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Economic and Socioeconomic Influences on Integration and Health in Immigrants to Sweden

Pello-Esso, Wazah

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DOCTORAL DISSERTATION

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Abstract:

Introduction: Economic and socioeconomic factors are key influences on a wide range of integration outcomes, including educational performance, the immigrant-native wage gap, susceptibility to sepsis, and the risk of developing drug use disorders. Understanding the interplay of these factors is important for developing policies that enhance immigrants' integration.

Aim: The thesis consists of four studies. The first study examines the effects of initial neighborhood socioeconomic status on school grades in 9th grade. The second study examines the impact of personality traits on the immigrant-native wage gap in Sweden. The third study examines how sociodemographic factors, including region of origin, influence the incidence of sepsis. The fourth study examines the relationship between school grades in 9th grade and the risk of subsequent drug use disorder and investigates whether this association differs by parental immigrant background and sex.

Material and methods: The analyses in the studies are based on Swedish national administrative registers. These registers contain information on socioeconomic and demographic characteristics as well health care usage. Quasi-experimental methods, Oaxaca-Blinder-decomposition, sibling analysis, and a variety of econometrics and statistical techniques were used in the studies.

Results: The findings show that the initial socioeconomic status of a neighborhood impacts school grades. Personality traits impact wages and influence the immigrant-native wage gap, which suggests that similar traits are differently remunerated in the labor market. The risk of sepsis varies across sociodemographic factors, but after adjusting for other covariates, it was not strongly linked to country of origin. However, men from Africa were less influenced by their country of origin compared to African women, highlighting sex disparities in health outcomes between immigrants. Finally, low school grades are associated with a higher risk of developing drug use disorder, with sibling comparisons suggesting a causal relationship. Furthermore, males with foreign-born parents had twice the risk of drug use disorder compared to those with Swedish-born parents, which was a pattern not observed among females, thus suggesting gender differences in the role of parental immigrant background.

Conclusion: This dissertation shows how neighborhood socioeconomic status, personality traits, and demographic factors influence educational performances, the immigrant-native wage gap, and health-related outcomes – and thereby the integration trajectory of immigrants. The results highlight the need for tailored interventions to address: 1) the impact of neighborhood effects on vulnerable groups, such as immigrant students in deprived neighborhoods, 2) labor market discrimination, 3) health disparities, and 4) drug use disorder.

Keywords: Neighborhood effect, Immigrant-native wage gap, Personality Traits, Sepsis, Risk factors, School Achievement, Drug Use Disorder

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Till min bortgångna mor, Iris, och hennes kusiner;
för ni kan uppnå vad ni än sätter er för - genom egen kraft och
ansträngning

Table of Contents

Abstract

Immigrants in Sweden face structural disadvantages, including lower educational attainment, higher unemployment rates, and lower wages compared to native-born individuals. They also experience poorer health outcomes, such as higher rates of infections and substance misuse. This thesis comprises four studies on education, the labor market, health, and substance use outcomes.

The first study examined the impact of initial neighborhood socioeconomic status (NSES) on the educational performance of immigrant adolescents. This study uses data from the Swedish Dispersal Policy. The results indicate that school grades are affected by initial NSES, highlighting the need to prevent the settlement of immigrant adolescents in low NSES areas.

The second study examined whether personality traits contribute to the wage gap between immigrants and natives in Sweden. This study uses a unique dataset where psychologists assessed personality traits during the Swedish military enlistment. The enlistment data are combined with post-conscription wages at ages 30 and 35. The results show that personality traits significantly affect the wage gap, with similar characteristics being rewarded differently based on an individual's background.

The third study examined how sociodemographic factors impact the risk of sepsis. Age and comorbidities were the strongest risk factors. Most immigrant groups had a lower risk compared to Swedish-born individuals. Notably, among migrants from Africa (excluding North Africa), men, but not women, had a lower risk after adjusting for socioeconomic factors.

The fourth study examined the relationship between early school performance and later drug use disorder (DUD). This study examines second-generation immigrants, focusing on variations by sex and parental immigrant background. Higher school grades are associated with a lower risk of DUD, with sibling analysis supporting for a causal interpretation. This study also considers other predictors of future DUD, including Attention-Deficit/Hyperactivity Disorder (ADHD), NSES, and parental history of DUD. The impact of these factors varied by sex and parental immigrant background.

Altogether, these studies offer new insight into how socioeconomic determinants influence integration and health outcomes among immigrants in Sweden.

Populärvetenskaplig sammanfattning

Andelen utrikesfödda i Sverige ökade mellan åren 2000 och 2025 från 11 procent till 20 procent av befolkningen. Sverige har med andra ord en stor och, potentiellt växande befolkning med utländsk bakgrund. Hur väl de integreras i samhället påverkar inte bara deras egna livsvillkor, utan även samhällets välfärd som helhet. Flera studier har visat att studenter med utländsk bakgrund presterar lägre i utbildningen än svenskfödda. Detta kan delvis förklaras av bostadsområde. Forskning visar också att utrikesfödda har en lägre sannolikhet att vara sysselsatta och tenderar att ha lägre löner än svenskfödda – även efter justering av s.k. störfaktorer. Dessutom finns det skillnader i hälsa och missbruk mellan personer med utländsk bakgrund och de med svensk bakgrund. Syftet med denna avhandling är att öka förståelsen för hur demografiska och socioekonomiska faktorer påverkar integration och hälsa bland invandrare i Sverige.

Avhandlingen består av fyra fristående, men delvis överlappande studier. I den första studien undersöker vi hur socioekonomiska förhållanden i det initiala bostadsområdets påverkar skolbetyg i årskurs 9 för studenter med utländsk bakgrund. Våra resultat visar att studenter som växer upp i socioekonomiskt utsatta områden tenderar att få lägre betyg. Detta tyder på att bostadsområdets socioekonomiska förhållanden är av betydelse för utbildningsprestationer. Slutbetyget från den obligatoriska skolgången är viktigt av flera skäl. Förutom att betygen speglar elevens akademiska förmåga, ligger de till grund för vidare studier och påverkar även vilka utbildningsvägar och framtida möjligheter en elev har. Detta kan i sin tur påverka livsvillkor, social rörlighet och möjligheter till långsiktig integration. I den andra studien undersöker vi hur personlighetsdrag, som utvärderas vid den svenska mönstringen, påverkar lönerna, och lönegapet mellan män födda i Sverige och män födda utanför EU-15-länderna. Resultaten visar att personlighetsdrag, generellt, har betydelse för lönenivåerna och att de även förklarar en del av lönegapet. Det verkar framför allt vara skillnader i hur vissa personlighetsdrag, särskilt emotionell stabilitet och intensitet, belönas som driver lönegapet mellan grupperna. Detta tyder på att arbetsmarknaden belönar vissa personlighetsdrag olika beroende på individens ursprung. I den tredje studien undersöker vi sambandet mellan sociodemografiska faktorer, inklusive ursprungsland, och risken för sepsis. Resultaten visar att ursprungsland generellt sett inte har en stark koppling till sepsisrisken. Däremot observeras vissa könsskillnader i relation till ursprungsland, där män från Afrika (exklusive Nordafrika) har en lägre risk än kvinnor från samma region. Detta kan tyda på att det finns underliggande könsspecifika faktorer som påverkar risken för sepsis, något som kan vara av klinisk betydelse. I den fjärde studien undersöker vi sambandet mellan skolresultat i årskurs 9 och risken för framtida narkotikamissbruk, med särskilt fokus på studenter med utländsk bakgrund, som jämförs med svenskfödda elever med två svenskfödda föräldrar. Tidigare studier har visat att högre betyg i grundskolan minskar risken för

att utveckla narkotikamissbruk senare i livet. Våra resultat bekräftar detta samband och visar dessutom att män med utrikes födda föräldrar har mer än dubbelt så hög risk att utveckla narkotikamissbruk jämfört med svenskfödda. Denna skillnad ses inte bland kvinnor, vilket tyder på att immigrantbakgrund påverkar risken för narkotikamissbruk på olika sätt beroende på kön. Genom att jämföra syskon, som växer upp i samma familj och som har gemensamma socioekonomiska förhållanden (så kallade syskonanalyser), kan vi styrka ett orsakssamband mellan skolbetyg och framtida drogmissbruk. Detta stärker slutsatsen att högre skolbetyg i årskurs 9 bidrar till en minskad risk för framtida drogmissbruk. Resultaten visar också att ADHD-diagnos, låg socioekonomisk status i bostadsområdet samt föräldrars missbruk ökar risken för missbruk.

Sammanfattningsvis visar avhandlingen att socioekonomiska faktorer spelar en avgörande roll för integrationen i Sverige. Bostadsområdets socioekonomiska förhållanden påverkar skolresultat, medan personlighetsdrag belönas olika på arbetsmarknaden beroende på individens bakgrund. Vidare förekommer könsskillnader relaterade till ursprungsland i hälsorisker som sepsis, och låga skolresultat ökar risken för framtida missbruk. Resultaten ger en djupare förståelse för hur dessa faktorer samverkar och hur de påverkar både individers och samhällens hälsa och välfärd i ett samhälle präglat av en växande andel personer med utländsk bakgrund.

List of papers

Paper I

Pello-Esso, W., Gerdtham, U., Larsson Lönn, S., Sundquist, J., and Sundquist, K. School Grades and Neighbourhoods - A Natural Experiment*; Nordic Journal of Migration Research*; **Resubmitted after review**.

Paper II

Pello-Esso, W., Gerdtham, U., Larsson Lönn, S., Sundquist, J., and Sundquist, K (2024). Immigrant – Native Wage Gap in Sweden - Do Personality Traits Matter? *Journal of International Migration and Integration*; **Published**: (2024)

Paper III

Stenberg, H., Li, Xi., Pello-Esso, W., Thønnings, S., Khoshnood, A., Dahl Knudsen, J., Sundquist, K., and Jansåker, F. (2023) The effects of sociodemographic factors and comorbidities on sepsis: A nationwide Swedish cohort study. *Preventive Medicine Reports:* **Published**: (2023)

Paper IV

Pello-Esso, W., Larsson Lönn, S., Sundquist, J., and Sundquist, K. Early School Achievement and Adult Drug Use Disorder. *Journal of Immigrant and Minority Health*. **Under review**.

Author's contribution to the papers

Paper I

The first study was based on Wazah's idea, and he collaborated with his supervisors to develop the research design. Wazah independently conducted the literature review and performed the statistical analysis with some support from a statistician. He also interpreted the findings and took the lead in drafting the initial manuscript. The article was subsequently revised with input and guidance from his supervisors and co-authors.

Paper II

The second study was conceived by Wazah. He conducted data analysis, interpreted the results, and drafted the initial manuscript. The article was later revised under his leadership with valuable guidance and input from his supervisors and co-authors.

Paper III

Wazah was a co-author of the third study but contributed actively to the design of the study and revising the manuscript for important intellectual content.

Paper IV

The fourth study was based on ideas from Wazah and two of his supervisors, as well as discussions within the whole group. Wazah independently wrote the manuscript, incorporating feedback from his supervisors before final submission. The statistical analyses were conducted in collaboration with one of the co-supervisors.

None of the studies are included in any other thesis.

Abbreviations

ADHD	Attention-Deficit Hyperactivity Disorder
CI	Confidence Interval
DUD	Drug Use Disorder
GPA	Grade Point Average
HR	Hazard Ratio
ICD	International Classification of Diseases
OB	Oaxaca-Blinder
RIF	Re-Centered Influence Function
RTC	Randomized controlled trial
SA	School Achievement
SAF	Swedish Armed Forces
SCB	Statistics Sweden
SAMS	Small-Area Market Statistics
SME	Swedish Military Enlistment
NSES	Neighborhood socioeconomic status
UQR	Unconditional quantile regression
PCA	Principal component analysis
PT	Personality traits

Preface

The process of writing this dissertation has been both intellectually stimulating and personally rewarding. My deep interest in understanding how economic and social factors shape people's lives — and, in the context of immigration, their integration — has been fueled by the many books I have read since my late teens. Books like: The Great Gatsby by F. Scott Fitzgerald, Utvandrarna, Din stund på jorden, Hedebyborna by Vilhelm Moberg, Stadserien by Per Anders Fogelström, and Kronprinsarna by Lars Ardelius, to name just a few. These books have, for me, been powerful literary works, delving into themes of social mobility and individuals' pursuit of a better life.

One of my greatest interests has been Swedish emigration. In the late 1860s, Sweden experienced consecutive years of poor harvests, which, combined with rapid population growth and increased competition for jobs and land, accelerated the Swedish "Exodus". Between the mid-19th century and the early 1920s, one-fifth of Sweden's population, around 1.5 million people, emigrated to America. Beyond famine and economic hardship, some Swedish emigrants sought religious freedom and greater social equality, while others were driven by the dream of a country of opportunities.

After a long and often difficult journey, one that often claimed lives due to the harsh conditions aboard the ships, the emigrants arrived in America. Before setting foot on Ellis Island, their first stop on the path to a new life, they were met by the Statue of Liberty and her iconic words:

"Give me your tired, your poor,

Your huddled masses yearning to breathe free,

The wretched refuse of your teeming shore.

Send these, the homeless, tempest-tost to me, I lift my lamp beside the golden door."

This was their new home, a new country, and a new beginning.

The typical starting point for Swedish immigrants was neighborhoods that had long been associated with America's slums, and their first jobs were often those that few Americans were willing to take, such as domestic work. Yet, for the immigrants, these neighborhoods and labor-market opportunities offered something far greater; the chance to build a new life. Or, as Peter Cassel, who emigrated from Kisa parish in Östergötland county to America in 1845, wrote in his letters home, "in this new land, everyone could enjoy personal freedoms […] people would be judged by what they could achieve through their own effort and determination rather than by the circumstances of their birth". He emphasized the absence of noble titles like counts and barons in America.

The quote above brings to life the personal reflections and motivations behind why millions of people emigrated from Sweden to America. This is also voiced in the Emigration Inquiry (1907–1913), which helps us understand the underlying reasons for the mass emigration, to inform and potentially address the issues that led to it. The conclusions drawn from the Emigration Inquiry contributed to reforms and modernization in Sweden, including the establishment of equal opportunities, the spread of liberal ideals, the rise of meritocracy, improved working conditions, and the democratization of society — transforming Sweden into a fundamentally different nation.

A hundred years later, immigrants arrived in Sweden for many of the same reasons that once inspired Swedes to emigrate, fleeing war and famine, seeking religious freedom, and economic opportunities. Each person arriving in Sweden carries a unique story, much like the emigrants who left Sweden in the past. The question I have often asked myself is: what factors have been crucial to their successful integration into Swedish society?

The curiosity to learn more about the mechanisms has been both a personal driving force and a motivation behind the research presented in this dissertation.

Introduction

In 2025, Sweden's population is estimated to reach approximately 10.5 million, with individuals of immigrant background comprising around 20% of the total population (Statistics Sweden, 2025). Immigrant background refers to individuals who are either born abroad or born in Sweden to two foreign-born parents (Statistics Sweden, 2019b). As global migration increases, with an estimated 281 million migrants worldwide (UNHCR, 2025), Sweden faces challenges in integrating its immigrant population. Integration involves adapting to the host country´s social, economic, and cultural context while maintaining their cultural identities (Ager & Strang, 2008; Harder et al., 2018). However, research shows that many immigrants, particularly from non-European countries, face disadvantages, including lower educational attainment (e.g., Grönqvist et al., 2023), higher unemployment rates and lower wages (e.g., Engdahl and Liljeberg, 2024), and poorer health outcomes, including mental health problems and substance misuse (e.g., Lindencrona et al., 2005; Rostila & Toivanen, 2012). Understanding the factors facilitating or hindering integration has become an increasingly important political and academic debate. Key questions include how initial settlement conditions affect immigrants' educational and labor market outcomes (e.g., SOU 2018:22). While a wage gap between foreign- and native-born individuals has been documented, the underlying cause of these disparities remains poorly understood. Additionally, the relationship between immigrant background and health disparities including, substance use, deserves further examination. Addressing these issues is essential for developing effective policies, as failed integration can lead to social exclusion, parallel societies, and increased burdens on Sweden's welfare system, while successful integration can promote economic growth and social cohesion. This thesis presents four independent but interrelated studies on integration. The first examines how initial neighborhood socioeconomic status impacts educational performance among immigrant adolescents. The second examines the role of personality traits in the wage gap between immigrants and native Swedes. The third study focuses on sociodemographic factors affecting sepsis incidence, considering the interaction with the country of origin. The fourth study examined the relationship between early school performance and later drug use disorder (DUD), factoring in parental background and sex. Together, these studies aim to deepen our understanding of the integration process in Sweden regarding education, labor markets, health disparities, and substance use.

Background

This section provides the necessary context for a deeper understanding of the research questions. It begins with a brief definition of "immigrant" and an overview of Sweden's immigration history. The section also situates the thesis within the broader context of the Swedish welfare state, with a particular focus on its institutional frameworks in education, the labor market, and healthcare.

Definition of Immigrants

An immigrant is "someone who leaves their country of origin to seek temporary or permanent residence in another country for various reasons" (International Organization for Migration, 2025). Within this broad category, immigrants may relocate to another country, either voluntarily or involuntarily, for reasons such as economic opportunity, family reunification, or humanitarian protection. Economic migrants move primarily for work and better financial opportunities in the receiving country (Borjas, 2014). In contrast, humanitarian migrants include refugees and asylum seekers who flee persecution, conflict, or violence. Refugees are individuals who have been formally recognized under international conventions as requiring asylum due to fear of persecution based on race, religion, nationality, political opinion, or membership in a particular social group. Asylum seekers are individuals who apply for asylum on individual basis and await legal recognition of their refugee status (UNHCR, 2025). Overall, immigrants form a heterogenous group, influenced by a variety of cultural, socioeconomic, and legal backgrounds, shaped by both their country of origin and the legal context of their reception in the host country (Castles et al., 2020).

Immigration to Sweden: A Brief History

Until the early 20th century, Sweden was predominantly a country of emigration. Between 1850 and the 1930s, approximately 1.5 million Swedes, corresponding to one-fifth of the population at the time, left the country. Most emigrants settled in North America (Statistics Sweden, 2014). Immigration to Sweden began in the 1950s when the country welcomed refugees under the United Nations Refugee Convention, which defined "refugees" outlined their rights, and established international protections (United Nations, 1967). Over the past century, the scale, composition, and characteristics of immigration to Sweden have transformed. Post-war economic growth, humanitarian commitments, shifting labor market demands, global armed conflicts, and political changes in immigration policies have driven these changes. For a historical overview and a comprehensive analysis of Swedish migration policy, see Borevi (2012), Spång (2008), Hammarstedt & Palme (2012),

Lundh & Ohlsson (1999), Nilsson (2004), Byström & Frohnert (2017), and Malm-Lindberg (2024).
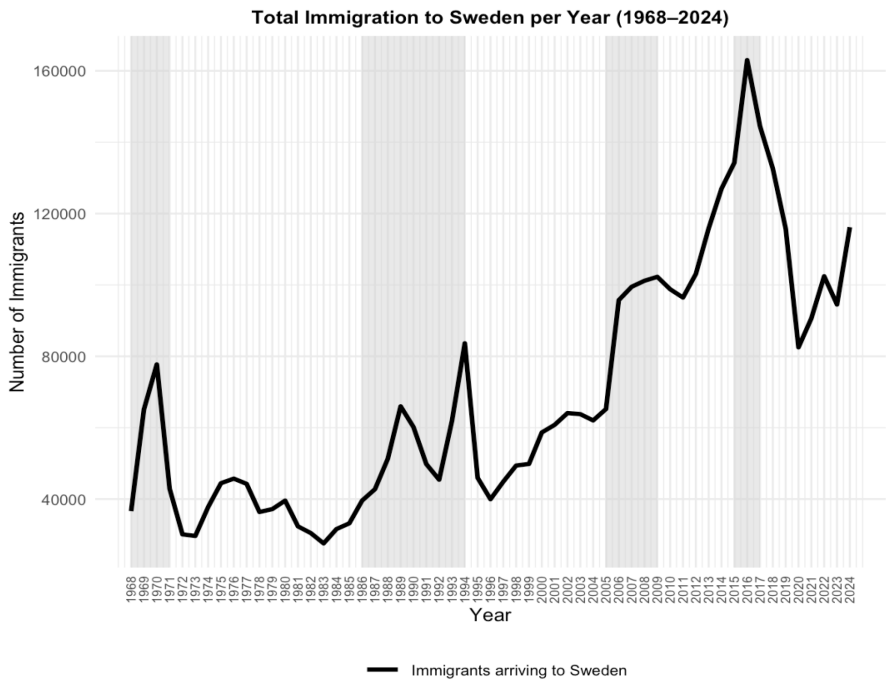
Figure 1. Immigration to Sweden 1968 – 2024. Source: Statistics Sweden

Figure 1 illustrates immigration to Sweden from 1968 to 2024, highlighting several distinct waves of immigration. The first wave (1950s–1970s) was driven by labor migration (Regeringskansliet, 2005). Unlike much of Europe, Sweden's industrial capacity remained largely intact after World War II, which led to strong demand for Swedish goods and exports. However, the economic expansion, combined with the low birth rates of the 1930s, led to a labor shortage. To address this shortage, Sweden implemented policies to attract labor migration. The Swedish government initially facilitated labor migration through free movement agreements with Nordic countries, primarily Finland. As demand for labor continued, the recruitment efforts were expanded through state-sponsored programs to attract guest workers from Yugoslavia, Greece, Italy, and Turkey. As a result, Sweden's foreign-born population tripled between 1950 and 1975, increasing from 124,000 to 410,000 (Van Mol & De Valk, 2016). The oil crisis of the 1970s led to a decline in demand for labor migrants. As a result, Sweden adopted more restrictive immigration policies, effectively ending large-scale labor migration.

During the second wave (1986s–1995s), Swedish immigration policies shifted focus toward humanitarian migration, including refugee and asylum seekers, as well as

family reunification due to armed conflicts, political persecution, and human rights violations (Bevelander & Lundh, 2007). Major refugee groups included the following: Iranians, fleeing the Iranian Revolution and Iran-Iraq War; Chilean and other Latin American political refugees escaping military dictatorships; Kurds from Iraq and Turkey due to persecution and conflict; Somalis, fleeing the collapse of the Somali government in the early 1990s and Bosnians, Croats, fleeing the Yugoslav wars. Between the mid-1980s and mid-1990s, Sweden granted asylum to over 250,000 refugees (Swedish Migration Agency, 2025). These refugees were granted permanent residence permits, access to the welfare system, and family reunification rights. However, as the number of asylum seekers increased, Sweden introduced more restrictive asylum policies in the late 1980s to reduce the growing numbers. For example, one change was the introduction of temporary residence permits, which made it more difficult for asylum seekers to obtain permanent residency (Borevi, 2012; Bevelander, 2011). Family reunification policies remained in place despite these restrictions and contributed to the third wave (mid-1990s).

From 2000 onwards, immigration to Sweden was characterized by a combination of refugee and labor migration. Refugee immigration was driven by armed conflicts in Iraq (2003–2010), Syria (2011–2017), and Afghanistan (2010–2020). In addition, the European Union's free movement agreement allowed labor migration from Poland, Romania, and the Baltic states to Sweden (Dahlstedt & Neergaard, 2019). The most significant migration event during this period was the European migrant crisis of 2015, following the Syrian civil war, as well as conflicts in the Middle East. Over one million migrants arrived in Europe, with Sweden receiving the second-highest number of asylum applications per capita (Eurostat, 2016). This period also marked a turning point in Sweden's immigration policy as stricter asylum policies and border controls were introduced. In 2022, another wave of immigration occurred following Russia's invasion of Ukraine, which forced millions of Ukrainians to flee their homes. Russian invasion of Ukraine led to significant refugee movement, with over eight million Ukrainians seeking refuge in various countries, including Sweden.

In summary, in 1970, individuals with an immigrant background made up approximately 7% of Sweden's population. Today, Sweden has one of the highest proportions of foreign-born residents in Europe. By 2025, it is estimated that two million people, around 20% of the population, will have an immigrant background. The immigrant population in Sweden is highly diverse, with the largest groups originating from Syria, Iraq, and Finland. This diversity reflects the evolution of Sweden's immigration policies which have fluctuated over time. Shifting between periods of openness and restriction, balancing labor market demands as well as humanitarian considerations.

The Swedish Context - Its Key Features and Integration Policies

Sweden is known for its egalitarian society, high levels of social trust between citizens and authorities, and generous welfare system (Svallfors, 2012; Rothstein, 1998). The Swedish welfare system supports individuals at various stages of life, including subsidized childcare, unemployment benefits, and parental leave (Korpi, 2000). Sweden's healthcare system is tax-funded, with universal healthcare ensuring equal access to medical services (Anell et al., 2012). The system emphasizes affordability, offering free or highly subsidized medications and treatments, significantly reducing financial barriers for individuals (Saltman et al., 2016).

The education system is one of the cornerstones of Sweden's welfare state. Sweden's education system is publicly funded and ensures free schooling from the age of six, with 10 years of compulsory education (Swedish National Agency for Education, 2020). Grades from compulsory schooling (9th grade) are the primary determinant for admission to upper secondary education (*Gymnasiebehörighet*) (see Olli Segendorf & Teljosuo, 2011). Upper secondary education (*gymnasium*) is optional and offers academic and vocational tracks, preparing students for higher education or direct entry into the labor market (Berggren & Trägårdh, 2015). Higher education in Sweden is publicly funded, and there are no tuition fees for Swedish or EU/EEA students, which ensures that university access is determined by merit rather than financial means. As we can see, one of the principles of Swedish education is that schools should compensate for students' varied backgrounds, an approach known as the compensatory role of education (see Arnesen & Lundahl, 2006; Holmlund, 2015). Students are not formally differentiated based on their social background (see Skollag (SFS 2010:800). This equity goal stems from the belief that factors outside a student's control, such as family background and financial means, should have as little impact as possible on their success in school and, consequently, their future life opportunities. However, school enrolment may effectively categorize students based on their neighborhoods and socioeconomics (Holmlund et al., 2020).

The Swedish labor market is characterized by high union density and influential labor and employer organizations (Kjellberg, 2011). Wages are primarily determined through collective agreements at the industry level, ensuring standardized compensation across sectors (Andersen et al., 2014). A key pillar of Sweden's labor regulations is the Employment Protection Act (LAS) (Swedish: *Lag (1982) om anställningsskydd*), which governs job security and regulates dismissals. LAS stipulates that terminations must be based on valid reasons, such as redundancy or employee misconduct, prohibiting arbitrary dismissals. A notable feature of LAS is the "last-in, first-out"-principle, which dictates that the most recently hired employees are dismissed first in cases of downsizing. While designed to promote fairness and job security, this principle can disadvantage newly hired workers,

including immigrants, who often have less seniority than native-born employees. As a result, immigrants face a higher risk of unemployment during economic downturns or periods of organizational restructuring (Calleman, 2010). Sweden has also implemented anti-discrimination laws to promote workplace equality. The Discrimination Act (2008:567) (Swedish: Diskrimineringslag (2008:567), which came into force on January 1, 2009, is a key instrument in ensuring equal rights and opportunities in the labor market. It prohibits discrimination based on gender, gender identity, ethnic origin, religion, disability, sexual orientation, or age. It also requires employers to promote equality and eliminate wage disparities. Despite this robust legal framework, research shows that wage gaps and labor market discrimination remain a persistent issue, particularly for individuals from non-European backgrounds (see for Engdahl & Liljeberg, 2024; Adermon & Hensvik, 2022).

Sweden has implemented various integration policies. A crucial element of these is how immigrants are initially settled upon arrival. The initial settlement of immigrants is often regarded as a key determinant of successful integration outcomes (Askim & Hernes, 2017; Jones & Teytelboym, 2017a; Åslund & Rooth, 2007; Aksoy et al., 2023). There are two main approaches. The self-selected settlement, where immigrants are allowed to choose where to settle. (see *EBO-lagen (Lag 1994:137*). However, many countries have encountered challenges with this approach, including the formation of ethnic enclaves and residential segregation (Danzer & Yaman, 2013; Andersson, 2007a/b). The second approach is a dispersal-based settlement, where immigrants are assigned to specific municipalities through a coordinated system (see *Mottagandeutredningen (SOU 2018:22)*. Several countries have adopted or considered similar policies (see Bansak et al., 2018; Ahani et al., 2020), including Denmark (see Damm, 2009), Norway (see Solodoch, 2022), and Germany (see Martén et al., 2019). Sweden implemented a dispersal policy between 1985 to 1994.

The Swedish Dispersal Policy 1985 - 1994[1]

Between 1985 and 1994, Sweden implemented a spatial dispersal policy known as "*Hela Sverige-strategin*" (All of Sweden strategy") aimed at newly arrived immigrants. The objective was to ensure a more even distribution of immigrants across municipalities (Andersson, 2003) and to improve their initial settlement conditions, which could enhance long-term integration outcomes (Åslund & Rooth, 2007).

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[1] This is a summary of the Swedish Dispersal Policy. For a more detailed description, see the work of Edin et al. (2003) and Åslund et al. (2011).

The dispersal policy followed a two-stage assignment process. Upon arrival in Sweden, immigrants were placed in a reception center while awaiting a decision on their residence permit. During this phase, placement officers, without direct contact with the immigrant, assigned individuals to municipalities using available information such as gender, level of education, marital status, family size, and country of origin. Families were treated as a single unit, and children were placed with their parents. The Swedish Board of Immigration (*Statens invandrarverk,* SIV) negotiated with municipalities regarding the number of immigrants each locality could receive.

In the second stage, individuals were assigned to a specific neighborhood within a municipality after a residence permit was granted. This process was managed by a local agency "*den kommunala invandrarbyrån*" (Soininen, 1992). The Swedish housing market has some distinctive features. Swedish municipalities provide accommodation through publicly owned housing companies with properties distributed across neighborhoods of varying socioeconomic status. Accommodation is allocated through a queuing system, where the next available housing is offered to the person who has been in line the longest and accepts the offer. Increased demand for rental housing leads to longer queue times (Magnusson & Turner, 2008).

Aims

This thesis explores how economic and social factors affect immigrant integration in Sweden, by identifying key drivers and barriers to improve understanding of the mechanisms shaping integration outcomes.

The specific aims of each study were as follows:

I. The aim of this study was to examine the impact of neighborhood socioeconomic status (NSES) of immigrant children's initial neighborhoods on their future educational performances.

II. The aim of this study was to examine the potential impact of four different personality traits on the immigrant-native wage gap in Sweden.

III. The aim of this study was to examine the potential effect of sociodemographic factors and somatic as well as psychiatric comorbidities on sepsis incidence in addition to exploring their interactions.

IV. The aim of the fourth study was to examine whether the associations between early school achievement and DUD present differently between the two population groups.

Theoretical considerations

This section outlines key theoretical considerations relevant to the studies included in this thesis. The integration of immigrants into host societies is a complex and multifaceted process shaped by a wide range of socio-psychological, cultural, and economic factors. Various theoretical models have been developed to conceptualize this process. The theoretical literature can be divided into two main strands. The first strand originates in socio-psychological theories, emphasizing socio-cultural factors such as cultural adaptation, intergroup contact, and the quality of interaction between immigrants and the native population. The second strand is rooted in economic theory and focuses on individual behaviors and the incentives influencing integration choices. This literature emphasizes how immigrants respond to opportunity costs, expected returns, and institutional constraints.

The Socio-Psychological Approach to Immigrant Integration

Assimilation Theories

The socio-psychological approach to integration emphasizes the importance of the socio-psychological environment as a key factor shaping the integration process. Four frameworks are essential for understanding integration: the classical model, the multiculturalism model, the structuralism model, and the segmented assimilation model.

Classical assimilation theory posits that immigrants gradually adapt to the host country's norms and values. Over time, cultural distinctions diminish as immigrants (or their children) integrate through language acquisition, educational achievement, labor market participation, and increased social interaction with the majority population (See Gordon, 1964). This model emphasizes conformity and full incorporation into the main society. However, empirical studies have shown that despite long-term residence, disparities in different domains remain between immigrant and native populations (Becker, 1963; Gans, 1992). These critiques have led to the development of more nuanced models of integration.

Rather than assimilation, multiculturalism emphasizes the value of cultural diversity. According to this model, immigrants may maintain their culture, languages, and religion, while being a part of society (Glazer & Moynihan, 1970). However, multiculturalism does not guarantee harmonious coexistence. In some cases, multiculturalism may lead to fragmentation or the emergence of parallel societies, especially if cultural norms clash with those of the majority population (see also literature on cultural distance Hofstede 2001; Penninx & Garcés-Mascareñas, 2016).

The structuralist approach shifts away from cultural adaption and emphasizes socioeconomic and institutional contexts that shape the integration process. Systematic inequalities such as unequal access to education, employment, housing, and health care can hinder integration (Blau & Duncan, 1967). According to this view, even highly motivated and skilled immigrants may find their opportunities constrained by structural inequalities and discrimination. Integration, therefore, is also a function of opportunity.

Segmented assimilation theory suggests that the integration process is a mix of individual characteristics, contextual, structural, and institutional factors encountered in the host countries, such as language proficiency or neighborhood conditions and socioeconomic status (see Portes & Zhou, 1994; Xie & Greenman, 2011). Later work by Alba & Nee (2003) further defined this theory, showing how immigrant groups navigate different forms of integration based on their point of entry and initial social context.

Cultural Identity, Transmission, and the Role of Social Capital

Assimilation theories emphasize how integration evolves as a graduate transformation of immigrants cultural and social identity as they adapt to the norms of the host society. Social identity formation plays an important role in the integration process, as it reflects how individuals position themselves within the new social structures and navigate their sense of belonging (Scott & Marshall, 2009). Scholars have developed theories surrounding social identity and integration.

Language acquisition is one of the most fundamental elements of social identity. According to Lazear (1999), language is a tool for communication, but it is also a signal of social affiliation and commitment to integration. His model demonstrates how adopting the dominant language of the host society facilitates and improves economic and social interactions. Language lowers transaction costs and enhances productivity. Immigrants who acquire the host country's language are more likely to succeed in the labor market, as language increases access to information, social networks, and economic opportunities. Building on Lazear´s work, Konya (2005) expanded the model by highlighting the dynamic role of language acquisition in the integration process over time.

Akerlof and Kranton (2000) introduce the concept of cultural identity, suggesting that individual behavior is not only shaped by economic incentives but also by the psychological benefits of identity congruence and the cost of non-conformity. People align their actions with the norms of their social identity, for example, ethnicity. This alignment is motivated by individuals´ desire to conform to the norms and expectations of their social group. Deviation may result in social sanctions or a loss of identity utility. A key implication of this concept is the emergence of oppositional identities. Immigrants can adapt to the host society's cultural norms and the beneficial economic outcomes, but this may threaten their cultural identity. Therefore, immigrants may adopt cultural norms in direct opposition to those of the dominant society, often as a response to social exclusion and limited economic opportunities.

The literature on oppositional identities suggests a negative relationship between strong ethnic identity and school performance (Austen-Smith & Fryer, 2005; Pattacchini & Zenou, 2006). Perceived social discrimination may reduce the expected return to education for immigrant students, leading them to view educational performances as a form of assimilation into the dominant culture. As a result, students may reject educational achievements to maintain group solidarity and gain acceptance within their ethnic group (e.g., Fordham and Ogby,1986). Oppositional identities may also manifest through antisocial or criminal behaviors such as taking drugs. Furthermore, social exclusion e.g., in a neighborhood or limited labor market opportunities, can reinforce the adoption of oppositional identities.

As outlined by Berry (1997), acculturation models, which show four strategies that reflect how immigrants relate to both their ethnic culture and the dominant culture of the host country. Integration involves strong identification with the original culture and the majority culture. Assimilation involves a connection to the majority culture but weak ties to the original culture. Separation is characterized by a weak connection to the majority culture and a strong attachment to the original culture. Marginalization reflects a weak bond between both the majority and original cultures. Understanding acculturation strategies within immigrant communities involves a balancing act between preserving their cultural identity and/or adopting the norms of the host society. Cultural transmission plays an important role in whether immigrants maintain their distinct cultural traits or gradually assimilate into the host country.

Bisin and Verdier (2001) present a model that explores cultural transmission and integration patterns. According to this view, parental socialization tools may influence cultural persistence in immigrant populations. For example, a family-based transmission (direct vertical socialization) or social imitation allows for influences from the broader society (indirect socialization). Cultural transmission through parental socialization can influence the formation of personality traits by shaping an individual's behaviors. These can also occur in the broader society

through peers and social networks. Personality traits are consistent patterns of thought, feeling, and behaviors that are relative across various situations (see Roberts, 2009). These traits reflect stable personal characteristics on how individuals respond and interact with the world around them. Recent theoretical literature suggests that personality traits interact with labor market outcomes, much like other skills such as education and cognitive abilities (see Bowles et al., 2001; Heckman, Stixrud & Urzua, 2006; Borghans et al., 2008). Personality traits influence wages through several mechanisms, including productivity differences, as certain personality traits enhance productivity (Mueller & Plug, 2006; Deming, 2017). Economic preferences through traits such as risk tolerance (Dohmen et al., 2010), time and social preferences (Daly et al., 2009), and attitudes toward work effort (Borghans et al., 2009) influence health, education, and career outcomes (Becker et al., 2012).

Indirect socialization also implies that cultural diversity or minority assimilation can depend on family decisions within different socioeconomic contexts. An important factor in this process is social capital, particularly the role of social networks in transmitting norms and values. According to the contact theory (Allport, 1954), group interactions can foster greater understanding and tolerance. The social capital literature identifies several ways neighborhoods may influence children's future outcomes. The institutional resources theory suggests that institutions such as schools, libraries, community activities, play an important role in socialization and skill formation (Jencks & Mayer, 1990; Galster et al., 2008). The social disorganization theory posits that neighborhood characteristics, like poverty, high residential turnover, and low homeownership, may weaken social ties and community cohesion. These factors may increase exposure to deviant behaviors like crime and substance abuse (Sampson et al., 2002). The normative environment theory suggests that the concentration of like-minded individuals strengthens local norms, which can be beneficial or harmful. For example, high-poverty neighborhoods may reinforce negative behaviors, while affluent communities may foster positive norms, such as ambition (Massey, Gross, & Eggers, 1991). Wilson's (1999) socialization model and Coleman's (1988) social capital theory highlight how neighborhood interactions may provide opportunities or constraints for children's development and future outcomes. In the context of immigrants, several theories specifically address how neighborhoods may influence immigrant integration. Massey and Denton (1993) argue that spatial separation hinders immigrants' social and economic integration. Segregated neighborhoods often lack access to quality education, employment opportunities, and public services, according to Portes and Zhou´s (1993) segmented assimilation model. Some immigrant groups may achieve integration, while others may experience downward assimilation due to environmental disadvantages (Alba & Nee, 2003). Borjas (1994) emphasizes the role of ethnic networks, or "ethnic capital", in shaping immigrants' integration. According to this theory, the quality within ethnic communities may either support or hinder the integration.

Socioeconomic Determinants of Health among Immigrants

Several theoretical frameworks help explain the socioeconomic determinants of health and substance use among immigrants. For example, Kaplan et al.´s, (2020) multilevel model suggests that individual, community, and societal factors interact to influence health outcomes. Marmot (2005) highlights the role of socioeconomic factors, such as education and income in controlling health, but also contributes to health inequalities. Similarly, William and Jackson's (2005) theory of health disparities highlight how structural inequalities and socioeconomic disadvantage contribute to health inequality across different groups. In addition to these socioeconomic determinants, several theories highlight social context as essential. Neighborhood characteristics, social networks, and access to healthcare are essential determinants of health. For example, social learning theory (Akers, 1998) highlights the influence of peer groups and social environment in shaping behaviors, including those related to health and substance use. Among immigrants, these determinants often interact with migration-related stressors such as social marginalization and loss of social capital, which may increase vulnerability to poor health and substance use. Individuals may then turn to substance use as a coping mechanism (Agnew, 1992).

The Economic Approach to Immigrant Integration

One theoretical framework for understanding the economic integration of immigrants is Becker´s (1964) human capital theory. According to this theory, an individual's productivity depends on investments in education, work experience, and skills such as language proficiency. Chiswick (1978) and Duleep & Regets (1997) extended this framework to the migration context, emphasizing that human capital acquired prior to migration is often only partially transferable to the host country's labor market. This limited transferability contributes to an initial wage gap between immigrants and natives. The degree of human capital transferability depends on several factors, including the similarity of skills and cultural context between country of origin and host country. Over time, immigrants usually acquire host-country-specific human capital, such as language, education, and labor market experience, which gradually narrows the wage gap between immigrants and natives with similar characteristics (Borjas, 1994). Ethnic claves can play a role in the integration process. However, the role of ethnic enclaves is more ambiguous. While such enclaves can provide social and economic support, they may also reduce incentives to invest in host-country-specific human capital by limiting exposure to the majority society (Borjas, 2000). Moreover, structural barriers such as labor

market discrimination (see Arrow, 1973; Becker, 1967) can further reduce immigrants' economic integration, reinforcing persistent wage gap between immigrants and natives.

Synthesis of the Theoretical Framework in Relation to the Research Aims

Theories from sociopsychology, health, and economics offer insights into the complex mechanisms shaping immigrant integration. Figure 2 illustrates how these theoretical perspectives are linked to the empirical studies included in this thesis.
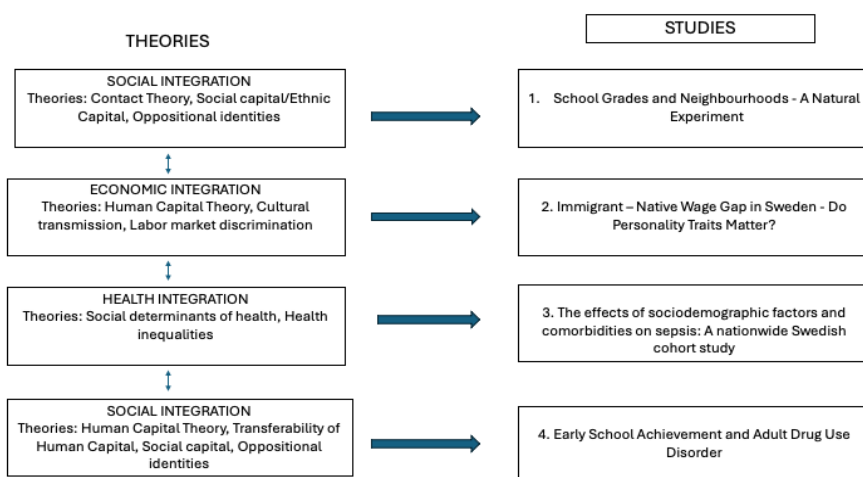
Figure 2. Overview of Theoretical Perspectives on Immigrant Integration in relation to the research aims.

In the first study, we examine how initial neighborhood socioeconomic status affects educational outcomes among immigrant adolescents. The analysis draws on several theoretical frameworks. First, we use contact theory (Allport, 1954), which suggests that intergroup contact can reduce prejudice and improve intergroup relations. Contact theory aligns with the concepts from social capital theory (Coleman, 1988), which is the role of peer exposure and social networks in shaping educational outcomes. Second, the study apart from Borja´s, (1994) ethnic capital theory, which highlights the influence of ethnic networks and the socioeconomic characteristics of co-ethnic communities on individual outcomes (see, for example, Åslund et al. 2011). Third, we consider economic frameworks, such as the rational choice theory, which suggests that neighborhood effect operates through parental education, employment, and local characteristics (see Durlauf, 2004; Chetty et al., 2018). For instance, poor local labor market conditions may indirectly impact

children´s education by increasing parental stress and reducing household resources. Finally, the concepts of oppositional identities (Akerlof & Kranton, 2000) may be relevant for understanding differences in educational performances among immigrant students. Research suggests that a strong ethnic identity, particularly when it conflicts with perceived majority norms, can negatively affect academic achievement (see Austen-Smith & Fryer, 2005; Pattacchini & Zenou, 2006). For example, if immigrant students perceive educational performances as a behavior associated with the majority culture, they may disengage from school performances as a form of identity resistance.

Economic integration is typically assessed through indicators such as the wage differentials between immigrants and natives (Yann et al., 2012 for an overview). In the second study, we examine the role of personality traits in explaining the wage gap between immigrants and native Swedes. The analysis builds on several theoretical frameworks. First, the economic assimilation theory suggests that over time, immigrants' wages tend to converge with those of natives (Chiswick, 1978; Borjas, 1985). However, empirical studies show that wage gaps persist even after controlling for wage determinants such as education (Engdahl & Forslund, 2016). In this study, we explore a new dimension by examining whether personality traits contribute to the wage gap. This approach is related to recent extensions of human capital theories, which highlights noncognitive skills as important determinants of labor market outcomes (see Bowles et al., 2001; Heckman, Stixrud & Urzua, 2006; Borghans et al., 2008). The study also draws on cultural transmission theory (Bisin & Verdier, 2001), which argues that cultural values and behaviors can be passed down from parents to children through direct vertical socialization. One could hypothesize that parental characteristics may influence immigrants' personality traits. Finally, the study is also linked to theories of labor market discrimination (see Arrow, 1973; Becker, 1967). If individuals with similar personality traits are differently rewarded on the labor market based on their immigrant background, this may indicate discriminatory practices.

In the third study, we examine how sociodemographic factors influence sepsis. The analysis builds on theories of social determinants of health (Kaplan, 2000; Marmot, 2005). According to this concept, health is shaped by structural factors such as education, income, and environmental characteristics such as neighborhood.

In the fourth study, we examine the relationship between early school performance and the risk of developing DUD later in life. Like the first study, the analysis draws on theories related to peer influence, social networks, and norms (Coleman, 1988), and the formation of oppositional identities (Akerlof & Kranton, 2000). Furthermore, the study can be related to segmented assimilation theories (Alba & Nee, 2003; Portes & Rumbaut's (2001), which suggest that limited socioeconomic opportunities or community context (e.g., neighborhood effect) in the host country can contribute to marginalization and engagement in anti-social and criminal behavior.

Poor school performance is a risk factor for DUD, as explained by several criminological theories. The Social Bond Theory (Hirschi, 1969) suggests that attachment to school and teachers discourages deviant behavior, including substance abuse. Similarly, self-control theory (Gottfredson & Hirschi, 1990) identifies low self-control as a predictor of both poor school performance and substance use. Becker's (1963) labeling theory suggests that students who perform poorly may be seen as "failures" and adopt substance use behaviors. In contrast, the rational choice theory Becker (1968) argues that students with poor school performances may have fewer educational and career opportunities, which may reduce the perceived costs of substance use.

In the context of integration, several theoretical frameworks can help explain the link between immigrant children's academic performances and substance use. Berry's (1997) acculturation model highlights the psychological stress immigrant children when adapting to a new culture, which can be worsen by stressors such as language barriers (Lazear, 1999) and school segregation (Cummins, 2000). These stressors may increase the risk of substance use as a coping mechanism.

Altogether, these theories suggest that early school performances play an important role in shaping future risks related to substance use, particularly for immigrant student navigating a complex social and cultural environments.

Literature Review

In this section, we reviewed the literature relevant to each study, summarizing methodological approaches and key findings and identifying gaps in the current research that this thesis aims to address.

Neighborhood Effect on Immigrant Student Achievement

In Sweden, students with an immigrant background tend to have lower educational performance than their native-born peers (André et al., 2019). The low educational performance of immigrant students can partly be attributed to their neighborhood environment (Holmlund et al., 2014; Grönqvist et al., 2020). Neighborhood effects are fundamental concepts in economics, sociology, health, and in social sciences. They refer to how the characteristics of the environment influence individuals' behaviors and socioeconomic outcomes (see Pebley & Sastry, 2003 – for an overview of the literature). Most theoretical models focus on the impact of neighborhood environments on children and adolescents, as these life stages involve important formative stages (Heckman, 2007; Ben-Shlomo, Y., & Kuh, D. 2002). Several Swedish studies have examined neighborhood effects on immigrant adolescents' educational performances. The commonly used theoretical framework in studies on neighborhood effects and immigrant students' educational performances is Borjas' (1994) "Ethnic capital". As a result, much of the existing research has focused on the impact of the educational attainment of an ethnic group on educational performances (Åslund et al., 2011) or the effect of ethnic concentration on immigrant students' educational performance (see Neuman, 2006; Szulkin & Jonsson, 2005, 2007; Bygren & Szulkin, 2010). The results show that while growing up in a neighborhood with a high proportion of educated co-ethnics can be beneficial, a high concentration of socioeconomically disadvantaged immigrant groups may reinforce existing inequalities. Previous studies have typically prioritized ethnic factors as a key factor influencing the educational outcomes of immigrant students. However, few studies have examined the broader role of neighborhood socioeconomic status (NSES) in shaping immigrant children's educational performances. Recent studies argue to focus on the socioeconomic characteristics of neighborhoods rather than ethnic factors, as these are important determinants of future outcomes (Andersson et al., 2024; Chakraborty & Schüller, 2022; Delmos, 2022). The socioeconomic characteristics of a neighborhood may

influence educational performance through a range of mechanisms beyond ethnic factors, such as social networks and peer effects (Kindler et al., 2015; Chetty et al., 2018). Our study seeks to contribute to this evolving literature by examining the impact of initial neighborhood socioeconomic characteristics on the educational performance of immigrant adolescents.

Personality Traits and the Immigrant-Native Wage Gap

In Sweden, as in many other European countries, a persistent wage gap exists between immigrants and native-born individuals. Immigrants, particularly those from non-European backgrounds, tend to earn lower wages than their native-born counterparts. (see Friedrich et al., 2022; Eliason, 2013). Previous research has explored various contributing factors, including parental characteristics (Grand & Szulkin, 2002), education, work experience, and language proficiency (Ekberg & Rooth, 2003), cognitive abilities (Nordin & Rooth, 2009), and psychological factors "PF" (Hanes & Norlin, 2011). Despite these variables, part of the wage gap remains unexplained.

Traditional human capital theory emphasizes the role of education and cognitive skills in determining wages (see Becker, 1964; Schultz, 1961; Mincer, 1974). While these factors are important, they do not fully capture the variation in earnings across groups (Almlund et al., 2011). Consequently, labor economist has increasingly turned their attention to non-cognitive skills, particularly, personality traits as determinants of wages (Heckman & Rubinstein, 2001; Heckman et al., 2006). Recent studies demonstrate a link between personality traits and wages (see Gensowski, 2018, for an overview).

Personality traits are difficult to observe, but commonly assessed using the Big Five personality traits framework (see American Psychological Association (APA), 2025 for a thorough description of each trait.

i) **Openness to Experience**: Creativity, curiosity, intellectual engagement, and a willingness to explore new ideas.

ii) **Conscientiousness**: Self-discipline, organization, punctuality, and a strong sense of responsibility.

iii) **Extraversion**: Sociability, energy, enthusiasm, and a tendency to seek social interactions.

iv) **Agreeableness:** Kindness, warmth, generosity, and a cooperative nature.

v) **Neuroticism:** Emotional instability, anxiety, worry, and susceptibility to stress.

Empirical studies show that personality traits significantly influence labor market outcomes. Conscientiousness is associated with higher wages, likely due to its

association with productivity (Nyhus & Pons, 2005; Semykina & Linz, 2007;). Extraversion also tends to have a positive impact on wages, especially in occupations requiring social interactions (Uysal & Pohlmeier, 2011). The impact of Openness is more mixed. While it is positively linked to wages in domains that prioritize creativity and innovation, such as technology and research its effect in other sectors is less clear (Mueller & Plug, 2006). Agreeableness is often negatively correlated with wages, especially among men (Cobb-Clark & Tan, 2011). While it may improve teamwork and interpersonal relationships, it can also be perceived as lack of assertiveness in competitive environments and in salary negotiations. Finally, Neuroticism tends to be associated with lower wages, possibly due to its link to stress sensitivity, lower job performance and self-confidence (Heineck, 2011; Osborne Groves, 2005).

These findings suggest that personality traits may help explain the immigrant-native wage gap. However, few studies have explicitly examined the role of personality traits in this context. Tverdostup and Paas (2019) highlight this research gap, while recent studies, by Laible and Brenzel (2022) have found that personality traits can partly explain the wage gap between German natives and migrants. Yet the evidence remains unclear, for example Ingwersen and Thomsen (2021) found no significant association between personality traits and the immigrant-native wage gap in Germany.

Given the mixed findings, little is known about how personality traits contribute to the wage gap between immigrants and natives in Sweden. This study aims to address that gap by examining the impact of four personality traits assessed during the Swedish Military Enlistment (SME).

The SME assessment evaluates for distinct personality traits:

i) **Social Maturity** (Swedish: *Social mognad*): Reflects sociability and a sense of responsibility.

ii) **Psychological Energy** (Swedish: *Psykologisk energi*): Encompasses focus, perseverance, and motivation.

iii) **Intensity** (Swedish: *Intensitet)*: Reflects the ability to self-activate and take initiative without external pressure.

iv) **Emotional Stability** (Swedish: *Emotionell stabilitet*): Captures stress tolerance and emotional resilience.

According to Hensvik et al., (2023), the SME- traits can be mapped onto the Big Five personality traits as follows: "Social Maturity" aligns with Extraversion, while Psychological Energy" corresponds to Conscientiousness. Intensity" is a blend of Conscientiousness and Openness, and "Emotional Stability" is inversely related to Neuroticism.

Sociodemographic Factors and Sepsis

Sepsis is a life-threatening condition that results from a dysregulated immune response to infection, leading to systemic inflammation and organ failure. Despite advancements in treatment, sepsis still has high mortality rates (Rudd et al., 2020). In Sweden, 60 to 70,000 adults are affected annually, with a mortality rate of 20% within three months of diagnosis (Mellhammar et al., 2023). The risk of sepsis is influenced by various clinical, socioeconomic, and demographic factors, but also severe mental disorders or chronic conditions (Andersson et al., 2016; Liu et al., 2020). Research on the impact of migration background on sepsis susceptibility remains limited (Black et al., 2024; DiMeglio et al., 2018). However, migrants may be a particularly vulnerable group due to lower socioeconomic status, language barriers, limited access to healthcare, and potential exposure to infectious diseases during migration (Castelli & Sulis, 2017). For these reasons, migrants may be at greater risk (Vogel, 2012). Research suggests that sepsis incidence may vary between migrant groups and native populations (Nilsson et al., 2021; Donnelly et al., 2018). Understanding the influence of migration background on sepsis risk may be important for developing effective health strategies. This study addresses this knowledge gap by examining the relationship between several demographic factors, including migration background, and sepsis risk in Sweden. By examining the impact of region of origin on sepsis risk, the study will contribute to improving clinical reception and tailored interventions for migrant populations.

Early School Achievement and Drug Use Disorders

Adolescents with an immigrant background generally have lower academic performance than their native-born peers (Grönqvist et al., 2020). In the general population, poor educational performance during early schooling strongly predicts DUD onset (Bugbee et al., 2019), with studies suggesting that this relationship is causal (Kendler et al., 2018). However, most studies in this area focus on the general population or minority groups compared to majority groups (Doherty et al., 2023; Zebrak et al., 2017; Ensminger et al., 2016), without explicitly considering migration background. Children from immigrant families often face multiple educational barriers that may hinder their academic performances, including language proficiency challenges, cultural adaptation difficulties, and social integration issues (Hjern, 2004). Additionally, many migrant adolescents experience socioeconomic disadvantages, which can further impact their school performance and drug use (Li et al., 2024). Immigrant students may also face psychosocial stressors related to acculturative stress and post-traumatic stress, which may increase the risk for substance use (Fazel et al., 2012; Szaflarski et al., 2011). These stressors, combined with the difficulties of adjusting to a new environment, may increase the likelihood that immigrant youths turn to substances as a coping mechanism (Myers, 2009). Despite the well-documented link between educational

performance and drug use disorders in the general population, little research has specifically examined how early school achievement influences the risk of DUD among immigrant students. This study focuses on second-generation immigrants and seeks to address this gap by examining how early school performance influences the risk of DUD, with particular attention to variations based on sex and parental immigrant background. Understanding contributing factors to the heightened risk of substance misuse in this group is crucial for developing tailored prevention and intervention strategies.

Data and Sample Construction

This thesis relies on Swedish national administrative registers, which provide high-quality, comprehensive data for examining key aspects of immigrant integration. The registers cover multiple domains, including residential areas, socioeconomic variables, personality traits, labor market participation, health care utilization, drug prescriptions, and criminal behavior. This extensive data enables a detailed analysis of the long-term integration process. Unique personal identification numbers (*Personnummer*) were used to link individuals across registers. For confidentiality, each study replaced these identifiers with pseudonymized serial numbers. The studies included in this thesis have received ethical approval from the Swedish Ethical Review Authority.

Data sources

Data on labor market outcomes, social security benefits, and other socioeconomic indicators were obtained from the Longitudinal Integration Database for Health Insurance and Labor Market Studies (*Longitudinal Intergrationsdatabas för Sjukförsäkrings- och Arbetsmarknadsstudier, LISA*) for the period 1985 to 2018. Information on academic performance, specifically Grade Point Average (GPA) at the completion of compulsory schooling (9th grade, typically at age 16), was extracted from the Education Register, covering the years 1988 to 2018. Demographic data for all individuals was obtained from the Register of the Total Population, which includes details on marital status and year of citizenship from 1968 onward. Parental information was obtained through the Multi-generation Register, which provides data on sex, birth year, country of birth, and links children to their parents if born in Sweden after 1932 or immigrating together with their parents.

Small-Area Market Statistics (SAMS) refers to a dividing of Sweden into approximately 9,000 neighborhoods to facilitate detailed spatial analysis. The SAMS database provides a rich source of information, covering all residents within a neighborhood. The database includes detailed socioeconomic characteristics of residents aged 25–64, allowing for in-depth analysis of demographic and economic patterns at the neighborhood level.

Test scores from the Swedish Military Enlistment (SME) were sourced from the Swedish National Service Administration (*Swedish: Pliktverket*).

Additionally, the following registers were utilized: The Hospital Discharge Register (1964-2018), the Prescribed Drug Register (July 2005-2018), and the Outpatient Care Register (2001-2018). The Crime Register provided national data on all lower court convictions from 1973 to 2018, while the Swedish Suspicion Register included data on individuals strongly suspected of committing a crime from 1998 to 2018. Mortality data, including dates and causes of death, were derived from the Mortality Register (1952-2018).

Healthcare utilization and hospital diagnoses were obtained from the National Patient Register (NPR) which includes information on all inpatient care and primary healthcare episodes nationwide. Medical diagnoses from Primary Health Care clinics were obtained from 18, out of in total 21, Swedish counties (*län*) with data covering varying time periods. The register includes ICD-coded diagnoses, admission and discharge dates, type of care, and was used to identify comorbidities.

Previous migration research has grouped immigrants based on their country, or region, of origin to account for diverse immigrant backgrounds (see Chartier et al., 2022; Edin et al., 2003). However, even among migrants from the same country, the reasons for migration can vary (Portes & Rumbaut, 2014). In contrast, this study benefits from data in the STATIV register (*Swedish: Registret för integrationsstudier*), which provides information on individuals' immigration status and the reasons for migration (Statistics Sweden, 2014). This information allows for more distinctions between refugees, labor migrants, family reunification, and other migrant groups. Furthermore, using information from STATIV enables a more precise understanding of migration dynamics than classification solely by country of origin.

Moreover, individuals are differentiated in each study based on their generational status (Careja & Bevelander, 2018). We distinguish between native-born individuals and first- and second-generation migrants. Native-born individuals are those born in Sweden to two Swedish-born parents (Both-Swe). First-generation migrants refer to individuals born outside of Sweden but now reside in the country. This category also includes foreign-born individuals who migrated as children and later acquired Swedish citizenship, which is especially relevant for our second study. Within this group, additional factors such as age at migration and duration of residence are considered, as they may be important in shaping experiences with integration. Second-generation migrants are individuals born in Sweden to at least one foreign-born parent.

Sample Construction

The first study focuses on immigrant adolescents affected by Sweden's dispersal policy, implemented between 1985 and 1994. The initial study population was comprised of 30,075 individuals from 80 different countries. However, we restricted our analysis to non-European refugees who arrived in Sweden between 1985 and 1991, as the dispersal policy was less applied after 1991 (Andersson, 2003). We excluded individuals who had emigrated and lacked final grade records, reducing the sample by 9,204. After these exclusions, the final study population consisted of 20,871 individuals. We used administrative graduation registers from 1988 to 2008, including information on Grade Point Average (GPA) from 9th-grade compulsory schooling, typically completed at 16.

The second study used a Swedish National Service Administration (*Pliktverket*) dataset containing personality traits test scores evaluated during the Swedish Military Enlistment (SME) for all enlisted men between 1997 and 2010. This cohort includes men born between 1975 and 1990. In Sweden, conscription typically occurs at the age of 18–19. The study sample consisted of 278,660 males, of whom 6% had a foreign background. Building on previous Swedish studies on the immigrant-native wage gap (Nordin & Rooth, 2009; Hanes & Norlin, 2011), we categorized male conscripts into two groups: individuals born in Sweden to two Swedish-born parents (Both-Swe) and naturalized child migrants born outside the EU-15 (Non-EU-15). The enlistment dataset was matched with individual labor market data, specifically wages from the LISA register, which were measured at ages 30 and 35. Female conscripts were excluded from the analysis, not only due to their low numbers, which would make meaningful statistical analysis difficult but also because of the negative impact of childbirth on women's wages and the tendency for women to withdraw from the labor force during the measured outcome period (ages 30–35) (see Blau & Kahn, 2000).

The third study was a nationwide open-cohort study that included all individuals aged 18 years or older residing in Sweden between January 1, 1997, and December 31, 2018, including immigrants. Sociodemographic factors, e.g., age, sex, family income, education, marital status, region of residence, and country of origin, were collected at the time of inclusion in the study. The primarily analysis excluded individuals (n = 751,101) with missing data on sociodemographic variables, representing 10% of the total population. The outcome measured was the time to the first occurrence of a sepsis event during the study period, which was defined as the first recorded sepsis-related hospitalization, identified through both primary and secondary diagnoses in the National Patient Register, based on the International Classification of Diseases (ICD-10).

The fourth study was a longitudinal cohort study that included individuals born between 1984 and 2000 who were followed until they reached 25. The study sample consisted of 1,374,568 individuals, of whom 93.5% were Swedish-born with two

Swedish-born parents. Educational performance was assessed using 9th-grade school grades obtained from the National School Registry. Drug use disorders (DUD) were identified using data from multiple sources, including medical records, prescribed drug registries, and criminal registers. Several International Classification of Diseases (ICD) codes were used to classify DUD cases. To minimize the risk of reverse causality, individuals with a history of DUD before the age of 16 were excluded from the study.

Methodological considerations

This section outlines key methodological considerations relevant to the studies included in this thesis. Particular attention is paid to challenges such as self-selection, endogeneity, self-reporting bias, and the difficulties associated with establishing causality. In addition, it describes how each study seeks to address these issues, drawing on the strengths of the available data sources.

School Grades and Neighborhoods- A Natural Experiment

Definition of Neighborhood and Neighborhood Socioeconomic Status

The first study examines the impact of initial neighborhood socioeconomic status (NSES) on the educational performances of immigrant adolescents upon graduation from compulsory schooling (9th grade). A key challenge in the neighborhood effects literature is defining a neighborhood. Common approaches include using geographic units such as census tracts, zip codes, or administrative boundaries (Chetty, 2018). However, neighborhoods are not only geographic constructs, but can also encompass social dimensions. For example, a child may live in a specific geographic unit but attend social activities in another (Dietz, 2002). In the first study, neighborhoods were identified using detailed geographical SAMS. One could argue for using DeSO (*Demografiska statistikområden*), recently developed by Statistics Sweden, to define neighborhoods, as they offer a finer spatial resolution. However, in the study, we rely on SAMS units to remain consistent with Edin et al. (2012), whose study is closely related to ours in scope.

The second challenge in the study of neighborhood effects concerns defining neighborhood quality. Previous studies have used various proxies to capture neighborhood quality (Dietz, 2002), which highlights that neighborhood quality is multidimensional and shaped by various social and economic factors. In this study, to assess NSES, we constructed an aggregated measure using principal component analysis (PCA) applied to SAMS-level data. This measure was derived from four key socioeconomic indicators of the working-age population in each SAMS area: *percentage of residents with low income*, *unemployment rate, percentage with low educational attainment, and percentage receiving social welfare assistance* (see White et al., 2016; Winkleby et al., 2007). The NSES index was constructed for each SAMS neighborhood between 1985 and 1994. It serves as a proxy for the

quality of social interactions and networks that may be important for educational performance. NSES at the initially assigned neighborhood ranges from -12.85 to 3.15 with a standard deviation of 2.25, where negative values indicate low neighborhood SES and positive values indicate high neighborhood SES. The average initial NSES for subjects is -1.27; indicating that they were, on average, assigned to neighborhoods with slightly lower NSES. However, the standard deviation reflects that they were somewhat scattered into different types of NSES.

Measurements of school grades

We used administrative graduation registers containing information on Grade Point Average (GPA) from compulsory schooling in 9th grade, corresponding to a typical graduation at 16. In the first study, we analyzed data from 1988–2008; in the fourth study, we examined the period 2000–2016. During this time, the Swedish grading system changed. Before 1997, a norm-referenced grading system was used, where students were graded on a scale from 1 to 5 based on their performance relative to their cohort peers. After 1997, Sweden transitioned to a criterion-referenced grading system, where fixed performance criteria determined student´s grades. In this system, students received a failing grade (*Icke-Godkänt*), and those who met the minimum requirements received a passing grade (*Godkänt*). At the same time higher performance levels were awarded distinctions (*Väl godkänt* and *Mycket Väl Godkänt*) (see Lundahl, 2002). Students' educational performance was assessed using grades from two different grading systems: a norm-referenced scale (1988–1997) ranging from 1 to 5 and a criterion-referenced system (1998 onwards) with scores ranging from a minimum of 0 to a maximum of 320. To ensure comparability across cohorts, we standardized GPA scores by year of graduation using the following formula:

$$GPAscore = \frac{X_i - \mu_t}{\sigma_t}$$

Where X_i is individual *i*'s final GPA score, μ_t is the mean GPA score, and σ_t is the standard deviation at year *t*. Standardizing the GPA scores allowed us to capture students' relative performance within each graduation year, ensuring comparability across different grading systems. This approach also addressed the issue of grade inflation observed in the criterion-referenced grading system (see, e.g., Cliffordson, 2004; Vlachos, 2010).

Immigrant – Native Wage Gap in Sweden - Do Personality Traits Matter?

The second study examines how personality traits contribute to the immigrant-native wage gap in Sweden. Previous studies have shown that personality traits influence various life outcomes, including education and wages (Almlund et al., 2011). However, little is known about this impact on the immigrant-native wage gap. This may be related to the methodological difficulties associated with the reliable measurement of personality traits.

Measurement of Personality Traits

Personality traits are not directly observable, which presents challenges for empirical analysis. Previous studies have relied on the Big Five personality framework, typically assessed through self-report questionnaires. For example, recent studies on the immigrant-native wage gap have used personality trait measures derived from self-reported datasets, such as the German Linked Personnel Panel (LPP), the Betriebspanel (BP), and the German Socio-Economic Panel (SOEP) (see Laible & Brenzel, 2022; Ingwersen & Thomsen, 2021). In contrast to previous studies on the immigrant-native wage gap, our study used personality trait measures, based on observed actions rather than self-assessments. Personality traits were assessed via a 20- to 40-minute semi-structured interview conducted by a trained psychologist randomly assigned to conscripts during the Swedish Military Enlistment. By leveraging objective, psychologist-assessed measures of personality traits, we eliminated self-reporting bias, a standard limitation of questionnaire-based personality assessments (Chen et al., 2020). Therefore, our study provides a more robust and unbiased evaluation of personality traits than the self-reported methods used in previous research. However, the selection of individuals included in a study is important for the generalizability of the findings. In this study, personality traits were measured only among naturalized immigrant men, which may introduce a potential selection bias, especially positive selection. Those men who choose to become Swedish citizens could differ from the broader immigrant population in terms of motivation, integration, and/or socioeconomic background (see Carlstedt, 2006) and the theoretical literature about to segmented assimilation (Alba & Nee, 2003), and formation of oppositional identities (Akerlof & Kranton, 2001).

Measurement of wages

The LISA dataset provides information on employment status for all individuals aged 15 and older, recorded annually in November. The primary labor market outcome was wages defined as individual pre-tax standardized annual gross income, which includes taxable benefits and transfers from the social security system (e.g., sick leave and parental leave pay). Gross wages were assessed at ages 30 and 35 over a 19-years (2000–2018). All wages were adjusted to 2018 price levels using

the Consumer Price Index (CPI) to ensure comparability over time. In the primary analysis, we applied an income threshold of at least 100,000 Swedish kronor (SEK) per year, adjusted to 2018 prices. This threshold corresponds to approximately three months of full-time employment per year at an average Swedish salary. This excludes individuals with short employment durations and low-paying jobs, ensuring an analytical sample consisting of individuals with a more stable attachment to the labor market. The threshold is consistent with previous research (see Dackehag et al., 2015). The choice of threshold may be considered somewhat arbitrary; therefore, we conducted sensitivity analyses using alternative earnings thresholds to validate our findings.

The effects of sociodemographic factors and comorbidities on sepsis: A nationwide Swedish cohort study

The third study examines how sociodemographic factors and comorbidities influence sepsis incidence, focusing on interactions with the country of origin. The sample included all individuals aged 18 or older residing in Sweden between January 1, 1997, and December 31, 2018. Immigrants entered the sample at age 18 or upon immigration if older. This design presents methodological challenges, especially as the sociodemographic variables were measured at study entry and may not reflect changes over time which could influence the risk of sepsis. Educational attainments among immigrants suffer from measurement issues, including misclassification (see Saarela & Weber, 2017) and missingness (see Careja & Bevelander, 2018). Individuals with missing sociodemographic data were excluded from the primary analysis but were included in the sensitivity analysis. Country of origin was categorized following previous studies (Chartier et al., 2023) to reflect country-specific risk factors. This could pose a challenge if certain groups are less likely to seek care, e.g., language barrier, potentially leading to underreporting or misclassification.

Measurements of Sepsis and Severe Mental Disorders
Sepsis cases were identified using ICD-10 codes and categorized by cause and severity. The majority (81.2%) of sepsis cases were classified as A41 "Other sepsis" while 13.2% of cases were classified as A40 "Sepsis due to streptococcus". These categories accounted for 94.4% of all sepsis cases in the study. Mental disorders were identified based on ICD-10 diagnoses, including psychotic disorders (F20, F22, F25) and bipolar and single manic episodes (F30, F31). To account for the overall disease burden, the analysis also included the Charlson Comorbidity Index (CCI) (see Stenberg et al., 2023 for details).

Early School Achievement and Adult Drug Use Disorder

The fourth study examines the relationship between school grades at the end of compulsory education (9th grade) and the onset of drug use disorders, exploring whether this relationship varies based on parental background and sex. This study, focused on individuals born in Sweden with one or two foreign-born parents (see Statistics Sweden, 2019b). We excluded individuals where at least one parent was born in a Western country (Nordic countries, EU28, USA, Canada, Australia, and Oceania). According to Chiswick (1978) and Borjas (1985), greater similarity between countries tends to ease the transferability of human capital and assimilation. We used standardized grades for each year and sex, as previously explained, as a comparable measure of school grades. Additionally, we also examined grades from the criterion-referenced system. We included students without grades in the analysis, as school dropouts may have experiences that influence the likelihood of DUD. However, only 1.8% of the sample had no grades. The relationship between early school achievement and the onset of DUD presents several methodological challenges. One concern is endogeneity. Although previous studies, Kendler et al., (2018) show a causal link for the whole population, immigrant students may be at higher risk of developing DUD because of early exposure to adverse environments, e.g., parental immigration that negatively affect both their academic performance and drug use (see theoretical discussion e.g., assimilation and oppositional identities). This raises the possibility that poor academic performance does not cause drug use but rather reflects underlying vulnerabilities that lead to both poor grades and substance abuse. Therefore, distinguishing between correlation and causality is particularly challenging. This study uses register-based data on DUD from the Hospital Discharge and Prescribed Drugs Registers, and the Crime and Suspicion Register. However, these sources may be subject to underreporting and biases, particularly for individuals with an immigrant background. For example, immigrants may be less likely to seek treatment for DUD, which can lead to underrepresentation in healthcare data. Furthermore, immigrants can be overrepresented in criminal records. This can introduce measurement errors and misrepresent the true prevalence of drug use disorders among the groups.

Measurements of Drug use Disorders

Drug use disorders (DUD) were identified using data derived from multiple sources. DUD cases were classified based on the following International Classification of Diseases (ICD) codes: ICD-8: 304. ICD-9: 292, 304, 305.1–305.9 and ICD-10: F11–F16, F18–F19. Alcohol (F10) and tobacco (F17) use disorders were excluded from the analysis. DUD-related crimes were identified from the Crime Register, specifically Violations of narcotics laws (Swedish: *Narkotikastrafflag (1968:64*) and Drug-related driving offenses (Swedish: *Straff för vissa trafikbrott 1951:649*).

Additionally, suspicion codes: 3070, 5010, 5011, and 5012 from the Suspicion Register were included to capture DUD-related offenses.

Causality

This section will briefly discuss causality issues in the studies. The discussion will center around observational and quasi-experimental designs and their approaches to causal inference. It will also address potential biases from confounders, i.e., variables directly or indirectly related to the exposure and the outcome.

Natural experiment

One of the main challenges in identifying neighborhood effects on individual outcomes is the issue of self-selection into residential areas (Diez Roux, 2004). To address this concern, researchers often rely on strategies that introduce exogenous variation in neighborhood assignment. In our first study, we used *the Swedish Dispersal Policy* - described in the Background section - as a natural experiment. We argue that the policy´s design led to a quasi-experimental allocation of immigrant across neighborhoods (See Angrist & Pischke, 2008). The Swedish Dispersal Policy has previously been used in studies examining neighborhood effects, including Åslund et al., (2011) on educational performances, Edin et al., (2003) on labor market outcomes, and Grönqvist et al., (2012) on income inequality and health.

For our identification strategy to be valid, it is critical to rule out systematic self-selection of individuals into neighborhoods. Three potential threats to this assumption are: 1) case officers assigning immigrants to specific neighborhoods based on observable characteristics for example, age and country of origin. 2) more informed immigrants somehow influencing their initial neighborhoods; and 3) municipalities cherry-picking immigrants based on country of origin or sociodemographic profiles e.g., education. Another threat is housing constraints which could also influence initial placement (Nekby & Pettersson-Lidbom, 2017).

To assess the randomness assumption, we conducted a series of balancing tests and regression analyses to examine whether individuals' characteristics at time of arrival were systematically correlated with initial neighborhood socioeconomic status (NSES). The results show no significant correlation between individuals' characteristics and initial NSES. However, we observed some imbalances related to parental characteristics e.g., education. This may be partly related to missing data.

Overall, considering the design of the dispersal policy, the fact that immigrants had no real influence over the location of their initial housing, and the growth in

participation of numbers of municipalities from 60 by 1985 to 284 by 1989. Additionally, given that municipal housing was spread across different types of neighborhoods, ranging from affluent areas to less advantaged areas, we argue that immigrants were randomly exposed to various neighborhood SES.

To further support the assumption of exogenous placement, we examined the spatial distribution of immigrants across municipalities and neighborhoods. Figures 3a and 3b illustrate a widespread dispersion across Swedish municipalities, including various neighborhood within Stockholm County.

(20,333]
(10,20]
(2,10]
[1,2]

(262...
(110,26...
(57,1...
(5,7,1...
[1,57]
No data

Figure 3a. Spatial Distribution of immigrants into Swedish Municipalities Figure 3b. Spatial Distribution of immigrants into neighborhoods in Stockholm

Notes: We used variation in exposure to NSES in initial neighborhoods by utilizing the Swedish refugee placement policy to account for potential self-selection of refugees into specific neighborhoods. Darker blue shades indicate areas with higher numbers of allocated refugees, while lighter blue shades represent areas with fewer placements.

Observational studies

Observational studies, whether cross-sectional or longitudinal, are subject to issues of temporality and confounding, which can threaten the assumption of causality between exposures and outcomes (Gianicolo et al., 2020). In the second study, this challenge is related to endogeneity, as shown in German studies on wage gaps (Laible & Brenzel, 2022; Ingwersen & Thomsen, 2021), where personality traits were measured after individuals had already entered the labor market. Labor market experience may influence personality traits, resulting in a spurious correlation. We used the SME-enlistment data to address this issue and adopted a "pre-labor market" approach (see Neal & Johnson, 1996; Nordin & Rooth, 2009). Although we refrain from making strong causal claims, this approach strengthens a potential causal interpretation of our results. Furthermore, we used Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973) used to decompose wage gaps between groups. While not a fully causal method, it can be interpreted within a counterfactual framework (see Jann, 2008; Kline, 2011; Fortin, Lemieux & Firpo, 2011).

The third study employs a longitudinal observational cohort design, which establishes the temporal sequence between sociodemographic factors, comorbidities, and the onset of sepsis. While the analysis controls for a broad range of observed covariates, the possibility of confounding remains. For example, pre-migration environmental conditions may be particularly relevant for immigrants and influence both sociodemographic outcomes and sepsis risk. Consequently, immigrants may have arrived in Sweden already at higher risk of sepsis. These unobserved factors may bias the estimates. As a result, while the study identifies important associations, it does not claim causality.

The fourth study is a longitudinal cohort design establishing the temporal order between school achievement and the onset of DUD. Various background factors, including NSES, parental characteristics, peer influences, and early-life events, such as parental immigration, influence school performances and DUD.Even with such rich register data, it is difficult to account for all relevant confounders. If unobserved factors influence school performance and DUD risk, estimates may be biased. To strengthen causal inference, we used a fixed effect model based on same-sex sibling pairs who were discordant for school achievement and DUD timing. This approach controls for all shared family-level characteristics both observed and unobserved.

Empirical strategies

School Grades and Neighborhoods – A Natural Experiment

To assess the impact of initial NSES on future educational performance, we estimated the following equation:

$$y_i = a_0 + \beta_1 NSES_{it_0} + \beta_2 X_i' + \delta_t + \varepsilon_i \qquad (1)$$

where y_i is the GPA score of the individual i, and $NSES_{it_0}$, is the exposure of interest, i.e., assigned NSES to individual i at the year of arrival, t_0. The coefficients, β_1, represent the mean impact of initial NSES on GPA scores. Thus, a positive estimate of β_1 suggests that higher initial NSES, on average, improves GPA-scores. β_2 is a vector of control variables, e.g., children's and parent age at migration. δ_t is a set of dummy variables e.g., country of origin, causes of migration, year of immigration and graduation etc. ε_i, is an error term. A special mention is needed regarding the estimated treatment effect β_1. Equation (1) estimate the effect of policy exposure by examining the Intent-to-Treat (ITT) (see Chetty et al., 2015, 2018). To estimate other treatment effects, such as Average Treatment Effect (ATE), Treatment on the Treated (TOT), and Local Average Treatment Effect (LATE), it is important to account for actual policy exposure whether immigrant resided in designated neighborhood. According to our data, approximately 77-78% of individuals in our sample remained in their initial neighborhood at time of graduation, while the remaining 22-23% either relocated or no longer lived in their initial area. This challenge of mobility complicates the estimation of ATE, TOT, and LATE (see Angrist & Pischke, 2009).

We tested the robustness of our baseline results by modifying Eq. (1) in several ways. First, we applied Unconditional Quantile Regression (UQR) to assess the heterogeneous impact of NSES across the GPA distribution (Firpo et al., 2009; Rios-Avila, 2020). We also examined subgroup effects by sex and age at migration, and as part of our sensitivity analysis, evaluated the probability of obtaining a college degree and labor market outcomes at ages 25 and 30.

Personality Traits and the Immigrant-Native Wage Gap in Sweden

We examined the impact of personality traits on the immigrant-native wage gap using two approaches. First, we estimated how personality traits are associated with wages by applying Equation 2:

$$\ln w_i = a + \beta X_i' + \varepsilon_i \qquad (2)$$

where the subscripts i, indicates the individual. $\ln w_i$ denotes the natural logarithm of annual wages for individual i and α is the intercept. The intercept indicates the average log wage for an individual with no personality traits or education. In practice, such profile does not exist, so the intercept serves as a computational baseline in the model. $\mathbf{X}'_i$ is a vector of individual variables, including personality traits, immigration status, and adjusting factors, $\hat{\beta}$ measures the estimated return to the different personality traits and ε_i is an error term.

In the second step, we employed the Oaxaca-Blinder (OB) decomposition technique (Oaxaca, 1973; Blinder, 1973) to analyze the contribution of personality traits to the wage gap. The wage gap between the "Both Swe" and "non-EU-15" groups was decomposed into three components. The first component, the *endowment* component, captures the difference in observed personality traits between the two groups. The second component, the *coefficients* component, reflects the gap arising from differences in the returns to these traits across groups. Finally, the *interaction* component accounts for the combined effects of differences in both endowments and coefficients on the wage gap.

Wage gaps can be measured in various ways, such as mean, median, or quantiles and the choice of measure can significantly influence the results. Therefore, equation (1) and the Oaxaca-Blinder decomposition technique have been extended to unconditional quantile regression (UQR) as proposed by Firpo et al. (2009), Fortin et al. (2011), and Rios-Avila (2020). The extension is applied to decompose wage gaps at the mean and selected quantiles. The quantile decomposition allows for examining heterogeneity along the wage distribution. Additionally, we performed a mediation analysis to investigate to what extent higher education mediated the relationship between personality traits and wages.

Sociodemographic factors on Sepsis incidence

The main outcome was the time to the first recorded sepsis, defined as the initial hospitalization with a sepsis diagnosis. We used an event study framework and Cox proportional hazards models, as specified in Equation (3).

$$h(t|x) = h_0(t)\exp(\beta_1 x_1 + \cdots + \beta_k x_k). \qquad\qquad (3)$$

where $h(t)$ hazard function at time t, $h_0(t)$ is the baseline hazard, i.e. at inclusion in the study and $\beta_1 x_1 + \cdots + \beta_k x_k$ are the coefficients associated with the sociodemographic variables e.g., sex, family income, education, marital status, region of residency, and country of origin, comorbidities. Three models were used: Model 1, a univariable model; Model 2, an age-adjusted model; and Model 3, fully adjusted for all covariates. Furthermore, we evaluated whether the impact of the

covariates on the first sepsis event varied by sex and country of origin using an interaction term in Model 3.

Early School Achievement and Drug Use Disorder

The empirical strategy in the fourth study was also built on an event study framework, using Cox proportional hazards models, as specified in Equation (3). We estimated two models to examine the association between school achievement at age 16 and various predictor variables, including parental education, parental immigration status, parental DUD, and parental separation (defined as both parents not living together), in relation to individual DUD. First a univariable model for each predictor and next a second model that included all risk factors. All analyses were stratified by sex. To assess whether the associations between DUD and various predictors differed by parental immigration status, we included interaction terms. Additionally, we conducted several sensitivity analyses based on parents' region of origin for each sex. To explore the potential causal effect of early educational performance on DUD, we performed an analysis using same-sex sibling pairs discordant for school achievement and timing of DUD.

Tables 1. Summary of the Data, Methods and Empirical strategy

	Study Design	Study Population	Follow-up time	Outcomes	Main predictors/Exposure	Covariates	Methods
Study 1	Cross-sectional analysis	Immigrants affected by the Swedish Dispersal Policy	1985 - 2008	School Grades Labor market outcomes	NSES	Parental education, Age at immigration	Linear regression Binned scatter, UQR-regression, Fixed effects
Study 2	Longitudinal cohort study	Swedish citizens: Swedish-born i.e., with two Swedish-born parents and Naturalized immigrant	2005 - 2018	Wages at 30, 35	Personality traits: Social Maturity Intensity Psychological Energy	Education, Parental characteristics	Linear regression Oaxaca-Blinder Decomposition, UQR
Study 3	Nationwide open-cohort study	All individuals aged 18 years or older who were residing in Sweden including immigrants.	January 1, 1997, - December 31, 2018,	First Sepsis diagnosis	Age, Sex, Income, Education, Region of residency, Country of origin, Marital status, Comorbidities		Proportional Hazard models
Study 4	Longitudinal cohort study	Individuals born between 1984 and 2000, who were followed until they reached the age of 25.	2000 - 2016	Drug Use Disorders (DUD)	School grades – 9th grade Parental immigrant background	ADHD NSES Parental DUD Parental education Parental separation Birth year	Proportional Hazard models

Results

This section summarizes the main results of the four papers in this thesis. For a full presentation of the results, readers are referred to the separate papers.

School Grades and Neighborhoods – A Natural Experiment

The results from the crude model (Eq. 1) are illustrated using a non-parametric binned scatter plot in Figure 4. The figure shows a positive relationship between initial NSES and standardized GPA scores; a one-unit increase in initial NSES is associated with an average increase of 0.016 standard deviations in GPA scores (95% CI: 0.009, 0.023). Previous research suggests that neighborhood effects may vary across socioeconomic status distribution (Galster et al., 2018). To examine this, we analyzed the distribution of standardized GPA scores, which account for variation in the grading system by graduation year and/ or sex. Table 1A in the Appendix provides an overview of GPA characteristics within the study population. The findings reveal that differences in standardized GPA between NSES deciles are relatively small in the middle of the distribution but become more pronounced at the extremes. Students from lower NSES backgrounds consistently achieve lower standardized GPAs and grades across both grading systems. For instance, in the highest NSES decile (Decile 1), the average standardized GPA is -0.17, whereas in the lowest NSES decile (Decile 10), it declines to -0.46, illustrating a sizeable gap. These findings suggest that children who grow up in more socioeconomically advantaged neighborhoods tend to achieve higher academic performance. Furthermore, students in the lowest NSES decile experience the steepest decline in GPA, suggesting that socioeconomic disadvantages have a cumulative and more pronounced impact on educational outcomes.
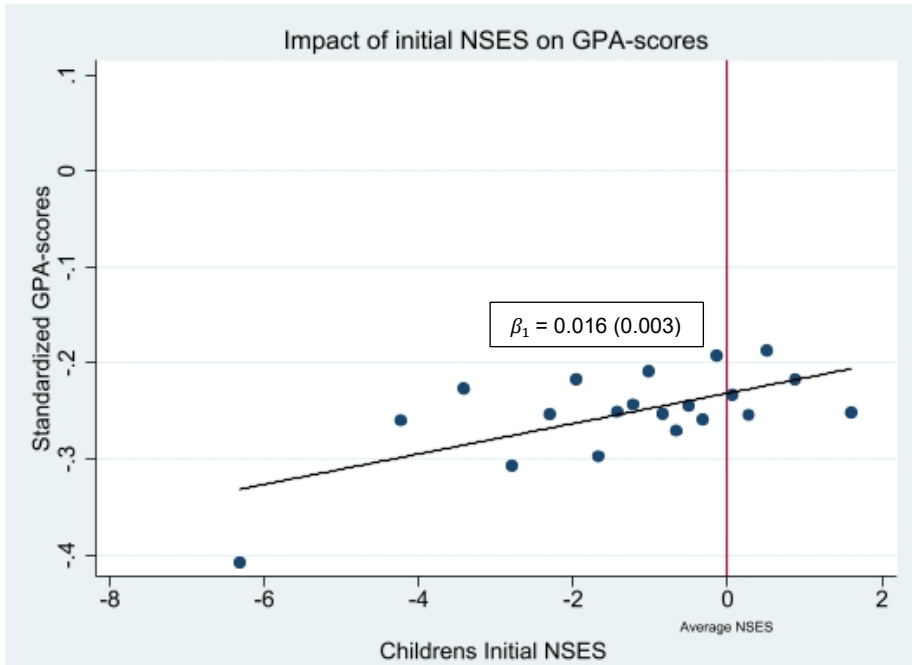
Figure 4. Relationship Initial NSES and GPA scores

Notes: The graph is a visual representation of the relationship between initial NSES and GPA scores. The initial NSES for assigned neighborhoods ranges from -12.85 to 3.15, with negative values indicating low neighborhood SES and positive values indicating high SES. The average initial NSES is -1.27 (red line), suggesting that, on average, subjects were assigned to neighborhoods with slightly lower SES. Bin scatter groups the NSES variable into equal-sized bins, computes the mean of each NSES and GPA-scores variable within each bin, then create a scatterplot of these data points. It also plots a fitted line based on the underlying data. In the regression models, we controlled for parents' country of origin, as well as parents' year of arrival and child's sex and year of graduation as fixed effects.

We assessed heterogeneous effects across the outcome distribution using UQR (Firpo et al., 2009; Rios-Avila, 2020). The results (Figure 5) indicate that at the 10th percentile, an increase in NSES improves GPA by approximately 0.04 standard deviations, whereas at the 90th percentile, the effect is only 0.01 standard deviations. This suggests that NSES has a more impact on students with lower academic performance, who represent around 10–15% of the study population. These results remain robust across sensitivity analyses, including different grading systems, gender, and age at migration, consistently demonstrating that a higher NSES index is associated with improved GPA scores.

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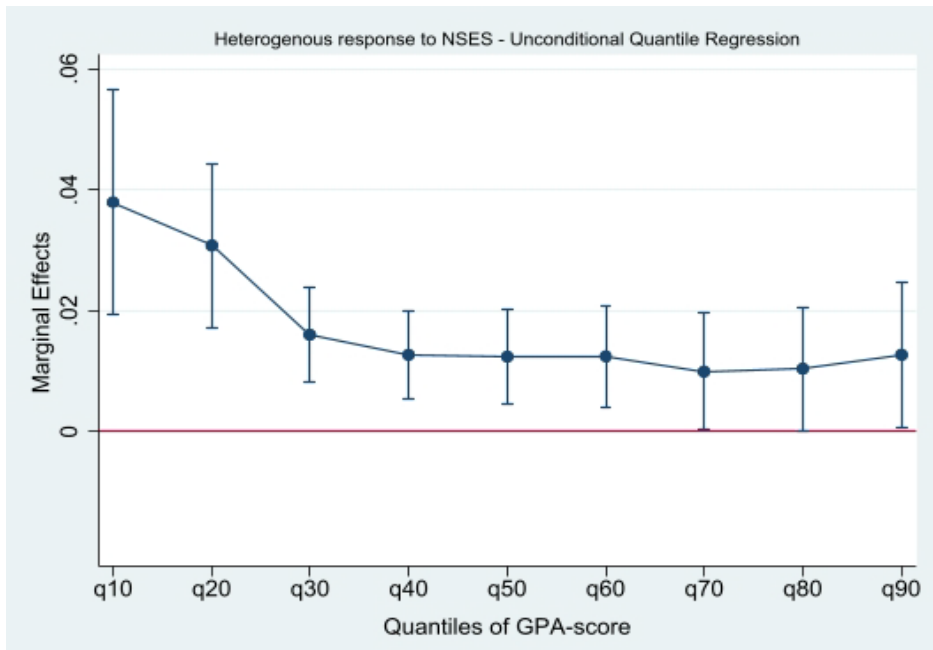
Figure 5. Marginal Grade Point Average (GPA) scores and Neighborhood Socioeconomic Status (NSES)

Notes: The figure shows the marginal changes in GPA-scores. Quantiles of GPA is shown on the x-axis, and marginal change in GPA-scores on the y-axis. The solid blue line represents relationships and dots point estimates with corresponding 95% CI at each quantile. A refence line at zeros is added to show which coefficients are significantly different from zero. We controlled for parents' country of origin, as well as parents' year of arrival and child's sex and year of graduation as fixed effects.

Personality Traits and the Immigrant-Native Wage Gap in Sweden

Figures 6 and 7 present the descriptive results of this study. Figure 6 illustrates the income distribution across personality traits. While there is overlap in income distributions, "non-EU-15"- men consistently earned lower average wages than "Both-Swe- men, even when showing similar personality trait scores. This pattern holds across all four personality traits and remains evident across the entire score range (1 to 5).
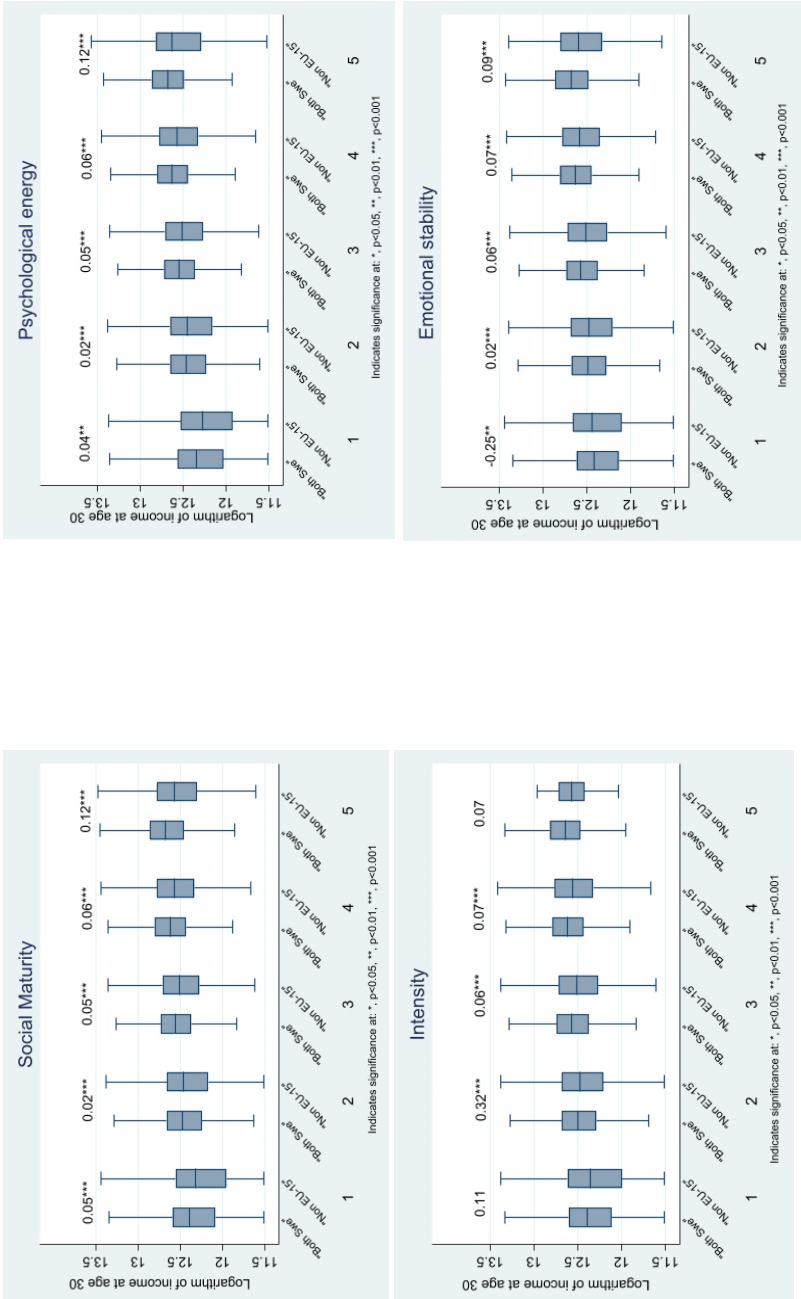
Figure 6. Personality traits from the Swedish Military Enlistment (SME) and incomes at 30 years

Notes: Boxplots illustrate (log) deflated income in year 2018 in Swedish crowns (SEK) for the birth cohorts 1975-1990. Scores for personality traits 1 (lowest) – 5 (highest). Mean difference with corresponding significance level. * Refers to p<0.01, ** to p<0.01, and *** to p<0.001.

To assess group differences in personality traits, we calculated Cohen's d, a commonly used measure in psychological research that quantifies the size of the difference between two groups. Cohen´s d compares the mean of two groups and expresses these differences in relation to the standard deviation. A larger d scores ≥ 0.8 indicates big differences between groups, while lower d scores ≤ 0.3 suggests small differences. The analysis revealed effect sizes ranging between 0.22 and 0.35, indicating small differences between the groups. Additionally, the standard deviations showed that personality traits were similarly distributed across groups. The variation within groups was greater than the variation between groups.
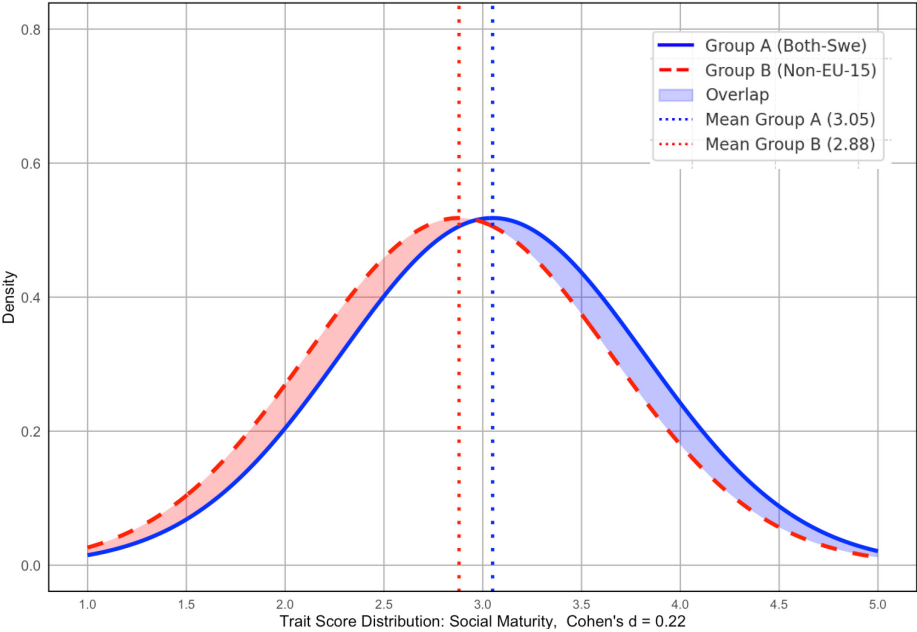
Figure 7. Distribution of Trait Scores for "Both Swe" and "Non-EU-15"
Notes: The figure illustrates the density distribution of trait scores Social Maturity for "Both-Swe", blue solid line and "non-EU-15", red dashed line. The vertical dotted lines represent the mean trait scores for each group (Group A: 3.05, Group B: 2.88). The shaded area indicates the overlap between the two distributions. Cohen's d = 0.22 suggests a small effect size, indicating that while Group A has a slightly higher average trait score than Group B, the distributions are largely overlapping.

The Impact of Personality Traits on Wages in the Swedish Labor Market

Table 2 presents the OLS estimates for the effect of personality traits on wages at age 30 in the Swedish labor market. The results indicate that personality traits have a positive and statistically significant impact on wages. Among the four traits, Psychological Energy and Intensity showed the highest return with higher wages, whereas Emotional Stability yielded the lowest economic return. Despite controlling for personality traits, a 4% wage gap remained between "Both-Swe" and "non-EU-15" men. Furthermore, the interaction term (model 4) suggests that the

economic returns on personality traits vary depending on an individual's background, indicating potential differences in how traits are rewarded in the labor market.

Table 2. Personality Traits and Wages

	Model 1	Model 2	Model 3	Model 4
Log wage differences between "non-EU-15" and "Both Swe"	-0.06*** (0.003)	-0.04*** (0.003)	-0.02*** (0.003)	-0.04** (0.01)
Social maturity	-	-	0.02*** (0.001)	0.02*** (0.001)
Psychological energy	-	-	0.04*** (0.001)	0.04*** (0.001)
Intensity	-	-	0.03*** (0.001)	0.03*** (0.001)
Emotional Stability	-	-	0.01*** (0.001)	0.01*** (0.001)
Social maturity "non-EU-15"	-	-	-	0.01* (0.007)
Psychological energy "non-EU-15"	-	-	-	0.003 (0.007)
Intensity "non-EU-15"	-	-	-	-0.01*** (0.006)
Emotional Stability "non-EU-15"	-	-		-0.02*** (0.006))
Controls	No controls	Parental education	Parental education	Parental education
Observations	233 299	230 361	230 361	230 361
R^2	0.0020	0.0042	0.0511	0.0513

Notes: Clustered robust standard errors are reported in parentheses. ***, **, *, indicates significance at 1%, 5% and 10% level, respectively.

Oaxaca-Blinder Decomposition of the Wage Gap

We applied an Oaxaca-Blinder decomposition to examine how personality traits contribute to the wage gap between "Both-Swe" and "non-EU-15" men. Figure 8 presents the results from a two-fold decomposition for illustrative purposes. The results indicate that approximately 33% of the wage gap (2% out of 6%) can be attributed to actual differences in personality traits between the groups. However, the remaining 66% of the gap comes from differences in returns to personality traits, rather than differences in the traits themselves. Across all four personality traits, a significant portion of the wage gap is unexplained (red bars), suggesting systematic differences in how personality traits are rewarded in the labor market – or potential discriminatory factors. Emotional Stability and Intensity contribute most to the unexplained gap, indicating that "non-EU-15" men receive lower wage returns for these traits than their "Both-Swe" counterparts. Psychological Energy is the only trait where the explained component (blue bars) stands out, thus suggesting that actual differences in this trait account for part of the wage gap. Social Maturity has the smallest impact, suggesting it plays a role in wage gaps. Overall, while

personality traits influence wages, the findings show that a substantial portion of the wage gap remains unexplained. This highlights that similar personality traits may be differently valued in the Swedish labor market.
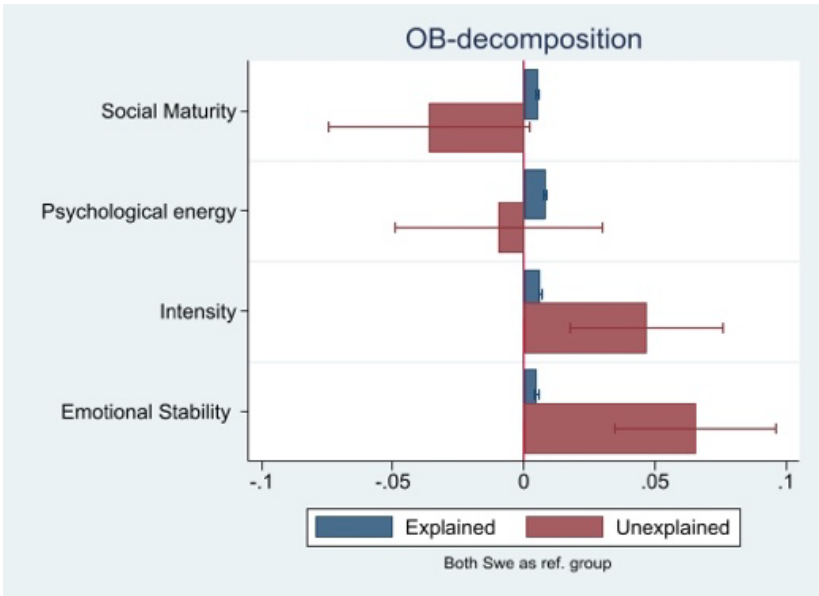
Figure 8. Oaxaca-Blinder (OB) Wage Decomposition

Notes: Two-fold OB-decomposition with deflated wages in 2018 SEK and conditioned on income exceeding 100,000 Swedish crowns (SEK). Figure 6 shows the OB results as horizontal bars including 95% (CI) shown as error bars where inclusion of 0 represents non-significance. "Both Swe" are used as the reference group. The mean wage gap was approximately 6% (-0.06, 95% CI= (-0.05, -0.07)).

The Effect of Sociodemographic Factors on Sepsis: A nationwide Swedish cohort study

Table 3 presents the univariable analysis examining the association between sociodemographic factors and the risk of experiencing a first sepsis event. The findings highlight age and comorbidities as the most significant predictors. The risk of sepsis increases substantially with age. Individuals aged 80 years or older had a hazard ratio (HR) of 18.19 (95% CI: 17.84,18.55) compared to the reference group (18–49 years), indicating a markedly elevated risk in older populations. The results are in line with Martins et al., (2003). A higher Charlson Comorbidity Index (CCI) score was strongly associated with sepsis risk. Individuals in the highest CCI category had an HR of 6.79 (95% CI: 5.41,8.52), reinforcing the link between pre-existing health conditions and sepsis susceptibility. These findings align with previous research (Mellhammar, 2023; Mayr et al., 2014), underscoring the critical

role of age-related vulnerability and comorbidity burden in sepsis risk. Across almost every immigrant group, the risk of experiencing a first sepsis event was lower compared to Swedish-born individuals, a pattern that persisted even after adjusting for sociodemographic factors. However, a difference in interaction between sex and country of origin was observed. Among individuals from Africa (excluding North Africa), men had a lower sepsis risk than women, with a risk ratio of 0.70 (95% CI: 0.55,0.89). A similar trend was noted across most immigrant groups, where men consistently exhibited weaker associations with sepsis risk compared to women, with risk ratios ranging from 0.83 to 0.93, many of which were statistically significant. These findings reinforce the role of age and comorbidities in sepsis risk while also showing disparities based on migration background and sex (Esper et al.,2006).

Table 3. Association and interaction test of individual sociodemographic variables, comorbidities, and sepsis by sex, in adults in Sweden (1997-2018)

Covariates	Men		Women		Ratio between men and women	
	HR	95% CI	HR	95% CI	Ratio	95% CI
Age (ref. age 18–49 years)						
50–59	4.13	(4.0, 4.22)	3.09	(3.02, 3.17)	1.33	(1.29, 1.38)
60–69	8.73	(8.54, 8.93)	5.43	(5.30, 5.57)	1.61	(1.56, 1.66)
70–79	16.15	(15.80, 16.52)	8.97	(8.76, 9.18)	1.80	(1.74, 1.86)
≥ 80	23.16	(22.51, 23.84)	11.06	(10.74, 11.39)	2.09	(2.01, 2.18)
Educational level (ref. > 12 years)						
≤ 9	1.13	(1.11, 1.16)	1.27	(1.24, 1.30)	0.89	(0.87, 0.92)
10–12	1.03	(1.01, 1.04)	1.10	(1.07, 1.12)	0.93	(0.91, 0.96)
Family income (ref. high)						
Low	1.04	(1.01, 1.06)	1.08	(1.06, 1.11)	0.96	(0.93, 0.99)
Middle	1.06	(1.04, 1.07)	1.13	(1.10, 1.15)	0.94	(0.91, 0.96)
Region of residence (ref. large cities)						
Southern Sweden	0.78	(0.77, 0.79)	0.82	(0.80, 0.96)	0.96	(0.93, 0.98)
Northern Sweden	0.82	(0.80, 0.83)	0.84	(0.83, 0.86)	0.97	(0.94, 0.99)
Marital status (ref. married)	1.05	(1.03, 1.06)	1.08	(1.06, 1.10)	0.97	(0.95, 0.99)
Country of Origin (ref. Sweden)						
Eastern Europe	0.93	(0.89, 0.97)	1.01	(0.96, 1.06)	0.92	(0.87, 0.99)
Western countries	1.06	(1.03, 1.10)	1.07	(1.04, 1.10)	1.00	(0.96, 1.04)
Middle East/North Africa	0.86	(0.80, 0.93)	1.04	(0.95, 1.13)	0.83	(0.74, 0.93)
Africa (excluding North Africa)	0.90	(0.76, 1.06)	1.27	(1.08, 1.51)	0.70	(0.55, 0.89)
Asia/Oceania (excluding Middle East)	0.88	(0.80, 0.97)	1.04	(0.95, 1.14)	0.85	(0.74, 0.97)
Latin America/Caribbean	0.81	(0.71, 0.93)	0.87	(0.76, 0.99)	0.93	(0.77, 1.12)
Charlson Comorbidity Index (ref. Low)						
Moderate (1–2 p)	2.10	(2.06, 2.13)	2.46	(2.41, 2.51)	0.85	(0.83, 0.87)
High (>2 p)	4.31	(3.25, 5.72)	3.58	(2.44, 5.26)	0.85	(0.83, 0.87)
Severe mental disorders (ref. No history)	1.59	(1.51, 1.68)	1.68	(1.60, 1.77)	0.94	(0.88, 1.02)

Notes: Fully adjusted for all covariates. HR: Hazard Ratio; CI: Confidence interval.

Early School Achievement and Drug Use Disorder

Table 4 presents the association between early SA and the onset of DUD, stratified by parental origin and sex. Males with two foreign-born parents had twice the risk of developing DUD compared to those with two Swedish-born parents (HR: 2.03, 95% CI: 1.87,2.21), while no increased risk was observed for females (HR: 0.99, 95% CI: 0.82, 1.19). Higher SA consistently reduced DUD risk across all groups, with a slightly more substantial effect among individuals with foreign-born parents (interaction ratios: 0.92 for males, 0.90 for females). ADHD and parental DUD were other strong predictors of DUD. However, their impact was weaker among individuals with foreign-born parents, particularly males (interaction ratios: 0.65 (95% CI: 0.60, 0.71) for ADHD, 0.83 (95% CI: 0.77, 0.89) for parental DUD). Among females, ADHD had an equal impact on DUD risk regardless of parental background (Interaction ratio: 1.00 (95% CI:0.85, 1.18)). Low NSES was a more substantial risk factor for males with foreign-born parents (interaction ratio: 1.19 (95% CI:1.08, 1.30)). Among females, low NSES had a weaker association with DUD in the foreign-born parent group, whereas mid-level NSES showed a more significant difference (interaction ratio: 0.66 (95% CI: 0.54, 0.80)). Parental separation or death significantly increased DUD risk, with a more pronounced effect among females with foreign-born parents (interaction ratio: 1.31 (95% CI: 1.15, 1.50)). Overall, the results indicate that higher SA, parental income and NSES consistently reduce the risk of DUD across all groups, with similar protective effects regardless of parental background. However, the influence of parental education, ADHD, and parental DUD appears weaker among individuals with foreign-born parents, particularly males. We further conducted sensitivity analysis by parental region of origin and family confounding to explore the link between parental background and DUD. Across these results, males with foreign-born parents had a higher DUD risk than those with Swedish-born parents, but high SA consistently reduced this risk across all groups. Among females, only those with Asian-born parents had a significantly lower DUD risk (HR: 0.43, 95% CI: 0.25,0.75), but high SA remained protective in all groups. We also analyzed individuals with one foreign-born parent separately, but overall, the main results remained stable. Furthermore, sibling analysis confirmed that males with foreign-born parents had higher DUD prevalence, while females showed no differences based on parental background. These findings highlight that educational and socioeconomic factors are important in DUD risk. We also noted variations by parental background and sex.

Table 4. HRs the association between SA on DUD, by parental background and sex

	Main effects		Interactions/ratio
Males	Two Swedish-born parents	Two foreign-born parents	Two foreign-born parents' vs two Swedish-born parents
Foreign vs Swedish background	1.00 (ref)	2.03 (1.87, 2.21)	
SA, by standardized unit increase	0.60 (0.60, 0.61)	0.55 (0.54, 0.56)	0.92 (0.90, 0.94)
Parental income, by decile	1.01 (1.00, 1.01)	1.00 (0.99, 1.01)	0.99 (0.98, 1.00)
Low vs high parental education	0.88 (0.84, 0.92)	0.90 (0.84, 0.96)	1.02 (0.94, 1.11)
Mid vs high parental education	0.89 (0.88, 0.91)	0.91 (0.86, 0.95)	1.02 (0.96, 1.07)
Low vs high NSES	0.83 (0.81, 0.84)	0.98 (0.90, 1.07)	1.19 (1.08, 1.30)
Mid vs high NSES	0.92 (0.89, 0.94)	1.13 (1.04, 1.23)	1.23 (1.13, 1.35)
Parental DUD	1.80 (1.76, 1.85)	1.49 (1.39, 1.60)	0.83 (0.77, 0.89)
ADHD (any time)	2.57 (2.51, 2.63)	1.68 (1.54, 1.83)	0.65 (0.60, 0.71)
Parental separation or death	1.67 (1.64, 1.70)	1.42 (1.35, 1.49)	0.85 (0.81, 0.90)
Birth year (by year)	1.04 (1.03, 1.04)	1.05 (1.05, 1.06)	1.02 (1.01, 1.02)
Females			
Foreign vs Swedish background	1.00 (ref)	0.99 (0.82, 1.19)	
SA, by standardized unit increase	0.57 (0.56, 0.57)	0.51 (0.49, 0.54)	0.90 (0.86, 0.95)
Parental income, by decile	0.99 (0.98, 0.99)	1.01 (0.98, 1.04)	1.02 (0.99, 1.05)
Low vs high parental education	0.87 (0.81, 0.94)	0.61 (0.51, 0.74)	0.71 (0.58, 0.86)
Mid vs high parental education	0.85 (0.83, 0.88)	0.94 (0.84, 1.06)	1.11 (0.98, 1.25)
Low vs high NSES	0.89 (0.86, 0.93)	0.86 (0.71, 1.04)	0.96 (0.79, 1.17)
Mid vs high NSES	0.96 (0.92, 1.01)	0.64 (0.52, 0.77)	0.66 (0.54, 0.80)
Parental DUD	1.83 (1.76, 1.90)	1.76 (1.52, 2.04)	0.96 (0.83, 1.12)
ADHD (any time)	3.76 (3.63, 3.90)	3.76 (3.21, 4.41)	1.00 (0.85, 1.18)
Parental separation or death	1.61 (1.56, 1.66)	2.11 (1.86, 2.40)	1.31 (1.15, 1.50)
Birth year (by year)	1.02 (1.02, 1.02)	1.02 (1.00, 1.03)	1.00 (0.98, 1.01)

Notes: Abbreviations: DUD, Drug use Disorder; NSES, Neighborhood Socioeconomic Status; ADHD, Attention Deficit Hyperactivity Disorder, SA, School Achievement i.e., grade point averages, standardized SA, Standardized grade point averages by sex and year of graduation.

Discussion

This chapter provides a discussion within which the results may be interpreted and understood.

School Grades and Neighborhoods – A Natural Experiment

Previous Swedish research on immigrant students' educational performance has primarily focused on ethnic neighborhood composition (e.g., Åslund et al., 2011). However, recent studies highlight the importance of socioeconomic factors within neighborhoods (Andersson et al., 2024). In this study, we examined how initial neighborhood socioeconomic status (NSES) influences the educational performance of immigrant students, using the Swedish Dispersal Policy (1985–1994) as a natural experiment.

Our findings show that early exposure to higher NSES significantly improves school grades, with the effect remaining robust across multiple empirical specifications. Notably, while GPA differences between middle-range deciles were minor, disparities widened at the extremes. Students with the lowest grades showed the greatest improvement if placed in higher-SES neighborhoods, suggesting that initial neighborhood conditions have a disproportionately strongly affect academically struggling students.

Our findings show that early exposure to high-NSES neighborhoods positively impacts immigrant students' educational performances. One of the underlying mechanisms driving this effect is possible peer effects, where students in high-NSES neighborhoods are more likely to be surrounded by high-performing classmates, fostering positive academic norms and higher expectations. Additionally, networks play a role, as students in more affluent areas often have better access to mentors and academic support systems. These resources could improve motivation, study habits, and access to higher education pathways. Another key factor may be aspiration – or lack thereof. Living in a high-NSES environment may expose students to successful role models, reinforcing the value of education and inspiration for future career choices. This exposure can be especially important

for students from immigrant backgrounds, who might otherwise lack access to such influences.

Overall, this study fills a gap in the literature by demonstrating how socioeconomic neighborhood composition shapes immigrant students' educational trajectories. Prior research has shown that initial settlement conditions strongly influence long-term integration outcomes, including education, employment, and income levels (Åslund & Rooth, 2007; Åslund, Östh, & Zenou, 2010, Damm, 2014; Martén, Hainmueller, & Hangartner, 2019). These findings are particularly relevant given the ongoing political debate in Sweden surrounding immigrants' initial settlement. The self-selected settlement (*EBO-lagen (Lag 1994:137*) allows asylum seekers to select their residential areas, which has led to high concentration of immigrants in certain metropolitan areas. The practice of The self-selected settlement is currently under review (SOU 2018:22). Our study highlights the long-term educational implications of initial neighborhood placement policies suggesting that reforms aimed at reducing residential segregation could be important in enhancing immigrant students' academic success.

Personality Traits on the Immigrant-Native Wage gap in Sweden

This study examines how specific personality traits contribute to the immigrant-native wage gap in Sweden. Our empirical analysis is based on Swedish Military Enlistment (SME) data where trained psychologists objectively assessed personality traits. These psychological evaluations are then linked to post-enlistment labor market data on wages, which provides a unique dataset. This dataset is unique for two key reasons: it relies on objective assessments of personality rather than self-reported surveys thus minimizing biases. It spans a long follow-up period covering birth cohorts from 1975 to 1990 allowing for a more comprehensive analysis of long-term wage outcomes.

Our results show that personality traits significantly influence wages. Among the assessed traits, Psychological energy (4%) and Intensity had the strongest positive effects on wages. Emotional stability (1%) exhibited the lowest economic return. These findings are consistent with previous studies on personality and wages (Mueller & Plug, 2006; Nyhus & Pons, 2005; Heineck, 2011). To further explore the relationship between personality traits and the immigrant-native wage gap we conducted an Oaxaca-Blinder wage decomposition. The results indicate that personality traits contribute to the wage gap as differences in personality explain part of the gap. However, most of the wage gap is driven by *differences in returns* to similar personality traits rather than differences in traits themselves. Intensity and Emotional Stability contribute most to the unexplained component of the wage gap,

supporting findings by Laible & Brenzel (2022). These results are particularly significant because personality traits are not directly observable by employers. Instead, they are subjectively assessed, opening the door for biases and potential discrimination. Recent evidence suggests that employers perceive immigrants as having different personality traits compared to natives, even when they have identical qualifications (Ayaita, 2021). This perception may influence hiring, wage negotiations, and career advancement, ultimately affecting labor market integration. From a societal perspective, the immigrant-native wage gap is concerning because it may reflect barriers to socioeconomic integration. Furthermore, persistent wage disparities can contribute to long-term economic inequalities. These inequalities may lead to negative consequences for immigrants' physical and psychological well-being.

Our study makes three key contributions to existing research on personality traits and wage gaps. i) Objective Measurement of Personality. Unlike prior studies that rely on self-reported personality assessments, our study is based on objective behavioral assessments by trained psychologists. This approach mitigates the risk of self-reporting bias - a common limitation in previous studies (Chen et al., 2020). ii) Exogeneity of Personality Traits. Because personality traits were measured before labor market entry, they are less likely to be influenced by work experiences or higher education. This reduces concerns about reverse causality and simultaneity bias, which often affect wage gap studies (Almlund et al., 2011; Osborne Groves, 2005). iii) Addressing Omitted Variable Bias. By including personality traits in wage regression models, we demonstrate that these traits significantly contribute to the explanation of the wage gap. Excluding personality traits from wage analyses can therefore lead to biased results due to omitted variable bias, a common limitation in past studies (Becker, 1957). This may also be of relevance for previous Swedish wage gap studies, such as Nordin & Rooth (2009) and Hanes & Norlin (2011), which did not include personality traits as a key explanatory factor.

Overall, our findings highlight the importance of personality traits in wage determination and wage disparities between immigrants and natives. While these traits play a role in explaining wage gaps, differential returns to the same traits suggest the presence of biases in how personality is rewarded in the labor market. Addressing these disparities requires further investigation into employer perceptions, workplace discrimination, and policy interventions aimed at reducing wage inequalities.

Sociodemographic Factors and Sepsis Incidence

This study examines the role of sociodemographic factors in determining the incidence of sepsis among the Swedish population. Our findings highlight age and comorbidities as the most significant risk factors for sepsis, aligning with existing research on age-related immune decline and its impact on infection susceptibility (Hall et al.,2011; Rowe et al., 2017). Comorbidities may further weaken the immune system, reducing the body's ability to fight infections and thereby increasing the risk of sepsis (Esper et al., 2006; Kang et al., 2024).

The results also show that lower educational attainment and socioeconomic status (SES) are associated with an increased risk of sepsis. These findings support prior research linking lower SES to poorer health outcomes and higher infection rates (Cutler et al., 2008; Pickett & Wilkinson, 2015). Individuals from lower socioeconomic backgrounds may experience limited healthcare access, delayed medical attention, and a higher burden of chronic diseases, all of which contribute to sepsis risk. Interestingly, we found no overall association between region of origin and sepsis risk after adjusting for sociodemographic factors. However, significant gender differences emerged within immigrant groups. Men from Africa (excluding North Africa) showed a lower sepsis risk compared to African women. The lower gender risk among certain immigrant groups may reflect differences in underlying health conditions, lifestyle factors, or healthcare-seeking behavior (Klein & Flanagan, 2016). The gender disparities within immigrant populations suggest that sepsis risk is influenced by a complex interplay of biological, social, and healthcare-related factors (Ahmed et al., 2007). It may also be the case that foreign-born women face higher risks of sepsis due to barriers in healthcare access, for example, language difficulties, unfamiliarity with the healthcare system, and cultural differences in healthcare-seeking behavior (Gonzalez et al., 2010). Furthermore, it is possible that immigrants do not seek health care even if they are very sick, reflecting the lower risk of sepsis in these groups.

Early School Achievement and Drug Use Disorder

Low academic performance is a well-established risk factor for developing DUD (Kendler et al., 2018). In this study, we focused on the impact of immigrant background and gender on the relationship between school achievement and DUD risk. Our results confirm that lower school achievement is associated with an increased risk of DUD among both male and female adolescents. Academic failure may contribute to feelings of low self-esteem and frustration, which in turn may increase vulnerability to substance use as a coping mechanism (Richardson et al., 2012). The results also show that males with foreign-born parents were at twice the

risk of developing DUD compared to males with Swedish-born parents. However, this pattern was not observed among females, suggesting gender differences in how immigrant status interacts with DUD risk. There may be several potential explanations for this. The migration process is often accompanied by traumatic experiences, which may impact psychological vulnerability and increase susceptibility to DUD (Hjern, 2004; Fazel et al., 2012). Immigrant communities may have higher educational aspirations for females, which may be a more protective factor against DUD (Pina et al., 2011). We also saw that ADHD and parental DUD were significant predictors of DUD. However, their impact was weaker among individuals with foreign-born parents, particularly males. ADHD was consistently linked to increased DUD, probably due to a tendency toward short-term focus, reduced risk awareness, and a means of self-medication (Wilens et al., 2008). Interestingly, among males with two foreign-born parents, the link between ADHD and DUD was less pronounced, suggesting either low diagnoses or cultural or familial protective factors at play, such as higher parental involvement or alternative coping strategies. Beyond individual and family factors, neighborhood-level conditions may further increase DUD risk among young immigrants. Many migrants grow up in economically disadvantaged and ethnically segregated neighborhoods, which may have higher drug availability and increased exposure to drugs (Alaniz, 2002; Caetano & Clark, 2003). Low socioeconomic status and parental separation may also increase the risk for DUD, as low parental involvement means fewer controls (Szaflarski et al., 2011). The findings of our study contribute to the growing body of research on educational performance regarding DUD risk. Given the strong link between early school achievement and DUD, schools could play an important role by offering support to students identified as being at risk.

Strengths and Limitations

The main strength of the papers included in this dissertation is the use of large-scale registry data, ensuring high reliability and enabling a comprehensive and representative analysis. Furthermore, each study addresses policy-relevant issues, contributing to discussions on educational inequality, labor market fairness, health disparities, and the pathways leading to substance use disorder. By adopting an interdisciplinary approach between scholars in medicine and economy, the research provides broader and more nuanced insights into these critical societal challenges.

One of the key strengths of the first study is the high-quality data, which provides detailed information at both the individual and neighborhood levels over an extended period. This rich dataset allows us to track individuals' educational trajectories while simultaneously capturing the impact of socioeconomic characteristics of their early-life environments. Additionally, by using quasi-experimental methods, we enhance the potential for causal inference, strengthening

our ability to distinguish between individual and contextual influences on school outcomes. A further advantage is that we can link educational performance to broader life-course outcomes, such as labor market participation and the likelihood of pursuing higher education. This comprehensive approach provides deeper insights into how early socioeconomic conditions shape long-term opportunities.

A key strength of the second study is its integration of personality traits into traditional wage analyses, offering a novel perspective on the immigrant-native wage gap. While previous research has largely focused on observable characteristics such as education and work experience, our study highlights the role of unobservable traits, which are often overlooked despite their significant influence on labor market outcomes. From an empirical standpoint, the use of Swedish military enlistment data, collected at age 18, before individuals enter higher education or the labor market provides a strong foundation for identifying causal relationships. By measuring personality traits through psychological assessments rather than self-reported surveys, we reduce the risk of reporting bias and improve the reliability of our findings. This pre-labor market data also allows us to disentangle the direct effect of personality on wages from its indirect influence through educational attainment, strengthening our ability to assess its contribution to wage disparities. Moreover, our approach addresses key concerns in wage gap studies, such as endogeneity and omitted variable bias, by ensuring that personality traits are measured independently of labor market experiences. This methodological rigor enhances the study's contribution to broader discussions on wage inequality, particularly by shedding light on how personality differences, and their returns in the labor market, impact the economic integration of immigrants.

A key strength of the third study is its comprehensive coverage of the entire adult population of Sweden over an extended period, allowing for robust analysis of sepsis risk factors. By integrating detailed individual-level sociodemographic and medical data from high-quality, nationwide registers, the study ensures minimal loss to follow-up and high data reliability (see e.g., Ludvigsson et al., 2011). The ability to link clinical diagnoses with sociodemographic variables enables the identification of high-risk subpopulations, offering crucial insights into healthcare differences. These findings contribute to discussions on health differences, emphasizing the need for targeted interventions, particularly among vulnerable groups.

A key strength of the fourth study is its use of longitudinal data, tracking individuals from graduation to the onset of DUD. While establishing causality is challenging due to confounding factors like family environment and mental health, one of our methodological approaches (sibling analysis) strengthens causal interpretations. By controlling for individual and environmental risk factors and employing sibling analysis, we isolate the effect of school performance on DUD while accounting for shared familial influences. This approach provides robust evidence on the link between educational performances and DUD, reinforcing the importance of early

academic interventions as a strategy to reduce long-term addiction risk, especially targeting immigrant students at risk.

Some general limitations must also be noted. A key limitation of the first study is the potential issue of endogeneity. NSES is measured at an aggregate level, which may not fully capture individual heterogeneity. For example, even within the same neighborhood, households can differ in terms of economic conditions, social networks, and support structures, all of which can influence educational outcomes in ways that aggregate measures may not reflect. Additionally, the study is based on Swedish register data, which, while offering high quality, may limit the generalizability of the findings to other countries with different education systems and welfare models.

In the second study, a key limitation is the failure to account for demand-side factors in the labor market, such as firm size, industry, or occupational characteristics, which could significantly influence the wage gap between immigrants and natives. By not incorporating these factors, there is a risk that part of the wage gap attributed to personality traits may be driven by differences in job opportunities or employer preferences across sectors. Furthermore, the sample consists solely of naturalized immigrant men as evidenced by their potential participation in the military force, and as such, it is not representative of the broader population. This limits the generalizability of the results to the entire immigrant population. As a result, we may be underestimating both the wage gap and the impact of personality traits.

In the third study, we used sepsis diagnoses from administrative healthcare registers, which introduces the risk of misclassification bias. For instance, sepsis cases may be underdiagnosed or miscoded, leading to an underestimation of the true incidence. Additionally, the use of different classification systems, ICD-9 and ICD-10, presents a further limitation, as alternative definitions of sepsis could result in different findings between time periods. Another limitation is that socioeconomic status can change over time; however, our study does not fully account for these dynamic shifts, which may influence the observed associations and lead to potential confounding effects.

In the fourth study, while educational achievement is a strong predictor of substance use disorders (SUDs), it may not fully capture all aspects of early-life disadvantages that contribute to DUD. Other factors, such as mental health issues, medications, and peer influences, could also confound the relationship between school performance and DUD risk. Additionally, differences between Swedish-born and foreign-born individuals in both educational performances and drug use may be shaped by cultural, structural, and institutional factors that are not fully accounted for in our study. For example, foreign-born individuals are overrepresented in statistics on DUDs, which may reflect differences in social integration. These differences could bias the results if foreign-born individuals are more likely to be

included in DUD data due to selection biases, such as increased police intervention or surveillance.

Future directions

The findings presented in this thesis raise several policy-relevant questions and highlight areas for future research.

A key question arising from the first study is to further explore the mechanisms through which neighborhood effects operate. One potential approach is to examine the socioeconomic characteristics of the closest neighbors. By using a k-nearest neighbors' approach, we can gain deeper insights into how closest neighbors impact educational performances (see Andersson & Malmberg, 2015; Hedefalk & Dribe, 2020). This could be segmented by whether they are immigrants or native Swedes. This method allows for a more precise analysis of neighbors' influences by identifying individuals' immediate social surroundings.

The research of personality traits on socioeconomic outcomes is still in its infancy and the high-quality SME data presents a promising avenue for future studies. Future directions are to examine labor market sorting based on personality traits using Standard Industrial Classification (SNI) codes. This approach could provide deeper insights into how personality traits influence job sorting and wages. For instance, immigrants may prioritize job security by opting for lower-paying but stable positions with permanent contracts (*tillsvidareanställning*), rather than pursuing higher-risk, higher-reward employment opportunities. Another venue for future research is to examine the interaction between personality traits and how training programs designed to enhance specific personality traits affect employability and wages.

The third study highlights the impact of sociodemographic factors on sepsis risk in Sweden. Future research should examine how migration status influences healthcare-seeking behavior and contributes to disparities in sepsis incidence.

Future research should explore the link between lower school achievement and higher DUD risk, focusing on the overrepresentation of immigrants in DUD statistics. This should include examining variations across data sources like medical records, prescribed drug registries, and criminal registers. Additionally, studies could investigate how acculturation, including duration of stay in Sweden, influences drug use patterns among foreign-born individuals. Understanding these factors could help develop more tailored prevention and intervention strategies. Overall, future research should use an interdisciplinary approach to develop evidence-based policies.

Conclusions

This thesis provides evidence on demographic and socioeconomic factors potentially affecting the integration of immigrants into Swedish society by examining educational, labor market, and health outcomes, as well as drug use disorders. The main conclusions from this thesis are:

- **School Grades and Neighborhoods – A Natural Experiment**

The socioeconomic status of immigrants' initial neighborhoods significantly influences their educational performance. Adolescents placed in high-SES neighborhoods tend to achieve higher grades, are more likely to pursue higher education and have better labor market outcomes. These findings highlight the importance of early neighborhood environments in shaping long-term integration.

- **Personality Traits and the Immigrant-Native Wage Gap in Sweden**

Personality traits are important for wage setting and are important in explaining the wage gap between immigrants and natives in Sweden. The gap is primarily driven by *differences* in the returns on the following traits: Intensity and Emotional stability. These findings suggest discriminatory practices in the labor market.

- **Sociodemographic Factors and Sepsis Risk**

Old age and comorbidities were key risk factors for sepsis. The overall risk was lower among the immigrant groups. However, a significant interaction between sex and region of origin was observed, highlighting the need for increased clinical awareness, particularly for elderly immigrant women. The findings suggest that tailored interventions may be needed to address the risk faced by this group.

- **Early School Achievement and DUD**

Early school achievement is a key predictor of DUD, with differences between Swedish-born and foreign-born students. Other risk factors for DUD are factors such as ADHD, parental DUD, but also immigrant status. To reduce DUD risk, policy interventions should focus on improving academic achievement, especially for vulnerable groups, with tailored strategies for those from immigrant backgrounds.

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I boken Utvandrarna av Vilhelm Moberg beskrivs hur Karl-Oskar går i land i Amerika i för stora skor. Hans skor, liksom min rock, representerar den ovisshet som väntar i det nya landet – och viljan att växa in i något större, trots att det ännu inte riktigt passar. De är en brytpunkt: ett avsked från det gamla, en osäker ankomst till det nya. Han har ännu inte "växt i" sin nya tillvaro, precis som han ännu inte har vuxit in i sina skor. Det nya landet erbjuder möjligheter, men dessa måste erövras och fyllas med innehåll genom hårt arbete. Skorna kan också symbolisera brytpunkten mellan det gamla och det nya livet. De är ett praktiskt föremål från det förflutna som han tar med sig, men de passar inte riktigt i den nya kontexten. På samma sätt måste gamla vanor och identitet omformas för att passa in i det nya samhället. För stora skor kan även representera ambition och framtidstro. Karl-Oskar har kommit till Amerika med drömmar om en bättre framtid. Han har ännu inte nått dit, men han är redo att växa in i sin nya roll som nybyggare. Skorna påminner också om den materiella fattigdom som präglade emigranternas liv. Kanske var de en gåva från någon annan eller något han köpt trots att de inte passade, bara för att ha något att gå i. Detta kan spegla den utsatthet som många emigranter upplevde när de anlände till det nya landet.

Precis som Karl-Oskars för stora skor, blev min rock en symbol för att gradvis växa in i en ny roll. En påminnelse om att anpassa sig, steg för steg, till något större än det man först kan förstå. På samma sätt har denna avhandling blivit ett bevis på den resa jag har gjort – att växa in i min roll som forskare och förstå de komplexa processerna bakom integration och hälsa.

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Appendix A

Table 1A. Summary statistics Grade Point Average (GPA) scores and Neighbourhood Socioeconomic Status (NSES) deciles

Decile	Initial NSES Mean (min, max)	Standardized GPA (1988-2018)	Grades from norm-referenced grading system (1988-1997)	Grades from criterion-referenced grading system (1998>)
1	1.21 (2.75, 0.66)	-0.17	2.98	192.8
2	0.37 (0.66, 0.14)	-0.25	2.95	187.6
3	-0.07 (0.14, -0.28)	-0.22	2.98	189.6
4	-0.48 (-0.28, -0.66)	-0.25	2.98	187.9
5	-0.86 (-0.66, -1.07)	-0.28	2.92	188.2
6	-1.31 (-1.07, -1.59)	-0.21	2.97	190.4
7	-1.89 (-1.59, -2.29)	-0.24	2.92	190.4
8	-2.75 (-2.29, -3.26)	-0.25	2.96	190.1
9	-3.94 (-3.27, -4.70)	-0.25	3.02	186.3
10	-6.41 (-4.72, -12.85)	-0.46	2.76	172.6

Notes: Standardized GPA-scores ranged from a minimum of-3.42 to a maximum of 2.57, and on a scale from 0 to 5, within a norm-referenced grading system, and from 0 to 320 within the criterion-referenced grading system.

About the author

Wazah Pello-Esso is a PhD candidate in Medical Sciences and Epidemiology at Lund University.

My academic journey began with dual bachelor's degrees in Economics and Statistics, followed by a master's degree in Economics. Before starting my doctoral studies, I worked as a research assistant at the Ratio Institute, Linköping University, and the Institute for Evaluation of Labor Market and Education Policy (IFAU).

My doctoral research is conducted within the Primary Health Care research group at Lund University in Malmö, Sweden. I have long been driven by a deep curiosity about how economic and social forces shape people's lives, particularly in the context of migration and integration. This interest has led me to explore how structural conditions influence both opportunities and outcomes for immigrants navigating new societies.

My research is situated at the intersection of educational economics, labor economics, health economics, and econometrics. Specifically, I focus on the economic and social dimensions of integration and health among immigrants in Sweden. Drawing on large-scale register data and robust empirical methods, my dissertation investigates how socioeconomic factors impact the integration process and long-term health trajectories.

This work aims to contribute to a more nuanced understanding of the challenges immigrants face within a Nordic welfare state. By identifying key mechanisms and barriers, my findings provide insights for policymakers and contribute to broader conversations on equity, inclusion, and social cohesion in contemporary societies.

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