Neighbourhood Crime, Immigration & Health

The Epidemiology of Substance Use Disorder, and Somatic and Mental Health Outcomes in Immigrant Populations and Crime-affected Neighbourhoods.

Thompson, Sanjay

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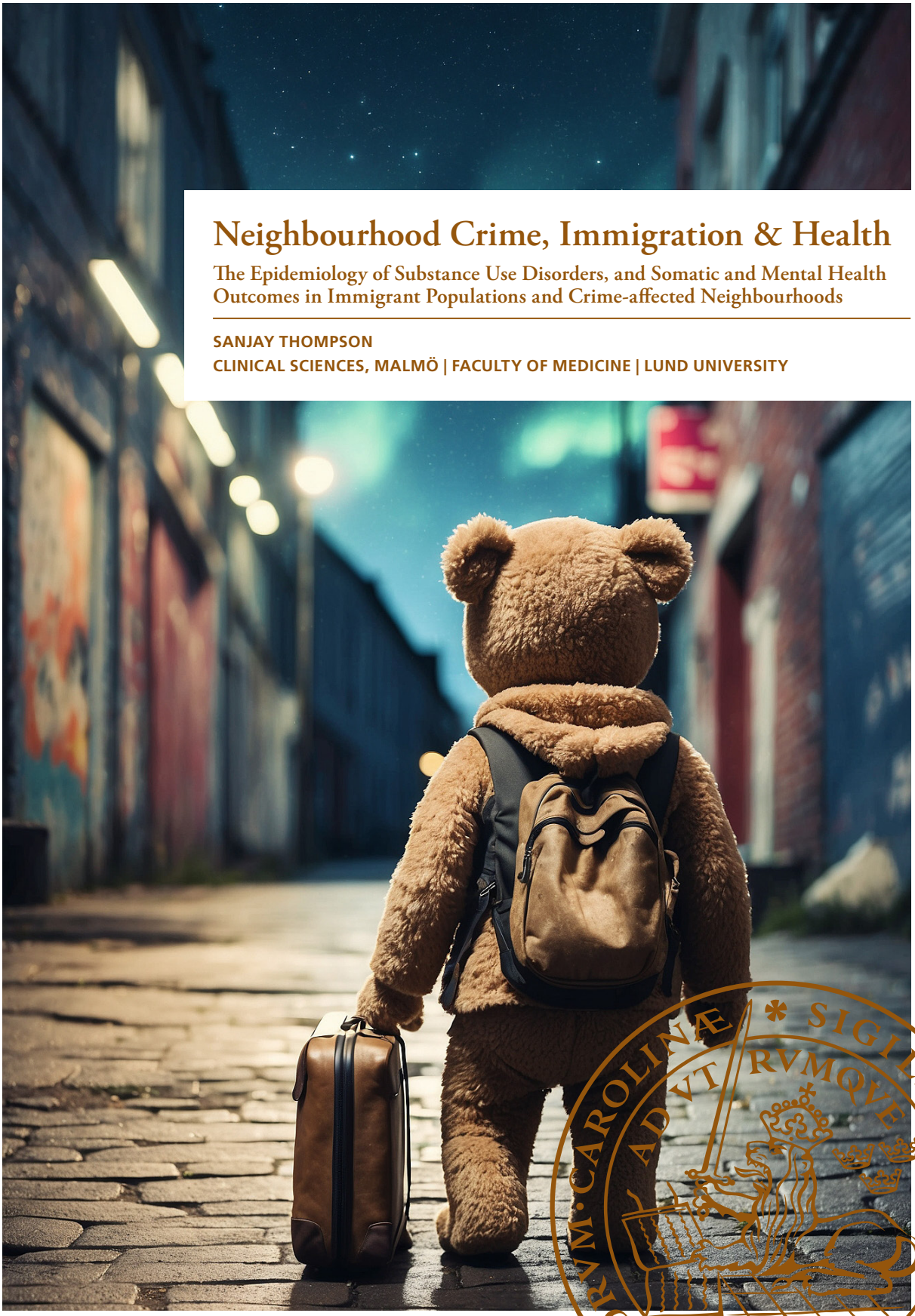

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The Epidemiology of Substance Use Disorders, and Somatic and Mental Health Outcomes in Immigrant Populations and Crime-affected Neighbourhoods

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An adept digital communicator and performer, Sanjay has utilized his skills to champion better sexual health practices in the Caribbean and to preserve Jamaican music and theatre culture. He has also used his talents to empower international students through his podcast Wise Grad, and his engagement in several student-related initiatives in Sweden, Japan, and Jamaica.

Sanjay is passionate about helping people and finding innovative ways to inspire change.

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The Epidemiology of Substance Use Disorder, and Somatic and Mental Health Outcomes in Immigrant Populations and Crime-affected Neighbourhoods

Sanjay Thompson

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DOCTORAL DISSERTATION

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Title and subtitle: Neighbourhood Crime, Immigration & Health: The epidemiology of substance use disorder, and somatic and mental health outcomes in immigrant populations and crime-affected neighbourhoods.

Abstract:

Background: The health and well-being of immigrant populations are important in understanding healthcare equity and the mechanisms surrounding social disparities in society. Increases in violence, drug use and other risk behaviours in addition to adverse mental health outcomes are increasingly common in urban neighbourhoods. However, the risk of adverse health and behavioural outcomes in immigrant and non-immigrant populations is understudied.

Methods: Logistic regression models were used to examine the association of risky sexual behaviours (RSB) and violent criminal behaviour (VCB), neighbourhood crime and opioid-related overdose-related death (OOD), and neighbourhood crime and major depression (MD) in the Swedish population. The models were further used to determine if the potential association was modified by immigrant status. Additionally, a Cox regression model was used to examine the potential effect of regions of origin on the risk of drug use disorder (DUD) in younger second-generation male and female immigrants in Sweden.

Results:

I. There was a strong association between RSB and VCB in the Swedish population. The prevalence and strength of the association differed among the immigrant and non-immigrant populations. The association was strongest among first-generation immigrants arriving in Sweden at or before seven years of age.

II. Neighbourhood crime was associated with the odds of MD. In addition, there was a significant interaction by immigrant status; the effect of neighbourhood crime on MD was weaker in immigrant groups relative to non-immigrants. There was no apparent association between neighbourhood crime and MD for male and female immigrants born outside Sweden in the model.

III. There was an association between neighbourhood crime and OOD. Increases in neighbourhood crime were associated with the risk of OOD and this risk differed between the immigrant and non-immigrant population. Overall, the effect of neighbourhood crime on OOD was lower among the immigrant population relative to the non-immigrant population.

IV. The risk of DUD was increased for second-generation immigrant males. This risk was more pronounced for those with parents from the Africa and the MENA regions. Among the female population, second-generation immigrants with parents from Africa, Western countries, and Eastern Europe regions had higher risks for DUD relative to the non-immigrant population.

Conclusion: The analyses revealed an association between RSB and VCB in addition to an association between neighbourhood crime and two adverse health outcomes, MD and OOD, in the Swedish population. The established association differed between the immigrant and non-immigrant populations. The risk of DUD was also higher among younger second-generation immigrants. To fully account for the differences in the established associations, future research may benefit from exploring the mechanisms behind these findings. Such investigations may add value to current public health education initiatives which benefit diverse urban neighbourhoods, such as those with large immigrant populations. This may be especially important in neighbourhoods affected by high levels of criminal activities which may need additional support from social workers, clinicians, and the police in the development of efficient interventions.

Keywords: Crime, Drug Use Disorder, Immigrant Health, Major Depression, Neighbourhood, Overdose Deaths, Sexual Health

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The Epidemiology of Substance Use Disorders, and Somatic and Mental Health Outcomes in Immigrant Populations and Crime-affected Neighbourhoods

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MADE IN SWEDEN

To my wonderful Mother, my caring family and
the memory of my amazing brother, Ric

Table of Contents

Abstract

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List of Papers

I. **Thompson S.,** Ohlsson H., Khoshnood A., Sundquist J., Sundquist K. Individual level Associations of Risky Sexual Behaviour and Violent Criminal Behaviour among the Native and Immigrant populations in Sweden

Manuscript Submitted to *Deviant Behaviour*

II. **Thompson S.,** Ohlsson H., Khoshnood A., Sundquist J., Sundquist K. (2022) Neighbourhood Crime and Major Depression in Sweden: A National Cohort Study.

Health & Place (published)

III. **Thompson S.,** Ohlsson H., Khoshnood A., Edwards AC., Sundquist J., Sundquist K. Risk of Opioid-related Overdose Death in High Crime Neighbourhoods: A National Cohort Study.

Manuscript Submitted to *Drug and Alcohol Dependence*

IV. **Li X.*, Thompson S.*,** Ludvigsson J., Sundquist J., Sundquist K. Drug Use Disorders in Younger Second-Generation Immigrants in Sweden.

Journal of Studies on Alcohol and Drugs (invited for resubmission)

*Shared first authorship

Abbreviations

CB	Criminal Behaviour
CI	Confidence Interval
DeSO	Demographic Statistics Areas/ Demografiska statistikområden
DUD	Drug Use Disorder
HR	Hazard Ratio
ICD	International Classification of Disease
LISA	The longitudinal integrated database for health insurance and labour market studies (LISA)
MD	Major Depression
MENA	Middle East/North Africa
NDI	National Deprivation Index
Obs.	Observed number of cases
OOD	Opioid Overdose Death
OR	Odds Ratio
PCB	Property Criminal Behaviour
RSB	Risky Sexual Behaviours
SAMS	Small Area Marketing Statistics
SCB	Statistics Sweden
SES	Socioeconomic status
VCB	Violent Criminal Behaviour

Introduction

‘All progress is precarious, and the solution of one problem brings us face to face with another problem’. – Martin Luther King Jr.

The symbiosis of neighbourhoods and people

‘It takes a village to raise a child’

- African Proverb

The world as we know it is an interconnected web of people and places. The influence that a place has on our identity may be evident in the way we speak, dress, the foods we eat and even the art that entices us [1, 2]. Overall, the places we call neighbourhoods facilitate the formation of a collective identity of the people who reside there [3]. In essence, there are two sides to this spade; neighbourhoods impact

the lives of individuals and individuals impact the characteristics of a neighbourhood.

As people grow and exhibit change within the spaces we call neighbourhoods, the socio-cultural characteristics of the neighbourhood may be altered. For example, neighbourhood composition may change as a result of families moving in, out and around the physical environment or larger scale working class immigrant replenishment i.e., the continuous flow of migrants from other countries over long periods, may change the economic characteristics of a neighbourhood [4, 5]. In addition, continuous development and/or deterioration of infrastructure, such as homes, communication channels and the availability of basic resources, may also modify the lives of those who call these spaces home *'for better or worse'* [6, 7]. Since everyday life is a fundamental characteristic of neighbourhoods, its impact on our well-being cannot be underestimated. Further, the extent to which individuals have shared experiences in these spaces, be it the availability and quality of human services, similar cultural background, or unfortunate exposures to criminal activities and drug use, adds to the quality of the experiences in neighbourhoods.

Neighbourhoods through time

The symbiotic relationship between neighbourhoods and individuals has been strategic to the development of society since the dawn of time. Historians point to the development of neighbourhoods, and by extension cities, from as early as 7500 BCE, within the region commonly known as Mesopotamia [8]. These early developments were greatly influenced by the fertility of the land at the time as agricultural development was necessary for survival. Another fitting example exists in Africa's Bantu migration, possibly one of the most important human migrations in history (Figure 1) [9]. Therein, the movement of people in and out of these spaces has influenced the development of local communities, through its impact on cultures, economic action, and skills [9].

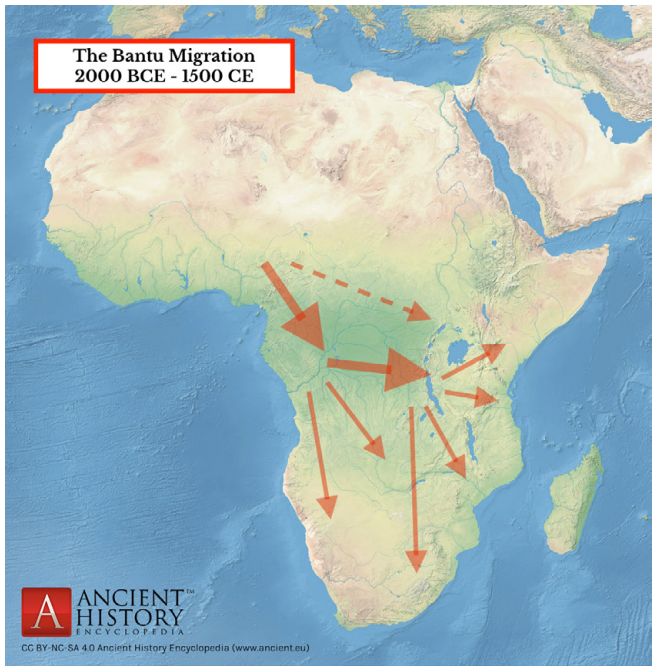

Figure 1. The Bantu Migration
A map illustrating the general route of the Bantu migration which occurred in various stages from the second millennium BCE to c. 1500 CE Attributed to Mark Cartwright, 2019. License: Creative Commons Attribution-Non-commercial-Share Alike.

While it may be clear that neighbourhoods have played an important role in the development of today's society, an operational definition of the concept is something that has consistently perplexed scientists [10]. When we think of the concept of neighbourhoods we can, for the most part, visualise its social and administrational weight. Neighbourhoods typically consist of a strong social component where people communicate, connect, agree, disagree, and operate individually or collectively [3, 11]. Therefore, the extent to which it may be defined could greatly depend on the perspective of the stakeholders i.e., those who live, work, or have a vested interest in the space.

In the development of a more tailored definition, researchers have utilised social, administrative and political boundaries to identify neighbourhoods within the built environment [12]. For example, in Jamaica, the definition of neighbourhoods is often tied to political constituencies overseen by an elected member of parliament and appointed caretakers [13]. Within these borders, basic resources such as clinics, supermarkets, green spaces, and churches are deemed important for the overall well-being of the neighbourhood. A more cultural example can be seen in the United States, where the sociological term *ethnic enclave* has been used to describe large area blocs of a city that have high concentrations of generations of immigrant

populations [14] These easily identified suburban neighbourhoods, quite often play an important social role in the lives of individuals with similar cultural backgrounds [15, 16]

In addition to these concepts, more recent developments in urban geography have facilitated the use of Geographic Information Systems (GIS) in the demarcation and definition of neighbourhoods. Some of these have included the use of census tracts, zip codes, radial buffers, and activity space [17-19].

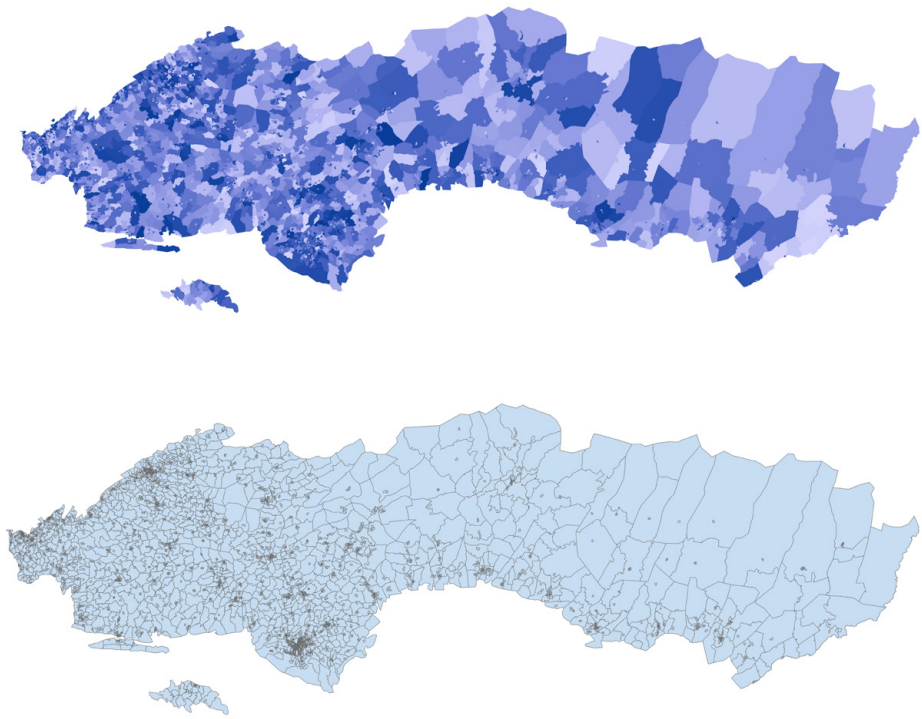

Figure 2. Map of Sweden showing DeSO areas
Attributed to Statistics Sweden [20]

In Sweden, epidemiological researchers have often classified neighbourhoods into one of several geographical divisions provided by Statistics Sweden (SCB). SCB's responsibility includes coordinating and supporting the system for official statistics which can be used for administrative purposes as well as research. In addition to well-known divisions such as grid squares, postal codes, and electoral districts, SCB provides information on advanced geospatial divisions such as Small Area Market Statistics (SAMS), Demographic Statistics Areas (DeSO) (Figure 2) and Regional Statistics Areas (RegSo). These divisions consider the number of inhabitants of the

area, topography, and local infrastructure. Previous studies which utilize these divisions have aided the understanding of the complex relationship between people and the social and built environment [21-23]. Historically, studies on neighbourhood effects in Sweden have used SAMS to identify neighbourhoods [24, 25]; however, the recent development of DeSOs may facilitate more accurate estimations than its predecessor [20]. The choice of which division to use largely depends on the objective of the research being conducted.

Vulnerability: An Intertwined Discourse

Whether it is through real estate marketing, a magazine spread or breaking news, knowledge of neighbourhood characteristics becomes an important factor in the identification of areas in which people may socially flourish or be placed at risk. Research has consistently shown that socio-economically vulnerable neighbourhoods may increase the individual risk of adverse health outcomes [26-28]. For example, neighbourhoods with high crime and social disadvantage have been associated with adverse physical and mental health within a population [29, 30].

As it has been established that people and neighbourhoods are connected, the observed adverse effects may very well be a result of these well-established connections. In this intertwined discourse, individuals and their neighbourhoods may be deemed as vulnerable. For example:

1) Researchers have collectively defined vulnerability within a population as "specific characteristics that make it [the population] at a higher risk of needing humanitarian assistance than others or being excluded from financial and social services."[31]. Within neighbourhoods, because of individual risk of direct and indirect harm or the exclusion from various services within a society, we often identify some populations as [more] vulnerable than others. Some examples of these are ethnic minorities, socioeconomically disadvantaged children, the elderly, and those suffering from a mental or physical disability [32]. Beyond the individual characteristics of vulnerability also lies the knowledge of how social and systemic barriers such as poverty, discrimination and literacy may increase the vulnerability of a population [33]. As such, in neighbourhoods, vulnerability on the individual level may be a product of an individual's interaction within the built environment.
2) The extent to which the built and social environment may put some individuals at risk for harm may also be considered in the concept of vulnerability. Take for example situations in which individuals may have a limited ability to protect themselves from being harmed or engaging in harmful activities [29, 34]. This includes, for example, criminal acts

(larceny, shootings, drug use and distribution, sexual exploitation), discrimination (race/colour, sexual identity, sexual orientation, religion), and environmental threats [35]. Wilson and Kelling's 1982 Broken Windows Theory provided evidence of this. In it, neighbourhoods that deteriorated were thought to encourage or be more vulnerable to deviant behaviours [36]. These behaviours were known to cause further harm to the environment and to the people who live there. For example, these neighbourhoods may have burnt car shells, vacant lots, empty apartment complexes, and overall low security [37, 38]. As research expands and the connection between neighbourhoods and individuals becomes deeper, we will be better able to understand how neighbourhoods may be deemed vulnerable.

In the Swedish context, neighbourhoods are often labelled as vulnerable due to their level of deprivation and the extent to which they are impacted by crime and criminal organisations [39]. Researchers often agree on the description of deprivation through several socioeconomic indicators such as a high proportion of adults with low socioeconomic status, unemployment, low income, low education and low-paying jobs [40]. However, the recent identification of a possible association with spatial grids of high population density, shootings, narcotics, crime, and foreign background within Sweden's definition of vulnerable neighbourhoods has been problematic in the discourse [39]. Addressing the definition of vulnerability through more objective lenses and mitigating issues concerning the population may lessen the impact on the upward mobility of individuals who live in these neighbourhoods.

Neighbourhood Crime, Immigration and Health: Relevant concepts and theories within the discourse

The Epidemiological Criminology Paradigm in Neighbourhoods

The exploration of crime and its relation to neighbourhoods and adverse health outcomes has been well established. Akers & Lanier's Epidemiological Criminology ('Epi-Crim') model (Figure 3) is built on the foundation that criminal behaviours and poor health behaviours share similar underlying mechanisms [41].

The emerging field of EpiCrim has been described as:

"*The explicit merging of epidemiological and criminal justice theory, methods, and practice. Consequently, it draws from both criminology and public health for its epistemological foundation. As such, EpiCrim involves the study of anything that affects the health of a society, be it: crime, flu epidemics, global warming, human trafficking, substance abuse, terrorism, or HIV/AIDS*." [41]

The framework also allows us to make connections between criminology and health in society through, for example, the use of large health and crime registers to understand associations within neighbourhoods. These applications may allow us to understand how various associations in a population may differ between groups. For example, scholars have long identified crime as a public health problem, identifying its commonality with ill health and socio-economic disadvantages [42, 43].

The extant literature indicates that crime is not randomly distributed across local areas, but is instead concentrated in very small geographical units [44, 45] This idea is key to the law of concentration of crime, which posits that a small number of microgeographic places account for a disproportionate percentage of all crimes in a neighbourhood [45]. Notably, the impact of crime and the concentration of criminals in neighbourhoods may be apparent far beyond its micro-level concentration. While these crimes are known to be influenced by the neighbourhood and by the socially created environment e.g. policy, local laws, and transport [46] the adverse effects created by the deviant activities provide evidence of the interconnectivity between neighbourhoods and vulnerability and may have a long-standing impact on the people who reside there. For example, the introduction of methamphetamine (or other narcotics) for sale, use or distribution to teenagers in a suburban neighbourhood may be problematic for the local community [47]. And even though the activity may have taken place within a small geographic area, the ramifications of it could extend to neighbouring communities and linger for years. The Figure below summarizes in part the concepts that are relevant to this.

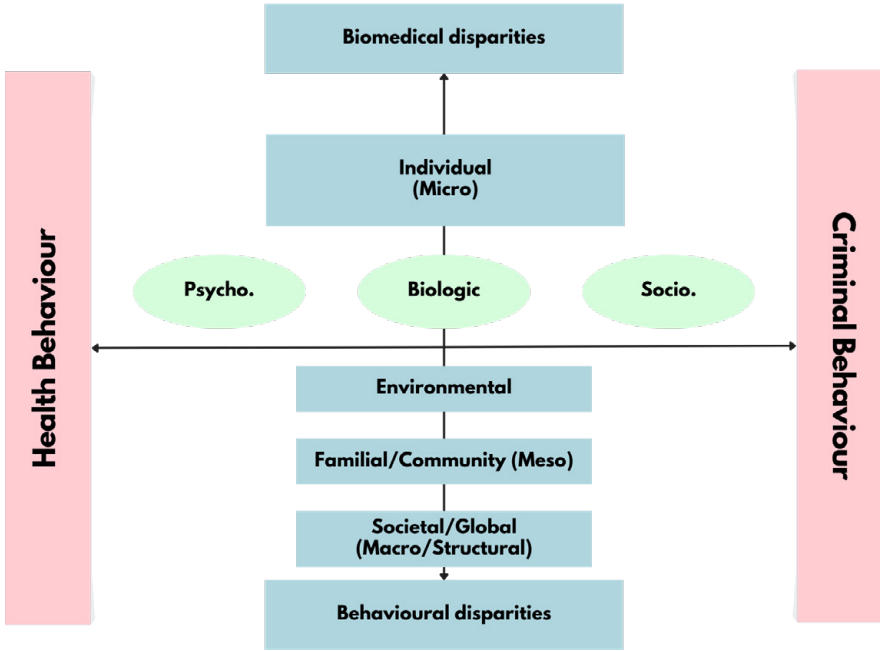

Figure 3. The Epidemiological Criminology Model
Adapted from Roberto Hugh Potter & Timothy A. Akers (2010) Improving the Health of Minority Communities through Probation-Public Health Collaborations: An Application of the Epidemiological Criminology Framework, Journal of Offender Rehabilitation, 49:8, 595-609, DOI: 10.1080/10509674.2010.519674 [48]

While the plethora of studies observing crime in neighbourhood research has often associated crime in neighbourhoods with deprivation and vulnerability, there are several concepts which span sociology, public health and epidemiology that may help to understand the connections between neighbourhoods and people.

Collective Efficacy & Social Cohesion

Collective efficacy describes the interpretation of people's perception in neighbourhoods and the capacity of these individuals to intervene on behalf of their community to achieve common goals [49]. Two major components of collective efficacy are social cohesion and social control.

Social cohesion can be defined as:

> "the quality of social relationships and the existence of trust, mutual obligations, and respect in communities, helps to protect people and their health." [50]

On the other hand, social control refers to how people's thoughts, feelings, appearance, and behaviour may be regulated in social systems [49]. The relationship between people in neighbourhoods is a key element in how acts of criminality such as neighbourhood crime are perceived and, in some cases, could prevent offences from being committed [49, 51]. It has also been shown to be an important determinant of overall health in communities [52-54]. However, criticism has been raised against these concepts as they may exclude and marginalize individuals who may not align with the dominant community norms, such as minorities. This could treat diversity as a problem, impose shared values on certain groups and challenge the balance between community unity and individual rights [55].

The Social Disorganization Theory

The social disorganization theory attributes variations in crime and delinquency in neighbourhoods to the absence of communal institutions e.g., schools, and local authorities [56, 57]. Through this perspective, a community may not adequately maintain social controls as they are unable to agree on common values and goals [57]. Additional evidence suggests that neighbourhoods with high levels of low socioeconomic status lack adequate resources to fulfil common needs [58]. These neighbourhoods are also characterised by high residential mobility i.e., the migration of people within the residential area, disrupting the social network and bonds within a neighbourhood [49, 59]. The social disorganization theory has also faced criticism as it might oversimplify the complexity behind delinquent behaviour, such as crime, by focusing too much on neighbourhood characteristics without adequately considering structural factors. For example, Linning et al. states that “Despite decades of research into social disorganization theory, criminologists have made little progress developing community programs that reduce crime. The lack of progress is due in part to faulty assumptions in the theory…” [60].

Figure 4. The Crime Triangle (Routine Activity Theory), attributed to Cohen and Felson [61]

The Routine Activity Theory

The Routine Activity Theory addresses the relationship between individuals and neighbourhood crime and may further indicate individual or collective risk of adverse outcomes. Cohen and Felson identified three components which facilitate a criminal offense; a suitable target/victim, an offender with a desire to commit a crime and an opportunity/place for the crime to be committed [61, 62]. These components converge in what has been called the 'Crime Triangle' (Figure 4.) and are commonly referenced in neighbourhood crime prevention strategies. Therein, environmental issues and personal vulnerability are addressed to reduce the risk of criminal acts being committed e.g., fixing broken streetlights, clearing bushy walkways, and increasing education on personal safety. While the theory assumes that criminals are not rational thinkers or are aware of various situational methods in place, it has its place in the discourse on neighbourhood crime, immigration, and health. However, it has also been argued that this theory overlooks those deeper factors that contribute to crime, including why individuals are motivated to commit a crime [63, 64].

Risk Environments and the Population

A growing body of research focusing on 'risk environments' has sought to establish how the dynamic and relational interaction between individuals and their environments interact to create different patterns of health outcomes in neighbourhoods [65, 66]. Heterogenous neighbourhoods, e.g., those with

individuals of different immigrant backgrounds, have been known to exhibit differences in health outcomes, owing to possibly varying perceptions of ill health, access to/interest in healthcare facilities and the influence of societal strains [52, 67, 68]. The well-documented immigrant paradox points to a possible effect of social cohesion as an explanatory factor in the unprecedented, better health outcomes of immigrants in neighbourhoods with high immigrant populations, when compared to non-immigrants in the same neighbourhood [69-71]. This leaves much to be investigated in this understudied area.

While studies on immigrant populations have consistently indicated that immigrants and non-immigrants may have differences in adverse health outcomes in disadvantaged neighbourhoods, there are gaps in the extant literature [52, 67, 69, 72]. The risk environment model, developed by Rhodes (2002) seeks to address gaps in the identified differences in health outcomes in the risk environment model [73]. The model suggests that harm and harm reduction is contingent upon social context 'contingent causation', in which interactions between individuals and their environments may be key determinants of risk and protective factors relating to such harm [73]. Race, gender, immigrant generational status, sexuality, class, and age have all been seen to be associated with health outcomes in neighbourhoods [74-78]. For example, in mitigating the complex association of neighbourhood disorders and drug use [79, 80] the risk environment framework (Table 1) identifies the micro and macro-level aspects which are critical in determining an individual's risk in neighbourhoods, in addition to the distribution of harm [81, 82].

Table 1. Environmental contexts of the risk environment.
Environmental contexts of the risk environment reprinted from Collins AB, Boyd J, Cooper HLF, McNeil R. The intersectional risk environment of people who use drugs. Soc Sci Med. 2019 Aug;234:112384. doi: 10.1016/j.socscimed.2019.112384. Epub 2019 Jun 22. PMID: 31254965; PMCID: PMC6719791[66]

	MICRO-ENVIRONMENT	MACRO-ENVIRONMENT
Social	• Gendered power relations • Dynamics of assisted injection • Drug-related stigma in interactions with healthcare professionals • Violence and interpersonal conflicts • Local policing practices and crackdowns • Peer group dynamics and social norms	• Gendered inequities and gendered risk • Stigmatization and marginalization of PWUD • Racial or ethnic inequalities • Public discourses around public health, drug use, and welfare policies
Physi-cal	• Drug use settings and characteristics (e.g. supervised injection facilities, public spaces) • Sex work locations • Homelessness and housing instability • Neighbourhood deprivation, urban development, and spatial inequalities • Exposure to violence or trauma • Prisons and incarceration	• Drug trafficking and distribution routes • Geographic population shifts (e.g. neighbourhood and population mixing) • Population mobility and cross-border migration
Econo -mic	• Cost of living (e.g. drug-related costs, health treatments, housing costs) • Sex trade or sex work engagement • Lack of income generation and employment opportunities • Food insecurity	• Investment in health and social services infrastructure • Growth of informal economies • Investment in social housing • Criminal justice expenditures
Policy	• Access to low threshold and social housing • Abstinence-only drug policies and drug criminalization in healthcare settings • Coverage and availability of harm reduction services • Operating regulations at supervised injection facilities • Local policing practices and crackdowns	• National and international drug laws • Policies and laws for harm reduction programs and services • Policies and laws criminalizing sex work • Universal access to healthcare • Laws governing the protection of human rights • Policies and laws governing pregnancy and drug use for women who use drugs

PWUD = people who use drugs

The importance of immigrant generational status in population studies

In perusing the complexities of immigration, the impact of societal influences on the immigrant population is often overlooked. One way in which scholars have illuminated social processes within society is by focusing on where and how immigrant generation status matters, especially in neighbourhoods [76, 83, 84]. The body of research which focused on immigrant generational status posits that contextual features such as a shared language, and availability of culture-specific activities may benefit the overall health and well-being of generations of immigrants, particularly the first-generation immigrants, i.e., those born outside of the host country and having no parental background in the country [85]. On the other hand, life course perspectives suggest that second-generation immigrants, i.e., those born in the host country to at least one parent from said country, may be more affected by the neighbourhoods they live in because they are more 'settled' there [84, 86]. Since the integration process happens over a long period, it should be considered how factors such as length of residence in the destination country, social connectedness in the neighbourhood and exposure to the host culture may impact one's well-being [83, 85].

Societal patterns of assimilation (in measurable outcomes) depend on the interactions between immigrant communities and the host society [3]. Limiting the understanding of the population to the individualistic approach i.e. solely the characteristics of the individual, may neglect the persistence across immigrant generations and the social, cultural and economic benefits which may be inherited e.g. the intergenerational link between home country culture and behaviour [3, 87]. Further, immigrant families are known to have unique challenges, such as raising their children within neighbourhoods with new social institutions and expectations from their upbringing [85, 88-90].

While information on immigrant generational status has been important, scholars have been mindful of factors which may muddle their findings. One example is the immigrant replenishment i.e., the continuous flow of migrants over long periods which may redefine the characteristics of various immigrant cohorts. In addition, a high and continuous flow within a short period may mean that first-generation and second-generation immigrants may be subjected to the same experiences at the same time. To rectify this, data included in these studies contain protracted immigrant replenishment [83].

Studies on immigrant populations in neighbourhoods have been accepted as an important research focus area in a broad range of disciplines, from health and economics to political science and development studies [91-96]. However, despite the numerous socio-economic benefits of migration, debates within the socio-political sphere have long been saturated with unfavourable attitudes towards the

age-old immigration process [97]. Recently, Avdagic et. al (2021) highlighted the influence of a negativity bias (negative frames have a stronger impact on citizens' attitudes than positive frames) in the political or media framing of migration and welfare [98]. The psychological adaptation found that while discussions surrounding the impact of immigration on the welfare state are inconsistent in terms of pros and cons, the general perception of immigrants straining the resources of welfare states remains present among many opponents of immigration in, for example, Sweden, the UK and Germany [98]. Notably, the societal impact of migration is not a new phenomenon. Instead, it has its roots in century-old studies about people and places and has influenced the formation of neighbourhoods and culture. Present-day resources have now facilitated high-quality studies which may benefit the health and well-being in neighbourhoods. For example, studies have shown the impact of higher immigrant density on social capital elements which support mental health and the possible protective ethno-cultural mechanism of diverse environments on both the immigrant and non-immigrant population [75].

Mental Health and Substance Abuse in the Immigrant Population

Today, mental disorders remain one of the leading causes of the global disease burden [99]. The National Institute for Health and Care Excellence (NICE) has identified six common mental health disorders (CMHD): depression; generalised anxiety disorder (GAD); panic disorder; obsessive-compulsive disorder (OCD); post-traumatic stress disorder (PTSD); and simple phobias [100]. The prevalence and risk of these disorders are known to vary by gender, background, and other social characteristics. For example, an umbrella review by the World Health Organisation (WHO) highlighted that immigrant girls and women face a higher risk of depression and anxiety than immigrant boys and men [101]. Poverty, living conditions, unemployment/underemployment, racism and discrimination were also found to have a strong association with the risk of mental disorders in immigrant populations [101]. Despite the general aspirations for universal health care in European states, research findings consistently show an overall higher risk of mental health problems among the immigrant population when compared to their native-born counterparts [101-104]. For example, a recent Finnish study revealed a higher prevalence of psychological distress among foreign-born individuals from five geographic regions when compared to the general population [102]. Possible inconsistencies in the use of mental health facilities may give rise to these findings. Some studies indicate that while immigrant populations may be greatly burdened by adverse mental health outcomes, there may be barriers to their health-seeking behaviours [103]. For example, immigrants have been found to use mental health services less than non-immigrants and with lower intensity [105]. However, as evident in other types of health behaviours, the immigrant populations tend to exhibit similar health-seeking behaviours to the non-immigrant populations over time [105, 106].

Research has previously indicated a rise in adverse health outcomes related to mental health and substance use [107]. Some have indicated nativity and age at arrival as important factors in the development of substance use disorders [108]. In addition, scholars have noted that the risk of these disorders may increase after the initiation of drug use behaviours in immigrant populations. Noting the stressful experience of migration, assimilation and integration, some immigrant populations may turn to substance use to cope with these negative neighbourhood effects. For example, the established positive relationship between discrimination, social stress and substance abuse [109] in addition to increased access to substances in deprived neighbourhoods [110], could influence substance abuse initiation in vulnerable populations. Further, as with other adverse health outcomes, the difference in the risk of adverse effects from substance use, abuse and initiation may differ among immigrant generations. For example, one US-based study highlighted that second-generation immigrants with at least one non-immigrant parent were exposed to higher levels of social stress and more frequently used substances [111].

Overall, immigrant and non-immigrant populations may be exposed to different stressors, perceive these stressors differently or engage in varying coping mechanisms [112]. The extent to which these experiences may negatively affect their mental health and make them more vulnerable to adverse outcomes such as substance use disorder or depressive disorders, could greatly depend on their social networks in neighbourhoods and their immigrant generational status as seen in established immigrant communities [3].

Aim

The overarching aim of the thesis was to investigate the association between neighbourhood crime and adverse health outcomes, and the risk of drug use disorders in the immigrant and non-immigrant population in Sweden. Additionally, the studies in this thesis aimed to examine the extent to which the identified associations differed by immigrant generational status.

The specific aims of **Study I – IV** are listed below:

Study I: Investigate the association of RSB and VCB in first-generation immigrants, second-generation immigrants, and the non-immigrant population in Sweden. In addition, examine whether this association, if identified, differ by immigrant status.

Study II: Investigate whether there is an association between neighbourhood crime rates and MD. Additionally, examine whether there is a differential effect of neighbourhood crime rates on MD in individuals of different immigrant backgrounds.

Study III: Investigate whether there is an association between neighbourhood crime rates and incidence rates of OOD in Sweden after taking potential confounders into account. In addition, examine the potential differences in the risk of OOD among non-immigrants and immigrants in neighbourhoods with high neighbourhood crime rates.

Study IV: Investigate the potential effect of regions of origin on the risk of DUD in younger second-generation male and female immigrants in Sweden. Additionally, investigate the role of years of migration (family time spent in the host country) and the reason for migration on the risk of DUDs among the younger second-generation immigrant population.

Methods

Overview

This body of work is a compilation of four studies on the Swedish population and uses health, population and crime register data. Table 2 summarises the population, exposures, and study design of the studies.

The studies were conducted at the Center for Primary Health Care Research, Department of Clinical Sciences (Malmö), Lund University, Malmö, Sweden.

Table 2. Summary of the studies included in this thesis.

OBJECT	SAMPLE	FOLLOW UP	OUTCOME	EXPOSURE	STATISTICAL MODEL
Study I	2,986,514	2000 - 2015	Risky Sexual Behaviour	Violent Criminal Behaviour	Logistic Regression
Study II	3,810,746	2012 - 2015	Major Depression	Neighbourhood Crime	Multilevel Logistic Regression
Study III	5,497,398	2012 - 2018	Opioid-related Overdose Death	Neighbourhood Crime	Logistic Regression
Study IV	907,360	1998 - 2018	Drug Use Disorder	Country of Origin	Cox Regression

Retrospective Cohort Studies

Studies I-IV were retrospective cohort studies. Cohort studies are longitudinal studies that follow research participants over time [113]. Retrospective studies ideally rely on data collected in the past to examine various exposures and outcomes. This method allows a researcher to study multiple outcomes that can be associated with single or multiple exposures during the specified time.

Ethical considerations

As the studies in this thesis utilized health and behavioural data on the immigrant and non-immigrant population, various medical, immigration and criminological ethics were considered (Figure 5). Overall, the authors ensured transparency by developing a sound methodology and meticulously analysing the data. The following are important ethical components of this thesis:

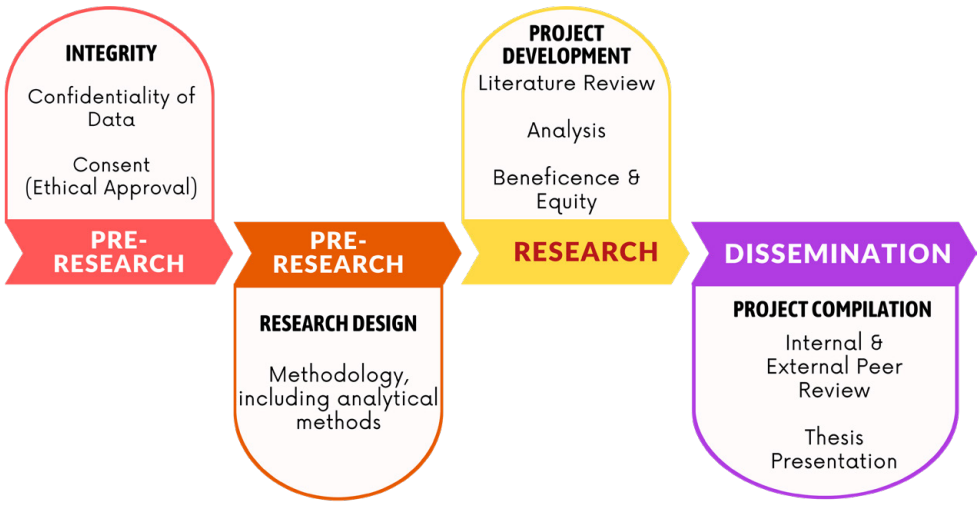

Figure 5 Ethical considerations in the thesis project Neighbourhood Crime, Immigration and Health

Consent

In Nordic countries, obtaining patient consent for deidentified large-scale registry data is generally waived [114, 115]. However, these studies may require ethical permission from their respected regional authorities [114]. For the studies in this thesis, approval was granted by the Regional Ethical Review Board in Lund.

Confidentiality

The confidentiality of the dataset used in this study was maintained by the pseudonymisation of the personal identification numbers which linked data in the registries. This process involves transforming and replacing the personal identification number into a unique serial code before its retrieval for analysis.

Pseudonymisation is often recommended or mandated to ensure research compliance with various data laws, regulations, and guidelines [116].

Beneficence and Equity

Through the principle of beneficence, researchers are often obligated to minimize the potential harm to individuals or groups and maximize the benefits of their research [117]. Marginalised communities such as the immigrant population, are often underrepresented in health research [118]. And, scholars have indicated a need to maintain justice and equality in research by including demographic factors (age, sex, country of birth etc.) [115]. As these studies seek to benefit the affected population, research which excludes such information may deprive these groups of sufficient health information which may be relevant to their well-being by including demographic factors (age, sex, country of birth, etc.) [115]. In line with this, the aims, and results of the studies in this thesis have contributed to the crime, health, and immigration discourse by increasing the knowledge of various risks in the immigrant and non-immigrant population. The information presented may impact the work of stakeholders such as those who work with these vulnerable groups by informing efforts to mitigate adverse health and behavioural outcomes in the affected populations. A previous examination of Nordic studies has contended that registry-based research may be more beneficial for study participants as they do not carry any physical or non-physical liabilities [115]. The studies in this thesis sought to further protect the study population and enhance the potential for equity by providing a clear interpretation of the findings, guidelines for future studies and suggestions on how stakeholders may utilize the findings.

Funding

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Registers and data

The data for this retrospective cohort project was retrieved from several Swedish nationwide registers, maintained by the National Board of Health and Welfare (Socialstyrelsen), Statistics Sweden (Statistiska Centralbyrån, SCB), the Swedish National Council for Crime Prevention (Brå) and the Swedish Migration Agency.

The use of Swedish register data has been deemed reliable in its application to immigrant population studies, particularly those which focus on the immigration

generational status of the population [119]. Studies find that the use of linked register data in comparison to survey data, facilitates a more accurate understanding of investigated processes in the familial life course e.g., MD [120] and alcohol abuse and DUD [121],[119]. In the creation of the database for these studies within this project, data from the registers were linked using the Swedish 'personummer'; a ten-digit identification number assigned to all individuals born or residing in Sweden and replaced with a pseudonymized serial number.

The following registers with nationwide coverage were used:

Total Population Register

Since 1968, the Total Population Register (maintained by SCB) has contained data on the entire population of Sweden. It reflects the content of the population registers at Skatteverket (The Swedish Tax Agency) which has information about various population statistics, for example, age, sex, marital status, internal migration, births, and deaths [122]. Because of its high quality and completeness, the Total Population Register can be used for large follow-up studies which focus on the health of the population in Sweden [122-124].

Register of Migration and Asylum Statistics

Since 1997, information on migration has been registered by the Swedish Migration Agency for any immigrant who applies for a residence permit in Sweden. The Swedish Migration Agency is also the decision-making authority on residence permits in Sweden and requires that all individuals from non-Nordic countries, who wish to remain in Sweden for more than three months possess a residence permit or the right of residence [125, 126].

Cause of Death Register

Since 1961, this annual register has contained all information on the causes of death in Sweden, including deaths of unregistered individuals. The register is largely complete and of international quality. It is aided by electronically coded death certificates which facilitates easier identification of the underlying cause of death in the register [127, 128].

National Patient Register

Since 1987 (est. 1964), the national patient register has contained nationwide personal, and administrative data on individuals who interact with the Swedish healthcare system and is a principal data source for research [122]. For example, it

contains information on inpatient stays and outpatient care. The register is a valuable and highly valid source of information for Swedish epidemiological studies [129, 130]. This register was supported by additional information from Swedish primary healthcare data.

Swedish Crime Register

Since 1973, the Swedish Crime Register has contained nationwide information about individuals convicted of a crime. The register is maintained by the Swedish National Council for Crime Prevention (Brå) and contains decisions including a guilty verdict for individuals aged 15 (the age of criminal responsibility in Sweden) and older [131-133]. These convictions may include decisions relating to several offences [131]. Registrations of crime and the extraction of crime statistics are aided by Information Communication Technology (ICT) [134].

National Prescribed Drug Register

Since 2005, the national prescribed drugs register has contained information on all the dispensed drugs in the Swedish population [135]. The information is updated monthly by the Swedish eHealth Agency and contains information about the patient (e.g., gender, age, residence), product, prescription, cost, date dispensed etc. [135].

The longitudinal integrated database for health insurance and labour market studies (LISA)

Since 1990 (extended in 2004), this database contains information on all individuals, 16 years or older registered in Sweden [136]. The register contains approximately 500 variables on individuals, 100 variables on firms and 30 variables on the workplaces of the Swedish workforce [137]. LISA forms a part of the Total Population Register. In addition, LISA is based on information from several sources, including the Register of Income and Taxation, Swedish Public Employment Service (Arbetsförmedlingen) and the Labour statistics based on administrative sources (RAMS)[126, 138].

Swedish primary healthcare data

Swedish primary health care data has been collected at the Center for Primary Health Care Research in Malmö, Sweden containing information on at least 72% of the population living in Sweden [139]. The data is a collection of almost nationwide data on clinical diagnoses from primary healthcare consultations in Sweden. Its coverage is based on the digitalisation of patient records in several regions and as

such, has varied over time. However, the data contains information from 20 of the 21 administrative regions in Sweden [139, 140]

Variables

Neighbourhood

In this project, Neighbourhoods were based on Small Areas for Market Statistics (SAMS) or Demographic statistical areas (DeSO).

Since 1994, Sweden has classified neighbourhoods within the context of geographical areas called SAMS [141]. These areas have approximately 1000 – 2000 people and are considered homogenous in terms of their socio-economic characteristics. SAMS remained intact for several years [25, 141]. This increased the accuracy when analysing register data over time [141]. Each of the 9200 SAMS can be referred to by a code which contains a municipal code and a serial number within the respective municipality and a name [142].

Since 2018, DeSOs have been created as a nationwide geographical division in Sweden and are maintained by SCB [20]. DeSOs were initiated to facilitate the monitoring of segregation and socio-economic data in small geographic areas [23]. For example, DeSOs follow geographical conditions which allow its boundaries to respect infrastructure such as streets, waterways, and railways [20]. The divisions are based on urban areas and electoral districts and are stable over time. In addition, as a more modernized successor to SAMS [23, 143], DeSOs include 5,984 geographical divisions in Sweden, each of which contains 700 – 2700 inhabitants and have so far, for example, been used to examine social vulnerability and the interaction between nativity and rurality of residence on suicide risk, among other neighbourhood effects [144-146].

Geographic region of residence

In Study IV, this variable was used to equitably describe residential areas as (1) large cities: Stockholm, Gothenburg, and Malmö (2) Southern Sweden and (3) Northern Sweden.

Crime

Crime (Neighbourhood Crime/Criminal behaviour) was the main exposure variable for studies I, II and IV. This variable was based on registrations in the Swedish Crime Register, where we defined three crime types, Violent Criminal Behaviour

(VCB), White Collar Criminal Behaviour (WCB) and Property Criminal Behaviour (PCB).

i. *Violent Criminal Behaviour (VCB)* included assault (aggravated), murder, manslaughter or filicide, threats, or violence against a police officer, (aggravated) robbery, kidnapping, illegal threats, intimidation and illegal coercion, arson, and sexual crimes (excluding the buying of sexual services but including child pornography).

ii. *Property Criminal Behaviour (PCB)* has been defined in several ways [147]. In this thesis, it refers to criminal activity that includes the destruction of or offence against an individual's property e.g., theft, vandalism, vandalism causing danger to the public, and trespassing.

iii. *White Collar Criminal Behaviour (WCB)* referred to non-violent crimes often used to produce financial gain through deception. For example, fraud, forgery and dishonesty, and embezzlement.

In Study I, Criminal Behaviour (CB) was based on registrations in the Swedish Crime Register for VCB, PCB and WCB. The variables were dichotomously coded (yes/no).

Neighbourhood Crime

In Studies II and III, the neighbourhood crime variable was based on the neighbourhood concentration of individuals convicted of a crime and used as a continuous variable where lower values indicated lower neighbourhood crime. We first identified registrations for VCB and PCB in the Swedish Crime Register from 2009-2011. These crime types were selected as they induced fear of crime among residents [35, 148]. The variable was assessed in DeSOs.

In Study II, clusters of Neighbourhood Crime were computed using the Gi* (G-i-star) statistic. The Gi*statistic looks for hotspots in each geographical unit together with its neighbours by comparing the local value among spatial neighbours to global values. Spatial neighbours were defined using queen contiguity, meaning that each DeSO area was considered together with all DeSO areas that shared a corner and/or border with the DeSO area, and each neighbourhood was “row-adjusted”. The Gi* star hotspot statistic was then computed using the ratio of crime and population adjusted for n in each DeSO. The Z-score of the resultant Gi* statistic was then used as the main exposure in the analysis [149, 150].

Immigrant Status (Immigrant Generational Status)

Non-immigrant/Immigrant

In the accompanying studies, I-IV, individuals were identified based on immigrant status as non-immigrants and immigrants. The non-immigrant population was identified as an individual who was born in Sweden to two Swedish-born parents i.*e., Swedish born with two Swedish-born parents*.

The immigrant groups were comprised of individuals with a history of migration or parents with a history of migration. As such, we identified the following groups:

i. Swedish-born with one Swedish-born and one foreign-born parent
ii. Swedish-born with two foreign-born parents
iii. Born outside Sweden
    a. In Study I, the immigrant generational status group, *Born outside Sweden,* was divided into two groups based on the age at arrival to Sweden: born outside Sweden arriving before 7 years (for those arriving at or before 7 years of age) and born outside Sweden arriving after 7 years (for those arriving after 7 years of age).

Based on previous studies, groups i and ii may be classified as second-generation immigrants and group iii, as first-generation immigrants [83, 85, 151, 152].

Region of Origin

In Study IV, region of origin identified parents as originating from any of the following regions:

i. Sweden
ii. Eastern European countries (referred to as Eastern Europe)
iii. Western countries
iv. Middle East/North Africa (referred to as MENA)
v. Africa (excluding North Africa, referred to as Africa)
vi. Asia (excluding the Middle East and Oceania, referred to as Asia)
vii. Latin America and the Caribbean (referred to as Latin America)
viii. Others

Reason for Migration & Years of Migration

In Study IV, information on the reason for migration and years of migration (the time the family has spent in the host country) was obtained from the Register of Migration and Asylum. As registrations are limited to those who apply, the variable

was only based on younger second-generation immigrants who had foreign-born parents with information in this register.

Number of years in Sweden

As individuals who were registered in Sweden for a longer period were more likely to be registered in the medical/criminal registers, we included a variable defining the number of years the individual had resided in Sweden from age 15.

Major Depression

In Study II, Major Depression (MD) was identified in the data by the 10th International Classification of Disease (ICD-10) codes F32, and F33 and was obtained from the National Patient Register and Swedish primary healthcare data [153].

Opioid-related Overdose-related death (OOD)

In Study III, OOD was a dichotomous variable (yes/no) which was defined as any occurrence of a fatal opioid OD as identified in the Cause of Death register by ICD-10 codes: F11.0, F19.0, X41-X44, Y11-Y14[153]. The definition of opioid OD also included overdoses from poly-drugs, as over 86% of polydrug fatalities in Sweden involve opioids [154].

Drug use disorders

In Study IV, Drug use disorders (DUD) were identified by the registration of ICD-10 codes, F11–16, F18- F19, which are associated with mental and behavioural disorders due to psychoactive substance use, with the exception of those due to alcohol use (F10) or tobacco use (F17) [153]. In addition, any record of suspected crimes related to drug use in the crime register, identified by codes 3070 (driving under the influence of drugs), 5010 (drug possession), 5011 (drug use), and 5012 (drug possession and use), and any convictions in the crime register involving narcotics (law 1968:64, paragraph 1, point 6) and drug-related driving offences (law 1951:649, paragraph 4, subsection 2 and paragraph 4A, subsection 2) were included. DUD was also identified in the Prescribed Drug Register in individuals (excluding cancer patients) who had filled prescriptions for hypnotics and sedatives (Anatomical Therapeutic Chemical [ATC] Classification System N05C and N05BA) or opioids (ATC: N02A) in average dosages of more than four defined daily doses a day for 12 months. Individuals in the study population with pre-

existing hospitalization of psychiatric disorders from 1987 to 1997 according to ICD-9 (code 290-319) and ICD-10 (code F00-F99) were excluded (n=12529).

Risky Sexual Behaviour (RSB)

In Study I, RSB was a dichotomous variable defined by the occurrence of a risky sexual behavioural outcome such as the diagnosis of sexually transmitted infection. These registrations were specific to two sexually transmitted infections, chlamydia and/or gonorrhoea, at the individual level. The following registrations were identified in the National Patient Register and Swedish primary healthcare data by ICD-10 codes A56.0, A56.0A, A56.0C, A56.2, Z11.3E, Z20.2B (Chlamydia) and A54.0, A54.A, A54.0C, A54.0D, A54.0E, A54.0F, A54.0X, A54.1, A54.2, A54.9, Z20.2A, Z11.3B (Gonorrhoea)[155, 156].

Neighbourhood Deprivation (NDI)/ Neighbourhood Socioeconomic Status (SES)

Utilized in Studies I-IV, NDI/SES was used to determine the neighbourhood-level status of the population. The variable is a previously developed socioeconomic summary measure based on the combination of several deprivation variables [157, 158]. Indicators of deprivation used by previous studies were used in the development of the index. Therein, small geographic units e.g., SAMS, were used to define neighbourhoods [25]. The index has been used as a strong predictor of substance abuse and mental health trajectories [159, 160]. In addition, it has been associated with psychiatric medication prescriptions in adults [161]. In its development, the following variables were used for socioeconomically active individuals aged 20 to 64; proportion of inhabitants who receive social welfare, low education levels (<10 years of formal education), low income (from all sources, including interest and dividends, that is <50% of the median individual income), and unemployed individuals (excluding full-time students, those completing military service, and early retirees). The summary measure was categorised into three groups: 1) <1 standard deviation (SD) below the mean was equal to low deprivation or high neighbourhood SES, >1 SD from the mean was equal to high deprivation or low SES, and within 1 SD of the mean was equal to moderate deprivation or middle SES. Lower scores indicate more affluent neighbourhoods, whereas higher scores indicate more deprived neighbourhoods. A principal component analysis was used in the development of this variable [162, 163]

Year of birth/Age

Generally, this variable referred to the age of the individuals at the baseline. To describe the population distribution in Study III, the total population was divided into six age groups: 24 years and younger, 25-34 years, 35-44 years, 45-54 years (base category), 55-64 years and 65+ years and was based on previous research on drug overdose mortality in immigrant populations [164]. In Study IV, the population was divided into three age groups, 12-14, 15-17 and 18-20.

Sex/Gender

Studies have often shown differences in the health and behavioural outcomes of males and females [61, 165, 166]. As such, in Study I and IV, the analyses were separated by sex/gender which referred to the biological and physiological characteristics of males and females.

Education

In Studies II and IV, this variable described the educational level of the individuals/parents and was categorized as attendance in elementary school (≤ 9 years), secondary school (10–11 years) and college and/or university (≥ 12 years). Low education levels were equivalent to <9 years of formal education.

Marital status

In Studies III and IV, this dichotomous variable described individuals (Study III), or parents of younger second-generation immigrants (Study IV), who were either married/cohabiting partnerships or not married (unmarried, widowed, and divorced).

Income

In Study II, income referred to personalized family income and was divided into five groups (20% each) i.e., low income, middle-low income, average income, middle-high income, and high income.

Social Welfare

In Study II, this variable was used to identify receipt of social welfare and was indicated by yes/no registrations for social welfare. This data usually includes individuals who are unemployed when unemployment support is insufficient,

guardians who are unable to work outside the home and families with very low incomes. Refugees and immigrants are also entitled to social welfare in Sweden [167].

Employment/Unemployment status

This dichotomous variable was indicated by registrations for unemployment (yes/no) with the Swedish Public Employment Service.

Statistical Analyses

Study I

Individual-level Association of Risky Sexual Behaviour and Violent Criminal Behaviour in Sweden

Outcome variable: RSB was the outcome variable for this study. The population was followed from January 1, 2000, to December 31, 2015.

Exposure Variable: VCB

Covariates: Year of Birth, Number of Years in Sweden

Analysis: Logistic regression models were used to investigate the association between RSB and VCB. The analyses were separated by sex. To investigate whether the association differed among the immigrant and non-immigrant population groups, interaction terms[1] were included in the models. The ORs of the association of RSB and VCB for each of the immigrant groups in this analysis allowed us to test the effect modification i.e. if the effects are different in the immigrant population groups compared with the effect in the non-immigrant population.

Study II

Neighbourhood Crime and Major Depression in Sweden: A National Cohort Study

Outcome variable: MD was the outcome variable for this study. The population was followed from January 1, 2012, to December 31, 2015, for the first registration of MD during the study period.

Exposure Variable: Neighbourhood Crime

[1] In this thesis, interaction terms are indicated by asterisks (*) in the associated tables

Covariates: NDI, Year of Birth, Immigrant Status, Income, Education, And Social Welfare

Analysis: For statistical analyses, multilevel logistic regression models were used to estimate the association between neighbourhood crime and MD and the extent to which the association differed by immigrant status. To identify the difference in the association, an interaction term was included between immigrant status and neighbourhood crime.

Study III

Risk of Opioid-related Overdose Death in High Crime Neighbourhoods: A National Cohort Study

Outcome variable: OOD was the outcome variable for this study. The population was followed from January 1, 2012, to December 31, 2015.

Exposure Variable: Neighbourhood Crime

Covariates: NDI, Age, Sex, Marital Status, Unemployment Status, and Immigrant Status

Analysis: Logistic regression models were used to examine the association between neighbourhood crime and OOD in the non-immigrant and immigrant groups. To estimate if the effect of neighbourhood crime on the risk of OOD in neighbourhoods differed by immigrant status, we included an interaction term between immigrant status and neighbourhood crime.

Study IV

Drug Use Disorders in Younger Second-Generation Immigrants in Sweden

Outcome variable: DUD was the outcome variable for this study. The population (individuals aged 12 to 20 years) was followed from January 1, 1998, to December 31, 2018,

Predictor Variable: Region of Origin

Covariates: Age, Region of Residence in Sweden, SES, Educational Level, Marital Status

Analysis: Cox regression models were used to calculate the hazard ratios of DUD in young second-generation immigrants.

Results & Discussion

Study I

Individual -level Association of Risky Sexual Behaviour and Violent Criminal Behaviour in Sweden

Previous investigations have identified an association between several risk-taking behaviours at the individual level [73, 168, 169]. In this study, we aimed to add to the discourse, by investigating the association of RSB and VCB in the Swedish population. Based on previous literature investigating the immigrant paradox in diverse populations [69, 70, 170] we examined if the association differed among first-generation immigrants, second-generation immigrants, and the non-immigrant population.

The results were separated by sex and included 2,986,514 individuals. Therein, Swedish-born with Swedish-born parents was the largest group (60.2% of the total population). Swedish-born with two foreign-born parents was the smallest group (4.3%).

1. There was an association of RSB and VCB, RSB and WCB and RSB and PCB. In addition, the association between RSB and all other CBs differed by immigrant status.

Overall, there was a positive association between RSB and VCB in the population. These results are presented in Table 3. In each subgroup, individuals with RSB were compared with individuals without RSB. In the male and female population, the association of RSB and VCB was strongest among those born outside Sweden who arrived before 7 years of age (OR = 4.46, CI: 3.96; 5.04 for males and OR = 4.62, CI: 3.50; 6.10 for females). The weakest association of RSB and VCB was observed among males who were Swedish-born with one foreign-born parent (OR = 1.74, CI: 1.57; 1.94) and females who were Swedish-born with two foreign-born parents (OR = 1.85, CI: 1.39; 2.47).

Males born outside Sweden arriving before 7 years also had a strong association of RSB and WCB (OR= 3.42, CI: 2.70;4.33), and RSB and PCB (OR = 3.21, CI: 2.75; 3.76). A weaker association of RSB and WCB was found among males who were Swedish-born with one foreign-born parent and Swedish-born with two foreign-

born parents (OR=1.54, CI:1.26; 1.89). There were similar associations of RSB and WCB, and RSB and PCB in the female population.

Table 3. The association of RSB and CB in the population groups.
Individuals with RSB are compared with individuals without RSB in each subgroup.

MALE	VCB	WCB (ONLY)	PCB (ONLY)
Swedish-born with two Swedish-born parents	1.89 (1.80;1.98)	1.84 (1.69; 1.99)	1.59 (1.52; 1.66)
Swedish-born with one foreign-born parent	1.74 (1.57; 1.94)	1.54 (1.26; 1.89)	1.37 (1.23; 1.54)
Swedish-born with two foreign-born parents	1.79 (1.61; 2.01)	1.54 (1.23; 1.89)	1.32 (1.15; 1.51)
Born outside Sweden arriving at/before 7 years	4.46 (3.95; 5.04)	3.42 (2.70; 4.33)	3.21 (2.75;3.76)
Born outside Sweden arriving after 7 years	2.58 (2.36; 2.82)	1.91 (1.60; 2.30)	1.96 (1.74; 2.20)
FEMALE	**VCB**	**WCB (ONLY)**	**PCB (ONLY)**
Swedish-born with two Swedish-born parents	2.46 (2.21; 2.74)	2.41 (2.12; 2.75)	2.02 (1.90; 2.14)
Swedish-born with one foreign-born parent	2.14 (1.71; 2.68)	1.84 (1.35; 2.51)	1.79 (1.56; 2.05)
Swedish-born with two foreign-born parents	1.85 (1.39; 2.47)	1.99 (1.36; 2.92)	1.85 (1.57; 2.20)
Born outside Sweden arriving at/before 7 years	4.62 (3.50; 6.10)	3.93 (2.74; 5.63)	3.29 (2.75; 3.93)
Born outside Sweden arriving after 7 years	3.80 (2.97; 4.84)	2.50 (1.73; 3.60	2.63 (2.31; 3.01)

Summary:

> RSB and VCB were strongly associated. There was a difference in the strength of the association among the immigrant and non-immigrant population.

The findings of an association of RSB and VCB in the Swedish population contribute to previous studies exploring the connection between adverse health outcomes and crime [168, 171, 172] and the differences in the prevalence of risky behaviours among the immigrant and non-immigrant populations [106, 173-178]. For example, one recent study exploring these trends over time, found a positive association between homicide rates and rates of adolescent pregnancy in the Netherlands, an indication of the structural similarities between them [179]. Earlier findings also showed that risky behaviours covaried with homicide and homicide rate of change in the United States and Canada according to Mishra and Lalumière [168]. Several studies have indicated that the associated risks of potentially risky behaviours may be higher for individuals who have thrill-seeking behaviours, are

more vulnerable to peer pressure, have reduced impulsivity, have reduced self-control, abuse substances, and have mental ill health [168, 180-184].

The investigation of the strength of the association between RSB and VCB and how this association differed by immigrant status is a novel contribution to the public health discourse. While previous studies have suggested that generational differences could account for the discrepancies in the discourse [106, 177, 178], most studies have not expanded their investigations into the association of RSB and CB in heterogeneous populations i.e. those consisting of immigrant and non-immigrant populations [171, 185]. Examinations into the different health trajectories of the immigrant and non-immigrant population in Sweden have shown that Swedish sexual and reproductive health education has played a more significant role in influencing behaviours among Swedish-born youth compared to foreign-born youth [186].

Studies also show that several important factors could explain these findings [106, 187, 188]. For example, some suggest that immigrant populations often reside in socially disadvantaged areas, which may increase their risk of adverse effects [133]. This may be exacerbated among vulnerable first-generation immigrants such as those with a refugee background. For example, vulnerable populations may face racial discrimination, blocked resources, and exposure to deviant behaviours in these neighbourhoods [106, 133, 187, 188]. Further examinations into the connections between immigrant generational status and risky behaviours have also suggested that immigrant populations, particularly second-generation immigrants are particularly vulnerable to falling prey to criminogenic influences in neighbourhoods [106]. Corroborating our findings of higher prevalences of risky behaviours among the second-generation population, some scholars suggest that downward assimilation may be associated with risky behavioural outcomes among second-generation males. Within this, second-generation males who have close contact with non-immigrant deviant males may have higher risks of being involved in criminal and risky behaviours.

Earlier studies which examined the differential experiences of immigrant and non-immigrant populations facilitate alternative explanations behind the mechanisms of our results [106, 187, 188]. For example, some studies have provided strong evidence of the importance of social conditions where, in addition to downward assimilation, minorities and immigrants residing in disadvantaged neighbourhoods often face racial discrimination, counter-culture exposure, and blocked educational and occupational opportunities [106, 133, 187, 188], consistently indicating that there are strong linkages between risky behaviours and contextual factors. [56, 189]. The tendency of immigrants to live in socially disadvantaged areas may also increase their risk of encountering potentially delinquent peers [133]. These neighbourhoods may lead to slow integration, low social cohesion and lack of collective efficacy which may be attributed to the high prevalence and a strong association of risky behaviours observed.

The result of this study stresses the need to increase supportive intervention strategies for vulnerable populations, particularly first-generation immigrants. These public health initiatives could address the complex social-environmental questions relating to the association of risky behaviours in immigrant and non-immigrant populations. Future studies should utilize these findings to enhance the understanding of the linkages between risky behaviours and contextual factors such as the environment. Further, these findings may help stakeholders such as public health workers, policymakers and clinicians who work with vulnerable immigrant populations efficiently identify and lessen the adverse effects of RSB and VCB.

Study II

Neighbourhood Crime and Major Depression in Sweden: A National Cohort Study

This study was aimed at investigating the association between neighbourhood crime and clinically diagnosed MD. The study was based on previous findings of adverse health outcomes in neighbourhoods [68, 158, 190, 191].

The main findings of the study are as follows:

1. There was an association between Neighbourhood Crime and MD in the Swedish population.

In Model A, we investigated the effect of neighbourhood crime on the odds of MD after controlling for several confounding variables (Table 4a and 4b). Among males, the odds of MD increased by 14% with each unit increase in neighbourhood crime (OR = 1.14, 95% CI: 1.12; 1.17). This increase was similar in the female population where a unit increase in neighbourhood crime increased the odds of MD by 15% (Model A, OR = 1.15, 95% CI: 1.13; 1.17). Males and females with one Swedish-born and one foreign-born parent had 10% (OR = 0.90, 95% CI: 0.87; 0.92 (Males)) and 5% (OR = 0.95, 95% CI: 0.93; 0.97 (Females)) lower odds of having MD relative to the non-immigrant population. For those born outside Sweden, males had 27% lower odds of MD (OR= 0.73, CI: 0.72; 0.75) and females 25% lower odds of MD (OR =0.75, CI: 0.74; 0.76) relative to the non-immigrant population.

2. There was a significant interaction by immigrant status.

The effect of neighbourhood crime on the odds of MD by immigrant status is shown in Model B (Tables 5a and 5b). To investigate this potentially differential effect, the model includes an interaction term between immigrant status and neighbourhood crime. The model shows that the effect of neighbourhood crime on MD was weaker in immigrant groups relative to non-immigrants. For example, 75%, 77% and 90%

of the effects were observed in males who were Swedish-born with one foreign-born parent (OR = 0.75, 95% CI: 0.72; 0.77), males born outside Sweden (OR = 0.77, 95% CI: 0.76; 0.79) and Swedish-born males with two foreign-born parents (OR = 0.90, 95% CI: 0.87; 0.93). In the female population the effect of neighbourhood crime on MD was 20% weaker for those born outside Sweden (OR = 0.80, CI: 0.78; 0.81), 16% weaker for the Swedish born with one Swedish-born parent, (OR = 0.74, CI: 0.72; 0.76) and 7% weaker for those Swedish-born with two foreign-born parents than the effect in the non-immigrant population (OR = 0.93, CI: 0.91; 0.95).

Table 4a. Relationship between Neighbourhood Crime and rates of MD among female non-immigrants and immigrants in Sweden: 2012-2015

MALES	MODEL A – OR (95% CI))	MODEL B – OR (95% CI))
Neighbourhood Crime	1.14 (1.12; 1.17)	1.26 (1.23; 1.29)
NDI	0.98 (0.97; 0.99)	0.99 (0.98; 1.00)
Year of birth	0.99 (0.99; 0.99)	0.99 (0.99; 0.99)
Non-immigrants	Reference	Reference
Swedish-born with one Swedish parent	0.90 (0.87; 0.92)	0.94 (0.91; 0.97)
Swedish-born with two foreign-born parents	1.15 (1.13; 1.18)	1.14 (1.12; 1.17)
Born outside Sweden	0.73 (0.72; 0.75)	0.77 (0.76; 0.79)
Income (5 groups)	0.87 (0.87; 0.88)	0.87 (0.87, 0.88)
Social Welfare	2.25 (2.20; 2.30)	2.26 (2.21; 2.48)
Education	0.96 (0.96; 0.96)	0.96 (0.96; 0.96)
Neighbourhood Crime * Swedish-born with one Swedish parent		0.75 (0.72; 0.77)
Neighbourhood Crime * Swedish-born with two foreign-born parents		0.90 (0.87; 0.93)
Neighbourhood Crime * Born outside Sweden		0.77 (0.76; 0.79)
Constant	-2.89 (0.004)	-2.87 (0.004)
Deviance	821001.9	820560.7

Table 4b. Relationship between Neighbourhood Crime and rates of MD among female non-immigrants and immigrants in Sweden: 2012-2015

FEMALES	MODEL A – OR (95% CI))	MODEL B – OR (95% CI))
Neighbourhood Crime	1.15 (1.13; 1.17)	1.25 (1.23; 1.28)
NDI	0.99 (0.99; 1.00)	1.00 (0.99; 1.01)
Year of birth	0.99 (0.99; 0.99)	0.99 (0.99; 0.99)
Non-immigrants	Reference	Reference
Swedish-born with one Swedish parent	0.95 (0.93; 0.97)	1.00 (0.97; 1.02)
Swedish-born with two foreign-born parents	1.16 (1.15; 1.18)	1.15 (1.14; 1.17)
Born outside Sweden	0.75 (0.74; 0.76)	0.78 (0.77; 0.79)
Income (5 groups)	0.95 (0.93; 0.97)	0.95 (0.94; 0.95)
Social Welfare	1.97 (1.96; 1.98)	1.98 (1.95; 2.02)
Education	0.96 (0.96; 0.96)	0.96 (0.96; 0.96)
Neighbourhood Crime * Swedish-born with one Swedish parent		0.74 (0.72; 0.76)
Neighbourhood Crime * Swedish-born with two foreign-born parents		0.93 (0.91; 0.95)
Neighbourhood Crime * Born outside Sweden		0.80 (0.78; 0.81)
Constant	-2.15 (0.002)	-2.13 (0.002)
Deviance	1257672.9	1257040.4

Figure 6 (Page 50) illustrates the effect of neighbourhood crime on MD in the non-immigrant and immigrant population. The illustration is based on the interaction Model B. Similar patterns of the association were observed for both males and females. Increases in neighbourhood crime were positively associated with the odds of MD in the non-immigrant population. Individuals who were born outside Sweden had no association between increases in neighbourhood crime and the odds of MD and a small protective effect (negative association) was observed among those who were Swedish born with two foreign-born parents.

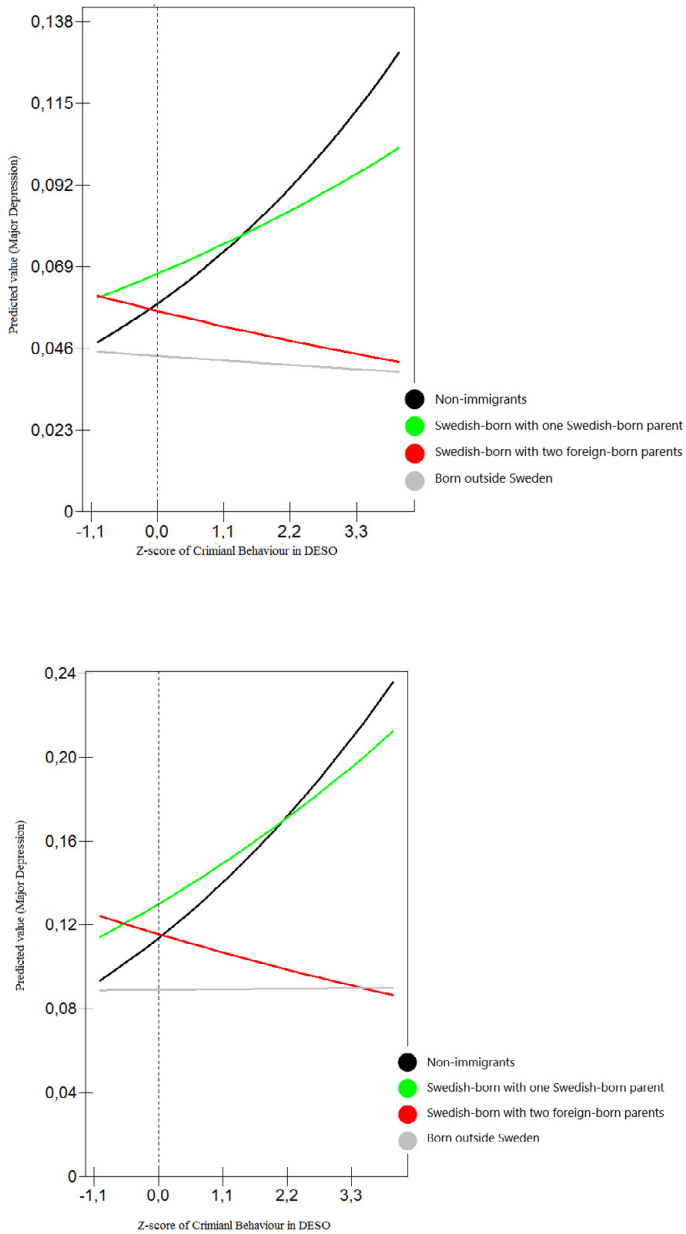

Figure 6 The effect of Neighbourhood Crime on MD by immigrant status in Sweden: 2012-2015

Summary:

> Overall, neighbourhood crime was associated with the odds of MD. There was a significant interaction by immigrant status where the odds of MD among those with non-immigrant backgrounds were more strongly associated with increases in neighbourhood crime, after adjusting for potential confounders. Increases in neighbourhood crime did not seem to affect the odds of MD for male and female immigrants who were born outside Sweden.

Neighbourhoods may expose individuals to various risks e.g., crime, and their structural characteristics may be possible mechanisms for adverse mental health outcomes in these spaces [192-194]. However, previous studies focusing on the association of crime and adverse health outcomes have not investigated the effect of neighbourhood crime on MD by immigrant status. In the present study, the key findings suggest that neighbourhood crime was associated with MD in Sweden. Further, the pathways to MD may vary between individuals with different immigrant backgrounds, where neighbourhood crime has a weaker association with the risk of MD for individuals born outside of the country or born in the host country with two foreign born parents.

This study was in line with previous studies highlighting several associations between adverse health outcomes and living in areas with crime [29, 195-197]. For example, the differences observed in the effect of neighbourhood crime on MD could corroborate previous findings of multiple indirect pathways to depressive symptoms e.g., perceptions of neighbourhood disorder and experiences of violence [195]. Studies show that individuals who have repeated exposures to unavoidable and uncontrollable stressors may be more prone to MD because of their impaired cognitive and behavioural competence [198]. This results in an inability to cope with additional stressful neighbourhood characteristics. In addition, individuals who have a lowered sense of well-being and heightened anxiety may be more affected by CB and have increased avoidance behaviours resulting from fear of crime [29, 34]. Overall there is strong evidence that violence in neighbourhoods may not be feared equally by all residents of shared geographic areas [68].

Studies indicate that social cohesion in neighbourhood networks and consistently positive health outcomes in neighbourhoods with high immigrant populations could account for the differences in the observed risks by immigrant status [52, 152, 199]. For example, the key findings of this study may be an implication of familial perception of risks, where some households may view existing violence as less risky based on their previous exposure to negative neighbourhood effects like neighbourhood crime [52, 94]. Further, families with immigrant backgrounds can compare their current risks in neighbourhoods with increases in crime to those of their home country. This weighing of pros and cons may lessen the potential effect of neighbourhood crime on the mental health outcomes at the meso-level [52, 94]. Some evidence points to a higher level of internal support-seeking behaviours and

community support among immigrant populations when compared to non-immigrant residents, especially in times of high external stress such as neighbourhood crime [52]. Through this, immigrant networks may exhibit more protective characteristics than those of their non-immigrant counterparts living in the same neighbourhoods.

However, these internal-seeking behaviours and high levels of social cohesion within the immigrant population may counter their efficient use of mental health services. For example, some studies have indicated a high level of stigmatisation of the use of mental health services among various immigrant populations [200, 201]. This has been tied to cultural explanations of mental health and the association of mental health diagnoses with severely ill and hospitalised individuals [200]. Previous research findings could suggest that non-immigrants may be more likely to seek professional care for mental health problems, owing to their access to more socioeconomic resources [105, 202]. However, Sweden's equal access to health care could be more indicative of the gravity of the mental health issues affecting the non-immigrant population who reside in neighbourhoods with high crime.

Study III

Risk of Opioid-related Overdose Death in High Crime Neighbourhoods: A national cohort study

Opioid overdose-related deaths (OODs) are an increasing concern in Western countries. In this study, we investigated the association between neighbourhood crime and OODs. The population consisted of 5,497,398 individuals of which 50.9% were male and 49.1% female. Among the population groups, Swedish born with one and two foreign-born parents had the highest percentages of OODs when compared to the reference group (0.10 and 0.11% respectively. When we examined the population by age, those 35-44 years old had the highest percentages of OODs. We also found that individuals who were Swedish born with two foreign-born parents or born outside of Sweden tended to live in neighbourhoods with high crime and deprivation.

The main findings of the study are as follows:

1. <u>There was an association between neighbourhood crime and OOD in Sweden.</u>

The logistic regression models shown in Table 5 shows the relationship between Neighbourhood Crime and OOD in the study population. In Model A, one unit increase in neighbourhood crime was associated with a 19% increase in the odds of having an OOD among non-immigrants (OR = 1.19, 95% CI: 1.12;1.27). The odds

of having an OOD was 54% lower among individuals born outside Sweden (OR = 0.46, CI:0.41; 0.52). However, neighbourhood crime was associated with 30% and 45% higher odds of OOD among those born in Sweden with two foreign-born parents (OR =1.30, CI: 1.13; 1.50) and one foreign-born parent (OR =1.45, CI: 1.30; 1.62), respectively.

2. The effect of neighbourhood crime on the risk of OOD differed by immigrant status.

We added an interaction term in Model B. This allowed us to estimate the potential differences in the risk of OOD between the population subgroups. The analysis showed that a unit increase in neighbourhood crime increased the odds of having an OOD by 39% in the non-immigrant reference group (OR = 1.39, CI: 1.29; 1.49). Relative to non-immigrants, this effect was weaker in all immigrant groups. 86% of the effect of neighbourhood crime on the risk of OOD was found in those born in Sweden with one foreign-born parent (OR = 0.86, CI: 0.75;1.00). 59% of the effect was found in those born outside Sweden (OR = 0.59, CI: 0.52; 0.67) and 57% in those who were Swedish born with two foreign-born parents (OR = 0.57, CI: 0.49;0.68).

Table 5. Relationship between Neighbourhood Crime and OOD in the non-immigrant and immigrant residents of Sweden between 2012 and 2018

	Model A	Model B
Neighbourhood Crime	1.19 (1.12;1.27)	1.39 (1.29;1.49)
Non-immigrants	Reference	Reference
Swedish-born with one foreign-born parent	1.45 (1.30; 1.62)	1.46 (1.31;1.64)
Swedish-born with two foreign-born parents	1.30 (1.13; 1.50)	1.63 (1.40;1.90)
Born outside Sweden	0.46 (0.41; 0.52)	0.59 (0.52;0.67)
NDI	1.12 (1.10; 1.15)	1.14 (1.11;1.17)
Age (Age Group)		
24 years and under	0.37 (0.30; 0.47)	0.39 (0.31;0.49)
25 – 34 years	0.87 (0.78; 0.96)	0.87 (0.79;0.97)
35 - 44 years	1.15 (1.04; 1.28)	1.15 (1.04;1.28)
45 – 54 years (Base category)		
55 - 64 years	0.99 (0.88; 1.12)	0.99 (0.88;1.11)
65+ years	0.67 (0.55; 0.81)	0.66 (0.54;0.80)
Sex	0.38 (0.35; 0.41)	0.38 (0.35;0.41)
Marital Status	0.21 (0.18; 0.24)	0.21 (0.19;0.24)
Unemployment Status	2.59 (2.39; 2.82)	2.59 (2.39;2.81)
Neighbourhood Crime * Swedish-born with one foreign-born parent		0.86 (0.75;1.00)
Neighbourhood Crime * Swedish-born with two foreign-born parents		0.57 (0.49;0.68)
Neighbourhood Crime * Born outside Sweden		0.59 (0.52;0.67)

Summary:

> Neighbourhood crime was associated with OOD in Sweden. However, the risk of an OOD differed by immigrant status. For example, relative to the non-immigrants, the effect of neighbourhood crime on opioid-related overdose death was overall lower among all immigrant groups.

The main findings of this study are in line with previous literature on differences in the adverse health effects in immigrant and non-immigrant populations [69, 164, 175]. For example, it adds a broader perspective to a recent large US-based study which explored the differential rates of drug overdose mortality across race/ethnicity and sex. Therein, rates of drug overdose deaths were lower for foreign-born men and women than the US-born population and the extent of the difference varied by race, ethnicity and sex [164]. Several studies which explore the immigrant paradox in heterogenous populations i.e., those consisting of individuals of different immigrant backgrounds, have indicated that immigrant and non-immigrant populations may perceive neighbourhood disorder differently and may in turn cope with stressful situations differently [52, 94, 203]. This study suggests that these differences, in tandem with environmental mechanisms, may moderate the risk of OODs in neighbourhoods with high crime.

Scholars have long indicated the significant role that neighbourhoods play in the connection between drug-related deaths and crime [204-206]. For example, pointing to a potential lack of social cohesion and weak social networks within them, environments with deteriorated quality of life have been associated with increases in deviant behaviours such as drug use [159, 207, 208]. Studies show that these deviant behaviours may be further exacerbated by increased criminality in neighbourhoods owning to increased access to illegal substances and drugs being used as coping alternatives in these high-stress environments [209]. Weisburd's law of crime concentration could help us further understand the impact of these findings. The law suggests that criminal activities in neighbourhoods are concentrated in small geographic areas [45]. Further, previous explorations into the drug-crime connection have found that the concentration of violent crime has been associated with open drug markets, especially in vulnerable neighbourhoods [110] and that concentrated areas of OOD spatially overlap with areas of concentrated violence [210]. Considering the findings of this study, time-sensitive effects may also be at play in the risk of OOD in the population. Therein, socio-cultural experiences within vulnerable populations could be affected by a positive association between opioid prescriptions and length of stay in the host country [211]. These findings indicate a potential benefit from studies focused on the impact of these environmental impacts on vulnerable populations and may aid in the development of more effective interventions for those affected.

Previous studies have shown that immigrant populations are less likely to misuse substances than their non-immigrant counterparts [108]. However, a potentially multigenerational immigrant paradox was found among the population i.e., while second-generation immigrants were less likely to meet the criteria for opioid and other substance use disorders, first-generation immigrants were three to five times more likely to do so [108]. Studies have indicated that greater emotional dysregulation is evident among those who misuse opioids [212]. As such, in neighbourhoods where high crime is consistent, individuals who already suffer from anxiety, depression and chronic pain may further suffer from the development and severity of opioid and depression relations [159]. The coping mechanisms utilised by the immigrant population may differ substantially from those of the non-immigrant population [52, 94]. While most associations between neighbourhood crime and drug overdose deaths have been linked to environmental characteristics such as socioeconomic distribution, neighbourhood deterioration and the built environment [205, 213, 214], studies show a protective mechanism within immigrant networks which may modulate the relationship between negative environmental characteristics such as neighbourhood crime and drug overdose deaths [212]. For example, for some immigrant populations neighbourhood disorder may be perceived as less threatening and, in turn, less detrimental to their mental health and coping strategies. However, a possibility exists that the risk of OOD among the immigrant population may increase after initial misuse.

Study IV

Drug Use Disorders in Younger Second-Generation Immigrants in Sweden

Within the last decade, life course research has expanded the existing knowledge of substance use and health disparities in diverse populations [76, 112, 203, 215]. Within its exploration, there is a highlighted importance of identifying risks of adverse health outcomes in, for example, children and adolescents [177, 216]. This study aimed to uncover the risks of drug use disorders in younger second-generation individuals with respect to region of origin, years since family migration and reasons for migration. The results are based on the population in Sweden where 907, 360 individuals aged 12- 20 who were born in Sweden were studied.

1. Risk of DUD was high among second-generation immigrants.

As shown in Table 6, the overall risk of DUD was higher for second-generation immigrant males relative to the non-immigrant male reference group (HR=1.69, 99% CI: 1.64;1.75). For the regions of origin, the HR for the risk of DUD was notably higher for those with at least one parent from Africa (HR = 3.53, CI: 3.21;

3.68) and MENA (HR = 2.31, CI 2.18; 2.44) regions compared to the reference group. Among the female population, the risk of DUD was also higher for second-generation immigrants (HR =1.24, CI: 1.17, 1.31) compared to the reference group. Further, the risk was particularly increased for second-generation immigrants from Eastern Europe (HR=1.20, CI: 1.08; 1.34) Western countries (HR=1.30, CI: 1.21;1.39) and Africa (HR=1.61, CI: 1.37; 2.05). In addition to these findings, the selected covariates were associated with DUDs in the study population.

Table 6. Risk of drug use disorders in the second-generation immigrant population

Model 1: adjusted for age; Model 2: adjusted for age, region of residence in Sweden, educational level, parental marital status, and neighbourhood socioeconomic status; Model 3: model 2 + comorbidities.

Male Population

		MODEL 1			MODEL 2			MODEL 3		
	OBS.	HR	99% CI		HR	99% CI		HR	99% CI	
Sweden	27963	1			1			1		
All Regions	16032	1.93	1.88	1.99	1.78	1.72	1.83	1.69	1.64	1.75
Eastern Europe	3295	2.12	1.94	2.16	1.95	1.85	2.06	1.83	1.74	1.94
Western countries	5973	1.50	1.40	1.52	1.35	1.30	1.41	1.31	1.26	1.37
MENA	3174	2.72	2.48	2.76	2.59	2.45	2.74	2.31	2.18	2.44
Africa (excluding North Africa)	951	4.14	3.77	4.55	3.52	3.20	3.87	3.53	3.21	3.88
Asia (excluding Middle East and Oceania)	1450	2.00	1.75	2.05	1.70	1.57	1.85	1.71	1.58	1.85
Latin America and the Caribbean	415	2.32	2.01	2.68	2.00	1.74	2.31	1.95	1.69	2.26
Others	774	3.57	2.99	3.69	2.65	2.38	2.94	2.53	2.27	2.81

Female Population

		MODEL 1			MODEL 2			MODEL 3		
	OBS.	HR	99% CI		HR	99% CI		HR	99% CI	
Sweden	10607	1			1			1		
All Regions	4222	1.31	1.24	1.38	1.28	1.21	1.35	1.24	1.17	1.31
Eastern Europe	780	1.23	1.11	1.37	1.26	1.13	1.40	1.20	1.08	1.34
Western countries	2178	1.39	1.30	1.49	1.33	1.24	1.42	1.30	1.21	1.39
MENA	556	1.20	1.06	1.36	1.28	1.13	1.45	1.11	0.98	1.26
Africa (excluding North Africa)	151	1.63	1.29	2.06	1.49	1.17	1.89	1.62	1.27	2.05
Asia (excluding Middle East and Oceania)	261	0.85	0.71	1.02	0.83	0.69	0.99	0.89	0.74	1.07
Latin America and the Caribbean	96	1.31	0.98	1.77	1.16	0.86	1.56	1.13	0.84	1.52
Others	200	2.06	1.68	2.53	1.69	1.37	2.07	1.53	1.24	1.88

2. Years since migration and reason for migration were associated with the risk of DUD.

The findings of the examinations are presented in Figure 7. The examinations revealed that male second-generation immigrants living in Sweden for less than 10 years had a higher risk of DUDs (HR = 2.42, 95% CI 2.33;2.51). Among the second-generation immigrant females and especially in those living in Sweden for less than 10 years, the relationship between time since migration and DUD was minimal. The risk of DUD in the second-generation immigrant population differed greatly by reason for migration (Table 7). The highest risk of DUD was observed in the refugee population (HR = 2.48, 96% CI: 2.39; 2.57) and those migrating for familial reasons (HR = 2.04, 95% CI: 1.96;2.13)

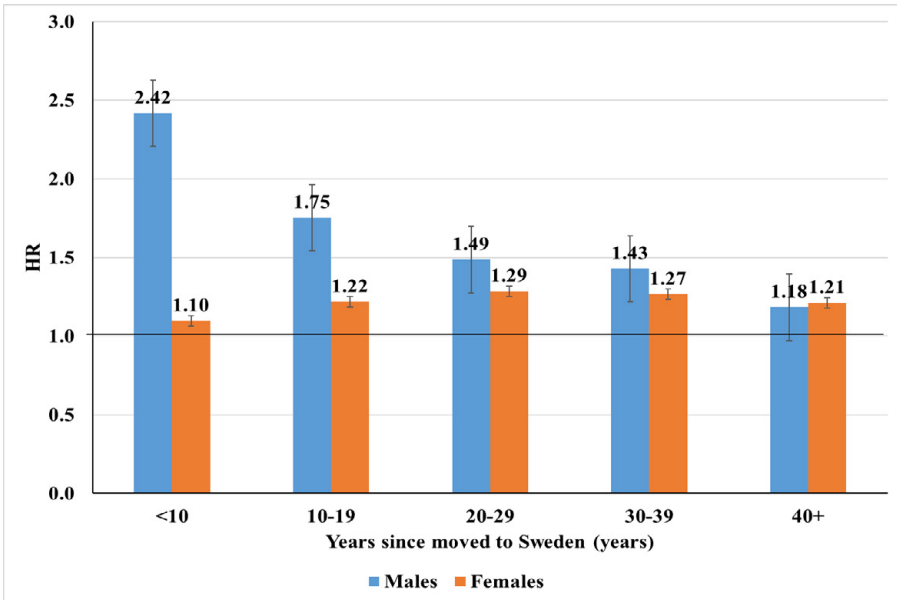

Figure 7 Drug use disorders in the younger second-generation immigrants by years of migration.

Table 7. Risk of drug use disorders in the study population by reason for migration

	Males				Females			
Reason of migration in family	**HR***	**95% CI**		**P-value**	**HR***	**95% CI**		**P-value**
Swedish-born	1.00				1.00			
Refugees	2.48	2.39	2.57	<.0001	1.12	1.03	1.21	0.0103
Work	1.56	1.21	2.02	0.0007	0.93	0.54	1.61	0.7987
Family	2.04	1.96	2.13	<.0001	1.14	1.04	1.24	0.0045
Study	1.55	1.08	2.21	0.0169	1.79	0.96	3.32	0.0671
Others	1.52	1.18	1.96	0.0013	0.91	0.52	1.60	0.7425

*: Fully adjusted.

Summary:

> The risk of DUD in younger second-generation immigrants was significantly different from that of younger individuals with Swedish-born parents. The risks of DUD were also higher during the first 10 years after arrival to Sweden among males.

The findings of this study are in line with previous literature which explores adverse health outcomes such as drug use disorders in immigrant populations [217-220]. In addition, the findings of higher risks of DUDs among younger individuals add value to the extant literature which has been mostly focused on adult populations and first-generation immigrants to Sweden [221-223]. In addition, it corroborates previous examinations which aim to elucidate the sociocultural environment and complexity of risk factors associated with substance use in the adolescent population [224, 225].

Earlier Nordic examinations into the use of drugs among the immigrant and non-immigrant populations have highlighted that, compared to non-immigrants, the risk of hospitalization from drug use was lower among first-generation refugee populations and higher among other first and second-generation immigrant populations [226]. Supporting advocations for the use of information on countries and regions of origin in population analyses [227], Lundgren (2019) also found that immigrants from other Nordic countries to Sweden were at a higher risk of drug mortality than the non-immigrant population [228]. The use of country-of-origin information in this study may then facilitate more in-depth analyses of drug use disorders in the population and aid current public health initiatives.

Despite findings of increased later life vulnerability after the initiation of drug use in early adolescent years [215] and the increasing risks of adverse health outcomes related to drug use among immigrant populations [108, 121, 203, 215, 229, 230], only a few studies have focused their studies on younger immigrant populations [231]. Once perceived as society's healthiest, drug use has become commonplace

in the adolescent population [112, 232]. Now, the difference in family cohesion and peer encouragement among the immigrant and non-immigrant populations could further implicate these findings [233]. Through this, the accumulation of societal restrictions such as social barriers, stress exposure and ability to cope may impact the severity of adverse health outcomes such as DUDs [234-236]. For example, life course perspectives within the behavioural sciences indicate that weak social bonds, for example, family ties within the host country, would have a limited effect in constraining risky health behaviours such as substance use [237].

There is evidence that individuals who migrate to already disadvantaged areas at younger ages may be particularly susceptible to adverse health outcomes [78]. These effects may be evident in previous associations of DUDs and neighbourhood social deprivation in populations [199, 234-236, 238]. For example, one recent cohort study found an overall higher risk of alcohol and drug use disorder for second-generation immigrants when compared to first-generation immigrants [121]. Notably, the effect sizes were greater for females than males, differed with migration from areas with high alcohol consumption and had a significant interaction between generational status and SES for alcohol and some drug disorders [121]. Additional implications of the findings may be time-sensitive and neighbourhood-dependent, as scholars have indicated that, over time, second-generation immigrants exhibit similar behaviours to their non-immigrant counterparts [106].

Strengths & Limitations

Firstly, the thesis contains novel findings (e.g., Study I) of which no previous study exists for direct comparison. In addition, it presents particularly useful information which may help stakeholders understand the effect of neighbourhoods and assimilation on the immigrant population by furthering the examinations on the association of risky behaviours in immigrant and native populations.

Secondly, the studies utilized several high-quality registers which were based in Sweden. This includes, but is not limited to, the Swedish Crime Register, the National Patient Register, the National Prescribed Drug Register, and the Total Population Register which were linked to develop a rich dataset to fulfil the aims of these studies. These registers have been recognised as high quality and have been validated through rigorous population studies [122-124, 129, 130].

Thirdly, in defining neighbourhoods, the use of SAMS and DeSO areas to identify 'hotspot' areas such as in its application to our definition of neighbourhood crime is well supported by previous studies which show that crime is concentrated in smaller areas versus being randomly distributed [239-241]. This may provide more robust estimations for CB than in previous neighbourhood studies. Geographical areas such as SAMS and DeSOs, have corresponded well with the definition of neighbourhoods by residents [242]. Furthermore, diverse geographical databases may allow for a more accurate estimation of neighbourhood effects than previous neighbourhood studies [45, 195, 243].

Despite the notable strengths of the studies in the thesis, there are a few limitations which should be considered in the interpretation of the findings.

It should be noted that the nature of the studies in this thesis does not allow for the estimation of causal relationships between the association of our predictor and outcome variables (e.g., RSB and VCB, Neighbourhood Crime and MD, Neighbourhood Crime and OOD, Region of Origin, and DUDs). In addition, the strength of the association between the variables may have been affected by residual confounding factors despite adjustments. Also, while the study had several well-developed variables, there was no access to measures of collective efficacy which has been associated with several adverse health outcomes in populations [52-54, 193].

The use of quantitative data from registries could also limit the full understanding of the perception of neighbourhood crime by non-immigrants and immigrants and

how it impacts mental health, risky behaviours and substance use inclination. This understanding may benefit stakeholders such as public health practitioners who administer care to the affected populations. Knowledge of such potential differences may aid in the understanding of the effects of neighbourhood crime on adverse mental health outcomes in immigrants and non-immigrants. Further, the use of registers such as the Swedish Crime Register limits data to convicted or suspected offenders. This may introduce bias in the interpretation of the results when compared to victim surveys. This bias may be evident in neighbourhoods which experience increases in neighbourhood crime and over-policing which may lead to higher rates of convictions and suspicions [244]. Evidence suggests that the use of ICT in Swedish crime reporting may contribute to a 'misleading picture of conditions', where crime statistics may be influenced by organizational factors such as the police's routine activities, their willingness to detect crimes, and the development of crime-related projects or units [134]. In addition, police databases are largely dependent on the ability of the police to exercise control in neighbourhoods and the willingness of residents, including victims, to report crimes [245]. These findings may make vulnerable populations such as the immigrant population more susceptible to overrepresentation in police databases as one Swedish study has highlighted that deprived neighbourhoods, which are prone to over-policing [246], may house a high percentage of immigrants [247].

While the diagnoses of MD, OOD, DUD and RSB were obtained from high-quality registers, the data is only limited to cases which have been reported or identified by healthcare practitioners. In addition, despite the ease of access to these health services in Sweden, evidence exists that these services may be underutilized by immigrant populations due to various stigmas and biases to adverse health outcomes such as MD [105]. In addition, there may be a lack of will to contact emergency services in some neighbourhoods which may also impact the data. Studies show that, in cases of overdoses, some residents, out of fear of police involvement, may resist contacting emergency services [214, 244, 248].

The use of the advanced geographical divisions, SAMS and DeSOs, may add limitations. For example, while SAMS were meant to contain homogenous divisions, there is evidence that due to the settlement morphologies and the origins of SAMS (some areas contain residents and some contain electoral districts), there are divisions which may not have a homogenous character [141]. DeSO areas may also be subject to splitting which could change their characteristics [20]. For example, the area may split if the population in the area becomes too large or if there are changes in the country or municipal boundaries as these components are integral in the definition of a DeSO unit [20].

While immigrant populations have previously been studied as a group e.g., first-generation immigrants, second-generation immigrants etc., are not entirely homogenous population groups. As such, there may be important within-group differences which may impact studies in these populations. For example, individuals

who choose to immigrate as first-generation immigrants may be healthier at the baseline when compared to those who choose to remain in their home country and their counterparts in the destination country due to health and immigration controls [67].

Conclusion & Future Perspectives

This thesis examined the association between several adverse health outcomes and neighbourhood crime. In addition, it identified the risk of these outcomes in the population. The conclusions are summarised below:

I. Individual-level Association of Risky Sexual Behaviour and Violent Criminal Behaviour

This study found that RSB was associated with VCB and that, the behaviours, had a strong association among first-generation immigrants. The first-generation immigrant population was also found to have a lower prevalence of RSB and VCB. This important contribution to the risky behaviour discourse may guide future examinations into the association of risky behaviours in the immigrant and non-immigrant populations. These investigations may also aid the enhancement of current public and behavioural health initiatives and help stakeholders to better understand the role of risk environments, which are conducive to risky behaviours. Understanding the role of immigrant generational status in the health trajectories of individuals may further help initiatives which focus on minimizing the risk of adverse health outcomes in vulnerable immigrant populations and support the Sustainable Development Goals of ensuring universal access to sexual and reproductive health care services and information [249].

II. Neighbourhood Crime and Major Depression in Sweden: A National Cohort Study

In this retrospective cohort study, increases in neighbourhood crime were associated with the odds of MD. The odds of MD also differed between those of different immigrant statuses i.e., increases in neighbourhood crime were more strongly associated with the odds of MD crime in the non-immigrant population. The study supports the call for in-depth investigations into the perception of mental health outcomes in heterogenous populations and highlights the importance of evidence-

based neighbourhood interventions especially in areas which are susceptible to crime increases. These investigations may uncover important mechanisms which could explain the differences in the mental health outcomes between immigrant and non-immigrant populations.

III. Risk of Opioid-related Overdose Death in High Crime Neighbourhoods: A National Cohort Study.

This addition to the crime health discourse presents an association between neighbourhood crime and OOD. In addition, it highlights that this association may differ by immigrant status as neighbourhood crime increased the risk of having opioid-related overdose deaths among non-immigrants. The study adds value to the discourse which suggests that multiple mechanisms in neighbourhoods may influence the health trajectory of non-immigrants and immigrants.

IV. Drug Use Disorders in Younger Second-Generation Immigrants in Sweden

This study highlights that the overall risk of DUD was higher among younger second-generation immigrants from all regions relative to the non-immigrant population. Younger second-generation immigrant males with parents originating from Africa or MENA had particularly high risks of DUD. In addition, the time since migration and the reason for migration were associated with the risk of DUD.

In summary, to the benefit of the discourse on crime, immigration and health, future research may explore the mechanisms behind the associations found in these studies. For example, future research may benefit from explorations into the mechanisms behind the association between neighbourhood crime and opioid and other drug-related deaths in non-immigrant and immigrant populations. These investigations may affect current policy directions and public education on ways in which the affected groups may mitigate these adverse health outcomes. For example, studies have shown that, because of a fear of prosecution, some residents of vulnerable communities may resist contacting ambulances and other emergency services after having a complication from drug use [214, 244, 248]. Stakeholders such as social workers, psychologists, health care workers, and school administrators may incorporate these findings to assist the most vulnerable in tandem with additional research investigations into this topic.

Popular Science Summary

The big picture of crime and health

Imagine being told that increases in neighbourhood crime could increase your likelihood of having major depression. Understandably, a shooting near everyone's favourite supermarket or the theft of a neighbour's car could make any household uncomfortable and, to be honest, quite scared.

It might be clear for many to see the association between crime and their health. However, have you ever wondered if the association could be different between the people living in your city? Well, a recently published study on neighbourhood crime, immigration and health in Health & Place showed interesting differences in the immigrant and non-immigrant population.

Big Data Helping Society

A new 'big data' study shows that increases in crime were associated with more depression diagnoses in Sweden. In fact, neighbourhood crime had a large effect on

major depression diagnoses in the immigrant and non-immigrant populations. Three accompanying papers to this study (in this thesis) have also seen differences between immigrants and non-immigrants relating to crime and other health issues.

First, one study showed that crime was associated with what scientists call the new epidemic, opioid-related overdose deaths. In the study, the effect of crime on opioid overdose-related deaths also differed between immigrants and non-immigrants.

Second, with the knowledge that risky behaviours may be associated, the association of risky sexual behaviours and various criminal behaviours ranging from violent crime and property crimes to white-collar crimes like fraud was examined. The association was established, and it was also found that the strength of the association differed between immigrants and non-immigrants.

To further understand these differences in the health risks within the population, another study examined the risk of drug use disorders among young people. It showed that younger immigrants from seven regions of the world had a higher risk of drug use disorders.

What does it mean?

Scientists have long indicated a rise in drug and mental health issues in populations. However, many researchers are calling for more public health research on how the health risks might differ in immigrant and non-immigrant populations.

The information in this series of studies on crime, immigration and health has the potential to aid social workers and policymakers. Through the studies, they can get a greater understanding of the population and their health and behavioural issues. When it comes to our neighbourhoods, we all can agree that fully understanding the health of the population could benefit current public health education initiatives geared towards the most vulnerable in society. This may be even more important if these issues are associated with the ever-increasing crime rates.

Use of individual data

The researchers had permission to use individual data which had the personal identification numbers removed. This made it possible to link several public health and social registries. These registries contained information on depression diagnoses, crime convictions and drug use to name a few. This access also allowed the identification of generations of immigrants, for example, first generation who were born outside of the country and second-generation immigrants, who were born in Sweden to one or two foreign parents.

To examine the relationship between crime and health in the population well-known statistical approaches were used. For example, when the association between crime and major depression was found, the next step was to examine if the association was different between immigrants and non-immigrants. The answer was ‘It Depends!’.

The association, whether stronger or weaker depended on the immigrant background of the individuals and was a key finding of the study.

Adding value to our neighbourhoods, through research

While *'It depends'*, the findings are compelling and add to decades of conclusions highlighting the importance of studies regarding immigration, crime, and health. These studies have also pointed out the importance of research which includes factors such as age, sex, and country of birth. These factors, when excluded, may deprive vulnerable individuals of well-needed information on their health and well-being. This information could be important to improve current efforts to lessen several health issues in society.

What else do we need to know?

Because the study only looked at how crime was associated with health outcomes and the risk of drug use disorders in younger people, it wasn't possible to say that crime caused these issues. However, the research considered several factors such as social welfare, the socioeconomic status of the neighbourhood, education, and marital status in the examinations. This leaves room for future studies to explore how other social or cultural factors could influence these differences.

Populärvetenskaplig sammanfattning

Kriminalitet och hälsa

Föreställ dig att få höra att ökad brottslighet i grannskapet kan öka din sannolikhet att drabbas av depression. Förståeligt nog kan en skottlossning nära ens närbutik eller stöld av en grannes bil göra vilket hushåll som helst obekvämt och, om man ska vara ärlig, ganska rädd.

Det kan vara tydligt för många att se sambandet mellan brott och hälsa. Men har du någonsin undrat om sambandet kan vara annorlunda mellan de olika grupperna som bor i din stad? Jo, en nyligen publicerad studie om bostadsområdets brott, invandring och hälsa i Health & Place visade intressanta skillnader mellan invandrar- och icke-invandrarbefolkningen.

"Big data" hjälper samhället

En ny 'big data-studie' visar att ökningen av kriminalitet var förknippad med fler depressionsdiagnoser i Sverige. Faktum är att brottsligheten i bostadsområdet hade stor effekt på depressionsdiagnoser i invandrar- och icke-invandrarbefolkningen. Tre medföljande artiklar i denna avhandling har också funnit skillnader mellan invandrare och icke-invandrare avseende samband mellan brott och andra hälsoutfall.

För det första visade en studie att brott var förknippat med vad forskare kallar den nya epidemin, opioidrelaterade dödsfall pga. överdoser. I studien skilde sig effekten av brott på opioidrelaterade dödsfall pga. överdoser även mellan invandrare och icke-invandrare.

För det andra undersöktes sambandet mellan riskfyllda sexuella beteenden och olika kriminella beteenden, allt från våldsbrott och egendomsbrott till bedrägeri, med tanken om att riskfyllda beteenden hade ett sådant samband. Samband fanns och man fann också att styrkan i sambanden skilde sig mellan invandrare och icke-invandrare.

För att ytterligare förstå dessa skillnader i hälsoriskerna inom befolkningen undersökte en annan studie risken för narkotikamissbruk bland unga. Den visade att yngre invandrare från sju regioner i världen hade en högre risk för narkotikamissbruk.

Vad betyder det?

Forskare har länge signalerat att en ökning av problem med droger och psykisk ohälsa föreligger i befolkningen. Många forskare efterlyser dock mer folkhälsoforskning om hur hälsoriskerna kan skilja sig åt i invandrar- och icke-invandrarbefolkningar.

Informationen i dessa studier om brott, invandring och hälsa har potential att hjälpa t.ex. socialarbetare och beslutsfattare. Genom studierna kan man uppnå en större förståelse för befolkningen och deras hälsa och beteende. När det gäller våra bostadsområden kan vi nog alla vara överens om att en bättre förståelse av befolkningens hälsa skulle kunna hjälpa nuvarande folkhälsoåtgärder inriktade på de mest utsatta i samhället. Detta är ännu viktigare eftersom dessa frågor är relaterade till den ständigt ökande brottsligheten.

Användning av individuella data

Forskarna har tillstånd att använda individuella uppgifter med personnumren borttagna. Detta gjorde det möjligt att koppla ihop flera folkhälso- och socialregister. Dessa register innehöll information om depressionsdiagnoser, brottsdomar och droganvändning. Denna tillgång till data gjorde det också möjligt att identifiera generationer av invandrare, till exempel första generationen födda utomlands och andra generationens invandrare, som föddes i Sverige av en eller två utländska föräldrar.

För att undersöka sambandet mellan brott och hälsa i befolkningen användes etablerade statistiska metoder. Vidare, när sambandet mellan brott och depression fastställdes var nästa steg att undersöka om sambandet såg olika ut mellan invandrare och icke-invandrare. Svaret var 'Det beror på!'. Sambandet, vare sig det var starkare eller svagare, berodde på individernas ev. invandrarbakgrund och var ett huvudresultat i studien.

Att tillföra värde till våra bostadsområden genom forskning

Trots "Det beror på" är resultaten övertygande och bidrar till slutsatser som lyfter fram vikten av studier om omgivningens betydelse i utvecklingen av kriminalitet och ohälsa hos utsatta grupper, såsom invandrare. Dessa studier har också konstaterat vikten av forskning som inkluderar faktorer som ålder, kön och födelseland. Detta är viktig information for utsatta grupper om hälsa och välbefinnande. Informationen är viktig för att förbättra nuvarande insatser och därmed minska ett flertal hälsoproblem i samhället.

Vad mer behöver vi veta?

Studierna undersökte bl.a. hur brottslighet är förknippad med hälsa och risken för drogmissbruk men det var inte möjligt att konstatera att brott orsakade dessa problem. Forskningen tog dock hänsyn till flera faktorer såsom försörjningsstöd,

bostadsområdets socioekonomiska status, utbildning och civilstånd. Detta lämnar utrymme för framtida studier för att utforska hur andra faktorer kan påverka dessa skillnader.

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Wan, wan cuoco, ful baaskit – Jamaican proverb

(single cocoa beans will fill a basket)

Achievements do not come suddenly. Everything takes time.

Growing up, I made conscious decisions to surround myself with people who would motivate me, help me face my faults and fears and make me better. I also yearned for these people to be good listeners and have a passion for success as much as I did. This PhD journey marks the end of a fun but challenging stage, and the start of something new.

It started with my family

From an early age, Pauleen - the supermom - who made me, and my brother Ric want to learn, made her intentions clear. She wanted her boys to be confident, hardworking, empathetic, and God-fearing. And while me and my brother had completely different passions, my mom made it her duty to let us know that whatever we did, we should aim to be excellent. While my father would have punctuated her actions with the simple *'tek op yu buk'* (read your books), my mother made sure that I put the pedal to the metal and did my best. Her love and support have been amazing, and her sacrifices made all my academic and performing arts achievements possible. The positive energy and quality support from Ric ensured that on rainy days, I could count on him. He made stressful times lighter through brotherly banter and well-needed support.

His memory is forever etched on our hearts.

Growth does not come easy, but hard work pays off

When I joined the Center for Primary Healthcare (CPF), I knew something special was about to happen. For one, Kristina and Jan welcomed me with open arms and did not doubt my skills or my potential. As my main supervisor, Kristina's recipe for my growth was simple. A cup of humility, a pinch of drive, a slice of resilience

and a dash of understanding. She taught me how to hone those traits and never stop improving. At times when our creative points of view did not align and many darlings had to be killed, I trusted the process and knew that the hard work would pay off.

To ensure the scaffolding provided at CPF was successful, my co-supervisor Henrik had a big role to play. My work had a lot of numbers -- and numbers can be tricky. However, by having a straightforward yet understanding supervisor in the midst, I was able to learn from him and improve my skills and by extension, improve my work. While our love for science communication was *almost* mutual, we made work lighter with talks of the sea, the sauna, and unplanned laughter.

Most of these moments happened in my dynamic office. There, switching from a space of high stress (e.g., computer issues and random heat or cold waves) to joyful moments shared with the likes of Henrik, my office mate Kenta and frequent (and fun) visitor Wazah was common. Those moments made the rough times a little less rough. But what else would you expect with a great office mate like Kenta? His temperament and relatability allowed for easy discussions about everything from academics and the future as well as why he should not water my artificial plant.

In many academic settings, the support would have ended there. However, the CPF is a centre with great people. When Xinjun and Ardavan came on board as my co-supervisors, I knew that my skillset would have been greatly improved. They have selflessly assisted my development and did not bat an eye when I had last-minute pleas for help. In addition, technical assistance from Mats-Åke and Helene's administrative prowess added value to my work.

Many would not know this, but Geography was my first love at university; however, in short, the love ended after my first semester as I felt more connected with the behavioural sciences. To my excitement, I collaborated with Anton W. who helped me revisit that geo-love and by navigating the world of Geographic Information Systems. His professional mark on my thesis methodology cannot be understated. I also appreciate the passionate work of my other collaborators Alexis C E. and Jonas L.

My social circle helped me to thrive

There's no doubt that my time at Lund University was dedicated to my PhD. However, my involvement in the Medical Doctoral Students Union (MDR) was a great opportunity for me to refine my digital communication skills as their Communications Officer and connect with influential individuals in the medical field. The likes of Sakshi, Esther, Kreema, Christopher, Iran and many others provided well-needed support and friendship during my days in the role. The confidence that Sakshi and Esther had in my creative ideas made me thrive from development to execution.

This story has its roots in Jamaica. However, the fruit of the PhD has ripened here in Sweden with the support of my neo-Swedish family and my best friends.

While we have been separated by international waters, Kerisha, Javier, Andrew, and Geronimo are undoubtedly my extended family. Their love and support have kept me grounded. Moreover, the time difference worked well when I was working late nights and needed to ramble about the Swedish weather.

While living in the land of IKEA and ABBA, Ajrus, Yahneake and Chloe performed a significant role in helping me keep my hair follicles (or what's left of it) in place. Friendship was the calming pill Ajrus gave me when my laptop crashed the day before my halftime seminar. Not to mention bringing *matlåda* to the hungry academic who was reluctant to move from his computer. Yahneake's grounding attitude was also a big support; she not only made me feel at home with her 'Jamaican-ness', but she also provided well-needed mental breaks through calming conversations and laughter. Then there is Chloe's supportive attitude which could never be understated. The check-ins and well-timed encouraging words helped me even in the darkest and coldest Swedish days.

Even though the end of this era might mean giving up things like my work-on-the-weekend residency at Espresso House, Stortorget (my favourite manuscript writing café), I'll cherish all the lessons learned from every *'wan wan cuoco'* moment this journey offered.

Sanjay, yu gwaan gud!

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