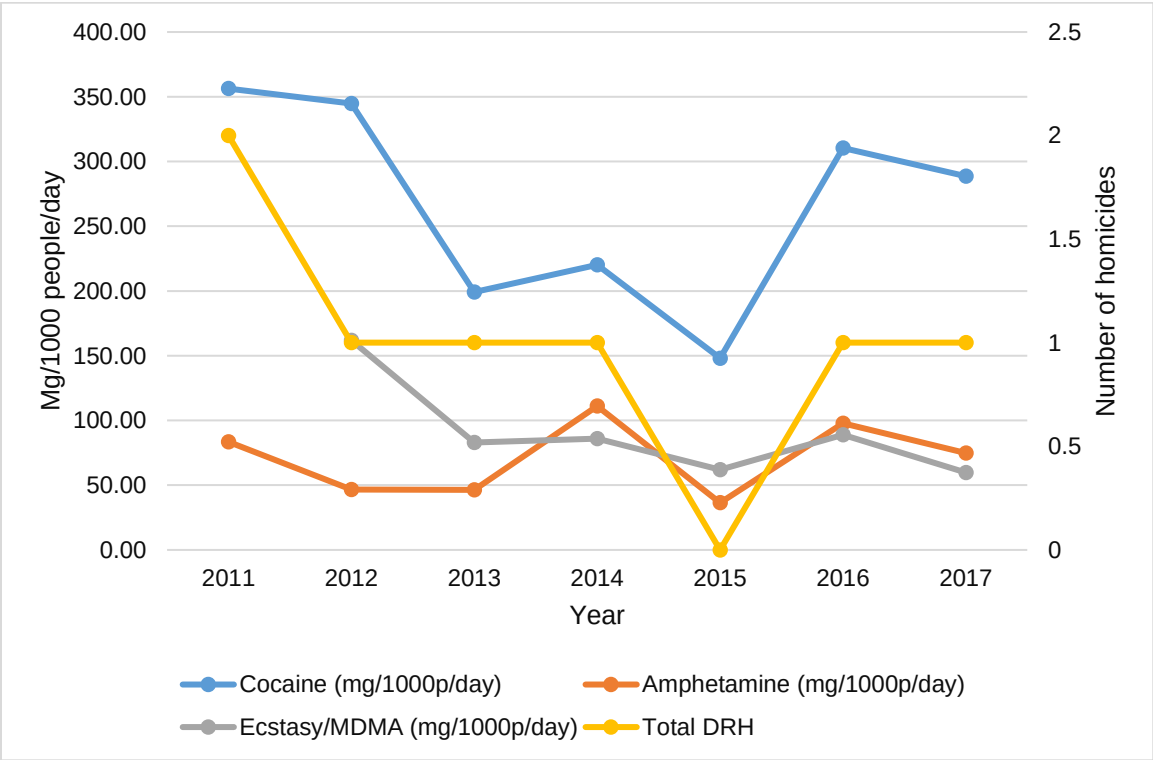


Figure 2: Quantities of drugs inside sewage water & total DRH in Utrecht, 2011-2017



Social Cohesion (2012-2016)

In order to analyse whether social cohesion scores per postal code (for G3) are different for when homicides were committed or not (per postal code), a Mann-Whitney U test was performed with DRH committed (yes/no) on average social cohesion score. The accompanying hypotheses are displayed below.

Hypotheses:

H_0 *The median social cohesion score (2012-2016) does not differ between postal codes in the G3 where drug-related homicides (total DRH) were committed or not*

H_1 *The median social cohesion score (2012-2016) differs between postal codes in the G3 where drug-related homicides (total DRH) were committed or not*

The test indicated a statistically significant group difference: U = 2026, p = .011. H_0 was rejected and H_1 was accepted (Table 1.1 & 1.2). The value of the mean rankings indicates that postal codes (within G3) with systemic drug-related homicides (DRH) had a lower social cohesion score (*MR* = 77.09; *Mdn* = 4) than postal codes (within G3) without drug-related homicides (DRH) (*MR* = 104.15; *Mdn* = 6). This test implies that systemic DRH were committed in neighbourhoods (postal codes) with lower social cohesion.

Table 1.1 & 1.2: Mann-Whitney U: Social cohesion (per PC4) and DRH (yes/no)

(1.1) Time period: 2012-2016	**DRH in PC4 (yes/no)**	**N**	**Mean rank**	**Sum of ranks**
Average social cohesion per PC4	Yes	34	77.09	2621.00
	No	164	104.15	17080.00
	Total	198		

(1.2) Time period: 2012-2016	**Average social cohesion per PC4** [23]
Mann-Whitney U	2026.00
Wilcoxon W	2621.00
Z	-2.540
Significance (2-tailed)	0.011

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

Additionally, a Spearman rank-order correlation analysis was performed (Table 2), which also indicated a small negative, statistically significant, correlation between the average social cohesion score (2012-2016) and total systemic DRH (r_s (198) = -.174, p = .014), and (drug-related) assassinations (r_s (198) = -.154, p = .030). This analysis also concludes that postal codes with one (or multiple) systemic DRH have a lower social cohesion score compared to postal codes without systemic DRH.

Table 2: Spearman rank-order correlations: average social cohesion & DRH in G3 (per PC4) [24]

Time period: 2012-2016	**Average social cohesion & DRH per PC4**		
	r_s	***p-value***	**N**
Total systemic DRH	-.174*	.014	198
Drug-related homicides	-.078	.277	198
(Drug-related) assassinations	-.154*	.030	198

[24] ** Correlation is significant at the 0.01 level (2-tailed).
***** Correlation is significant at the 0.05 level (2-tailed).

Appendix D – Syntax SPSS

1. 'Drug Market Stability'

Reliability analysis & correlation (Pearson & Spearman): DRH & drug seizures (National: 1995-2008)

```
RELIABILITY
  /VARIABLES=Heroin_Cocaine_Seizures_1000KG XTC_Amphetamines_Seizures_MILLIONTABLETS
    Nederwiet_Seizures_1000KG
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.

COMPUTE SUM_VARIABLE_SEIZURES_3=(Heroin_Cocaine_Seizures_1000KG +
    XTC_Amphetamines_Seizures_MILLIONTABLETS + Nederwiet_Seizures_1000KG).
EXECUTE.

EXAMINE VARIABLES=TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER
    Cannabis_EXCL_Nederwiet_Seizures_1000KG SUM_VARIABLE_SEIZURES_3
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

CORRELATIONS
  /VARIABLES=TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER Cannabis_EXCL_Nederwiet_Seizures_1000KG
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

NONPAR CORR
  /VARIABLES=TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER SUM_VARIABLE_SEIZURES_3
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

2. 'Social Disorganization Theory'

Correlation (Spearman): DRH & income (G3:2004-2014)

```
EXAMINE VARIABLES=TOTALDRH DRUG_RELATED ASSASSINATION OTHER GEM_GESTANDAARD_INK
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NONPAR CORR
  /VARIABLES=TOTALDRH DRUG_RELATED ASSASSINATION OTHER GEM_GESTANDAARD_INK
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlation (Pearson): DRH & percentage of 1st and 2nd generation non-western immigrants (National: 1996-2017)

```
EXAMINE VARIABLES=TOTALSYS_DRH DRUG_RELATED ASSASSINATION OTHER PERC_FIRST_GEN_NW_IMM
    PERC_SECOND_GEN_NW_IMM
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NONPAR CORR
  /VARIABLES=TOTALSYS_DRH DRUG_RELATED ASSASSINATION OTHER PERC_FIRST_GEN_NW_IMM
    PERC_SECOND_GEN_NW_IMM
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlation (Spearman): DRH & percentage of 1st and 2nd generation non-western immigrants (G3: 1996-2017)

```
EXAMINE VARIABLES=TOTALDRH DRUG_RELATED ASSASSINATION OTHER Percentage_FIRST_GEN_NW_IMM
    Percentage_SECOND_GEN_NW_IMM
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NONPAR CORR
  /VARIABLES=TOTALDRH DRUG_RELATED ASSASSINATION OTHER Percentage_FIRST_GEN_NW_IMM
    Percentage_SECOND_GEN_NW_IMM
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlation (Spearman): DRH & residential mobility (G3: 1992-2017)

```
EXAMINE VARIABLES=TOTALDRH DRUG_RELATED ASSASSINATION OTHER VERHUISMOBILITEIT_AANTAL
    VERHUISMOBILITEIT_RELATIEF
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NONPAR CORR
  /VARIABLES=TOTALDRH DRUG_RELATED ASSASSINATION OTHER VERHUISMOBILITEIT_AANTAL
    VERHUISMOBILITEIT_RELATIEF
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Mann-Whitney U & correlation (Spearman): DRH & social cohesion (PC4: 2012-2016)

```
EXAMINE VARIABLES=AVERAGE_SC TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NPAR TESTS
  /M-W= AVERAGE_SC BY HOMICIDESY_N(1 2)
  /MISSING ANALYSIS.

NONPAR CORR
  /VARIABLES=AVERAGE_SC TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Mann-Whitney U & correlation (Spearman): DRH & social cohesion (PC4: 2002-2014)

```
EXAMINE VARIABLES=SC_AVERAGE_2002_2014 HOMICIDE_Y_N TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NPAR TESTS
  /M-W= SC_AVERAGE_CAT BY HOMICIDE_Y_N(1 2)
  /MISSING ANALYSIS.

NONPAR CORR
  /VARIABLES=SC_AVERAGE_2002_2014 TOTAL_DRH DRUG_RELATED ASSASSINATION OTHER
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlation (Spearman): percentage of non-western immigrants & social cohesion (PC4)

```
EXAMINE VARIABLES=PERC_M_2002 SC2002 PERC_M2008 SC2008 PERC_M2012 SC2012
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

NONPAR CORR
  /VARIABLES=PERC_M_2002 SC2002 PERC_M2008 SC2008 PERC_M2012 SC2012
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```