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Differentiating landscapes of schools:

A geographical analysis of socio-spatial segregation of school catchment areas and educational outcomes of primary schools in the Uusimaa region

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Abstract

Socio-economic segregation has been increasing in Helsinki for decades and the relation between socioeconomic factors and educational outcomes have been discussed frequently recently and have been an important topic for politicians and researchers. An increasing segregation and dwindling school results in the more disadvantaged areas of Finland have been connected in various reports.

The main objective in this master's thesis is firstly to investigate the spatial socio-economic differences between school catchment areas of the 26 municipalities in the Uusimaa region. And secondly, the relationship between educational outcomes and socio-spatial segregation in Uusimaa, as the former research evidence has only documented the socio-spatial differentiation within the municipalitan core of the region. The aim is to analyze the relationship of the four different socio-economic variables of *basic level education*, *higher education*, *unemployment* and *low income households* in each school catchment area and present them with help of four different maps created in GIS. Lastly data consisting of educational outcomes from first year pupils (N=1 920) from 41 different schools in the Uusimaa region provided by Kansallinen koulutuksen arviointikeskus were analysed. The data consisted of two standardized tests, one regarding mathematics and one about the finnish language. These two tests were part of a longitudinal evaluation which started in the fall of 2018.

The core finding of this study is that Helsinki is by far the area with the largest socio-economic differences between the school catchment areas in the Uusimaa region, where eastern Helsinki often displayed low socio-economic levels and where western Helsinki and southern Espoo often presented a high socio-economic level compared to the rest of the Uusimaa region. And that the educational results regarding the Finnish language had a stronger correlation with the socio-economic data compared to the mathematical educational outcomes. These findings offer new insights for Finnish educational policies and demonstrate the need for supporting schools in disadvantaged neighbourhoods in different types of urban and rural areas.

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Socioekonomisk segregation har ökat i Helsingfors under de senaste decennierna och relationen mellan socioekonomiska faktorer och utbildningsresultat har diskuterats frekvent den senaste tiden och har varit ett viktigt ämne för politiker och forskare. En ökande segregation och fallande skolresultat i de mer missgynnade områdena i Finland har blivit kopplade i flera olika rapporter.

Huvudmålet för den här magisteruppsatsen är för det första att undersöka de rumsliga socioekonomiska skillnaderna mellan skolupptagningsområden i de 26 kommunerna i Nyland. Och för det andra, att undersöka relationen mellan utbildningsresultat och den rumsliga socioekonomiska segregationen inom Nyland, då tidigare forskning bara har dokumenterat den sociogeografiska differentieringen i kommunernas kärna inom Nylands regionen. Målet är att analysera de fyra socioekonomiska variablerna *grundläggande utbildning*, *högre utbildning*, *arbetslöshet* och *låginkomsthushåll* undersöktes i varje skolupptagningsområde och presenterades med hjälp av fyra kartor som var skapade i GIS. Slutligen data innehållande skolresultat från första årselever (N=1 920) från 41 olika skolor inom Nyland tillhandahållna av Nationella centret för utbildningsutvärdering blev analyserade. Datan bestod av två standardiserade prov, en gällande matematik och den andra om finska. Dessa två prov var en del av en longitudinell utvärdering som startade under hösten av 2018.

De viktigaste resultaten från denna studie är att Helsingfors är med stor marginal det område med de största socioekonomiska skillnaderna mellan skolupptagningsområden i Nyland, där östra Helsingfors ofta visade på låga socioekonomiska nivåer och där västra Helsingfors och södra Esbo ofta presenterade höga socioekonomiska nivåer jämförelsevis mot resten av Nylands regionen. Och att skolresultaten gällande finska hade ett starkare samband med den socioekonomiska data jämfört med de matematiska skolresultaten. Dessa resultat ger ny insikt om finsk utbildningspolitik och visar behovet av att stödja skolor i missgynnade stadsdelar i olika stads- och landsbygdsområden.

Nyckelord	
Segregation, skolupptagningsområden, skolresultat, stadsgeografi, Nyland	
Förvaringställe	
HELDA	
Övriga uppgifter	

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1. Introduction

The relation between socio-economic factors and educational outcomes have frequently been discussed recently and have been an important topic for politicians and researchers. An increasing segregation and dwindling school results in the more disadvantaged areas of Finland have been connected in various reports. This trend seems to be continuing, especially in the Helsinki metropolitan area where many pupils are applying for schools outside of their assigned school catchment areas. There seems to be a need for investigating the socio-economic differences between the school catchment areas, not only in the Helsinki metropolitan area, but in all of the Uusimaa region with the following subsequent effects on the pupils educational outcomes. In the current chapter an overview of the context and motivation behind the research will be given, as well as the adopted research method and approach. Information of the Uusimaa region will also be included. Also, an outline of the overall structure of the thesis will be provided.

1.1 Context

Segregation in Finland has continually increased during the last three decades and are continuing to do so. When defining the community, the school seems to be the central element of the creation of a community identity. Moreover, school choices seems to be strongly related to neighborhood segregation, where stronger socio-economic groups take advantage of it to a much greater extent than weaker socio-economic groups (Boterman, 2013), studies further go on to show that negative segregation and mobility effects are even stronger for children than adults (McArdle & Acevedo-Garcia, 2017, p.2).

Research on this topic points out education as one of the main driving factors of dividing groups from one another and increasing inequalities in our society. School choices are suggested to be a main factor of an increased segregation affecting opportunities provided for the youth (Tammaru et al., 2016) Studies regarding school segregation in Sweden have continually demonstrated the relation between school segregation and the free school choice that was introduced in the beginning of the 1990s. (Östh et al., 2013; Söderström and Uusitalo, 2010).

Research about school choice and segregation in the Finnish context within the Helsinki region found connections between urban schools and segregation. The study presented findings that:

> *"school segregation was affected by the socio-spatial segregation within the city: where the structure of neighborhood's forms the initial student composition and learning outcomes of schools"* (Bernelius & Vaattovaara, 2016).

Finland has continually been among the top performing countries in the OECD PISA assessments in the last decade for educational outcomes. A large share of students in Finland have performed well. Moreover, studies showed that there is only a small percentage of poorly performing pupils, which suggests that the schools in Finland are balanced regarding educational outcomes. However, there are trends indicating that this balance is about to change, especially in the Helsinki metropolitan area (PISA, 2018). Still, Finland has continually ranked among the highest countries globally in income equality, as well as other indicators of welfare within the topic of spatial distribution (Anttonen et al., 2012).

1.2 Aim of the research:

We know that socio-economic background is related to educational outcomes within the school-level. This phenomenon is reflected in the relationship between socio-spatial segregation, school segregation and educational outcomes where higher educational status of the neighborhood is associated with stronger educational outcomes in the local school. The PISA research also revealed relatively large differences between individual schools and between large regions in Finland (such as between Uusimaa and North-Eastern parts of the country). Research demonstrates that the most significant differentiation happens within smaller geographical units than the "maakunta"-regions (PISA, 2018), but we do not have any research evidence on the local differentiation in the school catchment areas or the near neighbourhoods of schools in the capital region of Helsinki, Espoo and Vantaa. Still, the nature of this segregation and its relationship to school outcomes has only been analysed in the individual case of Helsinki. Thus, we do not know how the smaller-scale intra-municipal differences between neighboring schools are reflected in school segregation, and the differentiation of school outcomes in Finland.

The answer is not only theoretically interesting, but also societally crucial for supporting equal opportunities in education. The aim of this research is firstly to investigate the spatial socio-economic differences between school catchment areas in the 26 municipalities in the Uusimaa region. And secondly, the relationship between educational outcomes and socio-spatial segregation in the Uusimaa region.

1.3 Uusimaa region

The Uusimaa region is diverse and the municipalities within the region differ a lot in population, economy and challenges. The Uusimaa region consists of 26 different

municipalities with a wide variation of size, urban or countryside and a growing or declining population. The biggest municipality is Helsinki with over 650 000 inhabitants compared to the smallest municipalities Myrskylä and Pukkila with 2000 inhabitants (Nylands förbund, 2019). This gives the municipalities very different prerequisites regarding socio-economic segregation and the outcomes thereof.

For most cases, the students are going to a local school near their home. Moreover, there seems to be a trend where more students are applying to schools outside their home for various reasons. There are many mechanisms that have an effect on what school the students go to, and the regulations differ widely between the municipalities in Finland.

1.4 Thesis structure

The thesis is structured as follows. In the **first chapter** the research is introduced and motivated. The **second chapter** introduce socio-economic segregation, as well as the theory behind some of the possible mechanisms contributing to socio-economic segregation. **Chapter three** presents school choice and segregation, as well as some history and theory of these two concepts. Chapter three also explains the possibly mechanisms affecting educational outcomes. **Chapter four** describes the data and the limitations thereof in more detail. **Chapter five** presents the spatial socio-economic differences between school catchment areas in the Uusimaa region, presents the educational outcomes and the relationship between educational outcomes and socio-spatial segregation within the Uusimaa region. In **chapter six**, a concluding discussion is presented where the findings and the theory are discussed as well as answers regarding the research questions are presented.

2. Introducing socio-economic segregation

Socio-economic segregation is prevalent in many levels of our society. From a larger to a smaller-scale. Socio-economic segregation is the most likely outcome of the combination of inequality and poverty within certain groups in our society. The mechanisms behind the rise of socio-economic segregation includes many factors. This chapter entails to introduce socio-economic segregation and the theory behind some of the possible mechanisms contributing to socio-economic segregation.

2.1 Socio-economic segregation

Research within the topic of segregation is complex and often found controversial due to the focus on problems within or caused by specific groups in the society. Segregation, often explained as an institutional separation between groups in the society caused by ethnic, economic or cultural differences are an increasing problem (Kaplan & Woodhouse, 2004). The normative goal in most of our societies aim to eliminate segregation with the hope of ending the division between different socio-economic classes and ethnical enclaves within the cities and suburbs (Boal, 2000).

Segregation is often seen as something negative where the assimilation of certain groups has failed with negative consequences for minority groups who are often victimized in this process (Kaplan & Woodhouse, 2004). Further research about segregation provides evidence that:

> *"Segregation is seen as something negative for economy, democracy, wellbeing and opportunities for the residents in the city, these negative effects are even stronger for children than adults" (McArdle & Acevedo-Garcia, 2017, p.2).*

Hence, it's important to focus on the youth and to make sure that they have the best opportunities possible for their future endeavors. The youth play an essential role in building up and strengthen our societies in the aim for a more equal opportunity-based society. Research points out that the youth growing up in a lower socio-economic class often inherit the same socio-economic class as adults in a much larger scale than young people growing up in a higher socio-economic class (Andersson & Subramanian, 2006).

Moreover, research continues to provide findings that suggest the relationship between the housing system and the negative impact of the gap between rich and poor within different socioeconomic groups (Wind & Dewilde, 2019). It is well known that homeowners have a higher net-worth than renters, and that homeowners accumulate more capital compared to the renters (Turner & Luea, 2009). Findings suggest that the wealth gap between homeowners and renter is largest in familistic welfare states, where more marginalised tenants are unable to save, compared to homeowners who can save up more economic capital (Wind & Dewilde, 2019). This is something that is common in the Nordics where a strong welfare state has been the norm over decades and that might have increased inequalities between certain groups within the society.

Trends in residential segregation, often referred to the concepts of suburbanisation, discrimination, and personal preferences are understood to produce negative socio-economic outcomes for minority groups in our society. In many countries, public policies are implemented with the purpose of promoting integration and hinder the increasing segregation with its following negative effects. Many European countries have implemented policies prevailing desegregations, but in Helsinki, the mixing policies are more preventing in its

purpose, generally known for its uniform social spatial structure (Dhalmann, & Vilkama, 2009). In Helsinki, the spatial concentration of poverty is scarce and, in most cases, exists in smaller enclaves (Vaattovaara, 1998). Segregation research in the finnish context further explains that after the severe economic depression that took place in the 1990s, that the reduction of spending and costs in response to the economic difficulties leading up from the economic depression gradually have given way to a rising income difference within the finnish society. Where the economic top has taken off and the more unfortunate bottom end of the population have fallen behind (Vaattovaara & Kortteinen 2003).

The socio-spatial structure is becoming more uneven and have accelerated the last decades, contributing to the increasing segregation in the Helsinki metropolitan area. It is proven difficult to change and prevent negative patterns when economic inequalities between groups have already taken place, highlighting the importance of preventing the inequalities even before the negative trends have begun.

Moreover, Segregation is not only focused on where we live, but also in schools, work and leisure. People living "parallel lives" seem to be an increasing problem in our cities, with minority groups living in isolation from the wider-society, with little contact outside their own group (McArdle & Acevedo-Garcia, 2017). The local school is often the "social hub" of a neighborhood or village, where students and parents, often from different levels of socio-economic groups meet and create social networks. Schools with a larger mix of socioeconomic status and ethnicity among their students would thus be important in the pursuit of building more understanding and equality among different socio-economic groups with the long-term goal of providing equal opportunities in education of the youth

2.1.1 intergenerational disadvantage

Intergenerational disadvantaged can be defined as:

> *"Disadvantage induced by the attitudes, social circumstances or economic limitations of a person's parents" (Vinson, 2009, P. 1).*

The intergenerational disadvantaged can take shape in many different forms but a lack of access to opportunities compared to what other children have access to explains the phenomena in a general term. Other factors increasing the disadvantage could be in terms of labour force or poverty level that follow from one generation to another (Tanton et .al, 2011). Inequalities within education are a difficult problem within our society where people without a hereditary privilege many times fall behind. It is especially problematic due to the increasingly demanding educational qualifications needed in order to find a place on the labor market (Maloutas & Lobato, 2015). Education does produce a selection process that can differ from other countries depending on the system that is in place within each country and region. Elite schools and private high-profile intuitions who can choose from more well of students are leading to a substantial increase in school segregation. This is more common in countries with a more private system and not like in the Scandinavian countries where a national curriculum is in place (Boterman, 2013).

Research on this topic points out the importance of investing in future generations by maximizing the pupils well-being, development and health in order to optimize the future potential and increase the possibility of the pupil being a productive adult later in life. Another aspect to consider is if areas with a high level of disadvantage have the same high level of disadvantage for all age groups. Or if some areas might have many elderlies that are suffering from disadvantage but not the young and vice versa. Research proves that parents do have an impact on their children's prospects in life, either negatively or positively. And it

is important to break the negative trends of disadvantage that some children are suffering from, to promote more equality regarding the childrens prospects for the future.

2.2 Segregation and social capital

How could segregation affect the social capital for residents in segregated neighborhood's? Discourses about public policy have problematised residential segregation and ethnic residential segregation to be a major reason on residents living "parallel lives". But this issue does not only apply to ethnic segregation, in fact the same isolation can happen by other factors like inequalities among socio-economic groups as well as natural population change (Laurence, 2016).

When people live in segregated neighborhoods, they tend to isolate themselves in their own small social group. Moreover, social capital seems to be increasingly important in our society, having a strong social capital or the possibility to use an already existing network will greatly improve the possibilities to receive a good employment after finished studies. The social capital of the youth might affect negatively if they grow up in a more socially isolated environment in their home, school and everyday life. This issue might also affect their confidence in applying to schools and jobs negatively in the sense that they might not have the support or contacts needed to do so (Skelton & Gough, 2013).

One arena where residents can have an increase of social capital are within the neighborhoods. Characteristics in neighborhoods are often affected by various factors like the structure, social pressures and expectations among its residents. Many theoretical models exist with the purpose of investigating the dynamics of neighbourhood's and how it might affect the residents. *"Epidemic"* models' suggestion that residents being exposed to their neighbors who engage in

negative behaviours will be more likely to engage in such behaviour themselves. (Settersten, 2019). Moreover, models of *"social disorganization"* stand by the view that neighborhoods plagued with social problems become disorganized, which could affect in negative behavior at the individual level. However, the term of *"social organization"* is explaining the opposite, where neighbors sharing values, trusting each other, helping with supervising the youth and commonly striving to promote common good in the community. Supposedly strengthen the community and its residents (Furstenberg & Hughes, 1997).

3. Theory and Mechanisms of School choice and school segregation

Educational outcomes can be affected by many various socio-economic factors. It is a complex topic where more research is needed to get a better understanding of the phenomena. Some common factors that affects educational outcomes tends to involve school segregation and school choice. This chapter will entail a deeper review of these factors and how they might affect educational outcomes.

3.1 School choice

The school choice, first introduced by Milton Friedman, an American economist and most known for his strong belief in free-market capitalism. Friedman published the article The Role of Government in Education in 1955. The article explained the need for lesser government involvement in education and that there should be more competition between schools (Friedman, 1955). Friedman said that this idea will lead to better education quality and productivity. In 1983, Friedman published an article "undermining school monopoly, where he said:

> *"The only solution is to break the monopoly, introduce competition and give the customers alternatives." (Friedman, 1983)*

The initial school choice started by the economists in the mid-1950s, but today's research about the topic of school choice consists mostly of educational scientists. This idea is especially prevalent in Finland today (Hoxby, 2006).

3.1.1 The School choice in the Finnish context

In Finland, everyone was given the right and possibility to attend school from the year 1898 (*kansakoulu*), but education was not compulsory for everyone until 1921, when formal education became mandatory (Seppänen, 2006). The municipalities in Finland are obliged to arrange basic education for children within its border according to the Finnish Basic Education Act (1998/628). The Finnish comprehensive schooling system includes nine years of formal education (grades 1 to 9) and is entirely public funded. The vocational and general upper secondary education are publicly funded as well with the state and the municipalities sharing the financial costs. Private schools do exist, but they are few and are public funded as well, meaning that they are not allowed to charge tuition fees.

The government in Finland has given the municipalities a substantial responsibility to organize their education. In Finland, the tool for student sorting is based on closeness, where most of the municipalities in Finland have decided to implement school catchment areas. Students can apply to schools outside of their school catchment area but are accepted on the premises of if there are spots available at the school (Seppänen, 2006). In Helsinki, the parents have the possibility to apply for any school in the municipality, but their children are only guaranteed a spot in the local school, however, they can get accepted to other schools according to available spots. The trend of applying to a school outside of the local area seems to increase in Helsinki, where almost of one third of all the primary school students attend a school located outside of their local school's catchment area (Bernelius & Vaattovaara, 2016).

Parents that participate in school choices for their children are often anxious about whether they made a good or bad decision. But the risks of making a 'bad' school choice are small in the Finnish context (Kosunen 2012). The school's reputation has proven to be an important

factor for the parents in the decision. Moreover, research provides evidence that parents prefer for their children to attend schools who consist of populations ethnically and socio-economically like their own (Musset, 2012). This division tends to become even stronger when parents get more power to choose the school in which their children will attend. This increasing problem with social divisions requires more attention in order to prevent the society from becoming more divided. Most parents given the choice would most likely want their children to attend the best schools possible that can provide the best prospects and opportunities for their children.

However, research shows that the parents that take advantage of school choices more often belongs to a stronger socio-economic group than those parents that don't (Pareliussen, André & Hwang 2019). The children in these stronger socio-economic groups often inherit an educative privilege from their parents at the expense of the education of the disadvantaged (Feinberg, & Lubienski, 2008). This issue creates a systemic unevenness and inequality in school choice and school segregation. Many factors could be the reason for why this issue exists, but knowledge, confidence, possibility to drive their kids to other schools and stronger networks might be some of the reasons. In the end meaning that there might be schools with a much higher percentage of well achieving students leaving the rest of the students behind in the less popular schools.

Swedish studies have repeatedly demonstrated that the free school choice policy, which was introduced and implemented in the 1990s in Sweden, has contributed to a substantial increase in school segregation. The increase in school segregation cannot be explained by the increase of residential segregation alone, and the policy of the free school choice seems to be an important factor (Östh et al., 2013; Söderström and Uusitalo, 2010)

Research about school choice and segregation in the Finnish context have discovered connections between urban schools and segregation (Bernelius & Vaattovaara, 2016). This affected the school choices of families in the local neighborhood's, where students who changed schools away from their local school had better educational outcomes. Meaning that, the choice of school has led students with excellent grades, from rejected schools to more popular schools (Bernelius & Vaattovaara, 2016). This phenomenon helps increasing the inequalities between different schools and hinders the learning for some of the pupils already lacking behind.

3.1.2 Free school choice, is it inherently bad?

The free school choice is not only advocated as something negative to segregation and inequality. There are voices and studies that argues for the opposite. Some researchers suggest that the free school choice can promote more equality and hinder segregation. And that there is no such thing as "one true school choice", instead, there are many variations of what a school choice can entail. Where some of these variations can bring us closer to educational equality than others. The idea is that the school choice can enhance the quality of schools and force the schools to raise the school's quality level as well as give the possibility for a more diverse school environment where pupils from different neighborhoods goes to the same school. One important aspect of this idea is to make it known to the parents about the school choice and to help them make an active school choice and to apply to a school that would suit the need for their children. One thing to consider is how well informed the parents are about the school choice, enthusiasts for school choice tend to overestimate the quality of information parents have. Another thing to consider is how to measure the quality of a school. Schools cannot be valued by a single value or score alone, different schools tend to be differentially 'effective' for different kinds of students and in different subjects and environments (Goldstein, 2014).

This issue adds even more pressure on the parents when they are trying to make the right school choice for their children, but in the end, it is not about how good the school is, but it is about how high the likelihood is that it will be good for one's own child. And lastly, one might argue that parents should have a good deal of control over their children's education as a matter of right, meaning that school choice should be a right to pursue as a parent (Feinberg & Lubienski, 2008).

Policymakers play an important role in preventing residential segregation. The policymakers can for example influence how easy it is for parents to select desired school characteristics by regulating the housing market, at least to some extent (Feinberg & Lubienski, 2008). For example, zoning boards can be implemented to promote socio-economic integration, Policymakers can require the integration of affordable housing into every neighborhood, to promote more mixed schools and to prevent more socio-economically segregated schools. Lastly, policymakers could work towards twinning advantaged and disadvantaged neighborhoods together by using mechanism like, bussing children from disadvantaged neighborhoods to certain schools and vice versa to create more integrated schools.

3.2 School segregation

School segregation and the outcomes thereof seems to have an important impact in shaping the young students' prospects for the future. Professor John Coldron (Coldron, 2010) suggests that some common problems that school segregation produce are that the more highly educated and affluent parents get an easier access to the better schools when comparing to the less affluent and lower educated parents. This fuel an already existing inequality between the rich and poor for the educational opportunity. Moreover, this inequality affects the poor pupils negative when they are educated in schools with high concentrations of other poor pupils, as they do not

progress as well as if their school would have a more balanced concentration between poor and well performing pupils. This problem also fuels the stigma that pupils and adults from different social backgrounds rarely interact with each other which adds to the inequality of opportunity (Coldron, 2010, p 2-3). This highlights that segregation started in schools can affect many other levels of our social life, explaining how problematic the effects of school segregation can be. It is understood that those students that already are advantaged and educated with more affluent peers are improving and flourishing more educationally, and, on the other hand, concerns have been raised on the children left behind in concentrations of disadvantage. This is not only unjust for the unfortunate students, but it also affects negatively the overall attainment, as well as the position in the international evaluations of educational performance (Coldron, 2010).

Studies in Sweden about educational outcomes of young Swedes have provided important insight on the phenomena. In one of these studies researchers investigated the difference of educational outcomes between different neighborhood's during a 10 year time period and the different domains of neighborhood characteristics. *Income*, *level of education*, *single mothers*, *foreign born* and *cultural capital* where factors considered in the different neighborhoods and included in the study. The study was conducted on people born between 1974-1976 and who lived in the investigated neighborhoods between 1990-1993 when they were in the age between 14-18 years old. An analysis of their educational outcomes where made in the year 2000 when they were between 24-26 years old (Andersson & Subramanian, 2006). The findings showed that some important factors in the neighborhood that affected the adolescent's educational outcomes were demographic instability (foreign born and single mothers) as well as financial resources within the neigborhood. But the research also showed that the predictors of socio-cultural status affected and were even more predictive of educational outcomes. The factors

included in the socio-cultural status in this research were blue collar workers, university degree and social allowance (Andersson & Subramanian, 2006).

Moreover, the research showed that neighborhood's consisting of people that had high averages of social allowance affected the education in the coming years negatively. Findings in this study suggested that socio-economic segregation affects educational outcomes negatively and that we need to find sustainable ways of preventing this increasing segregation in our societies and schools. Educational outcomes seem to be influenced by many factors: Segregation, school segregation, school choice, socio-economy and home environment are all contributing factors to how the students perform in school. But other factors like interest for the subject, motivation, group of friends and mental health that can affect the educational outcomes of the students. (Rutter, Maughan, Mortimore, & Ouston, 1979; Rutter & Maughan, 2002) This points out the difficulty of defining the relevant aspects of schooling and the learning environments as well as the complexity of defining the mental health of the students. The school environment itself have proved to have a big impact on the student's educational outcomes. Factors including school climate, relations between students and teachers and organizational aspects seems to be an important factor on how the students performed in school (Gustafsson et al., 2010).

4. Data and methods

4.1 Research methodology

This research was based on quantitative methods where datafiles were examined and analysed with help of the data programs Excel, QGIS and SPSS. Quantitative methods were used because it was decided to be the most suitable way of identifying patterns and generalizing the data available for this research. Quantitative methods emphasize measurements and the statistical analysis of already pre-existing data with help of different computer techniques. The data can also be collected through various tools and channels, like surveys for example. The idea of quantitative research is the focus on generalizing data to explain a specific phenomenon, which is the aim for this thesis.

The stepwise regression method was used in the regression analyses because it was suitable for the data provided for this thesis. The idea of a stepwise regression is to pool relevant data in order to be able to find significant correlations between various independent variables. The stepwise regression uses a step-by-step construction involving automatic selection of independent variables that automatically excludes variables based on their predictive power in order to create a regression model.

Stepwise regression is a popular tool to use when creating a multiple-regression model. However, there exist substantial critique against the stepwise regression model. One critique towards stepwise regression are that some of the explanatory variables that influence the dependent variables might not be statistically significant, while some inconvenience variables might be coincidentally significant (Smith, 2018). The result of this could turn out to be a model that fit the data well in sample, but who fit poorly outside the sample. Some other critique

towards stepwise regression involve inconsistencies among model selection algorithms, problem regarding multiple hypothesis testing and bias in parameter estimation (Whittingham, Stephens, Bradbury & Freckleton, 2006). However, the stepwise regression method was still decided on being suitable for the type of regression needed for the data in this thesis even with this critique in mind.

The procedure of collecting and applying the data for this research proceeded in this manner. Firstly, the finnish primary schools in the Uusimaa region where collected in an excel sheet with their names and following addresses. A total of 337 Finnish primary schools were collected from the 26 municipalities located in the Uusimaa region. The excel sheet with all the school's addresses were then converted to a csv file, in order to prepare for adding the file to the MMQGIS plugin in GIS. The MMQIGS plugin can find the coordinates from a selection of addresses stored in a tab delimited txt file or a csv file, like in this thesis. This made it possible to map out most of the addresses at the same time in GIS, even though some of the addresses needed to be added manually to the map, see figure 1.
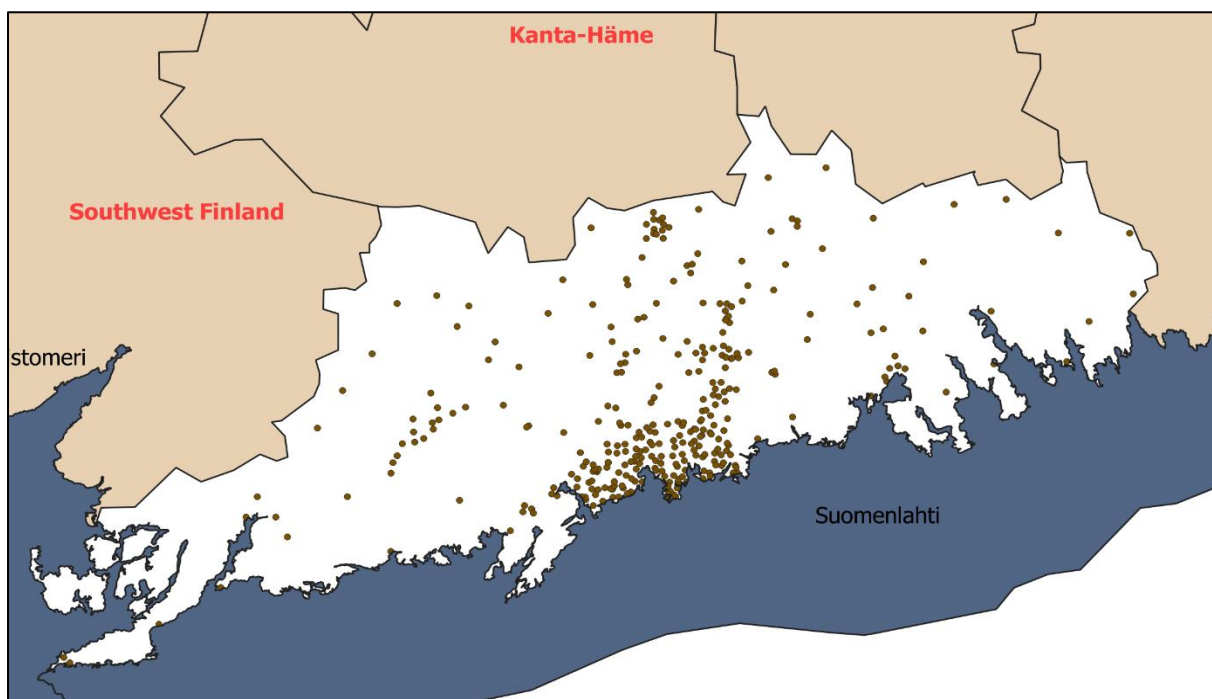

Figure 1. Schools in Uusimaa N=337

Then Thiessen polygons (otherwise known as Voronoi polygons) were created in order to determine the school catchment areas for every school that were mapped out. The Thiessen polygons was an important tool in order to analyse different proximities and neighborhoods, and to measure differences between them. The Thiessen polygons are based on a geographical approach were the center of these polygons allocate space to the nearest point feature and defines the area around this point, and then expands until it hits the border of the nearby expanding polygons (Hagget, et al. 1977). The schools were the centre of each polygon and each polygon that were created represented the school catchment area of each school in this data, see figure 2.

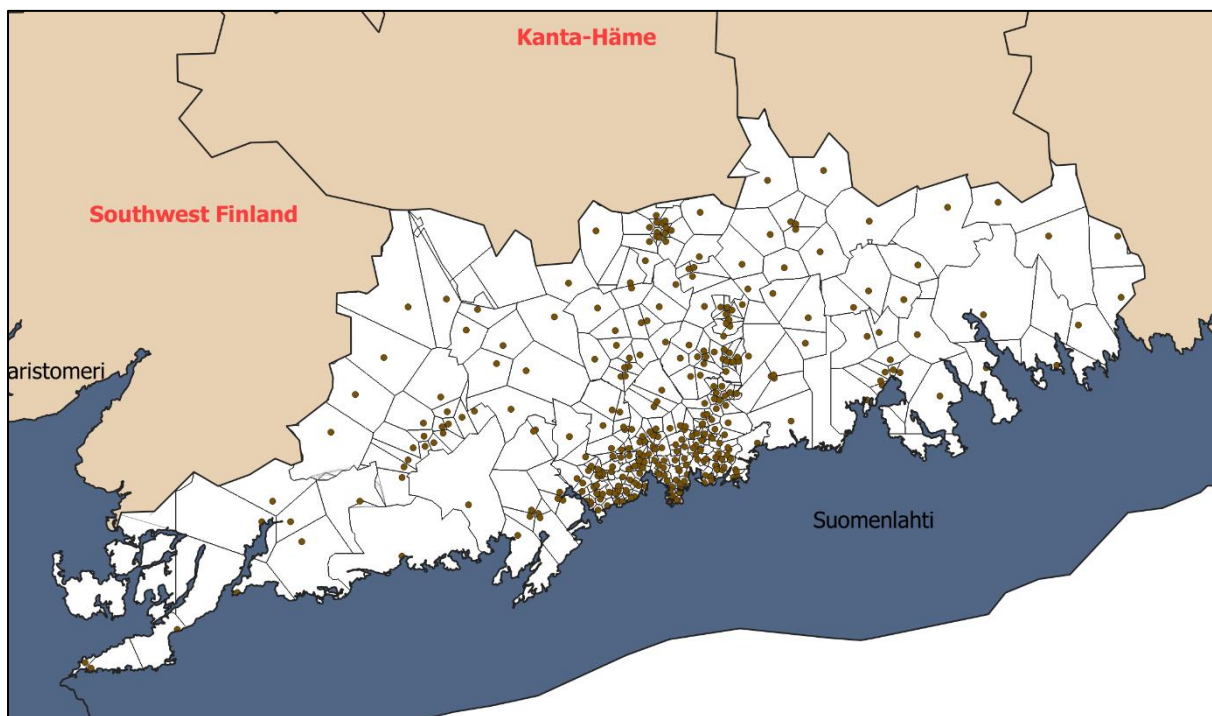*Figure 2. Thiessen polygons within the Uusimaa region N=337*

During the next step four different socio-economic variables consisting of *basic level education*, *higher education*, *unemployment* and *small income households* within the 337 school catchment areas were investigated. This data was based on the "Grid database 2019" and the grid dimensions used were 250m x 250m in size provided by Statistics Finland

(Statistics Finland, 2019). The school catchment areas and the data from the four socio-economic variables were aggregated in order to investigate the spatial differences between the different school catchment areas in the Uusimaa region. Data aggregation means that data is collected and brought together in a summary form, this usually needs to be done prior to a statistical analysis.

Lastly data consisting of educational outcomes from 1 920 first year pupils from 41 different schools in the Uusimaa region were analysed. The data consisted of two standardized tests, one regarding mathematics and one about the finnish language. The tests were done digitally by the pupils and were part of a longitudinal evaluation which started in the fall of 2018. The data from the educational outcomes where provided by *Kansallinen koulutuksen arviointikeskus.* The statistical method used to analyse the data where done by a regression analysis in SPSS to determine if socioeconomic factors and educational outcomes did correlate. The purpose with a regression analysis is to examine the influence of one or more independent variables on a dependent variable. The use of regression analysis in this research were needed in order to examine the relationship between the socio-economic data and the educational outcomes.

4.1.1 Research questions:

Two research questions were created from the data available and with the purpose to help define this research and are presented as follows.

1. How is the Uusimaa Region internally differentiated in relation to socio-economic differences between school catchment areas?

2. What is the relationship between educational outcomes and socio-spatial segregation in the Uusimaa Region?

4.2 Challenges with the data and validity considerations

The aim of this study was to investigate the differences of socio-economic level in the school catchment areas in the Uusimaa region, and to investigate the correlations between socio-economic factors educational outcomes. The data set for the educational outcomes were small but still enough to provide an insight into possible links between socio-economic factors and educational outcomes, as well as a starting point for further research on this topic. The pupils in this study were first graders and might not have been shaped by socio-economic factors as much when comparing to high school students. Differences of educational outcomes were still found between the pupils even though the pupils were only first graders, which points out the problems of socio-economic segregation even from an early age. Data containing educational outcomes for all the 337 school catchment areas instead of only 41 of them might have given a better geographical understanding of the correlation between socio-economic factors and educational outcomes as well. There was not enough time to investigate more than the four socio-economic variables of basic level educated, highly educated, unemployed, and small income households included in this study. Other variables may have provided more information for this study. However, the data provided in this study provides a good overview of the topic and presented a foundation for further research within the topic

It is important to mention the problem of omitted variables bias as well. The problem of omitted variables meaning why the excluding of some relevant **variables** or under-specifying the model in question (Beccarini, 2016). For example, in my thesis I included the four variables of *basic level education*, *higher education*, *unemployment* and *small income households*. Why did I not include for example foreign-language speakers and population density? The four variables of basic level education, higher education, unemployment and small income households were used because these variables were found to be most relevant for this thesis after testing several

variables. There are other variables then those four that were selected for this thesis that would be interesting to include, but the four selected variables presented enough data due to the time limit as well as the amount of work needed.

Lower primary schools in Finland consist of both Finnish speaking schools and Swedish speaking schools. The Swedish speaking schools do many times have a much larger school catchment area compared to Finnish schools, that often consist of areas that include several school catchment areas of Finnish schools. The school catchment areas of Swedish speaking schools sometimes even cross municipal boundaries which creates problems for this study. This study will therefore only focus on Finnish school's due to the problems of combining Finnish and Swedish school catchment areas when using the data for this study.

4.3 Spatial autocorrelation

It is important to discuss the phenomenon of spatial autocorrelation while investing spatial geographical patterns. A Spatial autocorrelation can be explained as a clustering pattern in the spatial distribution of a variable, which might happen since these occurrences are happening geographically close together (Mayhew, 2015). What is the relevance of spatial autocorrelation in segregation research? An important finding within segregation research is the spatial clustering of households in cities that share a similar ethnic or socio-economic background, forming distinct neighborhoods. There is a long tradition in human geography of observing these spatial patterns as well as analysing them, in order to understand what creates them and how they are changing over time (Frank, 2002). This is important to have in mind because statistics relies on observations that are being independent from one another, meaning that if autocorrelation does exist in a map, it might violate the observations due to the observations being independent from each other (GIS geography, 2020).

The Spatial autocorrelation can be either positive or negative, where a positive spatial autocorrelation is the likelihood for areas that are near one another to have similar values of the same variable (i.e., both high and low values of the same variable). A negative spatial autocorrelation is on the other hand the tendency for adjoining values to be dissimilar, which means high values next to low values (Smelser & Baltes, 2001). This issue is especially something to consider when the Helsinki metropolitan area were examined, where clusters of positive spatial patterns were found. These clusters were often found in the eastern and southwestern part of Helsinki. The Spatial autocorrelation is an important tool in interpreting spatial patterns and is often used as an indication that there is something of interest in the distribution of map values that call for further investigation in order to understand the reasons behind the observed spatial variation (Smelser & Baltes, 2001).

The findings of the socio-economic variation and the similarity between the school catchment areas in the Uusimaa region were on a general level. The spatial patterns presented in this research provide a general overview of a systematic spatial variability which may provide a starting point for further study of its spatial results.

5. Results of socio-economic differences between school catchment areas and educational outcomes

Research have been done about segregation and educational outcomes in the Helsinki metropolitan area before, but there are no previous analysis on the school catchment area level segregation in the Uusimaa region as a whole. Therefore, it was important to investigate the socio-economic differences between school catchment areas in all of the Uusimaa region and what association this could have with educational outcomes. This yields important research evidence on the role of socio-spatial differentiation in different types of urban and rural contexts and allows for more detailed understanding on the spatial preconditions for educational opportunities in different types of municipalities and neighbourhoods. This chapter presents four maps, one map for each of the four socio-economic variables. The socio-economic data were aggregated to each school catchment area of the four maps.

5.1 Definitions of the Uusimaa region

The aim of this section was to explain the definitions of the Uusimaa region used in this study and to provide information of the socio-economic differences between school catchment areas in the Uusimaa region.

Definitions of four different areas in the Uusimaa region were used when presenting the findings from the socio-economic data. *Helsinki, the Helsinki metropolitan area*, *the KUUMA area* and *Uusimaa outside of the KUUMA area*. Helsinki referred to the municipality of Helsinki, the Helsinki metropolitan area referring to the four municipalities, Helsinki, Vantaa, Espoo and Kauniainen. The KUUMA area in this study consisted of the 10 KUUMA municipalities (Järvenpää, Nurmijärvi, Tuusula, Kerava, Mäntsälä, Pornainen, Hyvinkää,

Kirkkonummi, Vihti and Sipoo), surrounding the metropolitan area (New Finnish Government must continue metropolitan policy, 2019). And lastly, Uusimaa outside of the KUUMA area, which refers to the municipalities outside of the Helsinki metropolitan area and outside the KUUMA area, see figure 3.
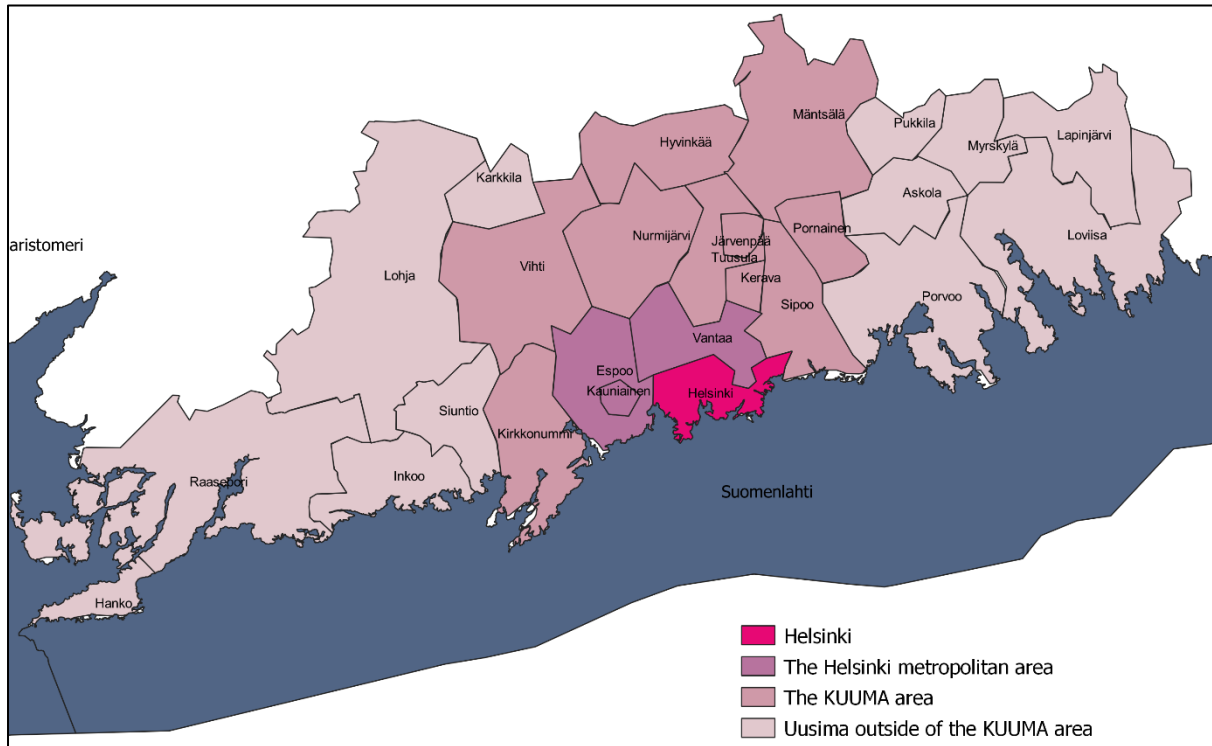
Figure 3. The Uusimaa region

5.1.1 Basic level education Uusimaa

This section focused on those who have only received basic education in Uusimaa. Basic level education refers to people who have completed nine years of basic education in a comprehensive school and are over 18 years of age. At the age of 16, students can choose to continue their secondary education in academic courses (lukio) or vocational courses (ammattioppilaitos). Both tracks usually take three years and are eligible for continuing higher education. However, those who completed secondary education are not included in this data, but only those who have received 9 years of basic education.
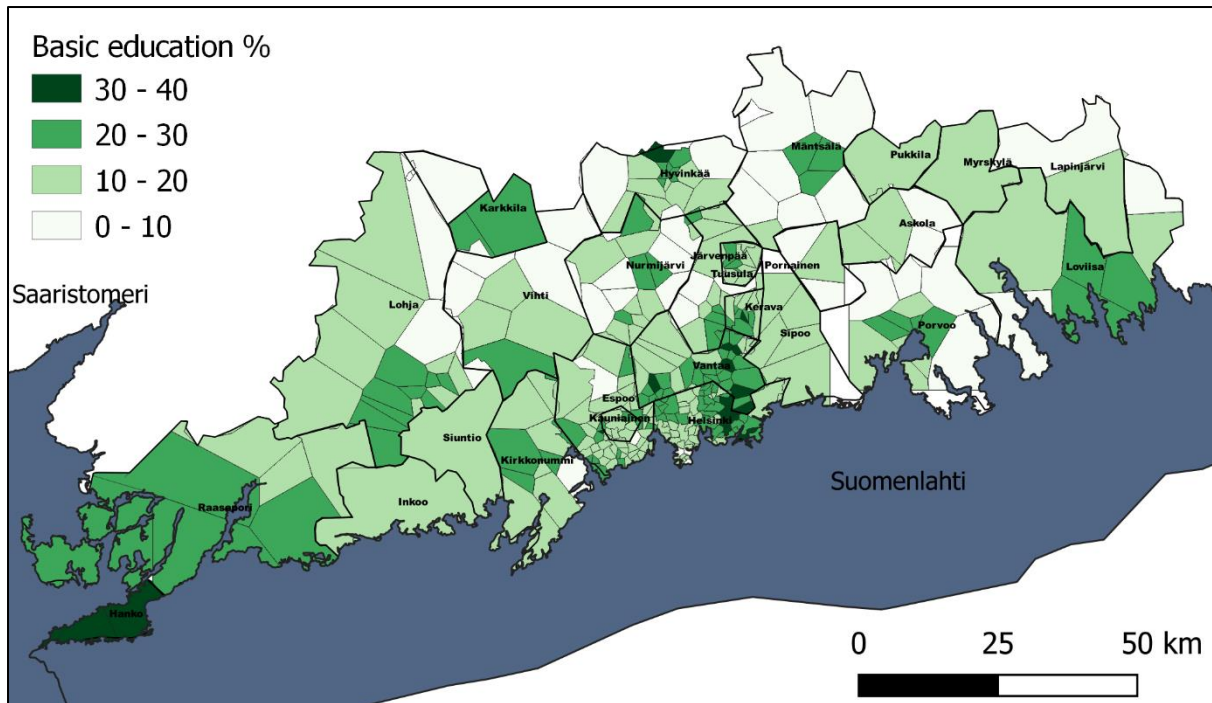
Figure 4. Percentage of people with only a basic level education in Uusimaa.

Figure 4 illustrated an unevenness between the school catchment areas in the basic education levels in Uusimaa. The categorisation of the 4 classes from 0-40% in figure 4 was selected by defining the data by constant ranges of 10.

The southwestern part of Uusimaa had a high percentage of people with only a basic level education, where all three school catchment areas in Hanko had between 30% - 40% of people that only had acquired a basic level education. The municipalities of Lohja, Hyvinkää, Loviisa and Kerava also presented a high percentage of people with only a basic level education compared to the other municipalities in Uusimaa outside of the KUUMA area. The average of people with only a basic level education in Uusimaa outside of the KUUMA area was 16,5%. Findings presented a trend where there seems to be a higher concentration of people with only basic level of education in the more urban parts of the municipalities in Uusimaa.

The highest concentration of school catchment areas with people who only had a basic level education in *Helsinki* was found in the eastern parts of Helsinki. Almost all the school catchment areas with the highest percentage of between 30-40% of people with only basic level education where found in eastern Helsinki.

Helsinki presented a large unevenness, where the southwestern part of Helsinki had the lowest percentage of people with only a basic level education. While the northern part was more diverse with school catchment areas consisting of both high and low percentage of people with only a basic level education. The average percentage of people with only a basic level education in Helsinki was 21%. Espoo and Kauniainen presented a more even distribution between their school catchment areas compared to Helsinki with most of their school catchment areas consisting of 10-20% of people with only basic level education.

Vantaa presented a bit more diversity in the school catchment areas, where the school catchment areas in the eastern parts closest to the Helsinki border had a higher percentage when compared to the rest of the municipality of Vantaa. In Vantaa, the areas along the main railway line and the Martinlaakso rail direction presented a higher ratio of people with only a basic level education. *The Helsinki metropolitan area* had an average of 19% of people with only a basic level education, slightly lower when comparing to only Helsinki (21%). *The KUUMA area* had the lowest levels of people with only basic level education within their school catchment areas with an average of 13,5%. The standard deviation in all of the four geographical areas were between 7-8%.

Table 1. Basic level education average in the Uusimaa region

Area	Helsinki	Helsinki metropolitan area	The KUUMA area	Uusimaa outside of the KUUMA area
Average basic level education	21%	19%	13,5%	16,5%
Standard deviation	7,5	7,2	7,5	7,8

5.1.2 Higher education in Uusimaa

People with a higher education entails those that have a higher-level university degree, equivalent to a master or doctorate degree. Only one type of education has been taken into account for each person, i.e., the highest qualification acquired of the latest acquired qualification if a person has several same level qualifications.
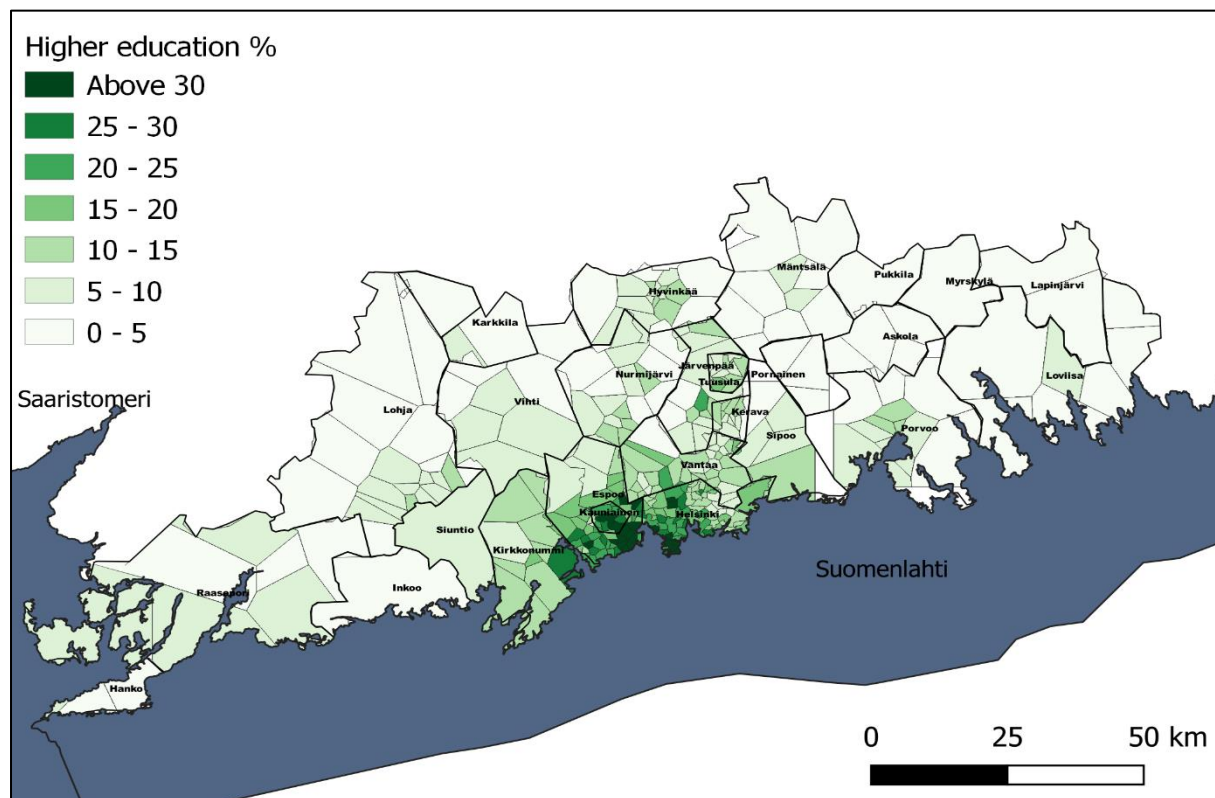

Figure 5. Percentage of higher education in the Uusimaa region.

The categorisation of the 7 classes in figure 5 was selected by defining the data by constant ranges of 5 except for the last class of *above 30%*. The school catchment area who consisted of the highest education level had 42% of people with a higher education.

There was a clear pattern in Figure 5, with a high concentration of highly educated people in the school catchment areas in *Helsinki* (21%) and *the Helsinki metropolitan area* (17,5%). *The KUUMA area* (6,8%) and *Uusimaa outside of the KUUMA area* (3.7%) had substantially lower percentage of highly educated people in comparison. Figure 5 presented a pattern where most of the highly educated people were concentrated in the Helsinki metropolitan area, but a large unevenness of the higher education levels among the school catchment areas in the Helsinki metropolitan area was found as well, especially in Helsinki. The eastern part of Helsinki had the lowest percentage of people with higher education, where many school catchment areas contained between 0-10% of people with a higher education. The southwestern part had the highest percentage of highly educated people with between 20-40%. The rest of the school catchment areas in Helsinki contained even levels of between 10-30% of people with a higher education. The southern part of Espoo and Kauniainen also presented high percentages of people with a higher education.

Uusimaa outside of the KUUMA area mainly shared the same pattern with a low percentage of people with a higher education, where most of the municipalities' school catchment areas consisted of 0-10% of people with a higher education. Some tendencies of a higher percentage of higher education were distinguished in stronger concentration in some of the more urbanised parts of some of the municipalities in the Uusimaa region.

Table 2. Higher education on average in Uusimaa.

Area	Helsinki	Helsinki metropolitan area	The KUUMA area	Uusimaa outside of the KUUMA area
Average of higher education	21%	17,5%	6,8%	3,7%
Standard deviation	8,4	9,4	4,6	2,4

It is evident from the data that a majority of those with a higher education in the Uusimaa region were found in the Metropolitan area with a strong concentration in Kauniainen, Southern Helsinki and southern Espoo.

5.1.3 Unemployment levels in Uusimaa

The unemployed labour force in this data comprises people aged 15 to 64 who were unemployed on the last working day of year 2018.
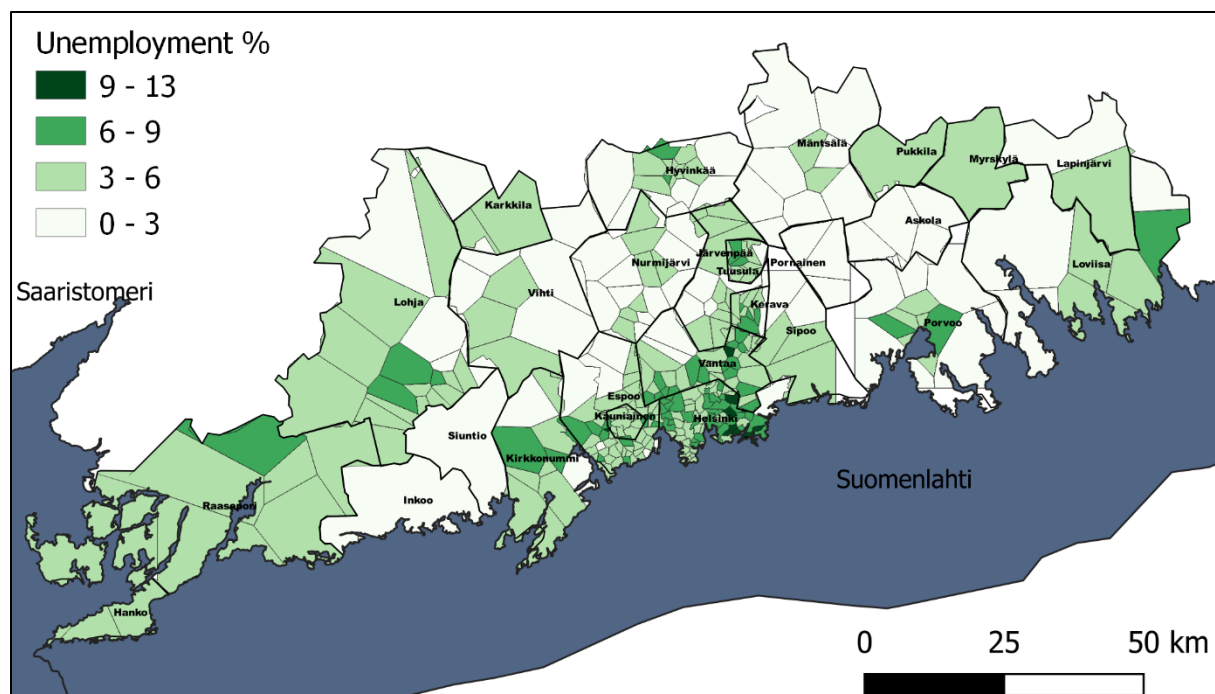

Figure 6. Percentage of unemployment in the Uusimaa region.

The categorisation of the 4 classes from 0-13% in figure 6 was selected by defining the data by constant ranges of 3, except for the 9-13% classification which consisted of the range of 4.

The highest percentage of unemployment on average in Uusimaa was found in *Helsinki* (6,4%), where the eastern part of Helsinki presented the highest concentration of unemployment. The area with the second to the highest percentage of unemployment was distinguished in the *Helsinki metropolitan area* where the average unemployment percentage was 5,3%. The school catchment areas in the Helsinki metropolitan area outside of Helsinki mostly had even levels of unemployment percentage among them. The unemployment in the *KUUMA area* with an unemployment percentage of 3, was the lowest in the Uusimaa region. *Uusimaa outside of the KUUMA area* also presented similarly low levels of unemployment (4%) as the KUUMA area.

The most striking observation from the unemployment data was firstly the high percentage of unemployment in Helsinki and the Helsinki metropolitan area compared to the rest of Uusimaa. And secondly, the low percentage of unemployment in the municipalities of Mäntsälä, Inkoo, Nurmijärvi, Porvoo, Pornainen and Vihti. A pattern of a higher concentration of unemployment in the more urbanized areas of the municipalities in Uusimaa was distinguished. This was especially evident in Porvoo, Hyvinkää, Kerava, Siuntio and Järvenpää, with a higher percentage of unemployment in the central parts of their municipalities.

The Helsinki metropolitan area had more diverse levels of unemployment compared to the other municipalities of Uusimaa, were Helsinki's school catchment areas stood out the most. The eastern part of Helsinki had a substantially higher percentage of unemployment levels compared to the other parts of Helsinki, mostly between 9-13%. The school catchment areas in Helsinki consisted on average between 3-9% of unemployment outside of the eastern part of

Helsinki. The school catchment areas in Espoo and Kauniainen consisted of mostly 3-9% of unemployed people, almost the same levels were found in Vantaa with one exception, that slightly more school catchment areas in Vantaa consisted of 6-9% of unemployment.

Another observation from figure 6, was a pattern with a higher percentage of unemployment following the eastern metro line in Helsinki going east and the train line going north through Vantaa, Kerava, Järvenpää and Hyvinkää with a higher percentage of unemployment compared to other municipalities' school catchment areas within that area.

Table 3. Average unemployment levels in Uusimaa

Area	Helsinki	Helsinki metropolitan area	The KUUMA area	Uusimaa outside of the KUUMA area
Average unemployment	6,4%	5,3%	3%	4%
Standard deviation	2,1	2,2	1,8	1,6

5.1.4 Low income households in the Uusimaa region

This data included households belonging to the lowest income category, 2017. Households with the lowest income entails those households earning at most 16 979 EUR per year (deciles 1-2). The deciles are formed by listing all persons included in the dwelling population in order based on their equivalent disposable monetary income and dividing them to ten shares that contain an equal number of persons (Statistics Finland, 2018).
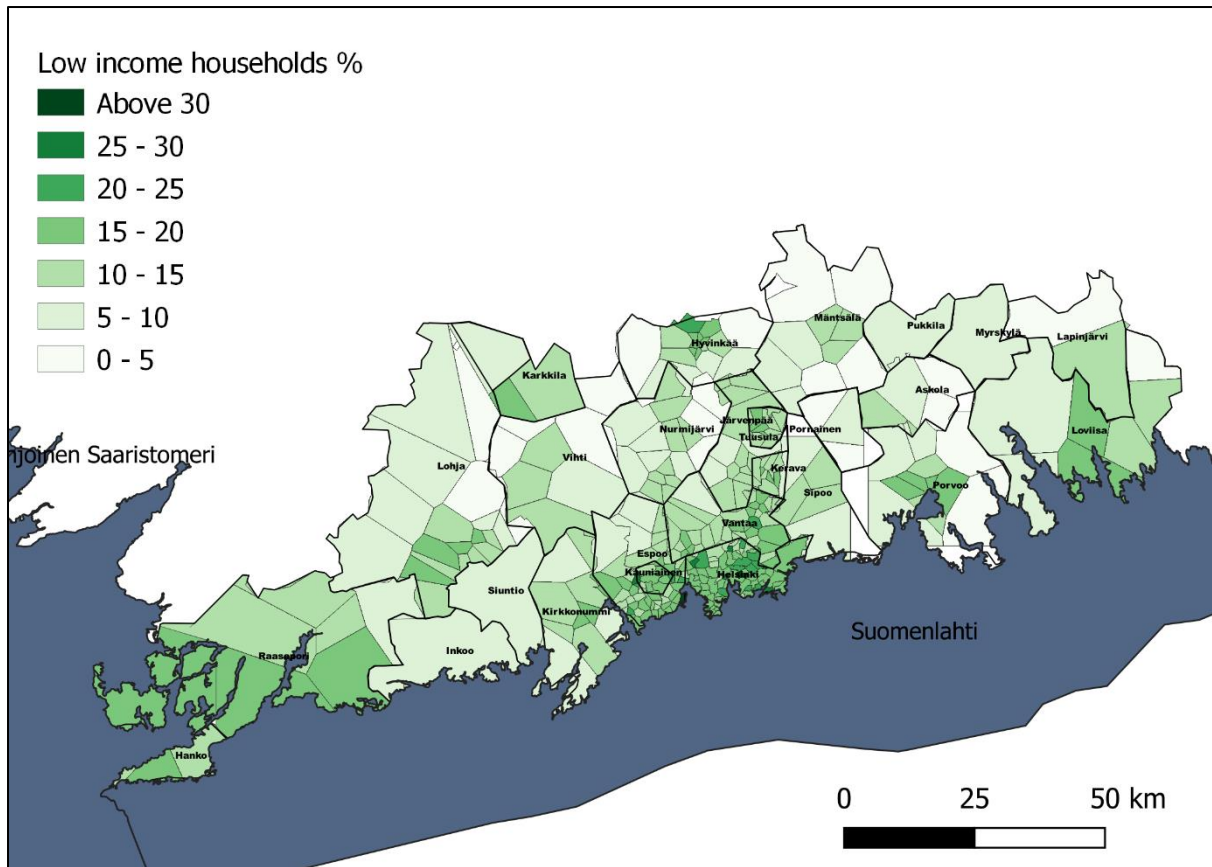
Figure 7. Percentage of low income households in the Uusimaa region

The categorisation of the 7 classes from 0 to above 30% in figure 7 was selected by defining the data by constant ranges of 5. Only a few school catchment areas had over 30% of low income households within the school catchment areas. The school catchment area with the second highest percentage of low income households had 34% (Espoo), while the school catchment area with the highest percentage of low income households had 50% (Helsinki) of low income households.

The data in Figure 7 presented an unevenness of low-income households among the municipalities in Uusimaa. The highest concentration of low-income households was found in *Helsinki* (18%), closely followed by the Helsinki metropolitan area (15%). In the *Helsinki metropolitan area*, the school catchment areas in Espoo, Kauniainen and Vantaa had a bigger

difference between them, where the school catchment areas in the southern part of Espoo had the highest percentage of low income households. There was no school catchment area that had less than 10% of low level incomes in the Helsinki metropolitan area (except from the most northern part of Espoo and Vantaa).

The KUUMA area (9%) and *Uusimaa outside of the KUUMA area* (10%) had a significantly lower percentage of low income households when comparing to Helsinki and the Helsinki metropolitan area. The percentage of low income households in Uusimaa outside of the KUUMA area differed widely among the school catchment areas. A clear trend of a higher percentage of low income households were found in the more urbanised areas in Uusimaa. Meanwhile, the municipalities of Mäntsälä, Hyvinkää, Pornainen, Askola and Porvoo, Lohja and Vichti had a substantially lower percentage of low-income households compared to the rest of Uusimaa.

A higher concentration of low level income households compared to the rest of Uusimaa outside of the KUUMA area, were found in the most western parts of Uusimaa in Hankoo and Raasepori. In Raasepori, all school catchment areas had 10-20% of low level income households. Hankoo shared the same pattern as Raasepori where all school catchment areas had between 10-20% of low level income households.

Table 4. Average of low income households in Uusimaa

Area	Helsinki	Helsinki metropolitan area	The KUUMA area	Uusimaa outside of the KUUMA area
Average of low income households	18%	15%	9%	10%
Standard deviation	3,2	4,9	4,3	4,1

5.2 Summary of socio-economic factors

Table 5 presents a summary of the percentages of the four socio-economic variables from the four different areas of Uusimaa presented in the findings chapter. With the purpose to give an overview of the socio-economic levels in the Uusimaa region.

Table 5. Socio-economic percentage in the Uusimaa region

Area	Basic level education	Higher education	Unemployment	Low income households
Helsinki	21%	21%	6,4%	18%
Min	10%	6%	3%	13%
Max	39%	39%	13%	34%
St dev	7,59	8,43	2,19	3.23
Helsinki Metropolitan area	19%	17,5%	5,3%	15%
Min	5%	2,3%	0,8%	3,7%
Max	39%	42%	13%	51%
St dev	7,2	9,4	2.2	5
The KUUMA area	13,5%	6,8%	3%	9%
Min	0.7%	0%	0%	0%
Max	32.6	25%	9%	21%
St dev	7,5	4,6	1,8	4,3
Uusimaa outside of the KUUMA area	16,5%	3,7%	4%	10%
Min	1,2%	0%	0,5%	0,2%
Max	35,6%	12,2%	8%	17,2%
St dev	7,8	2,4	1,6	4,1
Average percentage in the Uusimaa region	**17,6%**	**12,2%**	**4,6%**	**13%**

It is evident from table 5 that the school catchment areas in Helsinki contained the highest percentage of all the four socio-economic variables when compared to the other school catchment areas in the Uusimaa region. The school catchment areas in the Helsinki metropolitan area had the second highest percentage of all the socio-economic variables.

Uusimaa outside if the KUUMA area presented a substantially low percentage of people with a higher education (3,7%), especially in comparison to Helsinki (21%). Uusimaa outside of the KUUMA area had a low level of unemployment, and a substantially lower percentage of small income households in comparison to Helsinki and the metropolitan area. The percentage of people with only a basic level education did not present any big differences between the areas in Uusimaa but were a bit higher in the Helsinki and the metropolitan area compared to Uusimaa outside of the KUUMA area.

Table 6. Summary of the socio-economic data from the Uusimaa region

Variable	Basic level education	Higher education	Unemployment	Low income households
Areas with highest percentage	Eastern part of Helsinki, Hankoo, some parts of Lohja and most eastern part of Uusimaa.	The Helsinki metropolitan area, with a strong concentration in southern Helsinki and Espoo	In the Helsinki metropolitan area with a strong concentration in eastern Helsinki.	Mostly in the Helsinki metropolitan area. And some areas in the most western and eastern part of Uusimaa.
Areas with Lowest percentage	Mostly in the northern part and eastern part of Uusimaa (Porvoo & Askola area)	A majority of the school catchment areas outside of the KUUMA area region.	Mostly school catchment areas in the northern, and to some extent eastern parts of Uusimaa.	Northern part of Uusimaa and around Porvoo.
General trend	Highest percentage of people with only basic level of education were concentrated in the most urban areas of Uusimaa.	The higher educated people were almost exclusively found in the Helsinki region.	Higher concentration of unemployment in the cities. Northern Helsinki presented the lowest levels of unemployment.	A clear trend of low income households was found in the cities in Uusimaa. Where the Helsinki metropolitan area stood out the most.

In table 6, a table was created in order to summarize the socio-economic data in text form. *Basic education*, *Higher education*, *Unemployment*, and *Low income households* were reviewed in three categories, namely areas with the highest percentage, areas with the lowest percentage and lastly a general trend were presented for the four socio-economic factors.

In conclusion, *the Helsinki metropolitan area* with *Helsinki* in particular, was by far, the area with the largest differences between the school catchment areas in the Uusimaa region. The Helsinki metropolitan area presented large difference in socio-economic level between the school catchment areas, where eastern Helsinki often displayed low socio-economic levels and where western Helsinki and southern part of Espoo often presented a high socio-economic level compared to the rest of the Uusimaa region. The Helsinki metropolitan area also had the highest number of school catchment areas with the highest percentage of low income households, where almost all of Helsinki's school catchment areas had over 15% of low income households. We know that the socio-spatial structure is becoming more and more uneven due to an increasing segregation in the Helsinki area (Vaattovaara & Kortteinen 2003). And the findings from this study confirm unevenness in several socio-economic variables.

The education level was on average much lower outside of *the Helsinki metropolitan area*, were most of the school catchment areas outside of the Helsinki metropolitan area consisted of between 0-5% of highly educated people. The employment level was on average low, between 0-6% in the **Uusimaa region outside of the KUUMA area**. Especially compared to the Helsinki metropolitan area, who had a substantially higher percentage of unemployment. The Uusimaa region outside of the KUUMA area had on average a substantially lower percentage of low income households (8,8%) compared to the Helsinki metropolitan area (15%).

5.3 Educational outcomes

The data regarding educational outcomes consisted of 1 920 first year pupils (age 7) from 41 different schools in the Uusimaa region. The data were part of a longitudinal evaluation that started in the fall of 2018. These first year pupils participated in two standardized tests, one in mathematics and one consisting of the Finnish language. These two tests were done digitally and consisted of 927 girls and 993 boys.

The data consisted of a smaller sample and included educational outcome results from 16 out of the 26 municipalities within the Uusimaa region. The aim with the data was not to investigate the educational outcomes alone, but to use them as a variable when comparing educational results and socio-economic factors together. And to investigate the correlation of educational outcomes and socio-economic factors in The Uusimaa region. The educational results from the two tests in *Mathematics* and *the Finnish language* were not important for this research as a single variable but are presented below to give a better understanding of the data used in this analysis.

The pupil with the highest score for the mathematics test had a value of 907 while the pupil with the lowest score had a value of 108. The mean value of the pupils in the *mathematics test* was 504. The difference between the pupil with the lowest performing pupil and the highest performing pupil was larger in the mother language test compared to the mathematical test. The pupil with the highest score for the *Finnish language* test had a value of 948, while the pupil with the lowest score had a value of 61 The mean value of the pupils in the mother language test was 504

The individual educational data were aggregated with the school catchment areas, which also compiled the individual data to one mean value for each school. Thus, made it possible to compare each schools' educational outcomes and investigate the variation between them. A regression analysis was made with the socio-economic data from the 41 school catchment areas were the educational outcomes were included, which will be presented in this chapter. First, the 41 schools' variation in educational outcomes in mathematics and the Finnish language will be presented. And secondly, how the socio-economic data affects the variation of educational outcomes between the schools.

5.3.1 Educational outcomes – Mathematics

The data consisted of 41 schools in the Uusimaa region. The school with the highest performing pupils had a score of 555, while the school with the lowest performing pupils had a score of 447. The range between the highest and lowest performing school was 108. The average of the educational achievements of these schools was 503.

Table 7. Educational outcomes – mathematics

Educational outcomes		
Mathematics		
N	Valid	41
	Missing	0
Mean		503
Median		506
Std. Deviation		30
Range		107
Minimum		447
Maximum		555

5.3.2 Educational outcomes – Finnish language

The data consisted of 41 schools in the Uusimaa region. The school with the highest performing pupils had a score of 558, while the school with the lowest performing pupils had a score of 441. The range between the highest and lowest performing school was 117. The mean value of the educational achievements of these schools was 503.

Table 8. Educational outcomes – Finnish language

Educational outcomes		
Finnish language		
N	Valid	41
	Missing	0
Mean		503
Median		505
Std. Deviation		29
Range		117
Minimum		441
Maximum		558

When comparing the educational results of the mathematical test and the Finnish language test, the differences between the schools were on average similar. This data was presented with the aim of giving a better understanding of the difference of the educational outcomes between the 41 schools included in this data.

5.4 Association between socio-economic factors and educational outcomes

A regression analysis was done for the mathematical and Finnish language educational outcomes separately. The dependent variable was the educational outcome and the four independent variables was *basic level education*, *higher education*, *unemployed*, and *small income households*. The sample size was small and included 41 out of 337 school catchment areas within the Uusimaa region. But the data sample still presented a foundation for investigating the subject and proposing further research. The coefficient of determination used in the regression analysis was the R 2 (adjusted square). R 2 explained the variation between the schools' educational outcomes determined by the independent variables.

5.4.1 Socio-economy and mathematical educational outcomes

One of the four independent socio-economic variables included in the regression analysis proved to be significant for the mathematical educational outcomes. The socio-economic significant variable was *Basic level education*.

Table 9. Coefficients – mathematical educational outcomes

Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	532,749	12,720		41,883	,000
	Basic level education	-1,492	,602	-,369	-2,477	,018
a. Dependent Variable: Mathematics_result_mean						

We can see that the significance value is 0.018 (i.e., p = .018), see table 9, which is below 0.05. and, therefore, basic level education was associated with the educational outcomes in

mathematics in a statistically significant way. The adjusted R-squared was ,114 see table 10. This meant that 11% of the variation between the school's mathematical educational outcomes could be explained due to the percentage of basic level education in the 41 school catchment areas.

Table 10. Regression statistics - Mathematics

Regression statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,369[a]	,136	,114	28,74609
a. Predictors: (Constant), basic level education				

The three socio-economic variables *higher education*, *unemployed* and *small income household's* significance value were all above 0.05. Therefore, when investigating the association with mathematical educational outcomes, these variables were not significant variables, see table 11.

Table 11. Excluded variables – mathematical educational outcomes

Excluded Variables[a]					Collinearity Statistics
Model	Beta In	t	Sig.	Partial Correlation	Tolerance
1 Higher education	,248[b]	1,706	,096	,267	,999
Unemployed	-,160[b]	-,554	,583	-,089	,269
small_income_households	,105[b]	,432	,668	,070	,380
a. Dependent Variable: Mathematics_result_mean					
b. Predictors in the Model: (Constant), Basic level education					

5.4.2 Socio-economy and finnish language educational outcomes

Two out of the four independent socio-economic variables proved to be significant in the regression analysis regarding the finnish language educational outcomes. The two significant variables were *basic level education* and *higher education*.

Table 12. Coefficients – Finnish language educational outcomes

Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	535,111	11,787		45,398	,000
	Basic level education	-1,642	,558	-,426	-2,941	,005
2	(Constant)	518,120	13,090		39,582	,000
	Basic level education	-1,687	,526	-,438	-3,207	,003
	Higher education	,772	,315	,334	2,448	,019
a. Dependent Variable: Finnish language_result_mean						

We can see that the significance value of *basic level education* was 0.005 (i.e., p = .005), and that the significance value of *higher education* was 0.019 (i.e., p =.019), see table 12. The significance value was less than 0.05, for these two variables, therefore, there was a statistically significant correlation between the two variables of *basic level education* and *higher education* and the achievements from the *Finnish language test*. The adjusted R-squared combining the two variables of basic level education and higher education was ,256 see table, 13. This meant that 25% of the variation between the schools' mathematical educational outcomes could be explained due to the two variables of basic level education and higher education within the school catchment areas.

Table 13. Regression statistics – Finnish language

Regression statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,426[a]	,182	,161	26,63808
2	,541[b]	,293	,256	25,08097
a. Predictors: (Constant), basic level education				
b. Predictors: (Constant), basic level education, higher eduation				

The two socio-economic variable's *unemployed* and *small income household's* significance value were all above 0.05. Therefore, when investigating the association with Finnish language test, these variables are not significant variables, see table 14.

Table 14. Excluded variables – Finnish language educational outcomes

Excluded Variables[a]						Collinearity Statistics
Model		Beta In	t	Sig.	Partial Correlation	Tolerance
1	Higher education	,334[b]	2,448	,019	,369	,999
	Unemployed	,045[b]	,158	,875	,026	,269
	Small income households	,302[b]	1,297	,203	,206	,380
2	Unemployed	-,235[c]	-,821	,417	-,134	,230
	Small income households	-,253[c]	-,743	,462	-,121	,162
a. Dependent Variable: Mother_language_result_mean						
b. Predictors in the Model: (Constant), Basic level education						
c. Predictors in the Model: (Constant), Basic level education, higher education						

5.4.3 Conclusion of the correlation results

It is evident that the educational results regarding the Finnish language had a higher correlation with the socio-economic data (25%) compared to the mathematical educational outcomes (11%). It seems that mathematical results correlate much less to the socio-spatial indicators than what the Finnish educational outcomes did. This is a common finding throughout previous research and literature. Language skills have proven to be a much stronger correlation to home background, while proficiency in math is more independent of the cultural capital and resources available in their homes.

This analysis only included aggregated explanatory variables, which is why we do not know if the association is about potential contextual effects or "just" selection or composition in the neighborhoods. In low education areas we just have more of those families which only have a low education status, and the resulting lower educational outcomes may thus be a sign of intergenerational effects within the families. However, we must consider neighborhood effects, which would mean that it is not only the pupils own background, but also something in their school or residential context that might have an impact on their outcomes. This study presented a foundation for further research within this topic, where investigating a larger data sample might provide more information about the association between socio-economic variables and the pupils educational outcomes.

6. Conclusions

Based on the findings presented, it is evident that there are notable socio-economic differences between the school catchment areas within the Uusimaa region. These socio-economic differences are not unique only to the Uusimaa region, inequality is increasing in many major European cities, with increasing concerns, since it is understood to threaten social stability (Tammaru et al., 2016). The Helsinki metropolitan area is especially socio-economically diverse, with some of the weakest socio-economic groups, but some of the strongest socio-economic groups as well within the Uusimaa region. The Helsinki metropolitan area and Helsinki in particular, had the highest percentage of highly educated people but the highest percentage of lower educated people as well. This confirms earlier research of an increasing residential and socio-economic segregation in the Helsinki metropolitan area, were education levels are one of the factors contributing to segregation.

The metropolitan area offers many opportunities to obtain a higher education, where the University of Helsinki is the largest provider of higher education in the Uusimaa region. The job market in the Helsinki metropolitan area is assumed to provide a higher percentage of well-paid jobs than rest of Uusimaa, where higher education is required, making the Helsinki metropolitan area attractive for highly educated people to live and work in (Statistic Finland, 2017)

The main purpose from this research was to investigate how the Uusimaa region internally differentiated in relation to socio-economic differences between the various school catchment areas. And it is clear from the findings presented in this research that there are socio-economic differences between the school catchment areas in all of the Uusimaa region, and not only in the Helsinki metropolitan area.

A negative effect that socio-economic inequalities create is the possibility of residents and minority groups living in isolation and "parallel lives" from the wider-society. Public discourses have problematised this negative trend, mostly within the major cities (Laurence, 2016). The eastern part of Helsinki continually stood out as the area with the lowest socio-economic level in the Uusimaa region. Is it possible that a higher percentage of people in eastern Helsinki are living in isolation from the society? The findings from this study and earlier research of the topic are supporting such a claim. But this idea must be investigated and studied in more broader terms to get a better understanding about this dilemma.

Moreover, the trend of an increasing division between household's income in Finland seems to continue. The findings in this study presented spatial differences between the percentage of low income households in the Uusimaa region. Where the highest concentration of low income households in the school catchment areas were in Helsinki with an average of 18%. Statistics Finland's newest statistics on living conditions shows that: "890,000 Finns, or 16.4% of the household population were at risk of poverty or social exclusion in 2017. Most of the people that are at risk of poverty or social exclusion live in low income households, which constituted 12.1% of the population "(Statistic Finland, 2017) The possibility of social exclusion of people in low income households presents a difficult problem, where weaker socio-economic groups diverge even further from the rest of the society. This negative trend could also be affecting their children and their education negatively.

What kind of structures are contributing to this social inequality in Helsinki or other major cities? The four key factors often discussed in structural theory is: *social inequality*, *changing economic structure*, *welfare system* and *housing system*s (Tammaru et al., 2016). Research continues to provide findings that indicate the relationship between the housing system and the

negative impact of the gap between rich and poor in different socio-economic groups (Wind & Dewilde, 2019). These economic gaps will most likely continue to increase between homeowners and renters, hence increasing the inequality between these two groups (Turner & Luea, 2009). But one must consider that the concept of a renter is broad and consists on many levels. Some are forced in to renting due to economic reasons and some are renters by choice. Due to the high rents, many communities composed of rented houses constitute a strong economic group. This fact is especially true in popular and central areas of the major cities as well in many new rise areas.

Finland is often referred to as successfully implementing social integration policies. Where the typical Finnish approach consists of housing complexes with buildings dedicated to accommodating many different uses like, student's accommodation, social rental housing and supported housing for elderly. But less successful areas in Finland does exist, and in Helsinki in particular, with neighborhoods consisting of a high concentration of municipal rental housing which pre-date the introduction of social mix policy that Helsinki is applying today. The policy of creating neighborhoods with different kinds of facilities is becoming more common in Finland, where private rental, municipal rental and tenant ownership facilities are being built in the same areas (Housing Europe, 2017).

But are mixed housing policies enough to stop the ongoing socio-economic segregation, and the difference in socio-economic levels among the school catchment areas found in this study? Many theoretical models exist with the purpose of investigating the dynamics of neighborhood's and how it might affect the residents. A group of models commonly used to explain this phenomenon are "Epidemic" models' suggestion that residents who are exposed to their neighbors who engage in negative behaviors will be more likely to engage in such

behavior themselves (Settersten, 2019). Hence, the importance of creating more dynamic and mixed neighborhoods to hinder these negative trends.

An important factor in this master thesis was to investigate the relationship between educational outcomes and socio-spatial segregation in the Uusimaa Region. This study focused on the first-year pupils. Research suggests that socio-economic effects on the pupils educational outcomes will show later in their schooling. But it was of interest to investigate if these effects of socio-economic factors already showed in the educational outcomes for the first-year pupils. Studies show that negative segregation effects are stronger for children than adults, hence the importance of investigating this at an early stage of the schooling (McArdle & Acevedo-Garcia, 2017). This negative trend will likely continue throughout their schooling, and therefore, it might be of importance to investigate this at the beginning of the pupils schooling.

A link between educational outcomes and socio-spatial segregation in the Uusimaa region where found in this study. But how strong was the relation between them? The data sample was small and consisted of 41 out of 337 schools that were mapped out in this study. The sample was still large enough to find a correlation and promote further research in the topic. The correlation results showed that the educational results for the finnish language had a higher correlation with the socio-economic data, explaining 25% of the school's variation compared to the mathematical educational outcomes, who explained 11% of the variation between the schools.

Basic level education and *higher education* were the two socio-economic variables that were significant to the association with the educational outcomes presented in this thesis. We know from the data presented in the finding's section that there was a substantial unevenness of

education levels between the school catchment areas in the Uusimaa region and between the four geographical areas that were compared in the findings chapter, see table 1 and 2.

Table 1 presented a difference of the percentage of people with only a basic level education between the four geographical areas. For example, in Helsinki were only 21% of the people in the school catchment areas only had a basic level education on average compared to the KUUMA area, were (13,55%) only had acquired a basic level education. The standard deviation was close to 7 for the four geographical areas, which explains an unevenness in the areas as well.

An even higher unevenness was found in the percentage of people with a higher level education, see table 2. Where the average in Helsinki was 21% compared to Uusimaa outside of the KUUMA are who had 3,7% on average. What could the possible long-term outcomes of this difference in education levels in the Uusimaa region be? The findings proved that there was a significant association between the education level in the school catchment areas and the educational outcomes of the students. What could be the possible outcomes if this unevenness continues to increase? Studies presented in this thesis points out that neighborhoods with high averages of social allowance were predicted to affect negatively years of education (Andersson & Subramanian, 2006). What will happen if this segregation, and the divisions between school catchment areas within Uusimaa continue to increase? We know that a policy regarding social mix is implemented in Helsinki when new areas are being developed for this very reason of preventing this, but how well does it work in reality? And what about the already existing segregated areas in the Uusimaa region?

Moreover, what relation could socio-economic segregation, school segregation and school choice possibly have? Research shows that the parents who take advantage of school choices

more often are in a higher socioeconomic group than those parents that don't (Pareliussen, André & Hwang 2019). There might exist many reasons to why, but knowledge, confidence, possibility to drive their kids to other schools and stronger networks might be some of the reasons. Moreover, School choices seems to have a strong association with the socio-economic and ethnic characteristics of both the geographic catchment area and the schools themselves (Bernelius & Vaattovaara, 2016). Findings in this thesis presented a socio-economic geographical inequality between the school catchment areas in all the Uusimaa region, not only in the Helsinki metropolitan area. It seems that socio-economic inequalities might affect school segregation and school choice with subsequent negative effects on the pupils educational outcomes.

The results show that socio-spatial segregation in the Uusimaa region is significant and affects the pupils educational outcomes already as they start school. And in conclusion, it is safe to assume, based on the findings from this study and the theory behind, that the socio-economic differences found between the school catchment areas in the Uusimaa region in this study do exist, but how the socio-economic differences between the school catchment areas actually affect the pupils and their educational outcomes are still mostly unknown. This issue suggests the need for more research and a deeper understanding of this phenomenon within the Uusimaa region.

It would be of great interest to study a larger quantity of socio-economic variables in the Uusimaa region outside of the four presented in this study. It would also be interesting to investigate other regions in Finland for future research. A larger dataset of educational outcomes with students in high school age would also be suitable, in order to get a better understanding of the topic. It could be of interest to find out more about the students and their

parents thoughts and opinions about their educational outcomes and the factors behind. Students from other age groups might also give add to the understanding of this phenomena as well.

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